International Energy Agency

Secure • Sustainable • Together

# Eastern Europe, Caucasus and Central Asia





Energy Policies Beyond IEA Countries

## INTERNATIONAL ENERGY AGENCY

The International Energy Agency (IEA), an autonomous agency, was established in November 1974. Its primary mandate was – and is – two-fold: to promote energy security amongst its member countries through collective response to physical disruptions in oil supply, and provide authoritative research and analysis on ways to ensure reliable, affordable and clean energy for its 29 member countries and beyond. The IEA carries out a comprehensive programme of energy co-operation among its member countries, each of which is obliged to hold oil stocks equivalent to 90 days of its net imports. The Agency's aims include the following objectives:

- Secure member countries' access to reliable and ample supplies of all forms of energy; in particular, through maintaining effective emergency response capabilities in case of oil supply disruptions.
- Promote sustainable energy policies that spur economic growth and environmental protection in a global context – particularly in terms of reducing greenhouse-gas emissions that contribute to climate change.
- Improve transparency of international markets through collection and analysis of energy data.
- Support global collaboration on energy technology to secure future energy supplies and mitigate their environmental impact, including through improved energy efficiency and development and deployment of low-carbon technologies.
- Find solutions to global energy challenges through engagement and dialogue with non-member countries, industry, international organisations and other stakeholders.

**IEA member countries:**

Australia
Austria
Belgium
Canada
Czech Republic
Denmark
Estonia
Finland
France
Germany
Greece
Hungary
Ireland
Italy
Japan
Korea
Luxembourg
Netherlands
New Zealand
Norway
Poland
Portugal
Slovak Republic
Spain
Sweden
Switzerland
Turkey
United Kingdom
United States

The European Commission also participates in the work of the IEA.

International Energy Agency

Secure • Sustainable • Together



**International Energy Agency**
9 rue de la Fédération
75739 Paris Cedex 15, France

*www.iea.org*

International Energy Agency

Secure • Sustainable • Together

# Eastern Europe, Caucasus and Central Asia

Energy Policies Beyond IEA Countries

# FOREWORD: INTERNATIONAL ENERGY AGENCY EXECUTIVE DIRECTOR

I am delighted to introduce this compendium of energy policy reviews for eleven countries of Eastern Europe, the Caucasus and Central Asia.

Armenia, Azerbaijan, Belarus, Georgia, Moldova, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Ukraine and Uzbekistan all declared independence over two decades ago and embarked on sovereign development and growth based on their natural potential. Since gaining independence, however, political and economic developments in these countries have been asymmetrical, with some countries maintaining regulated structures and others designing more liberalised economies, depending on their political and economic goals. Examples of these diverse developments include the Association Agreement with the European Union signed by the governments of Georgia, Moldova and Ukraine in June 2014; the Eurasian Customs Union formed by Kazakhstan and Belarus with the Russian Federation in January 2010, soon to be joined by Armenia and possibly Kyrgyzstan and Tajikistan; and the declared permanent political neutrality maintained by Turkmenistan.

Developments in these countries' energy sectors have also been uneven. Endowed with abundant hydrocarbon reserves, the region is emerging as an important contributor to global energy supplies and therefore to world energy security. The producing countries in the Caspian Sea region have significantly expanded their oil and gas outputs to international markets over the past two decades, while the region's substantial but largely untapped hydro, renewables and energy efficiency potential offers the possibility for sustainable development and further growth. I therefore believe that the time is ripe to take stock of developments to date and to review the aims of the medium- and long-term energy policies of the countries in this important region.

This publication, the first regional review in the IEA series Energy Policies beyond IEA Countries, evaluates energy policy developments in Eastern Europe, the Caucasus and Central Asia. This report focuses on key policies related to energy security, market design, sustainable development and investment climate, corresponding to the four pillars of the INOGATE framework, one of the oldest energy technical assistance programmes funded by the European Union and promoting regional energy co-operation since 1996.

This report presents the results of the two IEA-led peer review cycles conducted with INOGATE partner countries' government designees and the INOGATE Technical Secretariat during 2013 and 2014 under the INOGATE Programme. The peer reviews involved extensive meetings with relevant government authorities, as well as with key public and private energy stakeholders in each country.

The International Energy Agency is most grateful to the European Union for the financial assistance provided through the European Neighbourhood and Partnership Instrument that made this review and its publication possible, as well as to the INOGATE Technical Secretariat and the governments of the INOGATE partner countries for their constructive co-operation and participation in the peer review process.

This report is published under my authority as Executive Director of the IEA.

Maria van der Hoeven
Executive Director
International Energy Agency

# FOREWORD: EUROPEAN COMMISSIONER FOR NEIGHBOURHOOD AND ENLARGEMENT NEGOTIATIONS

Energy is at the core of sustainable development, and the European Union has been promoting the development and implementation of energy security strategies worldwide. These strategies are aimed at balancing economic development with environmental sustainability, while respecting social values.

This is particularly important for the neighbours of the European Union: Eastern Europe, the Caucasus and Central Asia (EECCA). These countries are experiencing numerous challenges in the field of energy, such as the need to modernise energy infrastructure, rising public debt, concerns about security of supply, a lack of established strategies for energy efficiency, and the need for robust demand management. A well-developed national policy framework, targeted investments, and improved energy management practices are needed to satisfy the growing demand for energy in an environmentally sustainable way.

In the framework of the European Neighbourhood Policy and the Eastern Partnership (the joint initiative launched in 2009 among the European Union, EU countries and the Eastern European partner countries), the European Union has supported reforms aimed at strengthening energy security in the partner countries. The activities under the Eastern Partnership platform on energy security have contributed to enhancing framework conditions and solidarity, and to supporting infrastructure development, interconnections and diversification of supply. Moreover, they helped to promote energy efficiency and the use of renewable resources, and to link regulatory frameworks and energy policies.

This compendium publication provides highlights of the energy policy reviews of eleven countries in Eastern Europe, the Caucasus and Central Asia, including an overview of the status of reforms in each of the countries and key recommendations for energy policy makers. Energy policy reviews focus on each country's developments in improving overall energy security and promoting domestic and regional market convergence, sustainable energy and attracting necessary investments.

The European Union has joined forces with the International Energy Agency and the INOGATE Technical Secretariat to support the progress of Partner Countries in achieving energy reforms, thus the work presented in the following pages is the product of fruitful and ambitious international co-operation. The INOGATE Programme has been one of the main development and co-operation instruments used to deliver the goals set under the Baku Initiative (2004) and the Astana Energy Roadmap (2006), which focused on security of supply, energy market convergence, sustainable energy, and investment attraction. In addition, the European Union has been supporting countries that signed the EU Energy Community Treaty (Ukraine and Moldova) to implement it, and candidate countries (Georgia) to make the necessary reforms that would allow them to join the Energy Community.

Looking to the future, the European Union is committed to continuing its regional support to participating countries by assisting them to define and implement sound, result-oriented energy policies. This support will enhance the know-how needed to ensure that reforms have a real impact on the ground, improving the well-being of local communities. This comprehensive status report will be crucial to shaping, driving, and measuring this support in the long term.

Johannes Hahn
Commissioner for Neighbourhood and Enlargement Negotiations
European Commission

# TABLE OF CONTENTS

# List of figures, tables and boxes

## FIGURES

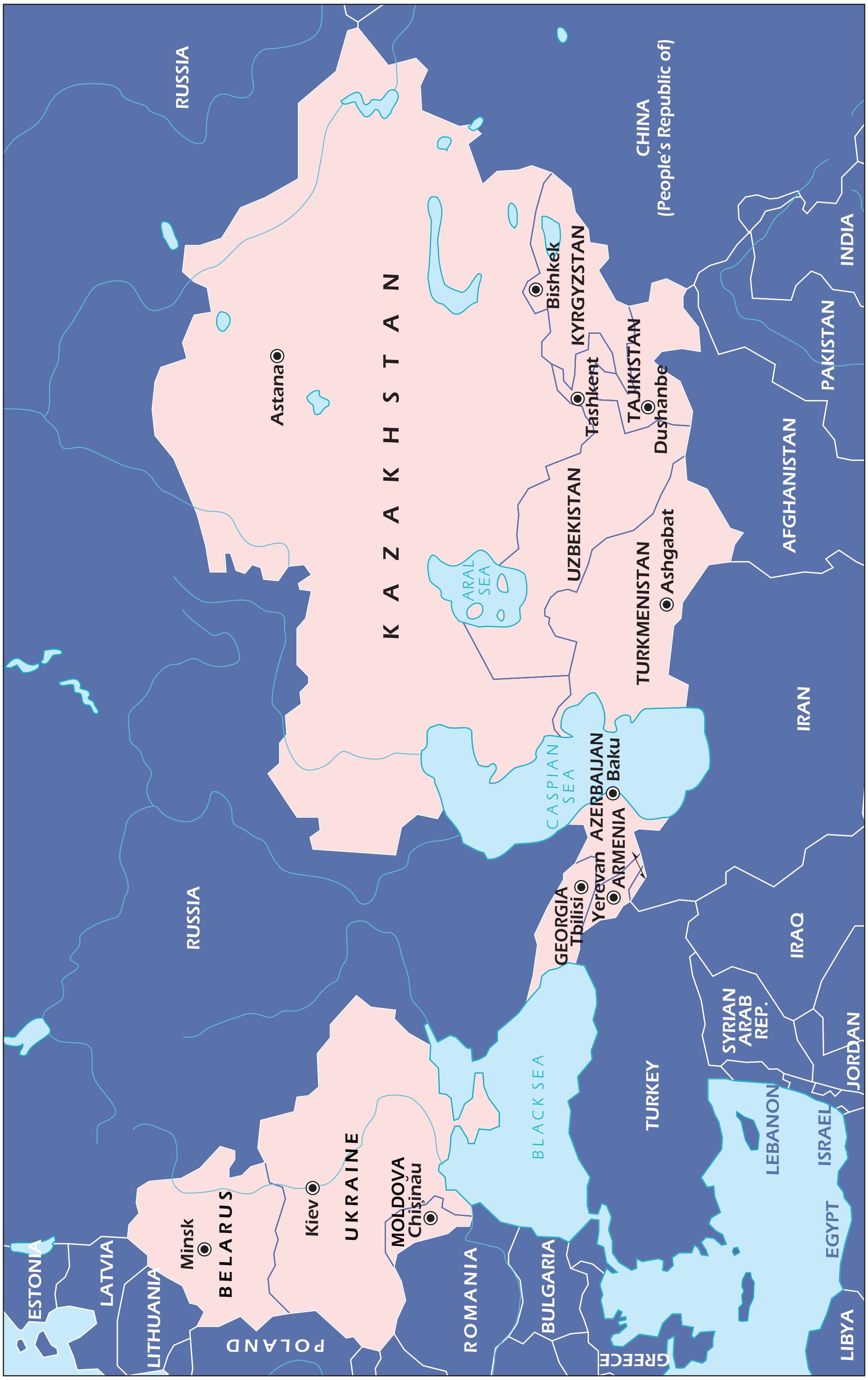
## TABLES



## BOXES

# EXECUTIVE SUMMARY

**Figure ES.1** Map of Eastern Europe, Caucasus and Central Asia (EECCA)




This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries, and to the name of any territory, city or area.

# EXECUTIVE SUMMARY AND KEY RECOMMENDATIONS

## EXECUTIVE SUMMARY

Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Tajikistan, Turkmenistan, Ukraine and Uzbekistan (collectively referred to as the countries in Eastern Europe, the Caucasus and Central Asia [EECCA]), cover a large geographic area of approximately 5 million square kilometres across central Eurasia, with a total population of 140 million.

More than two decades after the break-up of the Soviet Union into 15 sovereign states with their declarations of independence, the levels of national sovereignty and the political and economic structures of these countries vary. They all have significant ethnic, historical and economic differences, and vary in size, geopolitical location, energy endowment, economic outlook and developmental milestones and prospects. However, they all share a recent Soviet past, from which they have inherited significant similarities in national economic design, governance structure, public institutions and infrastructure.

The post-Soviet period began with heavily interlinked industries and infrastructures, and fully integrated regional systems, preventing the newly independent states' functioning autonomously from one another. Augmented by the fact that their economies had been centrally governed during the Soviet era, none of these countries had the ability to master the full administrative spectrum of their internal or external affairs and were thus left with sovereign authorities that had no leverage over the neighbouring economies with which they were so strongly linked.

Physical, economic and institutional dependence on Russia, as heir to the Soviet legacy, became stronger and more inevitable for some of these countries, while in others nationalistic movements took a high toll on efforts to secure independence and self-sufficiency. Indeed, the region continues to see numerous conflicts, civil wars and disconnections from neighbouring economies, in addition to the political and economic challenges to building national economies on existing common structures.

With political and economic developments in the region, a diversity of regional preferences continues to emerge, based on each country's political and economic interests and aspirations. The countries east of the Caspian Sea have substantially strengthened economic and trade ties with markets in Asia; Moldova, Ukraine and Georgia signed an EU Association Agreement in June 2014; and Kazakhstan and Belarus opted to establish the Russian Federation-led Eurasian Customs Union in 2010, joined by Armenia from January 2015 and soon to be joined, Kyrgyzstan and possibly Tajikistan.

Throughout these transformations, the energy sector suffered the most of key segments of the economy in all the newly independent states. The energy markets that were originally set up to suit the overall Soviet planning were no longer effective. This was particularly evident for fixed energy infrastructures, designed to serve regional energy markets in the most rational way, which in some cases meant that countries had to cross the boundaries of their neighbouring countries to supply remote parts of their own territories. One of the most illustrative examples is the Central Asian Power Grid, which was built to serve all five republics in the region and continued functioning after independence, overlooking the new economic and political realities. The former barter-exchange arrangements for operating hydro plants in irrigation mode were no longer economically feasible for countries upstream in the Syr Darya and Amu Darya river basins. Replacement fuels, offered at world market prices, were not feasible options for economically depressed hydro-rich countries, which opted to develop their own natural potential for further growth and prosperity. These developments prompted further political tension in the region and resulted in the Central Asian economies isolating their energy systems, moving away from a regional market set-up by consolidating their domestic power transmission systems in a bid to maintain higher levels of energy supply security. Non-payments and disconnections from the regional system gradually challenged routine operations in the Central Asian Power Grid and caused system disturbances across the region.

Malfunctions in the previously centrally governed system operations at national level also became apparent from the outset. Energy systems became largely disordered in an attempt to nationalise previously commonly held assets. The energy companies were split into two segments: decision-making authorities that became the basis for energy ministries, and commercial operators, which were initially set up as vertically integrated national energy companies. In the region – with the exception of Azerbaijan, Belarus, Tajikistan, Turkmenistan and Uzbekistan – national energy (electricity and natural gas) companies have undergone numerous waves of restructuring, commercialisation and/or privatisation procedures in an attempt to legally and/or commercially unbundle the energy sectors.

As a result, the national electricity generation and distribution companies in Armenia, Georgia, Kazakhstan, Kyrgyzstan, Moldova and Ukraine have been privatised and sold to national or international investors in a bid to safeguard system operability, whereas transmission systems largely remained state-owned commercial operators. As for the natural gas sector, in almost all import-dependent countries the majority of supply, transmission and distribution assets slowly relapsed to the ownership of a single supplier, Russia, which gradually regained the previously owned systems as debt payments for unpaid gas supply across the region. In the case of the transit pipelines, Russia set up majority-owned joint ventures for transit/cross-boundary pipelines with most of the transit pipeline asset-owning countries. Only newly built oil and gas export pipelines fall outside this established pattern and therefore have different ownership structures.

Pricing policies have moved from the ministries of economy either to sector ministries or to the dedicated regulatory agencies. These developments, in countries like Armenia, Georgia, Kazakhstan, Moldova and Ukraine, resulted in independent regulatory agencies in the mid to late 90s, with more elaborated market structures, market rules and tariff-setting methodologies. These early developments, however, did not provide enough footing for these newly established institutions to strengthen the development of energy markets. In the mid to late 2000s (2006-08), a similar pattern was observed in all these countries, where governments interference in directly engaging with the electricity companies jeopardised the independence of the regulators, which were left to merely approve the tariffs dictated by direct contracts between the government and the energy companies. Recently, however, governments have been revising tariff structures, methodologies and set-ups in an attempt to relinquish their direct arrangements with energy companies and restore the independence of the regulatory authorities.

In countries where the government continues to set energy prices, at least one form of energy is subsidised. Pricing structures kept below cost-recovery level therefore do not attract investment to the sector, which in most cases is further encumbered with aged infrastructure in urgent need of upgrades and/or new, efficient system instalments. The energy subsidies, coupled with heavy public sector indebtedness in most of these economies, resulted in the energy sector inability to generate adequate financial resources to maintain aged infrastructure at the necessary technical standards; most upgrade programmes are carried out as part of government-guaranteed long-term loans from international financial institutions. These practices further prevented energy system self-sufficiency, instead leaving many at the edge of collapse. Urgent and severe structural changes and reforms are required for the robust restructuring and revitalisation of the sector.

New developments in the upstream oil and gas sector in hydrocarbon producing countries, mainly in Azerbaijan and Kazakhstan, are clear exceptions from these practices. In these countries, the interests of the world's major oil and gas companies have resulted in foreign investment in both exploration and production, and in the construction of new transport infrastructure.

## TRENDS IN ENERGY POLICY DESIGN AND GOVERNANCE

More than two decades since gaining independence, most of the reviewed countries continue to focus on current affairs and very little attention is being paid to formulating well-elaborated medium- to long-term overall energy policy directions and related strategies, or policy-implementing mechanisms, in line with the countries' long-term economic outlooks. Setting up fully functional domestic energy markets and maximising full energy potential have proved challenging since independence and continue to remain the key focus for many governments in the region.

The current trends in energy policy design in almost all the countries remain supply side prone, based mostly on segmented sector developmental plans. Some countries, like Kazakhstan and Moldova, have aligned ambitious targets for energy sector development with their general economic outlook and developmental goals. Meanwhile, the long-term energy policy directions of Belarus, Turkmenistan and Uzbekistan continue their paths of planned developments, aimed mainly at the system reliability, planned growth and reduction of energy intensity of their respective economies. Armenia and Kyrgyzstan require further elaboration on their approved energy sector development concepts, whereas Azerbaijan, Georgia and Tajikistan need to replace their dated energy sector strategies with new medium- to long-term strategies to implement their declared sustainable development goals. Ukraine's recently updated energy strategy to 2030, approved in June 2013, also needs to be revised to adapt to new realities, elaborating on the pressing need for swift restructuring and robust energy sector reforms.

In policy design, most countries appear to continue setting their energy policy preferences based on annual GDP growth targets rather than on actual energy statistics-based growth potential or sector performance patterns. This policy design approach neglects the substantial improvements made by all reviewed countries in energy statistics data-gathering in recent years; in fact, most countries have moved to producing their energy balances in an internationally recognised format. Nonetheless, energy statistics are predominantly used for recording historical developments rather than for developing sound energy policies and projections, mainly due to the lack of analytical personnel in the public sector capable of interpreting statistics data for policy makers.

Further, the emphasis in energy data collection remains on the supply side even though there is a strong need for accurate demand-side data collection, management and integration in the national energy balances. The other obvious gap in data collection is countries' inability to collect comprehensive and all-inclusive information on the use of renewable energy sources and off-grid developments. This information is vital to comprehensive energy policies which would take into account all current and prospective developments in the energy sector and lead to sound and sustainable strategies with various energy mix options. To collect demand-side and renewable energy data in these countries, the combined efforts of central and local government authorities is needed to design surveys and organise data collection efforts. This co-ordination is currently impossible due mainly to scarce human and financial resources at the national statistics agencies. Placing higher priority on this important and long-needed endeavour would maximise energy efficiency gains, boost renewable energy developments and move sustainable energy development agendas forward.

Most of the countries appear to have a large body of energy sector legislation in place, but its implementation remains challenging. This is due in most cases to a lack of well-elaborated secondary legislation, detailing rules and procedures for sector governance alongside concerns for rule of law. In addition, legal acts appear to be regularly amended without subsequent changes being made to other related acts, leaving them vulnerable to multiple interpretations and shadow practices.

Sector governance is often spread across multiple authorities, and the lack of a clear division of power, the presence of hybrid regulatory practices and monopolistic market participants are often cited as factors in non-performance or delayed developments. Countries like Georgia and Moldova, using one-stop-shop structures for investment-related permits and operational matters have clearly benefited from simplified procedures.

## ENERGY ENDOWMENT AND DEVELOPMENT POTENTIAL

The reviewed countries in Eastern Europe, the Caucasus and Central Asia share abundant hydrocarbon, hydro and renewable energy-resource wealth, concentrated around the Caspian and Black Sea basins. Giant oil and gas fields – such as Absheron, Azeri-Chirag-Guneshli and Shah Deniz in Azerbaijan; Karachaganak, Kashagan and Tengiz in Kazakhstan; Galkynysh, Shatlyk, South Gutliyak and South Iolotan in Turkmenistan; and Gazli, Kokdumalak, Shakhpakhty and Shurtan in Uzbekistan – place the Caspian region among the richest worldwide with proven oil and gas reserves. Kazakhstan and Ukraine also possess large coal deposits and Belarus is rich in peat, while Tajikistan, Kyrgyzstan and Georgia top the list of countries with ample hydro resources, of which only 6%, 12% and 18% respectively are utilised for power generation.

These regions are also considered rich in unconventional oil and gas reserves, although only Ukraine and Uzbekistan have started exploring their shale oil and gas potentials. Kazakhstan and Uzbekistan also have large uranium and rare earth deposits and remain among the largest uranium suppliers to world markets. The exact potential for renewable resources in these regions has yet to be fully assessed; however, current projections and renewables mapping, put in place by number of these economies, provide promising forecasts.

In addition to sizeable alternative and renewable sources of energy, the region's potential for energy efficiency gains is vast and remains largely untapped in all the reviewed countries. The contribution of modern renewables also remains marginal across the regions, hindered mainly by the energy sector's inability to attract investors due to evident price competition from other energy sources and conventional fuel industry resilience. Raising public awareness on the tangible benefits of energy efficiency and renewable energy would boost the deployment of modern energy-efficient and renewable energy technologies and spur the penetration of variable renewables in the power systems.

Energy consumption in the region is moderate and growing, as standards of living and economic growth improve after the post-Soviet trauma and the more recent global financial crisis. Government policies on energy consumption and the energy mix determine the volumes available for export and energy export policies. The primary energy mix is unlikely to change drastically in the near to long term as little progress has been achieved towards more sustainable energy use. However, some countries in the region have set ambitious goals for renewable energy and primary source diversification, principally Kazakhstan with its goal of having a 50% share of alternative and renewable sources in its primary energy mix by 2050, while Azerbaijan, Georgia, Moldova and Ukraine are aiming at their declared energy efficiency and renewable targets for 2020. Azerbaijan has achieved a significant decrease in energy intensity in all sectors of its economy thanks to the replacement of oil with natural gas and the installation of new energy-efficient technologies in electricity production. Meanwhile, those countries party to the Russian-led Customs Union are increasingly considering installing new,[1] or expanding existing,[2] nuclear capacity to enhance their primary energy mix.

The region is conveniently located for the world's largest and fastest-growing energy markets to its west, east and south. Past developments in the region's energy exports have favoured exporting energy resources from the western shores of the Caspian Sea and of the Black Sea region to markets in the West, while the eastern part of the Caspian Sea is expanding its exports to East and Southeast Asia.

Recent developments in Ukraine, including the reduction of Russian gas deliveries to Europe via Ukraine, have created a renewed interest and momentum for Central Asian gas deliveries to European markets through various potential Southern Corridor "projects of common interest" (PCI), initially considered to come on board at a later stage, beyond 2020. The advantages of Turkmen gas deliveries to Europe have been long anticipated, the multiple benefits of which include the potential for sizeable gas deliveries to European markets as well as a potentially different pricing structure, should construction of the transport infrastructure be developed as an open-access independent business venture, non-contingent to upstream investments with clear and transparent capacity booking mechanisms.

Another noteworthy development, observed initially in Uzbekistan and later in Turkmenistan, is the advanced growth of a downstream petroleum sector where natural gas is used as a direct feedstock for fertiliser and petrochemical ventures, end-product exports aimed at the fastest growing Asian markets. These developments are likely to lead to more direct foreign investment in the region, further aiding regional development and growth.

## ENERGY SECURITY

Energy resource-rich countries in Eastern Europe, the Caucasus and Central Asia are emerging as important contributors to global energy supplies and to world energy security. The region has significantly expanded its oil and gas exports to international markets since the early 1990s, and Azerbaijan, Kazakhstan, Turkmenistan and, to a lesser extent, Uzbekistan all have the potential to increase hydrocarbon production, while the region's hydropower export potential is largely untapped. Increases in output are encouraged by an increasing range of export routes and markets, first for oil and more recently for gas, reducing reliance on export routes through Russia. Central Asian oil and gas exports to China are delivered by multiple pipelines, while exports to markets in the south (Afghanistan, Pakistan and India) as well as to the west, towards European markets, are currently under consideration.

**1.** Kazakhstan and Belarus.

**2.** Armenia.

In the region's import-dependent countries, diversifying import sources and routes to minimise dependence on one single source has become a priority. Supply shortages in these countries follow distinctive cycles, in most cases occurring during the winter months when heating needs increase or when the water levels in large hydro dams are low. Although these recurrent supply shortages indicate a need for reliable primary or alternative fuel storage structures, this costly option has not yet been considered as a measure for enhanced energy security. Stored fuel would inevitably ease the strain by offering an easily accessible fuel-switching alternative to meet regular supply shortages. The most import-dependent countries could store their indigenous energy resources (i.e. domestically produced coal, natural gas or refined heavy fuel) for use in times of imported-fuel shortages, but the absence of regulatory mechanisms and pricing structures impede putting necessary arrangements in place. The previous Soviet regime imposed compulsory fuel storage requirements for thermal power generation enterprises, which in some countries were kept until recently but then relinquished for either technical or financial reasons related to accumulated storage debt.

Recent developments in Ukraine have drawn attention to the importance of sound emergency response procedures, with well-elaborated demand restraint programmes for import-dependent countries. Although industry is able to deal with wide-ranging, short, technical faults in the system, backed by reliable technical procedures, a larger supply-disruption response mechanism is yet to be put in place in most import-dependent countries in the region.

Access to energy, according to the standard indicator measuring electrification rate (i.e. access to electricity), is very high in the reviewed countries in Eastern Europe, the Caucasus and Central Asia. Their rating of above 99% dates to Soviet times when electrification was of the utmost importance. However, there is strong evidence that, despite such a high electrification rate, access to modern energy services is limited in some countries, particularly outside large cities and in the remote regions where incomes are generally lowest. Average electricity consumption per capita in the residential sector in the region is low and there are regular incidents of load-shedding and brownouts, particularly in the South Caucasus and Central Asia. These incidents in import-dependent countries are due mostly to generating-fuel shortages in the supply countries. For example, low reservoir levels and poor hydrological conditions in Kyrgyzstan and Tajikistan provoke electricity shortages and cut-offs during the winter months.

There are two major barriers to energy access observed in the reviewed regions: reliability of energy supply and affordability. Poorly maintained Soviet-era infrastructure is the main obstruction to supply reliability, and investment funds are limited by prices that are below cost-recovery levels in some Central Asian economies. Yet even these subsidised prices can create difficulties for consumers, resulting in increased non-payment for electricity. While collection rates for household customers have increased substantially with widely metered energy supplies, they have dropped just as significantly for the public sector, especially in Central Asia where state-owned enterprises remain the largest debtors.

The energy policy reviews show a considerable increase in the installation of individual meters, which allows for individual disconnections and a rise in collection rates. There are substantial improvements in keeping technical and commercial losses to a minimum within the technically allowable standards across the region, which also suggests a decrease in illegal connections to the grids.

Many low-income rural households across the reviewed regions still lack access to clean, affordable fuels for cooking and heating, and they often rely on traditional biomass (straw, wood or coal) for open-fire cooking. Countries with traditional biomass potential are developing forest cadastres and management systems to prevent the degradation of local biomass resources.

The use of other renewables for energy similarly suffers from inaccurate accounting. This makes it difficult to assess the need for the decentralised deployment of renewable energy technologies, which in many cases could be a way to alleviate energy poverty and to support the provision of (or access to) modern energy infrastructure.

Although levels of electrification and access are high, the energy infrastructure itself is aging and requires a high level of maintenance, modernisation or rehabilitation throughout the energy supply chain. The large capital investments required are particularly difficult to mobilise under the current pricing and regulatory structures in countries where prices remain below cost recovery levels. Fixed energy infrastructures, including centralised district heating systems and natural gas and power transmission and distribution networks, are most at risk: lack of investments resulting in further inefficiencies and loss of capacity over time could put energy security in further jeopardy.

## MARKET CONVERGENCE

The energy policy reviews have demonstrated that the homogeneity often implied among the countries in these regions does not exist in practice. In assessing the regional markets, the review teams observed inverted trends over the two decades of disconnecting from the previously existing regional markets and securing self-sufficiency of domestic energy networks to the extent possible. The trends for each country are dictated by political situation, type of centralised/decentralised economy, and political and economic ties to neighbouring countries. Many countries in the region have little or no co-operation with their immediate neighbours, which has forced them to either internalise their markets or consider harmonising with previously unexplored markets (like Europe, China or the Middle East).

Regional support and co-operation is primarily observed in newly developed energy export infrastructures, which also include transit countries by offering them energy offtakes at a discounted price. Earlier developments in Kazakh and Azeri oil and gas exports to world energy markets have shown exceptional regional co-operation and solidarity. The Baku-Supsa, Baku-Ceyhan and South Caucasus pipelines have provided the way for Caspian resources to reach the world energy markets. Equally remarkable regional co-operation has been observed in moving energy resources of the Caspian from its eastern shores to the Chinese markets. The unprecedented speed in developing an oil and gas export infrastructure from Central Asia to China has dismantled longstanding prejudices over the region's ability to negotiate feasible and mutually beneficial large energy infrastructure projects. This extensive oil and gas export infrastructure to China now encompasses all the countries of Central Asia, offering record export openings to producer countries and offtake potential to the transit countries in the region, in addition to generous economic and social benefits.

Electricity, heat and gas providers in almost all the countries are state-owned, vertically integrated companies dating back to the Soviet era. The transition to a liberal market has been a slow one even for countries with strong policy decisions favouring a free market (e.g. Moldova, Ukraine and Georgia), mainly due to legislative hurdles, poor capacity building and financing problems. Other countries (mainly in Central Asia) have expressed little interest in market convergence and are mostly concerned with tariff subsidies and energy affordability. Energy regulation is most often conducted by the ministries and, as such, consumer protection and tariff methodology are not independently reviewed. Transparency is also weak, with most end-users and investors unaware of the tariff structure and the level of government subsidies.

Overall, the progression to a free market and market-set pricing in the region is still in an early stage, with the exception of the few countries which have signed the EU Accession Agreement and are likely to work towards integration into the EU market.

## SUSTAINABLE DEVELOPMENT

The reviewed region remains highly energy-intensive, reflecting continued gross inefficiency in energy use, as well as climatic and structural economic factors. There is considerable potential for energy savings in all sectors, particularly in district heating, electricity generation and networks, and industry and buildings. If the region were to use energy as efficiently as OECD countries do, primary energy consumption in the Caspian region as a whole would be cut by one-half. How quickly this energy efficiency potential might be exploited hinges largely on government policies, especially on energy pricing (most countries subsidise at least one form of energy), market reform and improved access to financing for energy projects.

With rising energy consumption, governments need to place more emphasis on energy efficiency improvements to benefit from the large untapped potential for improved energy security and economic growth. It is essential that energy efficiency strategies be well integrated into the broader policy framework of economic development. Energy efficiency strategies and related action plans need to ensure a stable source of financing, but energy pricing across the region remains a barrier to investment.

There is a tendency to focus on lower energy intensity targets across the reviewed regions. Energy efficiency targets should be aligned with energy efficiency gains potential, based on solid statistical data on both the supply and demand sides at a sufficient level of disaggregation and modelling. To develop effective policies and to establish baselines for tracking progress, energy supply- and demand-side data should be established and maintained, covering all the sectors and subsectors of the economy.

Energy efficiency governance remains vague in almost all the reviewed countries; a clear definition of the role of local governments in energy efficiency policy implementation is therefore of prime importance. The placement of a dedicated public authority in charge of energy efficiency policies and measures, with licence to oversee the implementation of those policies, could ensure that energy efficiency is a strategic priority and could provide greater co-ordination.

There is also an obvious gap in energy efficiency governance in the transport sector, as it is difficult to establish a government department to oversee energy efficiency policies and measures in this sector. Vehicle markets in these regions are rapidly growing and are often dominated by imported second-hand cars, with a sizeable share being large-engine and fuel-inefficient vehicles. The exceptions to this trend are Uzbekistan, which has well-developed vehicle production, supplying local and neighbouring markets, and Azerbaijan, which has put in place strict fuel efficiency standards that prohibit the use of old and inefficient vehicles. A number of other countries are in the process of implementing higher fuel efficiency standards, resulting in the replacement of dated vehicle fleets from these markets.

Considerable progress in promoting renewable energy in the reviewed regions has been observed. Most countries have put in place detailed strategies and financial support mechanisms (including green tariffs in some cases), and have relaxed investment procedures for renewable energy development. However, these measures did not prove sufficient to reach the expected level of renewable technology deployment. One common barrier to policy implementation is the absence of secondary legislation which would elaborate on legal, regulatory and financial mechanisms and on clear and enforceable technical rules for grid integration. Policy development could also greatly benefit from cost-benefit analysis, considering all renewable resources and available technologies with competitive advantages. This would help governments further develop renewable energy strategies and promote sector development.

**Box ES.1** Potential for saving energy in district heating

The energy savings potential in district heating sectors across the region is one of the highest. In most of the reviewed countries, a significant share of energy used in buildings comes from district heat, and in many cases the heat is produced, distributed and consumed very inefficiently.

Modernising district heating plants and rehabilitating or replacing inefficient combined heat and power (CHP) plants alone could substantially reduce overall primary energy consumption. Further energy savings could be realised by reducing heat-distribution losses, by insulating buildings and by installing metering and thermostats in buildings to discourage waste. Heat is priced at well below the true cost of supply in most countries, but the inefficient use of district heat is only partly due to low prices. Another reason is, especially in the residential sector, end-users not being billed for the actual amount of heat they use because supplies to individual dwellings are not metered. Hence there is little incentive to use heat efficiently or conserve it. Heating tariffs for residential buildings are often based on the size of the apartment, so there is no incentive to limit consumption.

In addition, in large housing blocks it is often not possible to adjust the amount of heat supplied to each apartment. Simply raising prices for heat would therefore make no difference to consumption: people would still need to heat their apartments and higher prices would simply result in many households being unable or unwilling to pay – a common problem in many parts of the region in recent years.

Experience has shown that policies to remove heat subsidies are generally effective only when accompanied by investments in metering and heat-control systems, and by the introduction of billing systems based on the actual consumption of individual households. District heating infrastructure in the region is aged and current pricing policies fail to provide sufficient funds for regular system maintenance and required upgrades. Sector management has also become fragmented, as it remains under the local governance structures in most cases.

The key to maximising energy savings potential in the district heating sector therefore lies in fundamental and all-embracing sector reforms, which should address at least the following: moving tariffs to full cost-recovery levels; installing metering and heat control systems; removing all forms of subsidies from this sector (moving to targeted social subsidy schemes for the most vulnerable); and requiring the system operator to perform system upgrades and rehabilitation.

## INVESTMENT CLIMATE

Investment attraction has been the key focus of governments in the region since gaining their independence. One of the most successful changes in national legislation has been to liberalise fiscal structures to attract much-needed investment. While initially based on project-by-project incentives, most of the countries have gradually moved to more widespread reforms. Lengthy licensing and permitting procedures have been removed, and various types of fiscal holidays are granted for energy-related investments that maintain existing systems or install new energy infrastructures.

Most of the countries in the region have been moving up the World Bank's rankings for "Ease of Doing Business" (in the case of Georgia, improvement has been outstanding); however, foreign direct investment has only been in the upstream and midstream sectors, mainly from oil and gas majors. Investment in fixed energy infrastructure, including upgrades and maintenance, is attained with the help of donor agencies and international financial institutions.

The main impediments to attracting investments for upgrading and maintaining existing systems were tariff structures, where energy tariffs remained below cost-recovery levels, and energy subsidies, which do not provide investors with the opportunity to recoup their investment. Those countries that have undergone a number of cycles of commercialisation and privatisation of their national companies have opted to restructure and sell parts of their energy infrastructures to potential investors in exchange for system rehabilitation and system reliability. Those countries that have opted for regulatory reforms, in addition to privatising their energy sectors, have generated greater benefits for their populations and industry at large.

The other notable pattern across these regions is the absence of government policies on national research and development (R&D). Dedicated scientific and research centres for energy, present in all reviewed countries, remain under the academies of sciences or as part of the technical university frameworks, with very little or no funding for technology research and development. Neglecting this important area also discourages the growth of a new generation of scientists and researchers, and further impedes the scientific and technological research potential of these countries. To invest in R&D is to invest in the future; this untapped potential should therefore be prioritised and scaled up in government policies.

## *KEY RECOMMENDATIONS*

*The recommendations, shared to different degrees with the reviewed countries, include advice to governments to:*

### General energy policy

- ☐ *Prepare a comprehensive sustainable energy strategy for the horizon beyond 2015. Revise/develop medium-to-long-term energy scenarios (to 2030, with the view to 2050) on the basis of a robust assessment of energy supply and demand trends accounting for different energy futures including the potential of renewables and energy efficiency, to strengthen the implementation and frequent update of the energy strategy.*
- ☐ *Maximise the use of existing energy data, identify additional data requirements, take steps to acquire and keep up-to-date the data necessary to develop tools for strategic planning and monitoring the supply, demand and consumption of energy throughout the economy. Consider establishing an analytical centre to interpret statistics and provide modelling for improved policy-making.*

- *Continue sustainable energy policy reforms/development; ensure transparent implementation/enforcement of the energy legislative frameworks; strengthen the rule of law and improve transparency.*
- *Promote research and development activities in most pertinent aspects of conventional, alternative or unconventional energy resources, for smart investments for the country's conventional and alternative energy developments.*

**Energy security**

- *Enhance energy security by increasing both conventional and unconventional production outputs, utilising renewable energy potential and maximising energy efficiency gains; upgrade the energy infrastructure and diversify supplies via interconnections with neighbouring markets.*
- *Modernise the energy supply chain. Encourage investments in infrastructure necessary to improve the sector performance and efficiency of the energy supply chain. Ensure an attractive business climate, a competitive and fair regulatory framework and market-price incentives to mobilise necessary investments.*
- *Develop emergency response mechanisms for oil, gas and electricity supply shortages, with clear indication of the priorities for demand restraint management and authorities in charge for overseeing the process. Consider compulsory alternative fuel storage buildups for import dependent countries for the length of the most critical supply shortage periods.*

**Market convergence**

- *Continue developing an efficient energy market model and support it with an adequate legal and regulatory regime. Review regional market setups as new interconnections develop, and adapt market rules (in line with EU legislation where applicable) to enhance system interoperability and to remove regulatory and trade barriers.*
- *With the objective of fostering regional integration of the energy markets and interconnection, actively discuss the setup of a regional market with neighbouring countries and at international level to improve energy security and overcome isolation of the national energy markets.*
- *In the context of the new market design, strengthen the competencies and the independence of the national regulatory authority and reinforce its role in safeguarding consumer interests, e.g. by creating a consumer board at the regulator and implementing quality of supply regulation with a focus on natural gas distribution.*
- *Develop a comprehensive tariff methodology for electricity and heat tariffs. (Where applicable) consider the gradual phase-out of subsidies over a set medium-term period, with a view to reaching fully cost-reflective tariffs that also allow for planned capital investment. The phase-out of tariff subsidies should be done on the basis of affordability, in conjunction with well elaborated social schemes, targeting support for the most vulnerable customers only until the phase-out is complete.*

**Sustainable development**

- *Introduce a balanced regulatory framework for promoting renewable energy sector development; assess and work towards removing barriers to renewable energy* *technology deployment; ensure a sound, transparent and well-integrated regulatory framework and procedures for grid integration of variable renewables. Broaden public awareness campaigns for tangible, long-term benefits of renewable energy use.*

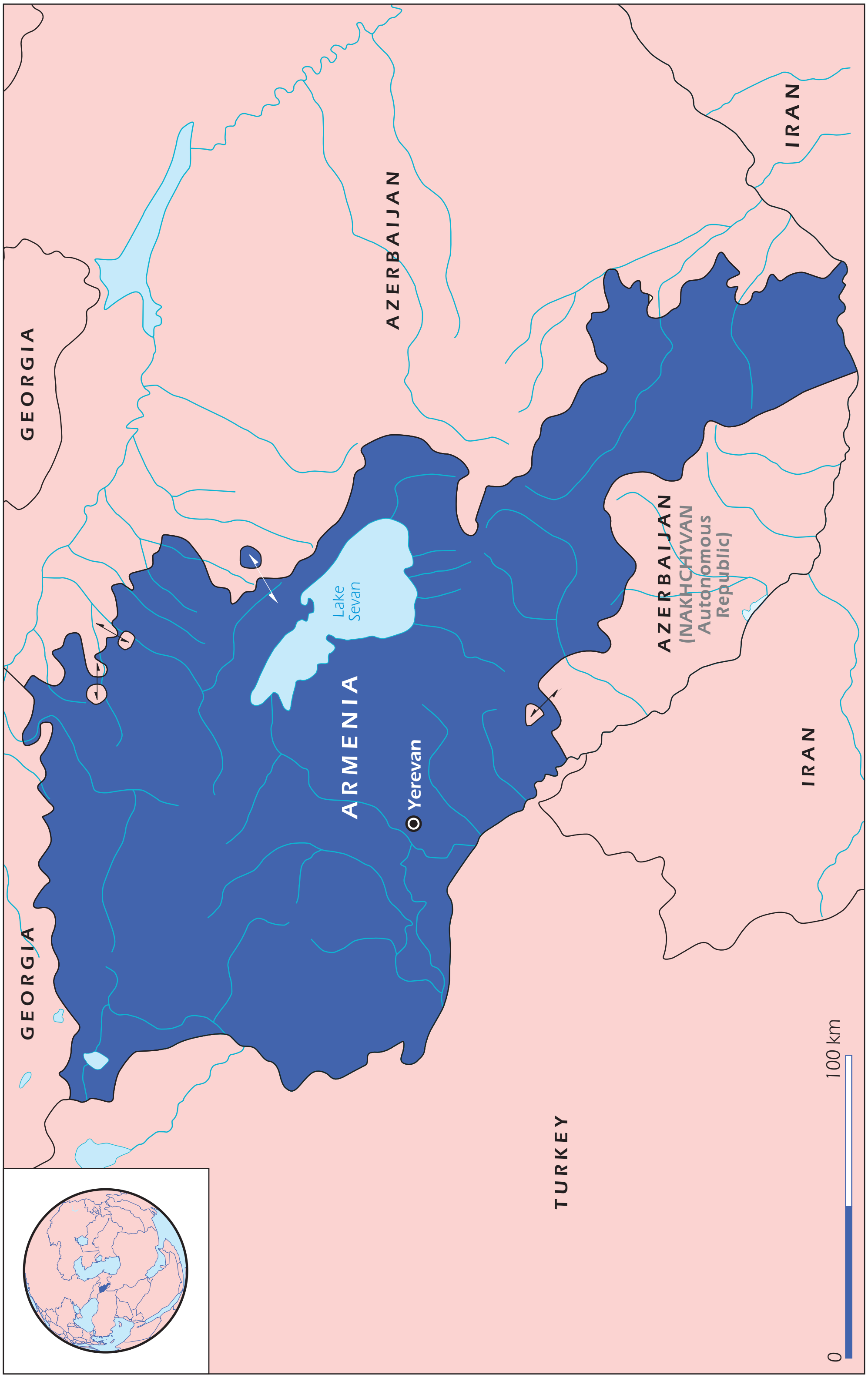
- *Elaborate and/or boost implementation of the energy efficiency plans with regulatory measures to encourage energy savings across all sectors of the economy, particularity in buildings and transport sectors. Introduce adequate tariff structures to incentivise energy savings and building codes for renovation and construction. Scale up efforts for raising public awareness of the benefits of energy efficiency gains and incentive mechanisms and schemes for residential and transport sectors.*
- *Take a lead in coordinating the implementation of energy efficiency measures across the government, e.g. by increasing the role and functions of the energy saving/ efficiency agencies (where applicable) or work towards creating a dedicated public entity in charge of energy efficiency policy implementation. Strengthen initiatives at local and city levels on energy savings and the use of renewable energies and increase awareness of essential energy efficiency measures.*
- *Improve demand side data collection, compilation and use, and encourage the development of energy efficiency indicators to support long-term energy policy planning and monitor progress.*

**Investment attraction**

- *Maintain and/or enhance open, stable, predictable, fair and transparent investment frameworks, with clear procurement rules and procedures and well-defined steps to facilitate investment undertakings and boost effective access to markets. Consider creation of a One-Stop-Shop public entity for managing all investment related affairs.*
- *Encourage and mobilise the investments in infrastructure necessary to improve the performance and efficiency of the energy supply chain. This will require an attractive business climate, a competitive and fair regulatory framework, and market price incentives. Strengthening the rule of law and improving transparency as well as implementing the Energy Community Treaty provisions will further promote investments.*
- *Continue the application of the latest technologies for enhanced oil and gas recovery, opening up new fields for oil and gas exploration and production, assess the country's shale oil and gas potential, and encourage foreign direct investments in country's upstream oil and gas sectors.*

# ARMENIA

**Figure 1.1.1** Map of Armenia




This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries, and to the name of any territory, city or area.

# 1.1. GENERAL ENERGY POLICY

### Key data (2012)

**TPES:** 3 Mtoe (natural gas 64.9%, nuclear 20.3%, oil 12.4%, hydro 6.7%, biofuels and waste 0.3%), +58.3% since 2002

**TFC:** 2.1 Mtoe (natural gas 61.7%, electricity 20.6%, oil 17.3%, biofuels and waste 0.4%, coal 0.1%), +93.9% since 2002

**TFC per sector:** residential 31.1%, transport 24.9%, commercial 22.9%, industry 21.1%

**Electricity generation:** 8 TWh (natural gas 42.3%, hydro 28.9%, nuclear 28.8%), +45.6% since 2002

**Heat generation:** 0.1 PJ, -94% since 2002

**Energy intensity:** 0.15 toe/USD 1 000 GDP PPP, -18.6% since 2002

## COUNTRY OVERVIEW

The Republic of Armenia (Armenia) is a land-locked country in the southern Caucasus region, located between the Black and Caspian seas, bordered by Turkey on the west, Georgia to the north, Azerbaijan on the east and Iran to the south. The country is approximately 29 800 square kilometres in size with a population of 3.1 million. Yerevan, the capital, is the largest city with about 1.1 million inhabitants.

Armenia's economy has undergone numerous reforms since an economic crisis in the early to mid-1990s. It has evolved from a Soviet-era centralised structure to a partial market-orientated economy. Most enterprises have been privatised. An influx of foreign capital and funding from donors over the past 15 years has contributed to healthy economic growth (World Bank, 2014). Armenia's real gross domestic product (GDP) increased 6.9% per year from 2002 to 2012 (measured in US dollars [USD] with purchasing power parity [PPP] at 2005 prices). Real GDP per capita was USD 6 500 in 2012, which is double the value in 2002.

Armenia's economy is exposed to price and demand fluctuations due to its reliance on export-orientated industries and high remittances from Armenian diasporas. Remittances accounted for 12% of GDP in 2011 (World Bank, 2014). During the global financial crisis, Armenia's real GDP fell 15% and poverty levels increased from 27% in 2008 to 35% in 2011. Targeted social expenditures and pension increases are expected to reduce poverty levels as economic growth returns (World Bank, 2014).

Lacking indigenous resources, Armenia imports natural gas and oil for most of its energy needs (around 75% of total energy supply), mainly from the Russian Federation (Russia). Natural gas is imported from Russia via a pipeline through Georgia. Armenia also imports gas from Iran through a barter agreement under which it exports electricity.

Electricity is traded with Georgia, though the volumes are low since their networks are not synchronised. Energy interconnections with Azerbaijan and Turkey are inactive due to political impasses.

Prompted by a severe electricity supply crisis in the mid-1990s, Armenia has revamped its energy sector over the past 20 years. Parts of the sector have been privatised, some companies have been restructured, most households are now gasified and cost-reflective tariffs have been introduced. This has led to ample investment in capacity and networks, which has improved reliability considerably. A significant portion of the investment was from the donor community upon which Armenia still relies for support.

Today the energy policy focus is on development of indigenous energy sources, mainly renewables, and replacement of a nuclear reactor that supplies nearly a third of all electricity. While there is ample opportunity for energy efficiency improvement, it is not a focus of current policy.

Armenia's regional policy focuses on strengthening its position and broadening market integration. The European Union and Armenia completed negotiations regarding the Association Agreement and the Deep and Comprehensive Free Trade Area (DCFTA) in July 2013; soon after, however, their implementation was suspended as Armenia has expressed strong interest in joining the Customs Union with Russia, Belarus and Kazakhstan (EC, 2014). Armenia became a member of the Eurasian Economic Union (EEU) in January 2015, along with Russia, Belarus and Kazakhstan, with Kyrgyzstan expected to join in May 2015. Armenia has been an observer in the Energy Community since 2011 and a member of the Eastern Partnership since 2009.

## KEY ENERGY DATA

### SUPPLY

Over the last decade, total primary energy supply (TPES)[1] in Armenia increased by 58.3% to 3 million tonnes of oil-equivalent (Mtoe) in 2012 (Figure 1.1.2).

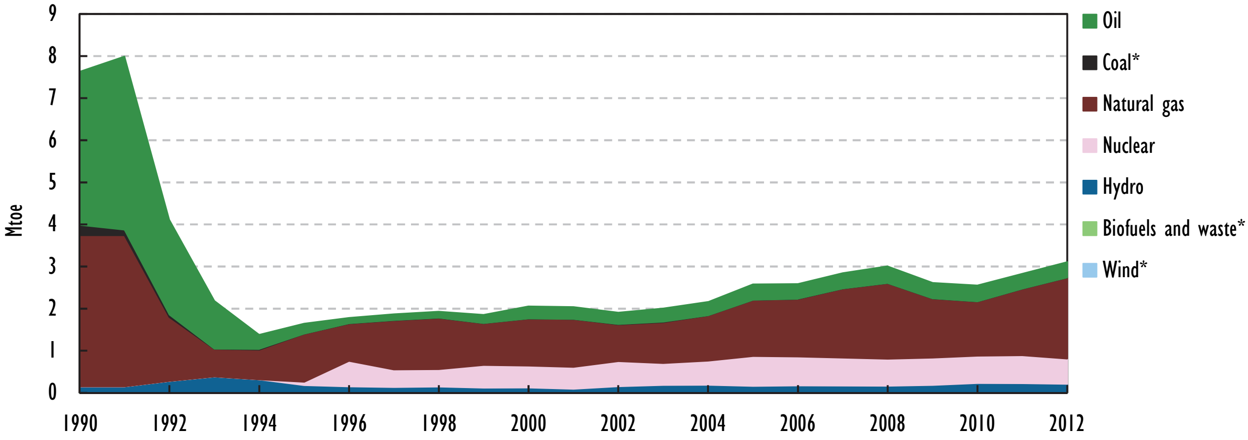
The growth trend was interrupted during the recession, with a 13.1% dip in 2009 and one of 4.9% in 2010. Natural gas is the main source of energy in Armenia, mainly imported from Russia. It accounted for 64.9% of TPES 2012, expanding from 46.6% in 2002. Gas imports have increased by 120% since 2002. Oil accounted for 12% of TPES in 2012. Oil supply increased by 33.2% over the ten years to 2012, which is a slower rate of growth compared to TPES. As such, the share of oil in TPES has contracted from 14.7% in 2002.

The production level at Armenia's one nuclear power plant has remained unchanged; as such, its 20% share in TPES in 2012 is down from 32% in 2002.

Hydropower, at 6.7% of TPES, has also lost some of its share of TPES, down from 7.6% in 2002. Although hydro power production has increased by 40% over the decade to 2012, its growth has been slower than that of TPES. Biofuels and wind power, as well as coal, contribute only a very small amount to TPES.

**1.** TPES is made up of production + imports - exports - international marine bunkers - international aviation bunkers ± stock changes. This equals the total supply of energy that is consumed domestically, either in transformation (for example, refining) or in final use.

**Figure 1.1.2** TPES, Armenia, 1990-2012




* Negligible.

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

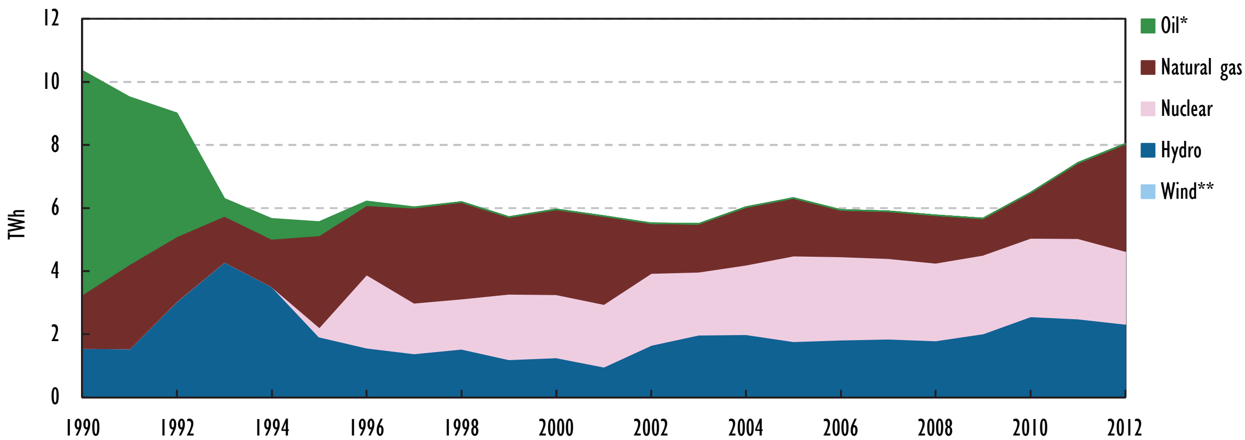
## ELECTRICITY GENERATION

Electricity generation was 8 terawatt hours (TWh) in 2012, an increase for a third consecutive year from 5.7 TWh in 2009, up almost 46% since 2002. Electricity capacity has also grown over the same period, by around 30% to reach 4.1 gigawatts (GW), growing mainly in combustible fuel capacity.

Electricity supply has experienced some volatility over the past decade, with a few years of slow decline followed by a year or two of a surge in production. Natural gas fuels 42% of electricity production while hydro and nuclear power each account for 29% (Figure 1.1.3).

Heat generation is less than 0.1 petajoules (PJ), down from 14.7 PJ in 1990 as district heating systems are phased out. They have been replaced by natural gas, with more than 90% of households having connections.

**Figure 1.1.3** Electricity generation by source, Armenia, 1990-2012




* Oil use in electricity generation ceased in 1996.

** Negligible.

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## IMPORT AND EXPORT

Armenia relies on imports of natural gas and oil for 75% of its energy needs. Natural gas imports were 2.4 billion cubic metres (bcm) in 2013, originating from Russia (82.9%) and Iran (17.1%). Oil product imports were 363 kilotonnes (kt) in 2013, from Iran (35%), Russia (26.7%), Bulgaria (12.4%), Israel (11.3%), Iraq (8.8%) and others. All of Armenia's nuclear fuel is imported from Russia.

Armenia is a net exporter of electricity at 1.7 TWh in 2012. Electricity exports are mostly to Iran under a bilateral trade agreement to import gas and export electricity. Armenia is interconnected with Georgia, with which electricity trade flows both ways, though primarily as export from Armenia.

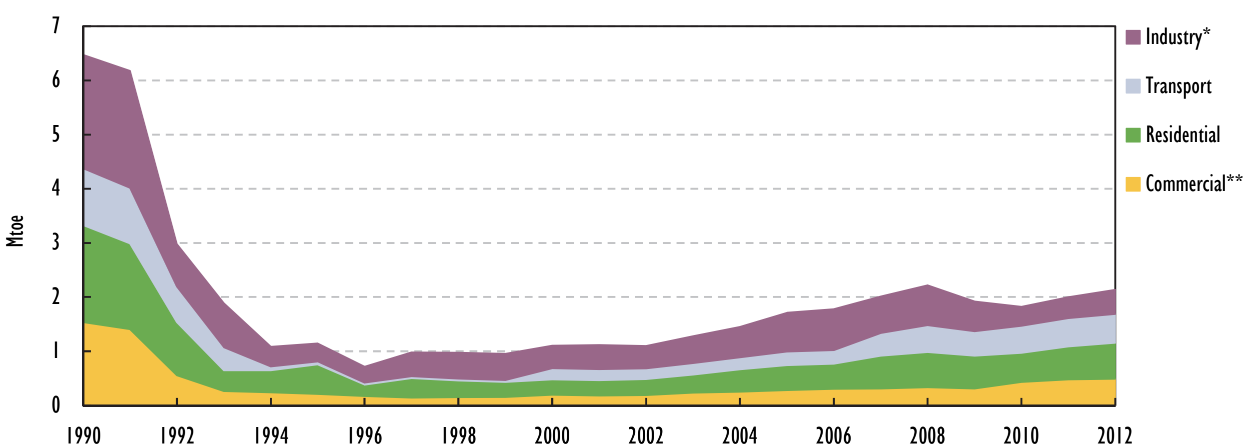
## DEMAND

Total final consumption (TFC)[2] of energy was 2.1 Mtoe in 2012. Since 2002, TFC has grown at a faster rate than TPES, indicating that more fuels are used directly in final consumption, such as transport, rather than for electricity or heat generation.

The residential sector accounts for the largest proportion of TFC at 31% in 2012, up from 25% in 2002 (Figure 1.1.4). Energy demand in the transport sector was 25% of TFC and about 23% in the commercial and public services sector in 2012, both of which have increased significantly over the decade. The industry sector accounted for 38% of energy demand in 2002, but grew by only 7% in the period to 2012 to account for 21% of TFC.

Natural gas is used across all end-use sectors and in power generation, accounting for about 62% of TFC in 2012. About 21% of TFC is electricity to supply households, businesses and industry. Oil, at 17% of TFC, is used in transport, industry and business.

**Figure 1.1.4** TFC by sector, Armenia, 1990-2012




* *Industry* includes non-energy use.

** *Commercial* includes commercial and public services, agriculture/fishing and forestry.

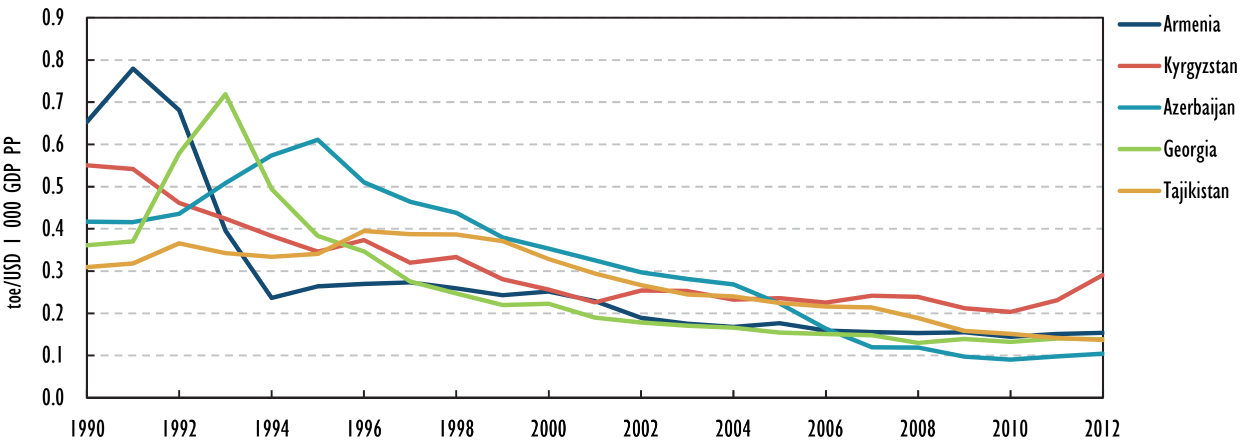
Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

**2.** TFC is the final consumption by end-users, i.e. in the form of electricity, heat, gas, oil products, etc. TFC excludes fuels used in electricity and heat generation and other energy industries (transformations) such as refining.

## ENERGY INTENSITY

Armenia's energy intensity, measured as the ratio of TPES to real GDP, was 0.15 tonnes of oil-equivalent (toe) per USD 1 000 GDP PPP (toe/USD 1 000 GDP PPP) in 2012. This is the fourth-lowest intensity compared with other EECCA countries, higher than Azerbaijan, Tajikistan and Georgia. Since 2002, the level of energy intensity in Armenia has declined by 18.6% (Figure 1.1.5).

**Figure 1.1.5** Energy intensity in Armenia and selected EECCA countries, 1990-2012

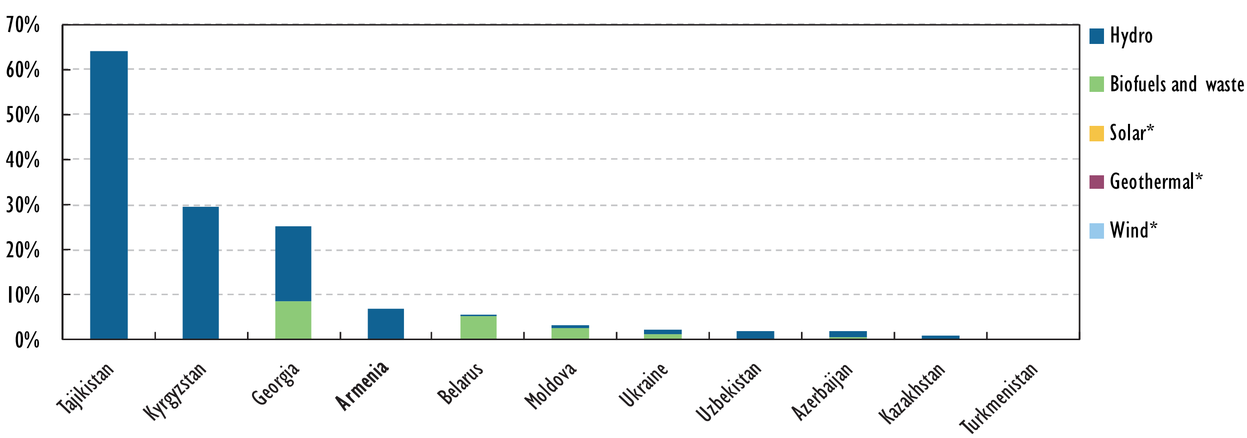



Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## RENEWABLES

Renewable energy in Armenia accounts for 7% of TPES and is primarily hydropower (6.7%). Biofuels account for 0.3% while wind power accounts for less than 0.01%. Hydropower has increased at a slower rate than overall TPES over the decade while energy from biofuels has declined by 13%. As such, the share of renewables in TPES declined from 8% in 2002. Armenia ranks fourth among EECCA countries in the share of renewables in TPES, behind Tajikistan, Kyrgyzstan and Georgia, which have plentiful hydro resources (Figure 1.1.6).

**Figure 1.1.6** Renewable energy as a percentage of TPES in Armenia and other EECCA countries, 2012




* Negligible.

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## ENERGY DATA SOURCES

The figures presented in this report are official energy statistics and balances of the International Energy Agency (IEA) for Armenia and other EECCA countries, based on IEA methodology.

In July 2013, a Memorandum of Understanding (MoU) on Statistics was signed between the Armenian government and the INOGATE Technical Secretariat on co-operation in the field of statistics and developing an action plan for the modernisation and standardisation of data.

The government is currently working on improving its methodology, collection and use of energy statistics. It is also strengthening the institutional framework related to energy statistics. The Law on State Statistics (2000) outlines the responsibilities and a three-year programme (2013-15) has been established.

The National Statistical Service (NSS) carries out the collection and processing of energy data and aims to institute the IEA balance methodology by 2015. Within the existing NSS collection method, final energy consumption data is the most challenging although improvements have been made through research. The introduction of IEA standards will result in further quality improvements.

Armenia's energy statistics are used by a number of ministries, as well as public enterprises and municipalities. Statistics are accessible to the public on the government website. For example, the Ministry of Nature Protection is preparing the third national inventory of greenhouse-gas emissions in co-operation with the United Nations Development Programme (UNDP) with the use of country statistics. The official inventory will be submitted to the United Nations Framework Convention on Climate Change (UNFCCC) secretariat in December 2014, and every two years after. Also based on the country's energy data, Armenia has to approve the National Emissions Mitigation Plan in 2015.

# ENERGY SECTOR DESIGN

## MARKET STRUCTURE

### Electricity

Armenia's electricity market operates under the "single buyer" model and includes six large generation companies (private and state-owned), more than 180 small power producers, and one transmission system operator (TSO). Electricity generation and transmission operations are unbundled.

There is no competitive wholesale electricity market. The one distribution system operator (DSO) has exclusive rights to buy electricity from the generators at regulated prices and to sell to final consumers. Closed Joint Stock Company (CJSC) Power System Operator, the state-owned TSO, is financially and legally unbundled. CJSC Settlement Centre, also state-owned, provides control and metering services at the wholesale level. CJSC High-Voltage Electricity Network is the state owner and operator of the transmission network. Owned by Open Joint Stock Company (OJSC) Inter-RAO UES, Electricity Network of Armenia (CJSC ENA) is the only retailer in the country.

The government is planning to soon build a high-voltage interconnection with Georgia to export excess electricity. This could lead to market opening and more competition. As of the end of 2014, the interconnection feasibility study had been completed and the construction is planned to begin in 2015, but there have been no concrete steps to open the power market.

Power generation from renewable sources is supported through purchasing power agreements (PPAs) with feed-in tariffs. The PPAs are mandatory for 15 years at feed-in tariffs specific to each technology and are reviewed annually by the regulator. PPAs currently apply to 260 megawatts (MW) of small hydro plants and 2.6 MW of wind capacity.

### Natural gas

The natural gas sector is owned and operated by one vertically integrated operator, Gazprom Armenia (previously ArmRusGazprom). Since January 2014, it is fully owned by Russia's Gazprom which purchased the remaining 20% from the Armenian government. No unbundling or market opening is envisaged.

## INSTITUTIONAL FRAMEWORK

**The Ministry of Energy and Natural Resources (MENR)** is responsible for the development and implementation of energy policy. It develops relevant primary and secondary legislation and investment plans for state-owned enterprises.

**The State Nuclear Safety Regulatory Committee** is the regulator for nuclear energy.

**The Ministry of Nature Protection** oversees the conservation and protection of natural resources and is responsible for environmental impact assessments. It serves as the designated national authority for projects under the Kyoto Protocol's Clean Development Mechanism.

**The Public Services Regulatory Commission (PSRC)** is independent with main responsibilities for tariff methodology and review, licensing procedures and import/export regulation. PSRC also regulates water, waste, telecommunications and rail transport.

**The Energy Saving and Renewable Energy Fund (R2E2)** is responsible for the implementation of renewable energy projects. Armenia does not have a dedicated agency for renewable energy policies.

## LEGAL FRAMEWORK

Armenia's primary energy legislation is the Law on Energy (2001) which includes provisions for market rules and ownership structure, among other aspects. The Law on Energy Saving and Renewable Energy (2004) defines the policy principles for renewables and energy savings, and efficiency licensing and tariffs are regulated mainly by the laws of the Public Services Regulatory Commission, Licensing and Energy.

Amendments to the Law on Energy were adopted in mid-2013 to attract investment by reducing licensing requirements and administrative burdens. Changes include the easing of construction licences for some energy facilities (including facilities for energy own-use) and the removal of regulations on solar photovoltaic (PV) installations with capacity up to 150 kW.

The Law on the Construction of New Nuclear (2009) provides for the construction of a nuclear unit with a capacity of 1 000 MW and for the decommissioning of the operating nuclear plant. In 2012, for electricity supply security reasons, unit 2 of the nuclear plant (built in 1976) was given authorisation for a ten-year extension of service to 2026, provided that the necessary rehabilitation is carried out (IAEA, 2014).

## KEY POLICIES

Armenia is reliant on imports of natural gas and oil for most of its energy needs, which poses supply risks and dependence on a single supplier. The Armenian government considers energy security and the development of indigenous sources to be of prime importance for the energy sector: the development of renewables and efficiency measures are seen as key. To satisfy expected demand growth while increasing reliability, the government is focusing on increasing capacity and promoting domestic energy sources.

In 2013, the government developed a National Energy Security Concept that outlines strategies for fuel diversification mainly through renewables and nuclear power, building fuel reserves and increasing power generation capacity. In 2014, the government approved the Schedule of Activities for 2014-20 for the implementation of the security concept. The security concept complements previous energy sector development strategies as part of the 2005 Context for Economic Development to 2025, including the National Program on Energy Saving and Renewable Energy (2007) and the Action Plan of the MENR (2007).

The above-mentioned strategies and action plans are the main energy policy documents. They set out targets and objectives for the energy sector, in line with the following principles:

- Make full use of the economically and environmentally sound potential of renewables and energy efficiency across the whole economy.
- Develop nuclear power for electricity supply.
- Integrate Armenia into regional energy markets and participate in regional projects.
- Diversify supply routes of primary energy resources.

In 2014, the government developed the Scaling-up Renewable Energy Program Investment Plan. It is an update of the Renewable Energy Road Map that was developed in 2011. It includes comprehensive analyses of renewable energy potential, cost-benefit and the viability of specific technologies. It also sets targets and objectives for renewables to 2025, including a plan for financing. The investment plan describes the first geothermal and solar PV projects, which are expected to be developed by the government and serve as examples for other investors. Nuclear energy accounts for nearly a third of the electricity supply and is of strategic importance. The existing reactor is old but has been given an extension of service life to 2026. The government is planning to build a new reactor of about 1 000 MW by then, if financing is secured.

The government has an ambitious target to increase the amount of renewables in the power generation mix from 7% in 2012 to 26% by 2025. The approach includes small hydro, wind power, solar PV and geothermal, but excludes biofuels. In order to reach this target, Armenia would need to have 677 MW of new renewable energy capacity installed by 2025. Estimated capacity additions are 397 MW of small hydro, 100 MW of wind and geothermal, and 80 MW of solar PV.

Energy efficiency measures in Armenia are outdated and based on the National Plan of Measures for Enhancement of Energy Efficiency which was elaborated for the period 2001-13. The R2E2 was established during this period. The government plans to extend the programme to 2020, including setting targets for improving energy efficiency for all sectors.

Regulatory reform has supported achievements in the power sector since the mid-1990s. A commitment to cost-recovery tariffs has facilitated investment in infrastructure and attracted substantial private sector investment. As a result, reliability, service quality and the efficiency of sector operations have improved.

In recent years, however, the increasing costs of electricity service and the government's concerns about affordability led to a tariff structure departing from a cost-recovery approach. The government has taken steps to maintain affordable rates; however, some measures have hurt the financial performance of the sector. A World Bank study estimates that that the average residential electricity tariffs are 13% below cost (World Bank, 2013). As the state owns and operates the majority of the power sector, prolonged subsidies and inadequate cost recovery could hinder investment and weaken private sector interest. This is a particular concern since substantial investment is needed to replace ageing generation capacity.

Strengthening regional integration is also a key component of Armenia's energy policy. Currently there are political disagreements with two neighbours. Plus, the electricity interconnection with Georgia is not fully functional due to asynchronous systems and the connection with Iran is operating under limited conditions. Armenia plans to increase electricity production and sell more to Georgia and Iran during the summer months, while relying on electricity imports if necessary in the winter. In order to synchronise systems and to provide electricity at competitive prices, Armenia will have to open its electricity market, which is relatively closed.

## INVESTMENT

The investment climate in Armenia has improved substantially since the mid-1990s as institutions were restructured and the centralised economic structure moved in a more market-oriented manner. This attracted donor and private sector investment. Today many parts of the economy have been privatised. This has been supported by a reduction in perceived corruption and stronger ties with the European Union and the United States. However, Armenia is still perceived to be corrupt and run by a number of powerful individuals. This, along with administration burdens and a weak legislative framework, still poses a challenge for investors. In April 2014, the Investment Plan for Armenia outlined steps to remove barriers to entry and to attract investment, particularly for renewables. It proposes:

- further streamlining of licensing and registration processes
- extending purchasing power agreements to 25 years for solar and geothermal projects and 20 years for wind projects
- improving resource assessments
- providing concession loans.

Over the decade to 2014, investment in Armenia's energy sector has been mainly in rehabilitation and the modernisation of aged gas and electricity infrastructure. This included substation upgrading and network improvements that have improved efficiency and reduced losses in the electricity network. Gazprom Armenia has increased residential gas connections from 21% in 2002 to 95% of all households in 2011. Gazprom Armenia invested in an efficient gas unit at the Hrazdan-5 plant, which began operations in 2013.

Investment in small hydropower plants has been the main development in the renewables sector with more than 260 MW of capacity additions by 2014. The Kreditanstalt für Wiederaufbau (KfW) bank, a German government-owned development bank, provided USD 7.4 million in loans for most of the plants up to 2010.

In 2010, the KfW bank granted a USD 22 million loan for existing small hydropower plants and those under construction. In 2012, under the second stage of the Support to Renewable Energy programme, KfW bank approved the refinancing of 26 small hydro power plants with installed capacity of 62.4 MW. In November 2012, the Central Bank of Armenia and the KfW bank signed a credit agreement for USD 50 million for the third stage of the same credit programme. The agreement would provide financing for different renewable energy technologies' development (hydro, wind, solar, etc).

Armenia's investment requirements in the period to 2025 include the development of 677 MW of renewable energy capacity, construction of a 1 000 MW nuclear reactor and 400 kilovolt (kV) interconnections with Iran and Georgia, as well as the upkeep of the network. Its Investment Plan proposes government investment in a geothermal and a solar PV project. The government, with financing assistance from donors, is funding the service life extension to 2026 for the existing nuclear plant, but financing for the planned new nuclear plant has not been secured.

The construction of a 400 kV line to Iran began in 2013 and is expected to be operational by late 2015 or early 2016. The project also implies the construction of a power substation Noravan of 400/220 kV in the Syunik region of Armenia. It is funded by the Export Development Bank of Iran. Armenia is obliged to supply electricity to Iran in lieu of loan payments for 15 years, after which it will become the owner and operator of the line.

A feasibility study, financed by KfW, has been completed for construction of a 400 kV line to Georgia. Construction is due to begin in 2015 and will take three to four years to complete.

### TECHNOLOGY AND INNOVATION

Research and development (R&D) in energy technology and innovation is not at a significant level in Armenia, though its importance is increasing. The country has a highly skilled labour force, particularly in the fields of science and information technology. The government is planning to develop new renewable energy technologies, which will increase the need for technology and innovation spending, and skilled human resources.

There were approximately 84 research institutes and universities involved in state-financed programmes and projects in Armenia in 2011. Government priorities in R&D include social sciences and humanities, life sciences, renewable energy and new energy sources, information technologies, space and earth sciences and applied research (Republic of Armenia, 2011).

## ASSESSMENT

Armenia's economy, including the energy sector, has exhibited healthy growth over the past decade, driven by reforms and targeted policies which have attracted foreign investment and funding from donor communities. Investment in the energy sector has been of primary importance for security of supply, notably in the modernisation and the rehabilitation of ageing infrastructure and increasing energy independence through developments of small hydropower plants and the refurbishment of the aged nuclear power plant.

Strategic focus has also been placed on improving regional integration with neighbouring countries and diversifying supply routes. A gas/electricity barter trade between Iran and Armenia has been established and a new high-voltage interconnection is under construction. Another interconnection with Georgia is in the advance planning stage with construction expected to begin in 2015. Armenia has excess electricity capacity particularly during the summer months, so new interconnections could increase exports if existing regulatory barriers are reduced. Armenia will also have higher export capabilities by 2026 when additional nuclear capacity comes on line.

Investment in renewable energy could bring less dependence on imports to improve security of supply and provide new markets. However, the government is hesitant to invest significantly in renewable technologies to keep energy costs from rising. Investment in small hydropower has been plentiful in the past decade, developing 260 MW of capacity. However, this relatively rapid growth has raised environmental concerns that may curb further small hydro developments. The government is evaluating the resource potential for geothermal and solar developments.

Armenia has significant potential to improve the efficiency of energy use in buildings and heating, as well as the water supply and industry sectors. While some measures have been promoted, energy audits and implementation remain inadequate. Relevant public authorities have responsibility for energy efficiency, but there is no co-ordination for developing and implementing efficiency measures. There is not an official authority responsible for the development of energy efficiency policy. Some efficiency-related measures are included in the R2E2, but its primary focus is on renewables. Armenia lacks a structure to design, implement and monitor energy efficiency policies and measures.

Efficiency improvements could also be spurred by economic signals through tariffs. For example, current tariffs for natural gas decline at higher consumption levels, thereby reducing the incentive to make energy use more efficient. The government should consider revising the tariff structure and level to encourage energy savings and more efficient consumption.

The government lacks a comprehensive long-term energy sector vision and the required investment strategy for the period to 2030 and beyond. While the Investment Plan for Armenia assesses the potential for renewables, it does not include efficiency potential in its scenario analysis and long-term assessments have not been done. A robust assessment of future energy markets, economic trends and demographic changes in Armenia and neighbouring countries is also missing. In order to maintain high levels of foreign investment, the government should ensure its energy policy strategies are thorough and look beyond the short term. The framework conditions need to attract investors. The proposed amendments to the Law on Energy, such as to reduce the burden of foreign investment, need to be considered in the light of a long-term energy investment policy.

In addition, the development of sound energy statistics will be a key factor in setting energy policy priorities and measuring progress. The government should continue to improve their statistical database and methodology, while developing the capacity to analyse the data and prepare various scenarios for the energy system.

## *RECOMMENDATIONS*

*The government of Armenia should:*

- ☐ *Continue the development of energy policy reform on the basis of the Energy Security Concept of 2013 and complement the legislative framework to ensure the effective exploitation of indigenous energy sources, in particular solar, wind, biomass and geothermal. The government needs to develop a sound regulatory structure for grid* *integration and adapt the licensing procedures and feed-in tariffs for renewables in accordance with the Scaling-up Renewable Energy Program Investment Plan for Armenia.*

- *Consider further elaborating the Energy Security Concept by developing various energy scenarios for the period to 2030 with an outlook to 2050 on the basis of a robust assessment of energy supply and demand trends, including the effective development of renewable resources and energy efficiency measures. The scenarios can help to inform the direction and implementation of the energy strategy and guide its monitoring and updating.*
- *Continue progress on interconnections with neighbouring countries to support regional integration of energy markets and, at an international level, to overcome isolation of the domestic energy market. Review the market model as new interconnections develop and ensure adaptation of balanced market rules in line with EU legislation and Customs Union to remove regulatory and trade barriers.*
- *Maximise efficiency gains by developing an energy efficiency plan with legislative measures to encourage energy savings across the economy, importantly in buildings and transport sectors. Introduce supportive tariff structures to incentivise energy savings and strengthen building codes for both new construction and renovations. Adopt adequate practices to collect demand-side data. Develop energy efficiency indicators in order to design sound policies and measure progress.*
- *Strengthen local and regional initiatives for energy savings, for better awareness of efficient practices and the use of renewables for electricity and heating.*
- *Take the lead in developing and implementing energy efficiency policies and measures. One approach may be to elevate the role of the R2E2 to the level of a government agency and furnish it with an adequate authority for intergovernmental co-ordination and policy implementation.*

# 1.2. ENERGY SECURITY

## RESOURCE ENDOWMENT

Armenia has no proven reserves of natural gas or oil. It has only modest hard coal deposits of 154 million tonnes (Mt), resources of 163 Mt and further potential of 317 Mt (BGR, 2013). There are six known coal fields and some oil shale deposits. The economic viability of mining these deposits has not been determined. Currently there is no production of coal or oil shale (GENI, 2014).

Armenia has significant small hydropower potential which has been the focus of considerable development in recent years. Armenia has more than 400 rivers of at least 10 kilometres (km) in length. They are mostly small, steep mountain rivers. There is also potential for other forms of renewables, which the government is assessing. Its estimates are summarised in Table 1.2.1.

**Table 1.2.1** Estimated renewable energy potential, Armenia, 2014

| Technology | Capacity (MW) | Generation (GWh/yr) |
|---|---|---|
| Wind | 300 | 650 |
| Solar (concentrated solar, utility-scale PV and distributed PV) | 3 600 | 6 300 |
| Geothermal | > 150 | > 1 100 |
| Landfill gas | 2 | 20 |
| Small hydro | 100 | 340 |
| Biogas and biomass | 35 | 260 |
| **Total electricity** | **4 300** | **8 700** |
| Solar thermal hot water | x | 260 |
| Geothermal heat pump | x | 4 430 |
| **Total heat** | | **4 690** |

Note: GWh/yr = gigawatt hours per year; x = not applicable.

Source: Republic of Armenia (2014), *Scaling-up Renewable Energy Program Investment Plan for Armenia*, Yerevan.

## ENERGY SECURITY AND DIVERSIFICATION

Energy security in Armenia has greatly improved over the past 20 years following a gas and power supply crisis in the early to mid-1990s. During the crisis, energy sector management was dysfunctional, losses were extremely high and the collection rate was lower than 50%. This resulted in acute supply shortages. Households only got a few hours a day of power supply. Since then, an increase in the use of natural gas for heating, investment in new generation capacity and the network, and improved operational management has resulted in the restoration of consistent and uninterrupted electricity and gas supply.

Demand for electricity and gas is expected to continue to grow as living standards improve and poverty is reduced. Meeting energy needs will require significant new investment. Large portions of the electricity and gas networks date back to the Soviet era and infrastructure modernisation is needed to maintain and improve supply reliability. In its Energy Security Concept, the government estimates about 1 000 MW will be retired by 2026 and new investment will be required in order to satisfy growing demand without increasing import reliance. The proposed new 1 000 MW nuclear plant accounts for the planned new capacity, but financing has not been secured.

Renewable energy investment is a government focus for its features of sustainability and reduced import dependence. Its target is to increase the contribution from renewables from 7% in 2012 to 26% by 2025 with a total capacity of 397 MW of small hydro capacity, 100 MW each from wind and geothermal and 80 MW of solar PV. In 2014, small hydro capacity was about 260 MW, signalling that government targets are ambitious and significant investment is required. In 2014, some 140 MW of small hydro were planned or under construction, according to the Armenian government.

Regional integration and diversity of supply is progressing with a 400 kV interconnection with Iran under construction. The feasibility study has been completed and construction is planned for a high-voltage interconnection with Georgia. The interconnections will strengthen regional integration, expand the market, improve supply reliability and could serve as an additional source of electricity in case of shortages.

## ENERGY INFRASTRUCTURE AND INVESTMENT

### ELECTRICITY

Installed generation capacity is 4 147.2 MW. Available capacity is lower due to the age and condition of plants: some 50% of capacity is more than 40 years old. The Yerevan thermal power plant was retired in 2010 and the government plans to retire the oldest units at the Hrazdan plant by 2017. Power system assets need to be replaced and modernised in the upcoming 10 to 20 years, requiring significant investment. Table 1.2.2 shows the installed generation capacity and ownership as of 1 January 2014.

Base load electricity is produced from the 407 MW Metsamor Nuclear Power Plant. The plant was scheduled for retirement by 2016, but its life has been extended by ten years due to insufficient replacement capacity. Approximately USD 300 million is required to keep the reactor operating until 2026 and rehabilitation is underway. The government plans to build a new 1 000 MW nuclear plant as a replacement; however, financing remains a challenge and no concrete progress has been made to date.

Output from thermal power plants covers peak periods and base load power when the nuclear plant is offline for maintenance. Some units of the Hrazdan-5 and all units of the Yerevan combined-cycle gas turbine plants generate electricity for export under the gas-for-electricity barter agreement with Iran.

Hydropower from the Hrazdan River and other dams, including small hydro, is a stable component of Armenia's electricity system and provides daily load regulation with installed capacity of 1 200 MW. Installed capacity of small hydropower plants is 260 MW, and 164 MW of new capacity are licensed for construction. In 2014, hydro capacity of 140 MW was under construction or in advanced planning stages.

The Megri hydropower, with a capacity of 130 MW, is under construction and is expected to be operational by 2020. The plant is being contracted and financed by Iran and after 15 years of operation by Iran the plant will be transferred to Armenian ownership.

Wind power, at 2.6 MW, is a relative newcomer in the power supply system.

**Table 1.2.2** Installed generation capacity and ownership structure, Armenia, January 2014

| Generation capacity by type | Ownership | MW |
|---|---|---|
| Hrazdan | Russia | 1 110 |
| Hrazdan- Unit 5 | CJSC Gazprom Armenia | 480 |
| Yerevan | MENR | 790 |
| Vanadzor | Private Zakneftegazstroy-Prometey | 96 |
| **Total thermal power plants** | | **2 476** |
| International Energy Corporation (Sevan-Hrazdan Cascade) | RusHydro | 559 |
| Vorotan | MENR | 404 |
| Dzora | Private | 26 |
| Small hydro plants | Private | 262.6 |
| **Total hydropower plants** | | **1 251.6** |
| Lori-1 wind power plant | MENR | 2.6 |
| Other (combined-cycle, biogas) | Private | 10 |
| **Total wind and others** | | **12.6** |
| Metsamor Unit 2 | MENR | 407 |
| **Total nuclear** | | **407** |
| **Total** | | **4 147.2** |

Note: MENR = Ministry of Energy and Natural Resources.

Source: MENR.

Armenia is interconnected to Georgia with a 65 km, 220 kV line and 54.8 km of 110 kV lines. A 400 kV line is planned to commence a three- to four-year construction period in 2015. The interconnection with Iran is more than 80 km of 220 kV lines. A high-voltage 400 kV line to Iran is under construction and expected to be operational by early 2016. Table 1.2.3 shows the existing and planned interconnections. Armenia also has idle connections to Azerbaijan and Turkey.

Armenia's electricity network is mostly old and inefficient. Significant investment in rehabilitation is needed. Improvements in grid infrastructure are carried out as part of government-authorised programmes supported through loans from international donors and investment programmes of individual utilities as approved by the PSRC. The electricity network reconstruction programme was partially complete by 2012 with donor support, but further progress has been suspended due to lack of financing.

**Table 1.2.3** Main power grid interconnections, Armenia, 2014

| Country | High-voltage line connections (with length where available) | Status |
|---|---|---|
| Georgia | Line 220 kV (65 km) | Operational |
| | Line 110 kV (35.8 km) | Operational |
| | Line 110 kV (19 km) | Operational |
| | Line 400 kV | Feasibility study complete. Construction planned for 2015. |
| Iran | Line 220 kV (79 km) | Operational |
| | Line 220 kV (79 km) | Operational |
| | Line 400 kV | Under construction |

Source: MENR.

## NATURAL GAS

The gas transmission network includes 1 863 km of pipelines and a connection to Russia through Georgia and one to Iran (Figure 1.2.2). The pipeline from Russia dates back to the Soviet era. The pipeline to Iran was built in 2009 with a capacity of 2.3 bcm to barter gas imports from Iran for electricity exports from Armenia. An existing pipeline to Azerbaijan is not in operation.

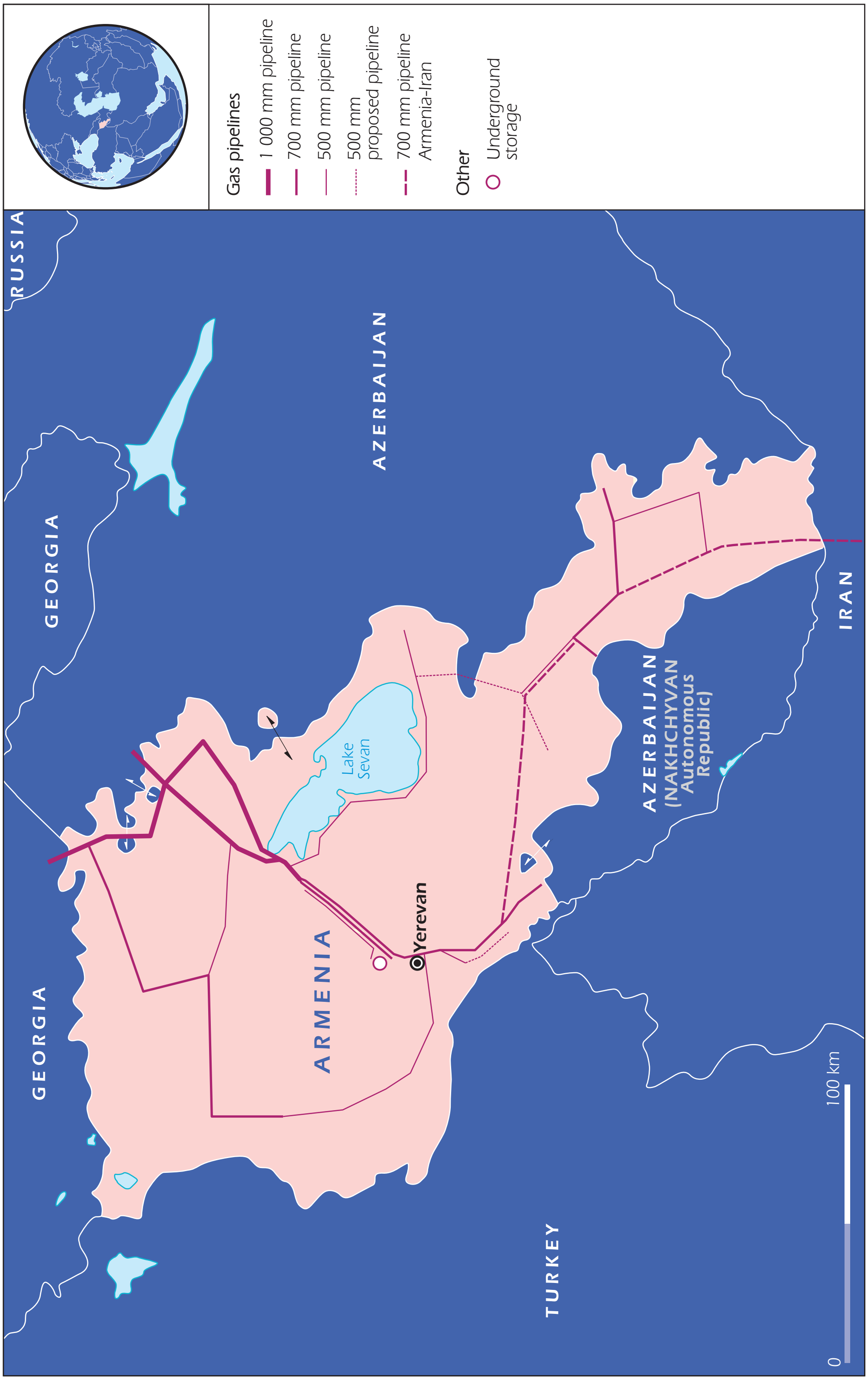
The gas distribution network includes 10 483 km of high-, medium- and low-pressure gas pipelines. It is connected to about 640 000 households. Gazprom Armenia has carried out large gasification projects in the past decade worth approximately USD 120 million, boosting the residential connection rate from 20% in 2002 to 95% by 2011. It rehabilitated the Abovyan underground gas storage facility, almost doubling its capacity to 135 million cubic metres (mcm) in 2012. Gazprom Armenia has also invested USD 215 million to install a new gas unit to the Hrazdan-5 power station, which began operations in March 2013.

## SYSTEM RELIABILITY

Today energy system reliability in Armenia is considered to be adequate. Since an energy supply crisis during the early to mid-1990s, investment in electricity and gas infrastructure, gasification of the residential sector and operational improvements have led to a significant decline in outages and losses.

Network losses in both the gas and electricity sectors are in line with international standards. In the gas sector, transmission losses were 4.2% and distribution system losses 2.3% in 2013. Losses are kept relatively low due to installations of modern metering devices and a SCADA system. In 2013, electricity transmission losses amounted to 1.8% while distribution losses were about 13%. Since 2003, CJSC ENA has installed Automated Metering and Data Acquisition Systems in the 110/35 kV portions of the network to improve operation and monitoring.

**Figure 1.2.1** Armenian natural gas infrastructure




This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries, and to the name of any territory, city or area.

Source: Gazprom Armenia.

## EMERGENCY RESPONSE

Emergency response capabilities related to nuclear power have received increased focus across the globe since the Fukushima accident in Japan in 2011. Armenia is a party to the Non-Proliferation Treaty, has an Additional Protocol with the International Atomic Energy Agency (IAEA) and has ratified the Comprehensive Nuclear Test Ban Treaty. In 2011, the IAEA inspected the Metsamor nuclear power station for operational safety, deeming the plant acceptable (IAEA, 2014).

Armenia is also working closely with the United States in the management of its nuclear safety measures. In September 2013, the US National Nuclear Security Administration (NNSA) conducted two emergency response training sessions in Armenia, with 28 participants from the relevant authorities, civil protection agencies and other specialised parties (NNSA, 2013). NNSA also provides direct emergency management assistance to Armenia, among other countries.

In May 2013, Armenia signed an agreement with Belarus on information exchange and co-operation in nuclear safety and radiation protection. Armenia will assist Belarus with operation of its first nuclear power plant, which is expected to be operational by the end of the decade (NTI, 2014).

According to an Energy Charter report (2008), oil product storage infrastructure in Armenia is adequate in capacity as requirements are far higher than annual consumption. It can store up to 1.2 Mt of light products and 0.9 Mt of fuel oil. However, most depots do not comply with modern standards, and many need repairs. The Abovyan underground gas storage facility was upgraded recently and its capacity was doubled to 135 mcm in 2012.

Armenia is under no international obligation to hold oil stocks. Its oil stock requirements are legislated by old Soviet laws, and most of the time the availability of oil stocks is based on the financial situation in the country, rather than strong implementation of the legislation.

# 1.3. MARKET CONVERGENCE

## NATIONAL MARKET STRUCTURE

### ELECTRICITY

Armenia's electricity market operates under the "single buyer" model and includes six large generation companies (private and state-owned), more than 180 small power producers and one TSO. Generation and transmission operations are unbundled.

There is no competitive wholesale electricity market. The one DSO has exclusive rights to buy electricity from the generators at regulated prices and to sell to final consumers.

The Power System Operator, state-owned, is the TSO and is financially and legally unbundled. At the wholesale level, state-owned CJSC Settlement Centre provides control and metering services. CJSC High-Voltage Electricity Network is the state owner and operator of the transmission network. CJSC Electricity Network of Armenia (CJSC ENA) is the only retailer in the country and is owned by OJSC Inter-RAO UES.

### NATURAL GAS

The natural gas sector is owned and operated by one vertically integrated operator, Gazprom Armenia (previously ArmRusGazprom). Since January 2014, it has been fully owned by Gazprom, which purchased the remaining 20% from the Armenian government. No unbundling or market opening is envisaged.

### REGULATORY FRAMEWORK

The PSRC is independent with main responsibilities for tariff methodology and review, licensing and import/export regulation. The PSRC also regulates water, waste, telecommunications and rail transport. Energy companies may have more than one licence, but the Law on Energy provides for certain limitations on the size of shareholdings.

#### Tariffs

Electricity and natural gas tariffs are regulated by the PSRC on a cost-plus basis that allows a set rate of return for the operators after accounting for fixed and variable costs. Government policy on tariffs is cost recovery. In recent years, however, the increasing cost of electricity service and the government's concern about affordability have led to a departure from cost-recovery tariffs, and subsidies and below-cost pricing have increased (World Bank, 2013).

The tariff-setting procedure is fully transparent. An operator applies for a tariff review on the PSRC official website, which is then subject to consultation with consumer protection organisations and other interested parties. The PSRC reviews the matter and makes its decisions available on its website. The PSRC is expected to take a decision within 80 working days from the date of application for most operators, and 25 working days for small hydropower and other renewable generators.

The tariff structure for payments to electricity generators has two components (energy and capacity) if they participate in the balancing market controlled by the power system operator. For other generators a one-part tariff is applied. The gas supply system uses a single tariff structure.

At the retail level, electricity rates for residential consumers increased about 40% from 2009 to 2014 and natural gas rates went up by 164% from 2005 to 2013. In 2014, the import gas price was reduced from USD 270 per 1 000 cubic metres ($m^3$) to USD 189 per 1 000 $m^3$ under the purchase agreement for Gazprom Armenia; however the gas price for end-consumers continued to increase. The PSRC gas tariffs set in mid-2013 was 0.38 USD/$m^3$ for consumption less than 10 000 $m^3$ per month and 0.277 USD/$m^3$ for consumption above 10 000 $m^3$ per month.

According to the Energy Regulators Regional Association, electricity tariffs in the first half of 2014, including taxes:[3]

- 0.11 USD/kWh for residential
- 0.083 USD/kWh for non-residential.

Electricity rates have a time-of-day element for consumers are fitted with meters. Table 1.3.1 shows the breakdown of the current electricity tariffs (excluding taxes).

The introduction of an Automated Metering and Data Acquisition System (AMDAS) and computerised customer billing system has significantly improved collection rates over the last decade. In 2013, collection rates were 96% for electricity and about 94% for gas.

**Table 1.3.1** Electricity tariffs, Armenia, 2014

| Tariff type | Voltage | Tariff (including VAT) |
|---|---|---|
| Day | 35 – 110 kV | 32.85 drams (USD 0.07) |
| Night | 35 – 110 kV | 28.85 drams (USD 0.06) |
| Day | 6 – 10 kV | 38.85 drams (USD 0.08) |
| Night | 6 – 10 kV | 28.85 drams (USD 0.06) |
| Day | 0.38 kV | 41.85 drams (USD 0.09) |
| Night | 0.38 kV | 31.85 drams (USD 0.07) |

Source: MENR.

### Feed-in tariffs

Provided by the Law on Energy, electricity generated by small hydropower plants and other renewables are afforded feed-in tariffs for a period of 15 years from their licence date (Table 1.3.2). The tariffs are specified on an annual basis to take account of exchange rate fluctuations of the Armenian dram to a foreign currency (USD or EUR). Feed-in tariffs were introduced in 2007 and since then 260 MW of small hydropower and 2.6 MW of wind power have come on line. Table 1.3.2 shows feed-in tariffs for various renewables generation.

**3.** www.erranet.org.

**Table 1.3.2** Feed-in tariffs for renewable generation, Armenia, 2013

| Renewable energy source | Tariff (USD/kWh)* |
|---|---|
| Wind | 0.08 |
| Biomass | 0.09 |
| Small hydro on rivers | 0.05 |
| Small hydro on irrigation systems | 0.03 |
| Small hydro on drinking water supply systems | 0.02 |

* Excluding VAT.

Note: kWh = kilowatt hour.

Source: Republic of Armenia (2014), *Scaling-up Renewable Energy Program Investment Plan for Armenia*, Yerevan.

### Technical rules

Armenia uses state standards for technical applications. They are harmonised with the International Organization for Standardization (ISO), the International Electro-technical Commission (IEC) and the European Committee for Standardisation (CEN). With a government resolution in 2012, Armenia was on the path to harmonise its standards with those of the European Union. The National Institute of Standards worked out an action plan for 2013-15, including a schedule of harmonisation up to 2020. Recently, however, the Armenian government took a decision to join the Customs Union with Russia, Belarus and Kazakhstan by the end of 2015. This is likely to result in a different set of standards for harmonisation.

## REGIONAL MARKETS AND INTERCONNECTIONS

## ELECTRICITY

Government policy to enhance energy security in the power sector is to strengthen regional integration and increase trade flows. Armenia could increase exports of electricity to Georgia during the spring and summer periods when hydro generation is high. Electricity during the summer months could serve the Turkish market via Georgia, as Georgia often has surplus electricity during the summer. Alternatively, Georgia could supply Armenia with low-cost electricity from hydropower when markets are favourable. If the new nuclear plant is realised around 2026, it may offer further opportunities to increase trade. More electricity trade would lead to market opening and more competition in the Armenian electricity sector.

Armenia's electricity network is connected to Georgia with 110 kV and 220 kV lines. Connections with Iran are 220 kV lines. In both cases 400 kV lines are under construction or significantly advanced in planning. Interconnections to Azerbaijan and Turkey exist, but are not active. In the long term, Armenia is planning active involvement in the development of a Black Sea power ring and the creation of north-south synchronised operation relations (Russia-Georgia-Armenia-Iran and others).

Currently, the trading of electricity is limited. Georgia and Armenia have asynchronous systems and the market in Armenia is mostly closed, which restricts trade. Electricity trade with Iran is based on a barter agreement whereby much of the imported gas from Iran is used in power generation at the Yerevan power plant which in turn exports power to Iran. By March 2014, Iran had bartered around 0.9 bcm of gas for 1.14 TWh of Armenian electricity, according to Iran's Energy and Oil Ministry.

The governments of Armenia and Georgia are co-operating to build a 400 kV interconnection. In 2012, the utilities in Armenia and Georgia signed an agreement for parallel operation of the power systems, including the organisation of operational-dispatch management and a contract for power supply in emergency situations. A feasibility study was completed in 2013. Construction is due to begin in 2015.

Collaboration with Iran on electricity market integration is focused on the full realisation of the existing interconnection via a 220 kV transmission line and a new 400 kV line. The construction of the line began in 2013 and is expected to be in operation in 2016.

## NATURAL GAS

Nearly all gas consumed in Armenia is imported from Russia, via a pipeline that transits through Georgia. Metering of the gas supply is carried out on Georgian territory. The control of the gas imports is done on Armenian territory. The National Agency of Georgia, responsible for standards, technical regulations and measurements, carries out annual metrological control and supervision of gas metering.

In January 2014, Russia’s Gazprom purchased the remaining 20% of ArmRusGaz, through a deal in which ArmRusGaz’s debts to Gazprom were forgiven and the price of gas was reduced from USD 270 per 1 000 $m^3$ to USD 189 per 1 000 $m^3$ (Gevorgyan, 2014). The price remained at USD 189 per 1 000 $m^3$ at the end of 2014.

# 1.4. SUSTAINABLE DEVELOPMENT

## RENEWABLE ENERGY

As a land-locked country in a region with political instability, Armenia plans to strengthen its domestic energy supply and reduce reliance on imports to improve energy security. Renewable energy development is a key focus of the government.

The country's overall plan to expand the use of renewable energy is reflected in the latest statements (2013) of energy strategy and concept of energy security. The government has an ambitious target of 26% of energy consumption from renewables in 2025, up from 7% in 2012. This includes small hydro, wind power, solar PV and geothermal, but excludes biofuels.

In 2014, the government developed the Scaling-up Renewable Energy Program Investment Plan. It is an update of the Renewable Energy Road Map that was developed in 2011. It includes comprehensive analyses of renewable energy potential, cost-benefit and the viability of specific technologies. It also sets targets and objectives for renewables to 2025, including a plan for financing. The investment plan describes the first geothermal and solar PV projects, which are expected to be developed by the government and serve as examples for other investors.

The investment plan proposes developing the Karkar geothermal site, with a potential of 28.5 MW, and investing in some 40 to 50 MW of utility-scale solar PV. These would be the first demonstrations of geothermal and solar power developments in Armenia. The government expects that success would lead to private sector investment for more renewable projects.

By 2025, Armenia expects to have 677 MW of installed renewable energy capacity, excluding existing large hydropower plants. The mix is expected to be 397 MW small hydro; 100 MW wind and geothermal; and 80 MW solar PV.

Feed-in tariffs for generation from renewable sources for a 15-year period have been available since 2007. By far, small hydropower plants have been the main developments. In 2014, 150 small hydropower plants were in operation, generating 650 gigawatt hours (GWh) from 260 MW of installed capacity. Licences have been issued for 71 more small hydro plants with planned capacity of 140 MW.

Small hydropower plants have been rapidly deployed and are likely to reach a target of 397 MW of capacity by 2025. However, wind power development has not progressed and utility-scale solar PV has not been taken up under the current framework. High costs and uncertainty about economic risks after the 15-year feed-in tariffs period are barriers. Other barriers include scant availability of financing, cumbersome administrative and regulatory requirements, and insufficient data and analysis of the resource potential.

The government's investment plan for renewables attempts to overcome these barriers to attract the necessary investment over the next two decades. The solutions include low-cost financing and grants, streamlining administrative and regulatory procedures, fast-tracking small projects for licensing, and extending the term of power purchasing agreements to 25 years for solar and geothermal, and 20 years for wind. If achieved, these changes could attract more investment in renewables; however, implementation may be challenging as the required changes are substantial.

The Ministry of Energy and Natural Resources is responsible for energy policy. Policy implementation for renewables and energy efficiency is carried out by the Energy Saving and Renewable Energy Fund (R2E2). Since its establishment in 2004, the Fund has contributed to removing barriers for renewable energy investment and improving the country’s investment climate with support from the World Bank, Global Environmental Fund (GEF), European Bank of Reconstruction and Development and local governments. The R2E2 will continue to play a significant role in the implementation of policies over the next two decades, particularly in terms of selecting projects and facilitating financing, grants and other incentives.

At an international level, Armenia is active in a number of sustainable energy initiatives. Armenia participated in the Rio+20 Assessment Reports in 2012 which analysed the status and the main barriers to a transition to a “green economy”. Armenia joined the Sustainable Energy for All initiative of the UN Secretary General in 2012 and presented a report on the country's needs in this area.

## ENERGY EFFICIENCY

Energy efficiency potential in Armenia is high. The potential for energy efficiency was last evaluated by the government in 2007. The National Programme on Energy Savings and Renewable Energy (the Energy Savings Programme) estimates sector energy efficiency potential as follows:

- Industry: 164.5 Mtoe (75.4 Mtoe - natural gas; 89.1 Mtoe - power consumption), with sub-sector energy savings of:
  - 5% mining
  - 23% chemicals
  - 35%-40% food production
- Transport: 7 Mtoe
- Residential: 402 kilotonnes of oil-equivalent
- Water supply and irrigation: 15%
- Optimisation of lighting: 475 GWh over ten years.

Energy efficiency in natural gas use is expected to largely come from modernisation of gas-fired power generation. For example, the new combined-cycle gas turbine at the Yerevan thermal power plant is expected to save 265 mcm of gas per year, while the retrofitting of the Hrazdan TPP unit 5 will save 223 mcm per year.

The R2E2 started implementation of the Energy Saving Programme in 2012 with support from the World Bank. The total cost of the Energy Saving Programme is estimated at USD 10.7 million.

In the framework of the World Bank loans, the National Plan of Measures for Enhancement of Energy Efficiency was elaborated for the period 2011-13. It identified primary measures for energy efficiency in five sectors, including a set of 20 horizontal and departmental actions. The most significant actions are:

- strengthening the national statistical system for the energy sector
- establishing a national energy agency for energy efficiency and renewable energy sources
- making amendments to the national building code
- supporting financial measures for energy efficiency.

This plan will be expanded to cover the period to 2020. In subsequent stages, it plans to set targets for improving energy efficiency for all sectors.

Armenia, Georgia and Moldova joined the Eastern Europe Energy Efficiency and Environment Partnership (E5P) in October 2013 to significantly boost their support for energy efficiency and reduce harmful emissions. The international donor community is expected to provide more than EUR 60 million to enable projects under the E5P Fund.

## ENVIRONMENTAL PROTECTION

Priorities and objectives for environmental protection and the rational use of natural resources are contained in four main laws: Ambient Air (1994); Environmental Impact Assessment (1994); Environmental Fee Rates (2000); and Environmental Inspectorate (2005).

Environmental impact assessments are required for specific projects under the Law on Expert Testing of Environmental Impacts (1995). Information on public hearings is published on the Ministry of Nature Protection website.

The legislative framework for the organisation of energy audits is set out under the Law on Energy Savings and Renewable Energy (2004) and the Regulation on Conducting Energy Audits (2006). The government is currently developing a methodology for conducting energy audits of buildings. Energy audits are voluntary.

An Energy Audit Institute is being developed by the government. Training and development of energy auditors is supported by technical assistance from international organisations, e.g. UNDP, GEF and INOGATE Programme.

One of the existing environmental concerns in Armenia is the rapid development of small hydro power. The construction of 260 MW of capacity has outpaced monitoring and compliance tools and careful planning will be required in the future to reach near 400 MW of capacity by 2025 (as planned).

## CLIMATE CHANGE

Armenia is a signatory to and has ratified a number of international environmental conventions:

- the UNFCCC (1994) and its Kyoto Protocol (2005)
- the Convention on Long-Range Transboundary Air Pollution (1983)
- the Montreal Protocol on Substances that Deplete the Ozone Layer (1989)
- the Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal (1992)
- the Convention on the Environmental Impact Assessment in a Transboundary Context (1991).

Armenia ratified the Kyoto Protocol in 2005 as a non-Annex I Party and has implemented a number of clean development mechanism (CDM) projects. The energy sector accounts for 93% of $CO_2$ equivalent emissions according to Armenia's national communications to the UNFCCC. As part of the UNFCCC Copenhagen Accord in 2009, the Ministry of Nature Protection prepared a list of priority climate change mitigation measures:

- investment in renewable energy
- modernisation of thermal power plants
- energy efficiency improvements
- reduction of fugitive emissions of methane from gas distribution and gas supply systems
- development of electrical transport and increased share of natural gas as engine fuel
- reduction of methane emissions from solid municipal waste
- restoration of degraded forests, reforestation, reduced logging volumes, and conservation.

Armenia's energy-related emissions of carbon dioxide ($CO_2$) totalled 5.4 Mt in 2012. This is a quarter of the level of emissions during 1990, mainly due to a strong decline after the breakup of the Soviet Union. In Armenia, the power generation sector accounts for 26.3% of energy-related $CO_2$ emissions, followed by transport (23.8%), households (21.3%), commercial and other services (16.1%) and manufacturing (12.5%).

# 1.5. INVESTMENT ATTRACTION

## INVESTMENT CLIMATE

The investment climate in Armenia has improved substantially from a period of significant economic turmoil during the early to mid-1990s. It continues to improve in order to attract foreign investment.

The government has restructured the economy over the past 15 years, moving from a centralised structure towards a more market-oriented one. The economy is now largely privatised and has attracted private investment. Similarly, a reduction in perceived corruption and stronger ties with the European Union and the United States has led to more global exposure and interest from abroad. Armenia has a highly educated population, particularly in the sciences, which makes it attractive for foreign investors (DOS, 2013).

Nonetheless, concerns over persistent corruption, high administrative burdens and weak legislative frameworks remain a challenge for maintaining a favourable investment climate. Dominant local business people control many sectors of the economy and have close ties with the government. This has led to instances of unfair tendering processes and preferential treatment in the past.

In 2011, Armenia became the first EECCA country to accede to the World Trade Organization's Government Procurement Agreement (GPA). This should provide positive signals regarding the country's level of openness and transparency (DOS, 2013).

According to the World Bank's "ease of doing business" indicator, Armenia was ranked 45th among 189 countries in 2014. A high ranking on the ease of doing business index means the regulatory environment is conducive to starting and operating a local firm. This index averages the country's rankings on ten topics, comprised of a variety of indicators, giving equal weight to each topic. Armenia is ranked second among the EECCA countries, just after Georgia.

According to the Corruption Perceptions Index (CPI) prepared by Transparency International that measures the level of perceived corruption in a public system, Armenia ranked 94th among 175 countries in 2014, with a score of 37. This is a relatively high score with regards to perceived corruption, as a score of 100 represents no corruption. Perceived corruption has decreased substantially over the past ten years. From 2012 to 2013, Armenia has improved its rank from 105th to 94th, with the score increasing from 34 to 36. The rank remained unchanged during 2014.

The government has instituted several reforms in recent years to promote investment, particularly in renewable energy. Amendments to the Law on Energy adopted in 2013 simplify licensing requirements and administrative processes, such as easing construction licensing procedures for energy facilities and removing regulations for solar PV with capacity up to 150 kW. The Turnover Tax Law came into effect in 2013 and modifies the tax regime in some areas, by replacing VAT and profit tax. Small hydropower plants with annual sales revenue that does not exceed about 58 million drams (USD 134 000) pay a turnover tax of 3.5% of revenue. If revenues are above that level, then the VAT, at a higher level, applies (approximately 17%).

In order to continue to attract investment for renewable energy projects and to remove barriers to entry, the government is planning to continue to streamline processes for licensing and registration; to extend purchase power agreements to 25 years for solar and geothermal, and 20 years for wind projects; to improve resource assessments; and to provide concessional loans. These are set out in the Investment Plan for Armenia (April 2014).

## INVESTMENT FRAMEWORK

Armenia's energy development concerns lie mainly in attracting investment for renewables generation and in construction of a new nuclear reactor. The 2014 Investment Plan includes an assessment of potential projects, estimates costs and proposes changes to the framework to improve the investment climate.

Prior to the 2014 Plan, the investment strategy for the energy sector was part of the Strategy of Development of the Energy Sector in the Context of Development of the Economy (2005) and its supporting action plan. As part of the energy strategy, investments are mainly carried out as a result of state programmes authorised by the government, supported through loans from international donor organisations and the investment programmes of individual utilities as approved by the PSRC. The main focus has been on rehabilitation, modernisation and attraction of foreign direct investment for hydropower plants.

The R2E2 was established in 2004 to implement the renewable energy programme and create an enabling environment for private investors. The R2E2 is financed by donors and local governments to provide concessional loans for appropriate renewables and energy efficiency projects.

Basic provisions regulating foreign investments are set in the Law on Foreign Investment (1994) and the Law on Privatisation (1997). These laws state that foreign investors have the same rights as local enterprises. In practice, however, most privatisation of large assets was not competitive and transparent (DOS, 2013).

## INVESTMENT PLANNING

The 2014 Investment Plan is the main strategic document outlining the future of renewable energy investment. In the plan, the government has identified geothermal energy and solar PV technologies as areas in which it would like to increase investment.

Proposed investment includes developing the Karkar geothermal site in the southeast with estimated potential of 28.5 MW. Government funding may be used for exploratory drilling to prove the resource, with other investment for the development stage if the field is deemed technically and economically viable. The government also proposes to develop 40 to 50 MW of utility-scale solar PV. Initial studies indicate that the area in the vicinity of Lake Sevan has some of the highest potential in Armenia. More site-specific assessment is needed to define opportunities. Such a project would require donor funding or private investment.

The strategy is that government support for demonstration projects and successful outcomes will make private sector funding more likely. The government expects that initial government and donor financing will contribute to lower costs and subsequent tariffs from the initial utility-scale solar facilities.

In investment planning for generation assets other than renewables, Armenia is looking for support for nuclear power. The existing nuclear plant is old and its life is being extended with donor financing. The government is planning for a new 1 000 MW nuclear plant by 2026, but has yet to secure the necessary investment.

# References


BGR (German Federal Institute for Geosciences and Natural Resources) (2013), Energy Resources 2013, Reserves, Resources, Availability, Tables, BGR, Hannover, Germany.

DOS (US Department of State) (2013), 2013 Investment Climate Statement – Armenia, DOS website, www.state.gov/e/eb/rls/othr/ics/2013/204593.htm (accessed 16 December 2014).

Energy Charter (2008), *Armenia: Follow-up Review of the Investment Climate and Market Structure in the Energy Sector of Armenia*, Energy Charter Secretariat, Brussels.

EC (European Commission) (2014), "Trade: countries and regions: Armenia", EC website, http://ec.europa.eu/trade/policy/countries-and-regions/countries/armenia (accessed 15 December 2014).

GENI (Global Energy Network Institute) (2014), An Energy Overview of the Republic of Armenia, GENI website, www.geni.org/globalenergy/library/national_energy_grid/ armenia/ EnergyOverviewofArmenia.shtml (accessed 15 December 2014).

Gevorgyan Tigran (2014), "Russian Energy Giant Captures Armenian Market", Press Release, IWPR website, https://iwpr.net/global-voices/russian-energy-giant-captures-armenian-market, 14 January.

IAEA (International Atomic Energy Agency) (2014), Country Nuclear Power Profiles: Armenia, accessed 15 December 2014, www-pub.iaea.org/MTCD/Publications/PDF/cnpp2014cd/ countryprofiles/Armenia/Armenia.htm.

IEA (International Energy Agency) (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

NNSA (US National Nuclear Security Administration) (2013), "NNSA conducts two emergency response training courses in Armenia", press release, 3 September 2013, NNSA website, accessed 15 December 2014, www.nnsa.energy.gov/mediaroom/pressreleases/ armeniairapter.

NTI (The Nuclear Threat Initiative) (2014), "Armenia overview", NTI website, accessed 15 December 2014, www.nti.org/country-profiles/armenia/.

Republic of Armenia (2014), *Scaling-up Renewable Energy Program Investment Plan for Armenia*, Yerevan.

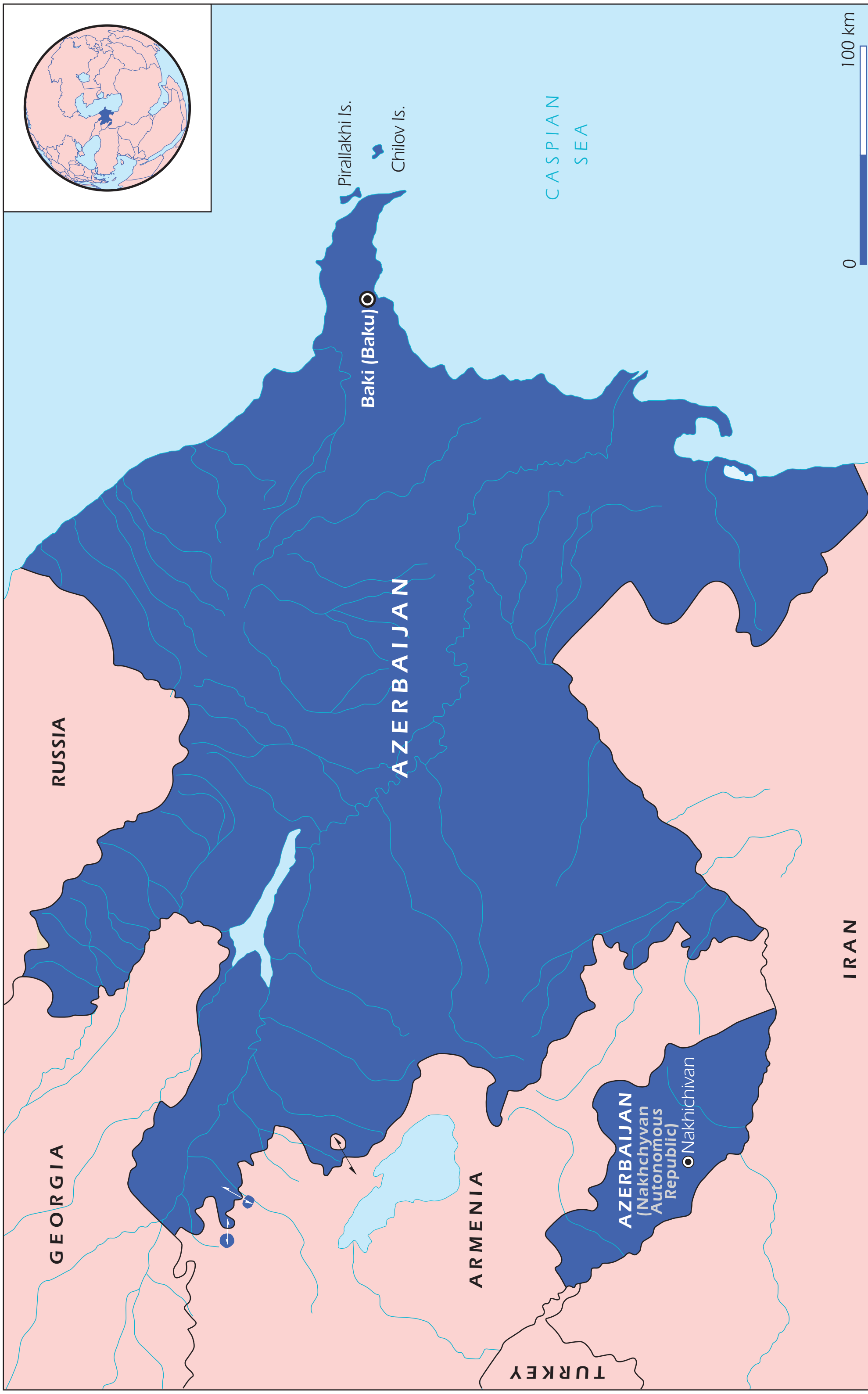
Republic of Armenia (2011), "Commercialization of research and development in Armenia", State Committee of Science presentation, www.unece.org/fileadmin/DAM/ceci/ppt_presentations/ 2011/SubRegCapBuild_Chisinau/Asatryan.pdf.

World Bank (2014), "Armenia Overview", World Bank website, accessed 1 May 2014, www.worldbank.org/en/country/armenia/overview.

World Bank (2013), *Republic of Armenia: Power Sector Tariff Study*, World Bank, Washington, D.C., www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2013/06/27/ 000333037_20130627161449/Rendered/PDF/ACS48450WP0P120cial0use0only0900ACS.pdf.

# AZERBAIJAN

**Figure 2.1.1** Map of Azerbaijan




This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries, and to the name of any territory, city or area.

## 2.1. GENERAL ENERGY POLICY

### Key data (2012)

**Energy production:** 58.7 Mtoe (oil 74.3%, natural gas 25.3%, hydro 0.3%, biofuels and waste 0.2%), +197.2% since 2002

**TPES:** 13.7 Mtoe (natural gas 66%, oil 32.4%, hydro 1.1%, biofuels and waste 0.7%), +18.4% since 2002

**TFC:** 7.8 Mtoe (oil 41.8%, natural gas 38.9%, electricity 17%, biofuels and waste 1.3%, heat 1.1%), +12.7% since 2002

**TFC per sector:** residential 35.4%, transport 28.2%, industry 23.3%, commercial and public services 13.1%

**Electricity generation:** 23 TWh (natural gas 89.9%, hydro 7.9%, oil 2.2%), +22.9% since 2002

**Heat generation:** 5 PJ (natural gas 99.3%, oil 0.7%), -77.2% since 2002

**Energy intensity:** 0.10 toe/USD 1 000 GDP PPP, -65% since 2002

## COUNTRY OVERVIEW

The Republic of Azerbaijan (Azerbaijan) is located in the southern Caucasus region. It is bordered by the Caspian Sea on the east, Armenia and Georgia on the west, the Russian Federation on the north and Iran on the south. The country is approximately 86 600 square kilometres in size with a population of 9.2 million. Baku is the capital and the largest city.

Azerbaijan's economy has experienced exceptional growth over the past decade. Real gross domestic product (GDP), measured in US dollars (USD) on a purchasing power parity (PPP) basis has increased fourfold since 2000. In 2005 it surged by 35%. During the global economic crisis, the economy continued to grow, albeit at a slower rate. Consequent to strong economic growth, poverty rates have fallen dramatically from 50% in 2001 to 7.6% in 2011 (World Bank, 2014).

Azerbaijan's economy is heavily dependent on energy exports, with more than 90% of total exports accounted for by oil and gas. The production of oil and natural gas has increased considerably during the 2000s following the discovery of the Shah Deniz gas field, reaching record levels during 2010. Government support and participation from international companies has led to substantial investment in the energy sector. Commendably, the construction of several new power plants as well as the rehabilitation and modernisation of the gas and electricity networks has improved reliability and security of supply.

The renewable energy sector has received little attention in Azerbaijan and developments have been slow compared to the developments in oil and gas production. However, the current government is making renewables a priority, with an ambitious target of 20% renewables in electricity generation by 2020, up from 12% in 2012 (according to government data). The state agency responsible for renewables is working on a new strategy and drafting a Law on Renewable Energy that is expected to accelerate the deployment of renewables and attract foreign investment. The government is seeking to increase private investment in the renewables sector through supportive policies and incentives.

The energy sector in Azerbaijan is predominantly government-owned despite the majority of the economy having been privatised since the country's independence. Only a number of small hydropower plants are in private ownership and they account for less than 1% of electricity generation.

## KEY ENERGY DATA

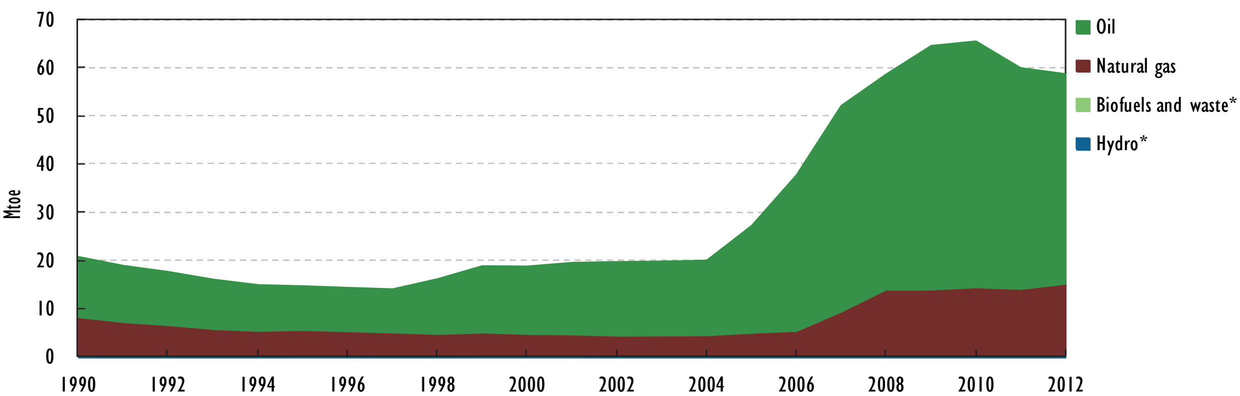
### SUPPLY

Azerbaijan is a major energy producer with rich deposits of oil and natural gas. Oil reserves ranked 20th in the world in 2012, at 952 million tonnes (Mt). Natural gas reserves were estimated at 952 billion cubic metres (bcm) in 2012, about 0.4% of global reserves (BGR, 2013). Additional 150-300 bcm are estimated at the Absheron field in the Caspian Sea, discovered in 2012.

In 2012, Azerbaijan produced 58 Mt of oil equivalent (Mtoe), about five times more than domestic demand. Oil production was 43.6 Mtoe and natural gas was 14.8 Mtoe. Since 2002, gas production has increased by 256% and oil production by 183%. Oil production reached a peak in 2010 and has been on a declining trend since (Figure 2.1.2). Azerbaijan also produces modest amounts of energy from hydro (0.3%) and biofuels (0.2%). There is a negligible amount of wind power.

Crude oil production was 43.5 Mtoe in 2013 while natural gas production amounted to 18.3 bcm. Natural gas production was 3.5% higher compared to 2012 while crude oil production remained unchanged.

**Figure 2.1.2** Energy production by source, Azerbaijan, 1990-2012



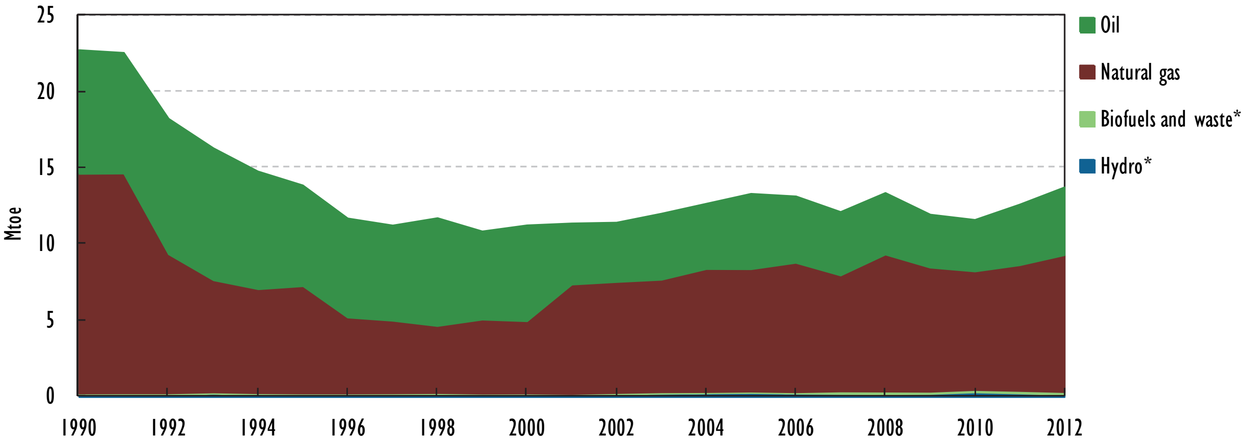

* Negligible.

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

Total primary energy supply (TPES)[1] in Azerbaijan was 13.7 Mtoe in 2012 (Figure 2.1.3). TPES increased by more than 18% over the ten years from 2002. Azerbaijan's TPES is made up of mainly natural gas (66%) and oil (34%). Hydro accounts for 1% and biofuels for 0.7%.

**1.** TPES is made up of production + imports - exports - international marine bunkers - international aviation bunkers ± stock changes. This equals the total supply of energy that is consumed domestically, either in transformation (for example, refining) or in final use.

**Figure 2.1.3** TPES, Azerbaijan, 1990-2012



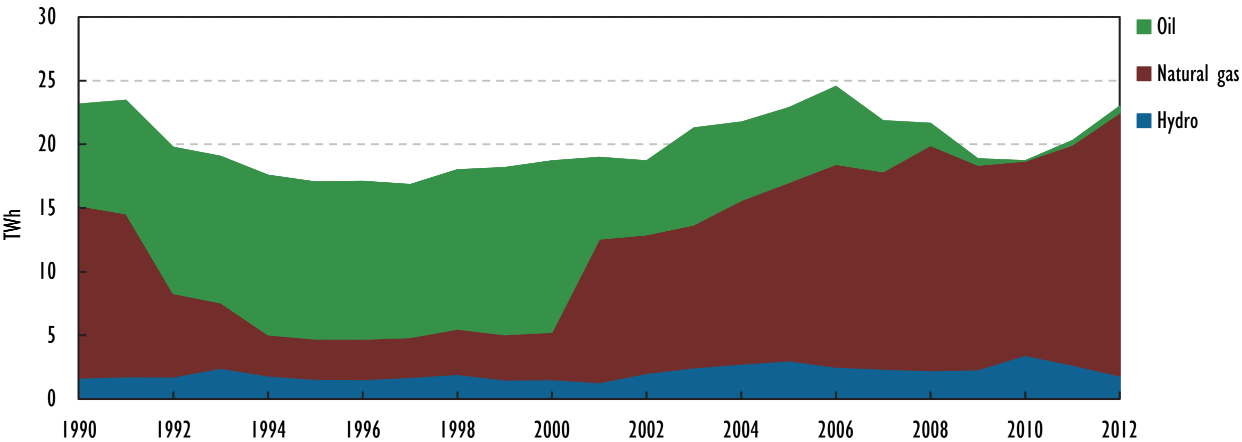

* Negligible.

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## ELECTRICITY GENERATION

Electricity generation in Azerbaijan totalled 23 terawatt hours (TWh) in 2012, 23% higher than in 2002. Natural gas accounts for 90% of generation, hydro (8%) and oil (2%) (Figure 2.1.4).

**Figure 2.1.4** Electricity generation by source, Azerbaijan, 1990-2012




Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

Over the past decade, the use of natural gas in power generation has nearly doubled to almost 21 TWh while the use of oil has nearly been eliminated. Gas-fired generation capacity in Azerbaijan increased by 46% from 2005 to 6.3 GW in 2012 (85% of total generation capacity). Hydro generation is subject to seasonal and water volume variations.

## IMPORT AND EXPORT

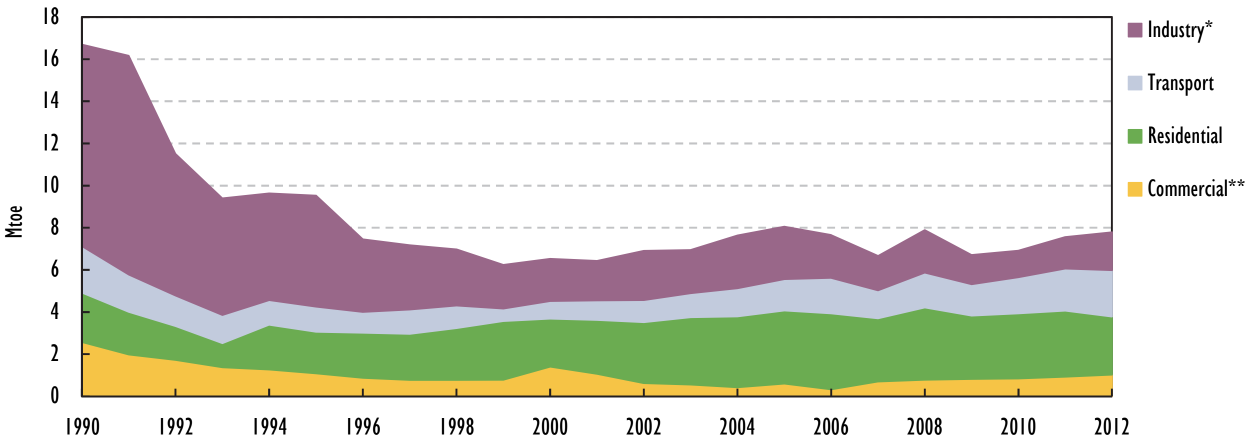
Azerbaijan exports most of the oil and natural gas that it produces. In 2012, exports were 44 Mtoe, of which about 83% were oil and oil products. Exports have boomed over the past decade, increasing more than threefold since 2002. The majority of the oil and gas exports are destined for European markets, with the remainder exported to Russia and other countries in the region. Azerbaijan used to import gas from the Russian Federation, but it became a net exporter of natural gas in 2007 following the start-up of the Shah Deniz field. Natural gas exports increased from 1.5 Mtoe in 2007 to 5.5 Mtoe in 2012.

Azerbaijan trades electricity with Russia, Turkey and Georgia. Trade volumes are low. In 2012, exports amounted to 0.7 TWh while imports were 0.1 TWh.

## DEMAND

Total final consumption (TFC)[2] amounted to almost 8 Mtoe in 2012, which is 13% higher than in 2002 (Figure 2.1.5). Energy demand in Azerbaijan has been increasing, albeit with some variation. Energy demand is increasing in the transport sector, where it rose 110% in the decade from 2002, and also in the commercial sector where demand expanded 65% over the period. The transport sector share of TFC was 15% in 2002 and increased to 28% by 2012, while the commercial sector share grew from 9% to 13% over the same period.

**Figure 2.1.5** TFC by sector, Azerbaijan, 1990-2012




* *Industry* includes non-energy use.

** *Commercial* includes commercial and public services, agriculture/fishing and forestry.

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

Conversely, energy demand in the residential and industry sectors declined. The residential sector's share of TFC fell from 42% in 2002 to 35% in 2012, while industry's share fell from 34% to 23.3% over the same period.

Natural gas and oil account for more than 83% of TFC: about 43% is gas demand for power generation and the residential sector, and 40% is oil for use in transport. Electricity represents 17% of TFC. Heat and biofuels play a small role in energy consumption in Azerbaijan.

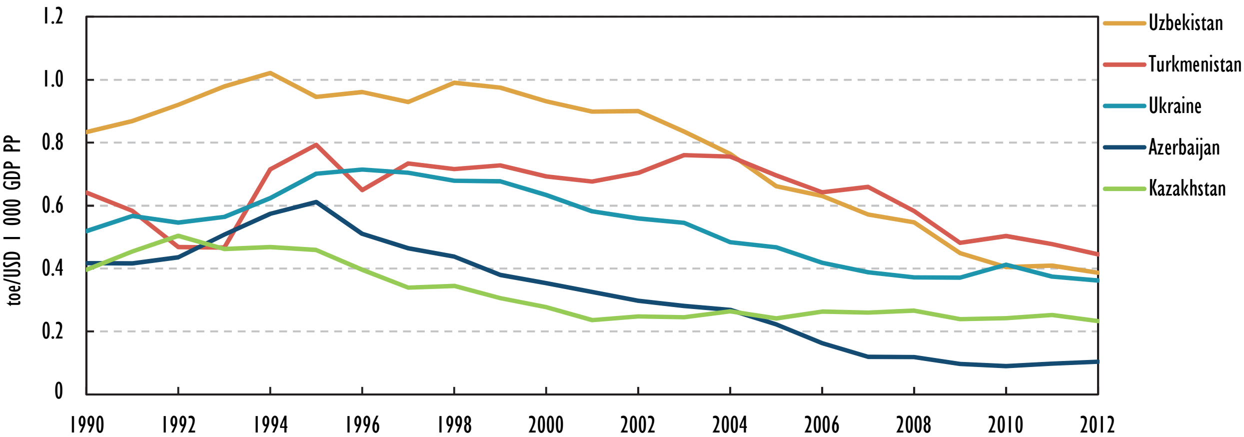
## ENERGY INTENSITY

Azerbaijan's energy intensity, measured as the ratio of TPES to real GDP, was 0.10 tonnes of oil equivalent (toe) per USD 1 000 GDP PPP in 2012. This ratio is the lowest in comparison with other EECCA countries, mainly due to its higher GDP (Figure 2.1.6).

**2.** TFC is the final consumption by end users, i.e. in the form of electricity, heat, gas, oil products, etc. TFC excludes fuels used in electricity and heat generation and other energy industries (transformations) such as refining.

Since 2002, energy intensity in Azerbaijan has declined by 65%, down from 0.3 toe/ USD 1 000 GDP PPP. Energy intensity has been declining since the mid-1990s due to strong economic growth and TPES which is growing at a comparatively slower rate.

**Figure 2.1.6** Energy intensity in Azerbaijan and selected EECCA countries, 1990-2012



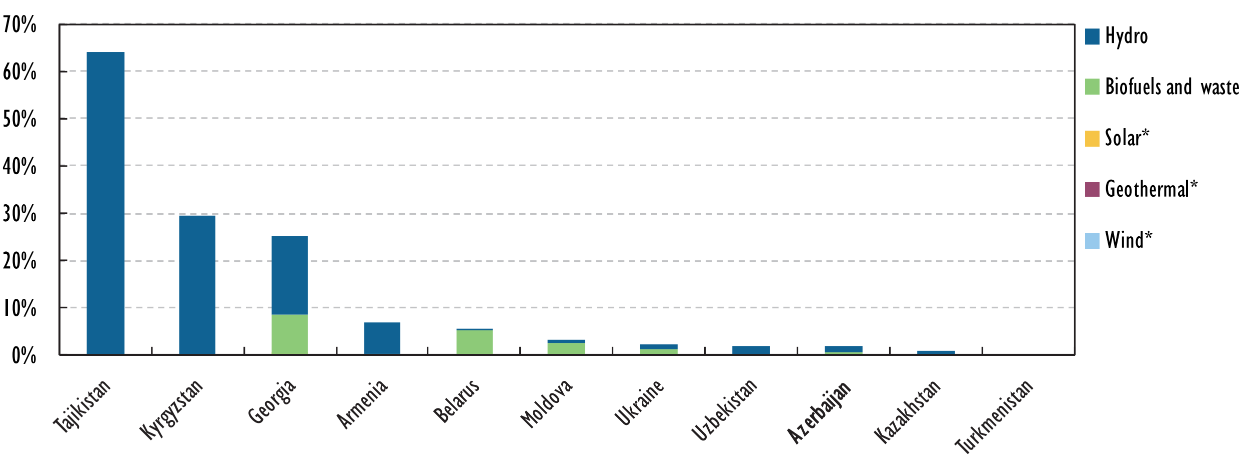

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## RENEWABLES

Renewable energy in Azerbaijan accounted for about 2% of TPES in 2012, from hydro and biofuels (Figure 2.1.7). Wind power is only in the early stages of development. The country has the third-lowest share of renewables in TPES among EECCA countries, behind Turkmenistan and Kazakhstan.

Energy from biofuels, used mainly in the residential sector, has increased substantially over the past decade. Hydropower production is subject to seasonal and water volume variations, for instance with a share of 2.6% in TPES in 2010 and 1% in 2012.

**Figure 2.1.7** Renewable energy as a percentage of TPES in Azerbaijan and other EECCA countries, 2012




* Negligible.

Source: IEA (2014), *Energy Statistics of Non-OECD Countries*, OECD/IEA, Paris.

### ENERGY DATA SOURCES

The figures presented in this report are official energy statistics and balances of the International Energy Agency (IEA) for Azerbaijan and other EECCA countries, based on IEA methodology.

Azerbaijan is working on improving its energy statistics quality and processes. The State Program on Improvement of the Official Statistics for 2008-2012 included activities to bring energy statistics up to international standards and to produce data series on alternative and renewable energy sources. The programme was implemented successfully. The State Program for 2013-2017 includes improvement of indicators on energy efficiency, development of energy reports and other activities.

The energy balances of Azerbaijan are compiled according to the requirements of the International Recommendations on Energy Statistics, prepared by the Oslo Group and adopted by the UN Statistical Commission session in 2011. Previous energy balances were compiled in accordance with the Eurostat structure.

The State Statistical Committee provides official energy statistics for Azerbaijan. The Committee provides information to the Cabinet of Ministers, the State Agency on Alternative and Renewable Energy and other government bodies, as well as international organisations including the Joint Organisation Data Initiative (JODI), BP Statistical Review of World Energy, ECO National Statistical Offices, United Nations Statistical Division, CIS STAT, Asian Development Bank and others.

## ENERGY SECTOR DESIGN

### MARKET STRUCTURE

The market structure in electricity as well as in the oil and gas sectors in Azerbaijan is one of vertically integrated state-owned monopolies.

AzerEnergy is the vertically integrated monopoly in the electricity sector and is involved in electricity generation, transmission, distribution and retail. It serves most of the country, while BakiElektrikshebeke is the state-owned distribution system operator (DSO) in Baku. There are a few independent power producers that have access to the transmission network but they account for less than 1% of electricity generation.

In the Nakhchivan Autonomous Republic, the Nakhchivan Energy Authority is the state-owned transmission system operator (TSO) and the DSO, which also carries out dispatch operations.

The State Oil Company of Azerbaijan Republic (SOCAR) carries out all activities in the oil and gas sectors. SOCAR is also a part of the Azerbaijan International Oil Company (AIOC), a consortium of major oil producing companies that operate in Azerbaijan. The consortium also includes BP, Chevron, Devon Energy, Statoil, Turkish Petroleum Corporation (TPAO), Amerada Hess, ExxonMobi, Inpex and Itochu.

### INSTITUTIONAL FRAMEWORK

**The Ministry of Industry and Energy** is in charge of state policy and regulation in the energy and industry sectors. The ministry has control of fully and partly state-owned enterprises.

**The Ministry of Ecology and Natural Resources** is in charge of policy and regulation for environmental protection, including monitoring the extraction of natural resources and their conservation in Azerbaijan and its section of the Caspian Sea.

**The Tariff Council** is the implementing body across all regulated entities in the economy for prices, service fees and collections.

**The State Agency on Alternative and Renewable Energy Resources (SAARES)** is an independent agency and the principal regulatory institution for alternative and renewable energy resources. It is tasked with the assessment of sustainable energy potential and shaping relevant policies, including tariffs for renewable technologies. It is also responsible for the elaboration and enforcement of relevant procedures such as permits to construct renewable power generation facilities. SAARES was established in 2009. It was made independent from the ministry in 2013 and includes an entity that is developing renewable energy projects. SAARES also prepares energy efficiency policy initiatives in the area of renewables, but its statute does not cover energy efficiency, which is formally assigned to the Ministry of Industry and Energy.

### LEGAL FRAMEWORK

The main body of legislation for the energy sector in Azerbaijan was drafted in the mid- to late-1990s and includes laws related to resource development, oil, gas, electricity, heat, and price regulation. Secondary legislation includes the 2005 Rules of the Use of Electricity and the 2011 Rules of the Use of Natural Gas. A draft Law on Renewable Energy was presented to the government in 2014 and was under consideration by the end of the year.

During 2013, the government approved new laws on electricity, gas supply and network rules. These were prepared in 2010 as part of the European Union-funded Twinning Programme on legal and structural reform of the energy sector in Azerbaijan, with assistance from the German Federal Ministry of Economics and Technology (BMWi).

## KEY POLICIES

The main energy policy is set out in the 2004 State Programme on the Development of the Fuel-Energy Complex in Azerbaijan for 2005-2015. The programme was developed to support oil and gas developments and to ensure energy supply security. As part of the programme in recent years, Azerbaijan has invested in capacity building, rehabilitation and natural gas extraction, reducing electricity shortages and improving energy supply security. Since 2005, electricity production capacity has increased by 1.5 gigawatts (GW), electricity and gas losses have been reduced and the country has become a net exporter of gas due to the opening of the Shah Deniz field. There are plans for further field exploitations and capacity building.

Renewable energy has become a focus of energy policy in recent years. Azerbaijan has significant untapped renewable energy potential in wind, solar, small hydro, biomass and geothermal. A presidential decree in 2011 called for a new State Strategy on the Use of Alternative and Renewable Energy Sources in Azerbaijan for 2012-2020, which was still under consideration by the government by the end of 2014. The new programme (20/20/20) proposes a legal framework to achieve by 2020 goals to:

- reduce greenhouse gas (GHG) emissions by at least 20% below 1990 levels
- produce 20% of electricity from renewables
- increase energy efficiency by 20%.

A Law on Renewable Energy was drafted in 2014 and was under consideration by the government by the end of the year. It includes a feed-in tariff for renewables and other incentives.

Energy efficiency is the responsibility of the Ministry of Industry and Energy. There are no specific policies or incentive schemes for efficiency at present.

Azerbaijan became a member of the International Renewable Energy Agency in 2009. Azerbaijan is a non-Annex I country in the United Nations Framework Convention on Climate Change (UNFCCC) and it ratified the Kyoto Protocol in 2000. The State Commission on Climate Change was established in 1997. Azerbaijan has been in negotiations to accede to the World Trade Organization since 1997.

## INVESTMENT

### ELECTRICITY

The electricity sector has seen notable investment in new gas-fired generation over the past decade, with capacity increasing by 1.5 GW since 2005. In 2013, 780 megawatts (MW) of new capacity came on line with the commissioning of the Janub power plant in Shirvan. The construction of the Shimal-2 power plant is ongoing and is expected to add another 400 MW by 2015.

The state-owned utility AzerEnergy invests in maintenance and rehabilitation according to its annual and long-term programmes. Currently it is rehabilitating distribution lines across the country. It is considering implementation of a smart meter programme. AzerEnergy is continuing negotiations with Russia and Georgia on the improvement of synchronisation of their power systems and increased electricity trade.

The government is participating in the Black Sea Regional Transmission Planning Project, with support from the US Agency for International Development and the United States Energy Association (USEA), to strengthen the regional electricity market conditions and interconnections. In 2009, the Azerbaijan-Georgia-Turkey Power Bridge (AGT) project was established by a Memorandum of Understanding among the TSOs of the three countries (AzerEnergy, GSE [Georgia] and TEIAS [Turkey]). The line from Azerbaijan to Georgia was completed in December 2013, while the energy bridge is expected to become operational by 2015. According to project specifications, 1 200 MW capacity per year are expected to be exported to Turkey (Azernews, 2014).

In order to reach its 9.7% share of renewables target by 2020, the government has approximately 335 MW of renewable investment in planning. These include 210 MW of wind farms, 50 MW of biogas and 75 MW of solar power projects.

### NATURAL GAS AND OIL

Natural gas production is a key area of energy sector investment in Azerbaijan. The first gas field, Shah Deniz, opened in 2007. The Umid and Absheron natural gas deposits are also expected to have fruitful results. The Umid field began production in 2012 while the Absheron field is expected to begin output in the early 2020s.

Phase II of the Shah Deniz development field negotiations are underway within the consortium that operates the field. The consortium is made up of BP (28.8%), TPAO (19%), SOCAR (16.7%), Petronas (15.5%), LUKOIL (10%) and NIOC (10%). The consortium plans for the first output of about 4 bcm/year from the phase II development to be delivered to the Turkish market by 2018, with volumes increasing up to 12 bcm/year in 2019. This would nearly double the level of natural gas production in Shah Deniz in 2011; production has increased to 9 bcm/year in 2014. The Shah Deniz consortium plans to reach the designed project capacity of 16 bcm/year by 2020. To October 2014, the field has exported approximately 30 bcm in total to Turkey and more than USD 11 billion has been invested (Natural Gas Europe, 2014).

The Absheron field is estimated to hold 150-300 bcm of deposits and will require approximately USD 5-7 billion to develop. The project is financed by Total S.A. (40%), SOCAR (40%) and GDF Suez S.A. (20%) (Bloomberg, 2014).

Four governments signed the Baku Declaration in 2010, which led to the creation of the Azerbaijan-Georgia-Romania-Hungary Interconnector (AGRI) liquefied natural gas (LNG) project. A feasibility study was completed in late 2012 (AGRI, 2014). Owned by the four countries, project costs are estimated at EUR 4.5 billion with a projected capacity of 8 bcm and completion by 2020. The AGRI is an integral part of the Southern Gas Corridor to provide Caspian gas to European markets.

In late 2011, the European Union began negotiations with Azerbaijan and Turkmenistan on development of the Trans-Caspian pipeline. Negotiations are ongoing, but support is lacking from surrounding countries.

Investment planning in upstream oil over the next five years to 2019 amounts to development of 150 kb/d in the West Chirag Oil project and 150 kb/d in Shah Deniz 2. First oil form the West Chirag platform was achieved in January 2014 while the Shah-Deniz 2 project is expected to start in 2017 (IEA, 2015).

### TECHNOLOGY AND INNOVATION

Technology and innovation policies are led by the Azerbaijan National Academy of Sciences (ANAS), the Ministry of Education, the State Oil Academy and SOCAR. Research and development (R&D) is funded from the state budget, the State Science Fund and SOCAR. R&D spending is falling, according to UNESCO, whose most recent data show that R&D expenditure was 0.17% of GDP in 2007, down from 0.34% in 2000 (UNESCO, 2011). In 2009, UNESCO assisted ANAS in designing a road map for the formulation of a new Azerbaijan Science, Technology and Innovation Strategy and Policy, with a focus on capacity building over the period 2011–15. The country has a large number of researchers and publications are increasing.

## ASSESSMENT

The energy sector plays an important role in Azerbaijan's economy, as it is a large producer and exporter of oil and gas. Developments in both have led to robust economic growth over the past decade. Investment from international companies has led to higher government revenues which have been re-invested in the energy sector, including new generation capacity, network extensions and rehabilitation, and modernisation of systems. This investment has resulted in improvements in electricity shortages and overall energy supply security.

Challenges remain as Azerbaijan's energy policy is based on the State Programme on the Development of the Fuel-Energy Complex to 2015 and a strategy beyond then has not been elaborated. The government is considering an alternative energy and renewables development path to 2020. It has the ambitious 20/20/20 goals, yet it has not set out a strategy for achieving them.

In order to align overall energy policy objectives, including renewables, energy efficiency and fossil fuel production, a comprehensive long-term view is needed along with appropriate analytical tools to assess the possible mechanisms and instruments to achieve the 20/20/20 goals. The outlook should include supply and demand scenarios under various economic conditions, and potential returns to 2030 and 2050.

Commendably, Azerbaijan has established SAARES as an independent agency with a mandate for alternative and renewable energy policies and programmes, such as drafting a new law on renewables. The draft Law on Renewables includes incentive schemes for renewable energy development, such as a feed-in tariff. Incentives are needed to attract the foreign investment required to develop renewables in Azerbaijan, as their costs are higher than those of traditional fuels. At the same time, the government needs to work towards opening the power market and establishing grid codes to facilitate access for new producers.

Electricity demand will continue to increase with economic growth and a rising standard of living. The network infrastructure is old and bottlenecks in the national transmission system cause shortages and reduce system reliability. Azerbaijan needs to continue to invest in the modernisation of its electricity networks and in expansion of regional interconnections. Investment in construction, maintenance and rehabilitation of the power grid should be prioritised in the energy strategy and its implementation.

To attract the necessary investment for renewable energy developments and network rehabilitation, the government should establish an independent regulator for the whole energy sector, which sets tariffs that reflect the full cost of supply in the context of affordable rates for vulnerable consumers. An independent and stable regulator can improve the investment environment to attract needed foreign investment.

Azerbaijan has improved the energy intensity of its economy over the past two decades, yet more progress in demand-side management is needed. For example, the uniform electricity tariff structure does not differentiate between peak and off-peak demand periods and so limits demand-side measures.

There is no energy efficiency strategy to influence energy demand and to promote energy savings in Azerbaijan. A stronger focus on energy efficiency in key sectors would enhance the performance of the country’s economy and underpin more sustainable use of its resources. Developing and implementing an effective energy efficiency strategy would help Azerbaijan to explore the cost-effectiveness of different measures and to co-ordinate efforts across different sectors. The strategy should set out the necessary measures to achieve the 2020 target, such as minimum performance standards and other incentives and/or regulations to promote the more efficient use of energy.

## *RECOMMENDATIONS*

*The government of Azerbaijan should:*

- ☐ *Develop a comprehensive sustainable energy strategy for the post-2015 period building on existing programmes and including an effective consultation process to incorporate the views of industry and other energy actors and consumers. The outlook should consider energy scenarios to 2030 and 2050 on the basis of a robust assessment of energy supply and demand trends, including the potential for renewables and energy efficiency, to strengthen the energy system perspective and demand-side focus.*

- *Promptly adopt the appropriate legal framework, including the draft Law on Renewables and secondary legislation, to put into place the necessary incentives and policies to reach the 2020 targets for renewables, energy efficiency gains and GHG emissions reductions.*
- *Expedite structural energy policy reforms to move towards competitive markets, particularly in electricity. Ensure transparent and non-discriminatory access to the grid and set out long-term and cost-effective support mechanisms for renewables, while ensuring investment in the modernisation and expansion of the networks, quality of supply and consumer choice of suppliers.*
- *In this context, set up an independent regulatory authority to safeguard business and consumer interests. Strengthen consumer protection by introducing quality of service regulation, transparency and public consultation in tariff-setting and monitoring of price developments.*
- *Develop an effective energy efficiency strategy to encourage energy savings in all sectors. Assign clear responsibilities for energy efficiency at the government level and continuously improve efficiency data collection and monitoring. In addition, make progress on raising the efficiency of exploration and production and minimising gas flaring.*

# 2.2. ENERGY SECURITY

## RESOURCE ENDOWMENT

Azerbaijan is rich in oil and natural gas deposits. In 2012, oil reserves were 952 Mt, ranking 20th and accounting for 0.4% of global reserves. Oil resources were 1 245 Mt with remaining potential estimated at 2 197 Mt (BGR, 2013). Oil is produced both onshore and offshore in the Caspian Sea, with offshore production accounting for about one-quarter of the total (Azerbaijan.az, 2014).

Azerbaijan held an estimated 991 bcm of natural gas proven reserves, with reserves of 2 000 bcm and remaining potential of 3 518 bcm in 2012 (BGR, 2013). An additional 150-300 bcm of reserves are estimated at the Absheron field in the Caspian Sea, discovered in 2012.

According to the operator, BP, the Shah Deniz gas field is one of the world's largest and holds more than 1 000 bcm. While Azerbaijan is not as large a player in gas on a global scale as it is in oil, gas extraction is expected to continue to contribute significantly to the economy over the coming decades.

Other large fields include (with estimated reserves, some of which are proven): Umid (200 bcm), Babek (400 bcm), Azeri-Chirag-Deepwater Guneshli (ACG) (300 bcm), Nakhichevan (300 bcm), and Shafag-Asiman (200-500 bcm).

Overall hydropower potential in Azerbaijan is 40 gigawatt hours (GWh) (Verdiyev, 2012). The technically feasible potential is 16 GWh, 5 GWh of which is small hydropower.

## ENERGY SECURITY AND DIVERSIFICATION

The energy mix is heavily concentrated on fossil fuels, with oil and gas accounting for more than 98% of total supply in Azerbaijan. Azerbaijan is well-endowed in oil and gas resources, so the security of supply of these fuels is not of immediate concern. However, reliance on fossil fuels adds to GHG emissions and exposure to fuel price fluctuations.

Ageing natural gas networks have been significantly modernised with new compressor stations and ancillary infrastructure. Distribution system losses and quality of gas supply remain a concern.

Electricity generation is dominated by natural gas at about 90%, while hydro amounts to 8%. Azerbaijan has improved the security of its electricity supply over the past decade with major investment in modernising generation and strengthening the west-east transmission system. Construction of gas-fired generation capacity has mitigated the electricity shortages that used to be common, as will a number of hydropower projects underway. Resource-related income has boosted the growth of the middle class, and consequently the demand for electricity such that further capacity additions are needed.

The government has targets to increase the share of renewable energy sources in the energy mix and to reduce GHG emissions by 2020. In 2011, the president signed a decree to prepare a new State Strategy on the Use of Alternative and Renewable Energy Sources in Azerbaijan for 2012-2020, but as of mid-2014, it is still under consideration.

The new programme is expected to determine the key directions for the production of electricity and heat from renewables. To date, renewable energy focus has been on small hydro and wind power with more than 300 MW of new renewables capacity in the planning or development stage. Commendably, Azerbaijan is advanced on metering of household and industry consumption.

## ENERGY INFRASTRUCTURE AND INVESTMENT

### ELECTRICITY

Azerbaijan has a total installed capacity of 7.4 GW: 3.5 GW of oil-fired generation; 2.4 GW gas-fired; 1.1 GW hydro; and 0.3 GW of multi-fuel (Table 2.2.1). The power network includes 63 high-voltage substations and more than 4 100 km of lines (Table 2.2.2). Most of the substations have been operating for more than 60 years (EIA, 2014).

**Table 2.2.1** Installed generation capacity by type, Azerbaijan, 2012

| Type | Installed capacity (MW) |
|---|---|
| Oil-fired (steam) | 3 450 |
| Gas-fired (gas turbine) | 622 |
| Combined-cycle gas turbine | 1 825 |
| Combined heat and power | 106 |
| Multi-fuel | 300 |
| Hydro | 1 063 |
| **Total** | **7 366** |

Source: EIA (2014), "Azerbaijan overview", EIA website, www.eia.gov/countries/cab.cfm?fips=AJ (accessed 16 December 2014).

**Table 2.2.2** Electricity transmission and distribution network, Azerbaijan, 2012

| Type | Number of lines | Length (km) | Substations |
|---|---|---|---|
| 550 kV | 2 | 529 | 1 |
| 330 kV | 13 | 1 207 | 6 |
| 220 kV | 19 | 1 226 | 9 |
| 110 kV | 119 | 1 500 | 47 |

Source: EIA (2014), "Azerbaijan overview", EIA website, www.eia.gov/countries/cab.cfm?fips=AJ (accessed 16 December 2014).

The electricity sector has seen notable investment in new gas-fired generation capacity over the past decade, with capacity increasing by 1.5 GW since 2005. In 2013, 780 MW of new capacity entered into operation with the commissioning of the Janub power plant in Shirvan city. The construction of the Shimal-2 power plant is ongoing and will add another 400 MW.

### OIL

There are three crude oil export pipelines in Azerbaijan.

About 80% of the oil is exported through the Baku-Tbilisi-Ceyhan (BTC) pipeline which began operations in 2006 and has a capacity of 1 million barrels per day (bbl/d). The BTC pipeline transports crude oil produced at the Azeri-Shirag-Guneshli field as well as condensate produced at Shah Deniz from the Sangachal terminal near Baku through Georgia and to the Mediterranean port of Ceyhan in Turkey. From there the oil is shipped to world markets via tankers. BTC is 1 768 km in length, with 443 km in Azerbaijan, 249 km in Georgia and 1 076 km in Turkey. The pipeline has ample free capacity and transports some Turkmen and Kazak oil.

The Northern Route Export Pipeline (NREP) runs from the Sangachal terminal in the Caspian Sea to the Novorossiysk terminal on the Black Sea in Russia. The pipeline is 1 335 km in length with a capacity of 100 000 bbl/d and has been operating since 1996. SOCAR operates the Azerbaijani section and Transneft operates the Russian section. There are proposals to increase the capacity on the pipeline, which would be a key transportation addition as production expands in the Caspian in years ahead. Nevertheless, operations of the pipeline were stopped in 2014 and have resumed in 2015 at lower loading levels.

The Western Route Export Pipeline (WREP) transports crude oil from offshore oil fields in the Caspian Sea to Supsa, Georgia on the Black Sea where it continues to European markets via tankers. It is 829 km in length with a capacity of 145 000 bbl/d and has been in operation since 1999.

## NATURAL GAS

Azerbaijan became a net exporter of natural gas in 2007 with the start-up of the huge Shah Deniz natural gas and condensate field; before then it imported gas from Russia.

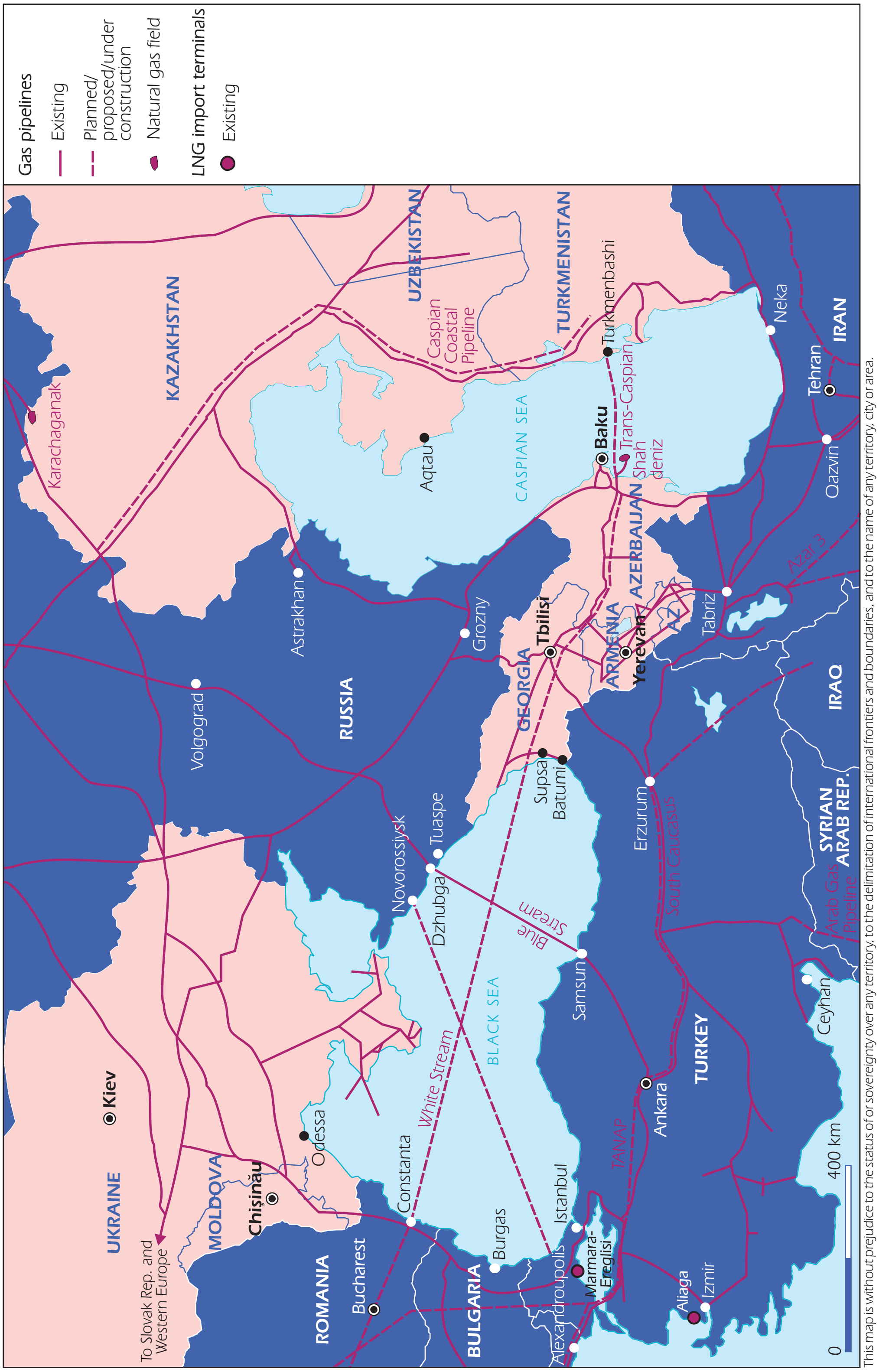
Azerbaijan has two main gas export pipelines. The largest is the South Caucasus Pipeline (SCP) which transports gas from the Shah Deniz field paralleling the route of the BTC crude oil pipeline from Azerbaijan through Georgia to Turkey. The SCP is 691 km in length (443 km in Azerbaijan and 250 km in Georgia), 42 inches in diameter and has a capacity of 7 bcm.

The second export route is the Gazi-Magomed-Mozdok Pipeline. Prior to 2007, this pipeline transported natural gas from Russia to Azerbaijan, but an agreement between SOCAR and Gazprom allowed the pipeline flow to be reversed. Gas exports to Russia began in 2010. The pipeline is approximately 240 km long and has a capacity of 1 bcm/year (EIA, 2014).

Trans-Anatolian Pipeline (TANAP) is a 1 850 km pipeline that will transport gas from Azerbaijan’s Shah Deniz 2 field to Turkey and onto European customers via the connection to the Trans-Adriatic Pipeline (TAP). The construction of TANAP began in March 2015 in Turkey. The first gas is expected to flow in 2018 and the pipeline is expected to reach capacity of 16 bcm/y by 2022, 23 bcm/y by 2024 and 31 bcm/y by 2028. In March 2013, a Shareholder Agreement for the pipeline was signed in Ankara, with shares of 58% for Southern Gas Corridor Closed Joint Stock Company (SGC), 30% for BOTAS and 12% for BP (SOCAR, 2015).

Shah Deniz 2 is expected to produce around 4 bcm per year of natural gas in its first year of production (end-2018) with volumes increasing up to 12 bcm per year in 2019, making it one of the largest gas development projects in the world. Shah Deniz I is producing around 9 bm per year at present. The Shah Deniz consortium plans to reach the designed project capacity of 16 bcm by 2020. Transportation of additional Shah Deniz gas from the Caspian Sea to Europe will require enhancement of the existing pipelines and development of new infrastructure.

**Figure 2.2.1** Black Sea and Caspian Sea natural gas infrastructure




Sources: IEA (2010), *World Energy Outlook*, OECD/IEA, Paris; IEA analysis.

The AGRI LNG project stems from the four countries signing the Baku Declaration in 2010. It led to the creation of the AGRI LNG Project Company, owned by the four states. In November 2012, the feasibility study was completed. The project is expected to cost EUR 4.5 billion with a projected capacity of 8 bcm, with completion by the end of the decade (AGRI, 2014).

Azerbaijan has two existing underground gas storage facilities, Kalmaz and Garadag, both located at Garadag. Gas is supplied from the Gazi-Mammad-Baku pipeline. Total design storage capacity is around 3.5 bcm: Kalmaz (1.5 bcm) and Garadag (2 bcm).

### SYSTEM RELIABILITY

Azerbaijan's electricity generation is mainly located in the west, but the centres of consumption are in the east and south. The importance of west-east transmission network has been a focus for the government. The production and consumption centres are connected by two transmission lines. Transmission losses and bottlenecks were high. In 2008, the Asian Development Bank approved a USD 160 million loan to rehabilitate the transmission lines.

Power system reliability in Azerbaijan is hampered by ageing infrastructure and under-investment. Recent maintenance and rehabilitation programmes, however, are delivering improvements through the progressive installation of SCADA systems and rehabilitation of high-voltage substations. The state-owned utility, AzerEnergy, is implementing annual and five-year investment programmes which include:

- rehabilitation and improvement of all regional distribution grids
- installation of pre-paid meter systems
- dispatch control and information systems
- installation of SCADA systems
- improved training and development.

**Table 2.2.3** Electricity losses in transmission and distribution networks, Azerbaijan, 2013

| Network | % |
|---|---|
| Total technical losses | 17.3 |
| Transmission | 4.2 |
| Distribution | 13.9 |

Source: AzerEnergy.

Investment in the natural gas sector, rehabilitation programmes and the installation of smart metering devices have significantly reduced losses and cut outages. Losses have been reduced from 14% in 2012 to 8% in 2013, with the aim to further cut them to 3% in 2014.

## EMERGENCY RESPONSE

The Ministry of Emergency Situations, established in 2005, is responsible for emergency response mechanisms in all sectors of the economy. Its mandate includes natural and man-made disasters and fire, as well as emergency situations with power system incidents, utility systems, hydropower facilities, oil and gas production and processing facilities, main pipelines and others. It provides policy measures in the fields of civil defence, rescue and restoration works.

# 2.3. MARKET CONVERGENCE

## NATIONAL MARKET STRUCTURE

### ELECTRICITY

There is no competition in the electricity market in Azerbaijan. It is dominated by a number of state-owned vertically integrated monopolies. AzerEnergy, the largest electricity provider, owns and operates the majority of generation assets including gas- and oil-fired and hydro plants, and operates as the TSO, DSO and retailer. AzerEnergy supplies electricity to most of the country, except for electricity distribution in Baku, which is operated by BakiElektrikshebeke.

In the Nakhchivan Autonomous Republic, the Nakhchivan Energy Authority is the state-owned TSO and DSO and carries out dispatch operations. Existing legislation envisages unbundling in the electricity sector in the future. Presently, however, there are no implementation measures on the horizon.

The Law on the Power Industry (1998) sets out some provisions for third-party access. AzerEnergy can purchase electricity from other producers, and other entities can buy electricity from AzerEnergy (or other state companies) and sell it to final consumers. Alternatively, independent generators or industries can supply electricity to consumers on their own grids or through the state transmission system. These account for around 1% of electricity generation.

### OIL AND NATURAL GAS

SOCAR is the national oil and natural gas company. Its functions include: exploration and production of onshore and offshore oil and gas resources; processing and transportation; domestic and international sales; and scientific research. SOCAR was established in 1992 by presidential decree through a merger of state-owned AzeriNeft and AzerNefkimya. AzeriGaz is the distribution subsidiary company of SOCAR.

AIOC, a consortium of major oil producing companies operating in Azerbaijan includes SOCAR, BP, Chevron, Devon Energy, Statoil, Turkish Petroleum Corporation (TPAO), Amerada Hess, ExxonMobil, Inpex and Itochu.

Third-party access to pipelines is not permitted under existing legislation. Changes to the existing market structure are not envisaged.

### REGULATORY FRAMEWORK

Azerbaijan does not have an independent energy regulator. Licensing procedures are regulated by the Ministry of Industry and Energy, while tariffs are determined and set by the Tariff Council. The Council is chaired by the Minister of Economic Development and has 12 members.

#### Tariffs

The Tariff Council establishes the tariff methodology, reviews the levels proposed by regulated companies (including but not limited to energy), and proposes changes to the legal framework as it relates to pricing. It also is responsible for dispute settlements concerning price regulation and tariff application. Electricity and heat tariffs subject to state regulation include purchase by producers, wholesale and retail sales, and import/export transaction. The Law on Electricity stipulates that tariffs must cover the full cost of generation, transportation and distribution and ensure the profitability of power enterprises.

Electricity and natural gas tariffs for households and most commercial entities are uniform. The retail price of electricity paid by households in Azerbaijan is USD 0.08 per kilowatt hour and USD 0.14 per cubic metre for natural gas. Large consumers such as chemical and aluminium producers and steel smelters have a differentiated rate structure. There are no feed-in tariff incentives or special tariffs for foreign investors; however, a feed-in tariff is included in the new draft Law on Renewables.

Government bodies may modify decisions made by the Tariff Council, where such right is granted to them by legislation. Regulatory decisions may also be overturned by court rulings. Energy companies may appeal against a decision of the Tariff Council, either directly to the Council or through court action.

### Metering and collection

All consumption of electricity and natural gas is metered in Azerbaijan. There is an ongoing programme to change all consumers to pre-paid meters. Metering systems fully comply with international standards. Distribution entities own all of the end-user meters.

AzerEnergy has plans to complete a roll-out of smart meters over the coming years to improve tracking of consumption and avoid illegal connections. The company has installed around 20% of its 1.5 million customers with smart pre-paid meters, which has significantly improved collection rates. The collection rate for electricity was 90% in 2013 and 102% for gas.

Cross-border flows are operated and metered by AzerEnergy for electricity and by SOCAR for oil and gas. Metering on both sides is done electronically. Both parties submit meter readings, reconcile the data, and prepare and verify metering reports. Bilateral agreements govern the transactions. A working committee is established which carries out investigations and resolves conflicts in the case of data discrepancies.

### Technical rules

The standards of the former Soviet Union (GOST standards) are still in use in both the electricity and gas sectors in Azerbaijan, including a number of national standards. The State Committee on Standardisation, Metrology and Patents represents Azerbaijan in international and regional standardisation organisations, notably in:

- the International Organization for Standardization (ISO): member
- the European Committee for Standardization (CEN): affiliate
- the Codex Alimentarius: member and national contact point
- the Interstate Council for Standardization, Metrology and Certification of the Commonwealth of Independent States/Eurasian Interstate Council for Standardization, Metrology and Certification (EASC).

The reform agenda includes adoption of a national plan for converting mandatory standards to technical regulations and voluntary standards, a draft law on technical regulations, and draft laws on standardisation and accreditation.

This process of Azerbaijan's World Trade Organization (WTO) accession involves significant reforms in its trade policies. One of the key areas is standards and technical regulations. In particular, Azerbaijan needs to ensure its compliance with the requirements of the WTO Technical Barriers to Trade (TBT) Agreement. Azerbaijan is in the process of reforming its standards and technical regulations to ensure harmonisation with the TBT Agreement.

## REGIONAL MARKETS AND INTERCONNECTIONS

Oil and gas pipelines connect Azerbaijan with its neighbours, and European and world markets. The BTC oil pipeline, which connects Azerbaijan with Turkey via Georgia, began operations in 2005, and since then the level of regional integration has increased considerably as oil exports have more than doubled. Azerbaijan also exports oil via a Russian port on the Black Sea and maintains close trade relations with the Russian Federation. The South Caucasus Pipeline, whose route parallels that of the BTC, also began operations in 2006 and has contributed to stronger relations with both Turkey and Georgia.

Regional energy co-operation takes place within the framework of the Baku Initiative, which is a political dialogue launched by a ministerial conference in Baku in 2004. It is aimed at enhancing energy and transport co-operation between the European Union and the littoral states of the Black and Caspian seas and their neighbouring countries. In the field of energy, it was followed in 2006 by the adoption of the Energy Ministerial Declaration, which included a roadmap for the four priorities in the fields: energy market convergence; energy security; sustainable energy development; and attracting investment. Azerbaijan regularly participates in the Eastern Partnership and its energy security platform.

Bilateral co-operation between the European Union and Azerbaijan takes place in the context of the European Neighbourhood Policy, in line with the Partnership and Co-operation Agreement, which includes energy. The European Union and Azerbaijan launched negotiations in 2010 on a future Association Agreement, which would include energy security provisions.

The AGRI LNG project is of strategic importance to the Southern Corridor, as well as to Europe. It is expected to diversify the gas supply to Eastern Europe through LNG transport from the Caspian Sea via the Black Sea. With an estimated cost of EUR 4.5 billion and projected capacity of 8 bcm, it is expected to be completed by 2020 (AGRI, 2014).

In late 2011, the European Union began negotiations with Azerbaijan and Turkmenistan on the development of the Trans-Caspian pipeline, which would turn Azerbaijan into a transit country for Turkmen gas to Turkey and the European Union. Negotiations are ongoing; however, support for the projects is lacking from surrounding countries.

The government of Azerbaijan is participating in the Black Sea Regional Transmission Planning Project, with the support from USAID and USEA, aimed at strengthening regional electricity market conditions and interconnections. In April 2009, the AGT project was established by a Memorandum of Understanding among the TSOs of the three countries, namely AzerEnergy, GSE (Georgia) and TEIAS (Turkey). The line from Azerbaijan to Georgia was completed in December 2013, while the energy bridge is expected to become operational by 2015. According to project specifications, 1 200 MW/year of exports to Turkey are expected (Azernews, 2014).

# 2.4. SUSTAINABLE DEVELOPMENT

## RENEWABLE ENERGY

Renewable energy accounts for less than 2% of TPES, although its share in power generation is 8%. Azerbaijan has 1 063 MW of installed hydropower capacity with facilities ranging in size from 5 MW to 418 MW. Overall hydropower output varies with seasons and water volumes. The government has a target to increase the share of renewables in electricity to 20% by 2020, and is currently developing a national programme to address this objective. Additionally, the government has set a 2020 target of 9.7% share of renewables in total energy consumption (up from 2.6% in 2011). A number of renewable energy projects are planned (Table 2.4.1).

**Table 2.4.1** Planned renewable energy projects, Azerbaijan, 2014

| Project | Capacity (MW) | Estimated cost (USD million) |
|---|---|---|
| Pirkushkul wind farm | 110 | 202 |
| Hovsan biogas | 50 | 92 |
| Absheron solar PV park | 25 | 107 |
| Offshore wind farm | 100 | 307 |
| 1 000 house / 1 000 power stations | 50 | 98 |

Source: Government of Azerbaijan.

A 2004 national programme for alternative and renewable energy for the period 2005 to 2013 had seen little implementation by 2009. The government then established SAARES (under the Ministry of Industry and Energy) to accelerate the implementation of the programme. In June 2012, SAARES was abolished and replaced by the State Company on Alternative and Renewable Energy Sources, only to be reinstated again in February 2013 as an independent agency.

A new State Strategy on the Use of Alternative and Renewable Energy Sources in Azerbaijan for 2012-2020 is currently under consideration. The draft strategy (20/20/20) proposes a legal framework to achieve by 2020 goals to:

- reduce GHG emissions by at least 20% below 1990 levels
- produce 20% of electricity from renewables
- increase energy efficiency by 20%.

A draft Law on Renewable Energy includes incentives aimed at attracting private investment. Proposed incentives include a feed-in tariff for renewable energy generation and tax breaks for equipment imports.

Azerbaijan has renewable energy potential in wind, solar, small hydro, biomass and geothermal resources. According to SAARES, the estimated potential for wind power is 2.4 GWh/year and small hydro 5 GWh/year. Estimates for the potential from other renewable energy sources have not been made.

## ENERGY EFFICIENCY

The government of Azerbaijan has an ambitious target of a 20% improvement in energy efficiency by 2020 (within its 20/20/20 programme). However, it does not have a strategy, legal framework or official implementing body to support an energy efficiency programme. Similarly, there are no schemes or incentives to promote energy savings. Institutional responsibility related to energy efficiency lies with the Ministry of Industry and Energy. SAARES implements energy efficiency policies which coincide with renewable energy policies.

Under the framework of the INOGATE Programme, several activities to raise energy savings awareness have been implemented in Azerbaijan with the collaboration of the Ministry of Industry and Energy. A number of training activities have been carried out by SAARES since 2011 at the Gobustan Experimental Polygon training centre it created. In addition, relevant training has been carried out at the University of Construction and Architecture, the president's training centre, the Center for Strategic Studies (SAM Centre) and the Ministry of Foreign Affairs.

Energy audits, an important tool to assess and achieve energy efficiency gains, are not required. There are only a few specialists in this field in Azerbaijan. But several energy audit training programmes started in recent years. For example, Norway's Foreign Ministry, the INOGATE Technical Secretariat and Germany's Renac Academy have provided energy auditing seminars for the buildings and industry sectors. One school and one residential building in Baku have been audited under the Energy Saving Initiative in the Building Sector in the Eastern Europe and Central Asia Project of the INOGATE Programme. The State Committee on Statistics completed a survey of household consumption with the support of the Swedish International Development Cooperation Agency (SIDA).

## ENVIRONMENTAL PROTECTION

Environmental policy in Azerbaijan was guided by the National Program on Environmentally Sustainable Social and Economic Development for 2003-2010. Its action plan covered five major areas: environmental protection and the use of natural resources; global environmental problems; industrial complexes; agriculture and tourism; and education, science and culture. The programme and the action plan were followed up by the Comprehensive Action Plan on Improvement of the Environmental Situation for 2006-2010 which focused on improving environmental protection in certain areas of the country and improving legislation. The overall level of environmental protection is estimated to have improved in recent years; for example the share of protected forests increased from 5.5% in 2004 to 10.2% in 2012 (Energy Charter, 2013).

Environmental standards for assessment are the General Requirements for Environmental Management and Validation of Ecological Effectiveness (2011) and the Environmental Management Life Cycle Evaluation (2012), within national standards. There are also standards related to air and land quality.

## CLIMATE CHANGE

Azerbaijan joined the UNFCCC in 1995 and has been a member of the Kyoto Protocol since 2000 as a non-Annex I country. The State Commission on Climate Change was established in 1997.

According to a 2005 presidential decree, the Ministry of Ecology and Natural Resources is the Designated National Authority for the Clean Development Mechanism (CDM) under the Kyoto Protocol. To date, 17 CDM project proposals in Azerbaijan have been registered and four projects are under validation.

Azerbaijan's energy-related emissions of $CO_2$ totalled 29.3 Mt in 2012. This is 46.8% lower compared to 1990, mainly due to a strong decline after the breakup of the Soviet Union. In Azerbaijan, the power generation sector accounts for 39.9% of energy-related $CO_2$ emissions, followed by transport (21.8%), households (16.5%), manufacturing (8.8%), other energy industries (7.9%) and commercial and other services (5%).

## GAS FLARING

According to the Carbon Limits (CL) report on Associated Petroleum Gas (APG) (2013), APG utilisation in Azerbaijan is relatively high by international standards.

SOCAR operates a number of fields with considerable APG venting, including Shallow Water Guneshli, Neft Dashliari and Palchiiq Pilpiassi. SOCAR's collection and use of APG with small compressors is 375 million cubic metres (mcm)/year. Since oil production peaked in 2010, flaring has ranged 500-700 mcm/year, with the gas utilisation rate at around 94%. The ACG field has the largest production of APG, estimated at around 12 bcm with 60% re-injected, 25% used in domestic consumption or exports and 15% used as fuels at the installations or flared (CL, 2013).

Azerbaijan has cut almost 50% of its gas flaring since it joined the Global Gas Flaring Reduction (GGFR) partnership in 2010. SOCAR identified existing gas flaring sources with the assistance of the GGFR partnership between 2008 and 2010. The company prepared the Associated Gas Recovery Plan (AGRP) and the working group on AGRP was established under the Ministry of Industry and Energy. The AGRP was developed jointly with the Ministries of Ecology and Natural Resources, and gas and electricity operators.

SOCAR has also prepared a strategy on zero emissions through flared APG. The relevant project is in the validation stage and aims to reduce gas flaring in the offshore area of Oil Stones.

# 2.5. INVESTMENT ATTRACTION

## INVESTMENT CLIMATE

The investment climate in Azerbaijan is improving. This is due to an easing of legal and administrative hurdles and a more favourable tax regime. Major improvements in administrative processes include: establishing a one-stop shop for business registration; streamlining property registration and transfer procedures; improved tax administration; broadened credit availability; and improved corporate governance guidelines. The government reduced the level of tax for corporations and individuals in 2010, which is expected to increase the flow of private investment.

The government is currently drafting a number of legal amendments to improve investment conditions in the country. These include changes to the Law on Investment Activity. The consolidation of separate laws and legislative acts on unfair competition and anti-monopoly activity in a new Competition Code has been drafted and submitted to the parliament.

According to the World Bank's "ease of doing business" indicator, Azerbaijan is ranked 70th among 185 countries. The index measures how conducive the regulatory environment is to starting and operating a local firm. Azerbaijan's ranking is similar to that of Kyrgyzstan among EECCA countries.

Azerbaijan is perceived to be rather corrupt, but conditions are improving. According to the Corruption Perceptions Index (CPI) prepared by Transparency International, Azerbaijan ranks 127th among 177 countries, with a score of 28 out of 100 (where 100 represents no corruption). Its ranking is comparable of that of Russia. Azerbaijan has brought in measures to fight corruption, including Anti-corruption Action Plans, the third one for 2012–15 in force at present. However, according to the OECD monitoring report (2013), participation in assessing the anti-corruption policy has not improved over time.

Azerbaijan is also co-operating with the Extractive Industries Transparency Initiative (EITI) for improving the transparency and accountability of public and private operations in the resources sector. The EITI Board found Azerbaijan compliant in its last review in 2009. Implementation is on track in accordance with the work plan. Some of Azerbaijan's Production Sharing Agreements are disclosed on the EITI website.[3]

## INVESTMENT FRAMEWORK

The laws on Investment Activity, Investment Funds and Foreign Investments set the legal framework for investment in Azerbaijan. Under the Law on Foreign Investments, foreign investors have the same rights as local investors and may, additionally, be granted preferential rights.

**3.** www.eiti.az/en/doc/14.

The legislative framework also covers international agreements for which Azerbaijan is a party. This includes the New York and Washington Conventions, and 45 bilateral investment and 44 double taxation treaties. Azerbaijan has signed agreements with a number of countries on the promotion and reciprocal protection of investments.

In 2010 the government overhauled its tax framework, leading to lower taxes and higher earnings for individuals and businesses. Double taxation on income and property was eliminated, corporate earnings tax was reduced from 22% to 20%, the rate of value-added tax was reduced from 20% to 18% and the highest progressive income tax rate was reduced from 35% to 25%. Effective from 2014, all taxes, other than land tax, were removed for agricultural producers.

The government passed a new law regarding the establishment of Special Economic Zones (SEZ) in 2010, which allows for preferential tax and customs conditions for the zones. The creation of SEZs is subject to presidential approval and is open to domestic and foreign investors.

## INVESTMENT PLANNING

Public investment planning in Azerbaijan is done through a number of state programmes which identify investment priorities for different sectors and regions. These include:

- the State Program on Socio-Economic Development of Baku and its Neighbourhoods for 2011-2013
- the State Program on Socio-Economic Development of Regions of Azerbaijan for 2009-2013
- the State Program on Poverty Reduction and Sustainable Development for 2008-2015
- the State Program on Secure Food Supply to Population in Azerbaijan for 2009-2013
- Azerbaijan 2020: Vision Concept of Development.

# References


AGRI (Azerbaijan-Georgia-Romania-Hungary Interconnector) (2014), AGRI website, www.agrilng.com (accessed 14 December 2014).

Azerbaijan.az (2014), "Geological structure", Azerbaijan.net website, http://azerbaijan.az/portal/Nature/Geostructure/geostructure_e.html (accessed 16 December 2014).

Azernews (2014), "Azerbaijan-Georgia-Turkey Energy Bridge to strengthen energy security: Minister", press release, 4 June, www.azernews.az/business/67704.html.

BGR (German Federal Institute for Geosciences and Natural Resources) (2013) *Energy Resources 2013, Reserves, Resources, Availability, Tables*, BGR, Hannover, Germany.

Bloomberg (2014), "Total expects Absheron first gas delayed to 2021", *Bloomberg*, 3 June, www.bloomberg.com.

CL (Carbon Limits) (2013), *Associated Petroleum Gas Flaring Study for Russia, Kazakhstan, Turkmenistan and Azerbaijan*, Final Report for European Bank for Reconstruction and Development, CL, Oslo.

EIA (US Energy Information Administration) (2014), "Azerbaijan overview", EIA website, www.eia.gov/countries/cab.cfm?fips=AJ (accessed 16 December 2014).

Energy Charter (2013), *In-Depth Review of the Energy Efficiency Policy of Azerbaijan*, Energy Charter Secretariat, Brussels.

IEA (International Energy Agency) (2015), *Medium-term Oil Market Report*, OECD/IEA, Paris.

IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

IEA (2010), *World Energy Outlook*, OECD/IEA, Paris.

Natural Gas Europe (2014), "Total investment in Shah Deniz gas field at $11.4 billion", *Natural Gas Europe*, 19 November, www.naturalgaseurope.com.

OECD (Organisation for Economic Co-operation and Development) (2013), "Azerbaijan monitoring report, third round of monitoring", Anti-corruption Network for Eastern Europe and Central Asia, Istanbul Anti-corruption Action Plan, OECD, Paris.

SOCAR (2015), "TANAP Shareholder Agreement signed in Ankara", press release, 16 March, SOCAR website, www.socar.az.

UNESCO (United Nations Educational, Scientific and Cultural Organization) (2011), "UNESCO assisting Azerbaijan in reviewing its STI strategy", press release, 24 March, www.unesco.org/new/en/natural-sciences/science-technology/single-view-sc-policy/news/unesco_pledges_to_assist_azerbaijan_in_review_of_strategy_for_science_and_technology/#.VJBlnfnIbcy.

Verdiyev, Rafig (2012), *National Water Strategy of Azerbaijan Republic*, the Republic of Azerbaijan and EU Water Initiative, presentation, Geneva, 2 July, www.unece.org/fileadmin/DAM/env/water/npd/Pres_Rafig_Final.pdf.

World Bank (2014), *Azerbaijan Overview*, World Bank website, www.worldbank.org/en/country/azerbaijan/overview (accessed 16 December 2014).

# BELARUS

**Figure 3.1.1** Map of Belarus


This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries, and to the name of any territory, city or area.

# 3.1. GENERAL ENERGY POLICY

**Key data (2012)**

**TPES:** 30.5 Mtoe (natural gas 55.5%, oil 34.6%, biofuels and waste 5.3%, peat 1.5%, coal 0.9%), +21.2% since 2002

**TFC:** 23 Mtoe (oil 38.9%, heat 23.3%, natural gas 20.9%, electricity 11.4%, biofuels and waste 3.9%, coal 1.2%), +24.9% since 2002

**TFC per sector:** industry 44.4%, residential 23%, transport 17.7%, commercial and public services 14.9%

**Electricity generation:** 30.8 TWh (natural gas 96.7%, oil 2.6%, biofuels and waste 0.4%, peat 0.1%), +16.4% since 2002

**Heat generation:** 269.8 PJ (natural gas 87.6%, biofuels and waste 7.2%, oil 3.8%, peat 1.3%), -5.4% since 2002

**Energy intensity:** 0.21 toe/USD 1 000 GDP PPP, -39% since 2002

## COUNTRY OVERVIEW

The Republic of Belarus (Belarus) is a landlocked country in Eastern Europe, bordered by Russia to the northeast, Ukraine to the south, Poland to the west, and Lithuania and Latvia to the northwest. Belarus covers an area of 207 595 square kilometres (km) (40% of which is forested) with 9.6 million inhabitants. Minsk, the largest city, is the national capital and home to about 20% of the population while the majority lives in rural areas.

Belarus's economy has a diversified industrial profile. Despite a lack of natural resources and the economic crisis that it had to overcome after the breakup of the Soviet Union, Belarus has achieved solid economic growth through manufacturing and exports, including machinery and equipment, mineral products, chemicals, metals and textiles. Real gross domestic product (GDP), measured in US dollars (USD) with purchasing power parity (PPP) was USD 142.3 billion in 2012, an increase of 98.7% since 2002.

However, little structural reform has occurred in the country since its independence, and there are relatively low levels of foreign investments. The long-standing president opposes privatisation of state enterprises. The energy sector is owned and operated by the government and the president holds the exclusive right to all strategic decisions. The electricity sector is operated by a single vertically integrated national energy company, BelEnergo, while the gas distribution sector is operated by BelTopGaz. The government believes that having control over the entire sector provides a secure and stable energy supply.

Belarus has modest natural resources and therefore relies on imports from Russia to meet most of its energy needs. Belarus is also an important part of Russia's gas transit corridor to Western Europe. Matters related to natural gas transit, including the infrastructure, system operation, tariff structure and technical services are carried out under a bilateral agreement with Russia's Gazprom.

The main priority of energy policy and strategy in Belarus is to provide a reliable and sustainable energy supply for the national economy, while reducing dependence on energy imports and improving the financial stability of the sector. The government is looking at diversifying fuels in its power generation sector, including more coal and renewables. It has introduced a green feed-in tariff to attract more investment in renewables.

The government is also improving energy efficiency in electricity and heat production and is in the process of phasing out subsidies for electricity, heat and gas, which is expected to improve the attractiveness of the energy sector for private investment and make it more market-focused.

While energy policy has direction, the government lacks strong legislation and implementation tools. There is no long-term policy planning and/or analysis of different scenarios, and legislation on electricity and heat doesn't exist. At the end of 2014, the government was considering new legislation on electricity which may include provisions for future unbundling. The legislation is still under consideration only.

Belarus participates in the Russia–Belarus–Kazakhstan Customs Union which evolved into the Russia–Belarus–Kazakhstan Common Economic Space (CES) in 2012, run by the Eurasian Economic Commission (EEC) to which Belarus is party. The CES aims to remove barriers to the free movement of goods, services, capital and labour among its members. Belarus is a member of the Eurasian Economic Union (EEU), operational since January 2015, along with Russia, Kazakhstan and Armenia, with Kyrgyzstan expected to join in May 2015.

Belarus also participates in the European Commission's Eastern Partnership programmes. This is in addition to its bilateral relations and work performed as part of the Baku Initiative, which provides for political dialogue between the European Union and the countries of the Caspian and Black Sea littoral states and their neighbouring countries.

Belarus is involved in the implementation of a number of interstate and international treaties in the field of energy, including participation in the Commonwealth of Independent States (CIS) Agreement on the co-ordination of interstate relations in the power sector, and the treaty on the parallel operation of power systems of the CIS.

## KEY ENERGY DATA

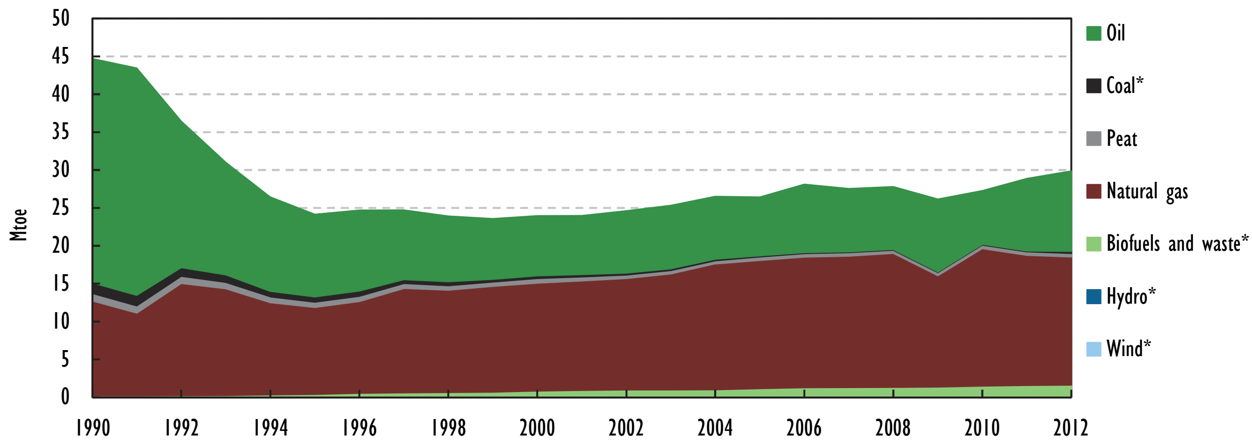
### SUPPLY

Total primary energy supply (TPES)[1] in Belarus was 30.5 million tonnes of oil-equivalent (Mtoe) in 2012 (Figure 3.1.2). Energy supply has been on the rise, increasing by 21.2% since 2002, with a dip during the 2009 global turmoil.

Natural gas and oil are the main fuels in the Belarus energy mix, representing more than 90% of TPES in 2012. Natural gas accounts for 55.5% and oil for 34.6% of TPES, shares which have not changed much over the last decade. Biofuels and waste accounted for 5.3% of TPES in 2012, up from 3.9% in 2002. Peat accounts for 1.5% of TPES, while coal, hydro and wind provide negligible amounts. Belarus produces less than one-fifth of its energy needs, with total energy production of 4.1 Mtoe in 2012. The mix includes fossil fuels and renewable energy sources. Belarus produced 1.7 million tonnes (Mt) of crude oil in 2012, which represented 40.5% of total production, while biofuels and waste represented 39.1%. Other fuels include peat (15.8%), natural gas (4.4%), hydro (0.1%) and some wind.

**1.** TPES is made up of production + imports - exports - international marine bunkers - international aviation bunkers ± stock changes. This equals the total supply of energy that is consumed domestically, either in transformation (for example, refining) or in final use.

**Figure 3.1.2** TPES, Belarus, 1990-2012




* Negligible.

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

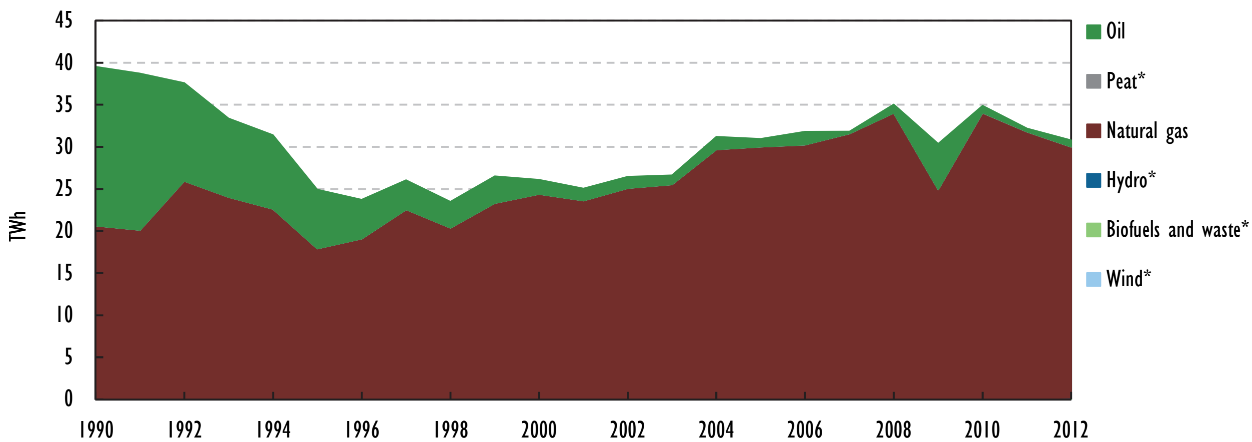
## ELECTRICITY GENERATION

Electricity generation was 30.8 terawatt hours (TWh) in 2012, 16.4% higher than in 2002 (Figure 3.1.3). Nearly all electricity, over 96%, comes from natural gas, the remainder from oil (2.6%), biofuels and waste (0.4%), hydro (0.2%) and peat (0.1%). Reliance on natural gas in electricity has increased over the last decade, due to a decline in oil use in generation.

However, during the 2009 global turmoil and shortages in supply from Russia, electricity from gas dropped to 81.7% of total generation with oil use up to 17.9%. Since then, gas use has returned to usual levels. Hydropower output has increased over the period, but remains negligible.

Total electricity generation capacity was 9.2 gigawatts (GW) in 2012, which is an increase of 17.4% compared to 2002. More than 99% of generation is gas-fired.

**Figure 3.1.3** Electricity generation by source, Belarus, 1990-2012




* Negligible.

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## IMPORT AND EXPORT

Belarus is a net importer of energy, as less than one-fifth is produced domestically. It relies on natural gas and oil imports for most of its energy needs. Imports in 2012 were made up of crude oil (48.6%), natural gas (39.3%) and oil products (9.9%). Exports of 17.6 Mtoe were mainly oil products (87.9%) and crude oil (9.6%).

Crude oil imports amounted to 21.3 Mtoe in 2013 and came from Russia. Imports of oil products were marginal at 68 kilotonnes in 2013, as they were 6.7 Mtoe the year before (three times higher than the average yearly imports). Oil product imports came from Russia (78%), the United Arab Emirates (4.4%) and other countries from Central Asia and the Middle East. Exports of crude oil were destined for Germany, while oil product export destinations were more diverse, including neighbours (mainly to Ukraine), Baltic countries, the Netherlands, the United Kingdom and Italy.

Gas imports were 20.3 billion cubic metres (bcm) and originated from Russia. Gas imports have increased by 15.3% compared to 2002.

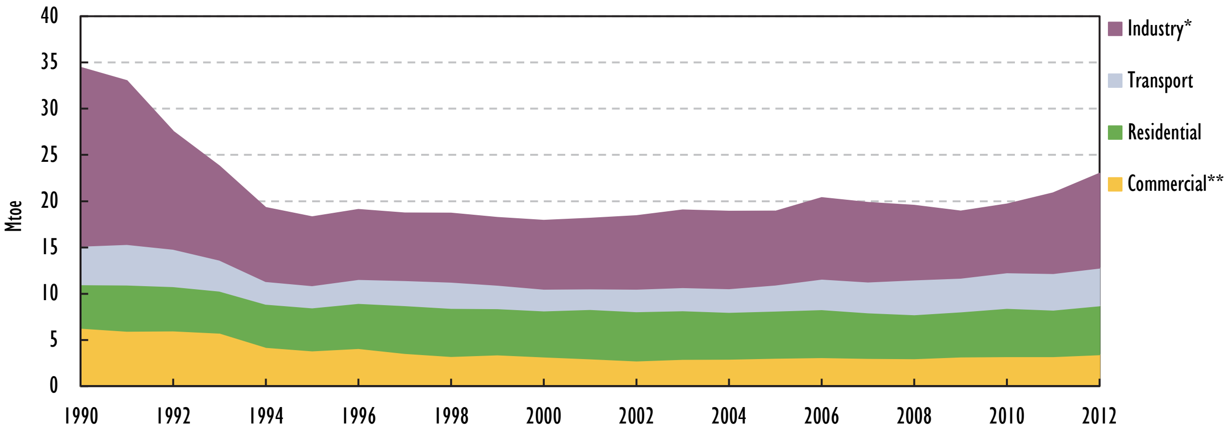
Belarus is interconnected with Ukraine, the Russian Federation and Lithuania for electricity trade and is a net importer. In 2012, Belarus imported 10.4 TWh and exported 2.8 TWh. Over the ten years since 2002, imports have increased by 3.2% but exports have dropped by 20% as both Lithuania and Ukraine have significantly increased their exports.

## DEMAND

Total final consumption (TFC)[2] of energy was 23 Mtoe in 2012, made up of the industry sector (44.4%), residential (23%), transport (17.7%) and services sector (14.9%) (Figure 3.1.4). The industry sector has dominated energy use for decades, although since 2002 the strongest growth rate, 67.6% over the period, has been in the transport sector. Industrial energy use grew by 29% and in the commercial sector by 25%, while in the residential sector it contracted by a modest 0.7%.

Industry uses oil, natural gas, electricity and heat. There has been an increase in the consumption of biofuels and waste, but they account for only around 2% of industry sector TFC. In the residential and services sectors, electricity and heat are the main sources of energy, while natural gas and oil account for about 30%. Biofuels and waste are also increasingly used in these sectors, and represent 10% of energy consumption.

**Figure 3.1.4** Total final consumption by sector, Belarus, 1990-2012




* *Industry* includes non-energy use.

** *Commercial* includes commercial and public services, agriculture/fishing and forestry.

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

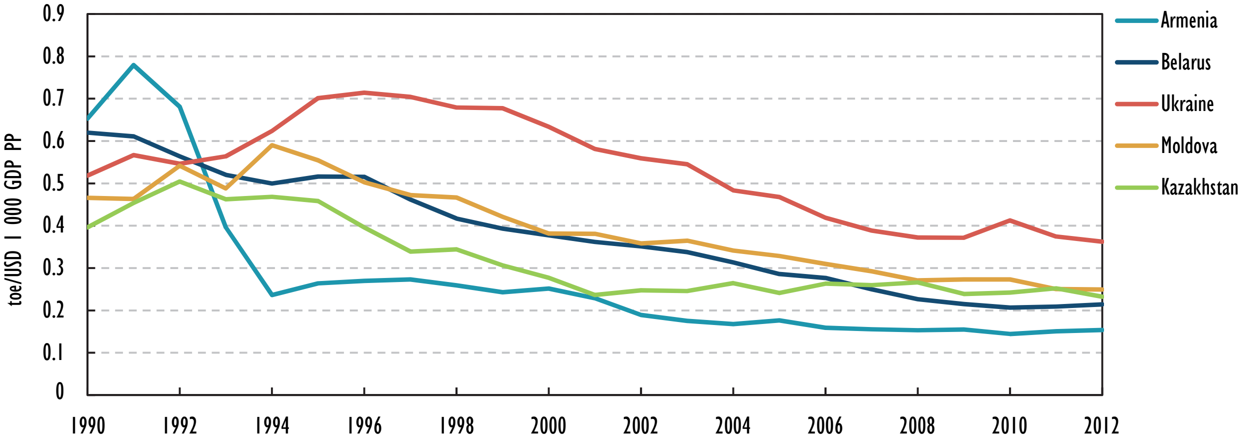
**2.** TFC is the final consumption by end users, i.e. in the form of electricity, heat, gas, oil products, etc. TFC excludes fuels used in electricity and heat generation and other energy industries (transformations) such as refining.

The transport sector is mainly fuelled by oil products (88.3%). Natural gas (7.5%) and electricity (3.7%) also play a role in transport. A tiny amount (0.2%) of biofuels and waste are used in transport.

## ENERGY INTENSITY

Belarus's energy intensity, measured as the ratio of TPES to real GDP, was 0.21 tonnes of oil equivalent (toe) per USD 1 000 GDP PPP in 2012. This ratio is the fifth-lowest in comparison with EECCA countries, close to the EECCA average of 0.23 toe/USD 1 000 GDP PPP. Since 2002, energy intensity in Belarus has declined by 39%, down from 0.35 toe/USD 1 000 GDP PPP. Energy intensity has been declining since the mid-1990s due to strong economic growth and TPES which is growing at a comparatively slower rate.

**Figure 3.1.5** Energy intensity in Belarus and selected EECCA countries, 1990-2012

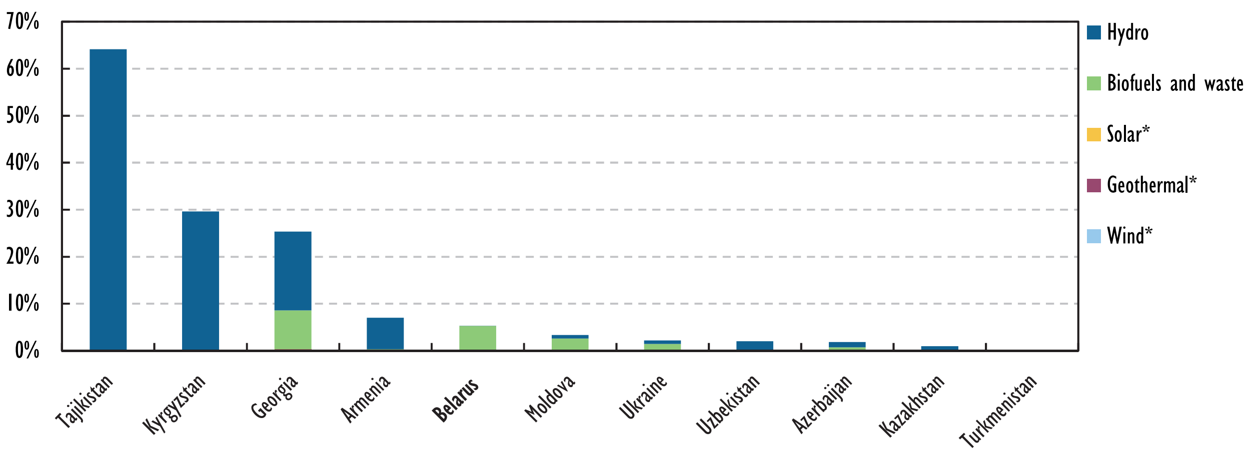



Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## RENEWABLES

Renewable energy in Belarus accounted for 5.3% of TPES in 2012, which is mid-range among the EECCA countries (Figure 3.1.6).

**Figure 3.1.6** Renewable energy as a percentage of TPES in Belarus and other EECCA countries, 2012




* Negligible.

Source: IEA (2014), *Energy Statistics of Non-OECD Countries*, OECD/IEA, Paris.

In Belarus, nearly all the renewable energy is from biofuels and waste, with small amounts of hydro and wind power. Wind turbines were installed in 2006 and capacity has not increased since then. Energy from biofuels and waste has increased by 64.1% since 2002, which is faster than the 21.2% growth in TPES. As such, renewable energy has increased its share of the energy mix over the past decade, up from 4% in 2002.

### ENERGY DATA SOURCES

The National Statistical Committee administers relevant laws, and collects, processes and publishes national statistics, including energy data and balances. It prepares energy balances in co-operation with the Ministry of Energy and energy companies. Energy data is predominantly used for the development of energy strategies and industry planning, as well as for assessments of investment projects.

Statistics are published on the National Statistical Committee website on monthly, quarterly and annual bases.[3] By 2016, Belarus is expected to align its energy balances with International Energy Agency (IEA) methodology.

The Committee co-operates with a number of international bodies for statistics under international obligations. It also regularly submits data to the IEA and other multinational statistics bodies including the United Nations Statistics Division (UNSTAT) and Eurostat.

## ENERGY SECTOR DESIGN

### MARKET STRUCTURE

#### Electricity and heat

The electricity and heat sectors are owned and operated by the State Production Concern BelEnergo (BelEnergo), a vertically integrated state-owned association. Its management is the responsibility of the Ministry of Energy.

BelEnergo is responsible for electricity and heat generation, transmission, distribution and retail services. It provides technical support and is the instigator of relevant investment projects. BelEnergo functions through a number of subsidiaries, including six regional distribution companies known as *oblenergos*. BelEnergo covers about 50% of the heat supply while the remainder is provided by local district heating entities which are owned by municipalities.

At the end of 2014, the government was considering a possible future law on electricity that includes electricity sector unbundling and the separation of transmission, distribution and retail operations of BelEnergo.

#### Natural gas and oil

Gazprom-TransGaz (previously BelTransGaz) owns and operates high-pressure transportation, transit and storage systems, and is responsible for new construction and maintenance. The company is fully owed by Russian Gazprom. Gas transit matters, including infrastructure, system operation, tariff structure and technical services are carried out under a bilateral agreement with Russia's Gazprom.

**3.** www.belstat.gov.by.

The natural gas distribution infrastructure is owned by the state, along with responsibilities for technical services, tariffs, and upgrade and maintenance programmes. The distribution network is operated by the State Production Concern of Fuel and Gasification BelTopGaz (BelTopGaz) which is managed by the Ministry of Energy. BelTopGaz includes seven distribution companies which serve Minsk and six other regions.

The petrochemical sector of Belarus is operated by enterprises and organisations of the Belarusian State Concern for Oil and Chemistry BelNeftekhim (BelNeftekhim), which reports directly to the Council of Ministers. BelNeftekhim includes more than 80 companies and organisations which carry out oil exploration and production, transportation, refining and retailing, as well as the production of a wide range of chemical and petrochemical products. The Mozyr oil refinery is owned by several Russian companies.

## INSTITUTIONAL FRAMEWORK

**The Ministry of Energy** is responsible for the fuel and energy sector of Belarus. It manages the vertically integrated state-owned natural gas supplier, BelTopGaz, and the vertically integrated state-owned electricity producer, supplier and retailer, BelEnergo. This ministry also oversees the State Institute for Management of Construction of Nuclear Power Plants and other state-owned organisations operating in the energy sector. It is responsible for the implementation of the new State Programme on the Development of the Electricity System of Belarus for the Period to 2016.

State regulation of the energy sector, including energy efficiency and renewable energy, is carried out through decrees, directives of the president, government decisions and the Ministry of Economy. Other relevant ministries and departments are active participants.

**The Department of Energy of the State Standardisation Committee** is responsible for the development and implementation of national energy efficiency and renewable energy policies. It also monitors and ensures state control over rational use of fuel, electricity and heat.

**The National Statistical Committee** is responsible for administering the laws on national data services. It collects, processes and publishes national statistics, including energy data. The Statistical Committee is responsible for preparation of energy balances, which it does in close co-operation with the Ministry of Energy and energy enterprises.

Local councils, executive authorities and administrative bodies implement state energy policy. There are a number of public and non-governmental organisations active in the field of energy efficiency, renewable energy and environmental protection in Belarus.

## LEGAL FRAMEWORK

The legal structure in Belarus differs from that of other EECCA countries. The highest legal act in Belarus is its constitution. Under this are decisions, decrees and orders of the head of state, followed by constitutional laws and other legal acts, decrees of the Cabinet of Ministers and other sectoral ministerial acts. In theory, this means that the head of state can override legislation that has been adopted by parliament. This rule is a fundamental barrier to long-term investment and serious consideration needs to be given to making national legislation more predictable and stable for both domestic and foreign investors.

The main body of legislation governing the Belarus energy sector includes:

- the Law on Gas Supply (2003)

- the Law on Renewable and Non-traditional Sources of Energy (2011), which includes regulations concerning electricity and heat
- the Law on Energy Savings (2014).

The government approved the Law on Energy Savings in December 2014. The law stipulates energy efficiency technology implementation and energy-efficient equipment requirements.

There is no law on electricity in Belarus. The government is considering drafting a law that may address electricity sector unbundling. There are also no laws on heat or gas, and no proposals in that regard are under consideration.

In May 2014, a Law on Urban Electricity Transmission was approved, legislating electricity network development and rehabilitation. In August 2014, a new Decree on Grid Connection was approved, allowing access to smaller private generators.

## KEY POLICIES

Energy policy in Belarus is based on a number of policy decisions made over the past decade, including the Concept of Energy Security to 2020 (2007), the Development Strategy of Energy Potential to 2020, the State Programme for Electricity Sector Development to 2016 (2013), and the Concept of Development of Heat Supply to 2020 (2010), among others.

Energy policies and measures in the programmes are synchronised with the major objectives set in the Concept of Energy Security and the Development Strategy for Energy Potential (the energy strategy). These include: the diversification of domestic fuels and imports; energy efficiency improvements in power generation; improved reliability; and the reduction of cross-subsidies. Some of the key policy decisions are listed below:

- Reduce the use of natural gas as the primary fuel for the production of electricity and heat.
- Increase use of indigenous fuels (oil, gas, biomass, peat, lignite and oil shale).
- Construct new electricity generation plants, including 2.3 GW nuclear power and two hydro plants (Western Dvina and Neman).
- Renovate existing gas-fired power stations into combined-cycle gas-fired turbines (CCGT) and renovate combined heat and power (CHP) plants.
- Construct two new district heating facilities and decommission aged plants.
- Develop 330 kilovolt (kV) grids.
- Install advanced automatic control and power supply management systems.
- Decentralise power and heat services by developing CHP plants in industrial enterprises in small towns to improve reliability and efficiency at the local level.
- Develop power system interconnections with neighbouring countries.
- Rehabilitate and expand the gas network and gas transmission infrastructure.
- Continue exploring oil fields and introduce new technologies to slow down oil resource depletion.
- Expand oil refinery capacity and introduce new oil products.

Table 3.1.1 shows the main targets to 2020 in comparison to 2009.

**Table 3.1.1** Key energy strategy targets to 2020, Belarus

| Target | 2009 | 2015 | 2020 |
|---|---|---|---|
| Energy intensity reduction compared to 2005 | 24.8% | 50% | 60% |
| Natural gas share in boilers | 71.8% | 64% | 55% |
| Energy market share of the largest supplier | 82.3% | 70%-71% | 57%-64% |
| Oil and gas security storage (days) | 61.2 | 78.9 | 118 |

Source: Ministry of Energy.

The strategy is also focused on improving the management of the energy sector while maintaining centralised operational control of all elements of the energy sector; establishing conditions for non-discriminatory access to electricity networks while ensuring reliability of supply and power quality for consumers; and improving the energy sector's legal and regulatory framework in order to develop nuclear power and to possibly improve market conditions. Additional objectives include the reduction of greenhouse gas (GHG) emissions and increased funding for research and development (R&D).

The State Programme of Electricity Sector Development to 2016 was developed in 2012 and adopted in October 2013.[4] It was developed in conjunction with the State Programme of Construction of Energy Sources on Local Fuels for 2010-15, the National Programme on the Development of Indigenous and Renewable Energy Sources for 2011-15, and the National Programme on Energy Savings for 2011-15.

Policies for district heating are in the Concept of Development of Heat Supply to 2020. Adopted in 2010, it outlines the planned development of district heating systems, tariff policy, district organisations and consumer relations, systems management, regulatory framework, demonopolisation and the formation of market relations.

The energy strategy includes plans for the development and rehabilitation of the gas network. These include the construction of new transmission pipelines in the Gomel, Mogilev and Brest regions, the construction of gas networks to large end users and new households, building liquefied natural gas facilities and expanding gas storage capacity from around 1 bcm to 4.5-5 bcm by 2020.

Peat development is carried out under the State Programme for Peat for 2008-20. The government plans to increase peat production from around 3 Mt in 2010 to 4.1 Mt by 2015, for the production of fuel briquettes to be used in boiler houses and mini-CHP plants.

Oil complex development plans include the introduction of new technologies to improve productivity of extraction and slow down resource depletion, as well as the development of new oil fields. Belarus is also planning to rehabilitate existing oil refining facilities and develop new competitive products.

The National Programme on Energy Savings for 2011-15 (legislated by the new Law on Energy Savings) and the National Programme for the Development of Local and Renewable Energy Sources for 2011-15 were adopted in 2011, aimed at developing plans and measures for energy efficiency improvements in supply and demand, as well as incentives for biomass and other renewable source development, including a green tariff. One of the major outlined tools to promote energy savings includes increasing energy tariffs.

**4.** Decree of Cabinet of Ministers, 8 October 2013, No. 892.

With regards to tariff policy, the government of Belarus is progressively removing cross-subsidies on electricity and heat tariffs to recover the cost of investment and to curb excessive energy consumption. Modification of tariffs is in two phases: first 2012 to 2014, then 2015 and after. The reform is expected to result in separate tariffs for generation, transmission and distribution, as well as a new methodology for industrial rates.

This includes the elimination of preferential tariffs for industrial customers, which occurred in 2012, and an annual increase in the price, based on nominal growth in the average salary.[5] During 2014, the average salary rose by 5.8% and so did the price of electricity, heat and gas (for lowest consumption bands only).

The climate change policy is under the State Programme of Measures to Mitigate the Effects of Climate Change for 2013-20, approved by the Council of Ministers in 2013. It sets a target to reduce GHG emissions by 8% in 2020 from 1990 levels, about 10 million tonnes of carbon dioxide equivalent ($MtCO_2$-eq). Measures to achieve this objective include energy efficiency improvements, increases in forest areas, restoration of peat lands and improved legal and regulatory approaches. The necessary measures are estimated to cost USD 10.2 million.

A number of other government programmes were developed during 2010-11 to assist in the implementation of the above-mentioned concepts and strategies. These focus on the medium term, 2011-15, and include:

- the State Programme for the Construction of Energy Sources with Local Fuels for 2010-15 (2010)
- the Programme for the Construction of Energy Sources (Biogas) for 2010-15 (2010)
- the State Programme for the Construction of Hydropower Stations for 2011-15 (2010)
- the State Programme of Social-and Economic Development for 2011-15 (2010).

## INVESTMENT

Under the electricity sector strategy, Belarus is implementing measures to develop, modernise and improve the efficiency of the energy sector, which requires the introduction of new technologies, and to attract significant investment, including foreign investment. Most of the investment is in the rehabilitation and development of the electricity and heat generation networks.

The estimated cost to implement the necessary programmes is USD 4.8 billion (USD 3.4 billion of capital investment and USD 1.4 billion in loans). Funding is planned to be sourced from: BelEnergo, USD 1.9 billion; loans and foreign investment, USD 1.9 billion; and the state budget, USD 0.9 billion. BelEnergo, the state-owned electricity and heat company, invested USD 1.2 billion in 2011-12, and for the period 2013-15 a further USD 0.7 billion in investments is expected.

BelEnergo is expected to bring a total of 1.8 GW of capacity on line in the period 2011-15 (Table 3.1.2).

**5.** www.tarify.by.

**Table 3.1.2** Major investment projects in the electricity sector, Belarus

| Project name | Year | Amount of foreign loan (USD million) |
|---|---|---|
| Construction of the 2.3 GW nuclear power reactor | 2018 | 10 000 |
| Reconstruction of Mogilev CHP Unit 1 with the installation of 25 MW | 2016 | 55.1 |
| Construction of Gomel CHP Unit 1 with 35 MW CCGT | 2016 | 36.5 |
| Construction of Luninec TPP | 2014 | 33.6 |
| Construction of Brest CHP with 400 MW CCGT | 2015 | 705 |
| Construction of 330 kV line Berezovskaya GRES | 2014 | 52.3 |
| Construction of 330 kV line Berezovskaya– Pinsk – Mikashevichy | 2017 | 130 |
| Reconstruction of 330/110/10 kV Minsk – Severnaya with 110 kV line | 2017 | 50.9 |
| Construction of 330 kV line Baranovischi – Columns | 2017 | 57 |
| Reconstruction of the 330 kV Smorgon – Ross – Minsk CHP Unit 4 | 2018 | 341 |

Notes: CCGT = combined-cycle gas turbine; TPP = thermal power plant.

Source: Ministry of Energy.

Planned projects to 2016 include two combined-cycle power plants at the Lukoml and Byaroza power plants of 400 megawatts (MW) each; rehabilitation of a power plant at Borisov to upgrade to a 65 MW combined-cycle plant; addition of 21 MW at the Polotsk hydropower plant; and new electricity generation sources in Luninets and Barani using indigenous fuels.

Construction of the first nuclear power plant in Belarus began in 2013 at Ostrovets with Russian financing. A number of reactors are expected to come on line from 2016 to 2020.

Investment to modernise and expand the electricity network is also needed in order to integrate new generation capacity, rehabilitate the ageing network and improve reliability of supply. The government expects that its measures will reduce total network losses by up to two percentage points from 2010 levels (around 11%).

The main areas in which investment is needed to improve the heat networks are energy efficiency improvements in heat plants, control automation and metering, as set out in the Concept of Development of Heat Supply to 2020. To modernise necessary assets and increase industrial and residential customer connections, the networks require annual replacement of 100-120 km of supply pipelines and 550-660 km of distribution pipelines. Modernisation of heat networks is expected to reduce losses by 2 percentage points from 2010 levels (or by 8% in total).

## TECHNOLOGY AND INNOVATION

The energy strategy includes more than 20 science- and technology-relevant objectives. One of the major projects is to build a national system of innovation in efficient energy technologies and equipment. Planned R&D areas of focus include:

- energy-saving technologies and efficient equipment
- modification of the typical internal combustion engines used in Belarus to create a base for gas piston units and to develop domestic heat exchangers for them

- reduced energy intensity of production with use of improved materials
- modern equipment for the use of local fuels including for industrial cogeneration
- development of technologies for extracting and processing lignite and shale oil
- development of waste ash from burning coal, wood and peat
- development of industrial biogas and municipal waste use
- creation of integrated electricity networks
- establishment of automated information, management and control systems
- resource assessment and expansion of renewable energy options.

Research funding under the state programme is to be from government budgets (up to 50% of the total amount) on a cost-shared basis with private sources. Scientific support will be within the framework of the Scientific and Technical Programme for Power Engineering and Energy Efficiency for 2011-2015 and other sectoral programmes. The Scientific and Technical Programme will require funding of approximately EUR 676 million for the four-year period.

## ASSESSMENT

The energy sector in Belarus is mostly in the hands of the state and the president holds exclusive rights to decisions made about and within the sector. The government believes that such centralised power makes the energy industry more stable and secure and helps to build investor confidence.

Hence Belarus is looking to attract foreign investment and is making its market more suitable for potential investors. In 2014, the World Bank's Doing Business Report ranked Belarus 57th out of 189 countries for the ease of doing business, only behind Georgia and Armenia among EECCA countries. Belarus adopted the Investment Code in 2001 which sets a legal framework for foreign investment. In terms of international instruments that afford legal protection to investors, Belarus is a party to the Convention on the Settlement of Investment Disputes between States and Nationals of Other States (1965), the Convention Establishing the Multilateral Investment Guarantee Agency (1985) and the Energy Charter Treaty (1994).

However, centralised power and the ability of the president to supersede all legislation is also a deterrent for certain investors and puts long-term commitments at risk of sudden change. To attract more foreign investors to finance future projects, the government will need to strengthen its legislation and offer more security for long-term agreements, by making national legislation fixed and more predictable.

Energy legislation in Belarus is weak, albeit improving. As summarised in the "legal framework" section, the main body of legislation for energy covers gas supply, energy savings and renewable sources. However, there is no law specific to the electricity sector or heat in Belarus. The government is considering a possible future law on electricity that may include electricity sector unbundling. The Review Team commends the government for starting a dialogue and considering restructuring in the energy sector, and encourages further efforts to advance the necessary legislation on electricity and heat.

Another area of insufficient attention to date is renewables and energy efficiency measures. The government is increasing focus on these factors of late, particularly on reducing GHG emissions, increasing the share of renewables in its energy mix and reducing energy consumption. However, the existing policies are for the medium term only and there is no specific implementing agency to monitor and track progress. The country also lacks strong incentives for foreign investment in the renewables sector as well as incentives for energy savings. The country should also consider establishing an independent energy regulator in the near future.

Green feed-in tariffs exist; however, other supporting mechanisms for renewable energy developments are not straightforward. This includes lack of understanding on responsibilities for connections to the grid, and no clear and transparent rules for third-party access. To increase the attractiveness of its renewable energy sector for foreign investors, clear and transparent rules and legislation are needed, without the possibility of sudden change to tariffs and other agreements.

The government subsidises electricity, heat and gas tariffs for all types of consumers at present, but it is slowly phasing these out. At present, the electricity sector is unprofitable and requires government subsidies and budget expenditure to maintain it. This has caused a lack of investment in existing infrastructure and ageing networks, leading to higher losses and lower efficiency. The government is slowly raising tariffs and phasing out subsidies in order to investment in networks and reduce losses, and to allow for new electricity generation capacity, necessary for the growing energy demand in Belarus. The Review Team commends the government for its decision to phase out subsidies, and recommends that the phase-out be done in a way that sends a strong signal to investors without impairing the most vulnerable customers.

## RECOMMENDATIONS

*The government of Belarus should:*

- ☐ *Ensure predictability of the investment climate, including honouring the long-term investment commitments to enable financing of key opportunities.*
- ☐ *Promote grid integration of renewable energy, ensure attractiveness of green tariffs to the grid operators/electricity distribution branches; establish detailed, clear and transparent rules for third-party access to electricity grids.*
- ☐ *Continue working towards improving electricity and heat laws (including considerations for legal unbundling) and ensure their timely adoption.*
- ☐ *Continue working to decrease energy demand through energy efficiency measures, paying particular attention to demand-side management options, and encourage renewable energy development to ease high energy import dependence which will also enhance energy security.*
- ☐ *Continue working towards gradually phasing out energy subsidies.*

# 3.2. ENERGY SECURITY

## RESOURCE ENDOWMENT

### OIL AND GAS

Oil deposits in Belarus are located in a single oil and gas basin, Pripyat. Belarus has several active oil fields and is currently developing 59 fields, of which the largest ones are in the final stages of development.

Belarus has 27 Mt of crude oil reserves and 30 Mt of recoverable resources according to a 2012 estimate of the Federal Institute for Geosciences and Natural Resources (BGR). Natural gas reserves are an estimated 3 bcm, with a recoverable resources estimate of 10 bcm (BGR, 2013).

### COAL AND PEAT

Reserves of peat are estimated at 4 billion tonnes. There are 41 peat deposits with total area of 34 000 hectares of peat and recoverable resources are estimated at 84.6 Mt. Peat reserves include 15 100 hectares with 30.8 Mt. Peat production in Belarus is about 2.8 Mt and is projected to increase to 4.1 Mt by 2015.

Identified brown coal reserves in Belarus are 150 Mt, with further potential of 98.2 Mt. The most promising deposits for commercial development are located in the western part of the Gomel Oblast, Zhitkovichi, Novoselovka and Tonezh.

### OIL SHALE

Oil shale is a large but undeveloped energy resource in Belarus. 8.8 billion tonnes of oil shale are estimated, with up to 3.6 billion tonnes of recoverable reserves, all concentrated within the Pripyat Shale Basin. About 30% of the Luban and Turovskoe fields have been explored. Probable resources are estimated at 1 223 Mt at Luban and 2 684 Mt in Turovskoe.

## ENERGY SECURITY AND DIVERSIFICATION

### ENERGY SECURITY OF SUPPLY/DEMAND

Energy security is one of the main objectives of energy policy in Belarus. It has a high reliance on oil and natural gas imports from Russia and is looking to increase energy efficiency and to develop renewable energy sources. The energy strategy increases the focus on reducing import dependency, particularly for natural gas from a single supplier, developing local energy sources, introducing nuclear power, decreasing overall consumption of energy and reducing the level of natural gas in the energy mix.

As detailed in the first section of this chapter, the Development Strategy of Energy Potential to 2020 and the Concept of Energy Security to 2020 have four main objectives:

- to diversify fuels and energy suppliers
- to increase energy efficiency of energy production
- to improve demand-side management
- to strengthen the reliability of the national energy system and reduce subsidies.

The government projects that achieving the measures elaborated for the period to 2016 will meet the targets set out for the electricity sector in capacity utilisation, asset depreciation and ratio of investment. However, it does not expect by 2016 to achieve a reduction in the dominant level of gas in electricity and heat production. Measurable diversification in this area will be evident when nuclear power is brought on line.

Diversification of the energy mix in the Concept of Energy Security calls for indigenous resources — mainly oil, gas, peat, wood and renewables — to contribute 30% of energy supply by 2015. The share of domestic energy sources in the mix was 20.6% in 2010. To increase the use of domestic wood and peat energy sources, the government approved the State Programme for the Construction of Energy Sources on Local Fuels for 2010-2015. It envisages the construction of 23.6 MW of new capacity and output of 769.7 megawatt hours (MWh).

In addition, in the period up to 2016, 162 MW of wind capacity is planned, with potential for 300 MW if funding is available. The Law on Renewable Energy in 2010 promotes the use of solar, wind, geothermal and biomass through financial support from the state and incentive tariffs for electricity produced from renewable sources. Biomass offers the most potential in Belarus.

The largest contribution to diversification of the energy mix will be the introduction of nuclear power by 2020. The government considers this the primary measure to reduce dependence on imported natural gas which is used in electricity generation. By 2016, the annual volume of imported natural gas by BelEnergo, the state-owned power generation entity, will be reduced by about 1 bcm.

Belarus may diversify its import sources for natural gas and oil. Options include liquefied natural gas (LNG) from Central Asia and oil from Azerbaijan, Venezuela and the Persian Gulf via the Baltic and Black Sea ports.

## ENERGY INFRASTRUCTURE AND INVESTMENT

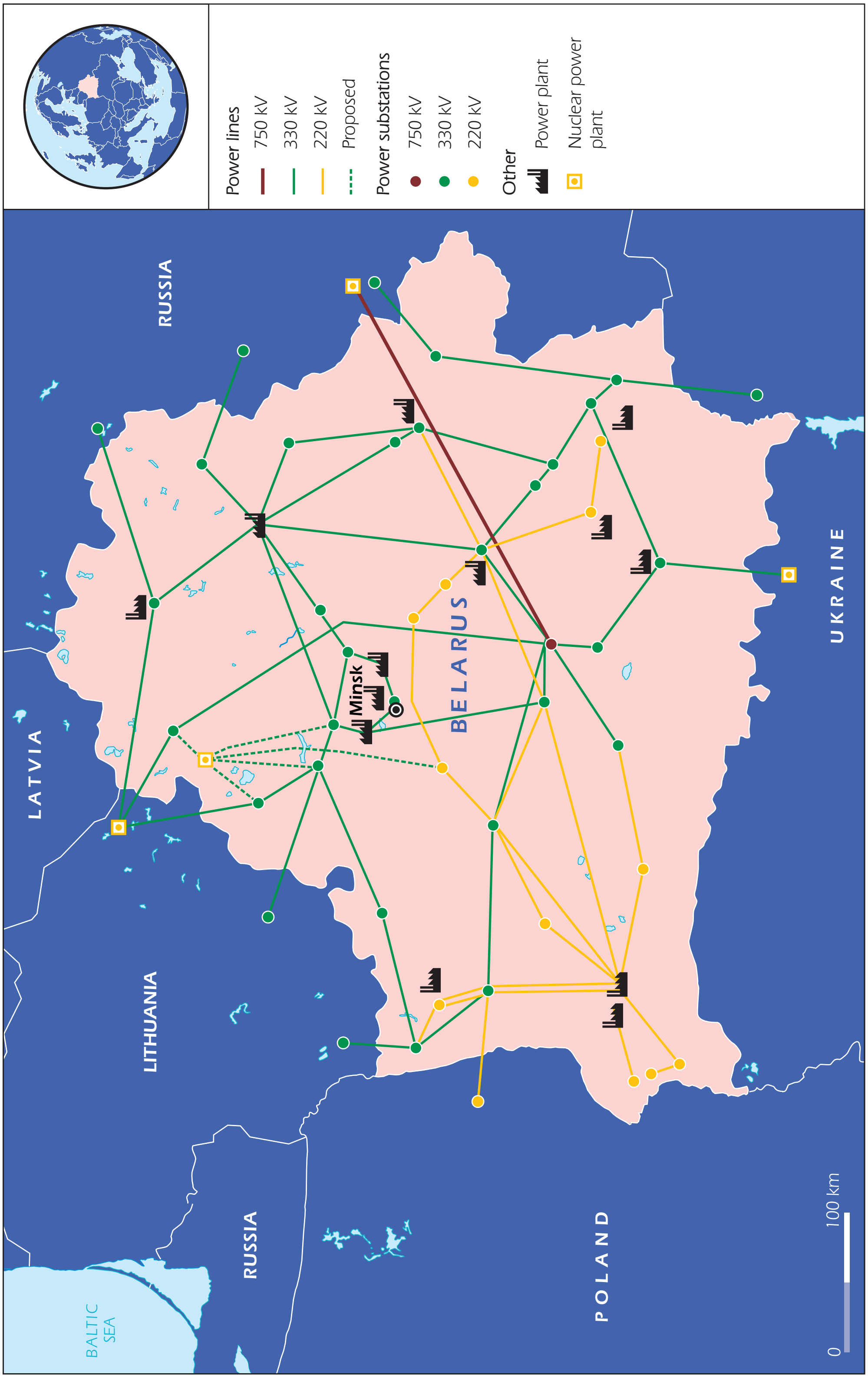
### ELECTRICITY AND HEAT

The electricity generation capacity of BelEnergo, the state-owned power production entity, was 9.2 GW at the start of 2014, an increase from 8.2 GW in 2010 (BelEnergo, 2014).

The length of the electrical networks was about 270 000 km, including power lines from 0.38 kV to 750 kV. Transformer station capacity was 34 GW with 35-750 kV and 15 GW of 0.4-10 kV voltages. The 220-750 kV power lines are the backbone of the network and include interconnectors, the total length of which is almost 7 000 km. The total length of the 110 kV lines is about 17 000 km while the 0.4-35 kV line network is about 250 000 km long.

The Belarus power system is interconnected with Russia, Ukraine, Lithuania and Poland.

**Figure 3.2.1** Electricity network, Belarus




This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries, and to the name of any territory, city or area.

Source: Ministry of Energy.

Investment in electricity generation includes modernisation, and BelEnergo modernised and commissioned 705.2 MW of generation in the period 2011 through the first half of 2013. It was expected that a further 26.91 MW of capacity would be commissioned by late 2013.

BelEnergo is expected to bring a total of 1.8 GW of capacity on line in the period 2011-15. Planned projects to 2016 include two combined-cycle power plants at the Lukoml and Byaroza power plants of 400 MW each; rehabilitation of a power plant at Borisov to upgrade to a 65 MW combined-cycle plant; addition of 21 MW at the Polotsk hydropower plant; and new electricity generation sources in Luninets and Barani using indigenous fuels.

Construction of the first nuclear power plant in Belarus began in 2013 at Ostrovets with Russian financing. A number of reactors are expected to come on line from 2016 to 2020.

In parallel with the new construction, 906 MW of inefficient generation capacity is to be decommissioned. Decommissioning of the generating equipment will be carried out taking into account the need to preserve part of existing capacity as reserve to guarantee the reliability of the power system until the nuclear plant is operational.

Electricity network investment includes the reconstruction of the Minsk-Severnaya 330/110/10 kV substation with a 110 kV transmission line, with works to begin in 2015 with an expected completion in 2017; the Belarussian substation 750 kV with expected completion in 2016; construction of the 330 kV power lines and substations needed to connect the nuclear power plant at Ostrovets to the network before 2016; and the construction and refurbishment of distribution lines (0.4-10 kV) in quantities no less than 1 500 km per year, including up to 300 km in cities and 1 200 km in rural areas.

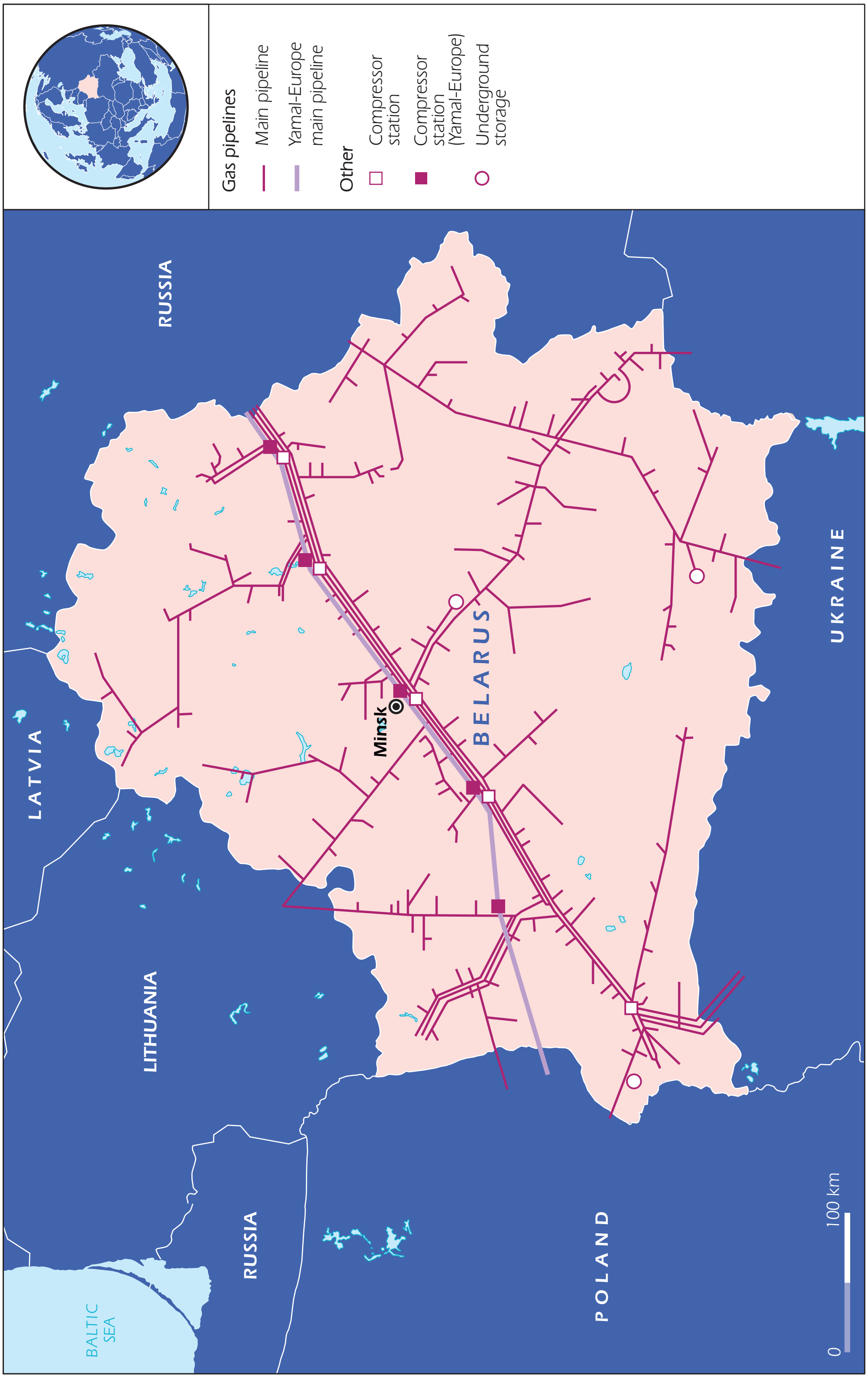
In the electricity sector, BelEnergo has annual and five-year maintenance programmes for thermal power plants, the power grid and heat networks. Local authorities have some responsibilities for their district heating networks. The focus of the heat sector is mainly on increasing efficiency by using thermal insulation and introducing automatic controls and metering. This will require the annual replacement of 100-120 km of distribution pipelines and 550-660 km of household connection pipelines. The aim is to reduce losses by two percentage points from 2010 levels (undisclosed).

The government reports that both the electricity and gas sector maintenance programmes are being implemented as planned. BelEnergo modernised and commissioned 705 MW of generating capacity from 2011 to the first half of 2013.

Belarus has electricity grid interconnections with the Russian Federation (three 330 kV lines and one 750 kV line), Ukraine (two 330 kV lines) and Lithuania (five 330 kV lines), and a relationship with Poland (one 110 kV line and one 220 kV line) (Table 3.2.1).

Authorities in Belarus and Poland are considering construction of a 110 kV direct current transmission line (Brest 2 – Wolka Dobrinskayaelectricity). Its realisation depends on developments in capacity installations and demand growth in both countries. This line would allow for 5 gigawatt hours (GWh) of electricity transport per year and would create the technical possibility to increase future electricity exports from Belarus to neighbouring countries and the European Union.

**Figure 3.2.2** Gas pipeline network , Belarus




This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries, and to the name of any territory, city or area.

Source: Ministry of Energy.

**Table 3.2.1** Interconnector capacity and length, Belarus

| Country | Substation | Voltage (kV) | Length (km) |
|---|---|---|---|
| Russia | Belarusian-Smolensk nuclear power plant | 750 | 418 |
| | Vitebsk-Talashkino | 330 | 132 |
| | Krichev-Roslavl | 330 | 102 |
| | Polotsk-Novosokolniki | 330 | 160 |
| Ukraine | Gomel-Chernigov | 330 | 103 |
| | Mozyr-Chernobyl nuclear power plant | 330 | 112 |
| | Belarusian-Ignalina nuclear power plant | 750 | 343 |
| | Molodechno-Vilnius | 330 | 119 |
| Lithuania | Grodno-Alytus | 330 | 75 |
| | Polotsk-Ignalina nuclear power plant* | 330 | 159 |
| | Fc Smorgon-Ignalina nuclear power plant* | 330 | 159 |
| Poland | Ross-Bialystok | 220 | 99 |
| | PS-PS 2 Brest-Vul'vska-Dobrin'ska | 110 | .. |

Note: ".." indicates data is not available.

* The Ignalina nuclear power plant has not been operational since 2009.

Source: Ministry of Energy.

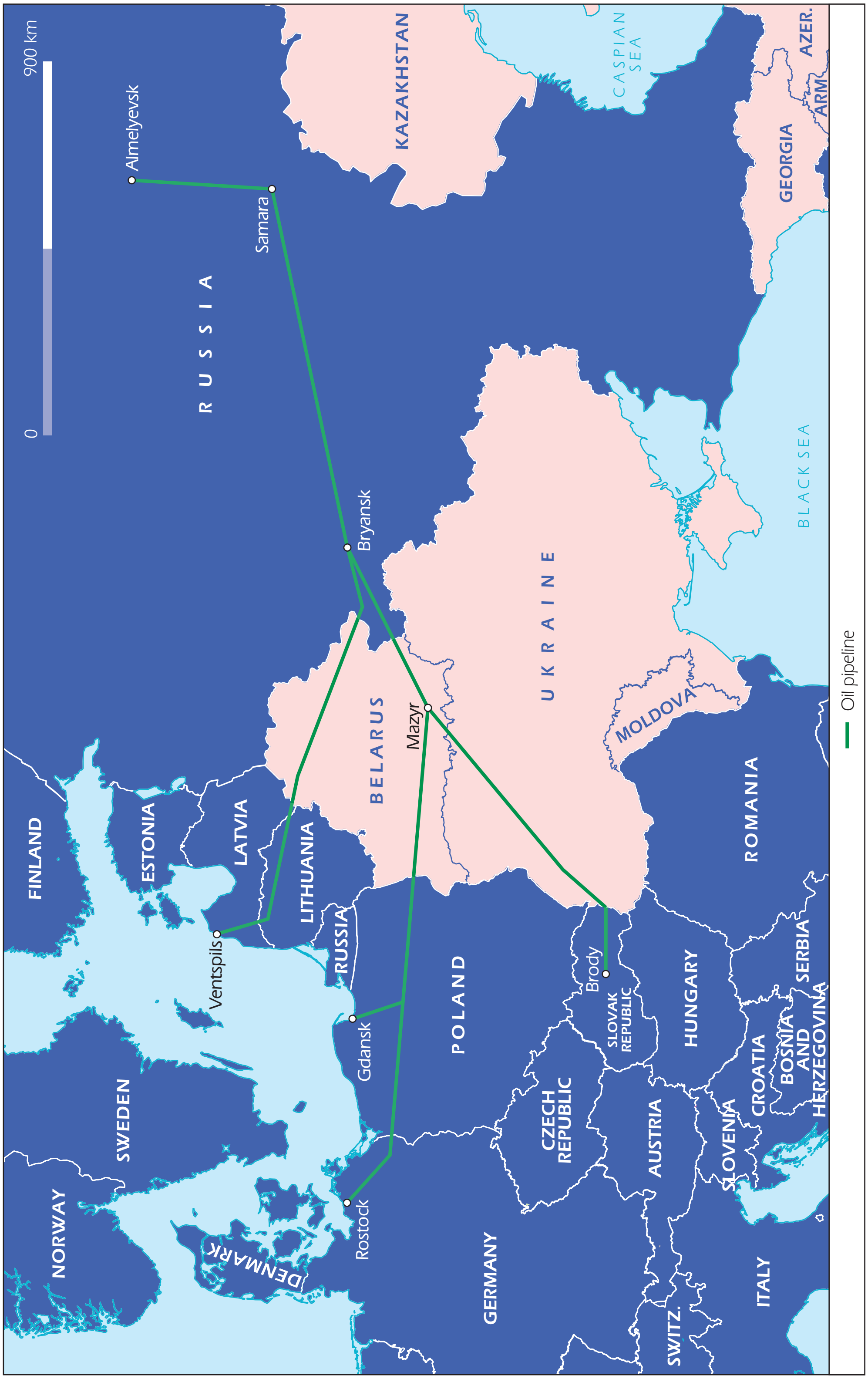
## NATURAL GAS AND OIL

The throughput of the system of main gas pipelines of Belarus is 51 bcm per year and the Belarusian part the Russian Yamal-Europe pipeline is 33 bcm per year (Figure 3.2.2). Belarus is a transit country for Russian natural gas to Poland, Ukraine, Lithuania and the Kaliningrad region of the Russian Federation. Natural gas is supplied to about 65% of residences in Belarus. The gas distribution network is 50 626 km in length with about half of it in rural areas. There are three underground gas storage facilities, at Pribugskoe, Osipovichskoye and Mozyrskoye. At the end of 2014, it was planned to expand storage at Pribugskogo to 600 million cubic metres (mcm) by 2015 and at Mozyr to 1 bcm by 2020. Thus active gas storage capacity will reach 1.3-1.5 bcm by 2015, 34-48% more than in 2010, and 4.5-5 bcm by 2020. As well, there are proposals to construct new storage capacity.

In the gas sector, Beltopgas and Gazprom are responsible for the transmission and distribution pipelines, and associated gas facilities (distribution stations, underground storage, compressor stations and administration). As the gas pipelines are old, they require substantial investment for upkeep and efficiency improvements. The main source of investment (approximately EUR 60 million per year) is a state amortisation fund. Infrastructure development of gas distribution systems includes:

- construction of gas transmission pipelines in Gomel, Mogilev and Brest
- conversion of small networks to accommodate industrial users where there is sufficient demand
- construction of gas networks to serve new connections.

**Figure 3.2.3** Oil transit pipelines through Belarus




This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries, and to the name of any territory, city or area.

Source: Ministry of Energy.

There are seven main gas pipelines operated by Gazprom TransGaz (owned by Russia's Gazprom) which transit natural gas through Belarus. The portions in Belarus have a total length of 2 500 km (Figure 3.2.2). The pipelines include the Torzhok-Minsk-Ivatsevichi (1 220 million metre [mm] diameter); two Ivatsevichy-Dolina pipelines (1 220 mm each); Kobrin-Brest-state border pipeline (1 020 mm); Minsk-Vilnius pipeline (1 220 mm); Torzhok-Dolyna pipeline (1 420 mm); and Volkovysk-state border pipeline (273 mm). Gazprom Transgaz Belarus also operates the main gas pipeline Yamal-Europe, with a diameter of 1420 mm and length of 575 km, owned by Gazprom. There is storage at the Osipovichi, Pribugskoe and Mozyr underground sites and seven gas metering stations.

Oil fields in Belarus are being depleted and the government is working on exploring new fields as well as introducing technology for decreasing the present rate of depletion.

Belarus also refines oil into oil products. The Naftan refinery has a capacity of 1.6 Mt and the Mozyr refinery has a capacity of 3 Mt. The government is planning to rehabilitate the two plants under the energy strategy to 2020.

The oil storage capacity of BelNeftekhim, the state-owned petrochemicals entity, is 1.4 mcm. Construction of additional oil storage capacity at Joint Stock Company (JSC) Naftan, a large oil refinery and petrochemical complex, and at Gmeltransoil Druzhba will increase the overall capacity to 1.7 mcm by 2020.

The oil pipeline system in Belarus includes the transit route for Russian oil to Latvia, the Slovak Republic, Germany and Poland. The northern part includes 1 068 km of high-pressure line with diameters from 720 mm to 1 020 mm. The southern part is 656 km long with diameters from 530 mm to 1 020 mm.

### SYSTEM RELIABILITY

Generally, Belarus does not experience significant electricity or heat supply shortages or power outages. The level of system reliability is stable, with losses decreasing slowly over time through network improvements.

Losses in the electricity transmission and distribution network were just under 10% in 2012, and fell slightly in 2013. Improvements envisaged in the 2013 energy strategy programme are expected to lower lines losses two percentage points by 2016. Losses in the heat sector are undisclosed; however, the heat sector rehabilitation programme is expected to also reduce losses by 2 percentage points by 2020, or 8% in total.

In the gas sector, the average transmission pipeline loss is about 0.5%, and is 0.2% in the distribution network.

## EMERGENCY RESPONSE

The Ministry of Emergency Situations is responsible for emergency preparedness and response mechanisms. In May 2013, the Council of Ministers approved the Rules on Electricity which, among other things, stipulate rules for emergency outages, electricity shortages, disconnections and other interruptions. Other emergency response measures include regulated fuel reserves, emergency reserves grids (rotating hot and cold) and interstate agreements.

# 3.3. MARKET CONVERGENCE

## NATIONAL MARKET STRUCTURE

### ELECTRICITY AND HEAT

Overall control and management of the electricity and heat sector falls within the responsibilities of the Ministry of Energy. BelEnergo is a vertically integrated association that owns and operates the electricity and heat sector in Belarus including generation, transmission, distribution and retail sales of electricity and heat. Transmission system operator functions are distributed among the holding company, BelEnergo, and its subsidiaries: the central dispatch unit and six regional power system companies, or *oblenergos*, which serve as distribution system operators. BelEnergo covers about 50% of the heat supply while the remainder is provided by local district heating companies which are owned by municipalities.

The State Programme of Electricity Sector Development to 2016 provides for progressive restructuring of the electricity and heat sector. This restructuring is to include creation of generation, transmission and distribution enterprises and a national wholesale electricity market; there would be full cost transparency, while the state would keep the dispatch management and electricity transmission functions (Energy Charter, 2013). The government expects that a wholesale market model would attract foreign investment, diversify the energy supply mix and provide for integration into the international markets. The government is considering a Concept of Electricity Law which could include these rules.

### NATURAL GAS AND OIL

The natural gas sector consists essentially of two companies: Gazprom-TransGaz, which operates the high-pressure transportation, transit and storage systems, and is responsible for new construction and maintenance; and BelTopGaz, which is responsible for gas distribution and retail sales. Gazprom-TransGaz sells gas to BelTopGaz, which through its seven subsidiaries (regional distribution companies) resells the gas to end users in all sectors.

Gazprom-TransGaz is fully owned by Gazprom and all matters related to natural gas transit, including the infrastructure, system operation, tariff structure and technical services, are carried out under a bilateral agreement with Gazprom. BelTopGaz is fully state owned.

The petrochemical industry is comprised of the entities of the State Concern for Oil and Chemistry BelNeftekhim, which reports directly to the Council of Ministers. More than 80 companies and organisations provide the full spectrum of activities related to the exploration and production of oil, its transportation, processing and retailing, as well as producing a wide range of chemical and petrochemical products.

### REGULATORY FRAMEWORK

Belarus does not have a single independent energy regulatory authority. The Ministry of Economy is responsible for the regulation of electricity and heat tariffs for industrial customers, independent suppliers and all categories other than residential, based on the

2011 Decree on Price Tariffs. Residential energy tariffs are regulated by the Council of Ministers. Regional executive committees and the Minsk City Executive Committee are responsible for regulation of heat tariffs for those which are not already covered by the Council of Ministers.

In view of progressive reform, the government is planning to develop a body of legislation governing the ownership structure of the electricity and heat industry, state involvement in electricity and heat tariff settings, and the basic principles of the formation and functioning of the wholesale electricity market, including the laws on electricity and heat supply.

Belarus simplified grid connection through the new Decree on Grid Connection (August 2014). The Decree allows for the connection of small private generators.

Regulatory functions in the gas sector are within the power of the president.

## Tariffs

Electricity, heat and gas tariffs are based on a cost recovery approach, though the methodology is not disclosed to the public. Tariffs are adopted by resolution of the Cabinet of Ministers and are subsidised for end-users. There is no obligation to publish annual reports or information about various tariff structures, although end-use consumer tariffs are available in the public domain.

Case-by-case feed-in tariffs are available for specific categories of consumers, such as strategic investors with large-scale industrial projects or industrial plants of strategic importance. Each case is considered separately and a relevant presidential decree is issued.

The price of imported gas is determined by contract between Gazprom and the Ministry of Energy. The state regulates the price of liquefied natural gas, tariffs for gas and oil transmission and distribution, and petroleum product prices. After consultation with the relevant companies, the Ministry of Economy approves the tariffs in a special document, which sets out the tariffs, costs and mark-ups.

Residential electricity tariffs are differentiated by consumption bands and peak and off-peak time periods. Other consumer categories have the choice of a single or a differentiated tariff. Gas prices for final consumers depend on import prices and costs of transport. Natural gas meters are installed for all industrial and domestic consumers. Heat tariffs vary according to consumer category and by area.

The State Programme of Energy Sector Development to 2016 aims to reform tariffs to create incentives for energy savings without heavy government subsidies. Modification of tariffs is in two phases: first in 2012 to 2014, then 2015 and after. The reform is expected to result in separate tariffs for generation, transmission and distribution, as well as a new methodology for industrial rates.

Before the transition to the second stage of tariff reform, the government has reduced cross-subsidies in the electricity and heat sector. This includes the elimination of preferential tariffs for industrial customers, which occurred in 2012, and an annual increase in the price, based on nominal growth in the average salary. During 2014, the average salary rose by 5.8% and so did the price of electricity, heat and gas (for lowest consumption bands only). Tables 3.3.1 and 3.3.2 summarise the tariffs in Belarus, including different consumption bands.

**Table 3.3.1** Electricity and heat tariffs, Belarus, 1 December 2014

| Type of consumer | Consumption band (kWh/month) | Tariff (USD/kWh) |
|---|---|---|
| Households equipped with electric stoves | 250 kWh <= | 0.07 |
| | 250 - 400 kWh | 0.08 |
| | > 400 kWh | 0.14 |
| Households without electric stoves | 150 kWh <= | 0.08 |
| | 150 - 300 kWh | 0.1 |
| | > 300 kWh | 0.14 |
| Households without electric stoves or centralised hot water system/gas heating | 300 kWh <= | 0.08 |
| | > 300 kWh | 0.14 |

Source: www.tarify.by.

**Table 3.3.2** Natural gas tariffs, Belarus, 1 December 2014

| Type of consumer | Consumption band, $m^3$/year | Summer tariff (USD/$m^3$) | Winter tariff (USD/$m^3$) |
|---|---|---|---|
| Households with individual gas heating appliances and individual gas meters | 3 000 cm <= | 0.06 | 0.21 |
| | 3 000 – 5 500 cm | 0.07 | 0.22 |
| | > 5 500 cm | 0.22 | 0.22 |
| Households with central heating and individual gas meters | Cm | 0.21 | 0.21 |

Source: www.tarify.by.

**Table 3.3.3** Recovery of electricity and heat costs from the residential sector, Belarus

| | 2011 | 2012 | 2013* | 2014* | 2015* |
|---|---|---|---|---|---|
| **Electricity** | 38.5% | 32.3% | 54.7% | 79% | 100% |
| **Heat** | 21.4% | 17.2% | 18.7% | 21% | 30% |
| **Average of electricity and heat** | 29.7% | 24.4% | 36% | 48.4% | 61.7% |
| **Cost of electricity (USD/kWh)** | 0.05 | 0.08 | 0.09 | 0.09 | 0.1 |
| **Cost of heat (USD/Gcal)** | 20.6 | 33.6 | 36.7 | 41.5 | 46.2 |

Note: Gcal = gigacalorie.

* Estimate.

Source: Ministry of Energy.

In 2012, the level of cost recovery was 32.3% for electricity and 17.2% for heat. The government is expecting electricity tariffs to be fully cost reflective by 2015 through tariff increases, while heat recovery rates will increase to 30% over the same period (Table 3.3.3).

## Green tariff

A green tariff for renewables was authorised by a Ministry of Economy decision in 2011, on the basis of the Law on Renewable Energy Sources. The feed-in tariffs is set for installations (industrial customers) with a capacity up to 750 kilowatts (kW) for a period of 20 years and is based on a correction factor of the standard tariff.

All persons legally in Belarus (national or foreign) can benefit from the tariff, except for installations belonging to BelEnergo group. The correction rates for plants commissioned from August 2011 onwards are as follows:

- wind, hydro, biomass, biogas and geothermal installations:
  - first 10 years: 1.3
  - next 10 years: 0.85
- solar installations:
  - first 10 years: 3
  - next 10 years: 0.85.

### Billing and collection

All electricity and gas consumers in Belarus are metered. The electricity meters are in line with European standards. Cross-border metering is electronic and both sides have meters. Collections rates for both electricity and gas are close to 100% for the commercial rate class, partly due to required prepayments. On the other hand, lower collection levels from some industry and agricultural customers is mounting and undermining BelEnergo's financial situation. Similarly, gas debts are large. In 2011, Belarus incurred a USD 145 million debt with Gazprom.

### Third-party access

Legislation permits foreign investors to own new power plants, and guarantees connection of independent power producers to the state power grid and the purchase of their output. In recent years, the number of independent electricity producers (mini-CHP and small and mini-hydro power plants [HPPs]) has been increasing, but still represents a negligible share of total electricity supply (Energy Charter, 2013).

There are no provisions for third-party access in the natural gas sector.

### Technical rules

The energy sector in Belarus still uses GOST standards.[6] However, the State Standard of Belarus aligns with EU standards. Public construction authorities are directly involved in the development of national industry codes, which usually meet the standards of the European Committee for Standardisation/European Committee for Electrotechnical Standardisation (CEN/CENELEC) and the International Organisation for Standardisation (ISO).

Belarus is a member of the ISO, and is an affiliate member of CEN/CENELEC. Belarus is also a member of the Organisation of the Euro-Asian Cooperation of National Metrological Institutions (COOMET) and is an active member of the Eurasian Council for Standardisation (EASC).

**6.** Gosudarstvennyy Standart (State Standards) under the USSR. GOST standards continue to be used by the 12 member countries of the Commonwealth of Independent States.

### HARMONISING ENERGY AND ENVIRONMENTAL STANDARDS

Harmonisation of standards in co-operation with the EASC and the INOGATE Programme is underway in the gas sector. More than 100 European standards for gas have been translated into Russian, and more than 40 have been sent for further consideration with key stakeholders.

From 2007–10, within the framework of the Programme for Developing the System for Technical Regulation, Standardisation and Conformity Attestation in the Field of Energy Saving, 129 technical regulations were developed with more than 80 of them harmonised with international and European requirements. Belarus is implementing a similar programme for 2011–15 which includes the development of 136 state standards, 123 of which will be based on European and international standards (Energy Charter, 2013).

## REGIONAL MARKETS AND INTERCONNECTIONS

### ELECTRICITY

Transit of electricity via the power grid of Belarus is carried out within the framework of the Common Economic Space which includes Belarus, the Russian Federation and Kazakhstan. The framework includes a 2010 pricing and tariff policy. Electricity transit from the Commonwealth of Independent States (CIS) countries is governed by the Agreement on Electricity Transit within the CIS (2000).

### NATURAL GAS

Belarus transits gas from Russia to Ukraine, Poland, Lithuania and Russia's Kaliningrad region (via Lithuania). Gazprom-TransGaz operates the Yamal-Europe transmission pipeline which provides gas to Germany and is owned by Gazprom. However, Gazprom-TransGaz does not participate in the work of the European Network of Transmission System Operators for Gas to prepare the Ten-Year Network Development Plans for Transmission Systems and Network Codes.

# 3.4. SUSTAINABLE DEVELOPMENT

## RENEWABLE ENERGY

Renewable energy developments are governed by the Law on Renewable Energy Sources (2011) and the National Programme for Renewable Energy Development for 2011-15. Under the programme, the government has developed feed-in tariffs and guaranteed connection for renewable power producers in order to attract private investment. Other measures include stimulation of investment activity, such as the creation of an inviting environment for national and foreign investors and the establishment of tax and other benefits for producers of electricity from renewable energy.

To increase the use of fuel wood, peat and other domestic fuels, the government approved the State Programme for the Construction of Energy Sources on Local Fuels in 2010-15. This programme plans for the construction of 23.6 MW of capacity and 769.7 MWh of thermal output from domestic sources. This will lead to savings of 0.96-1.12 bcm per year in natural gas consumption by 2016.

Other renewable developments include 162 MW of wind turbines by 2016, with the possibility of up to 300 MW if funding is secured. This includes the Vitsebsk and Hrodna regions (60 MW) and the Mogilev region (50 MW). Up to 102 MW of hydropower capacity is expected in the period to 2016.

In 2010, the Soligorsk district commissioned a solar installation with heat output of 160 kW. A similar installation is planned at the Lake National Bank of Belarus. Construction of the first geothermal installations with a heat output of 1-1.5 MW will be on the outskirts of Brest in southwest Belarus.

Also in 2010, the government introduced a programme to support the development of biogas power plants fuelled by agricultural and industrial waste. In 2012, 8.2 MW of biogas electricity generation capacity was installed.

There were 277 active renewable energy installations — biogas, solar, geothermal, biomass, hydro and wind — with a total capacity of 397 MW in September 2013 according to a government inventory. Maximum output from these facilities is 519 GWh/year of electricity and 2.7 million Gcal/year of heat.

### RENEWABLE ENERGY POTENTIAL

Hydropower potential in Belarus is 850 MW (technically viable 520 MW and economically viable 250 MW), according to government estimates. Existing capacity is 16 MW, so potential for further developments is large. Wind power potential is more than 1 600 MW with only 1.2 MW currently installed.

Biogas production could amount to 503.7 mcm per year while the potential for municipal waste is 470 000 tonnes of coal equivalent (tce). The overall amount of crop residues is estimated at up to 1.46 million tce per year. Belarus also has significant potential for the production of fuel ethanol.

Two geothermal fields, the Podlesse basin (Brest region) and the Pripyat trough (Gomel region), have been investigated. The government will continue to assess the geothermal potential of Belarus.

## ENERGY EFFICIENCY

Energy efficiency measures in Belarus are mainly through supply-side improvements in generation, transmission and distribution, and are based on the Law on Energy Savings (2010) and the Programme on Energy Savings for 2011-2015. The energy intensity reduction target is 50% in 2015 (from 2005 levels) and 29-32% in the period 2011-15, as set out in the Programme for Socio-economic Development for 2011-2015. The approach assumes growth in both real GDP and energy demand. The level of energy intensity in 2012 was 0.21 tonnes of oil equivalent (toe) per USD 1 000 GDP PPP, which is 39% lower than 2002 levels. Belarus's energy intensity is the fifth-lowest compared to other EECCA countries. The government approved a Law on Energy Savings in December 2014. The law stipulates energy efficiency technology implementation and the energy-efficient equipment requirements.

Government projections indicate that by 2015, electricity demand will reach 39.4 TWh/year and heat demand will increase to 70 million Gcal/year. By 2020, demand for electricity will grow to 42.9 TWh/year and demand for heat will increase to 81 million Gcal/year.

BelEnergo is expected to bring a total of 1.8 GW of capacity on line in the period 2011-15 which will include more efficient technologies. As a consequence, 906 MW of inefficient generation capacity is to be decommissioned in line with the need to reserve capacity for system reliability until the nuclear power plant is operational. Electricity grids will replace obsolete equipment and develop intelligent control systems. Plus, no less than 1 500 km of 0.4-10 kV lines will be rehabilitated. These measures are expected to deliver a two-percentage-point reduction in losses compared with 2010 levels.

For heat supply, the main efficiency improvements are heat production plants, the automation of controls and metering. In order to modernise necessary assets and increase customer connections (including industrial and residential), the network will require an annual replacement of 100-120 km of supply pipelines and 550-660 km of distribution pipelines. The efficiency gains are expected to reduce losses by two percentage points in 2015 compared with 2010 (or 8% in total).

A priority for efficiency is to introduce international technical norms and standards. From 2007 to 2010, 129 technical regulations were developed, with more than 80 harmonised with international and European requirements, based on the Programme for Developing the System for Technical Regulation, Standardisation and Conformity Attestation in the Field of Energy Saving. Similar efforts for 2011-15 include the development of 136 state standards, 123 of which will be based on European and international standards.

The Energy Efficiency Department (EED) of the State Standardisation Committee is the entity responsible for implementing and monitoring policies on energy savings, energy efficiency and renewable energy. The EED develops proposals for energy efficiency improvements, develops technical regulations and standardisation of energy equipment, provides state supervision of the efficient use of energy and develops legal and financial measures to stimulate energy efficiency. There are seven regional EED offices.

The International Energy Centre was inaugurated in Minsk in 2010 to attract domestic and foreign investment for long-term energy efficiency projects in Belarus. The Centre takes an active part in designing national, departmental and regional energy efficiency programmes and contributes to identifying potential project activities.

Public awareness of energy efficiency in Belarus is relatively high as information is regularly shared through media campaigns, information sessions, publications, educational seminars and other information dissemination approaches. In 2012, more than 110 events (conferences, seminars and exhibitions) were held for the promotion of energy efficiency and renewable energy.

## ENVIRONMENTAL PROTECTION

The national environmental policy provides for the gradual restructuring of energy production and a higher technological level of production, resource conservation, use of low-waste and non-waste technologies, reduction of emissions and discharges of pollutants into the environment, recycling and processing of waste, and the elimination of the negative effects of economic activity. Environmental improvements are to be achieved with new technologies, construction, modernisation of existing infrastructure and organisations, and environmental standards and regulation.

Renewable energy installations are exempt from value-added tax on imported goods and land taxes. Mandatory energy audits are required under the Law on Energy Saving. A government decree in 2006 established the procedure for conducting energy audits.[7]

Energy audits must be independent and are approved by the relevant national governments and other authorities at regional and local levels. They are also approved by the EED at least once every five years. The EED is required to carry out energy audits on government buildings.

A number of energy projects have been subjected to environmental impact assessments and received favourable evaluations:

- feasibility study for Zelva coal plant 600 MW
- construction of nuclear power plant
- construction of Nemnovskaya hydro facility
- construction of Mozyrskaya combined heat and power plant fuelled with indigenous fuels
- construction of 400 MW CCGT plant at Bereza
- construction of 400 MW CCGT plant at Lukoml.

Other main investment projects that have received favourable environmental reviews include: Lukoml'skaâ and Berezovskaya Gres CCGTs, Grodno CHP 2, Mozyr CHP, Minsk CHP 3, reconstruction of Borisov, reconstruction of Mogilev, Mogilev CHP 1, and Grodno, Polotsk and Vitebsk HPPs.

**7.** Decree No. 964.

## CLIMATE CHANGE

Belarus is an Annex I Party to the Kyoto Protocol of the UN Framework Convention on Climate Change (UNFCCC). Belarus had a target to reduce GHG emissions by 8% compared to 1990 in the 2008-12 commitment period. The government adopted a decree that established the target for the second period (2013-20) as a 12% reduction on 1990 levels. The target for the second period was changed from an 8% reduction at the Doha Conference of the Parties (COP) in December 2012. These changes have not yet come into effect.[8]

The main policy and measures are under the State Programme of Measures to Mitigate the Effects of Climate Change for 2013-20, approved by the Council of Ministers in June 2013. It indicates a target to reduce GHG emissions by 8% in 2020 compared with 1990, about 10 $MtCO_2$-eq. The measures include energy efficiency improvements, increases in forested areas, restoration of peat-lands and improvements to the regulatory and legal framework related to climate change. The estimated cost for the measures is EUR 8.3 million. Policy decisions on climate change were prepared with strong co-operation with international bodies.

GHG emissions in Belarus were 89.2 $MtCO_2$-eq in 2012, which is 35.8% lower than 1990 levels (not including land use, land use change and forestry [LULUCF]). Given its large forested lands, emissions including LULUCF were 63.7 $MtCO_2$-eq in 2012. GHG emissions in Belarus have been increasing since the mid-1990s along with economic growth and increased demand for energy. Belarus can continue to increase its emissions and still reach its 2013-20 Kyoto target.

Energy-related emissions of $CO_2$ totalled 71.1 Mt in 2012, representing approximately 80% of total GHG emissions in 2012. In Belarus, the power generation sector accounts for 41.6% of energy-related $CO_2$ emissions, followed by manufacturing (26.1%), transport (16.3%), households (6.9%), other energy industries (5.1%) and the commercial and services sector (4.1%).

**8.** http://climateactiontracker.org/countries/developed/belarus.html.

# 3.5. INVESTMENT ATTRACTION

## INVESTMENT CLIMATE

The Consultative Council for Foreign Investments headed by the prime minister plays an important role in creating a favourable investment climate in Belarus. The Council includes officials from government organisations, international agencies and foreign investors operating in Belarus. The National Investment and Privatisation Agency was established in 2010 and is authorised to represent interests of the Republic of Belarus on the issues related to attracting investment; it acts as a "one-stop shop" for foreign investors. In 2012, the government approved a National Strategy for Attracting Foreign Direct Investment by 2015. Its objective is to increase the level of investment confidence in Belarus. It aims to increase the share of foreign investment in fixed assets to at least 21% by 2015 (Belarus Digest, 2012).

The government has announced measures to reduce bureaucracy and red tape. Nevertheless, bureaucratic procedures, including those for licenses and permits, are neither sufficiently streamlined nor transparent and red tape remains a problem. The 2012 strategy on attracting foreign investment aims to remove some of the burden.

The government launched a privatisation programme in 2008 and committed to privatise some of the small and medium-sized enterprises; assets of the main energy sectors were not included. All major privatisation projects require presidential approval and are not transparent. Nevertheless, some of the subsidiaries of the larger state-owned companies were open to private investment or partnership. Over the period 2011 to 2013, the government was planning to sell 168 small and medium-sized enterprises. However, by January 2012 only 38 companies had been sold (Belarus Digest, 2012).

According to the World Bank's "ease of doing business" indicator, Belarus was ranked 57th among 189 countries in 2014. A high ranking on the ease of doing business index means the regulatory environment is more conducive to the start-up and operation of a local firm. This index averages the country's rankings on ten topics, made up of a variety of indicators, giving equal weight to each.

According to the Corruption Perceptions Index (CPI) prepared by Transparency International, which measures the level of perceived corruption in public systems, Belarus ranked 119th among 175 countries in 2014, with a score of 31. This is a relatively high score for perceived corruption in the country, as a score of 100 represents no corruption.

Belarus signed and ratified the Civil Law Convention on Corruption in 2005, the UN Anticorruption Convention in 2004, the Criminal Law Convention on Corruption and the UN Convention against Transnational Organised Crime in 2003. Belarus was ratified as a member of the UN Convention against Corruption in 2005. It has not signed the Organisation of Economic Co-operation and Development Anti-Bribery convention.

## INVESTMENT FRAMEWORK

Belarus adopted an Investment Code in 2001, which is the basis for regulating national and foreign investments. The Investment Code protects the property rights of local and foreign investors and promotes favourable conditions for their activity. Foreign investors enjoy additional guarantees within the framework of bilateral agreements of Belarus with other countries. The basis for promoting economic development of the regions of Belarus and encouraging foreign investments is a 2008 presidential decree.[9]

Belarus is a signatory to numerous international investment agreements. The countries of the Eurasian Economic Commission are in negotiations on agreements of investment and free movement of capital in the three countries. In 2015, Belarus is expected to officially become a member of the Russian-led Eurasian Economic Union, alongside Kazakhstan and likely Armenia.

Belarus has signed about 60 bilateral agreements related to investment promotion, which are reciprocal guarantees of favourable investment conditions, investment protection against nationalisation and expropriation, free transfer abroad of investment income, as well as the right to challenge the decisions of public authorities in respect of its investment in national and international courts.

National legislation also provides for the possibility of concluding an investment agreement with Belarus, which allows the investor additional legal safeguards to protect their capital and additional benefits in the implementation of the investment project.

Institutional reforms are expected after adoption of the Law on Electricity which is still pending. If adopted, the law might include provisions for the creation of market conditions and details of the necessary institutional framework.

Belarus has simplified its property registration procedures and created a one-stop shop for registration. It introduced a broad administrative simplification programme that set strict deadlines for registration and computerised records. As a result, the time required to register property in Belarus was cut from 231 days to just 3 days in 2010.

Belarus has a two-tier national and local tax system. Tax liabilities depend on the form of ownership, size of the company and location of the enterprise. Tax credits are available to businesses located in special tax zones, high-tech parks and specified rural areas.

In 2011-12, the tax code was amended to provide for electronic filing of tax returns and to simplify registration of legal entities and individuals. The government is working on further improvements to simplify the tax system and set practical conditions to improve the collection of taxes and fees.

The banking sector comprises over 30 banks. These include representative offices of foreign banks (i.e. Russia, Lithuania, Latvia and Germany) as well as representative offices of the European Bank for Reconstruction and Development (EBRD) and the World Bank. Foreign capital is present in the statutory funds of 25 banks, 8 of which are 100% based on foreign capital.

Belarus is a member of the International Centre for the Settlement of Investment Disputes (ICSID). It is also a member of the New York Convention of 1958 on the

**9.** Presidential Decree No. 1, 28 January 2008.

Recognition and Enforcement of Foreign Arbitral Awards. The government may accept binding international arbitration of investment disputes between foreign investors and the state. There have been no such cases to date.

## INVESTMENT PLANNING

The Law on State Planning and Programmes of Social and Economic Development (1998) defines the mechanisms for investment strategies and planning. Short (one-year), medium (five-year) and long-term (15-year) plans are drafted at national and regional levels. They are frequently complemented by specific sectoral plans adopted at the regional level and consistent with the broader national and regional plans.

The most significant documents governing the energy sector are the Concept of Energy Security to 2020 (2007) and the Development Strategy of Energy Potential to 2020 (2010). These documents define the medium-term priorities of national energy sector development through the improvement of energy efficiency, wider use of domestic energy resources including renewables, diversification of key energy resource supplies, and improvement of pricing and tariff policy and the regulatory framework. They also cover the priorities of electricity and gas sector developments. Implementation of the planned measures in the electricity sector will require USD 4.8 billion, including funding from international financial institutions.

## References

Belarus Digest (2012), "New privatisation plans: Belarusian authorities prefer western investors to Russian", press release, 15 February, Ostrogorski Centre.

BelEnergo (2014), company website, www.energo.by (accessed 12 February 2014).

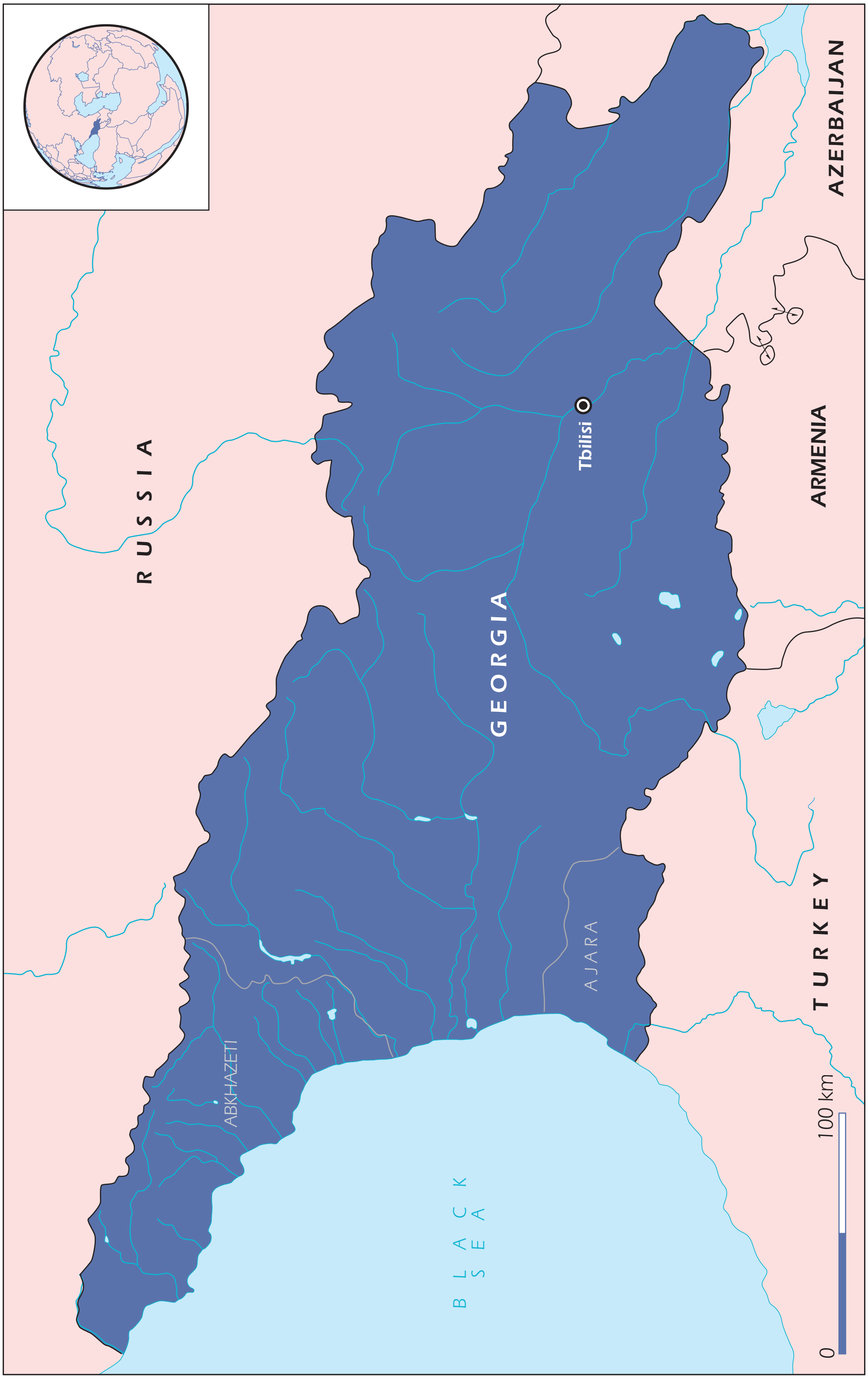
BGR (German Federal Institute for Geosciences and Natural Resources) (2013), *Energy Resources 2013, Reserves, Resources, Availability, Tables*, BGR, Hannover, Germany.

Energy Charter (2013), *In-Depth Review of the Energy Efficiency Policy of Belarus*, Energy Charter Secretariat, Brussels.

IEA (International Energy Agency) (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

# GEORGIA

**Figure 4.1.1** Map of Georgia




This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries, and to the name of any territory, city or area.

# 4.1. GENERAL ENERGY POLICY

**Key data (2012)**

**TPES:** 3.7 Mtoe (natural gas 44.5%, oil 27.1%, hydro 16.8%, biofuels and waste 8.3%, coal 2.9%, geothermal 0.3%, electricity net imports 0.2%), +45.7% since 2002

**TFC:** 3.2 Mtoe (natural gas 32.5%, oil 31.7%, electricity 22.3%, biofuels 9.7%, coal 3.5%, geothermal 0.3%), +56.8% since 2002

**TFC per sector:** residential 33.2%, industry 27.5%, transport 27.3%, commercial and public services 12%

**Electricity generation:** 9.7 TWh (hydro 74.5%, natural gas 25.5%), +33.6% since 2002

**Heat generation:** 0.03 PJ (geothermal 100%)

**Energy intensity:** 0.14 toe per USD 1 000 GDP PPP, -22.4% since 2002

## COUNTRY OVERVIEW

Georgia (Georgian: Sakartvelo) is located in the southern Caucasus region, at the crossroads of Western Asia and Eastern Europe. It is bounded on the west by the Black Sea, to the north by Russia, to the south by Turkey and Armenia, and to the southeast by Azerbaijan. Located on the shortest route between Europe and Asia, Georgia's transport system is a key link in the historic "Silk Road." The capital and largest city is Tbilisi. Georgia covers a territory of 69 700 square kilometres and its population is almost 5 million. Georgia is a unitary, semi-presidential republic, with the government elected through a representative democracy.

Georgia's overall economic policy has been focused on creating a liberalised economic environment with minimal state interference, deregulation, privatisation, reduced and simplified licensing and taxation and free trade. Georgia has pursued a westward-leaning political, economic and foreign policy, and signed the Association Agreement, including the Deep and Comprehensive Free Trade Area (DCFTA), with the European Union in June 2014. The Association Agreement was ratified by the European Parliament in December 2014.

Georgia achieved robust economic growth between 2003 and 2014, averaging 6% annually, following structural reforms that stimulated capital inflows and investment. The reforms helped improve the business environment, strengthened public finances, upgraded infrastructure facilities and liberalised trade. Growth was also supported by increased foreign direct investments (FDI) and was driven by capital accumulation and sound use of excess capacity rather than by net job creation, with productivity gains concentrated mainly in the non-tradable sectors. Gross domestic product (GDP) per capita increased from USD 920 in 2003 to USD 3 600 in 2013 (in current prices).

The World Bank's projection for Georgia's annual economic growth is 5.5% on average over the medium term, dependent on greater policy certainty, improved market access, and on strong structural reform implementation and attaining benefits from the DCFTA and Association Agreement with the European Union. With improved market access, net FDI is likely to amount to 6.3% of GDP on average, while the national savings rate should increase to 20.5% of GDP by 2017 (World Bank, 2015).

Georgia has a developed, stable and reliable energy sector, which has been largely unbundled since the mid-90s. Its primary energy source is hydropower, of which only 12% is utilised at present. The government is focused on securing private investments for the construction of new hydropower stations and diversifying fossil fuel supply sources and routes, but further efforts are required to improve efficiency in domestic energy use and utilisation of ample renewable energy potential.

Georgia has been a signatory to the Energy Charter Treaty since 1995, a member of the World Trade Organization since 2000, an observer to the Energy Community Georgia was in the process of joining the Energy Community as a full-fledged member at the end of 2014.

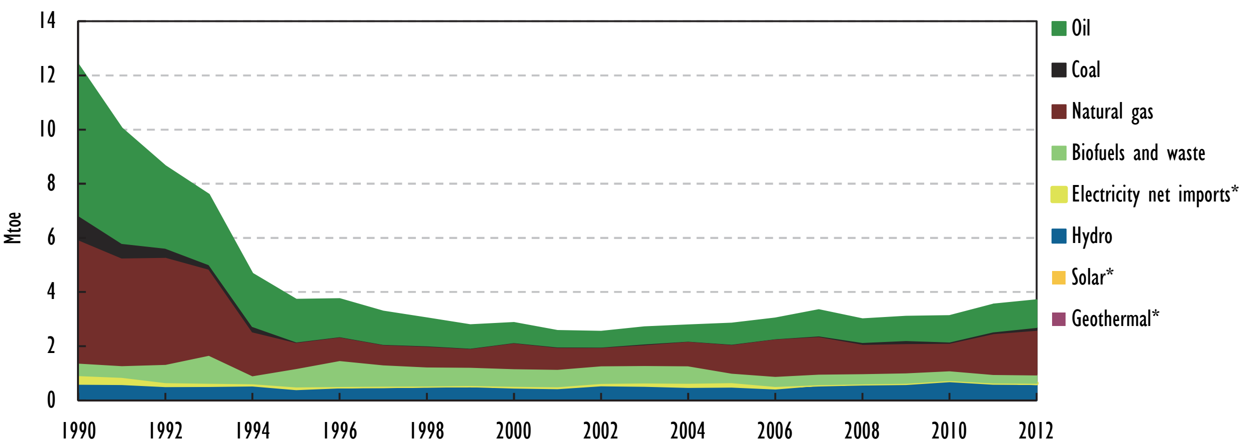
## KEY ENERGY DATA

### SUPPLY

Total primary energy supply (TPES)[1] was 3.7 million tonnes of oil-equivalent (Mtoe) in Georgia in 2012. Energy supply has increased by 45.7% compared to 2002, growing every year since, apart from in 2008 when TPES declined by 10.1% (Figure 4.1.2). Energy per capita was 1.04 tonnes of oil-equivalent (toe) in 2012, also up by 48.2% since 2002.

Natural gas is the main fuel in Georgia's energy mix, accounting for 44.5% of TPES in 2012. The supply of natural gas has increased at a faster rate than overall energy supply, growing by 142.6% since 2002. Demand from the residential and commercial sectors has driven this growth. Oil, including oil products, is also a significant fuel in Georgia, and it represents 27.1% of TPES. The supply of oil has increased by 76% since 2002, mainly driven by growing demand from the commercial and industrial sectors. The supply of coal has had a resurgence in the past five years, with its share in the energy mix increasing from 0.5% in 2002 to 2.9% in 2012.

**Figure 4.1.2** TPES, Georgia, 1990-2012




* Negligible.

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

Georgia has plentiful hydro resources, which power more than three-quarters of its electricity requirements. Hydropower represents 16.8% of TPES, and the supply of energy from hydro has increased by 6.7% since 2002. Biofuels and waste are the next largest source

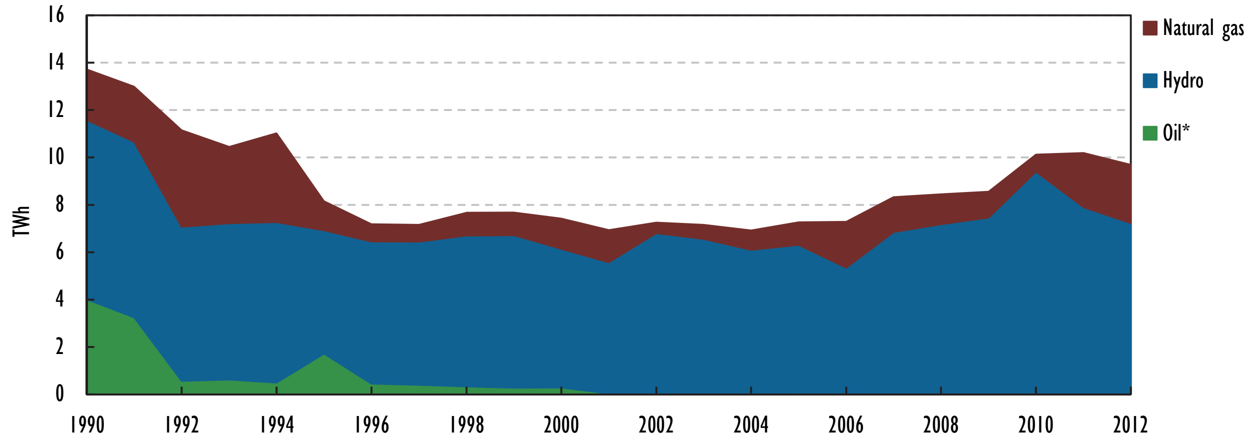
**1.** TPES is made up of production + imports - exports - international marine bunkers - international aviation bunkers ± stock changes. This equals the total supply of energy that is consumed domestically, either in transformation (for example, refining) or in final use.

of renewable energy, with a share of 8.3% in TPES. However, energy from biofuels and waste has declined by 52.5% since 2002. Geothermal exploration has existed since 2000, and in 2012 it accounted for 0.3% of energy supply. Electricity net imports account for 0.2% of TPES.

## ELECTRICITY GENERATION

Electricity generation in Georgia was 9.7 terawatt hours (TWh) in 2012. Electricity supply has been increasing since the mid-1990s, with 33.6% growth since 2002. However, generation declined by 4.9% in 2012, for the first time since 2004 (Figure 4.1.3).

**Figure 4.1.3** Electricity generation by source, Georgia, 1990-2012




Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

Electricity mainly comes from hydro (74.5% of the total in 2012), with the remainder from natural gas (25.5%). The use of oil in electricity generation ceased in 2012, after decades of steady decline. Generation from natural gas, however, has grown by 437% since 2002, with hydro increasing at a moderate pace of 6.7% over the ten years. Natural gas accounted for 6.3% of generation in 2002, while hydro supplied 93% of electricity, with the remainder from oil. Exact gas-fired electricity generation capacity is not available, while hydropower capacity is estimated at 2.7 gigawatts (GW).

Heat generation in Georgia came from geothermal in 2012 and was 36 terajoules (TJ). Since 2010, only geothermal has been used for heat generation and output has dropped considerably.

## IMPORT AND EXPORT

Georgia is a net importer of fuels and energy products. The country relies on imports of natural gas, oil products and some hard coal and biofuels to meet most of its energy needs. Net imports represent 77.4% of TPES, and this share has increased from 47.2% in 2002 as Georgia has had to increase its reliance on imports to meet robust demand. Georgia also exports modest quantities of feedstock and oil products, which account for less than 2% of TPES.

Azerbaijan is the largest trading partner with Georgia in energy, and is the main source of imports of natural gas and oil. Gas imports were 2 billion cubic metres (bcm) in 2013, and around 88% was from Azerbaijan. However, gas trade with Azerbaijan only began in 2009. Previously, all gas was imported from Russia, and Russia is still the source of 10% of gas imports, mainly through transit fees for gas transit to Armenia.

Oil product imports were 1 Mtoe in 2013 and came from Azerbaijan (48%) and other non-specified countries.

Georgia's electricity system is interconnected with those of Russia, Azerbaijan, Armenia and Turkey. The volumes of trade are relatively subdued at present, with net imports of 87 gigawatt hours (GWh). Over the ten years to 2012, net trade has varied from net imports of 1.3 TWh in 2004 to net exports of 1.3 TWh in 2010.

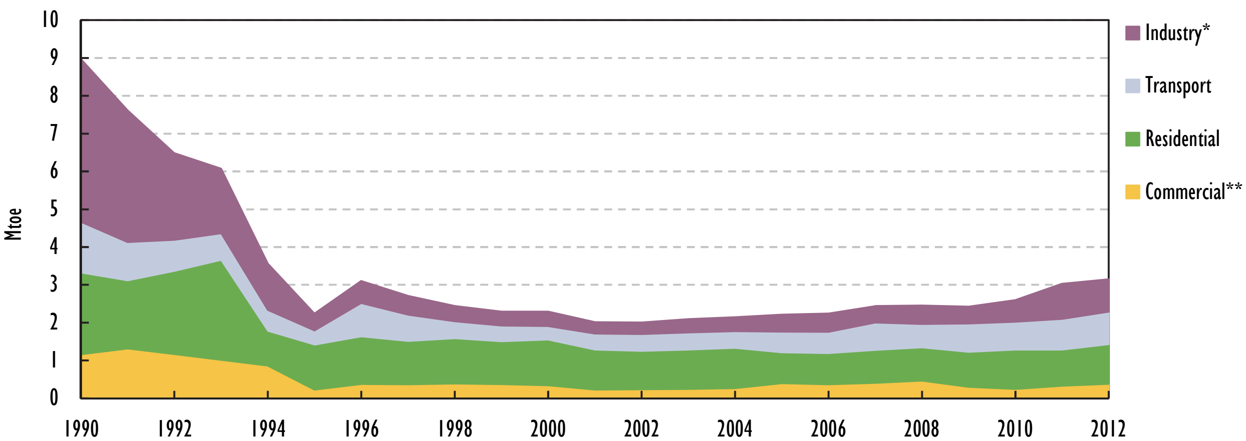
## DEMAND

Demand for energy in Georgia has experienced solid growth over the past decade, increasing by 56.8%. Total final consumption (TFC)[2] was 3.2 Mtoe in 2012, up from 2 Mtoe in 2002. Energy demand is highest from the residential sector, which accounts for 33.2% of TFC. However, growth from residential was the slowest of all sectors, up by only 3.2% since 2002. Households represented 50% of TFC in 2002 (Figure 4.1.4).

The overall growth in demand has been driven by a boom in industry and transport consumption. Industry accounts for 27.5% of TFC and transport for 27.3%. Demand from the industry sector increased by 172.6% since 2002, increasing its share in TFC from 15.8%. Transport consumption was 94.4% higher in 2012 compared to 2002, also growing from 22% of TFC.

The commercial sector (including public services, other services, agriculture, fishing and forestry) represents 12% of TFC, a share that has remained relatively unchanged since 2002. Demand in the commercial sector has increased by 60% over the ten years.

**Figure 4.1.4** TFC by sector, Georgia, 1990-2012




* *Industry* includes non-energy use.

** *Commercial* includes commercial and public services, agriculture/fishing, forestry and non-specified consumption.

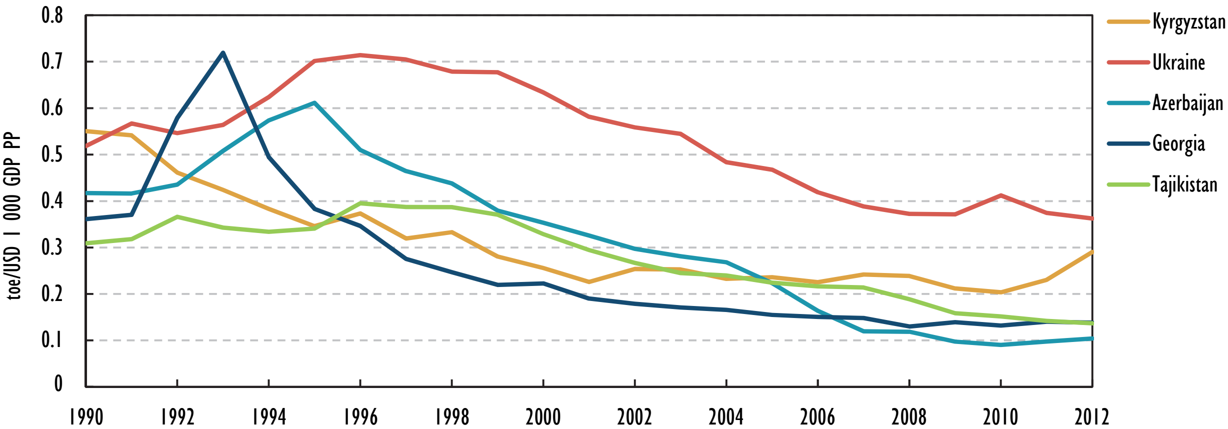
Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## ENERGY INTENSITY

Georgia's energy intensity, measured as the ratio of TPES to real GDP, was 0.14 toe/USD 1 000 GDP PPP in 2012. This level of intensity was the third lowest of all EECCA countries, higher than Azerbaijan and Tajikistan. Since 2002, Georgia's energy intensity has declined by 22.4%, down from 0.18 toe/USD 1 000 GDP PPP. Georgia's real GDP (USD GDP PPP at 2005 prices) increased by 88% over the ten years to 2012, while TPES grew by 45.7% over the same period (Figure 4.1.5).

**2.** TFC is the final consumption by end users, i.e. in the form of electricity, heat, gas, oil products, etc. TFC excludes fuels used in electricity and heat generation and other energy industries (transformations) such as refining.

**Figure 4.1.5** Energy intensity in Georgia and other selected EECCA countries, 1990-2012




Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## RENEWABLES

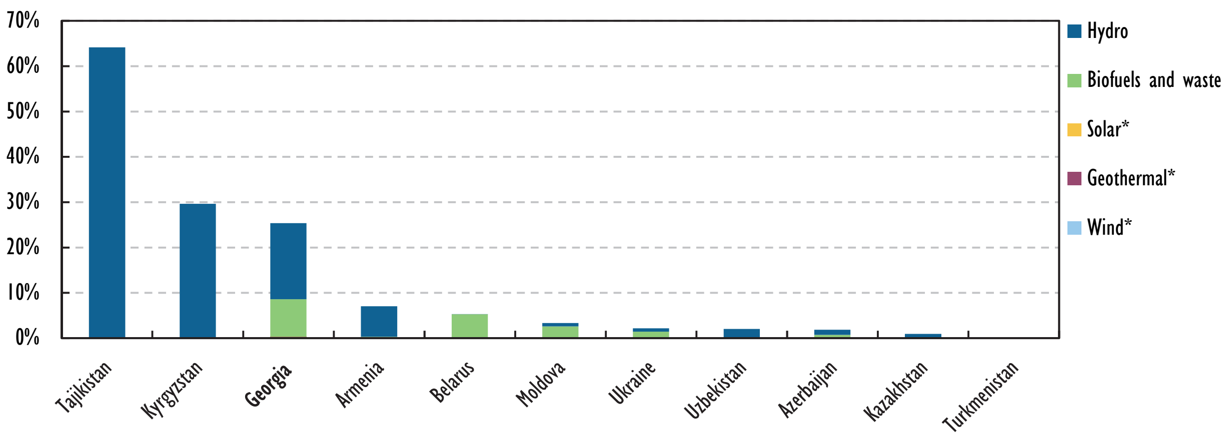
Renewable energy in Georgia accounts for 25.3% of TPES, made up of hydro (16.8%), biofuels and waste (8.3%) and geothermal (0.3%). Solar energy production began in 2012, albeit output is low (Figure 4.1.6).

Hydro is a source of around 75% of electricity generation, while biofuels and waste are mainly used in households for heating and cooking purposes. Geothermal is used in heat generation.

Over the past decade, the share of renewables in the energy mix has contracted from 48.6%, mainly due to a drop in consumption of biofuels (as households switch to natural gas). While hydropower has increased by 6.7% since 2002, energy from biofuels and waste has fallen by 52.5%. Energy from geothermal has grown by 10.2% over the same period.

Georgia has the third-highest share of renewables in TPES among EECCA countries, behind Tajikistan and Kyrgyzstan, both of which are endowed with plentiful hydro resources.

**Figure 4.1.6** Renewable energy as a percentage of TPES in Georgia and other EECCA countries, 2012




* Negligible.

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## ENERGY DATA SOURCES

The figures presented in this report are official energy statistics and balances of the International Energy Agency (IEA) for Georgia and other EECCA countries, based on IEA methodology.

The National Statistics Office of Georgia (GeoStat) is responsible for administering the laws on national data services, and collects, processes and publishes national statistics data, including energy data. GeoStat is responsible for the preparation of energy balances, which it does in close co-operation with the Ministry of Energy. In collecting energy data, GeoStat and the Ministry of Energy collaborate with the Georgian State Electric system (GSE), the Georgian Electricity System Commercial Operator (ESCO) and the Georgian Oil and Gas Corporation (GOGC) for the collection of information on balances on electricity and gas.

Statistics data in Georgia is open and in the public domain. GeoStat publishes monthly, quarterly and annual data on its website,[3] disseminates it widely to large number of public and private bodies, both nationally and internationally, and employees the latest applications for smart phones for easier and convenient reference. In 2014, GeoStat published an aggregated energy balance for 2013 in full compliance with international standards.[4]

GeoStat co-operates with a large number of international statistics bodies, regularly submitting statistics data under their international obligations. GeoStat regularly submits annual energy data to the International Energy Agency (IEA) and other multinational statistics bodies, including UNSTAT and EUROSTAT. In February 2013, GeoStat, the Ministry of Energy and the INOGATE Technical Secretariat signed a Memorandum of Understanding (MoU) on statistical co-operation. The main purpose of this MOU is to formally adopt the National Energy Statistics Action Plan for Georgia (ESAP), with the goal of developing institutional frameworks for energy statistics and to harmonise them with international standards, and to improve the methodologies applied in data collection and compilation of energy statistics, energy balances, energy prices and energy efficiency indicators.

## ENERGY SECTOR DESIGN

## MARKET STRUCTURE

### Electricity and heat

The electricity sector in Georgia is partially deregulated and fully unbundled into generation, transmission and distribution companies. Most generation and distribution assets are fully privatised. Hydropower plants (HPPs) provide up to 100% of generation in the summer months, while gas-fired power stations and imports meet peak consumption during winter months.

The wholesale electricity market operates under bilateral contracts and the state-owned ESCO purchases power not sold through bilateral contracts. ESCO is responsible for balancing and settlement according to market rules and exports surplus power. About 75% of all electricity generated is sold through bilateral contracts and the rest through ESCO. Three electricity transmission system operators (TSOs) operate in Georgia:

- GSE – state-owned
- EnergoTrans – owned by GSE/state-owned
- SakrusEnergo – 50/50 joint venture between the Georgian government and Russia's Inter-RAO.

EnergyTrans owns the 500/400 kV Black Sea Transmission Line (connecting Turkey to Georgia) and SakrusEnergo only operates the 500 kV line crossing the country from the

3. www.geostat.ge.

4. www.geostat.ge/index.php?action=wnews&npid=350&lang=eng.

north. Although all three TSOs provide a transmission service, only GSE has a dispatch licence. GSE's operations include ESCO and the dispatch centre.

Three distribution system operators (DSOs) operate in Georgia:

- Energo-Pro Georgia – owned by Energo-Pro (Czech)
- Telasi – owned by Inter-RAO (Russian)
- Kakheti Energy Distribution – owned by Akhema Group (Lithuanian).

Small HPPs (under 13 megawatts [MW]) have the right to supply electricity to end users.

In January 2014, the Georgian government approved a new Georgian Electricity Market Model 2015 (referred to as "GEMM 2015"), aimed at boosting hydropower generation to allow increased electricity exports to Turkey and eventually other European markets. The electricity market model and electricity trade mechanism will be implemented progressively from 2015 to encourage private sector investment in hydropower generation, allowing the country to boost its exports.

The model is based on EU electricity markets. Key market developments include: cross-border transmission capacity rights for Georgian exports to Turkey; regional competitive electricity markets; and electricity transit from Azerbaijan to Turkey and on to south-eastern Europe. The model includes spot power trading and rules for non-discriminatory market access. The eventual goal is for Georgian hydropower producers to have access to European buyers that have varying obligations to purchase electricity from renewable sources. The government has adopted six-monthly Action Plans for the progressive implementation of GEMM 2015.

### Natural gas, oil and coal

GOGC is a state-owned oil and gas company in charge of gas imports and transit, as well as oil and gas production through production sharing agreements (PSAs) with private investors.

Oil importation, storage and transport are carried out by private businesses.

Gas transmission, distribution and retail services are fully unbundled in Georgia. GOGC's subsidiary, Georgian Gas Transportation Corporation (GGTC), is the gas TSO. There are many gas DSOs in Georgia, all of which are private companies. KazTransGas (owned by the state and Kazakh investors) is the largest DSO and distributes gas to Tbilisi. Gas retail is carried out by many private companies.

Coal mining in Georgia is carried out by Saqnakhshiri, a subsidiary of the private company Georgian Industrial Group (GIG) (Saqnakhshiri, 2012).

## INSTITUTIONAL FRAMEWORK

**The Ministry of Energy** governs the energy sector and is in charge of national energy policy development and implementation. The Ministry of Energy also manages national energy companies and the privatisation of energy assets. Other responsibilities include energy efficiency policy developments and energy research, development and deployment (RD&D) policies.

**The Ministry of Environment and Natural Resources Protection** governs sustainable resource development and environmental protection, and develops national policies and strategies on environmental and natural resource protection.

The **Georgian National Energy and Water Supply Regulatory Commission** (GNERC or the Commission) is an independent energy and water supply regulator, established in 1997.

GNERC's responsibilities include: licencing for electricity generation, transmission, distribution and dispatch; licencing for natural gas transportation and distribution; regulation of electricity generation, transmission, distribution and end-user tariffs and import prices; dispute resolution; billing, reporting and fee-paying service development; and the promotion of local resources. GNERC also sets caps on wholesale prices for existing plants based on their costs. The exception to GNERC's regulations are small to medium-sized HPPs developed since 2008. These power plants have bilateral contracts with the government at deregulated prices, as per the State Programme on Renewable Energy 2008. The changes to the Electricity and Natural Gas Law in 2007 moved some of the key functions of the regulator (i.e. approval of market rules) to the Ministry of Energy, which substantially weakened its position as an independent regulator.

### LEGAL FRAMEWORK

The Law on Electricity and Natural Gas (1997) is the principal energy legislation in Georgia. This law incorporates some EU principles, after numerous amendments since 2006. Amendments include the establishment of the responsibilities of an independent energy regulatory authority, wholesale electricity market rules, third-party access for electricity and gas networks, unbundling of generation, transmission, distribution and retail activities, among others.

Secondary legislation comprises different statutory acts such as government resolutions, ministers' orders and GNERC's resolutions. Secondary legislation includes the Electricity Supply and Consumption Rules and the Electricity (Capacity) Market Rules (2006, amended in 2010) that outline electricity and natural gas tariff methodology, and retail market and power supply market conditions.

The latest amendments to the Law on Electricity and Natural Gas are the market rules for GEMM 2015, providing a legal framework for the electricity sector's new structure. The Electricity (Capacity) Market Rules will be replaced with new market rules in order to implement the new market model, legislating the change in the roles of, and the commercial and financial relations between, ESCO and GSE (Delphia et al., 2012).

Four working groups and subgroups have been created to work on cross-border trading rule development, amendments to energy legislation, amendments to the Grid Code and the development of new Market Rules. Members of these groups are from the Ministry of Energy, USAID, GSE and ESCO, as well as other Georgian and foreign experts.

The government was in the process of drafting a Law on Renewables at the end of 2014, albeit no legislative proposals for energy efficiency were being considered.

## KEY POLICIES

The government's main energy policy direction is longer-term hydropower development, dedicated to attracting foreign direct investments in the hydropower sector, in order to phase out thermal generation and imports; meet domestic demand in full; and expand electricity exports to neighbouring markets. Despite vast biomass, solar, wind and geothermal resources, the government has yet to fully assess the economic potential of renewable energy development and elaborate on a legal and regulatory framework with targeted measures and incentive schemes such as feed-in tariffs.

On 6 June 2014, the Georgian government approved the country's Socio-Economic Development Strategy to 2020, referred to as Georgia 2020. The strategy sets out the main directions of the country's energy sector, among other priorities. Energy sector developments focus on enhancing energy security and increasing self-sufficiency. Key energy sector directions include market liberalisation, strengthening private sector participation and competition, developing indigenous energy sources (mainly hydro) and increasing energy efficiency. The strategy stresses the importance of moving to the new GEMM 2015 and a new Electricity Trading Mechanism (ETM) both internally and in neighbouring markets. The ETM is a basic trading platform for making competitively priced sales across international borders.

GEMM and the ETM are designed to advance national electricity sector policies. The key objective (and a fundamental policy) is to ensure that the potential benefits resulting from Georgia's geographic location and natural resources run directly to electricity consumers and electricity sector investors.

Specific energy policy is under discussion with the government at present. In 2013, the government launched a process of developing medium- to long-term energy policy with a strategy to 2030, supported by USAID's Hydro Power and Energy Planning Project. Under the project, the government prepared a draft policy and presented it to the government for consultation in July 2014. Following the consultation process between the ministry and national energy companies, the government initiated wider public discussions on 25 July 2014.[5]

The key national energy policy directions provided in this draft, expected to serve as the basis of an energy strategy for Georgia from 2015 to 2030, include:

- diversification of supply sources and optimal exploration of local energy resources
- utilisation of Georgia's renewable energy resources
- gradual approximation, and later harmonisation, of Georgia's legislative and regulatory framework with the EU's Energy *acquis*
- improvement of the energy market and the ETM
- strengthening of Georgia's importance as a transit route in the region
- creation of a regional platform for the generation and trade of clean energy
- development and implementation of an integrated approach to energy efficiency
- adherence to the highest environmental protection standards when implementing energy projects
- improved service quality and protection of consumer interests.

Development of Georgia's Energy Strategy to 2030 will require the government's strong commitment in forming an accurate strategic outlook for reaching the maximum yield from developing countries' ample renewable energy resources, for maximising energy efficiency gains potential, for reaching energy security intentions and for utilising its export potential.

Until the adoption of the new energy policy, the energy sector in Georgia will continue to be guided by the Main Directions of State Policy in the Power Sector, dating back to 2006. Key policy directions have not changed significantly since 2006. The Georgian government continues to attribute strategic importance to improving self-sufficiency, reducing import dependency, expanding its electricity export capacity and utilising its energy transit potential. As such, construction of new large HPPs and new transmission lines remain its top priority. It is also continuing co-operation with neighbouring countries to develop regional energy markets, and co-operation in international projects aimed at transportation of Caspian energy resources to the EU markets.

**5.** www.energy.gov.ge/show%20news%20mediacenter.php?lang=eng&id=306.

The State Programme for Renewable Energy 2008, for the construction of new renewable energy plants and particularly HPPs, has been in force since 2008. The programme regulates and supports the construction of new renewables projects with less than 100 MW capacity. The programme allows the government to offer purchase agreements to investors in renewable energy, with a deregulated price and guaranteed purchases during the three winter months. Additionally, Georgia launched an investment programme and carried out intensive road shows to attract potential investors in small and medium HPP development, both locally and internationally. The government reduced regulations for small and medium-sized HPPs and built a new high-voltage electricity transmission line to Turkey to facilitate growth in electricity exports. Some 17 HPPs with 630 MW of capacity were under construction at the end of 2014.

Several IFIs have also been active in the support of energy efficiency and renewables' development in Georgia, funding a variety of activities including pilot projects, policy analysis, rehabilitation works and training.

Georgia has been a signatory to the Kyoto protocol since 1999 and has potential to attract investment to renewable energy and energy efficiency projects through the Clean Development Mechanism (CDM). However, despite of the development of a few CDM projects there is very little evidence of its active political support. According to the United Nations Framework Convention on Climate Change (UNFCCC), Georgia has 11 CDM projects under consideration, 10 projects under validation and 3 registered or pending registration. The main barriers to the implementation of CDM projects, identified by the Second National Communication of the UNFCCC in 2009, were weak market infrastructure, the inaccessibility of data to construct baseline scenarios, and small CDM potential. Additionally, despite its international commitment under the Kyoto Protocol, the government has not assessed national emissions and air pollution and has no plans in place for sustainable development up to 2020 and 2030.

On 8 May 2014, the government adopted the National Biodiversity Strategy and Action Plan 2014-20, for the implementation of obligations of the Convention on Biological Diversity (CBD), ratified in April 1994. By joining the CBD, the government committed to conserving biological diversity, the sustainable use of its components, and the fair and equitable sharing of benefits arising from the utilisation of native resources.

The first action plan was adopted in 2002, aimed at more effective and coherent implementation of the three objectives of the Convention. The original goal was to achieve declared commitments by 2010. The current action plan will take effective and urgent action to halt the loss of biodiversity and to ensure that by 2020 ecosystems are resilient and continue to provide essential life-sustaining services to forestry ecosystems, meadows, wetlands and lakes, the Black Sea and glaciers, and regulate the flow of water into the country's river systems.

Georgia is also party to other global biodiversity-related conventions such as the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Ramsar Convention on Wetlands of International Importance, the Convention on Migratory Species (CMS) and the UNESCO World Heritage Convention.

## INVESTMENT

Total foreign direct investments in Georgia's energy sector amounted to USD 923 million in 2014.[6] Investment has increased compared to USD 658 million in 2006; however, it is lower compared to USD 1.5 billion on average during 2006-08.

**6.** http://geostat.ge/index.php?action=page&p_id=140&lang=eng.

In the electricity sector, regional projects of strategic interest include the 500 kV/400 kV connection line to Turkey and the 400 kV Electricity Transmission Line project between Georgia and Armenia. The Black Sea Energy Transmission System was completed in 2013 at the cost of approximately EUR 159 million, financed by the European Bank of Reconstruction and Development (EBRD), the European Investment Bank (EIB) and the German Reconstruction Credit Bank (KfW).[7]

The State Programme for Renewable Energy was adopted in 2008, under which investor incentives for small to medium-sized HPPs included: deregulated prices; the possibility of export without a license for nine months a year; low taxes; and eased bureaucracy in licensing/permitting. However, the prices on the internal Georgian market are too low (especially in spring-summer when there is an oversupply of cheap electricity from the existing hydro plants) to make sales to the local market profitable. Therefore, most HPPs under construction are linked to export markets. In order to secure electricity during the winter months, the government introduced an obligation for all new HPPs with capacity over 13 MW to sell electricity on the internal domestic market during the three winter months – either to ESCO or through bilateral contracts.

Gas sector projects of strategic interest for Georgia include Caspian gas transportation projects, transiting through Georgia, including projects of common interest aimed at developing integrated EU energy markets and the construction of the underground gas storage in Samgori. Developments for expansion of the South Caucasus pipeline (SCP) are underway to allow an additional 16 bcm/y of gas transportation from Shah Deniz 2.[8]

### TECHNOLOGY AND INNOVATION

The National Energy Academy under the Academy of Sciences of Georgia is the public institute in charge of developing energy RD&D programmes. Apart from small-scale programmes, no major developments have taken place in recent years due to the scarcity of funds and the government's low priority on home-grown energy technologies.

## ASSESSMENT

Georgia has vast renewable energy potential beyond existing capacity. Hydropower and biomass account for around 25% of TPES at present. Hydropower meets 100% of Georgian electricity demand in the summer months, while during the winter months the country is dependent on natural gas imports (due to low water availability). Existing hydropower capacity is estimated at only 12% of the total potential. Wind potential is estimated at 1 500 MW and solar potential at 108 MW. However, official government assessments have not been fully carried out. Solar power is currently used mainly by households with solar-powered boilers/hot water systems.

In 2008, the government adopted a State Programme for Renewable Energy for investment attraction in HPPs. The programme included deregulated prices for new HPPs, the possibility to export electricity without a licence for nine months a year, lower taxes and other incentives. However, market prices in Georgia were too low (especially in spring-summer when there is an oversupply of cheap electricity from the existing hydro plants) to make investment in new HPPs feasible.

**7.** http://energotrans.com.ge/?p=458&lang=en.

**8.** www.bp.com/en_az/caspian/operationsprojects/Shahdeniz/SDstage2.html.

Georgia is also thought to have sizeable oil and gas deposits and has been developing moderate amounts of oil for over a century.

Over the past few years, Georgia has made strong progress in enhancing the security of its electricity supply. The rehabilitation of electricity networks and hydropower stations has improved electricity supply reliability. A new interconnection to Turkey was completed by end-2013 and discussions are ongoing for increasing electricity exports to Armenia and Azerbaijan via Turkey. Georgia has a comfortable supply of adequate electricity for most of the year, and even in the winter thanks to thermal power plants providing up to a quarter of electricity during the wintertime. In the future, Georgia aims to export its rich hydropower generation, in particular to Turkey, and to become a major transit corridor for the electricity supply of the region. Commendably, the World Bank's assessment for "ease of doing business" ranked Georgia 15th out of 185 economies in 2014.

However, Georgia has not explored its sustainable energy potential in full, particularly in the area of energy efficiency in supply as well as in buildings, industry and the transport sector. While the government is preparing a draft law on renewables, there are no legislative proposals for energy efficiency. Energy efficiency potential is thought to be significant, as losses in the natural gas distribution networks are high in comparison to average European levels while aged infrastructure in buildings and the industry sector contribute to efficiency losses. Commendably, Georgia's household and industry consumption is metered. This provides the country with a good basis for developing demand-side policies and energy efficiency.

Georgia 2020 is the latest economic policy, developed in 2014, and it includes an overall energy sector direction to 2020. The country should not miss the opportunity to develop a specific energy policy in line with the country's medium- to long-term economic outlook under Georgia 2020. The draft energy policy, drafted by the USAID-funded Hydro Power and Energy Planning Project and presented to the government in July 2014, is indeed a step forward. However, development of a comprehensive Energy Strategy of Georgia from 2015 to 2030 requires high-level government commitment in elaborating the key theses of the draft strategy further, in consultation with all energy stakeholders. The new energy policy should include an analysis of a wide variety of scenarios and the use of different energy resources, with a focus on maximising renewable energy and energy efficiency gains while providing affordable and secure energy, in line with national and international commitments.

The new energy policy should also allow for the implementation of the new market model, GEMM 2015, approved in 2014. Under this model, new market rules will bring Georgia more in line with the EU market and progressively lead to the development of a regional market model that will harmonise electricity trade. A harmonised market will facilitate higher electricity exports from Georgia to Turkey, and to European markets via Turkey.

Once the policy is finalised, the government should prepare the necessary legal framework for its implementation in a timely manner. This includes rules for the new electricity market, in line with EU market rules, including rules for cross-border trade. Market rules should also allow for renewable energy integration, as well as provide incentives for energy efficiency schemes.

GNERC has been the independent energy regulator in Georgia since 1997. However, in 2006, amid energy supply security concerns and poor electricity supply quality, the government created a market model on the basis of bilateral agreements between the government and energy companies. Effectively, these bilateral contracts override the regulated sector. While the state-driven approach was successful in reducing electricity prices, modernising electricity grids and enhancing access to electricity supplies, the future priorities should focus on strengthening the role of the energy regulatory authority. The energy regulation institutional framework should include tariff setting and reviews, and provide energy incentives while protecting consumer interests. The legal framework should ensure that the regulator has the competences necessary to regulate the market and allow consumers free choice of their gas and electricity suppliers. The regulator's expertise, commitment and work at regional co-operation, such as through the successful co-operation under the EU twinning programme with international and EU regulators, can ensure stable governance for all market players.

The review team commends the Georgian government on the development of energy statistics and harmonisation with IEA and international standards. The government should continue to improve energy data and use the available information in energy policy analysis and development. Data-based analysis is necessary for medium- and long-term supply and demand projections, key strategic decision making and demand-side management. Georgia has no clear policy for energy RD&D beyond hydropower. Assessing cost-effectiveness and the potential of different renewable energy technologies (other than hydropower) as well as oil and gas production enhancements (both onshore and offshore in the Black Sea) could bring clear and tangible benefits to the country's economic growth. Energy policy should consider encouraging investments beyond hydropower in the upstream oil and gas sector, with the intention to develop the country's indigenous resources for domestic consumption to ease oil and gas import dependency.

## *RECOMMENDATIONS*

*The government of Georgia should:*

- ☐ *Develop a long-term comprehensive energy strategy in line with the national Socio-Economic Development Strategy to 2020. Such a strategy is best developed for the period up to 2030, with an outlook to 2050, in close consultation with all stakeholders and society at large. It should be based on a wide variety of scenario analyses, focused on maximising renewable energy and energy efficiency gains potential, and be aligned with national and international commitments to secure its sustainability.*
- ☐ *Continue development of a long-term stable regulatory framework for the new electricity market model, including market rules for cross-border electricity trade and regional market integration, renewable support schemes, and incentives for maximising energy efficiency gains potential. Continue alignment of these rules to the EU market model, while considering the multilateral regional context.*
- ☐ *In the context of the new market design, strengthen the competences and the independence of the national regulatory authority and reinforce its role to safeguard consumer interests, e.g. by creating a consumer board at the regulator and implementing quality of supply regulation with a focus on natural gas distribution.*
- ☐ *Maximise the use of energy data for energy policy setting and tracking progress. Continue improvements to the collection, compilation and use of energy data and encourage development of energy efficiency indicators as a tool for demand-side management and long-term energy policy planning.*
- ☐ *Explore the possibility of creating an analytical centre aimed at gathering experienced national experts for energy market and policy analysis, necessary for developing functional policies and industry regulations.*

# 4.2. ENERGY SECURITY

## RESOURCE ENDOWMENT

Hydro resources are one of Georgia's most important natural riches with 26 000 rivers. Around 300 rivers are significant in terms of energy production, with total annual potential capacity equivalent to 15 000 MW and a production potential of 50 TWh. Currently, only 12% are utilised for hydropower.

Georgia has an estimated wind potential of 4 TWh (1 500 MW). According to wind energy potential, the territory of Georgia is divided into high, mean and low speed zones where the wind speed fluctuates from 2.5 metres per second (m/s) up to 9 m/s. The most favourable places for wind farms are identified, including the whole territory of Georgia.

Solar energy potential in Georgia is high, with annual solar radiation ranging from 250 up to 280 days, amounting to approximately 1 900-2 200 hours. The total solar energy potential is evaluated at 108 MW. A large number of solar water boiling systems have been put in place by households in rural areas, where solar energy warms water up to 40-50°C.

Georgia has estimated stocks of geothermal waters equal to 200-250 million cubic metres (mcm) annually. Geothermal water temperature ranges from 30°C up to 110°C, and the total debit is 160 000 cubic metres ($m^3$) per day and night. There are well bores with water temperatures of 85°C. More than the 80% of geothermal deposits are located in western Georgia and the Zugdidi–Tsaishi geothermal field. The comparatively low temperature of the geothermal waters does not allow for generating electricity.

Crude oil economically viable reserves were estimated at 5 million tonnes (Mt) in 2012, with resources of 50 Mt. Natural gas reserves were estimated at 8 bcm with 102 bcm resources. Hard coal reserves were 201 Mt in the same year, with 700 Mt of hard coal resources (BGR, 2013).

## ENERGY SECURITY AND DIVERSIFICATION

Georgia is a net oil and gas importer and relies heavily on imports of natural gas, oil products, hard coal and biofuels in order to meet most of its energy needs. The share of net imports has increased from 47% in 2002 to 77% of TPES in 2012, in order to meet robust energy demand. Starting from 2009, Georgia imports around 88% of its natural gas and more than 45% of its oil from Azerbaijan, diversifying its import sources from Russia. Gas imports are highest during winter months, for heating, and when hydropower capacity for electricity generation falls.

Georgia exports excess electricity from hydropower and is interconnected with Russia, Azerbaijan, Armenia and Turkey. The volumes of trade are relatively minor at present; however, over the past decade electricity exports have increased by more than fourfold while imports have remained relatively consistent. Georgia launched an aggressive programme for promoting hydropower generation and expects to increase electricity trade with Turkey in the coming years. It is also in discussions with both Armenia and Azerbaijan to trade electricity with Turkey via Georgia.

Due to the substantial increase of domestic energy demand and the seasonal nature of hydropower generation, the Georgian government is exploring all avenues for diversifying its supply sources for oil and natural gas, as well as aggressively promoting further developments in the country's hydropower capacity. It also closely co-operates with neighbouring economies on the development of energy transit projects via Georgia in a bid to secure additional natural gas supply sources.

## ENERGY INFRASTRUCTURE AND INVESTMENT

## ELECTRICITY AND HEAT

### Electricity generation

HPPs provide around 75% of Georgia's electricity, with natural gas combustion generating the remaining 25%. The recently rehabilitated 1 300 MW Enguri large hydro facility is the backbone of the country's electricity generation system. A number of medium and small hydro facilities, totalling approximately 1 540 MW, also provide domestic power, either on a regular basis or seasonally. The main objective for the long-term policy of the country has been to satisfy the country's overall demand for electricity with domestic hydro resources. Besides tendering a number of new large HPPs, the Ministry of Energy has sought foreign investments for the development of new small and medium HPPs.

The Georgian government plans to facilitate further development of new renewable sources. There is significant potential in Georgia to develop micro hydropower plants. With this in mind, under the Electricity Supply and Consumption Rules, GNERC ensured free access of micro power plants to the network. It has also established fixed tariffs for the purchase of electricity produced by micro power plants.[9]

Total identified potential for hydro energy development amounts to 2 400 MW. Small and medium hydro potential is 985 MW, while large projects account for the remainder. In addition, the Ministry of Energy has already signed memorandums with private investors for construction and ownership of 2 213 MW, and for RD&D of approximately 350 MW. The USAID-funded programme Hydro Investment Promotion Project (HIPP) has studied the Tskhenistskali and Enguri river basins for potential hydro projects. HIPP has identified 19 projects with a total capacity of 489 MW. By November 2014, 17 HPPs (630 MW capacity) were under construction, 13 projects were in advanced planning stages and an additional 1 310 MW were at the research stage (Caucasian Business Week, 2014).

### Transmission and distribution

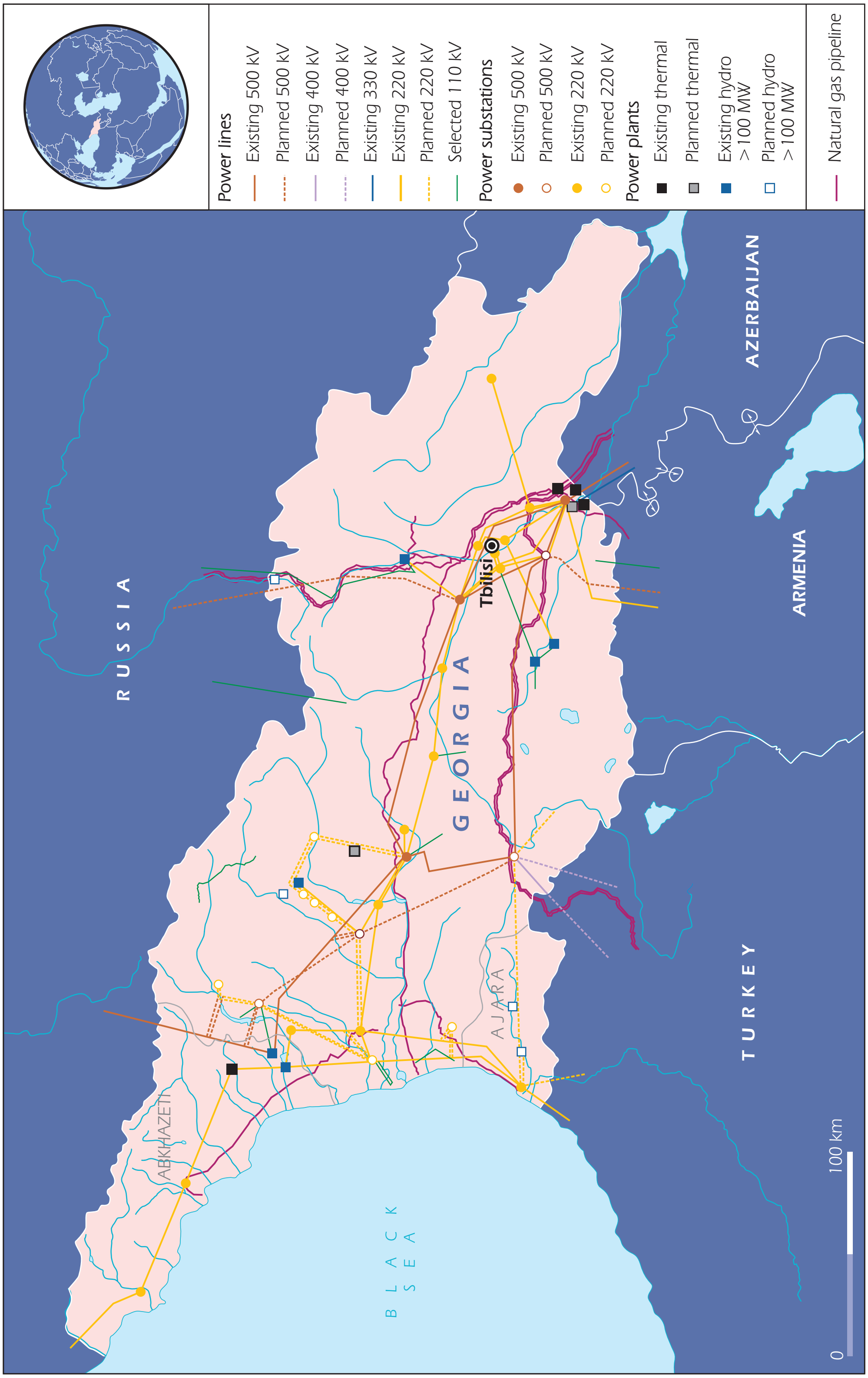
Three TSOs operate in Georgia. State-owned GSE's transmission assets include 2 938 km of 220/110/35 kV overhead lines, 91 substations with total installed capacity of 8 400 MW, and three 500 kV substations and seventeen 220 kV substations throughout the territory of Georgia.

EnergoTrans operates the 500/400 kV interconnection line with Turkey.

SakrusEnergo owns Kavkasioni, Imereti, Kartli I and Kartli II 500 kV transmission lines and the 330 KV interconnection line with Azerbaijan. The overall length of SakrusEnergo's assets passing through Georgia is 600 km.

**9.** Electricity Supply and Consumption Rules, GNEWRG Resolution #20, Article 25. 18/09/2008.

**Figure 4.2.1** Georgian electricity and gas network




This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries, and to the name of any territory, city or area.

Source: Georgian government.

In 2008, GSE (TSO) developed a rehabilitation plan that sets out the strategic targets for the company for the next 15 years (up to 2023). An intensive maintenance programme was launched in 2010 by GSE, under which 14 substations and 3 service centres were refurbished. The supporting fleet of vehicles was also renewed. Specialists have undergone training that included study tours.

Telasi is the electricity distribution and supply company that serves the Tbilisi region in Georgia. Telasi is seeking a loan of up to EUR 25 million from IFIs to finance its investment needs. The main purpose of these investments is to improve the quality and reliability of supply and reduce losses in the distribution network.

To secure a sustainable energy supply and reliable energy production in the country, the renovation of the large HPP Enguri is one of the main priorities. Rehabilitation works on Unit 1 and Unit 5 have been completed.

The USAID-funded Georgian Power and Gas Infrastructure Project (PGI) is also underway. The project includes the rehabilitation of Senaki 1-2 transmission lines and relevant substations. The project will increase the security of Georgia's power supply and increase clean energy exports through more a reliable transmission network in Georgia.

The ADB-funded Regional Power Transmission Enhancement Project is working on the construction of the new 220/110 kV substation Khorga, with 220 kV and 110 kV line bays and associated equipment.

Georgia is interconnected with Armenia, Azerbaijan, Russia and Turkey. Cross-border infrastructure includes:

- with Russia: 500 kV, 220 kV and 110 kV lines; 980 MW capacity
- with Azerbaijan: 330 kV and 500 kV lines; 1 100 MW capacity
- with Armenia: 220 kV lines; 180 MW capacity
- with Turkey: 400 kV and 220 kV lines; 820 MW capacity

In December 2013, the Black Sea Transmission Network (BSTN) Project, connecting Georgia and Turkey via the Black Sea, was commissioned. The project includes 700 MW back-to-back plant capacity, the 500 kV transmission line Vardzia and Zekari, the 400 kV interconnection line Meskheti and the 500/400/220 kV substation Akhaltsikhe.

Another project of strategic interest is a 400 kV connection with Armenia that is expected to begin construction in 2015. Other prospective projects include:

- by 2017 to Turkey: 200 kV line and 220/110 kV substation (Batumi-Muratli) with 350 MW capacity
- by 2017 to Turkey: 400 kV line (Akhlatsikhe-Tortum) with 350 MW capacity
- by 2017 to Armenia: 500/400 kV line (Marneuli - Alaverdi – Hrazdan) with 1 050 MW capacity
- by 2018-19 to Russia: 500 kV line (Ksani-Mosdok) with 850 MW capacity.

In rural areas, the DSOs Energo-Pro and Kakheti Distribution Company are carrying out re-metering projects, installing individual meters in household and industry in line with EU standards. The industry sector has been metered, while 90% of household meters were installed by end-2014. The remainder is to be installed by 2015.

There are two operational thermal energy generators in Georgia, Mtkvari Energy and G-Power. Total capacity is approximately 410 MW, with 300 MW of Mtkvari Energy and 110 MW of G–Power. G-Power units were built in 2006 with the latest technologies and an expected lifetime of 25 years. A new combined cycle thermal power plant, Gardabani, is currently under construction and will have 230 MW when built by the end of 2015.

## OIL AND NATURAL GAS

Georgia is connected by gas pipelines to Armenia, Azerbaijan, Russia and Turkey. It is also connected by an oil pipeline to Azerbaijan and Turkey. Georgia imports natural gas from Azerbaijan and Russia and it transits gas to Armenia and Turkey. Georgia imports oil from Azerbaijan and Russia and transits oil to Turkey.

The Baku-Tbilisi-Ceyhan (BTC) pipeline transports crude oil from Azerbaijan via Georgia to Turkey's Mediterranean port of Ceyhan. From there the oil is shipped to world markets via tankers. The BTC is 1 768 km long, with 443 km in Azerbaijan, 249 km in Georgia and 1 076 km in Turkey, and has been in operation since May 2005. The pipeline has ample free capacity and transports some Turkmen and Kazak oil.

The Western Route Export Pipeline (WREP) transports crude oil from offshore oil fields in the Caspian Sea (belonging to Azerbijan) to Supsa (Georgia) on the Black Sea, where it continues to European markets via tankers. It is 829 km long, with 375 km in Georgia, with a capacity of 145 000 barrels per day (bbl/day) and has been in operation since 1999.

Gas imports from Azerbaijan are via the SCP, which transports gas from the Shah Deniz field paralleling the route of the BTC crude oil pipeline from Azerbaijan through Georgia to Turkey. The SCP is 691 km in length (443 km in Azerbaijan and 250 km in Georgia), 42 inches in diameter and has a capacity of 7 bcm.

The Azerbaijan-Georgia-Romania-Hungary Interconnector (AGRI) liquefied natural gas (LNG) project stems from the four countries signing the Baku Declaration in 2010. It led to the creation of the AGRI LNG Project Company, owned by the four states. In November 2012, the feasibility study was completed. The project is expected to cost EUR 4.5 billion, with a projected capacity of 8 bcm and completion by the end of the decade (AGRI, 2014).

Other potential projects include the expansion of the SCP to allow exports from Shah Deniz II and the Trans Caspian and White Stream Gas Pipelines, all of which aim to bring gas from the Caspian Sea to European markets.

Studies on the construction of an underground gas storage facility were carried out by the government on various locations, including Samgori South Dome Reservoir, Rustavi gas-condensate field and Ninotsminda oil-gas reservoir. As a result, Samgori Southern flank has been selected by the government for underground gas storage development and GOGC has called for tenders for developing this project further in 2014.[10]

## SYSTEM RELIABILITY

System reliability in both natural gas and electricity systems is improving. According to the Ministry of Energy there have been no major outages over the past few years, thanks to the rehabilitation and refurbishment of gas and electricity networks.

**10.** www.gogc.ge/en/page/ugs-project.

Outages and losses are reported to the GNERC as part of the licence obligations. Electricity transmission network losses are around 2% and outages are rare. The collection rate is nearly 100% and there are no commercial losses. The level of technical losses in the gas sector is about 0.5% in the transmission network. Detection of losses is performed using Global System for Mobile Communications (GSM) and during regular field visits. Equipment for loss detection includes some advanced leak detection technologies and leakage metering equipment.

## EMERGENCY RESPONSE

Emergency response is defined and regulated under the Law on the State of Emergency (2005). However, there is no declared strategy on emergency stock holdings or fuel switching mechanisms for energy supply disruptions.

The government is considering holding minimal strategic gas reserves and has called for tenders for underground gas storage development in Samgori in 2014. The government estimates the minimal strategic reserve for gas at approximately 120 mcm. The imbalance between seasonal supply and consumption of gas was 150 mcm in 2014 and is projected to increase to a 170 mcm winter deficit and a 300 mcm summer surplus by 2020. The solution is to develop underground gas storage to overcome the recurring winter deficit, estimated at approximately 200 mcm by 2030.

# 4.3. MARKET CONVERGENCE

## NATIONAL MARKET STRUCTURE

### ELECTRICITY AND HEAT

The electricity sector in Georgia is partially deregulated and fully unbundled into generation, transmission and distribution companies. Most generation and distribution assets are fully privatised. HPPs provide up to 100% of generation in the summer months, while gas-fired power stations and imports meet peak consumption during winter months. Electricity generators are divided into regulated, partially regulated and deregulated. Regulated generators are HPPs with seasonal storage. Their tariffs are regulated by GNERC and are set based on the full-cost principle. The rest of the regulated HPPs operate under partially deregulated tariffs that have ceiling rates.

Small HPPs (less than or equal to 13 MW installed capacity) and HPPs that were built after August 2008 are fully deregulated and can sell their electricity production with competitive prices either to ESCO or to any other market participant. During the three winter months, all new HPPs with capacity over 13 MW have the obligation to sell electricity on the internal domestic market – either to ESCO or through bilateral contracts.

State-owned ESCO is responsible for balancing electricity not sold under direct bilateral contracts between the market participants. Its main functions are:

- purchase and sale of supplemental electricity and capacity, including medium- and long-term import-export contracts
- trade of guaranteed capacity
- operation and maintenance of the wholesale electricity trade database
- calculation of factual amount of purchased and sold electricity, and submission of information for final settlement
- wholesale meter inspections
- calculation of the volume and the price of electricity in excess of normative electricity losses on the transmission networks.

ESCO's service fee is USD 0.0001/kWh, which is approved by GNERC.

Two thermal power plants, Mtkvari Energy and G-Power, are fully privatised and owned by Inter-RAO and G-Power, respectively. The new combined cycle thermal power plant Gardabani will be state-owned, by GOGC (51%) and the Georgian Partnership Fund (49%).

Three electricity TSOs operate in Georgia: state-owned GSE; EnergoTrans, a subsidiary of GSE; and SakrusEnergo, a 50/50 joint venture between the Georgian government and the Federal Network Company of the Unified Energy System (FNC UES of Russia).

The three electricity DSOs are:

- Telasi – operates only on the territory of Tbilisi. A 75.1% share is owned by Silk Road Holdings B.V. (Inter-RAO), 24.5% is state-owned and 0.4% belongs to other shareholders.

- Energo-Pro Georgia – owned by Energo-Pro, a Czech private company. The company services around 70% of the Georgian territory.
- Kakheti Energy Distribution – operates in the Kakheti region. The company is owned by the Lithuanian company Achema Group, but is currently under bankruptcy administration.

A transparent system of third-party access to the distribution and transmission networks is in place in Georgia, both for the electricity and gas sectors. Since the implementation of free third-party access, a large number of private electricity generators has been established. More than 40 privately owned power stations (mainly hydro) operate in the country, with foreign and domestic owners.

The government is committed to facilitating the private sector-led development of Georgian hydropower resources and requires that Georgian HPPs have access to regional electricity markets. In order to increase hydropower capacity and provide rules for regional market development in line with EU competitive market principles, in January 2014 the Minister of Energy signed an agreement with USAID on the development of GEMM 2015. GEMM is intended to advance the national electricity sector's policies and increase competition in the local market as well as in the regional market. The key objective is to ensure that the potential benefits resulting from Georgia's geographic location and natural resources run directly to electricity consumers and electricity sector investors. GEMM 2015 will be put in operation in agreed stages in 2015.

## OIL, NATURAL GAS AND COAL

GOGC is the main oil and natural gas company in Georgia, in charge of oil and gas exploration, gas imports and gas transit. The company was established in 2006 by order of the Minister of Economic Development, following a merger of state-owned Georgian International Oil Corporation, Georgian International Gas Corporation and Saknavtobi (Georgian Oil). The company is managed by the Ministry of Energy.

GOGC also commissions, rehabilitates and replaces oil and gas pipelines, designs and constructs new pipelines, and builds, maintains and operates necessary required new infrastructure. GOGC represents the government in gas transit, and collects and manages transit fees from cross-border infrastructures. Oil and gas exploration are carried out by PSAs with private companies.

Oil imports, storage and transport are carried out by private business ventures.

Gas transmission, distribution and supply businesses are also legally and financially unbundled. GOGC's subsidiary, GGTC, is the gas TSO. There are many gas DSOs in Georgia, all of which are private companies. KazTransGas (owned by the state and Kazakh investors) is the largest DSO and distributes gas to Tbilisi. Gas retail is carried out by many private companies.

Coal mining in Georgia is carried out by Saqnakhshiri, a subsidiary of the private company GIG (Saqnakhshiri, 2012).

## REGULATORY FRAMEWORK

GNERC is the independent energy regulatory authority in Georgia, established in 1997. GNERC is a legal entity with the capacity to regulate the energy sector independent from the Ministry of Energy and is funded through fees paid by licensees and other energy sector players.

GNERC grants, amends and revokes licences for electricity generation, transmission, dispatch and distribution, as well as for natural gas transportation and distribution services. It regulates consumer tariffs for electricity generation, transmission, dispatch, distribution, transition, import and retail. It has authority to resolve disputes among licensees, importers, exporters, and suppliers and consumers, and monitors sanctions within the electricity and natural gas sectors according to the licence terms. It also approves procedures for billing, reporting and fee-paying services in the electricity and gas sectors. It is in power to give priority to and motivate local hydro, renewable, alternative and natural gas resources to ensure sustainable electricity generation, transmission, dispatch, distribution, import, export and supply, as well as natural gas import, transportation, distribution and, in certain cases, delivery and supply.

GNERC issues normative administrative legal acts – Resolutions. It approves operational rules and procedures, procedures for dispute resolution, regulatory fee amounts and its calculation methodology, licensing rules, supply and consumption rules, tariff methodology, tariffs and normative losses.

The exception to GNERC's regulation are small to medium-sized HPPs developed since 2008. These power plants have bilateral contracts with the government at deregulated prices, as per the State Programme on Renewable Energy 2008.

The Strengthening Capacities of the GNERC in Updating Incentive Based Electricity Tariff Methodology was launched in October 2012. The project includes the aligning of EU principles to the methods of receiving and analysing technical/financial information provided by companies in Georgia.

## Tariffs

In the electricity sector, tariffs for generation, dispatch, transmission, distribution and consumption are defined by regulatory resolutions (developed jointly by the GNERC and private stakeholders) on the basis of a published tariff methodology.

Generation tariffs differ depending on the size and ownership of the power plants as follows:

- Tariffs for all newly constructed power plants (after August 2008) and for HPPs under 13 MW are deregulated. In general, an investor is free to choose the market and the price at which to sell the power generated at the new plant. Electricity export is also deregulated. The investor needs to find a buyer and conclude a direct power purchase agreement.
- Generation tariffs for Enguri/Vardnili HPP, which is the largest HPP in Georgia, are regulated by GNERC, currently at USD 0.0007/kWh.
- Tariff caps are set for the rest of the power plants, including gas-fired.

Electricity TSO and DSO tariffs are regulated by the GNERC. The companies are entitled to submit a tariff application. GNERC introduced a new methodology for the calculation of distribution tariffs under the European Union-funded Twinning in 2013. The new methodology was used to calculate tariffs for Energo-Pro Georgia from 1 September 2014 and for Kakheti Energy Distribution from 1 January 2015. A memorandum with Telasi expires in 2025; however, the new tariffs may be determined earlier, depending on legislative changes. The new tariffs will likely increase the overall price of electricity, as they include provisions for necessary investment projects (Commersant.ge, 2014).

Gas tariffs and tariff methodologies are approved by GNERC. Tariffs for supply to the wholesale market and for consumers connected to the network after 2007 are deregulated.

Retail tariffs are also regulated and set by GNERC. According to the Energy Regulators Regional Association (ERRA),[11] average prices, including taxes, for electricity and gas paid by households in the first half of 2014 were:

- electricity: USD 0.083/kilowatt hour (kWh)
- gas: USD 7.9/gigajoule (GJ).

Prices paid by industrial customers, according to ERRA, were:

- electricity: USD 0.091/kWh
- gas: USD 13.1/GJ.

The tariff methodology for end-user prices is based on the principle of full cost recovery for production and supply. Depending on the customer category, the tariff methodology provides for seasonal, peak load, block and long-term pre-set tariffs as well as tariff caps. Electricity service costs are recovered from each category of customer in proportion to the costs of serving that category.

In the gas sector, the methodology is based on the principle of recovery of justified costs for natural gas supply, transportation and distribution, taking into account the interests of financial stability and improvement of the investment environment. Allowable costs of supply, transportation and distribution services include expenses related to gross revenue, taxes and returns.

In the electricity sector, individual meters in line with EU standards have been rolled out to 90% of households and all industrial customers. The remaining 10% to households will be rolled out by end-2015. In the gas sector, all consumers are metered, and GOGC has installed and implemented an advanced metering and monitoring system for the gas network.

Electricity collection rates are more than 95%, while gas collection rate are more than 90%.

### Feed-in tariff

Small HPPs (below 13 MW) are allowed to sell output to ESCO or directly to consumers. ESCO offers small HPPs a feed-in tariff during the winter months (September-April); however, no feed-in tariff is offered during the summer months. As such, HPPs often have difficulties selling electricity to the market due to a capacity surplus and limited export options, and close their plants (spill water) during this period.

### Technical rules

On 1 April 2009, GNERC approved the Instruction for the Monitoring of Commercial Quality Indicators of the Service by Electricity Distribution Licensee, with the aim of establishing commercial quality standards of electricity distribution. On 5 July 2012, the Commercial Quality Rules to Electricity Distribution Licensee Service were adopted, which divided services into eight categories and provided standard and binding implementation characters. In the case of non-compliance of standards by a distribution licensee, customers are allowed to receive compensation to elevate efforts protecting consumer rights. In the preparation of these regulations, GNERC took into consideration the best

**11.** www.erranet.org.

examples in international practice. Also in 2012, GNERC co-operated with USAID within the Hydropower Investment Promotion Project to harmonise regulatory frameworks with the principles of the Third Package.[12]

GOST standards are still dominant in the electricity and gas sectors and Georgia is progressively harmonising them to EU standards through the Technical Committee on Standards, created in January 2013.

## REGIONAL MARKETS AND INTERCONNECTIONS

### ELECTRICITY

Georgia is interconnected with the electricity systems of Russia, Azerbaijan, Armenia and Turkey. ESCO has the authority to trade electricity with neighbouring countries in order to balance the needs of the Georgian market. Regional agreements are made in the form of bilateral agreements and involve the signing of MoUs. The TSO ensures operations with the individual neighbouring countries and signs relevant agreements on technical issues.

As part of the development of GEMM 2015, the Ministry of Energy is committed to designing and implementing a cross-border ETM. The ETM is a basic platform that will assist in providing cross-border transmission capacity rights. The ETM will also enable neighbouring counties such as Azerbaijan to transit power through Georgia and into Turkey and further to European markets. GEMM 2015 and the development of the ETM will be carried out in phases, starting in 2015.

On 20 January 2012, an agreement on cross-border electricity trade via the Akhaltsikhe-Borcka interconnection line was signed between Georgia and Turkey. The agreement sets out trade rules in a competitive market as well as identifies the terms needed to govern the operation of interconnection facilities for electricity imports and exports on the line.

In 2009, the Azerbaijan-Georgia-Turkey Power Bridge (AGT) project was established by an MoU among the TSOs of the three countries (AzerEnergy [Azerbaijan], and GSE and TEIAS [Turkey]). The line from Azerbaijan to Georgia was completed in December 2013, while the energy bridge is expected to become operational by 2015. According to project specifications, 1 200 MW of capacity per year are expected to be exported to Turkey (Azernews, 2014).

### NATURAL GAS

Georgia is connected by pipeline to Armenia, Azerbaijan, Russia and Turkey. Georgia imports natural gas from Azerbaijan and Russia and transits gas to Turkey and Armenia. Cross-border agreements are bilateral, with suppliers in neighbouring countries. Georgia is also focused on developments in the transit of gas from the Caspian Sea to European markets, in order to diversify its imports and collect transit revenue.

**12.** Directive 2009/72 and Regulation 714/2009.

# 4.4. SUSTAINABLE DEVELOPMENT

## RENEWABLE ENERGY

The government developed the State Programme for Renewable Energy 2008, intended to boost investments in renewable energy and maximise the benefits of its vast renewable energy potential. As part of the programme, the government established the Georgian Energy Development Fund (GEDF) to facilitate investment in renewables. The core activities of the GEDF are the identification of potential HPP development sites, the development of jointly funded projects with private investors, and project investment promotion and support for investors. The fund was working on several projects at the end of 2014, including the Tsablari HPP (15 MW) and the Akhasopeli HPP (2.5 MW).

The government has also carried out an aggressive campaign aimed at attracting investment in hydropower developments. The campaign includes incentives such as tax breaks, looser administration requirements, and compulsory sales to the grid and deregulated prices for plants under 13 MW or built since 2008. The government enters into bilateral contracts with the new producers, namely ten-year power purchase agreements, at case-by-case tariffs.

Georgian legislation does not provide for feed-in tariffs for all types of renewables. Feed-in tariffs are available only for small-scale power plants with capacity under 0.1 MW.

Renewable energy potential is described above in "Resource Endowment", under section 4.2, Energy Security.

## ENERGY EFFICIENCY

The Ministry of Energy is actively assessing implications of EU energy efficiency directives in order to align its legislation to its commitments under the Energy Community Treaty, following the signature to the European Union Association Agreement. No legislation on energy efficiency exists in Georgia at present, and there is no governmental entity with a mandate to follow up implementation of energy efficiency and renewable policies.

The EBRD is expected to provide technical assistance to the Ministry of Energy with the preparation, drafting, adoption and publishing of the country's first National Energy Efficiency Action Plan (NEEAP). The NEEAP will identify energy efficiency improvement measures and expected energy savings in all sectors (e.g. buildings, transport, power generation, industry and services), taking account of the country's potential and national energy efficiency targets.

The Energy Efficiency Centre is an non-governmental organisation (NGO) that deals with energy efficiency and renewables, and is the key partner responsible for providing reliable energy statistics for Georgia to the IEA. There is also a Sustainable Development and Policy Centre (SDAP), a nongovernmental organisation involved in energy efficiency and energy audits and training.

Georgia participates in the Multi-Contributor Fund – the Eastern Europe Energy Efficiency and Environment Partnership (E5P) for Eastern Partnership countries (Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine), which aims at pooling funding for supporting energy efficiency projects. The E5P includes IFI loans and grants. Georgia joined the E5P in October 2013. The international donor community is expected to provide more than EUR 60 million to enable projects under the E5P Fund.

Recent implemented energy efficiency projects include:

- Energy Saving Initiative in the Building Sector in Eastern Europe and the Central Asian Countries during 2010-13
- Capacity Building Model for Ukraine and Georgia: Model Solution for Eastern Partnership and Central Asian Countries during 2012-14
- Energy Performance Assessment and Review of Energy Efficiency Management Systems at Joint Stock Company (JSC) SANTE GMT Milk Products during 2012
- Energy Sector Analysis (Oil and Gas Pipelines) during 2012
- The New Applied Technology Efficiency and Lighting Initiative (NATELI II), implemented by Winrock International Georgia and supported by USAID during 2011-13.

## ENVIRONMENTAL PROTECTION

With respect to energy auditing, despite many capacity-building initiatives implemented through donor-funded projects, there have been no legal requirements for energy audits, formal standards or certification procedures established until now. The New Applied Technology Efficiency and Lighting Initiative (NATELI) programme implemented in 2010 was dedicated to promoting renewable energy and energy efficiency technologies in Georgia. NATELI completed energy audits for major hospitals and residential buildings, and also developed an energy audit manual, accompanied by appropriate training. Energy efficiency measures' implementation of the assessed buildings is planned within the framework of the Sustainable Energy Action Plan of the City of Tbilisi, prepared under the Covenant of Mayors initiative.

A second National Environmental Action Plan and strategy setting out the priorities for 2009-13 has been prepared, and a new environment protection code is in preparation. The Ministry of Energy introduced new Waste Management Code, which will be entered into force from January 2015, comprising a set of new framework laws on key environmental sectors (Ministry of Energy, 2014). A draft convergence plan on water has been elaborated.

## CLIMATE CHANGE

Georgia has been a signatory to the Kyoto Protocol since 1999 and has the potential to attract investment to renewable energy and energy efficiency projects through clean development mechanisms (CDMs). Since 2003, the Ministry of Environmental Protection and Natural Resources of Georgia has been the Designated National Authority (DNA) for Kyoto Protocol purposes. According to the UNFCCC, Georgia has 11 CDM projects under consideration, 10 projects under validation and 3 registered or pending registration. To date, Georgia has had 53 138 CERs (Certified Emission Reduction credits) issued.

### LOW EMISSION STRATEGY

In 2012, the Georgian and United States governments signed an MoU on co-operation in the Low Emission Development field, aimed at developing strategies of economic priorities related to a low-carbon economy. The co-ordination committee, consisting of USAID and Georgian government representatives, was created and a work programme identifying the measures, goals and terms of a low-emission strategy was established.

Within the framework of this co-operation, USAID's five-year programme in Georgia would facilitate capacity building for the preparation of a low-emission development strategy, the Clean Energy Programme (Enhancing Capacity for Low Emission Development Strategies [EC-LEDS]). The programme will support climate change mitigation through facilitation of the production and usage of clean, renewable energy, as well as increasing energy efficiency.

Georgia has considerable potential to develop CDM projects, especially in the renewable energy and energy efficiency sectors. By leveraging investments in hydropower, waste, forestry and agricultural sectors, Georgia would have the possibility to generate tens of millions of dollars in carbon revenue over the next few years.

Energy-related $CO_2$ emissions totalled 6.8 Mt in 2012 in Georgia, which is 79.5% lower compared to 1990. The transport sector accounts for 35.7% of emissions, followed by manufacturing (19.5%), households (17.4%), power generation (16.7%), commercial and public services (8%) and other energy industries (2.8%).

Georgia is actively involved in the promotion of the Covenant of Mayors project concentrated on sustainable development by reducing $CO_2$ emissions even beyond the EU 20% target. During 2011-13, Tbilisi, Batumi, Gori, Kutaisi and Rustavi joined the Covenant of Mayors project. Creation of the branch office of the Covenant of Mayors for Azerbaijan, Georgia and Armenia is underway.

# 4.5. INVESTMENT ATTRACTION

## INVESTMENT CLIMATE

Georgia's privatisation entered a new stage in 1999. Privatisation is governed by the Law on Privatisation of State Property (1997). Amendments to this law in 1999 introduced auctions for public assets without a floor price, which greatly simplified the privatisation process. At the same time, the government developed a new privatisation strategy which focused on large-scale enterprises and included nearly all infrastructure companies. The Ministry of Economic Development is the privatisation authority responsible for privatisation and management of state property.

Georgia has undertaken a number of profound institutional reforms aimed at modernising the economy and improving the business climate. After the Law on Issuance of Licences and Permits (2005), the number of activities subject to licensing was reduced from 909 to 159. A one-stop shop was created for licence applications so that businesses can submit all documents in one place. Georgia also undertook a far-reaching reform of the labour market to curb black-market jobs and high unemployment. The new Labour Code was adopted in 2006. This law eases restrictions on the duration of term contracts and the number of overtime hours, and discards the premium required for overtime work.

To enhance Georgia's investment and business climate, the government has dramatically overhauled its tax system since 2004. By implementing a liberal reform agenda, Georgia has simplified its processes and has reduced the number of taxes from 21 in 2004 to 6 in 2014. The government adopted a new Tax Code in 2010 simplifying the taxation system. Internationally accepted methods and practices are in place, and Double Tax Agreements are fully in line with OECD standards.

For investors interested in relocating their industrial operations to Georgia, there are three tax-free zones available (Free Industrial Zone, Free Warehouse Enterprise and International Finance Company).

The banking sector remains relatively stable, though it went through a challenging phase during the 2008 armed conflict and the global financial crisis. The sector is open to foreign banks and several are operating in Georgia.

According to the law on promotion and guarantees of investment-related activities, any dispute arising out of, or in connection with, investment activity between the Georgian government and a foreign investor shall be resolved by the courts of Georgia, unless otherwise agreed between the parties. However, the most commonly favoured tribunal is the International Centre of Settlement of Investment Disputes, the decisions of which are final and legally binding on the parties, and are easily enforceable through the 1958 New York Convention on Recognition and Enforcement of Foreign Arbitral Awards, which Georgia joined on 2 June 1994.

According to the World Bank's "ease of doing business" indicator, Georgia was ranked 15th among 189 countries in 2014, higher than other EECCA countries. A high ranking on the ease of doing business index means the regulatory environment is more conducive to the starting and operation of a local firm. This index averages the country's rankings on ten topics, made up of a variety of indicators, giving equal weight to each topic. Georgia has the highest ranking among EECCA countries.

According to the Corruption Perceptions Index (CPI) prepared by Transparency International, which measures the level of perceived corruption in the public system, Georgia ranked 52nd among 175 countries in 2014, with a score of 50. This is the highest score among EECCA countries (a score of 100 represents no corruption). Georgia has seen a drastic fall in perceived corruption of tax officials over the past decade. The country acceded to the UN Convention against Corruption on 4 November 2008, but is not yet a signatory. It has not signed the OECD Anti-Bribery convention.

As a member to the 1994 Energy Charter Treaty, the arbitration procedures for energy-related investments, trade and transit apply.

## INVESTMENT FRAMEWORK

The cornerstone of the legislative framework is the Law on Investment Promotion and Guarantees (1996). Promoting investment is considered to be a primary goal of the state economic policy. Georgian legislation provides for the protection of investors and their assets through domestic regulations, as well as through a number of bilateral investment agreements and international treaties.

Georgia has one of the most liberal labour codes in the world. According to the Heritage Foundation, Georgia's ranking on the Labour Freedom Index was 99.9.

The legal framework has been strengthened with a new Law on Public Procurement (2006) and the Law on Conflict of Interest and Corruption (2007). Accountability mechanisms, such as the Chamber of Control and the Ombudsman, also help promote transparency and integrity in public service.

Total foreign direct investments in Georgia's energy sector amounted to USD 923 million in 2014.[13] Investment has increased compared to USD 658 million in 2006; however, it is lower compared to USD 1.5 billion on average during 2006-08.

In the electricity sector, regional projects of strategic interest are those that are already being implemented or considered, such as the 500 kV/400 kV connection line to Turkey and the 400 kV Electricity Transmission Line project between Georgia and Armenia. The Black Sea Energy Transmission System was completed in 2013 at the cost of EUR 159 million with loans from the EBRD, the EIB and the KFW.[14]

To attract investment to the renewable energy sector, the government has carried out an aggressive investment campaign both locally and internationally. The campaign was developed to increase awareness of the sector through road shows. The following incentives were offered to potential investors under the campaign:

- deregulated tariffs without caps
- the possibility to sell carbon credits
- HPPs of up to 13 MW have the exceptional right to sell electricity to any retail customers

**13.** http://geostat.ge/index.php?action=page&p_id=140&lang=eng.

**14.** http://energotrans.com.ge/?p=458&lang=en.

- deregulated electricity export
- guaranteed purchase of electricity for three winter months
- free third-party access to the grid.

Some 17 HPPs (630 MW of capacity) were under construction at the end of 2014.

Gas sector projects of strategic interest for Georgia involve Caspian gas transportation projects, transiting through Georgia, including projects of common interest aimed at developing integrated EU energy markets and the construction of underground gas storage in Samgori. Developments for expansion of the SCP are underway to allow an additional 16 bcm/y of gas transportation from Shah Deniz 2.

## INVESTMENT PLANNING

Provisions of the charter of the Georgian National Investment Agency (GNIA) involve principles of the strategy for attracting foreign direct investments to Georgia. The strategy itself is to be developed in co-ordination with other governmental bodies.

# References


AGRI (Azerbaijan–Georgia–Romania Interconnector) (2014), website, www.agrilng.com (accessed 14 December 2014).

Azernews (2014), "Azerbaijan-Georgia-Turkey Energy Bridge to strengthen energy security: Minister", press release, 4 June, www.azernews.az/business/67704.html.

BGR (German Federal Institute for Geosciences and Natural Resources) (2013), *Energy Resources 2013, Reserves, Resources, Availability, Tables*, BGR, Hannover, Germany.

Caucasian Business Week (2014), "Georgia to develop energy market new model by the end of the year", Caucasian Business Week, 25 November, http://cbw.ge.

Commersant.ge (2014), "Premier Garibashvili pledges no electricity price hikes", Commersant.ge, 16 July, http://commersant.ge.

Delphia, J. et al. (2012), *Georgian Electricity Market Model 2015 and Electricity Trading Mechanisms (Draft),* USAID Hydropower Investment Promotion Project, April, UNAID.

IEA (International Energy Agency) (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

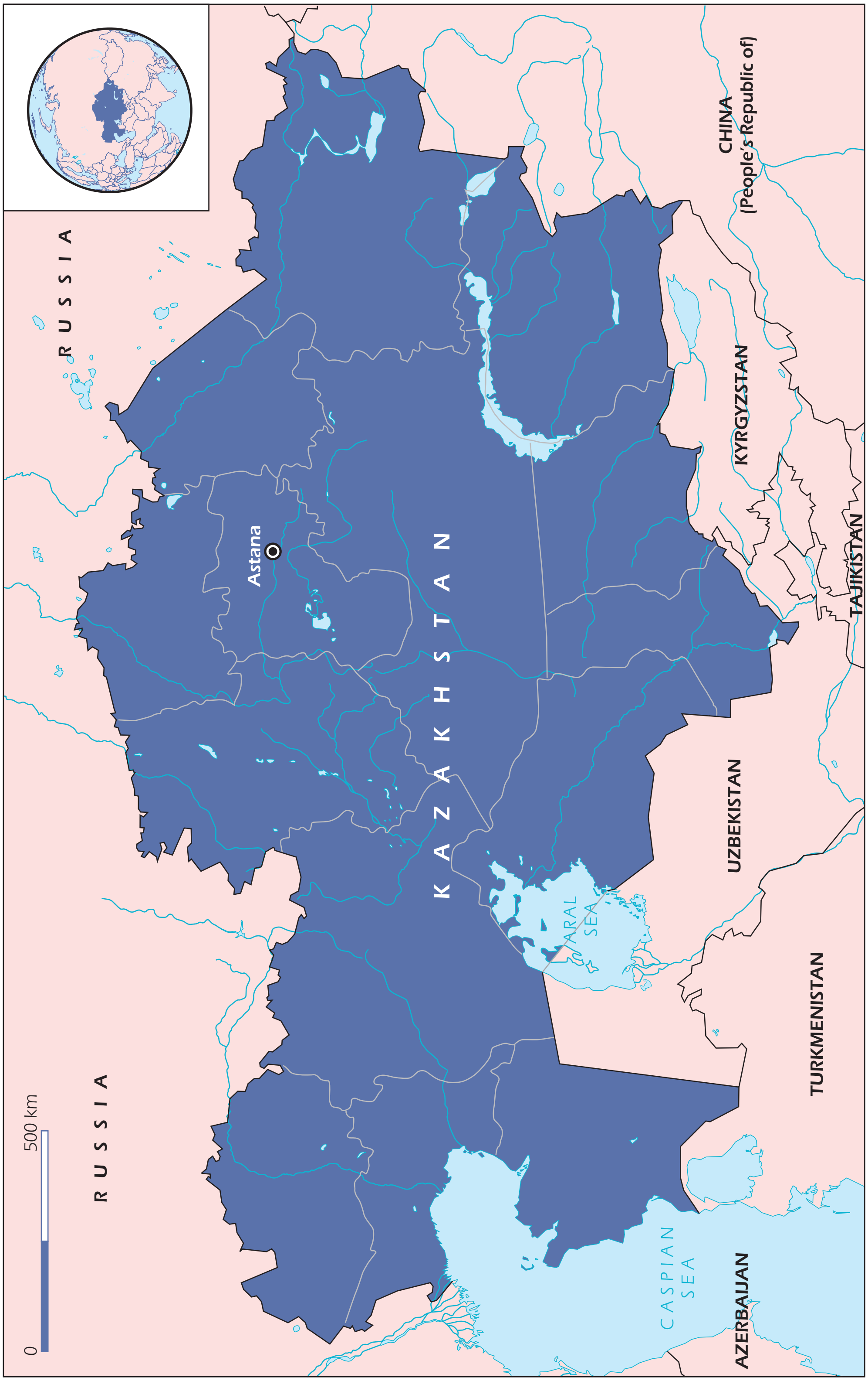
Ministry of Energy (2014), "In 2015 polyethylene bags will be replaced with biodegradable bags", press release, 27 December, Government of Georgia, http://moe.gov.ge.

Saqnakhshiri (2012), *Corporate Overview: 2012 Year*, Saqnakhshiri (GIG Group) Ltd, Tbilisi.

World Bank (2015), *Georgia Overview*, World Bank website, www.worldbank.org/en/country/georgia/overview (accessed 15 January 2015).

# KAZAKHSTAN

**Figure 5.1.1** Map of Kazakhstan




This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries, and to the name of any territory, city or area.

# 5.1. GENERAL ENERGY POLICY

**Key data (2012)**

**Energy production:** 164.6 Mtoe (oil 50.2%, coal 32%, natural gas 17.3%, hydro 0.4%), +80.4% since 2002

**TPES:** 74.9 Mtoe (coal 50.6%, natural gas 31.1%, oil 17.2%, hydro 0.9%, biofuels 0.1%), +88.4% since 2002

**TFC:** 41.7 Mtoe (coal 39.1%, oil 23.3%, heat 16%, electricity 14.3%, natural gas 7.2%, biofuels 0.1%), +105.3% since 2002

**TFC per sector:** industry 55.3%, residential 16.7%, commercial and public services 13.9%, transport 12.6%,

**Electricity generation:** 91.2 TWh (coal 76.1%, natural gas 14.7%, hydro 8.4%, oil 0.8%), +56.3% since 2002

**Heat generation:** 418.1 PJ (coal 98.9%, oil 1.1%), +28.8% since 2002

**Energy intensity:** 0.23 toe per USD 1 000 GDP PPP, -6.1% since 2002

## COUNTRY OVERVIEW

The Republic of Kazakhstan (Kazakhstan) lies in the north of Central Asia and is bordered by the Russian Federation (Russia) to the north, China to the east, Kyrgyzstan and Uzbekistan to the south, and the Caspian Sea and Turkmenistan to the west. Kazakhstan's land area is 2 717 300 km$^2$ with almost 1 894 km of coastline on the Caspian Sea. The capital is Astana and the country is home to 17.2 million people.[1]

Kazakhstan is among the world's top ten fastest-growing economies, according to the International Monetary Fund. The country has experienced strong growth over the past two decades, mainly through resource development and export-orientated policies. Real gross domestic product (GDP), measured in US dollars (USD) with purchasing power parity (PPP) has increased at an average annual rate of 10% per year from 2002 to reach USD 321.9 billion in 2012. GDP growth was 5% in 2012 and 6% in 2013, based on strong domestic demand and increased private investment, while the government contribution was negligible. Exports decreased in 2013 due to a weaker export demand for oil, metals and wheat, while imports were up (World Bank, 2014a).

With the global economic downturn from 2008, Kazakhstan's GDP growth slowed and a sharp fall in oil and commodity prices pushed the country into recession. Since then, rising commodity prices and the expansion of the oil industry have boosted the economy, though the country remains vulnerable to commodity price fluctuations. Most non-resource sectors of the economy, however, continue to suffer from low productivity and competitiveness (World Bank, 2014b).

**1.** www.stat.gov.kz.

Kazakhstan is endowed with significant oil, gas and coal resources and is a major energy producer in Central Asia. It produced 83.1 million tonnes (Mt) of crude oil in 2013. About half of the production is from two giant fields: Tengiz and Karachaganak. The Kashagan field is set to play a major role in Kazakhstan's oil production in the coming years. Natural gas production is lagging due to lack of domestic gas networks linking the western producing region with the eastern consuming region, as well as the lack of export pipeline infrastructure. However, over the last decade, increasing natural gas production has both boosted oil recovery, as a significant volume of natural gas is re-injected into oil reservoirs, and decreased Kazakhstan's reliance on gas imports.

Kazakhstan is a Caspian Sea littoral state, but the legal status of the Caspian area remains unresolved. Its lack of access to a seaport makes the country dependent mainly on pipelines to transport its hydrocarbons to world markets. It is also a transit country for pipeline exports from Turkmenistan and Uzbekistan.

The vast majority of power generation is from coal-fired power plants, concentrated in the north near the coal producing regions. Renewables have started to make a small contribution to the electricity generation mix.

Announced in December 2012, the Kazakhstan 2050 Strategy calls for widespread economic, social and political reforms to position the country among the top 30 global economies by 2050. Its three key goals are: to define new markets and sources of economic growth; to create a favourable investment climate; and to develop effective private sector and public-private partnerships. The Ministry of National Economy was launched in early 2013 to promote social and economic development.

The government has made steps towards developing a targeted energy policy in the past couple of years. The Concept for Transition of Kazakhstan to Green Economy (Green Economy Concept) was approved in May 2013.[2] Under the concept, the government plans to maximise hydrocarbon resource management while observing ecological standards. The overall goal is to increase the use of renewable and alternative energy and to reduce the energy intensity of the economy. In December 2014 the government approved the Concept of Gas Sector Development to 2030.[3] This concept defines the progressive reform and integrated development of the gas sector in Kazakhstan for the period up to the year 2030.

Kazakhstan's environmental concerns are mounting, largely related to past nuclear, military, industrial and other activities as well as water scarcity (World Bank, 2014b). Some of these problems are common across Central Asia. Kazakhstan pioneered a multilateral, cross-sectoral and voluntary Green Bridge Partnership Programme in 2010.[4] The programme was set up to foster technology transfers, knowledge sharing and investment support in green initiatives across Central Asia and beyond. In Central Asia, the programme is concentrated on issues related to energy and water linkages. The Kazakh government approved a comprehensive Water Management Programme in December 2013, with measures and implementation mechanisms for a sustainable water consumption strategy.

**2.** Presidential Decree No. 577, 30 May 2013.

**3.** Decree No. 1275, 5 December 2014.

**4.** The Green Bridge Partnership Programme is a result of two major ministerial processes that determine the trends for environment and development in the Asia-Pacific region (the Sixth Ministerial Conference on Environment and Development in Asia and the Pacific, held in Astana in 2010), and in Europe (at the time of the Seventh Ministerial Conference "Environment for Europe", held in Astana in 2011).

Kazakhstan has strong bilateral ties with the European Union. In 2006, the European Union and Kazakhstan signed a Memorandum of Understanding (MoU) on Co-operation in the Field of Energy. In January 2015, the European Union and Kazakhstan initialled an Enhanced Partnership and Cooperation Agreement that will strengthen political and economic ties between the two. Once signed and implemented, the Agreement will lead to an increase in trade and investment flows (EEAS, 2015). Regional energy co-operation between Kazakhstan and the European Union also takes place in the framework of the Baku Initiative, which provides for political dialogue between the European Union and the littoral states of the Black and Caspian seas and their neighbouring countries.

Kazakhstan signed a Customs Union Agreement with Russia and Belarus in January 2010. The agreement evolved into the Russia-Belarus-Kazakhstan common economic space (CES) in 2012, run by the Eurasian Economic Commission (EEC) that Kazakhstan is also party to. The CES removes barriers to free movement of goods, services, capital and labour among its members. Kazakhstan is a member of the Eurasian Economic Union (EEU), operational since January 2015, along with Russia, Belarus and Armenia. Kyrgyzstan is expected to join the EEU in May 2015. Kazakhstan is also pursuing accession to the World Trade Organization. Negotiations on trade agreements and conditions with the European Union are ongoing (World Bank, 2014b).

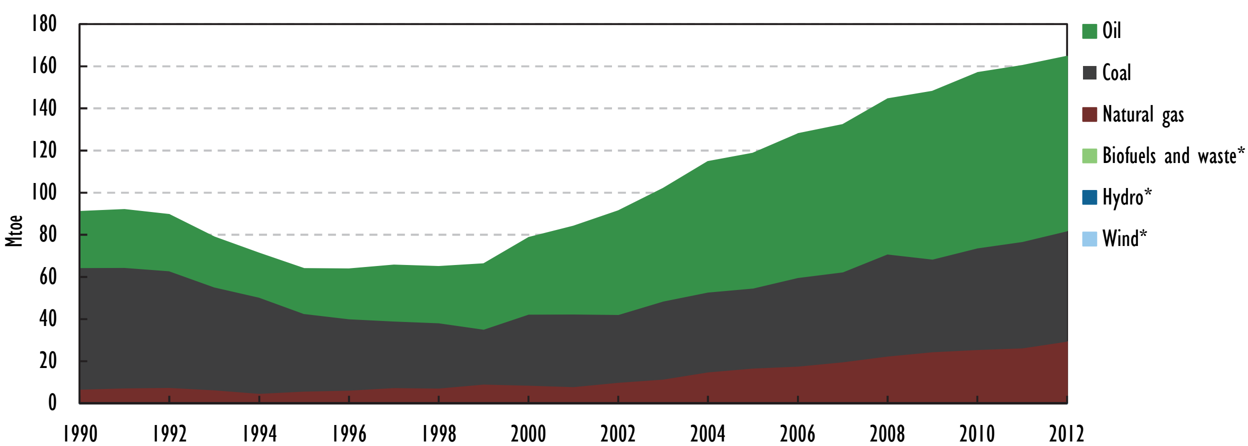
## KEY ENERGY DATA

### SUPPLY

Kazakhstan is rich in fossil fuel resources and is one of the largest energy producers in Central Asia. The country is ranked 8th highest with regard to crude oil resources and 12th highest with regard to crude oil reserves (BGR, 2013). Natural gas reserves are 18th highest in the world.

Total energy production in 2012 was 164.4 million tonnes of oil-equivalent (Mtoe), an increase of 80.4% since 2002, and it has been on the rise over the last 15 years (Figure 5.1.2).

**Figure 5.1.2** Energy production by source, Kazakhstan, 1990-2012




* Negligible.

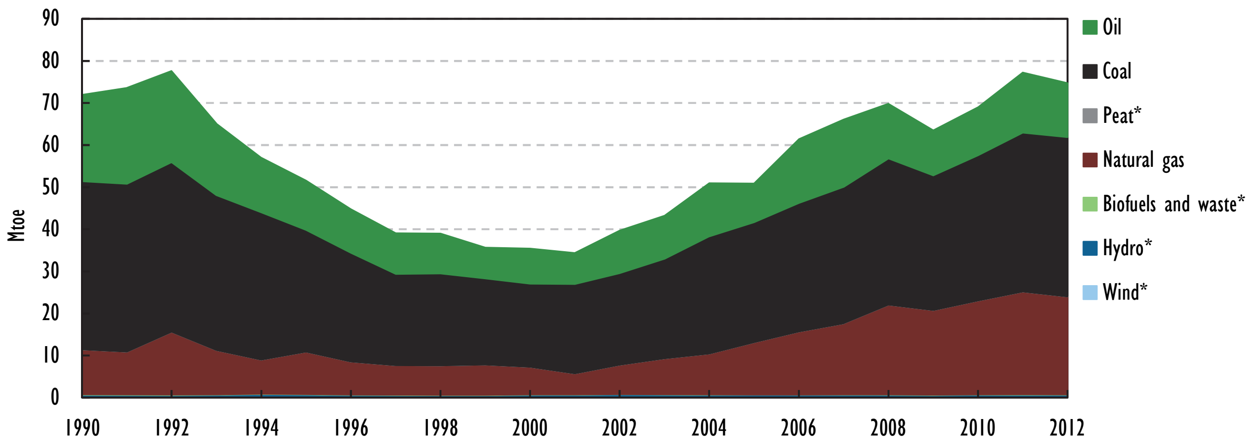
Source: IEA (2014a), *Energy Balances of Non-OECD Countries*, OECD/IEA.

Oil is Kazakhstan's most significant fuel, accounting for almost half of energy produced, at 82.6 Mtoe in 2012. In 2013, crude oil production was 83.1 Mtoe. Crude oil production increased about 74% since 2002 as investment in infrastructure enabled more drilling and transport was improved.

Similarly, natural gas production has tripled from about 10.7 billion cubic metres (bcm) in 2002 to 33 bcm in 2013. The share of total production was 17.3% in 2012. While coal production has increased 62% over the decade to 2012, its share of total energy production at about 32% has contracted slightly. Renewable energy sources – hydro and biofuels – contribute less than 1% of energy production.

Total primary energy supply (TPES)[5] was 74.9 Mtoe in 2012, about half the energy produced, while the rest was exported. Fuel shares in TPES are: coal 50.6%; natural gas 31.1%; oil about 17.2%; and less than 1% renewables. TPES rose by 88.4% over the decade to 2012, growing at a slightly faster rate than energy production (Figure 5.1.3).

**Figure 5.1.3** TPES, Kazakhstan, 1990-2012




* Negligible.

Source: IEA (2014a), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## ELECTRICITY GENERATION

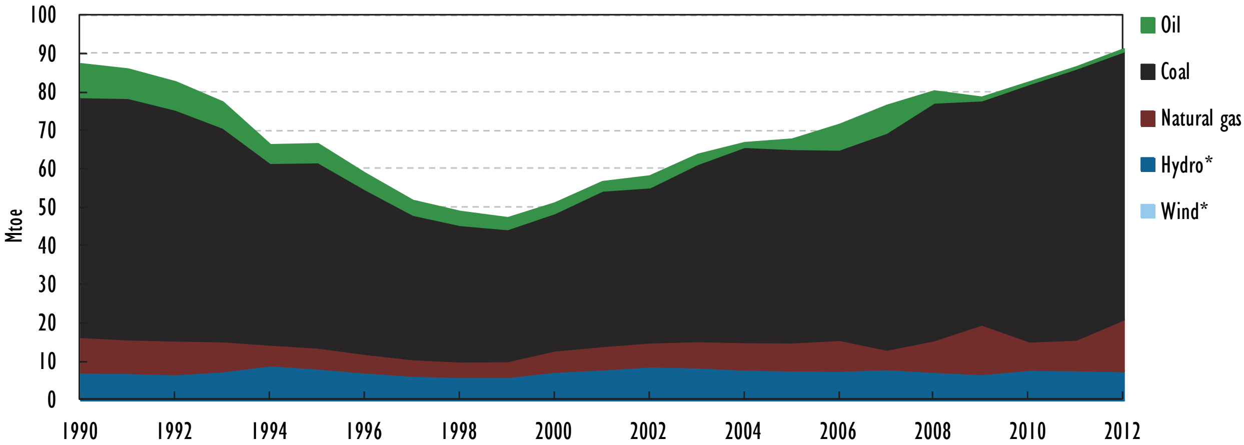
Electricity generation was 91.2 terawatt hours (TWh) in 2012, 5.3% higher than the previous year and up more than 56% since 2002 (Figure 5.1.4). Electricity supply has been on an upward trend since 2000, contracting by 2% only in 2009 during the economic recession.

Coal is the main fuel for power generation, as it is readily available and economical. Coal use accounted for about 69% of power generation in 2002 and 76% in 2012. Other sources in the power generation mix in 2012 were 14.7% from natural gas, 8.4% from hydro and 0.8% from oil. Natural gas has significantly increased its share in electricity generation from about 11% in 2002, hydropower production is variable and wind power entered the mix in 2012 with 3 gigawatt hours (GWh) output.

Heat generation was 418 petajoules (PJ) in 2012, an increase of almost 26% since 2002. Coal accounts for more than 98% of heat production and oil for 1%. This is a change from the mid-1990s when heat production was about equally split between coal and oil.

**5.** TPES is made up of production + imports - exports - international marine bunkers - international aviation bunkers ± stock changes. This equals the total supply of energy that is consumed domestically, either in transformation (for example, refining) or in final use.

**Figure 5.1.4** Electricity generation by source, Kazakhstan, 1990-2012




* Negligible.

Source: IEA (2014a), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## IMPORT AND EXPORT

Kazakhstan is a net energy exporter. In 2012, it exported 101.2 Mtoe of coal, natural gas, crude oil, oil products and electricity. Crude oil accounted for 70.3% of total net exports in 2012 at 71.2 Mtoe, while the country imported 6 Mtoe. Net crude oil exports have increased substantially since 2002, in line with growing crude oil production. In 2012, crude oil was mainly exported to Italy, China, the Netherlands, France and Austria.

Coal net exports were 13.6 Mtoe in 2012 (303.2 Mt), around 14% of total net exports and up from about 240 Mt in 2002. Coal is exported to Russia, the United Kingdom, Finland, Ukraine, Kyrgyzstan and Greece.[6]

Natural gas net exports were 10.2 bcm in 2013, which is a similar level compared to 2002. Kazakhstan also imported 4.3 bcm of gas in 2013. Gas imports have fallen over the past ten years (46.8% reduction in imports in 2002-12) due to growing production. Gas is exported to Russia and Ukraine and imported from Uzbekistan and Turkmenistan in the southern region of Kazakhstan, mainly for transit to China.

Oil product net exports were 3.8 Mtoe in 2013, up from 0.7 Mtoe in 2002, whereas before 2001 it was a net importer of oil products. Kazakhstan has increased production of oil products, leading to an increase in exports and a decrease in imports.

Kazakhstan is a net importer of electricity, though at negligible levels (113 GWh in 2012, about 0.1% of generation). It has interconnections with Russia and the Central Asian Power Grid.

## DEMAND

Demand for energy has more than doubled over the past decade. Total final consumption (TFC)[7] was 41.7 Mtoe in 2012. TFC had contracted by 2.7% compared to the year prior; however, it was 105.3% higher compared to 2002 (Figure 5.1.5).

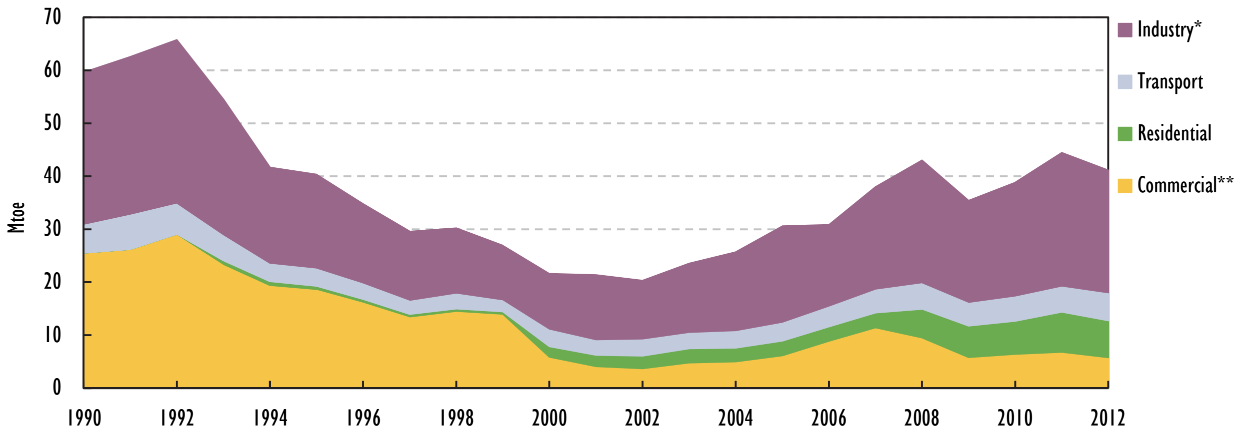
**6.** Customs Control Committee, Ministry of Finance of Kazakhstan.

**7.** TFC is the final consumption by end users, i.e. in the form of electricity, heat, gas, oil products, etc. TFC excludes fuels used in electricity and heat generation and other energy industries (transformations) such as refining.

Industry is the largest consuming sector, representing 55.3% of TFC in 2012, up about 110% since 2002. Next is the residential sector, accounting for 16.7% of TFC in 2012, up from 11.7% in 2002 and showing the strongest sector growth over the decade. The commercial/public service sectors and transport accounted for 13.9% and 12.6%% of TFC in 2012, respectively, with strong growth since 2002 levels but at a slower rate than the industry and residential sectors.

Coal and oil products are the most widely used fuels and together account for 62.4% of TFC. Coal, 39.1% of TFC, is mainly consumed in industry. Oil is used in all sectors. Natural gas and biofuels contribute to TFC, but the majority of natural gas is used in the power generation and transformation sectors.

**Figure 5.1.5** TFC by sector, Kazakhstan, 1990-2012




* *Industry* includes non-energy use.

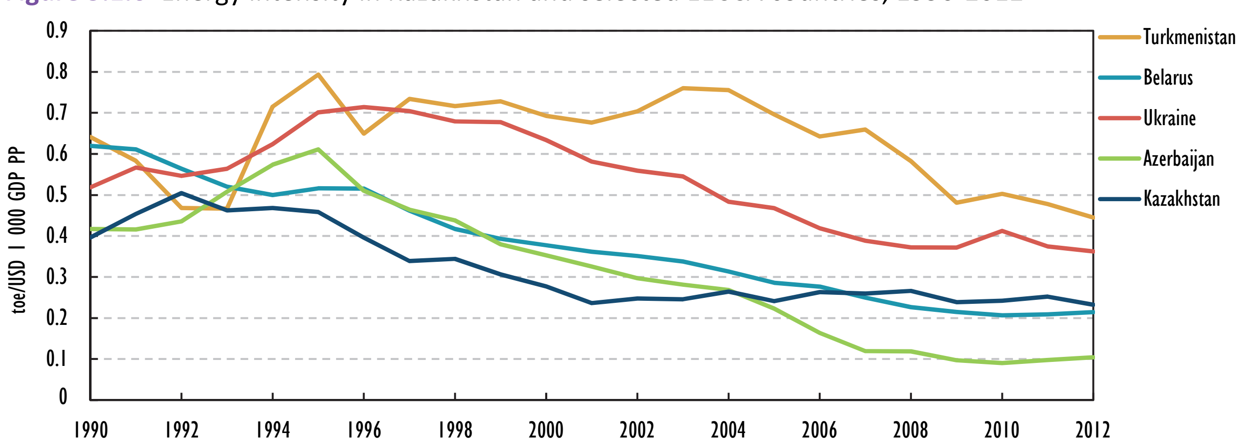
** *Commercial* includes commercial and public services, agriculture, fishing and forestry.

Source: IEA (2014a), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## ENERGY INTENSITY

Kazakhstan's energy intensity, measured as the ratio of TPES to real GDP, was 0.23 tonnes of oil equivalent (toe) per USD 1 000 GDP PPP in 2012 (Figure 5.1.6). This is a medium level of intensity compared with other EECCA countries. Since 2002, energy intensity in Kazakhstan has improved by 6.1%, which is the lowest rate of decline among the partner countries. While Kazakhstan had an increase of 100% in real GDP (USD PPP at 2005 prices) in the ten years, the increase in TPES was more than 80%, more than in other countries in the region.

**Figure 5.1.6** Energy intensity in Kazakhstan and selected EECCA countries, 1990-2012

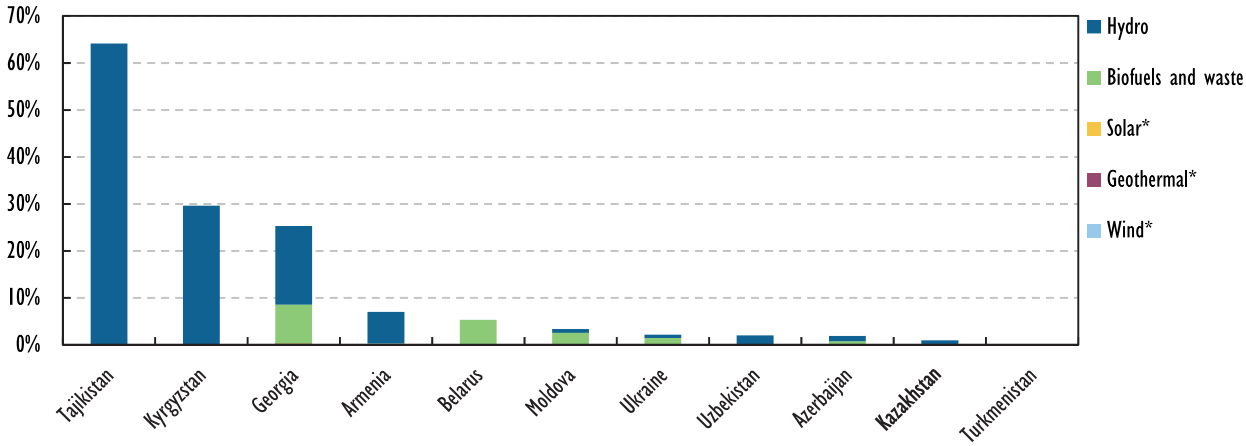



Source: IEA (2014a), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## RENEWABLES

Renewable energy, mostly hydro and biofuels, contributes about 1% of total energy supply in Kazakhstan, down from a 2% share in 2002 since fossil fuel production boomed over the decade. Hydropower accounted for 8.4% of electricity generation in 2012 and 0.8% of TPES. Biofuels, at 0.1% of TPES, are mainly consumed in the residential and commercial sectors. Wind power is just entering the energy mix. Kazakhstan has the second-lowest share of renewables among EECCA countries, behind Turkmenistan (Figure 5.1.7).

**Figure 5.1.7** Renewable energy as a percentage of TPES in Kazakhstan and other EECCA countries, 2012




* Negligible.

Source: IEA (2014a), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## ENERGY STATISTICS

The figures in this report are official energy statistics and balances of the International Energy Agency (IEA) for Kazakhstan and other EECCA countries, based on IEA methodology.

The Committee on Statistics at the Ministry of National Economy was founded in 1998. In 2010, the Law on State Statistics expanded on the committee's responsibilities. The committee develops the methodology on statistics and collects, analyses and publishes the data.[8]

The Committee on Statistics works according to Strategic Plans developed by the government, with the current plan active for 2014-18.[9] The Strategic Plan includes measures to improve data quality with three main objectives:

- to provide qualitative indicators for all sectors of the economy
- to develop and launch an e-Statistics integrated information system
- to improve statistics dissemination and quality.

The Committee on Statistics is also implementing a number of other projects around the improvement of country statistics. The KAZSTAT 2012-16 project with the World Bank has been operational since 2012 and its focus is the overall enhancement of national statistics. The Joint Work Plan with international partners such as the Federal Statistical Office of Germany (Destatis) has been operational since 2013. The Joint Work Plan

**8.** www.eng.stat.kz.

**9.** Governmental Decree No. 1540, 31 December 2013.

provides consultancy services, training, standardisation and unification of methodologies, questionnaires and processes to develop statistical indicators, in accordance with international standards and best practice.[10]

Kazakhstan submits five joint IEA/EUROSTAT/UNECE annual energy questionnaires. However, it is not yet clear when the Committee on Statistics will move to the International Energy Agency (IEA) energy balance methodology. Kazakhstan's data reporting obligations under the EEU may hinder swift transition to the internationally acceptable energy balance format.

## ENERGY SECTOR DESIGN

### MARKET STRUCTURE

#### Electricity

Kazakhstan is the most advanced country in Central Asia in terms of power sector reforms. Privatisation began in 1996 and all large power plants have been either privatised or transferred to investors under concessionary agreements. Kazakhstan's electricity sector is legally and financially unbundled.

State-owned Samruk-Energy is one of the largest energy companies in Kazakhstan. Samruk-Energy operates in power generation, transmission and distribution and coal mining, as well as in the rehabilitation, expansion and construction of power facilities. Samruk-Energy is managed by the Sovereign Wealth Fund Samruk-Kazyna.

The transmission system remains state-owned under the Kazakhstan Electricity Grid Operating Company (KEGOC). KEGOC is the state-wide transmission system operator (TSO), and the largely privatised distribution sector is run by 21 regional electricity distribution companies (REKs).

The unified power system (UPS) of Kazakhstan operates in parallel with Russia's power system and the Central Asia Power Grid. Kazakhstan's UPS is conditionally divided into three zones:

- Northern Zone (Akmola, Aktobe, Kostanay, Pavlodar, North Kazakhstan, East Kazakhstan, Karaganda regions)
- Southern Zone (Almaty, Zhambyl, Kyzylorda, south Kazakhstan regions)
- Western Zone (Atyrau, west Kazakhstan, Mangystau regions).

There is a two-tier electricity market: wholesale and retail. The wholesale market is primarily made up of bilateral contracts (88%) with the remainder traded on short-term, medium-term and long-term spot transactions (World Bank, 2014a). The wholesale market also has balancing mechanism.

Daily schedules of wholesale market activity are prepared and the dispatch of day-ahead load management is performed according to this schedule. Distribution system operators (DSOs) work with the regional control centres for dispatch to retail customers. Kazakhstan Operator of the Electricity Market (KOREM) administers the day-ahead market, develops preliminary dispatch schedules and implements supply/demand balances.

The retail market is competitive and has approximately 45 operators.

**10.** http://adilet.zan.kz/rus/docs/P1300001540.

The government is currently developing a new capacity market model, to be introduced in 2016. The market will stimulate new investment through an auction-based market mechanism.

### Oil and natural gas

State-owned KazMunayGa (KMG) is an integrated oil and gas company involved in oil and gas exploration, production, refining, transportation, distribution and servicing. The company also establishes management systems for subsoil.

Tengizchevroil (TCO) is a joint venture between Chevron (50%), ExxonMobil (25%), KazMunayGas (20%) and LukArco (5%). TCO was created to develop the super-giant Tengiz oilfield in the Atyrau region and is Kazakhstan's largest producer and marketer of oil and gas.

KazTransGas, KazMunayGaz's affiliate, is a vertically integrated TSO/DSO holding company. Its subsidiary, Intergas Central Asia, is the TSO. Kazakhstan has 14 regions and 9 are connected to the gas network (serving about 57% of the population). KazTransGas Aimak (another subsidiary of KazTransGas) is the DSO in six of these regions. In other regions, a variety of companies act as DSOs, some of which have been privatised while others remain state-owned.

The state-owned atomic company KazAtomProm is the national operator for the trade of uranium, rare metals, nuclear fuel for nuclear power plants, special equipment, technologies and dual-purpose materials. KazAtomProm is one of the world's leading uranium mining companies.

### Coal

Samruk-Energy is the largest producer and trader of coal in Kazakhstan and accounts for around 37% of total gross production volumes. Bogatyr Access Komir accounts for 35% of Kazakhstan's coal output. The company is a subsidiary of Access Industries Incorporated (a US company). Bogatyr Access Komir develops northern Kazakhstan's Bogatyr and Severny coal fields and is Kazakhstan's largest exporter to Russia. Russian firms are also stakeholders in Kazakhstan's coal industry.

## INSTITUTIONAL FRAMEWORK

**The Ministry of Energy** was established In August 2014 as the lead ministry for energy policy and governance. The Ministry was created following a merger of functions of the former Ministry of Oil and Gas, the Ministry of Industry and New Technologies and the Ministry of Environmental Protection and Water Resources.

**The Committee for Regulation of Natural Monopolies and Protection of Competition (CRNMPC)** at the Ministry of National Economy, the regulator, is responsible for tariff setting and competition matters and its board is appointed by the prime minister. CRNMPC is financed from the state budget.

**The Committee on Statistics** at the Ministry of National Economy is responsible for statistics methodology, data gathering, processing and dissemination, and implementing relevant policy measures. The committee is responsible for developing the national energy balance in close co-operation with relevant ministries.

**The Sovereign Wealth Fund Samruk-Kazyna**[11] is a state-run holding company for the management of Kazakhstan's state assets. Samruk-Kazyna was established by a merger of two joint-stock companies, Kazyna Sustainable Development Fund and Kazakhstan Holding for the Management of State Assets Samruk.[12] The fund is a shareholder of almost all national development institutes and national companies. It incorporates all investment and innovative development institutions (the Bank for Development of Kazakhstan, the Investment Fund of Kazakhstan, the National Innovation Fund, the Damu Fund and KazInvest, among others). It also holds interests in the major banks (BTA Bank, Alliance Bank, Temirbank) and the national companies KazMunayGas, KEGOC, Samruk Energy, KOREM, KazAtomProm, the National Mining Company Tau-Ken Samruk, the National Company Kazakhstan Engineering, the Kazakh Research Institute of Energy (named after the academic Chokin) and others.

**The National Fund** is a state-run fund that comprises financial assets accumulated in Kazakhstan's government account with the National Bank of Kazakhstan. The National Fund accumulates the major part of oil revenues. The fund was one of the first to be established in the post-Soviet period.[13] It was set up to work towards stable social and economic growth; financial resource accumulation for future generations; reduced exposure to adverse external impacts; and decreased exposure of the economy to volatile commodity prices.

## LEGAL FRAMEWORK

Key legal acts governing the power sector are a presidential decree in 1995 establishing the current structure of the electricity market, and the Programme of Privatisation and Restructuring of the Power Sector in 1996.[14]

The Law on Gas and Gas Supply was developed to reflect international practices in gas exploration and supply. The law came into force in January 2012. It sets national objectives to expand gas supply and attract investment for the development of the necessary infrastructure.

The Law on Electricity was developed in 2009 and amended in 2011 and 2012. It defines: responsibilities of the regulatory authority; separation of wholesale and retail electricity markets and their operations; consumer choice of supplier; and non-interference into activities of generation, transmission and distribution.

Kazakhstan has well-elaborated legislation in the field of renewable energy and energy efficiency. In 2013, the Law on Supporting the Use of Renewable Energy Sources was approved, including feed-in tariffs for wind and solar energy which came into force in 2014. In the previous year, the government approved the Law on Energy Saving and Energy Efficiency, providing a comprehensive legal, regulatory, and institutional framework for energy efficiency measures.

The Law on Subsoil Resources and Subsoil Use (2010) defines the rules for subsoil use and operations. The legislation is intended to stimulate subsoil users to search for local suppliers and contractors. It also prohibits gas flaring unless the Ministry of Oil and Gas grants a permit. Gas flaring restrictions and regulation are also defined in the Law on Gas and Gas Supply.

**11.** http://sk.kz.

**12.** Decree of the President No. 669, 13 October 2008.

**13.** Decree of the President No. 402, 23 August 2000.

**14.** Government Resolution No. 663.

Secondary legislation includes: the Concept of Further Development of Market Relations in the Power Sector (2004); Rules of Organising and Operation of the Wholesale Power Market (2004); Rules for Providing Services by the System Operator and the Organisation and Functioning of the Ancillary Services Market (2004); and the Rules for the Organisation and Functions of the Centralised Trading of Electric Energy.

Amendments to the acts on subsoil use were introduced in December 2014, initiated in support of the implementation of the Concept on Gas Sector Development to 2030, including rules and regulations on partnership agreements with investors in the gas sector.[15] Prior to this, the government introduced amendments to the legislative acts on subsoil use permit systems,[16] which were adopted on 16 May 2014.

## KEY POLICIES

The government launched the Kazakhstan 2050 Strategy in 2012, which defines the course for long-term economic development. In May 2013, the Green Economy Concept was adopted, setting an ambitious target of reaching 50% of alternative and renewable energy in the energy mix by 2050. The government plans to achieve this by phasing out ageing infrastructure, increasing the use of alternative fuels (such as natural gas, nuclear and renewables), installing efficient energy technologies and complying with high ecological standards.

The Kazakhstan 2050 Strategy includes social, economic and political reforms with the aim of placing Kazakhstan in the top 30 global economies by 2050. Economic growth is to be achieved through reaching new export markets, improving the investment climate and further developing the private sector as well as public-private partnerships. The Ministry of National Economy was launched in early 2013 to promote social and economic development (Kazakhstan Embassy, 2014).

Under the Green Economy Concept the government plans to optimise hydrocarbon exploration while observing ecological standards. The concept sets a target of 50% of Kazakhstan's energy consumption to come from alternative and renewable sources by 2050. Other targets include:

- generating 50% of power from renewable sources by 2050
- reducing energy intensity (per unit of GDP) by 10% by 2015 and by 25% by 2020, from 2008 levels
- resolving drinking water supply restrictions by 2020 and agricultural water supply by 2040
- increasing agricultural land productivity by a factor of 1.5 by 2020.

Under the Green Economy Concept, the government estimates that the transition to a green economy will boost GDP by 3%, add more than 500 000 jobs, develop new industries and raise living standards. Overall investment required for the transition is estimated at about 1% of GDP per year (USD 3-4 billion).

The Ministry of Energy inaugurated the Green Academy in mid-2013 to elaborate developments under the Green Economy Concept and related strategic approaches. Feed-in tariffs for wind and solar energy were introduced in June 2014, under a new Law

**15.** http://cis-legislation.com/search.fwx?countryid=5.

**16.** Law No. 203-V.

on Supporting the Use of Renewable Energy Sources and with support from the European Bank for Reconstruction and Development (EBRD).

The Action Plan for the Development of Alternative and Renewable Energy for 2013-20 was adopted in January 2013. Under the plan, 31 renewable energy projects are proposed with a capacity of 1 040 MW, including a wind farm of 13-793 W capacity, solar photovoltaic (PV) installations of 77 MW and a 170 MW hydropower plant. At the start of 2013, the country had 27 proposed renewable energy projects including wind, solar, biogas and small hydro.

A key initiative in renewable energy is the Programme of Wind Power Development to 2030 that defines wind power development as one of the priority directions. The programme was prepared in conjunction with the UN Development Programme – Wind Power Market Development Initiative. The goal is to develop wind power to generate 900 GWh by 2015 and 5 TWh by 2024, within the framework of the concept of Kazakhstan's transfer to sustainable development for 2007–24, and the strategy of industrial and innovative development of Kazakhstan for 2003–15, where the aim is the preservation of natural resources and the environment (Energy Charter, 2013).

Other state-run programmes that take renewable energy into consideration include the State Programme for Accelerated Industrial and Innovative Development for 2010–14 and the Programme of Electricity Sector Development for 2010–14 (Energy Charter, 2013).

Kazakhstan's energy demand is growing due to strong economic growth and rising living standards. As such, supply sufficiency concerns are mounting. The government has been expanding generation capacity from various fuel sources, through new investment and modernisation of existing capacity. This includes the construction of a 2 640 megawatt (MW) coal-fired power plant at Balkhash Lake. To bolster a weak investment climate for power generation, in 2009 the government established a premium tariff for electricity generators for returns to be used in infrastructure modernisation. The tariff will expire in 2015.

In December 2014, the government approved the Concept of Gas Sector Development to 2030.[17] This concept defines the approach to progressive reform and development of Kazakhstan's gas sector for the period up to the year 2030. Legislative changes were made in December 2014 to strengthen the sector's legal framework and define rules on production sharing agreements.

Kazakhstan's environment has been affected by past military nuclear testing programmes and industrial and mining activities, as well as land degradation, desertification and water scarcity. Some of these problems affect the entire Central Asia region. In response, Kazakhstan pioneered a multilateral, cross-sectoral and voluntary Green Bridge Partnership Programme. In Central Asia, the programme addresses issues related to energy and water linkages. Kazakhstan's dependency on trans-boundary river inflows, inefficient irrigation systems for water-intensive crops and a decrease of sustainable water supply are mounting concerns. Water deficits of 14 bcm by 2030 and 20 bcm by 2050 are expected in the Central Asia region, with serious impacts on the Balkhash-Alakol and Aral-Syrdarya basins.

To streamline water and energy governance, in 2013 the Ministry of Environmental Protection was reorganised into the Ministry of Environment and Water Resources[18] and

**17.** Decree No. 1275, 5 December 2014.

**18.** Presidential Decree No. 677, 29 October 2013.

in 2014 the reorganised ministry merged with the newly created Ministry of Energy. The government approved a comprehensive Water Management Programme in December 2013, with concrete measures and mechanisms to implement a sustainable water use strategy.

Kazakhstan ratified the Kyoto Protocol in 2009 and it participates in a number of climate change regional and international forums. Kazakhstan will host Expo 2017 Future Energy as a showcase to demonstrate the latest energy technologies and to raise awareness of sustainable development.

## INVESTMENT

Kazakhstan is planning to develop its energy sector considerably by 2050 in order to maintain strong economic growth. Existing energy infrastructure cannot support the expected scale of growth, and the country's investment projects are therefore largely focused on energy infrastructure development.

The Kazakhstan Caspian Transportation System (KCTS) has been proposed by the government. It would include the construction of an 823 km-long onshore pipeline from Eskene in western Kazakhstan to Kuryk on the Caspian Sea near Aktau, where a new oil terminal is to be built. This system would also include a maritime link to Baku, Azerbaijan, new port facilities and a transfer station in Baku, where the crude oil would be put into an expanded Baku-Tbilisi-Ceyhan pipeline to Turkey. The cost of the KCTS is estimated at USD 4 billion. Other proposals include the construction of the Trans-Caspian oil pipeline, which would provide a western export route for both Kazakhstan and Turkmenistan. Kazakhstan is working on increasing the capacity of the Kazakhstan-China oil pipeline under an agreement with the government of China.

The key gas transportation and storage projects include: rehabilitation of the Makat compressor station; a large-scale project to upgrade five gas transmission pipelines and related compressor stations of the Central Asia pipeline system; and rehabilitation of the Bozoy underground gas storage. Kazakhstan's two other underground gas storage units, the interconnected Poltoratskoye and Akyrtobe facilities, are having their ageing major systems such as gas compression, dehydration, and control automation upgraded or replaced.

Construction of a new domestic Beyneu-Akbulak pipeline (West KAZ – South East KAZ) was completed in 2013, which links the Central Asia-China gas pipeline from Turkmenistan to China. Kazakhstan is planning the construction of a number of new gas transmission pipelines, including the Beyneu–Bozoy–Shymkent gas transmission pipeline to provide gas from western Kazakhstan to the southern regions of the country. The Bozoi–Shymkent gas pipeline and the first stage of the Beyneu–Bozoi–Shymkent pipeline started construction in 2013.

The government is also promoting the construction of the Beineu-Bozoi-Akbulak gas transmission pipeline, which is intended to connect Kazakhstan's demand centres with its production areas and to allow more exports to China. The pipeline is expected to be completed by the end of 2015.

The Pre-Caspian gas pipeline with a capacity of 40 bcm is a project planned among the governments of Russia, Kazakhstan and Turkmenistan and ratified in 2009. The expected length of the pipeline is 1 217 km, envisaged to have 30 bcm of gas from Turkmenistan and 10 bcm from Kazakhstan. Its implementation, however, has been suspended for an indefinite time, pending the co-ordinated actions of the Russian and Turkmenistan parties.

In the power sector, the government is planning to undertake the large-scale modernisation of existing facilities and to construct new ones during 2015-30. Under the current Action Plan for Development of Electric Power Industry, the government is expected to continue to invest in the electricity network and generation infrastructure, with plans to 2030. The plan lists the facilities that need to be constructed, renovated or expanded by 2015 and outlines the measures for implementation. Current projects include:

- extension and reconstruction of Ekibastuzskaya state district power plant-2 coal plant, including implementation of power generating unit No. 3, 600 MW
- modernisation of the national power grid, Stage II (replacement of power equipment at 55 substations)
- construction of Balkhash thermal power plant, 1 320 MW, with the two units expected to come on line in 2017 and 2018; project cost: USD 2.3 billion
- construction of Alma 500 kilovolt (kV) substation with connection to the national power grid by 500 kV and 220 kV lines.

Kazakhstan's power sector requires considerable rehabilitation and upgrading to improve the efficiency of energy production and use. The ongoing programme for Modernisation of the National Electric Grid aims to upgrade the substations and infrastructure of the national grid, and ensure the efficiency and security of its operations. Phase one was completed over the period 2000 to 2009 and was financed by international financial institutions (IFIs) (USD 185 million) and the Kazakhstan Electricity Grid Operating Company (USD 134 million).

The project, now in its second phase with a horizon of 2016, will install modern high-voltage equipment, automation and relay protection facilities, a dispatch control system, monitoring and data processing and energy management systems, an automated metering system and a digital telecommunication network. This phase will complete the switch to automatic systems. The second phase covers the period 2010-14 and is financed by IFIs (USD 300 million).

Adopted in August 2013, the government's Energy Efficiency 2020 Programme aims to reduce energy consumption by 10% by 2015. The programme is expected to cost around USD 7.5 billion and will require private investment as well as budget funding.

## TECHNOLOGY AND INNOVATION

The share of research, development and demonstration (RD&D) in Kazakhstan's GDP was 0.16% in 2010, which is lower than in Russia or Belarus. Public funding accounted for 81% of RD&D expenditures in 2010. The State Programme on Development of Science for 2007-12 promoted private sector investment by collaborating with investors and channelling 25% of state spending on scientific research programmes through a Science Fund. This shift in financing was seen as a way to increase the share of applied research and development expenditures in total RD&D.

Innovation expenditure (energy RD&D and the acquisition of machinery and new technologies) was USD 1.5 billion in 2010. This represents 1.1% of GDP, twice that of the year prior. Around 11% was spent on RD&D. In developed economies, this share is 40-70%. The 2012 Law on State Support to Industrial Innovative Activity is focused on promoting scientific research and development activities in the country. Kazakhstan has set up several institutions and developed various programmes for this purpose; however, more co-operation is needed with the private sector. Companies play a limited role in the generation of knowledge in Kazakhstan (UNECE, 2012). RD&D expenditure in the oil and gas sectors is stagnant, since companies generally import technology.

## ASSESSMENT

Kazakhstan has a rapidly growing economy and significant energy resources. With the largest proven oil reserves in the Caspian Sea basin (40 billion barrels, 3.2% of the world's total), Kazakhstan is emerging as a leading oil producer and is set to become the second-largest non-OPEC supplier to global oil markets by 2020. Kazakhstan has 2 trillion cubic metres (tcm) of proven gas reserves, mainly gas associated with oil production. Natural gas production is likely to increase substantially in the period to 2030, particularly with the initiation of production at the giant offshore Kashagan field. Kazakhstan has abundant coal reserves in the northern part of the country, whereas large potential for wind, solar and small hydro are concentrated in the south. Kazakhstan is the world's largest producer of uranium, currently providing 35% of the global supply.

Kazakhstan's domestic energy mix is dominated by coal, which is mainly used for power generation and accounts for 48% of total primary energy demand, followed by natural gas at 31%. The country ranks among the most energy-intensive economies in the world, reflecting abundant supplies of affordable thermal energy that are used in inefficient infrastructure remaining from the Soviet era. For instance, coal, which accounts for more than 80% of electricity generation, is mostly combusted in power plants that are more than 50 to 60 years old. Production of oil, gas and coal also contribute to the high energy intensity, as does the heating of low-efficiency commercial properties and dwellings. Reducing the energy intensity of the economy is a government objective, and it has a target of a 25% decline by 2030.

The government launched Kazakhstan 2050 Strategy in December 2012, which defines the course for long-term economic development. In May 2013, the Green Economy Concept was adopted, setting an ambitious target of reaching 50% of alternative and renewable energy in its energy mix by 2050. The government plans to achieve this by replacing ageing infrastructure, increasing the use of alternative fuels (such as natural gas, nuclear and renewables), installing efficient energy technologies and complying with high ecological standards. All relevant government entities were tasked to elaborate on the Green Energy Concept and to prepare proposals for measures to achieve the targets. Key energy associations were asked to contribute as well. The review team commends the initiative.

The current development of key strategic directions for the medium and long terms also comes at a time when Kazakhstan's electricity sector is at a crossroads. With ageing infrastructure, rising consumption, and efficiency and renewable energy targets, the burden on power suppliers is growing. To address these demands, the government introduced an interim tariff structure in 2009 that allows generators to charge a premium to be used to modernise their assets. This tariff will expire in 2015.

Authorities are currently working on a new model for capacity markets, which has to be functional from 2016. Significant upgrades of existing power stations, and building new capacity and grid infrastructure, are required to ensure a sound electricity system and to meet established targets. This will necessitate substantial investment.

Efficiency gains and demand-management efforts require incentive schemes and enhanced awareness. Therefore, careful consideration of various scenarios and selection of the most cost-effective and socially acceptable models for strategic development in the power sector are instrumental to move towards the Green Economy Concept goals. Key opportunities for transitioning to a "green economy" include maximising Kazakhstan's vast potential for energy efficiency gains, encouraging the large-scale deployment of renewable energy technologies and promoting industrial technology improvements. The government estimates that the inefficient use of resources in every sector equates to a loss of USD 4-8 billion to the economy each year and could amount to USD 14 billion by 2030. Estimated current energy savings potential is USD 3-4 billion/year and could reach USD 6-10 billion/year by 2030.

The review team commends the government of Kazakhstan for developing concepts for fuel switching and stimulating the uptake of renewable energy technologies. It encourages further consideration and analysis of multiple scenarios for energy sector development, including those based on various fuel mix options. Such a comprehensive analysis of multiple scenarios can improve the strategic actions to transition to a sustainable energy future.

Kazakhstan's energy statistics are adequate in some areas. However, sufficient reporting and transparency are needed in areas related to the energy sector where reliable statistics are lacking. In order to provide a basis for more accurate analysis of the energy sector and more informed policy decisions, the review team strongly suggests that additional statistics be developed, reported and regularly updated.

The government recognises the need for modernisation and expansion of the power generation and network enterprises. As the tariff supplement for generators is being phased out next year, the capacity market will become functional in 2016. This will provide the main signals for investment in electricity projects. This calls for effective market structures, reasonable tariffs and return on investment in order to attract the required financing. As this substantial investment will ultimately be covered by consumers, strategies and projects need to be conceived and executed in a transparent and socially acceptable manner, and to advance the transition to sustainable development.

## RECOMMENDATIONS

*The government of Kazakhstan should:*

- ☐ *Continue to develop the national fuel and energy strategy to 2030 with an outlook to 2050. Consider extending policy scenarios based on fuel switching with various price alternatives by developing additional scenarios analysing a range of fuel mixes and demand-side options.*
- ☐ *Maximise the use of existing energy data, identify additional data requirements, take steps to acquire and keep up-to-date the data necessary to develop tools for strategic planning and monitoring of the supply, demand and consumption of energy throughout the economy.*
- ☐ *Consider establishing an analytical centre to interpret statistics and provide modelling to inform policy making.*
- ☐ *Continue the development of the new electricity generation capacity market model for 2016 by managing the proposals, selection and implementation of the most suitable model in a timely and efficient manner. The system to be implemented needs to provide incentives and security for investment, and facilitate the sustainable development of energy infrastructure while maintaining reasonable cost to consumers.*

- *Maximise energy efficiency gains by co-ordinating effective implementation of demand-side policies, especially in the energy efficiency and district heating segments. Scale up the efforts to raise public awareness of available mechanisms and incentives for energy savings, with particular emphasis on the buildings, residential and transport sectors.*
- *Ensure stable, predictable, fair and transparent investment procedures, with clear steps for energy sector investment developments to encourage the public and private investments required for effective energy markets.*

# 5.2. ENERGY SECURITY

## RESOURCE ENDOWMENT

### OIL AND GAS

Kazakhstan is endowed with significant oil, gas and coal resources and is a major energy producer in Central Asia. Crude oil reserves were 4 082 Mt in 2012, ranking 12th in the world (BGR, 2013). Resources were 10 700 Mt, with 4 000 Mt of conventional oil and 6 700 Mt of oil sands, to rank 8th in the world. Remaining oil potential is estimated at 14 782 Mt.

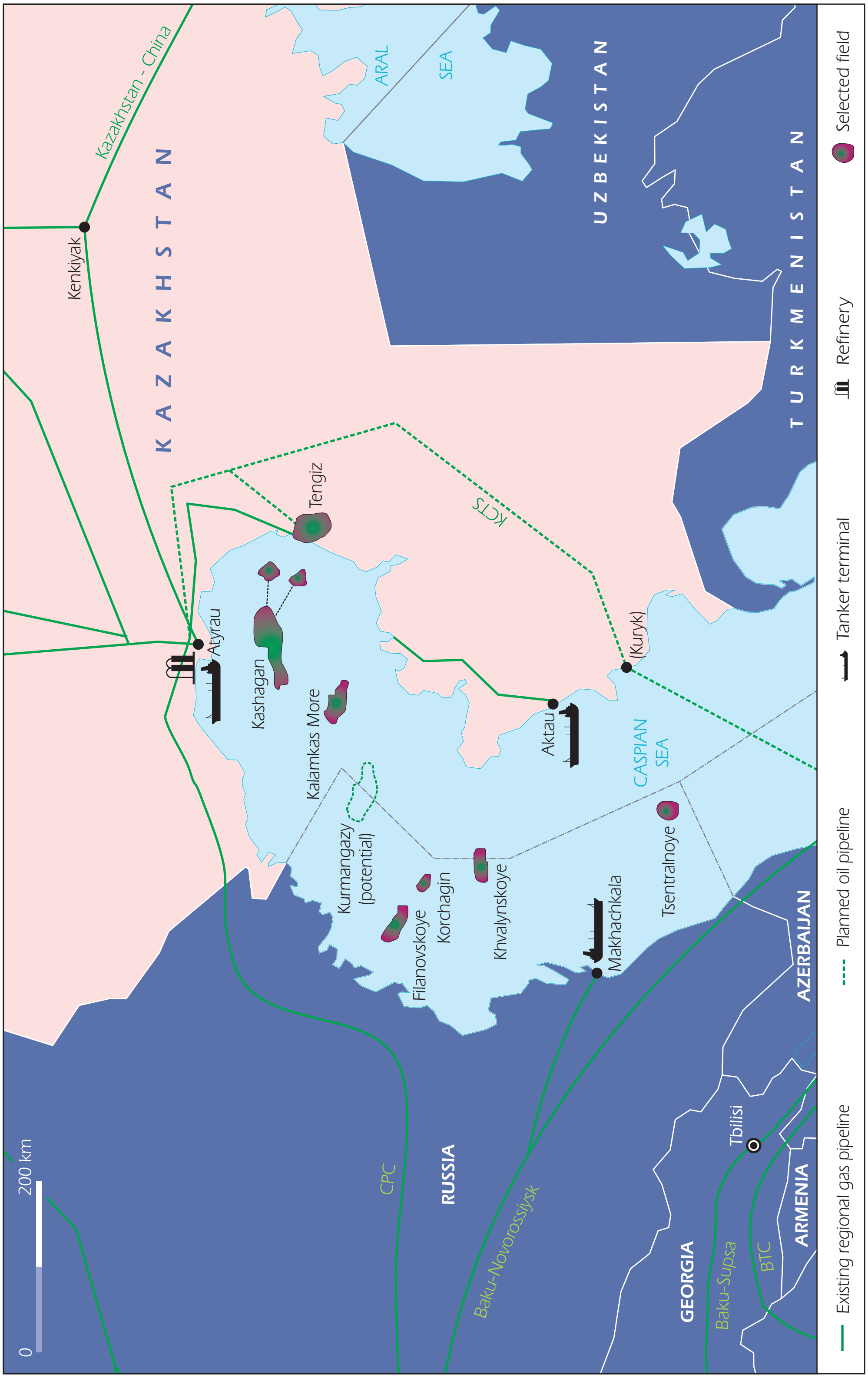
Kazakhstan is also rich in natural gas deposits with 1 950 bcm of reserves in 2012, 3 700 bcm of gas resources and 6 121 bcm of remaining potential. Kazakhstan is ranked 18th in the world for gas reserves (BGR, 2013). In 2014, *Oil & Gas Journal* estimated Kazakhstan’s gas reserves at 2 400 bcm (EIA, 2015).

There are 172 oil and 42 gas condensate fields in Kazakhstan. More than 90% of oil reserves are concentrated in 15 major fields (EIA, 2015). The super-giant Tengiz field and the giant offshore Kashagan field hold more than half the reserves (Box 5.2.1). Most of Kazakhstan's natural gas reserves are located in the west, with 77% of total natural gas reserves located in four fields: Karachaganak (46%), Tengiz (12%), Imashevskoye (7%) and Kashagan (12%) (EIA, 2015).

The Tengiz oil field was discovered in 1979. Recoverable reserves of crude oil are estimated at 750 Mt to 1.1 billion tonnes (Bt). Tengizchevroil Limited Liability Partnership (LLP) (TCO) has been operating the Tengiz field since 1993. 71% of all oil reserves are accounted for by two major subsoil users: 45% by for North Caspian Operating Company and 26% by for Tengizchevroil LLP. ManghistauMunaiGas Joint Stock Company (JSC), CNPC-AktobeMunaiGas JSC, OzenMunaiGas JSC and Karachaganak Petroleum Operating B.V. have 3% for each company; 2% are owned by the EmbaMunaiGas Company. Buzachi Operating LTD, KazakhOil Aktobe LLP and Karazhanbasmunai JSC each own 1%. The remaining medium and minor subsoil users own only 10%. Another 2% of the reserves are free from subsoil users and are in the general fund. About 90% of gas production in Kazakhstan is associated gas (found in association with oil). Total production of natural and associated petroleum gas in 2013 was 42.3 bcm: about 23 bcm was used for commercial purposes; almost 11 bcm was used for domestic consumption; and around 8 bcm were exported by KazRosGaz to Russia for processing at the Orenburg plant, part of which was re-imported into Kazakhstan. The government outlook is confident that gas production volumes will increase in the near term, particularly as oil production steps up from fields such as the Kashagan development.

Estimated recoverable reserves of the Karachaganak field being developed by Karachaganak Petroleum Operating (KPO) (joint venture established by several western companies led by BG Group and Eni) are 1.2 Bt of oil and gas condensate and 1.35 tcm of natural gas reserves.

**Figure 5.2.1** North Caspian oil fields




This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries, and to the name of any territory, city or area.

Sources: IEA (2010), *World Energy Outlook*, OECD/IEA, Paris; IEA analysis.

For a long time, Karachaganak was the last major oil and gas project without the participation of Kazakhstan. In 2012, KMG NC JSC became one of the participants in the project by acquisition of 10% interest from its current shareholders. In 2013, about 17 bcm of gas were extracted from the Karachaganak field, of which 49% was reinjected (IEA, 2014b).

**Box 5.2.1** Kashagan: Giant Caspian Sea Oilfield

Kashagan, the world's biggest oil find in decades and the most expensive stand-alone oil project, aims to produce up to 1.66 million barrels of oil per day. It took an estimated USD 50 billion and 13 years to start output in September 2013. It was soon shut down, however, due to pipeline leaks that may have been caused by stress linked to the presence of hydrogen sulphide gas. In May 2014, the Kazakh Oil and Gas Minister said that the oilfield may not restart until 2016.

The North Caspian Operating Company (NCOC), the consortium of oil companies operating the Kashagan field, includes the international majors ExxonMobil, Shell, Total and Eni as well as KazMunayGas, and each hold a 16.8% stake. Japan's Inpex has a 7.56% share and the China National Petroleum Corp acquired 8.33% in 2013.

The Kashagan project is in the harsh offshore environment of the northern part of the Caspian Sea. Much of its infrastructure is built on artificial islands to avoid damage from pack ice in a shallow sea, which freezes five months a year. Hydrocarbons will move from the drilling islands to hub islands via pipeline. The hub islands will contain processing facilities to separate recovered liquid (oil and water) from the raw gas, as well as gas for re-injection and use in power generation systems for the facilities. During the first phase of Kashagan production, about half the produced gas will be re-injected into the reservoir. Separate pipelines will carry produced liquids and raw gas to the onshore treatment plants in Bolashak, which will treat oil for export. Some of the processed gas will be returned to the field to fuel operations and some will fuel the onshore plant.

Sources: Reuters (2014), “Kazakhstan sticks to 2014 oil output plan despite Tengiz fall”, 20 December, Reuters, uk.reuters.com.; Ministry of Energy.

Significant possible additions to gas production in the medium term include the third phase of Karachaganak, though the development consortium has yet to agree on financing the next steps and it is uncertain whether the gas produced would be used for re-injection or marketed. Nostrum Oil and Gas, the Kazakhstan oil and gas company formerly named Zhaikmunai, is likely to contribute around 50 thousand barrels per day (kb/d) of gas condensate and liquefied petroleum gas (LPG) by 2017 from new processing facilities at the Chinarevskoye gas field.

## COAL AND PEAT

Ranked 8th in the world, Kazakhstan has 25 605 Mt of hard coal reserves. It has 123 090 Mt of hard coal resources and 148 695 Mt of further potential. Kazakhstan is also among the top eight lignite producing countries in the world, though data on lignite deposits are not available (BGR, 2013).

More than 90% of the coal reserves are concentrated in the north and central parts of the country. The largest coal reserves in Kazakhstan are owned by Bogatyr Komir LLP (8%), ArcelorMittal Temirtau JSC and Shubarkol Komir JSC (5%) as well as Maikuben West LLP (4%), YeEK JSC (3%) and others.

There are 47 coal deposits, of which 5 coal-mining fields and 14 deposits are under operation. 72% of the total coal production is concentrated at three giant sections of Ekibastuz, at four other sections (Borly, Shubarkol, Kushoky and Saryadyr) and at Karaganda Oblast mines. Coal mining is also developing in the sections of Aktobe, Almaty, East Kazakhstan (Karazhyra mine) and South Kazakhstan Oblasts in order to ensure the regional needs in coal.

In 2000-13, the increase of coal reserves was amounted to only 115 Mt at the cumulative production amounting to 1 141 Mt. According to British Petroleum estimates, Kazakhstan's coal will be exhausted in approximately 293 years.

### URANIUM

Kazakhstan has the third-largest deposits of uranium in the world, behind Australia and Canada. Total reserves were 279 kilotonnes (kt) in 2012, resources are much higher at 1 455 kt and potential is 1 934 kt. In 2012, Kazakhstan was the top global producer, with 21.3 kt or 36.5% of total uranium production, followed by Canada (9 kt) and Australia (7 kt) (BGR, 2013).

### HYDRO

Hydropower resources are spread throughout the country. There are three major districts: the Irtysh River basin with its main tributaries (Bukhtarma, Uba, Ulba, Kurchum, Kardzhil), the southeast zone with the Ili River basin; and the southern basins of Syrdaria, Talas and Churivers (NURIS, 2013).

## ENERGY SECURITY AND DIVERSIFICATION

Kazakhstan has significant fossil fuel resources and is a net exporter of energy and energy products. For natural gas, the reserves are in the west, the population centres are in the north, east and south, and the domestic pipeline system is under-developed. The lack of infrastructure means that Kazakhstan relies on gas imports to meet domestic demand. So, the security of gas supply depends somewhat on resource availability, and on the political and economic relations among the neighbouring countries with which it is interconnected. For example, in 2010, there was a partial outage of natural gas in Aktau, the country's main seaport on the Caspian Sea, due to an unexpected interruption of the natural gas supply from Turkmenistan, coinciding with the repair of an alternative transportation gas pipeline.

It is a government objective to develop a domestic natural gas system that would connect the producing and consuming centres and reduce reliance on imports. Of 14 regions in Kazakhstan, 5 are not connected to the gas pipeline system. It is a long-term goal to connect these regions, but the current availability of relatively low-cost LPG and coal render it uneconomic. In 2014, the government approved the Concept of Gas Sector Development to 2030 aimed at increasing domestic supply and developing gas infrastructure. The government is planning a Beyneu–Bozoy–Shymkent gas transmission pipeline to bring gas from the west to demand centres in the south to reduce dependence on supplies from Uzbekistan.

Energy security in Kazakhstan is also a matter of reliability. Today's gas and electricity transmission and distribution networks were mostly built during the Soviet era and are in need of replacement, refurbishment and expansion. Their present condition has resulted in higher than average outages, particularly in the gas sector. For numerous gas companies in the south, compressor losses can be as high as 30%. Investment in rehabilitation and modernisation would improve the efficiency of supply and reduce the risk of shortages.

Kazakhstan is experiencing strong economic performance and a rising standard of living for its population that is expected to considerably increase energy demand in the coming years. This poses a challenge for the government to ensure that energy needs can be meet in a reliable, affordable and sustainable manner. In order to meet growing demand, the government has been expanding generation capacity from various fuel sources, through new investment and modernisation of existing capacity. This includes the construction of a 2 640 MW coal-fired power plant at Balkhash Lake.

Kazakhstan's primary energy mix is dominated by coal, natural gas and oil, with a less than 1% contribution from renewable energy sources. However, the potential for renewable energy is substantial, particularly for small hydro, wind and solar. Investment in renewables and energy efficiency measures will help Kazakhstan to reduce the carbon intensity of its economy, diversify its energy mix and strengthen the security of supply. Samruk-Green-Energy, a subsidiary of state-owned Samruk-Energy, is undertaking wind power projects that will bring up to 300 MW of wind power by 2018.[19]

Kazakhstan has large uranium reserves and is the world's biggest uranium producer. The country's only nuclear power plant was decommissioned in 2001. Although plans have long existed to build additional nuclear power plants, there has been little progress.

## ENERGY INFRASTRUCTURE AND INVESTMENT

### ELECTRICITY AND DISTRICT HEATING

#### Electricity

Installed generation capacity in 2012 was 20.6 gigawatts (GW), an increase from 19.1 GW in 2010 based on refurbishment and new build. There are 71 power stations, including 5 hydropower plants. Coal-fired plants account for about 85% of the capacity. Combined heat and power (CHP) plants account for 38% of generation capacity. In recent years, wind and solar PV have entered the power generation mix. The one nuclear power plant was closed in 2001. The total length of transmission power lines is approximately 24 000 km, including 310 km of 0.4 kV to 1 150 kV lines.

Power plants are grouped in three categories: national, industrial and regional. National power plants include the largest coal-fired units (such as the Ekibastuz state district power plant [SDPP]), as well as all large HPPs. Industrial power plants include gas-turbine power plants (GTPP) and CHPs for autonomous electricity generation. Regional power plants are mainly CHPs for districting heating in certain towns/regions.

The government has a plan and has outlined the measures for the facilities that need to be constructed, renovated or expanded by 2015. From 2010 to 2011, the expansion of the Atyrau CHP by 75 MW and restoration of Unit 2 at Aksu SDPP were completed. Projects in the works include the restoration of Unit 8 at Ekibastuz SDPP-1 and the replacement of power equipment at 55 substations of the national power grid.

**19.** www.samruk-green.kz.

In the electricity sector, the government is planning to construct new facilities during 2015-30. Under the current Action Plan for Development of Electric Power Industry, the government is expected to continue to invest in the electricity network and generation infrastructure. Current projects include:

- construction of a gas turbine power station, 87 MW, at Akshabulak field to use gas that had been flared
- construction of the Balkhash thermal power plant, 1 320 MW, began in 2012 with the two units expected to come on line in 2017 and 2018 with estimated project costs of USD 2.3 billion
- installation of a third unit at Ekibastuz state district power plant-2 to add 600 MW capacity expected to be operational in 2014
- construction of the Alma 500 kV substation with connection to the national power grid by 500 kV and 220 kV lines.

In terms of renewable energy, Samruk-Green-Energy, a subsidiary of state-owned Samruk-Energy, is undertaking wind power projects that will bring up to 300 MW of wind power by 2018.[20]

Kazakhstan's UPS is connected and harmonised with Russia's electricity network and the Central Asia Power Grid (with Kyrgyzstan, Uzbekistan, Turkmenistan and Tajikistan). Turkmenistan and Uzbekistan disconnected from the Central Asia Power Grid in 2003 and 2009, respectively. This reduced trade volumes considerably.

KEGOC is obliged to ensure maintenance and operational availability of the electricity network. Although there is no comprehensive maintenance strategy in place, the TSO implements a centralised maintenance programme to fulfil its wholesale contracts.

The TSO and the DSOs have annual maintenance programmes, which are fully financed by the electricity companies, with an implementation rate in the range of 98-100%. The technical level of staff to implement the maintenance programmes is adequate, as are budgets for regular training programmes.

The ongoing programme for power grid modernisation is set up to upgrade the substations and infrastructure of the national grid, and ensure the efficiency and security of its operations. Phase one was completed during 2000-09 and was financed by IFIs (USD 185 million) and KEGOC (USD 134 million).

The project, now in its second phase with a horizon of 2016, will install modern high-voltage equipment, automation and relay protection facilities, a dispatch control system, monitoring and data processing and energy management systems, an automated metering system and a digital telecommunication network. This phase will complete the switch to automatic systems.

Monitoring of preventive maintenance is carried out by the Committee of Nuclear and Power Supervision and Control within the Ministry of Energy. The committee is expected to implement a uniform approach to the monitoring and control of the power sector, including preventive maintenance, and is considering establishment of a three-year preventive maintenance planning programme. GosEnergoNadzor, a state agency, carries out infrastructure inspections and can report insufficient maintenance to the Ministry of Energy.

**20.** Ibid.

### District heating

According to the Committee on Statistics, the total length of the two-pipe heat networks is 11 700 km, including 3 800 km (32.6%) in communal property and 7 900 km (67.4%) in private enterprises. A total of 23 300 meters are installed. All large and small cities and settlements are provided with extensive district heating networks at various levels of centralisation as follows: group level – heat supply of a group of buildings; district level – heat supply of a district in a settlement; city level – heat supply of several districts; and inter-city level – heat supply of several cities. Detached individual houses and cottages are supplied with heat by autonomous boiler houses using coal, gas and diesel fuel.

The heat supply in large cities such as Almaty and Astana is provided by CHPs, and large district boiler houses are in communal properties or in the properties of major companies. In addition to these sources, there are many enterprises owned by various organisations which supply heat to small cities, settlements and districts of large cities. These organisations, which have their own heat sources, include the Ministry of Defence, JSC National Company Kazakhstan Temir Zholy, and a number of large enterprises being local economic mainstays. These organisations transfer a part of their heat supply systems to the ownership of local executive bodies or establish independent legal entities for heat generation and distribution.

The district heating network is aged and some 63% needs replacement and repair. Heat losses are close to 20%. Metering is also low, with less than half of consumers being metered. As such, efficiency losses are difficult to measure.

## NATURAL GAS

The natural gas system in Kazakhstan is primarily a transit route for exports from Uzbekistan and Turkmenistan to Russia and China. The network consists of 11 900 km of pipeline, 22 compressor stations, and 3 underground storage facilities. The main pipelines are: the Central Asia-Centre pipeline – transit from Turkmenistan to Russia; Bukhara-Ural pipeline – transit from Uzbekistan to Russia (now largely idle); the Tashkent-Almaty pipeline – imports gas from Uzbekistan to Kazakhstan's main southern population centres; and the Central Asia-China pipeline (Table 5.2.1).

**Table 5.2.1** Technical characteristics of gas pipelines, Kazakhstan, 2013

| Pipeline | Length (km) | Available capacity (bcm/year) |
|---|---|---|
| Central Asia-Centre | 3 758 | 60 |
| Makat-North Caucasus | 371 | 25 |
| Soyuz, Orenburg – Novopskov | 848 | 60 |
| Bukhara – Ural | 1 304 | 80 |
| Tashkent - Almaty | 583 | 3.2 |
| Kazakhstan-China (dual lines) | 1 300 | 30 |

Source: Energy Charter Secretariat (2013), *Investment Climate and Market Structure Review in the Energy Sector of Kazakhstan*, Energy Charter Secretariat, Brussels.

The national gas transmission and distribution pipeline system distributes gas to consumers in 9 of its 14 regions and provides connection to about 57% of the population. Yet, the domestic natural gas distribution network is two distinct systems: one in the west that services the gas production fields, and one in the south which mainly delivers imported natural gas to the consuming regions. The absence of a network that connects the gas producing regions to the main industrial area between Almaty and Shymkent has hampered the development of the country's natural gas resources. Southern Kazakhstan receives much of its natural gas supply from Uzbekistan via the Tashkent-Shymkent-Bishkek-Almaty pipeline even as the country exports gas from its northwest region.

The maintenance strategy for gas assets is the responsibility of the gas companies. All gas TSOs and DSOs have medium-term maintenance programmes, which generally are fully funded and implemented. The technical level of staff to implement the maintenance programmes is adequate, though budgets for regular training programmes of maintenance staff are not sufficient. Regional divisions of the Committee of Emergency Situations can also be involved in gas network maintenance.

Representative current gas infrastructure projects include:

- Central Asia–Centre transmission pipeline rehabilitation
- Shymkent town gas distribution system rehabilitation
- Makat Compressor Station rehabilitation and seven new gas turbines
- Bozoy, Poltoratskoye and Akyrtobe underground gas storage facilities' rehabilitation.

The government is considering construction of the Beyneu–Bozoy–Shymkent gas transmission pipeline, which would provide gas from the west to the southern regions of the country to reduce gas imports from Uzbekistan. The pipeline would connect with all main gas transmission pipelines. Construction of Bozoi–Shymkent gas pipeline and the first stage of the Beyneu–Bozoy–Shymkent pipeline started in southern Kazakhstan in 2013.

The Pre-Caspian gas pipeline (40 bcm capacity) is a planned project among the governments of Russia, Kazakhstan and Turkmenistan, ratified in 2009. The expected length of the pipeline is 1 217 km, envisaged to have 30 bcm of gas from Turkmenistan and 10 bcm from Kazakhstan. Its implementation, however, has been suspended for an indefinite time, pending the co-ordinated actions of the Russian and Turkmenistan parties.

The government is also promoting the construction of the Beineu-Bozoi-Akbulak gas transmission pipeline, which is intended to connect Kazakhstan's demand centres with its supply, and allow more exports to China. The pipeline is expected to be completed by end 2015.

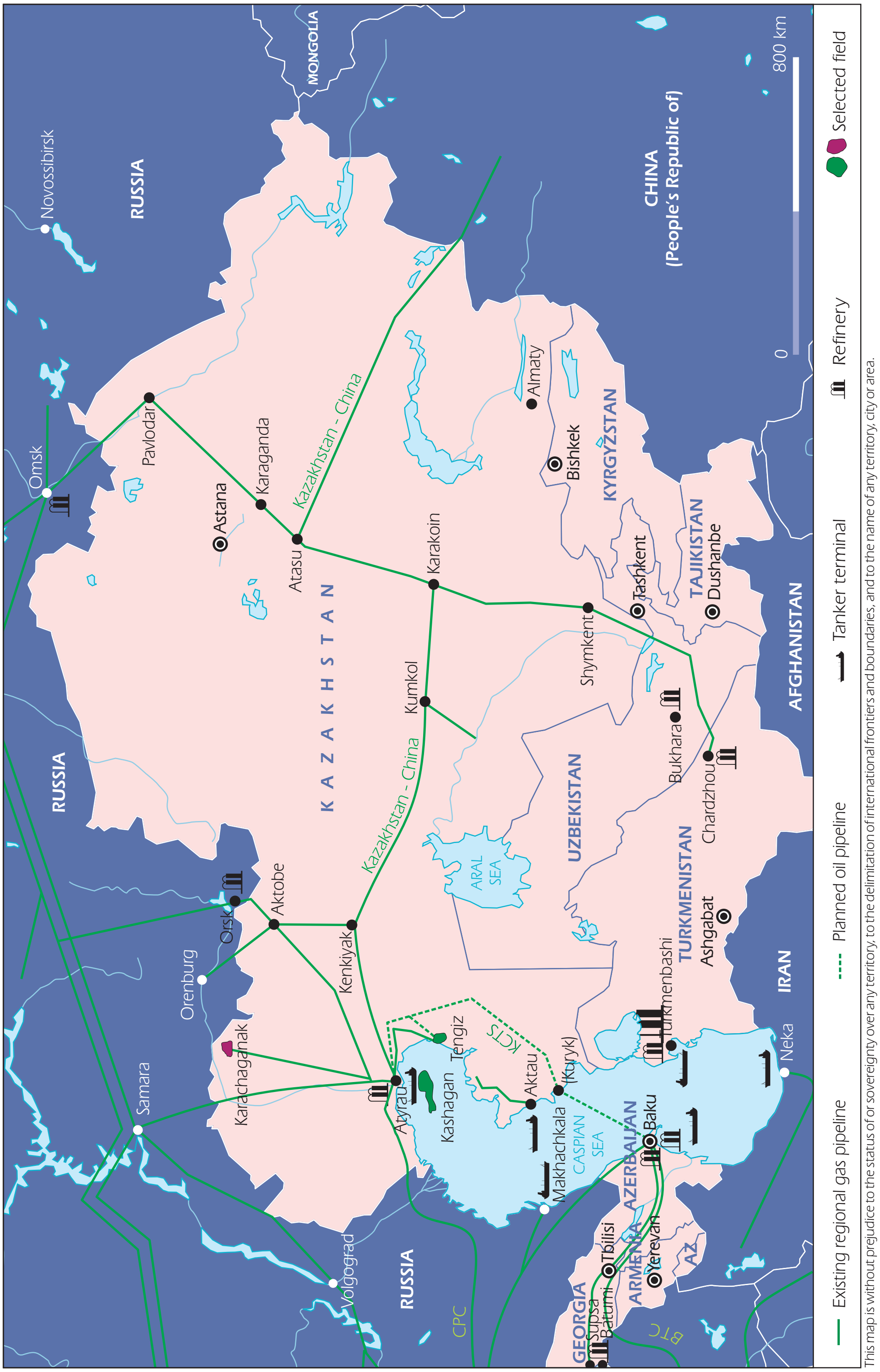
## OIL

Since its independence in 1991, Kazakhstan has invested substantially in new developments and upgrades of existing oil and gas infrastructure to expand its export capacity. Kazakhstan exports about 80–90% of its liquid hydrocarbon production.

When the pipeline system was developed as part of the Soviet system, the aim was to transport oil to Russia. Over time, Kazakhstan has been able to reduce its dependence on Russia's infrastructure by using Trans-Caspian tankers and rail, and by building a pipeline to China. Still, a majority of its exports have to be shipped via Russia's pipelines (EIA, 2015). Kazakhstan has an extensive rail network, which it increasingly uses to transport liquid fuels for both domestic consumption and export.

The Caspian Pipeline Consortium (CPC) oil pipeline, in operation since 2001, is 1 510 km in length and connects the Tengiz field with the Yuzhnaya Ozerevka terminal to the Russian Black Sea port of Novorossiysk. It is being expanded to increase capacity to 67 Mt, with completion expected in 2015.

**Figure 5.2.2** Central Asia oil pipeline network




Sources: IEA (2010), *World Energy Outlook*, OECD/IEA, Paris; IEA analysis.

Atyrau-Samara is Kazakhstan's other major oil export pipeline. It connects the Uzen field and Atyrau refinery to Samara to link with Russia's Transneft system, which provides Kazakhstan with a connection to world markets via the Black Sea. The 1 380 km line was upgraded in 2009 and has an annual capacity of 15 Mt.

The Kazakhstan-China 2 228 km long oil pipeline runs from the Atyrau port in northwest Kazakhstan to Alashankou in China, and has a capacity of about 20 Mt. The pipeline is currently being expanded to increase its capacity, at least partly to transport Kashagan oil.

The two main ports used for oil exports are Aktau and Semey. Aktau is located on the Caspian Sea and has a loading capacity of 12 Mt of oil and oil products. Aktau also has three oil storage facilities: JSC KazTransOil (8.5 Mt); Artis Overseas S.A. Kazakhstan (1.1 Mt); and Terminalex (2.4 Mt). The Semey port is located on the Irtish River in the northeast, and in summer months, ship traffic can travel to the Arctic Ocean and connect to the rail network.

Further development of Kazakhstan’s rich oil and gas resources for domestic and export purposes will require new supporting infrastructure. Development of new oil fields, including the Kashagan field, requires significant expansion of export capacity. Kazakhstan is promoting the KCTS, which includes the construction of an 823 km-long onshore pipeline from Eskene in western Kazakhstan to Kuryk on the Caspian Sea near Aktau, where a new oil terminal is to be built. This system would also include a maritime link to Baku, Azerbaijan, where the crude oil would be put into an expanded Baku-Tbilisi-Ceyhan pipeline to Turkey. The total cost of the KCTS is estimated at USD 4 billion. Other proposals include the construction of the Trans-Caspian oil pipeline, which would provide a western export route for both Kazakhstan and Turkmenistan (EIA, 2015).

### COAL

Karaganda coal basin, whose development was launched as far back as 1930, has long been Kazakhstan’s main coal supplier. It still produces up to 50 Mt annually. Ekibastuz coal deposits are 200 km to the northeast of Karaganda and are among the largest in Kazakhstan. In 2013, 63.9% of coal was mined in the Pavlodar Oblast and 27.9% in the Karaganda Oblast. Coal will continue to play a significant role in the energy sector. To meet coal needs, mining is projected to increase up to 160 Mt in 2015.

### SYSTEM RELIABILITY

Electricity system reliability is stable, with total transmission losses at approximately 7%. Outages are rare. Losses and outages are reported to the CRNMPC by the TSO and DSOs. Losses in the districting heating network are higher due to aged infrastructure – approximately 20%.

Gas network losses are significantly above established standards. Losses and outages are reported by KazTransGas to the CRNMPC. Gas use for internal needs and losses are as high as 30% in some compressors in many natural gas operations in the southern region. The Zhambyl region (oblast) in the south has registered several incidents of atmospheric gas releases related to the extremely poor condition of pipelines.

## EMERGENCY RESPONSE

In 2010, there was a partial outage of natural gas in Aktau, the country’s main seaport on the Caspian Sea, due to an unexpected interruption of the natural gas supply from

Turkmenistan, coinciding with the repair of an alternative transportation gas pipeline. Due to a partial reliance on gas imports, Kazakhstan needs to improve emergency response preparedness to avoid unexpected supply disruptions.

In 2011, an MoU was signed between the Committee of Emergency Situations and the EBRD to develop large-scale emergency response capacity for offshore oil and gas projects, modernise crisis management centres and develop effective international emergency co-ordination. Given the enormity of oil and gas flows in the Caspian Sea region, the EBRD and the government are planning to develop emergency response measures related to flow control, oil spills and fire at offshore facilities.

Information on Kazakhstan's strategic stocks of hydrocarbon resources is considered confidential. There are, however, legislative normative acts, regulating the levels of the strategic stocks to be kept by government and industry.

# 5.3. MARKET CONVERGENCE

## NATIONAL MARKET STRUCTURE

### ELECTRICITY

Kazakhstan's electricity sector was legally and financially unbundled in 1995-96. Progressive privatisation was approved in 1996.

The electricity sector was divided into competitive and monopoly segments. The Kazakhstan Committee for Regulation of Natural Monopolies and Competition Defence effects management in the natural monopoly segment and on the state regulation of sales prices for consumers in the retail market. The transmission and distribution of electricity has been attributed to the state's monopoly segment. Electricity transmission services were included in natural monopoly activities and are provided at charges established by the regulator. The generation of electricity and services provided by specialised enterprises were attributed to the competitive segment.

The electricity market structure in Kazakhstan is composed of a wholesale market, in which about 88% of transactions are through bilateral contracts, while a central spot market accounts for about 12% of electricity sales and balancing is on a real-time basis. The retail market has regulated tariffs.

To date, Kazakhstan has established an open two-tier competitive market of electricity: wholesale and retail.

The wholesale electricity market is made up of:

- Bilateral contracts - 88% of trade.
- Spot trade on short-term, medium-term and long-term bases. The spot market is operated by KOREM and accounts for 12% of trade.
- The real-time balancing market.
- The ancillary services market.

Daily schedules of wholesale market activity are prepared and the dispatch of day-ahead load management is performed according to this schedule. DSOs work with the regional control centres for dispatch to retail customers. State-owned KOREM administers the day-ahead market, develops preliminary dispatch schedules and implements actual supply/ demand balances.

Kazakhstan's electricity generation is carried out mainly by private enterprises. The electricity TSO is the state-owned KEGOC. Regional distribution companies (REK) (21 companies) act as DSOs. The retail market is competitive, with approximately 45 companies. Samruk-Energy is the largest state-owned energy company in Kazakhstan.[21] The company is involved in power production, transmission, distribution and sales through its many

**21.** www.samruk-energy.kz.

subsidiaries. It also produces and trades coal. Total installed capacity of power plants owned and operated by Samruk-Energy is 9.7 GW, with 69 285 km of transmission and distribution lines. The company accounts for 37% of gross coal extraction volume in Kazakhstan. Samruk-Energy is managed by the Sovereign Wealth Fund Samruk-Kazyna.

The Samruk-Kazyna fund and the government developed the Comprehensive Privatisation Plan for 2014-16 in January 2014. In April 2014, the government approved the list of the companies to be privatised. The plan was to privatise 106 companies managed by the fund.

## NATURAL GAS

KazTransGas, an affiliate of the fully state-owned enterprise KazMunaiGas, is a vertically integrated TSO/DSO holding company. Its subsidiary, Intergas Central Asia, is the TSO. Kazakhstan has 14 regions, and 9 are connected to the gas network to serve about 57% of the population. Another subsidiary, KazTransGas Aima, is the DSO in six regions. In other gasified regions, a number of companies act as DSOs and some have more than one DSO. Some DSOs are private, while others are state-owned. Gas transmission and distribution system operators are independent legal entities with their own financial and accounting systems, and are operationally independent.

## OIL

State-owned KazMunayGa (KMG) is an integrated national oil and gas company implementing national policy on oil and gas sector developments and is involved in oil and gas exploration, production, refining, transportation, distribution and servicing. The company also establishes management systems for subsoil use.

Tengizchevroil (TCO) is a joint venture between Chevron (50%), ExxonMobil (25%), KazMunayGas (20%) and LukArco (5%). TCO was created to develop the super-giant Tengiz oilfield in the Atyrau region and is Kazakhstan's largest producer and marketer of oil and gas.

According to the Ministry of Oil and Gas, the following PSAs have been signed in Kazakhstan: Tengizchevroil LLP (TCO); Kazakhstan branch of Karachaganak Petroleum Operating B.V. (KPO); NCOC; Zhaikmunai JV; Maersk Oil Kazakhstan *Gesellschaft mit beschränkter Haftung* (GmbH); Potential Oil LLP; Kurmangazy Petroleum LLP; KazMunaiGas NC JSC; Tyub-Karagan Operating Company B.V.; Maersk Oil Kazakhstan GmbH (Temir); Sagiz Petroleum Company LLP; Precaspian Petroleum Company LLP; Branch of Saigak Kazakhstan B.V.; and Branch of Caspi Meruerty Operating Company B.V. Licence areas are specified in the Subsoil Use Contracts, and therefore PSAs are transferrable.

In 2013, there were 203 hydrocarbon contracts: 61 hydrocarbon exploration contracts, 56 hydrocarbon production contracts and 73 combined hydrocarbon exploration and production contracts which are implemented on the basis of PSAs, and 13 contracts with Tengizchevroil LLP.

## REGULATORY FRAMEWORK

The CRNMPC, under the Ministry of National Economy, is responsible for tariff setting and overseeing competition. The CRNMPC is funded from the state budget and its board is appointed by the prime minister. Its decisions are not contested by the government. It regulates natural monopolies, including transmission and distribution, as well as all other energy markets.

## Tariffs

The CRNMPC regulates transmission, distribution and retail tariffs for electricity and natural gas. Wholesale electricity prices are determined by bilateral contracts and the spot market. In January 2009, the Law on Electricity came into effect, which sets a pricing regime for generators within the framework of tariff caps approved by the government up to 2015. To change the price caps, generators have to conclude an agreement with the relevant ministry that entails specific investment obligations. Transmission and distribution tariffs are regulated on the basis of cost. In 2013, the average household electricity retail price, including taxes, was USD 0.046/kilowatt hour (kWh).

Natural gas tariffs are calculated taking into account the gas price and the transmission and distribution network costs. Retail tariffs differ for the various customer categories. Gas prices are regulated only for major suppliers, which according to a 2012 law have preferential rights to buy gas from producers in order to serve domestic supply. This regulated price includes production and transmission costs, plus a 10% margin. In 2013, the average household gas price, including taxes, was USD 1.43/gigajoule (GJ).

In December 2014, the government introduced rules and procedures for retail pricing mechanisms for oil products, which set price margins (upper cap) and tax to be levied on prices outside of these margins.[22]

Household retail prices in Kazakhstan are considered to be among the lowest in the world due to government subsidies. Regulated retail tariffs are not fully cost reflective and do not always account for the cost of modernisation. As a result, much of the distribution sector is stagnant and unable to replace obsolete infrastructure.

In the electricity sector, third-party access to the transmission and distribution networks is allowed based on licensing and safety requirements. Generation, transmission and distribution activities require licences from the relevant ministry or the CRNMPC. Retail has no licensing requirements.

In the gas sector, access to the gas transmission system is allowed. Limitations are imposed only in case of breach-of-contract obligations, when gas does not meet the required specifications, or in case of lack of available capacity and/or respective agreements on natural gas supply.

## Feed-in tariffs

To address slow investment in energy infrastructure in times of growing demand, the government introduced an interim tariff structure in 2009 that allows all electricity generators to charge a premium to be used to modernise their assets. This tariff will expire in 2015, after which time the new capacity model will take effect.

Also, in 2013, under the new Law on Supporting the Use of Renewable Energy Sources, feed-in tariffs for wind and solar energy were proposed. In December 2013, feed-in tariffs of EUR 0.145/kWh for solar projects and USD 0.095/kWh for wind projects were proposed, as well as 15-year purchasing power agreements (PPAs). The feed-in tariffs entered into force June 2014 (Renewable Market Watch, 2014).

**22.** http://cis-legislation.com/document.fwx?rgn=71660.

### Billing and collection

In the electricity sector, modernisation of the metering system is ongoing. Currently, about 60% of industrial customers have electronic meters while the remainder have old induction meters. About 40% of household consumers have electronic meters while the rest still have induction meters. An automated electricity metering system is being installed as part of a USD 798 million project to modernise the national grid, partly financed by IFI loans. In addition, KEGOC plans to reinforce the remote metering systems.

In cities and towns, electricity collection rates are close to 100%. There are tariff collection problems only in remote areas. In 2013, KEGOC's overall collection rate was 98%.

In the gas sector, about 70% of household and 100% of industrial consumers had gas meters installed.

### Technical rules

The Law on Technical Regulation provides the legislative framework for the adoption of international standards. Kazakhstan is a member of the International Standards Organization (ISO) and the Eurasian Standardisation Council (EASC). It applies ISO technical standard 67 for materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries. The National TC 49 based on the Kazakh Institute of Oil and Gas also deals with gas standards. Kazakhstan is not affiliated with the European Committee for Standardization (CEN) and the European Committee for Electrotechnical Standardisation (CENELEC). There is no special technical committee for standardisation in the electricity sector in Kazakhstan that mirrors the CENELEC technical committee as a platform for common standards.

National gas and electricity codes of practice are within the competence of the Committee on Construction, Housing, and Communal Services and Land Management of the Ministry of National Economy.[23]

The principal stakeholders involved in the standardisation process are the Ministry of Oil and Gas, the Kazakh Institute for Standardization and the Kazakh Institute of Oil and Gas. Standards for oil products adopted in 2010 include: safety requirements for gasoline, diesel and fuel oil; safety requirements for lubricants and specialty fluids for motor vehicles; and safety requirements for additives to gasoline.

## REGIONAL MARKETS AND INTERCONNECTIONS

### ELECTRICITY

Kazakhstan's UPS is interconnected and harmonised with the Russian electricity system and the Central Asian Power Grid. The Central Asian Power Grid includes Turkmenistan, Uzbekistan, Tajikistan, Kyrgyzstan and Kazakhstan. Turkmenistan and Uzbekistan disconnected from the grid in 2003 and 2009, respectively, and Uzbekistan's disconnection cut off Tajikistan as well. This disconnection reduced traded volumes considerably. Kazakhstan's electricity trade volumes are negligible.

The majority of cross-border electricity trading in Central Asia is conducted in accordance with inter-governmental agreements. These provide a framework from which bilateral

**23.** Government Decree No. 933, 14 August 2014.

agreements are negotiated. In the past, the energy supplies under these agreements were bartered against delivery of fossil fuel. This practice has been largely abolished in recent years and the parties have adopted a strictly monetary method of payment.

## NATURAL GAS

Kazakhstan imports natural gas from Uzbekistan for industrial and household consumers in the South Kazakhstan oblast (region), and from Turkmenistan for consumers in the Mangystau oblast during periodic repairs of the Okarem-Beyneu transmission pipeline. Kazakhstan exports its own natural gas to Russia only. Kazakhstan transits natural gas from Turkmenistan and Uzbekistan to China through the Kazakh section of the Central Asia-China pipeline. The establishment of co-operation with China is an important step to help diversify Kazakhstan's gas export and transit potential.

# 5.4. SUSTAINABLE DEVELOPMENT

## RENEWABLE ENERGY

The Council for Sustainable Development is the advisory body on sustainable development, assisting the government in national policy development. There is not a specific agency responsible for the implementation of renewable and energy efficiency programmes and measures. The Committee on Renewable Energy Sources was established in 2011 stemming from a co-operation memorandum for renewable energy source development between the UNDP and the Kazakhstan Electricity Association. The main purpose of the committee is to promote state and private renewable energy development, raise the level of association of non-governmental organisations, advocate for the reduction of environmental pollution and ensure energy policy implementation in Kazakhstan.[24]

Renewable energy represents around 1% of the energy mix in Kazakhstan and 9% of electricity output. Renewable potential is much higher, estimated at more than 1 000 TWh per year, including wind potential at 1 300 TWh (not all viable), biomass at 35 TWh of electricity and 44 gigacalories (Gcal) of heat, solar at 30 Bt of reference fuel equivalent, and hydropower potential at 170 TWh (62 TWh technically feasible) (Energy Charter, 2013). In a 2010 economic development plan, the government set a target of 3% of alternative energy sources in the energy mix by 2020.

In May 2013, the government adopted the Green Economy Concept, setting an ambitious target of 50% alternative and renewable energy in the energy mix by 2050. The Action Plan for the Development of Alternative and Renewable Energy for 2013-20 was adopted in January 2013. Under the plan, 31 renewable energy projects are proposed with a capacity of 1 040 MW, including a wind farm of 13-793 MW capacity, solar PV installations of 77 MW capacity and a 170 MW hydropower plant. At the start of 2013, Kazakhstan had 27 proposed renewable energy projects, including wind, solar, biogas and small hydro. Feed-in tariffs for wind and solar energy were instituted in 2014, under the Law on Supporting the Use of Renewable Energy Sources and with support from the EBRD.

The Programme of Wind Power Development to 2030 was prepared in conjunction with the UN Development Programme – Wind Power Market Development Initiative. The goal is to develop wind power to generate 900 GWh by 2015 and 5 TWh by 2024. Other national plans that include a renewable energy component are the Programme for Accelerated Industrial and Innovative Development for 2010–14, and the Programme of Electricity Sector Development for 2010–14 that foresees wind power contributing about 1% of the total energy consumption by 2015 (Energy Charter, 2013). Samruk-Green-Energy, a subsidiary of state-owned Samruk-Energy, is undertaking wind and solar PV power projects. The first phase of a wind project that may be expanded to 300 MW will bring 45 MW on line before the end of 2014 and will supply green electricity to Expo 2017 Future Energy. Three wind power plants (60-300 MW) are expected to be launched in the Almaty area in the period from 2014 to 2018; two of them will be located in the

**24.** www.windenergy.kz/eng/about.

Shelek corridor and another in the Djungar Gates area. In December 2013, Samruk-Green-Energy launched the Kapchagai solar PV station with an installed capacity of 2 MW.[25]

## ENERGY EFFICIENCY

The Law on Energy Saving and Energy Efficiency, in effect since January 2012, provides a legal, regulatory, and institutional framework for energy efficiency and savings measures. In August 2013, the ambitious Energy Efficiency Program 2020 was approved, targeting a 10% reduction in energy intensity (of the economy) by 2015 and a 25% reduction by 2020. The programme incorporates 78 activities with an estimated cost of USD 7.6 billion. Most of the funding is expected to come from investment funds and enterprises (Kazinform, 2013).

Measures include approval of some 3 000 energy standards and energy efficiency categories for buildings and household appliances. Sixteen regional and five sectoral energy saving plans will be undertaken. More than 11 700 entities were listed in the State Energy Registry. More than 2 000 industries will have to undergo energy audits before July 2015. Three energy centres, which will demonstrate and promote efficient technologies, are being built in the cities of Almaty, Aktobe and Astana, the Kazakh capital.

A 2011-20 programme concerned with housing and communal services is undertaking the thermal renovation of houses. During 2014-16, improvements to 892 boilers with capacity from 1 – 100 Gcal/hour are expected to reduce their heat consumption by 30% (Kazinform, 2013).

Two large-scale efficiency projects are ongoing. The 2007-13 Efficiency Improvement Municipal District Heating Systems project has an overall budget of USD 7.8 million and is co-financed by international donors and private sector investment. The 2010-15 Energy Efficient Design and Construction of Residential Buildings has an overall budget of USD 32.5 million, of which USD 4.6 million is co-financed by international donors.

## ENVIRONMENTAL PROTECTION

Kazakhstan’s environment has been affected by past military nuclear testing programmes and industrial and mining activities, and is characterised by land degradation, desertification and water scarcity. Similar problems apply to the entire Central Asia region. In 2010, Kazakhstan established the Green Bridge Partnership Programme, concentrating on sustainable development in the region and beyond. In Central Asia, the programme addresses issues related to energy and water linkages.

Kazakhstan has ratified more than twenty international environmental treaties. They provide a basis for the national environmental regulatory framework, which includes a package of national laws, presidential decrees and government resolutions.

## CLIMATE CHANGE

Kazakhstan’s total greenhouse gas (GHG) emissions were 283.6 Mt in 2012, more than 20% below 1990 levels. Around 85% of the GHG emissions in 2012 are from the energy sector (UNFCCC, 2014). Energy-related $CO_2$ emissions totalled 225.8 Mt in 2012 in Kazakhstan,

**25.** www.samruk-green.kz.

which is 5% lower compared to 1990. The power generation sector accounts for 37.7% of emissions, followed by manufacturing (27.6%), refining and other energy industries (17.6%), transport (6.4%), residential (5.5%) and the commercial and public services sector (5.1%).

Kazakhstan signed and ratified the Kyoto Protocol in 2009. As an Annex B country it did not have an emissions target for the first commitment period. The government has declared its intent to become an Annex I country.

Under the 2009 Copenhagen Accord, Kazakhstan proposed to reduce emissions to 15% below 1990 levels by 2020. Kazakhstan has also proposed a 2050 target of 25% based on 1992 levels. It submitted a provisional 90% target for the second commitment period, meaning that Kazakhstan's average annual GHG emissions during the period 2013-20 would not be more than 90% of 1990 levels.

In 2011, the emissions trading scheme (ETS) (cap and trade mechanism) for Kazakhstan was approved. In 2013, 55% of total GHG emissions were covered under the ETS. The cap in 2013 was 147 million tonnes of carbon dioxide-equivalent ($MtCO_2$-eq). During the second and the third phases (2014-15 and 2016-20) the cap will decrease linearly to the 2020 target. The first two phases included free allowances, while auctioning may be introduced in phase three.[26]

## GAS FLARING

Kazakhstan participates in the World Bank Global Gas Flaring Reduction Initiative. As part of its commitment under the Global Gas Flaring Reduction, the country had set an ambitious target to eliminate gas flaring by 2012, except for technologically inevitable combustion.

Anti-flaring legislation was passed in 2010, specifying that gas that would normally be flared should be used as raw material for the production of petrochemicals, and that licences for oil production will be issued only to companies that agree to capture and use by-product gas. Companies have made efforts and the volume of gas flared was reduced by almost half in the period 2005-09. Based on the information provided by subsoil users, the Ministry of Oil and Gas reported lower volumes of associated gas combustion, from 3.3 bcm in 2006 to around 1 bcm in 2012.

The World Bank, however, reports an increase of gas flaring in Kazakhstan – a 24% increase, from 3.8 bcm in 2010 to 4.7 bcm in 2011. The 2011 data is collected through the US National Oceanic and Atmospheric Administration's satellite detectors with the visible infrared imaging radiometer suite. The data show a worldwide increase of associated gas combustion volumes, from 138 bcm in 2010 to 140 bcm in 2011. The major part of this increase is from the United States, Russia, Kazakhstan and Venezuela.

**26.** http://climateactiontracker.org/countries/developed/kazakhstan.html.

# 5.5. INVESTMENT ATTRACTION

## INVESTMENT CLIMATE

Kazakhstan has made extensive efforts towards a full market economy, allowing privatisation and decentralisation, and the introduction of markets in most sectors. According to the National Bank of Kazakhstan, a favourable business environment and political stability have contributed to a significant inflow of foreign direct investment (FDI) over the past decade, up from USD 4.6 billion in 2001 to USD 20 billion in 2011. Most investments in the energy sector were in hydrocarbon production: more than USD 30 billion in the oil and gas sector since 1993. The main investors in Kazakhstan's economy are the Netherlands, the United States, the United Kingdom, France, Italy, the Russian Federation and China (Energy Charter, 2013).

According to the World Bank's "ease of doing business" indicator, Kazakhstan was ranked 77th among 189 countries in 2014. A high ranking on the ease of doing business index means the regulatory environment is more conducive to the start-up and operation of a firm. This index averages the country's rankings on ten topics, made up of a variety of indicators with equal weight. Kazakhstan's ranking is the third-highest among EECCA countries, behind Georgia and Belarus.

According to the Corruption Perceptions Index prepared by Transparency International, which measures the level of perceived corruption in the public system, Kazakhstan was ranked 126th among 175 countries in 2014 with a score of 29. This is a poor score with regards to perceived corruption in the country, as a score of 100 represents no corruption. Its ranking is comparable of that of the Russian Federation.

Kazakhstan became a member of the Extractive Industries Transparency Initiative (EITI) in 2013 when the EITI Board found it compliant with the requirements. The country will be evaluated again in 2016 on the matters of transparency and an adequate process to ensure regular disclosure of natural resource revenues. Maintaining compliance will require that Kazakhstan meet all requirements in the recently revised EITI Standard (EITI, 2013).

Kazakhstan is also a member of a number of international treaties, including the Customs Union, the Energy Charter Treaty and the Kyoto Protocol, and is actively seeking to become a member of the World Trade Organization. Participation in these agreements creates certain expectations for the government, and contributes to a favourable investment climate.

## INVESTMENT FRAMEWORK

The privatisation process is governed by a 1995 presidential decree, the 1999 Programme of Privatisation and Management of State Property, and a number of other government decrees and resolutions of the Blue Chip Privatisation Programme. The authority for privatisation in Kazakhstan is the Committee on State Property and Privatisation under the Ministry of Finance. By 2001, Kazakhstan had privatised thousands of enterprises;

nevertheless, many large, important enterprises are still owned by the state. According to the Statistical Office, less than half of the large and very large enterprises are fully privatised.

Four major legislative acts govern foreign investment in Kazakhstan. They provide for non-expropriation, currency convertibility, guarantees of legal stability, transparent government procurement and incentives in certain priority sectors. These are the Law on Investment (2003), the Customs Code and the Customs Union Code (2010), the Law on Government Procurement (2007) and the Tax Code (2008).

These four laws provide that investment disputes with state bodies can be settled by negotiation in Kazakhstani courts or through international arbitration. Other dispute resolutions can be addressed in accordance with the laws of the Republic of Kazakhstan, thus restricting recourse to international arbitration in favour of the Kazakhstani judicial system. In December 2004, Kazakhstan adopted a law on international arbitration. The law appears to give broad authority for judicial review of arbitral awards in Kazakhstan. Kazakhstan has been a member of the International Centre for the Settlement of Investment Disputes since 2001.

The Tax Code adopted in 2008 lowered corporate income and value-added taxes (VAT), replaced royalty payments with a mineral extraction tax, and introduced excess profits and rent taxes on the export of crude oil and natural gas. It applies taxes universally and allows only a limited number of exemptions. The code applies an international model of taxation, based on the principles of equity, economic neutrality and simplicity.

The corporate income tax rate was reduced from 30% to 20% in 2006. VAT was reduced gradually from 16% in 2006 to 12% in 2009, where it remains. Kazakhstan reintroduced export duties on oil products in mid-2010. Duty on crude oil was set at USD 20/tonne and was increased to USD 40/tonne as of 1 January 2011. This tax is in addition to the mineral extraction tax and the rent tax.

The 2007 Law on Licensing establishes the legal framework and requires the relevant agency to issue a licence within one month of a company's submission of all required documents. The law simplified procedural requirements for issuing licences, reduced the number of licensed activities from 426 to 349 and introduced a mechanism to help prevent the extension of this list. Experts estimate that overall licensing for the period 2004-09 was reduced threefold. However, licensing remains problematic, particularly for small and medium-sized enterprises. There are pending proposals to reduce the complexity of issuing licences, including those in the oil and gas sector.

Kazakhstan's efforts to create a sound financial system and stable macroeconomic framework have been notable among the former Soviet republics. Of course, Kazakhstan, like most of the world, has been affected by the financial crisis of recent years. In October 2008, the government announced stabilisation plans that included the purchase of 25% ownership of Kazakhstan’s four largest private banks, thereby injecting an additional USD 4 billion into the domestic banking system. International donor organisations and local analysts generally agree that the situation in the banking sector improved significantly.

## INVESTMENT PLANNING

The annual amount of investment required to implement the Green Economy Concept from now until 2050 will be, on average, USD 3-4 billion per year. Investments are expected to peak from 2020 to 2024, equating to 1.8% of GDP, while the average over the period to 2050 is estimated at about 1% of GDP. Most if this investment is expected to be raised from private sources.

The bulk of the investment – about three-quarters of the USD 90 billion – will be directed to natural gas infrastructure, renewables and energy efficiency. Measures to develop the green economy aspects of agriculture, water and waste management will be less demanding in terms of financing.

Established in 2003, the Investment Fund of Kazakhstan (IFK) is to contribute to the implementation of the strategy by attracting investment to promising enterprises. The IFK participates in financing projects targeted at the expansion, reconstruction, and technical upgrade of both existing and newly established enterprises.

The 2013 budget included 46 investment projects in natural gas. This direction is to help achieve the objectives of the 2012 Law on Gas and Gas Supply, including increasing the share of gas in the energy balance, expanding its availability, ensuring reliability of supply to all consumers, and enhancing energy and environmental security.

## References

BGR (German Federal Institute for Geosciences and Natural Resources) (2013), *Energy Study 2013, Reserves, Resources, Availability*, BGR, Hannover.

EIA (US Energy Information Agency) (2015), *Kazakhstan Country Analysis*, www.eia.gov/countries/cab.cfm?fips=KZ (accessed 3 February 2015).

EITI (Extractive Industries Transparency Initiative) (2013), "Kazakhstan accepted as 'EITI Compliant'", 17 October, eiti.org.

Energy Charter Secretariat (2013), *Investment Climate and Market Structure Review in the Energy Sector of Kazakhstan*, Energy Charter Secretariat, Brussels.

EEAS (European External Action Service) (2015), "EU and Kazakhstan initial Enhanced Partnership and Cooperation Agreement", press release, EEAS, 20 January, http://eeas.europa.eu.

EIA (United States Energy Information) (2015), *Overview: Kazakhstan*, EIA website, January, www.eia.gov/countries/cab.cfm?fips=KZ.

IEA (International Energy Agency) (2014a), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

IEA (2014b), *Medium-Term Gas Market Report*, OECD /IEA, Paris.

IEA (2010), *World Energy Outlook*, OECD/IEA, Paris.

Kazakhstan Embassy (2014), "'Kazakhstan-2050' strategy: New political course of the established state", press release, Embassy of the Republic of Kazakhstan in the United States, Washington, DC, www.kazakhembus.com/content/kazakhstan-2050-strategy.

Kazinform (2013), "Kazakh government adopts Energy Efficiency 2020 Program", 27 August, Kazinform, www.inform.kz.

NURIS (Nazarbayev University Research and Innovation System) (2013), "Climate change domestic mitigation policies in Kazakhstan: A technical economic evaluation", presentation at IEA-ETSAP workshop, Paris, 18 June.

Renewable Market Watch (2014), "Kazakhstan solar and wind power markets. New feed-in tariffs and very good opportunities for 2014", Renewable Market Watch, http://renewablemarketwatch.com.

Reuters (2014), "Kazakhstan sticks to 2014 oil output plan despite Tengiz fall", 20 December, Reuters, uk.reuters.com.

UNECE (United Nations Economic Commission for Europe) (2012), *Innovation Performance Review Kazakhstan*, UNECE, New York.

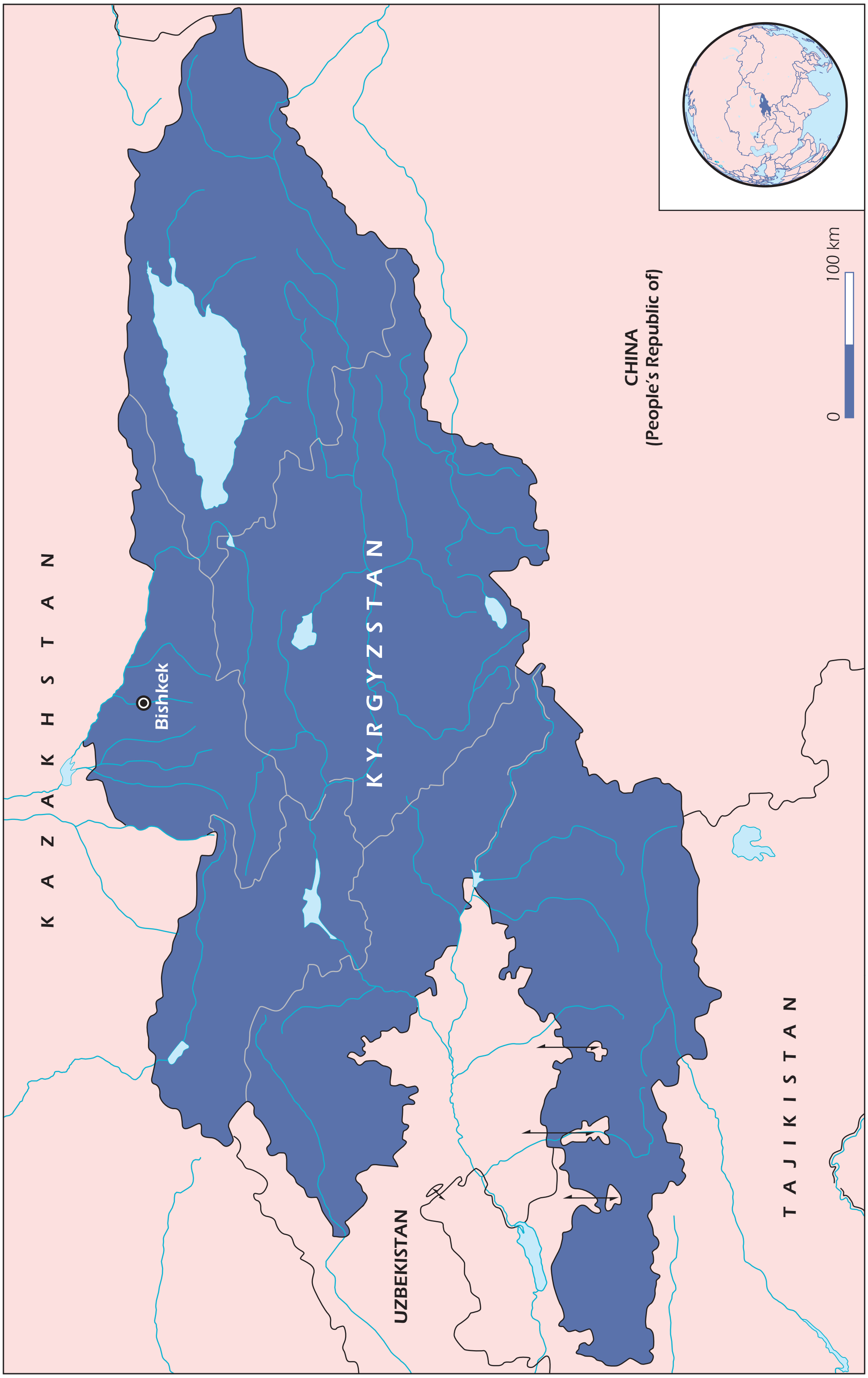
UNFCCC (United Nations Framework Convention on Climate Change) (2014), "GHG country profile: Kazakhstan", UNFCCC website, http://unfccc.int (accessed 17 December 2014).

World Bank (2014a), *Kazakhstan Partnership Program Snapshot*, World Bank Group, Astana.

World Bank (2014b), *Kazakhstan Overview*, World Bank website, www.worldbank.org (accessed 15 December 2014).

KYRGYZSTAN

**Figure 6.1.1** Map of Kyrgyzstan




This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries, and to the name of any territory, city or area.

# 6.1. GENERAL ENERGY POLICY

**Key data (2012)**

**TPES:** 4.1 Mtoe (oil 39.9%, hydro 29.5%, coal 25.3%, natural gas 8.6%, biofuels and waste 0.1%), +70.6% since 2002

**TFC:** 3.5 Mtoe (oil 44.9%, electricity 23.4%, coal 18.6%, heat 7%, natural gas 6%, biofuels and waste 0.1%), +100.5% since 2002

**TFC per sector:** transport 37.6%, residential 21.1%, industry 19.5%, commercial 9.1%, non-specified 12.7%

**Electricity generation:** 15.2 TWh (hydro 93.5%, coal 3.5%, oil 1.2%, natural gas 0.5%), +27.2% since 2002

**Heat generation:** 13.5 PJ (coal 84.9%, natural gas 15.1%), +76.1% since 2002

**Energy intensity:** 0.29 toe/USD 1 000 GDP PPP, +14.4% since 2002

## COUNTRY OVERVIEW

The Republic of Kyrgyzstan (Kyrgyzstan) is located in Central Asia and is bordered by Kazakhstan to the north, Uzbekistan to the west, Tajikistan to the south and China to the east. The country is approximately 200 000 $km^2$ in area, with a population of 5.6 million people. Its most important energy source is hydropower due to plentiful water resources. It also has significant deposits of coal. Its oil and natural gas resources are marginal.

Agriculture is the largest sector of the economy, whose main products are cotton, tobacco, wool and meat. Industrial exports include gold, mercury, uranium, natural gas and electricity. Kyrgyzstan has been a member of the World Trade Organization since 1998.[1] Kyrgyzstan has expressed interested in joining the Customs Union — an economic alliance of former Soviet states — with Russia, Belarus and Kazakhstan. Kyrgyzstan gained independence in 1991 from the former Soviet Union and struggled after the decoupling. Later in the 1990s, significant structural market reforms contributed to economic growth. Real gross domestic production (GDP) (adjusted for purchasing power parity [PPP]) increased 49% from 2002 to reach USD 14.2 billion in 2012. Yet, the poverty level remains around 30%.

Resentment at widespread poverty and ethnic divisions between north and south has fomented unrest. The country's first two post-Soviet presidents were swept from power by popular discontent, most recently in 2010. The social uprising was primarily due to government proposals to increase energy tariffs at the time of rolling outages and poor energy supply. These social uprisings in response to increasing energy tariffs influence government decisions concerning energy policy. The government heavily subsidises energy tariffs, which strains the financial condition of the energy sector and the economy as a whole.

1. www.indexmundi.com/kyrgyzstan/economy_profile.html.

The energy sector represents about 4% of GDP and 16% of industrial production. Hydropower accounts for two-thirds of energy production. Kyrgyzstan produces coal and some oil and gas, but most hydrocarbons are imported. Kyrgyzstan is reliant on imports of oil and gas for more than half of its energy needs, particularly during the winter months when hydropower production is low. As such, regional integration with neighbouring countries is important.

Kyrgyzstan is part of the Central Asian Power Grid, connecting Turkmenistan, Uzbekistan, Kyrgyzstan, Tajikistan and Kazakhstan; however, electricity trade in the grid has fallen substantially since 2009 when Uzbekistan disconnected its supplies. New integration plans include the CASA 1 000 project (Central Asia South Asia Electricity Transmission and Trade Project), which is planning to connect Kyrgyzstan and Tajikistan as electricity-exporting countries to supply electricity to Afghanistan and Iran. The project is in the advanced stages of planning and could be operational by 2020, provided security issues are cleared.

Suffering from lack of investment, Kyrgyzstan's energy sector is characterised by old infrastructure and high losses. They system operates at approximately 50% of its full capacity. The significant deterioration of energy assets and poor sector development result from heavy subsidies, particularly for electricity consumption, which drains resources for system maintenance and investment. Kyrgyzstan sold its natural gas network to Gazprom for USD 1 in 2013, due to its inability to finance the necessary rehabilitation. It is expected that Gazprom will invest USD 600 million in the gas system over 25 years.

Current energy policy focuses on improving energy security through the development of indigenous energy sources (mainly hydro and coal) as well as the rehabilitation and expansion of transmission and distribution networks. Sustainable energy development and energy efficiency improvements are also a priority.

Kyrgyzstan has strengthened ties with the Russian Federation (Russia) and China in the energy sector over the past few years. China and Russia are financing a number of key development projects currently underway. Kyrgyzstan signed the accession treaty for the newly established Russia-led Eurasian Economic Union (EEU) in December 2014 and is expected to become a member in May 2015.

## KEY ENERGY DATA

### SUPPLY

Total primary energy supply (TPES)[2] in Kyrgyzstan was 4.1 million tonnes of oil-equivalent (Mtoe) in 2012. Energy supply increased by 20% in 2011 and a further 25% in 2012, after a decade of subdued growth, mainly due to a 60% increase in oil imports over the same period (Figure 6.1.2). In 2012, coal production increased by 40% compared to 2011, to 1 million tonnes (Mt) of brown coal and 0.2 Mt of hard coal, which also contributed to the strong increase in TPES. Coal production is estimated to have increased to 1.5 Mt by end-2014 (Times of Central Asia, 2014).

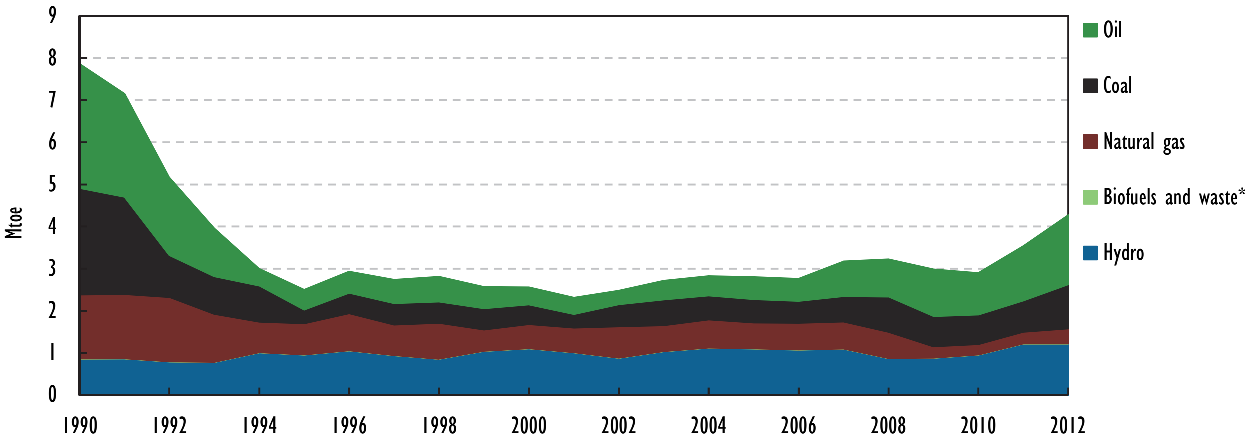
Over the ten years since 2002, TPES has increased by 70.6% in total. This is mostly due to an increase in the supply of oil and coal, despite a fall in natural gas supply. The supply of oil increased five-fold over the ten years, while the coal supply doubled. Conversely, the natural gas supply declined by 52%. Hydropower production also grew by 38.4% over the same period.

**2.** TPES is made up of production + imports - exports - international marine bunkers - international aviation bunkers ± stock changes. This equals the total supply of energy that is consumed domestically, either in transformation (for example, refining) or in final use.

Oil accounted for 40% of TPES in 2012. Hydro was about 30% and coal around 25%. Natural gas provided more than 8% of TPES, with other fuels contributing negligible amounts. Oil has been the dominant fuel in Kyrgyzstan's energy mix since 2007 and imports have significantly increased over the last decade. Prior to 2007, hydropower was the largest source and natural gas accounted for more than a quarter of TPES.

Kyrgyzstan produced 1.7 Mtoe in 2012, about 42% of its TPES, an increase of more than 51% from 2002. In 2012, hydro accounted for 70% of domestic energy production, coal for 24% and oil for 4.5%. Over the decade, hydropower production increased 38% and coal by 147% due to investment in new mines. Oil production increased by just under 4%, while natural gas production declined by 3.7%.

**Figure 6.1.2** TPES, Kyrgyzstan, 1990-2012



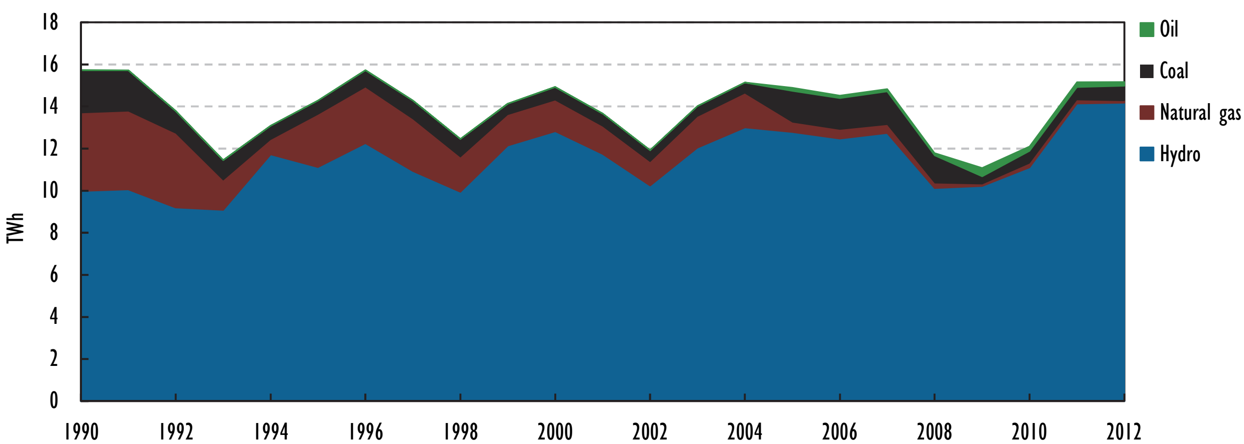

* Negligible.

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## ELECTRICITY GENERATION

Electricity generation in Kyrgyzstan was 15.2 terawatt hours (TWh) in 2012, about 27% higher than in 2002 (Figure 6.1.3). Hydropower supplies more than 93% of electricity, but the seasonality of water availability can mean volatility in output. Coal accounts for about 5% of power generation, oil for 1% and gas for 0.5%.

**Figure 6.1.3** Electricity generation by source, Kyrgyzstan, 1990-2012




Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

Heat production was 13.5 petajoules (PJ) in 2012, with 85% from coal and 15% from gas. While heat generation increased 76% over the decade, the fuel mix has changed notably from 71% gas and 29% coal in 2002.

## IMPORT AND EXPORT

Kyrgyzstan relies on imports of gas, oil and coal for two-thirds of its energy needs. Nearly all natural gas and oil products are imported. Coal imports account for more than half of the total coal supply.

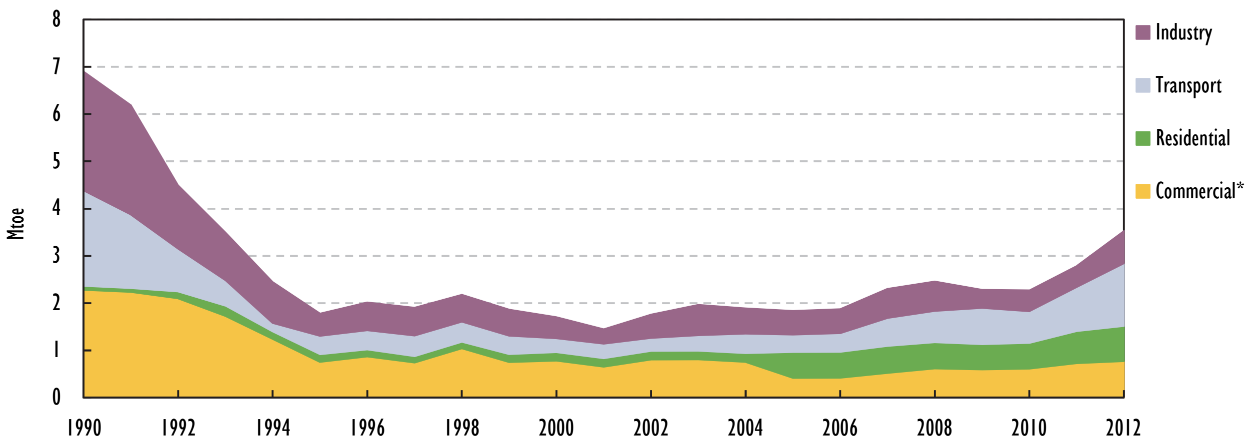
Net imports (excluding electricity trade) amounted to 2.5 Mtoe in 2012, primarily made up of oil products (67.6%), coal (24.7%) and natural gas (13.1%). Net imports of oil products were 1.7 Mtoe in 2012 and have increased by 366% since 2002. Coal imports have grown by 61.7% over the same period to 1.4 Mt in 2012. Gas imports amounted to 268 million cubic metres (mcm) in 2013, 67% lower than in 2002. Gas imports were from Kazakhstan (75%) and Uzbekistan (25%).

Kyrgyzstan interconnects to the Central Asia Power Grid (Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan); however, Uzbekistan disconnected from the grid in 2009, which has reduced electricity trade in the region substantially. Kyrgyzstan trades electricity with China, Tajikistan, Uzbekistan and Kazakhstan, although in smaller volumes than in 2009. Kyrgyzstan is a net exporter of electricity, with 1.8 TWh of exports in 2012 and marginal imports of 177 gigawatt hours (GWh). Export volumes have increased by 73% compared to 2002.

## DEMAND

Transport is the largest consuming sector in Kyrgyzstan and it accounts for 37.6% of total final consumption (TFC).[3] The residential sector accounts for 21.1%, while industry and the commercial sector make up 19.5% and 9.1%, respectively. Approximately 13% of TFC data for Kyrgyzstan is unspecified with regards to a sector (Figure 6.1.4).

**Figure 6.1.4** TFC by sector, Kyrgyzstan, 1990-2012




Note: Reporting on residential consumption changed in 2007.

* *Commercial* includes commercial and public services, agriculture/fishing, forestry and non-specified consumption.

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

**3.** TFC is the final consumption by end users, i.e. in the form of electricity, heat, gas, oil products, etc. TFC excludes fuels used in electricity and heat generation and other energy industries (transformations) such as refining.

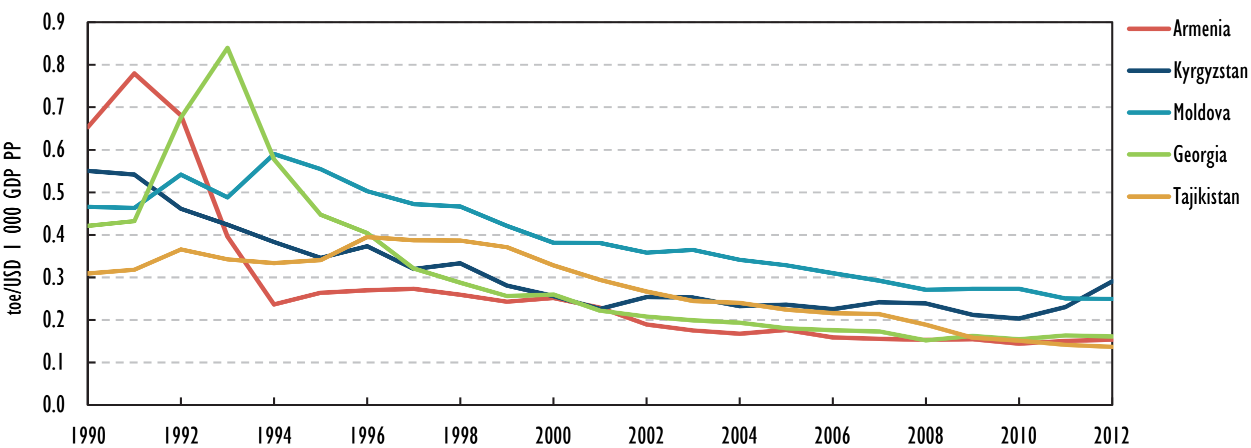
TFC was 3.5 Mtoe in 2012 and has doubled compared to 2002, growing at a faster rate than TPES. This indicates that demand from the above-mentioned sectors has been stronger in comparison to demand from electricity generation. This is particularly true for the transport sector, which increased consumption by 387% over the same period. The transport sector is fuelled by oil, and this increase coincides with an increase in oil products imports.

Oil dominated 44.9% of TFC in 2012. Oil is used in transport and to a certain extent in industry and power generation. Electricity represented 23.4% of TFC in 2012, consumed in households and the commercial sector (including agriculture). Coal accounted for 18.6% of TFC, used primarily in industry for localised electricity generation. Biofuels and waste, and gas, accounted for 7% and 6% of TFC, respectively, and both are mainly consumed in households.

## ENERGY INTENSITY

Kyrgyzstan's energy intensity, measured as the ratio of TPES to real GDP, was 0.29 tonnes of oil-equivalent per USD 1 000 of GDP PPP (toe/USD 1 000 GDP PPP) in 2012. This is the fourth-highest level of intensity among the EECCA countries (Figure 6.1.5).

**Figure 6.1.5** Energy intensity in Kyrgyzstan and other selected EECCA countries, 1990-2012




Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

Energy intensity in Kyrgyzstan has increased by 14.4% since 2002. The increase is unlike other EECCA countries, which have reduced their energy intensity over the same period. Much of the increase in the energy intensity in Kyrgyzstan has been since 2007 due to a surge in coal product and oil imports.

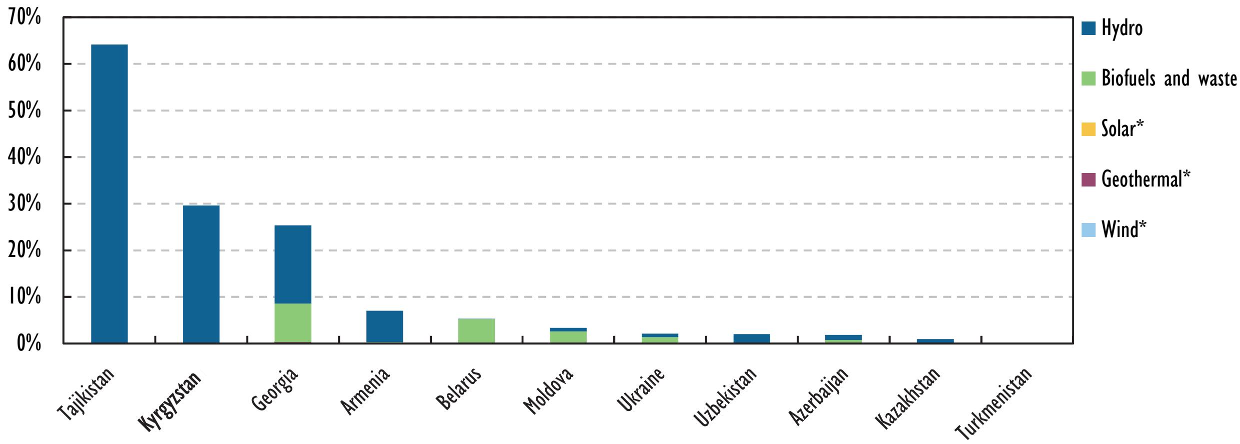
## RENEWABLES

Hydropower is the main source of renewable energy in Kyrgyzstan. It accounts for 29.5% of TPES, 70% of all energy produced in the country and 93.5% of electricity generation. Kyrgyzstan ranks second-highest with regard to the share of renewables in TPES among EECCA countries, behind Tajikistan. Biofuels and waste are also in the energy mix, however negligible at 0.1% of TPES (Figure 6.1.6).

Hydro production was 38.4% higher in 2012 compared to 2002. This is a slower rate of growth compared to TPES and so the share of renewables in TPES has decreased from

36.5% in 2002. In electricity generation, however, hydro has increased a share of the total, from 85.9% in 2002 to 93.5% in 2012, as electricity generation from natural gas has nearly diminished.

**Figure 6.1.6** Renewable energy as a percentage of TPES in Kyrgyzstan and other EECCA countries, 2012




* Negligible.

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## ENERGY DATA SOURCES

The data presented in this report are official energy statistics and balances of the International Energy Agency (IEA) for Kyrgyzstan and other EECCA countries, based on IEA methodology.

In Kyrgyzstan, Nazstatkom (NSC), the national statistics committee, is responsible for the collection, processing and publishing of statistics. The Department of Energy within the committee co-ordinates energy data collection and analysis in co-operation with local and regional administrations.

Energy statistics and balances are in accordance with the methodology approved by the NSC Board, which is in line with existing international standards. Data are available for free on the NSC website. Collected data and energy balances are used to monitor energy sector developments as well as for forecasting trends. NSC data were used to develop the energy strategy to 2025.

The government is working with the INOGATE Programme to improve the quality of its statistics and energy balances. During 2014, surveys for household energy consumption were being developed in consultation with INOGATE Programme recommended experts. There are no announced plans, however, to change the existing energy statistics methodology.

# ENERGY SECTOR DESIGN

## MARKET STRUCTURE

### Electricity and heat

KyrgyzEnergo, which owned and operated the electricity and heat production sector, was restructured and unbundled in 2002. This spawned seven companies that operate in generation, transmission and distribution. While legally unbundled, the companies in effect are still operated by the State Property Fund under the Ministry of Energy and Industry.

State-owned Electric Power Plants (EPP) Joint Stock Company (JSC) is the largest electricity generator. National Electric Grid Company (NESK) JSC is the state-owned transmission system operator (TSO) which operates the national transmission system and the national dispatch service.

The distribution and retail functions of the power sector are still bundled, and distribution system operators (DSOs) are obligated to provide retail service in their territories. There are four electricity DSOs in Kyrgyzstan and one district heating DSO. The existing market is based on bilateral contracts between generators and network operators with regulated retail tariffs. Without competitive prices, there is little incentive for the TSO and the DSOs to improve efficiencies.

According to the government, the KyrgyzEnergo restructuring failed to improve electricity supply conditions and had deleterious effects on the sector's financial condition. Weak regulatory frameworks and the inability to increase tariffs are responsible.

Under the Rehabilitation of the Energy Sector 2013-2014 project supported by the Asian Development Bank (ADB), the Ministry of Energy and Industry announced in September 2014 plans for the development of a Financial Settlements Center for Electricity. The settlement centre would be a new independent institution that will process all energy sales and distribute cash flow based on volumes and set tariffs. It is unclear when the settlement centre would become operational.

In the national energy strategy to 2025, the government states plans to introduce a fully liberalised and competitive electricity market model. The market mechanisms are intended to stimulate competition for a more cost-effective electricity supply as well as competition in the retail market. However, no changes to the existing market structure have been made to date.

### Oil and gas

KyrgyzNefteGaz JSC is the sole upstream oil and gas enterprise in Kyrgyzstan. Its subsidiary Kyrgyz Petroleum Company operates the country's sole refinery.

Before late 2013, KyrgyzGaz, 83% state-owned, operated the natural gas network. In December 2013, Gazprom purchased the network from KyrgyzGaz for USD 1, in exchange for a takeover of USD 38 million of debt and a pledge for USD 600 million worth of investment to improve Kyrgyzstan's gas grid over a 25-year period. The company was renamed Gazprom Kyrgyzstan.

The northern branch of the Bukhara–Tashkent–Bishkek–Almaty pipeline, Kyrgyzstan's main source of gas supply, is operated by a Kyrgyz-Kazakh joint venture, KyrKazGas, and is owned by Gazprom.

### Coal

The coal sector in Kyrgyzstan is managed by a state-owned enterprise, named KyrgyzKomur, which acts an umbrella organisation for 23 smaller private coal companies. Seven other companies engage in seasonal coal production during the autumn-winter periods. KyrgyzKomur was established in August 2012.

## INSTITUTIONAL FRAMEWORK

**The Ministry of Energy and Industry** manages and regulates the energy sector. It is responsible for energy policy and strategy development as well as energy-related legislation. Within the Ministry, the State Property Fund manages the state-owned electricity sector companies.

**The State Department of Regulation of Fuel and Energy** was established in 2009 and is run by the Ministry of Energy and Industry, funded from the state budget. It was the single energy regulator until September 2012, with tariff-setting and licensing functions.

From September 2012, the functions of "anti-monopoly regulation" in the field of energy were transferred to the **anti-monopoly authority**. Under the new rules, all monopolies (including most of the energy sector enterprises) are obliged to negotiate tariffs with the anti-monopoly authority. It is assumed that the companies then apply to the other regulator for the setting of the tariff.

**The Scientific Technical Centre for Energy** develops normative and legislative acts. It is engaged in research on energy efficiency, renewables including small hydropower and other research.

**The Centre on the Problems of Using Renewable Energy Resources (CPURER)** develops strategies for the development of renewables. The Association of Renewable Energy Resources works with CPURER on a programme to develop renewables.

**The Directorate for Small and Medium-size Power Facilities** was created in 2008 to develop small and medium-sized hydro power plants. It is responsible for facilitating their development.

In 2012, the **State Agency for Environmental Protection and Forestry** and the **Coordinating Commission on Climate Change (KKPIK)** were instituted, with responsibility for environmental protection and climate change policies.

## LEGAL FRAMEWORK

Kyrgyzstan's primary energy legislation is based on the following laws: Energy (1996); Electricity (1996); Energy Savings (1998); Special Status of the Toktogul Cascade of Hydropower Station and National High-Voltage Grid (2002); and Renewable Energy (2008). The oil and gas sector is legislated through the Law on Oil and Gas (2004). The Law on Energy Conservation and Energy Efficiency in Buildings was adopted in 2013 to legislate implementation of energy efficiency policies.

Changes to energy policy and strategy during 2012 and 2013 have led to a number of amendments to existing laws. In addition, draft laws related to the energy market and the natural gas market have been developed, but not adopted.

Secondary legislation adopted includes the National Energy Grid Rules (2012) and the Rules of Supply and Use of Natural Gas (2012). In March 2014, the Rules of Using Heat were approved by the government.

## KEY POLICIES

The government prioritises energy security, efficiency and sustainable development in its policy. Improving energy security and efficiency is important due to fluctuations in hydropower production, reliance on imports of hydrocarbons and inefficient old infrastructure with high losses. In 2014, the new energy minister announced a government plan to review the energy sector and to introduce new legislation and stricter measures on tariffs.

After an economic crisis in 2010, the government developed the Medium-term Development Programme for 2012-2014, in order to make immediate changes. Its aim is to improve the budget deficit and reduce poverty. The focus is on reducing corruption, fast-tracking large project implementation, improving state asset management and increasing the effectiveness of government policy for social development and poverty alleviation. In November 2014 the government approved the new Medium-term Development Programme for 2014-2017.

Part of the programme is a medium-term strategy to make tariffs more cost-reflective while providing energy affordability for the most vulnerable customers. These modifications have not been implemented in full. As of mid-2014, consultants from the donor community were developing an alternative cost-reflective tariff methodology, which is expected to be presented to the government by the end of 2014. The decisions under the 2014-17 programme plan for approximate 20% annual increases for residential consumers and 7% annual increases for commercial and industrial customers.

In 2013, the government approved the National Sustainable Development Strategy for 2013-2017 and its programme for political, economic and social development. The national strategy covers five critical sectors: agriculture, energy, transport and communications, supply logistics and mining.

The National Energy Programme and the Strategy for the Fuel and Energy Sector Development for 2008-2010 with an Outlook to 2025 remains the main long-term policy for the energy sector. The programme includes the following targets to 2025:

- ensure reliable electricity and heat supply
- liberalise the electricity market and adopt the necessary legislation to define market rules
- improve energy efficiency of production, transmission and distribution of electricity and heat with modernisation and new technologies
- increase hydro and coal-fired generation capacity, in order to improve the national electricity supply and expand exports
- participate actively in the development of the regional electricity market in the sphere of the EEU.

Energy savings potential in Kyrgyzstan is significant. Estimates are that rehabilitation and modernisation can provide up to 25% savings in electricity and 15% in heat. It is one of the main stated policy directions of the government. In 2008, the government adopted the Energy Saving Programme for 2008-2010, in conjunction with the medium-term tariff policy that was not implemented. The inability to raise tariffs to provide funding for energy efficiency measures has prevented action. By end-2014, a draft Programme of Energy Efficiency to 2017, including energy efficiency policies and measures, was presented to the government for approval.

The government also prioritises regional electricity market development to improve energy security in the country, intensify market competition and increase exports of Kyrgyz electricity. The most significant project on regional integration is the planned CASA 1 000, namely the development of a 500 kV Obi-Garm – Sangtuda – Kunduz – Puli

Khumri – Kabul transmission line connecting Kyrgyzstan, Tajikistan, Afghanistan and Iran. An agreement was signed between the countries in 2012 to build the transmission network, and by the end of 2014 the countries had agreed on tariffs. Security issues in Afghanistan and securing financing remain the largest hurdles at present. The project is expected to cost the Kyrgyz government around USD 200 million (approximately a fifth of the total cost).

Other regional participation includes integration of water and energy resources and their regulation, and sharing water facilities as well as oil and gas pipelines. The Kyrgyz government therefore needs to develop an external energy policy for the challenges involved in the development of an electricity market, and to legislate the necessary changes to the national policy.

The government is also planning to reform the coal sector. Priorities include its privatisation and increasing competition. The government plans to phase out financial support to the sector and to attract private investment. As coal is currently the most cost-effective and readily available fuel, the government is planning to increase production in existing fields from 450 kilotonnes (kt) in 2010 to 3 Mt by 2025. In 2012, coal production was 1.1 Mt. The main objectives of coal sector reform are to:

- privatise the coal sector and create a competitive coal market
- improve working and safety conditions
- improve socio-economic and ecological conditions in coal mining regions.

In the oil and gas sector, policies look to improve the fiscal regime of minerals management and to attract investment to develop new oil and gas fields. Further, they aim to foster competition in domestic oil supply with fair conditions for all market participants. Gazprom Kyrgyzstan, in co-operation with Gazprom, is developing a gas distribution policy to 2030.

Kyrgyzstan ratified the Kyoto Protocol in February 2005. A number of Clean Development Mechanism (CDM) projects have been identified, but not registered yet. In October 2013, the government adopted the Priorities for Adaptation to Climate Change up to 2017 programme, aimed at developing adaptation measures in water, agriculture, health, environmental emergencies, forestry and biodiversity. The respective ministries are expected to submit sectoral adaptation programmes by November 2014. The Programme for Adaptation to Climate Change for 2011-2015 and the implementation plan had been developed by the Ministry of Health, within the World Health Organization framework.

## INVESTMENT

The investment climate in Kyrgyzstan is considered unstable, as the system is heavily bureaucratic with weak legislation and inconsistent regulation. The country is also fighting corruption and is subject to political unrest, which makes it less desirable to potential investors.

The investment situation, however, is slowly improving. Kyrgyzstan has been working with the ADB since 2008 on a programme to improve its investment climate and has simplified bureaucratic procedures by introducing a “one-stop shop” for investors. It has also worked on reforming its tax code and making institutional changes to attract investment. The government has been successful in reducing corruption in the country through international commitments, new legislation and targeted actions.

The existing energy infrastructure is suffering from years of under-investment. The government is planning to implement a number of projects to increase electricity generation, build transmission lines and rehabilitate existing networks by 2025. Approximately USD 13 billion is required to fulfil the plans of the national programme. Some investments from Russia and China have been secured for the development of hydropower plants and transmission lines. To ensure an acceptable level of return to attract a wider set of investors, including those from the private sector, Kyrgyzstan will need to continue reforming its energy sector and tariff policy.

Line D of the Central Asia-China pipeline will cross about 225 km of Kyrgystan's territory and require investment of about USD 1.4 billion. This will turn Kyrgystan into a gas transit country (about 25-30 billion cubic metres [bcm] per year) and provide transit revenues that could be invested in energy projects.

## TECHNOLOGY AND INNOVATION

The government has developed a Science, Technology and Innovation policy to promote the use of modern and efficient technology in the energy sector. Its priorities are to rehabilitate energy facilities, foster scientific and technical capacity and improve international collaboration and sharing of technology. The policy aims to improve the reliability of electricity, heat and gas facilities and networks, reduce transmission and distribution losses and adopt more environmentally friendly technologies. Further, it expects to reform existing legislation and regulation (particularly building codes), institute environmental regulations in the fuel industry and adopt measures to ensure compliance.

Policy measures include targeted technical and innovation programmes, national centres for science and technology, and local technology promotion. Funding will be provided from the state, with an estimated annual budget of around USD 100 000. In addition, policies aim to stimulate increased research and development funding by industry.

Achievements in technology and innovation require adequate skilled labour and expertise. To attract personnel, the government plans to improve the quality of training on a national level and provide systematic training of managerial personnel and technicians in the energy sector.

The Kyrgyz Scientific and Technical Centre "Energy" at the Ministry of Energy and Industry is engaged in energy-related research in conservation and efficiency, and scientific developments in the fields of electricity and fuel resources.

## ASSESSMENT

The review team commends the Kyrgyz government for adopting the overall National Energy Programme for Developing the Fuel and Energy Complex for 2008-10 with an Outlook to 2025. This medium-term development programme spells out the government's vision for maintaining energy security, increasing domestic production and promoting sustainable development. However, six years since its adoption, very little of the policy has been implemented.

The rationale for lack of progress is the issue of social acceptability of energy pricing for electricity and heat at levels that reflect their true costs. It appears that both the government and the consumers assume heat and power to be a public good, which should be provided free. Electricity and heat tariffs therefore remain heavily subsidised. The same notion, however, is not true for other energy commodities such as petroleum, for which consumers pay market prices.

Subsidy reform is highly politicised. This is the case even though the government and the energy industry sector acknowledge that the subsidies are inefficient and often benefit consumers that are capable of paying a market price for electricity and heat. The team observed unanimity across the sector players that implementation of energy policy objectives and securing the required investments cannot be achieved without moving towards more cost-reflective tariffs. Yet, there is a striking reluctance on the part of the government to alter the established tariff structure due to concerns of social unrest.

The review team therefore suggests that the government implement its medium-term tariff-increase policy and continue to increase prices until they are cost-reflective. The objective is to phase out the inefficient power and heat consumer subsidies, while taking into account a detailed social impact/security assessment. Tariffs should reflect the actual cost of the production and delivery of the energy, while providing suitable means for protecting the most vulnerable in the society.

To implement tariff restructuring in the most effective manner, the government should replace the existing energy strategy with an outlook to 2025, with a new energy strategy to the medium-term 2020 and with an outlook to 2050. The new strategy should include a detailed overall assessment of the energy sector, including the use of energy data, together with a comprehensive social impact analysis.

Reforming subsidies and restructuring the tariff system to reflect cost of service could provide sources of investment for the much-neglected energy infrastructure in Kyrgyzstan. The implementation of the heat and electricity tariff restructuring under the extended 2020 strategy would allow for the necessary investment in ageing infrastructure. The greatest challenges lie in improving reliability of supply and the quality of service, while ensuring an energy mix which allows for switching between fuels when necessary. While precise measurements of transmission and distribution losses in electricity, heat and natural gas are not available, they are considered to be between 10% and 50%. These very high loss levels can be improved through the modernisation of networks and systems. Kyrgyzstan, much like its neighbouring countries, is overwhelmed with ageing infrastructure across the whole energy sector. The present state of the energy infrastructure reduces its reliability and causes outages. Investments in efficiency improvements in generation and networks are also fundamental to improve performance in a cost-effective manner.

A new strategy should also include a detailed analysis of possible new developments in the domestic energy sector with a focus on efficiency improvements, indigenous resource production and alternative fuel options. The potential in Kyrgyzstan for efficiency gains in both energy demand and supply is unclear and should be assessed. It should also include an analysis of the full potential for renewable and alternative energy sources, including a clear understanding of associated cost and available incentives/subsidies. Kyrgyzstan should evaluate its indigenous coal potential for use in combined heat and power generation and, if economical, it should develop it in a sustainable manner with clean coal technologies.

As district heating is one of least efficient energy systems in the country due to ageing infrastructure, it is important that the government consider restructuring the sector with more use of alternative fuels and efficient technologies. This includes the use of co-generation boilers, installation of individual meters and the replacement of ageing pipeline networks. Restructuring district heating should be done in tandem with the modernisation and expansion of the electricity system, with the cost of both approaches reflected in consumer tariffs.

As part of the implementation of its national strategy (existing and new ones), it is important to establish an energy regulatory authority that is independent and free from any political influence. A regulatory authority should have responsibility for overseeing the energy sector's functioning and the planned market, setting price controls and protecting consumers. Consumers should also be represented in order to protect consumer rights.

Since electricity, heat and natural gas tariff increases are necessary to rehabilitate the energy supply and delivery system and to bring on new facilities to improve reliability, efficiency and quality of energy supply, consumers need to gain a better understanding of the real costs of electricity and value it as a commodity. The review team commends the government for its education and outreach initiative to better inform the public through various media channels. This will help gain social acceptance of reasonable tariff increases accompanied by improvements in service.

## RECOMMENDATIONS

*The government of Kyrgyzstan should:*

- ☐ *Use the National Energy Programme for Developing Kyrgyzstan's Fuel and Energy Complex 2008-10 with the Outlook to 2025 as a foundation to develop a comprehensive energy strategy to 2020 and with an outlook to 2050. The energy strategy should include:*
  - *an assessment of the overall energy sector, together with a comprehensive social impact analysis*
  - *a roadmap for raising heat and electricity tariffs to cost-recovery levels, including a target date for phasing out subsidies, while maintaining social support (non-monetary) to the most vulnerable in the population*
  - *a power system rehabilitation plan and new infrastructure development based on energy security concerns, considering clean technologies and sustainable development. This should include an estimate of the necessary investment requirements and possible approaches to attract investment*
  - *an assessment of the potential for energy efficiency gains including the potential funding measures and fiscal incentives*
  - *an assessment of renewable and alternative energy resource opportunities.*
- ☐ *Develop a comprehensive rate structure for electricity and heat tariffs, taking advantage of local as well as international financial institution expertise. The tariffs should include an announced schedule for the phase-out of subsidies, with the view of reaching fully cost-reflective tariffs that allow for planned capital investment. The phase-out of consumer subsidies should be done on a basis of affordability, with the most vulnerable customers receiving the most support until the phase-out is complete.*
- ☐ *Determine the separate responsibilities of the anti-monopoly authority and the energy regulator as soon as possible to make sure they do not overlap, in order to reduce doubling up of work and to ensure clarity in duties and the direction of necessary work by each organisation. Make the energy regulator independent from the Ministry of Energy and Industry.*

- ☐ *Consider incentive schemes for energy efficiency improvements on both demand and supply sides. In demand management, this includes rehabilitation of older buildings and setting strict new building standards. On the supply side, energy efficiency improvements include incentives on investment in modern technologies and automated systems, rehabilitation of infrastructure and investment in grid access for new renewable generation.*
- ☐ *Establish an energy efficiency and renewable energy agency to implement the energy efficiency and renewable energy policies and measures.*
- ☐ *Raise public awareness on the real cost of electricity and the possible increase in tariffs, and on energy savings and energy efficiency gains which can help to offset electricity price increases, to combat public sensitivity on the issue of tariffs.*

# 6.2. ENERGY SECURITY

## RESOURCE ENDOWMENT

Kyrgyzstan holds marginal oil and gas resources and substantial coal resources. Recoverable oil reserves are estimated at 5 Mt, with 10 Mt of resources. Gas reserves are estimated at 6 bcm and 20 bcm of resources. Hard coal reserves amount to 971 Mt, with 27 528 Mt of resources. Kyrgyzstan ranks fifteenth-highest in the world regarding hard coal resources (BGR, 2013). According to government estimates, coal reserves are much larger, at 6 400 Mt, including 5 400 Mt brown coal and 1 000 Mt hard coal.

Most oil and gas deposits that have been exploited for more than 70 years have produced approximately 70% of economically viable capacity. Newer oil wells from 1992 have a depreciation of 30%. The production of oil and gas has declined compared to the early 1990s due to depleting resources and aged equipment. In the future, the government plans to exploit new wells, with potential recognised in the Ferghana Valley, the Alai Valley, the Naryn basin, the Issyk-Kul basin and the East of the Chuy basin.

Kyrgyzstan's coal resources are much higher than its reserves, as the majority is difficult to exploit. The country has approximately 70 coal deposits. However, the government is planning to increase coal mining considerably, from 450 kt in 2010 to 3 Mt in 2025. In 2012, coal production was 1.1 Mt. The growth will come from a 30% increase in the existing mines in Kara-Keche, Besh-Burhan, Žergalan, Sulukta and Tash-Kumyr.

The hydropower potential of the rivers in Kyrgyzstan is approximately ten times more than what is currently utilised.

## ENERGY SECURITY AND DIVERSIFICATION

Kyrgyzstan's energy system is highly challenged and faces supply security threats. The network is old and inefficient with high loss rates. Similarly, electricity production is subject to the seasonal and weather-dependent nature of its hydro-based system. Electricity reliability is lower during the winter months due to less water inflows and high demand. As well, the demand centres are in the north, while more than 80% of hydro capacity is in the south. Old transmission connections are a further handicap.

Electricity supply is also constrained by regional water-energy trade-offs. After the collapse of the Soviet Union, the Central Asian countries bartered for the exchange of fuel, electricity and water resources, which led to disagreements among countries that did not cease until 2003. Nonetheless, lengthy annual negotiations are still common on seasonal water flows, electricity export quantities and prices, and winter fuel prices.

The government is mainly focused on diversifying energy sources and increasing domestic production, mainly for hydropower. In addition, a number of rehabilitation projects for existing thermal power plants are under consideration. According to the National Sustainable Development Strategy for 2013-2017, measures to improve the security of supply include:

- reconstruction of the Bishkek TEC-1 plant to increase capacity to 400 megawatts (MW)

- reconstruction of the heating networks in Bishkek and Osh
- reconstruction of substations
- enhanced regional and international co-operation
- improved power regulation and water management at the Toktogul reservoir.

The government has concrete targets, yet their implementation remains a challenge due to the inadequate finances of the energy sector. The unsustainable tariff subsidy regime imposes a significant financial burden and results in a serious lag in the modernisation and expansion of the electricity, heat and gas systems. Growing demand and insufficient investment do not portend well for increased energy security in Kyrgyzstan.

In 2014, the government approved a feasibility study for a share of the Central Asia-China gas pipeline network, to transit gas from Turkmenistan to China via Tajikistan and Kyrgyzstan. Construction on the Tajikistan pipeline began in 2014 and is likely to begin in 2015 for Kyrgyzstan's share of the network. Once operational, depending on contract agreements, the new pipeline could diversify gas imports for the country and increase competition.

## ENERGY INFRASTRUCTURE AND INVESTMENTS

### ELECTRICITY AND HEAT

Electricity generation capacity in Kyrgyzstan was 3.7 gigawatts (GW) in 2013 with 15 hydropower plants (3 GW) and two combined heat and power (CHP) plants (0.7 GW). The electricity transmission network is more than 70 000 kilometres (km) long, including 546 km of 500 kilovolt (kV) lines, 1 714 km of 220 kV lines, 4 380 km of 110 kV lines, and some 490 transformer substations. About 80% of the hydro capacity is located in the south, connected by a 500 kV line to the northern regions that account for 60% of electricity consumption.

Four cities have district heating: Bishkek (85% of households), Osh (35-40%), Kyzyl-Kiya (60%) and Karakol (26%). Electric boilers are the main heat source for the district systems, with approximately 3 000 boilers in operation.

Demand for electricity and heat is increasing, but the existing systems are old and inefficient. Investment in rehabilitation and expansion is inadequate.

New electricity infrastructure in the national energy strategy is almost exclusively hydropower, ranging from large and medium-sized to 100 small plants. This is largely because the return on investment from hydroelectric resources in Kyrgyzstan significantly exceeds the return from other renewable sources. The national strategy also calls for the wider use of solar, biogas and wind power, though no targets or projects are specified.

Two hydropower sites are under construction and expected to come on line by 2019: Kambarata 2 (360 MW) and the Upper Naryn (180 MW). These are part of larger projects, agreed between the governments of Kyrgyzstan and Russia in 2012. The agreement includes the construction of the Upper Naryn dam (Naryn 1, 2 and 3) with a capacity of 180 MW, the Kambarata dam with a capacity of 2.3 GW, and the Akbulunskoy thermal power plant (TPP) with a capacity of 200 MW (Table 6.2.1). In order to integrate the new capacity, a 500/220 kV substation was built in 2013 and the 500 kV Datka-Kemin line connecting the north to the south is under construction. In 2014, construction of two 500 kV substations, Datk and Kemin, was completed.

The electricity distribution network also requires significant investment to decrease losses and improve reliability. In 2012, the Kyrgyz government approved legislation for the Rehabilitation of the Energy Sector 2013-2014 project for the rehabilitation of the electricity network, with a loan from the ADB. Project costs of USD 62 million are to be financed with USD 55 million from the ADB (a grant of USD 40 million and a loan of USD 15 million) and USD 7 billion from the government.

**Table 6.2.1** Forecast generating capacity by 2025, Kyrgyzstan

| Power plant | Construction period | 2010 | 2015 | 2020 | 2025 | Total end capacity (MW) |
|---|---|---|---|---|---|---|
| Kambarata HPP 1 & 2 | 2007-23 | 120 | 240 | 475 | 1 425 | 2 260 |
| The Upper Naryn HPP 1, 2 & 3 | 2012-20 | x | x | 180 | x | 180 |
| Akbulunskoy TPP | 2016-24 | x | x | x | 200 | 200 |
| **Total** | | **120** | **240** | **655** | **1 625** | **2 640** |

Note: x = not applicable.

Source: The Ministry of Energy and Industry.

The Project Strengthening of Power in Bishkek and Osh was also approved in 2012, including the rehabilitation of the Bishkek CHP. The expected cost of USD 28 million is to be fully financed by the Islamic Development Bank with a three-year implementation period.

A 500 kV Obi-Garm-Sangtuda-Kunduz-Puli Khumri-Kabul transmission line is planned under the CASA 1 000 project. CASA 1 000 represents a 1 200 km high-voltage power line grid connecting Kyrgyzstan, Tajikistan, Afghanistan and Pakistan. The project was approved in 2012 by all member countries and will likely begin construction in the next five years. The two exporting countries, Kyrgyzstan and Tajikistan, will generate foreign exchange earnings as a result of the export of surplus summer electricity. The project will also provide the connection of power between the two countries, which will improve the reliability of the high-voltage electricity transmission network in the region. For Afghanistan, the project will provide a source of additional net summer electricity that can be used to meet domestic needs and/or be re-exported to Pakistan. Afghanistan is also guaranteed a significant income from the transit of electricity. For Pakistan, the lack of electricity is a major constraint to economic growth.

## OIL AND NATURAL GAS

Natural gas is imported via the Bukhara-Tashkent-Bishkek-Almaty pipeline in the north, which transits from Uzbekistan to the main Kazakhstan population centre. The supply to Kyrgyzstan is approximately 900 mcm per year.

The gas infrastructure is more than 35 years old and is highly inefficient. It needs significant refurbishment. The gas network includes 709 km of transmission lines, 591 km of average pressure lines, 1 624 km of low-pressure lines, 203 gas distribution points, and 717 control and gas distribution stations.

In December 2013, Kyrgyzstan sold its gas network to Russia's Gazprom for USD 1 in exchange for a takeover of USD 38 million of debt and a pledge to invest USD 600 million to improve Kyrgyzstan's gas network over a 25-year period.

During 2012, Kyrgyzstan agreed with China to construct a part of the 2 000 km gas pipeline network in Kyrgyzstan. The Central Asia-China pipeline network is from Turkmenistan to China, and includes Lines A, B and C via Uzbekistan and Kazakhstan (first launched in 2009). In May 2014, Kyrgyzstan approved a feasibility study on the Kyrgyzstan section of Line D.

Talks began during 2013 for the construction of an oil pipeline from Kazakhstan to Kyrgyzstan.

## COAL

The government plans to significantly increase coal mining from 450 kt in 2010 to 3 Mt by 2025 with a 30% increase from existing mines. During 2012, coal production totalled 1.1 Mt. If production from the Kara-Keche coal mine is increased, this will ensure enough coal for the proposed construction of the Kara-Kečinskoj TPP to supply base load power in the north. Another coal-fired plant is proposed for Kara-Kečinskuû with a 1.2 GW capacity that would require at least 2.5 Mt of coal per year. The government is looking for investors to undertake the Kara-Kečinskuû project and is in talks with Chinese investors.

## SYSTEM RELIABILITY

Electricity, heat and natural gas system reliability in Kyrgyzstan is poor. Outages during the winter months (due to low water flow) are common and the highly inefficient transmission and distribution systems strain to meet demand during particularly cold winters. Plus, energy theft is common.

Much of the poor reliability is due to insufficient investment stemming from highly subsidised tariffs that do not cover the costs of operation. Financing is needed to refurbish and replace ageing equipment and infrastructure. Typically 30% of annual rehabilitation programmes cannot be implemented for lack of financing. There is no comprehensive preventive maintenance strategy in place.

In the electricity sector, technical losses in the transmission system are around 6-7% and about 15-17% in the distribution grids. Theft accounts for 8%. These losses amount to about 30% total loss in the electricity network. In the heat sector, losses are up to 25% due to aged infrastructure, with some parts of the network experiencing losses up to 45%. In the gas sector, actual losses are around 20% while the allowable level is 10% for gas distribution and 1.5% for transmission networks.

Kyrgyzstan has no effective system of reporting losses and outages. The INOGATE Programme's 'Enhancement of Environmental Protection Measures in the Oil and Gas Industry of Central Asia' (EPMOGI) project prepared proposals for such a system. However, they have not been adopted due to lack of funding.

The importance of enhancing the security and reliability of the grid-based portions of the energy sector is reflected in the energy policies envisaged by the National Energy Programme and Strategy for Fuel and Energy Sector Development 2010-2025. Yet because of the lack of financing, the government efforts can only manage the slow rehabilitation of existing infrastructure that can be supported by marginal tariff increases, equivalent to a few kilometres of line rehabilitation per year.

Some remedial measures that have been put in place in the past few years with donor support include programmes for raising public awareness and installing electricity meters with pre-paid smart cards.

## EMERGENCY RESPONSE

Emergency response policy for energy supply is part of wider national emergency procedures, managed by other public authorities outside of the Ministry of Energy.

Under the legal requirements, industrial users are required to have a backup fuel (usually diesel) in the case of power and gas supply stoppages.

# 6.3. MARKET CONVERGENCE

## NATIONAL MARKET STRUCTURE

### ELECTRICITY AND HEAT

State-owned KyrgyzEnergo, which owns and operates the electricity and heat production sector, was restructured and unbundled in 2002. This spawned seven companies that operate in generation, transmission and distribution. While legally unbundled, the companies effectively are operated by the State Property Fund under the Ministry of Energy and Industry. State-owned EPP JSC is the largest electricity generator.

NESK JSC is the state-owned TSO which operates the national transmission system and the national dispatch service. The distribution and retail functions of the power sector are still bundled and DSOs are obligated to provide retail service in their territories. The DSOs are joint stock companies, 83% owned by the state (through the State Property Fund) and 17% by private investors.

There are four electricity DSOs in Kyrgyzstan and one district heating DSO:

- Sever Electro serves Bishkek and the Chuy region, accounting for 42% of distribution.
- Vostok Electro serves the Issik-Kul and Naryn regions and accounts for 18% of distribution.
- Osh Electro serves the city of Osh, the Osh and Batken regions and accounts for 26% of distribution.
- Djalal-Abad Electro serves the Djalal-Abad region and accounts for 14% of distribution.
- BishkekTeploSet is the district heating DSO.

Kyrgyzstan has not implemented a transparent system of third-party access to the transmission and distribution networks. The Law on Electricity provides for third-party access to the network based on relevant licences issued by the energy regulator, but in the absence of relevant secondary legislation there are no third parties operating.

According to the government, the KyrgyzEnergo restructuring failed to improve electricity supply conditions and had deleterious effects on the sector’s financial condition. Weak regulatory frameworks and the inability to increase tariffs are responsible.

Under the Rehabilitation of the Energy Sector 2013-2014 project supported by the ADB, the Ministry of Energy and Industry announced in September 2014 plans for the development of a Financial Settlements Center for Electricity. The settlement centre would be a new independent institution that will process all energy sales and distribute cash flow based on volumes and set tariffs. It is unclear when the settlement centre would become operational.

Based on the national energy strategy to 2025, the government plans to introduce a fully liberalised and competitive electricity market model. The market mechanisms are intended to stimulate competition for a more cost-effective electricity supply as well as competition in the retail market. However, no concrete plans for such market development have been announced.

## OIL AND NATURAL GAS

KyrgyzNefteGaz Open Joint Stock Company (OJSC) is the sole upstream oil and gas enterprise in Kyrgyzstan. The company also refines oil through its subsidiary Kyrgyz Petroleum Company Closed Joint Stock Company (CJSC) in a single refinery in Bishkek.

Gazprom is the owner and operator of the gas transmission and distribution system in Kyrgyzstan through a subsidiary, Gazprom Kyrgyzstan. Gazprom purchased the network in December 2013 from KyrgyzGaz for USD 1, in exchange for a takeover of USD 38 million of debt and a pledge for USD 600 million worth of investment to improve Kyrgyzstan's gas grid over a period of 25 years. Before December 2013, KyrgyzGaz owned and operated the network with more than 83% in government ownership.

The branch of the Bukhara–Tashkent–Bishkek–Almaty pipeline that is in Kyrgyzstan is operated by a Kyrgyz-Kazakh joint venture, KyrKazGas, and owned by Gazprom.

Amendments to the Law on Oil and Gas in October 2012 allow for third-party access.

## COAL

The coal industry includes 23 private coal companies under the management of the state-owned enterprise KyrgyzKomur. Another seven smaller companies engage in seasonal coal production.

## REGULATORY FRAMEWORK

Energy regulation in Kyrgyzstan is split between two agencies: the State Department of Regulation of the Fuel and Energy Complex, and the anti-monopoly authority. It is not clear which authority holds which responsibilities, and they frequently overlap.

Established in 2009, the State Department of Regulation of Fuel and Energy is run by the Ministry of Energy and Industry with state budget funding. It was the single energy regulator until September 2012 with tariff-setting and licensing functions. From September 2012, the functions of "anti-monopoly regulation" for the energy sector were transferred to the anti-monopoly authority. Under the new rules, all monopolies (including most of the energy enterprises) are obliged to negotiate tariffs with the anti-monopoly authority. Presumably, companies then apply to the other regulator for tariff-setting.

### Tariffs

The tariff policy is developed by the Ministry of Energy and Industry, while the methodology for electricity tariffs is established by the Ministry of Finance. All tariffs are set by the regulator on an annual basis, after they have been agreed with the anti-monopoly authority (only for monopolies in the energy sector). Gazprom Kyrgyzstan negotiates gas distribution prices with the State Department of Fuel and Energy Complex.

Electricity and heat tariffs in Kyrgyzstan are below cost and subsidised by the government. While the government understands the implications of years of operating at a loss, there are no concrete plans to increase the tariffs to a cost-recovery level due to concerns of public resistance and heightened social tensions. According to the Energy Regulators Regional Association, in the first half of 2014 the average residential electricity tariff was 0.023 USD/kWh while the non-residential average was 0.012 USD/kWh.[4]

**4.** www.erranet.org/.

Gas prices decreased during 2014 to 0.17 USD/cubic metre ($m^3$) in October 2014 (down from 0.27 USD/$m^3$ in 2013) as the import price fell from USD 224 per 1 000 $m^3$ to USD 165 per 1 000 $m^3$ during the year.

Under the Medium-term Development Programme for 2012-14 and the new Medium-term Development Programme for 2014-17, the medium-term tariff strategy aims to increase tariffs to cost-reflective levels progressively, while providing energy affordability for the most vulnerable customers. However, tariff increases have not been implemented in full from the first programme and the government is planning to increase electricity tariffs by 20% per year to 2017 for residential consumers and by 7% per year for commercial and industrial customers. Heat tariffs will follow a similar pattern, with 20% annual increases for residential customers and 8% annual increases for commercial and industrial customers. The donor community is also consulting the government on another possible cost-reflective methodology for tariffs. Table 6.3.1 indicates the new electricity tariff policy from November 2014, while Table 6.3.2 indicates heat tariffs.

**Table 6.3.1** Electricity tariff breakdown and planned increases, USD/kWh, Kyrgyzstan, November 2014

| Consumer groups | June 2014 | 1 July 2014 | 1 April 2015 | 1 April 2016 | 1 April 2017 |
|---|---|---|---|---|---|
| Subscribers with 1-phase input | 0.012 | 0.012 | 0.014 | 0.017 | 0.02 |
| % change | | 0% | 20% | 20% | 20% |
| Subscribers with 3-phase input | 0.017 | 0.02 | 0.022 | 0.023 | 0.25 |
| % change | | 71.8% | 7.0% | 7.0% | 7.0% |
| Agriculture | 0.023 | 0.023 | 0.025 | 0.026 | 0.028 |
| % change | | 4% | 7% | 7% | 7% |
| Industry | 0.023 | 0.023 | 0.025 | 0.026 | 0.028 |
| % change | | 4% | 7% | 7% | 7% |
| Other consumers | 0.023 | 0.023 | 0.025 | 0.026 | 0.028 |
| % change | | 4% | 7% | 7% | 7% |
| Pumping stations | 0.012 | 0.012 | 0.013 | 0.014 | 0.015 |
| % change | | 4% | 7% | 7% | 7% |

Source: The Ministry of Energy and Industry.

**Table 6.3.2** Heat tariff breakdown and planned increases, USD/Gcal, Kyrgyzstan, November 2014

| Consumer groups | 1 July 2014 | 1 April 2015 | 1 April 2016 | 1 April 2017 |
|---|---|---|---|---|
| Residential (32$m^2$ per person + 14$m^2$ per additional person) | 15.3 | 19 | 22.9 | 27 |
| % change | 28.3% | 23.6% | 20.4% | 18.2% |
| Residential excess usage | 26 | 28.3 | 30.7 | 33.1 |
| % change | 117.8% | 8.8% | 8.1% | 8% |
| Industry | 26 | 28.3 | 30.7 | 33.1 |
| % change | 67.5% | 8.8% | 8.1% | 8% |
| Other consumers | 26 | 28.3 | 30.7 | 33.1 |
| % change | 67.5% | 8.8% | 8.1% | 8% |

Source: The Ministry of Energy and Industry.

In the electricity sector, 100% of industrial and household consumers are supplied with three-phase meters. Current efforts of international donors are directed towards the supply of hardware and software systems for better billing, collection systems, management of arrears and associated training and business advisory services to the four distribution companies. Presently only about 5% of customers have smart meters.

In district heating, however, only around 10% of customers are metered. Bishkek heat network operator BishkekTeploSet is in the process of installing meters to its customers. The Rules on Using Heat (March 2014) establish a strict payment deadline for district heating no later than 10 days from the receipt of an invoice. Full rehabilitation of the heating system, providing access to heat to all customers and employing fully cost-recovery tariffs for heat supply is envisaged only by 2050.

In the gas sector, all household and commercial customers are metered.

The collection rate for electricity and gas tariffs was 97.7% at the end of 2012. However, a major problem for Gazprom Kyrgyzstan was the collection of substantial arrears accumulated by industrial, residential and commercial customers for the natural gas consumed in preceding years. This debt was assumed by Gazprom with the sale of KyrgyzGaz.

Tariffs for all consumer categories are published while the relevant methodologies are not made public.

The Law on Renewable Energy, amended in 2012, provides for feed-in tariffs for individual renewable energy technologies. The tariffs cover investment costs for up to eight years. However, secondary laws that define the tariff methodology remain under development, so a feed-in tariff is not yet in place.

In November 2014, the government introduced new rules for the regulation of coal prices, which were unregulated in the past. Under the new legislation, prices would be regulated for a period up to 90 days.[5] The anti-monopoly authority would regulate the prices. This decision comes after the prices increased by USD 112.89 per tonne to USD 191.04 per tonne in the Batken region during September 2014 (Central Asia Online, 2014).

## Technical rules

Within the Law on the Basis of Technical Regulation, the government approved the Program of Development of Technical Regulations for 2012-13 and the implementation programme. Technical rules in electricity include technical standards for electricity safety and electromagnetic compatibility. Further drafts of technical rules for electricity installation safety and operations safety have been prepared and submitted to relevant public authorities for their consideration and approval.

In the gas sector, the National Institute of Standards and Metrology (NISM) provides the normative framework for standards and other harmonisation deliverables.

The principal stakeholders involved in the standardisation process include the Ministry of Energy and Industry, the NISM and the gas and electricity companies. National gas and electricity codes of practice are within the competence of the State Construction Authority.

Kyrgyzstan is a correspondent member of the ISO (International Standards Organisation) but not an affiliate of CEN/CENELEC (European Committee for Electrotechnical Standardisation). Kyrgyzstan is also a member of COOMET (Euro-Asian Cooperation of National Metrological Institutions) and an active member of EASC (EuroAsian Council for Standardisation).

**5.** http://cis-legislation.com/docs_list.fwx?countryid=006&page=1.

## REGIONAL MARKETS AND INTERCONNECTIONS

### ELECTRICITY

Kyrgyzstan's electricity grid is interconnected with the Central Asia Power Grid (Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan). However, since Turkmenistan's disconnection from the grid in 2003 and particularly since Uzbekistan's disconnection in 2009, trade volumes in the system have fallen substantially. Uzbekistan accounted for approximately half of the electricity supply to the interconnected grid. While volumes of trade are much lower, Kyrgyzstan still has cross-border electricity trade with Kazakhstan, Russia (export), Uzbekistan (export and import) and Tajikistan (import for the first time in 2013).

Under the framework of the Central Asia Power Grid, Kyrgyzstan's hydropower system was designed not only to produce electricity, but also to provide major ancillary services, frequency regulation and operating reserves. However, due to the political situation this system is currently not in operation.

Regional integration is one of the major energy policy directions in Kyrgyzstan. Kyrgyzstan supports the reinstatement of the Kyrgyzstan-Uzbekistan-Tajikistan-Kazakhstan exchange to improve integration and reduce the burden and inefficiency of bilateral contracts with each of the three countries. Agreements have been drawn up in the past, including the Concept of the Efficient Use of Water and Energy Resources in Central Asia for EurAsEC Member States[6] from August 2006, but none have been fruitful, mainly due to political friction between some member states.

During 2014, Kyrgyzstan and Kazakhstan agreed to increase electricity imports from Kazakhstan to Kyrgyzstan during the winter of 2014-15, for the exchange of the water required to generate the imported electricity. Kyrgyzstan is increasing electricity imports from Kazakhstan to deal with potential shortages in the winter months and to cover for the lack of gas after Uzbekistan stopped gas exports to Kyrgyzstan in the first half of 2014 (Oil Price, 2014).

The most relevant proposal for regional integration for Tajikistan is the CASA 1 000 project, a high-voltage power line connecting Kyrgyzstan, Tajikistan, Afghanistan and Pakistan. A feasibility study was approved in 2012, tariffs were agreed between parties in 2014 and the project will likely start construction in the next few years. Kyrgyzstan and Tajikistan, the two exporting countries, will generate foreign exchange earnings for the export of surplus summer electricity. Afghanistan will import electricity during the summer months when its shortages are most prominent, and transit some electricity to Pakistan, which also requires more electricity in the summer.

### GAS

Kyrgyzstan imports gas from Kazakhstan (75%) and Uzbekistan (25%). Imports are carried out through bilateral contracts. Kyrgyzstan also provides for the transit of Uzbek gas to southern Kazakhstan by a transit pipeline (operated by KyrKazGaz). However, in the first half of 2014, Uzbekistan ceased gas supplies to Kyrgyzstan over contract disagreements (Oil Price, 2014).

During 2014, Kyrgyzstan approved the feasibility study for a new gas pipeline to transit gas from Turkmenistan to China via Tajikistan and Kyrgyzstan, Line D of the Central Asia-

**6.** Member states include Belarus, Kazakhstan, Kyrgyzstan, Russia, Tajikistan and Uzbekistan.

China gas pipeline network. Construction of Tajikistan's share of the pipeline began in 2014 and the construction of Kyrgyzstan's share is expected in the near future. Kyrgyzstan will become a transit country for approximately 25-30 bcm of gas per year and collect gas transit revenues. This will also potentially open the market for diverse sources of gas imports, depending on contract agreements with the suppliers and purchasers.

# 6.4. SUSTAINABLE DEVELOPMENT

## RENEWABLE ENERGY

Kyrgyzstan has large untapped renewable energy potential. The existing renewable energy developments are large hydropower plants, which account for about 30% of total energy supply. However, the country has more opportunities to develop decentralised renewable energy technologies, primarily small hydropower stations on rivers in the mountains. At present, only 10% of hydropower potential is developed. In 2013, there was approximately 40 MW of small hydro capacity.

Development of small hydropower plants is one of the top priorities of the Kyrgyz government. The government hopes to reduce reliance on imported fuels through an increase in indigenous production, and to reduce emissions. Small decentralised power plants are more economically viable and practical in the dispersed mountainous and rural areas. Started in 2010, the UNDP/GEF (Global Environment Facility) project Development of Small Hydropower Stations is underway and expects to develop about 20 MW of small hydro capacity.

Other viable options for renewable energy development in Kyrgyzstan include heat supply through solar energy and biogas, and electricity from wind and solar power. There are no existing projects using these technologies.

The National Energy Programme and the Strategy for Fuel and Energy Sector Development (covering the period 2010-25) are the key policies for sustainable energy development. The strategy calls for the rapid expansion of renewables, especially hydro, as a priority for energy sector development. It foresees the construction of around 100 small hydroelectric plants with a total capacity of about 180 MW.

The strategy also foresees two large hydro projects at Kambarata and Upper Naryn, totalling more than 2.5 GW. This would substantially increase the national generation capacity. The Kamarhati 2 (360 MW) and the Upper Naryn (237 MW) are currently under construction and are expected to be operational by 2019. In 2012, an agreement was signed between the government and Russia on the construction of the Upper Naryn hydropower stations and Kambarata 1 with a capacity of 1.9 GW.

The Law on Renewable Energy was adopted at the end of 2008, as was the Programme for Development of Small and Medium Energy until 2012. The feed-in tariff was introduced in 2012 and the Law on Renewable Energy was amended. However, there are no secondary laws for the implementation of the feed-in tariff and it has therefore not yet been implemented.

## ENERGY EFFICIENCY

Both the energy supply and demand sides in Kyrgyzstan offer many opportunities for efficiency improvements. The infrastructure is old, worn and highly inefficient, with losses up to 30%. As well, the household and commercial building stocks were constructed during the Soviet era with few efficiency standards. Energy savings potential in buildings is estimated at 15% at least, while modernisation and rehabilitation in the energy system can lead to 25% savings.

The Law on Energy Savings is the main legislation related to energy efficiency, along with its Programme on Energy Saving for 2008-2010. The programme was meant to create a legislative and institutional backbone for efficiency measures, along with a tariff policy that includes their cost. However, due to public tensions over tariff increases, the programme has not been implemented.

In March 2013, a Law on Energy Conservation and Energy Efficiency in Buildings was adopted. A State Programme on Energy Savings up to 2015 was also developed, but not approved. By the end of 2014, a draft Programme of Energy Efficiency to 2017, including energy efficiency policies and measures, was presented to the government for approval.

Under the National Strategy for Sustainable Development for 2013-2017, the government plans to:

- improve regulation and encourage energy savings
- increase involvement of the state, local authorities and non-governmental organisations in energy savings and energy efficiency in buildings
- promote the use of energy-efficient technologies in buildings.

There is not a specific agency responsible for energy efficiency and renewables. The Ministry of Energy and Industry assumes the functions of monitoring and implementing energy efficiency and renewables policy. There were plans for restructuring and the creation of a new department dealing with energy efficiency and renewables, but there has been no progress.

The State Inspection on Energy and Gas is responsible for energy consumption control. A research laboratory on energy savings, energy efficiency and renewable energy in the Kyrgyz Scientific and Technical Centre (Ministry of Energy and Industry) carries out energy audits and certifications/labelling, and develops measures to implement the energy saving and renewable energy legislation. However, no formal certification or training mechanisms for energy audits exist. In 2011, the INOGATE Programme project Support to Energy Market Integration and Sustainable Energy in the NIS (SEMISE) developed a business plan for an institute in Bishkek to establish the feasibility of an energy auditor training centre.

## ENVIRONMENTAL PROTECTION

The Law on Environmental Protection, the Law on Ecological Expertise and the Law on Common Technical Regulations to Ensure Environmental Security represent the legislative backbone for environmental protection in Kyrgyzstan. They regulate environmental impact assessments and the process of environmental appraisal.

Environment impact assessments are required for all stages of new developments. In 2013, the feasibility of the Upper Naryn hydro project was approved and construction was expected to start in 2014. However, the level of the environmental assessment of transmission lines and substations is considered weak. Measures for the protection of nature in the construction of power lines are almost non-existent.

Kyrgyzstan charges a fee for pollution. The methodology for pollution fees was approved by the government in 2011.

In the oil, gas and coal extraction industries, the level of environmental protection is considered weak due to insufficient regulation and legislation. Concern is also rising over the planned increase in coal mining and the sustainability of the sector.

In 2012, the government formed the Coordinating Commission on Climate Change (KKPIK) responsible for issues of environmental protection. The KKPIK developed the State Agency on Environment Protection and Forestry, responsible for the implementation of the commitments under the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, aimed at stabilising greenhouse gas (GHG) concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.

At present, two projects have been approved and committed in the sphere of environmental protection and climate change:

- sustainable management of mountain forests and land management in the context of climate change - GEF/FAO for USD 5.5 million
- water supply, sustainable climate in Kyrgyzstan - EBRD/GEF for USD 5.5 million.

## CLIMATE CHANGE

Kyrgyzstan ratified the Kyoto Protocol in 2005, though it is not an Annex I or Annex II country and does not have a specific commitment under the Protocol.

The UNDP/GEF project Assistance to the Kyrgyz Republic in the Preparation of the Third National Communication under the UNFCCC is assisting the government in collecting the right information and fostering co-operation between the relevant ministries. During 2013, workshops focused on the creation of a GHG inventory, a national programme to reduce emissions in the transport, construction and energy sectors, and mitigation measures.

Energy-related emissions of $CO_2$ in Kyrgyzstan totalled 9.5 Mt in 2012, a level that is 57.6% lower compared to 1990. The transport sector accounts for 40.9% of energy-related $CO_2$ emissions, followed by commercial services (including agriculture) (20.8%), power generation (19.3%), manufacturing (16%), households (2.7%) and other energy industries (0.1%).

In October 2013, the government approved the Priorities for Adaptation to Climate Change to 2017 for the implementation of measures in water, agriculture, health, environmental emergencies, forests and biodiversity. The State Agency on Environment Protection and Forestry was expected to prepare sectoral programmes for adaptation to climate change on priority basis by November 2014. The Programme for Adaptation to Climate Change for 2011-2015 was developed in 2011 for the health sector in line with World Health Organization protocol.

Kyrgyzstan is participating in the Agreement of Mayors programme, an EU initiative to bring together local, regional and national authorities to achieve voluntary commitments to reduce $CO_2$ emissions by at least 20% by 2020 by improving energy efficiency and introducing renewables. At present, mayors of the cities of Osh and Talas are participating, with the mayor of Tokmok likely to join.

Since 2012, the government has signed and ratified a memorandum of understanding with the Danish government on the implementation of the Kyoto Protocol. Under the memorandum, the Danish environmental protection agency, jointly with the city of

Bishkek, has developed a project design document for the capture of methane from a landfill but, due to an insufficient amount of methane in the landfill, the project was terminated. The State Agency on Environmental Protection and Forestry has participated in the planning and preparation of possible CDM projects, but no projects have been registered to date.

In December 2013, the KKPIK approved a Programme on the Modernisation of Small Boiler-houses, which aims to increase the energy efficiency of the heat supply of small coal-fired boilers by 34% by 2020. The programme is expected to be listed with the UNFCCC register of affordable actions by developing countries to reduce GHG emissions.

# 6.5. INVESTMENT ATTRACTION

## INVESTMENT CLIMATE

The investment climate in Kyrgyzstan is considered unstable, though it is slowly improving with help from the donor community. The Kyrgyz system is heavily bureaucratic and legislation is weak, which leads to inconsistent outcomes and corruption/favouritism. Recently the country went through a political revolution and public unrest, placing private investment prospects at risk.

The ADB is assisting the government in efforts to improve the investment climate by removing regulatory barriers and initiating policy reforms in taxation, financing, skills development and forming public-private partnerships. The Investment Council was established in 2007 and includes government officers and representatives of the business community and international donor organisations. Approved in 2008, the Investment Climate Improvement Program was completed in September 2014 in three stages.

According to the ADB report on the programme (ADB, 2014), the investment climate has improved since 2008, with total investment increasing to 27% of GDP in 2013 and private investment up from 17% of GDP in 2007 to 19% of GDP during 2011-13. Foreign investment is about a third of all investment and half of private investment. However, the business environment remains challenging as there is a shortage of skilled workers and financing is expensive and unavailable.

According to the World Bank's "ease of doing business" indicator, Kyrgyzstan was ranked 102nd among 189 countries in 2014. A high ranking on the ease of doing business index means the regulatory environment is more conducive to the starting and operating of a local firm. This index averages the country's rankings on ten topics, made up of a variety of indicators, giving equal weight to each topic. Kyrgyzstan's ranking is below Ukraine's yet higher than Uzbekistan's, which has the lowest ranking among EECCA countries.

According to the Corruption Perceptions Index (CPI) prepared by Transparency International, which measures the level of perceived corruption in the public system, Kyrgyzstan ranked 136th among 175 countries in 2014 with a score of 27. This is a high score concerning perceived corruption in the country, as a score of 100 represents no corruption. Its ranking is comparable of that of Ukraine. However, the score is improving, up from 24 in 2013.

The country has improved its ranking in corruption from 166th in 2008 thanks to targeted government action. In 2003, the Law on Combating Corruption was adopted and in 2005 the government ratified the UN Convention against Corruption. In 2005 the government founded the National Anti-Corruption Agency and the National Anti-Corruption Council, which were tasked with implementation of the Anti-Corruption Strategy. Kyrgyzstan acceded to the UN Convention against Corruption on 4 November 2008, but is not yet a signatory. Kyrgyzstan is also a participant in the Istanbul Anti-corruption Investment Plan, by the OECD.

Furthermore, in 2012 the government developed a State Strategy of the Anti-corruption Policy as well as the Programme and Action Plan on Countering Corruption for

2012-2014 and the Measure to Counter Corruption Offences in the Country. These measures have contributed to an improvement in the level of corruption and the overall investment climate in the country.

Since March 2011, Kyrgyzstan has also been compliant under the Extractive Industries Transparency Initiative (EITI).

## INVESTMENT FRAMEWORK

The general legislative framework for privatisation of state property is based on the Law on General Principles of De-nationalisation, Privatisation and Entrepreneurial Activities (1991) and the Law on De-nationalisation and Privatisation of State Property (1994). Secondary legislation has been adopted; however, privatisation levels are low.

In 2001, the government established the Investment Promotion Centre (IPC) under the State Committee on State Property and Direct Investments, which acts as a one-stop shop to assist foreign investors.

According to the Law on Foreign Investments (1997), foreign investors and foreign investments have equal right with local investors. A Law on Investments (2003) also stipulates fair and equal treatment for all investors and protection of their investments. The law regulates legal relationships between investors and governmental bodies, allowing investors to resolve disputes that may arise through international arbitration. However, the implementation of these laws has been inconsistent in some cases.

Under the national programme to 2025, the government is planning to implement a number of projects to increase electricity generation, build transmission lines and rehabilitate existing networks. Total necessary investment is valued at USD 13 billion. Some investments from Russia and China have been secured for the development of hydropower plants and transmission lines.

Line D of the Central Asia-China pipeline will cross about 225 km of Kyrgyzstan’s territory and require investment of about USD 1.4 billion. This will turn Kyrgyzstan into a gas transit country (about 25-30 bcm per year) and provide transit revenues that could be invested in energy projects.

## INVESTMENT PLANNING

While the government does not have a specific strategy or plan for attracting investment, the National Energy Programme 2010-25 includes some investment targets. In the period 2011 to 2025, investment is required for the construction of the Kambarata 1 hydropower plant (HPP) (USD 1.9 billion), the Upper Naryn HPP (USD 200 million), the Jillan-Arykskih HPP (USD 220 million) and the Kara-Kečinskoj TPP (USD 1.1 billion). Investment from Russia has been secured for the construction of the hydro plants, while talks are in progress with China for the construction of the TPP.

Planned investment for networks is around USD 335 million, including the construction of two 500/220 kV substations (finished), the 500 kV Datka-Kemin line from north to south (USD 50 million; under construction) and a 220 kV line to Afghanistan (USD 55 million). The Rehabilitation of the Energy Sector 2013-14 project supported by the ADB is estimated to cost a further USD 62 million, including USD 55 million from the ADB (a grant of USD 40 million and a loan of USD 15 million) and USD 7 billion to be financed by the government.

The funding for the CASA 1 000 project is expected to be around USD 1 billion and includes funding for the construction of the assets of the four members of the project. Financing needs per country, according to calculations by SNC Lavalin, are: USD 300 million for Afghanistan, USD 270 million for Tajikistan, USD 200 million for Kyrgyzstan and USD 200 million for Pakistan.

## References

ADB (Asian Development Bank) (2014), “Proposed policy-based grant for Subprogram 3 Kyrgyz Republic: Investment climate improvement program”, *Report and Recommendation of the President to the Board of Directors*, Project 41544, ADB.

BGR (Federal Institute for Geosciences and Natural Resources) (2013), *Energy Resources 2013, Reserves, Resources, Availability, Tables*, BGR, Hannover, Germany.

Central Asia Online (2014), “Kyrgyzstan ready to impose coal price controls”, 1 December, Central Asia Online, http://centralasiaonline.com.

IEA (International Energy Agency) (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

Oil Price (2014), “Kyrgyzstan faces catastrophic energy crisis”, 10 August, Oil Price, http://oilprice.com.

Times of Central Asia (2014), “Kyrgyzstan ramping up coal production”, Times of Central Asia, 27 December, www.timesca.com.

MOLDOVA

**Figure 7.1.1** Map of Moldova


This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries, and to the name of any territory, city or area.

# 7.1. GENERAL ENERGY POLICY

**Key data (2012)**

**TPES:** 3.3 Mtoe (natural gas 68.4%, oil 22.7%, coal 3.3%, biofuels and waste 2.6%, electricity imports 2.2%, hydro 0.7%), +5.8% since 2002

**TFC:** 2.3 Mtoe (oil 32.5%, natural gas 31.1%, electricity 18.5%, heat 9.6%, coal 4.7%, biofuels and waste 3.6%), +20.8% since 2002

**TFC per sector:** residential 39.2%, industry 30.5%, transport 15.7%, commercial and other services 14.6%

**Electricity generation:** 5.8 TWh (natural gas 95.1%, hydro 4.6%, oil 0.3%), +0.2% since 2002

**Heat generation:** 10.9 PJ (natural gas 94.3%, oil 3.7%, biofuels and waste 1.5%, coal 0.4%), +66.2% since 2002

**Energy intensity:** 0.25 toe/USD 1 000 GDP PPP, -30.5% since 2002

## COUNTRY OVERVIEW

The Republic of Moldova (Moldova) is situated in central Europe in the north-eastern Balkans and is home to 3.6 million people. Chisinau is the capital city. The country covers 33 844 $km^2$ and is bordered by Ukraine on the north, east and south sides, while the Prut River on the west defines the boundary with Romania. (Transnistria, also called Trans-Dniestr, is a breakaway state located mostly on a strip of land between the Dniester River and the eastern Moldovan border with Ukraine.)

Moldova’s economy has experienced moderate growth over the past decade. Real gross domestic product (GDP), measured in US dollars (USD) on purchasing power parity (PPP) basis at 2005 prices, increased by 52% from 2002 to 2012. This was led by increased exports to EU markets and higher prices for agricultural products (World Bank, 2014). A ban on Moldovan wine imports to Russia in 2006 and severe drought in 2007 brought an economic shock. Since then, the ban has been lifted and growth returned to the agriculture sector, which is the backbone of the economy. Moldova is highly reliant on international donors and remittances from a large number of overseas workers (World Bank, 2014).

Improved economic performance has delivered benefits, with the national poverty level falling from 30% in 2006 to 16% in 2012 and the level of extreme poverty dropping from almost 5% to 0.6% over the same period. This makes Moldova one of the world’s top performers in terms of poverty reduction (World Bank, 2014).

Moldova lacks energy resources and is almost wholly dependent on imports of fossil fuels and electricity. Only 3% of its energy demand is met by domestic sources. Natural gas provides two-thirds of its energy needs — all of which was imported from the Russian Federation (Russia) via Ukraine up to the end of 2014. The Ungheni-Iasi gas interconnector between Romania and Moldova was commissioned in August 2014 and will likely become operational during 2015. Once at capacity, the pipeline is expected to supply a third of Moldova’s gas needs.

The government also plans to diversify the energy mix with more renewable energy resource development. This will require significant investment in the medium and long term, and developments will depend on the ability to attract funds.

Moldova signed an Association Agreement with the European Union on 27 June 2014. It has been a member of the Energy Community since 2010 and has until December 2017 to make its legislation conform to the EU *acquis communautaire*, i.e. core EU energy legislation related to electricity, oil, gas, environment, competition, renewables, efficiency and statistics. Moldova also plans to fully synchronise its electricity network to the European Network of Transmission System Operators for Electricity (ENTSO-E) by 2020 in order to connect to the European electricity market.

Regional energy co-operation with Caspian and Black Sea countries and the European Union takes place in the framework of the Baku Initiative, which aims to facilitate the progressive integration of the energy markets of the region into the EU market as well as the transportation of the extensive Caspian oil and gas resources towards Europe. Moldova also participates in the Eastern Partnership, an initiative of the European Union governing its relationship with the post-Soviet states of Armenia, Azerbaijan, Belarus, Georgia, and Ukraine; its purpose is to provide a venue for discussions on trade, economic strategy, travel agreements, and its energy security platform. Bilateral co-operation between the European Union and Moldova takes place in the context of the European Neighbourhood Policy in line with the Partnership and Co-operation Agreement, including energy co-operation.

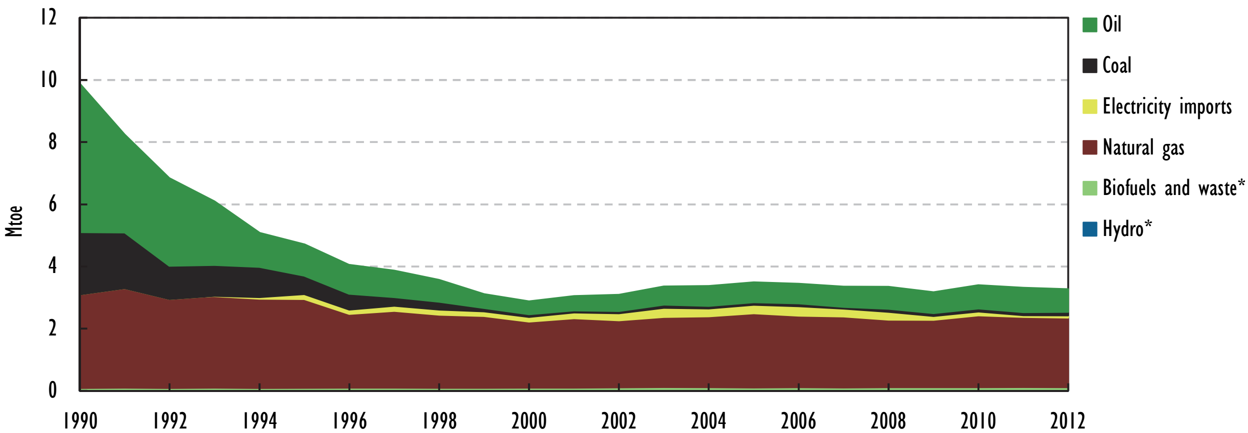
## KEY ENERGY DATA

### SUPPLY

Total primary energy supply (TPES)[1] in Moldova was 3.3 million tonnes of oil equivalent (Mtoe) in 2012 (Figure 7.1.2). TPES has increased 5.8% since 2002.

Moldova's energy mix is dominated by natural gas at 68.4% of TPES and oil at almost 22.7%. Along with coal at 3.3%, fossil fuels account for 94.4% of TPES. Biofuels contribute 2.6% and hydro 0.7% to TPES. Electricity imports account for about 2%.

**Figure 7.1.2** TPES, Moldova, 1990-2012




* Negligible.

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

**1.** TPES is made up of production + imports - exports - international marine bunkers - international aviation bunkers ± stock changes. This equals the total supply of energy that is consumed domestically, either in transformation (for example, refining) or in final use.

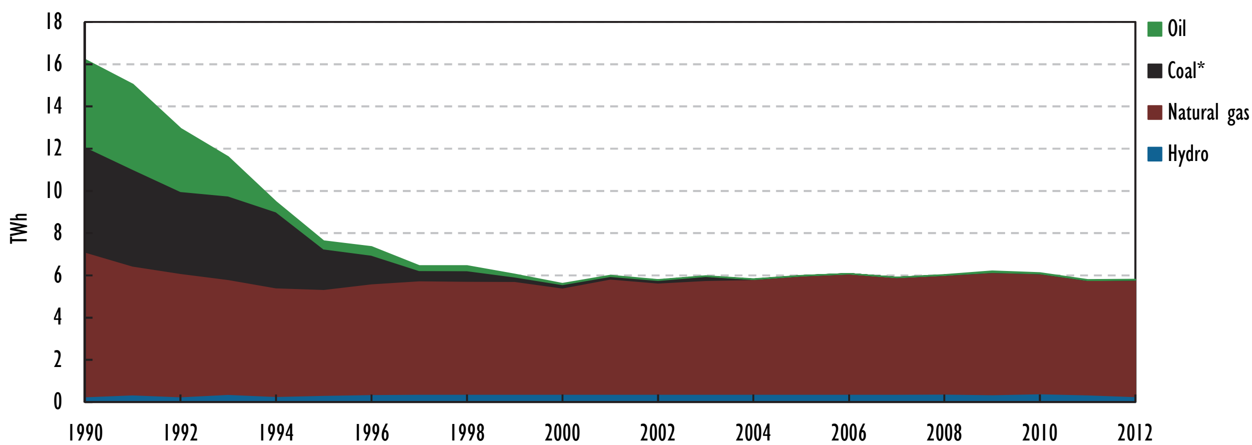
In the decade 2002 to 2012, demand for oil in Moldova increased at a faster rate than natural gas. Total supply of oil was about 39% higher in 2012 compared with 2002, while the supply of natural gas increased by 3.7%. As a percentage of TPES, oil has increased from 23% in 2002, while natural gas has contracted from about 70%.

## ELECTRICITY GENERATION

Electricity generation in Moldova amounted to 5.8 terawatt-hours (TWh) in 2012. Electricity production has been stable, increasing by a marginal 0.2% in the decade to 2012. Natural gas accounts for 95.1% of power generation, hydro for 4.6% with the remainder from oil. Coal use in electricity generation ceased in 2004 (Figure 7.1.3). Electricity generation capacity in Moldova was 421 megawatts (MW) in 2013, with a slight decline from 450 MW in 2007 due to aged infrastructure.

Heat generation in Moldova has experienced strong growth increasing by 66% from 2002 to reach 10.9 petajoules (PJ) in 2012. Natural gas is used for more than 94% of heat generation, oil for 3.7%, biofuels for 1.5% and less than 1% from coal.

**Figure 7.1.3** Electricity generation by source, Moldova, 1990-2012




* Coal use in electricity generation ceased in 2004.

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

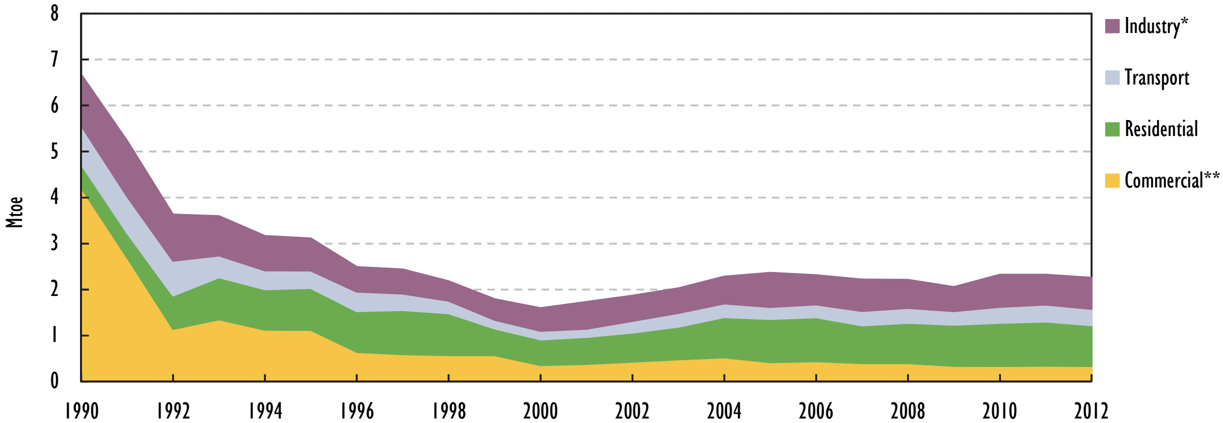
## DEMAND

Total final consumption (TFC)[2] was 2.3 Mtoe in 2012, almost 21% higher than in 2002 mainly due to 13% surges in 2004 and 2010 (Figure 7.1.4).

Accounting for 39.2% of TFC in 2012, the residential sector is the largest consuming sector. Consumption in other sectors in 2012 was 30.5% in industry, 15.7% in transport and 14.6% in commercial/services. Over the past decade, there has been a strong increase in energy use in the residential and transport sectors, while demand in industry experienced slower growth and the commercial sector declined by 22%. The residential and commercial sectors mainly consume natural gas, electricity and oil. The transport sector is reliant on oil and some electricity, while TFC in industry is mostly natural gas and electricity.

**2.** TFC is the final consumption by end-users, i.e. in the form of electricity, heat, gas, oil products, etc. TFC excludes fuels used in electricity and heat generation and other energy industries (transformations) such as refining.

**Figure 7.1.4** TFC by sector, Moldova, 1990-2012




* *Industry* includes non-energy use.

** *Commercial* includes commercial and public services, agriculture/fishing and forestry.

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## IMPORT AND EXPORT

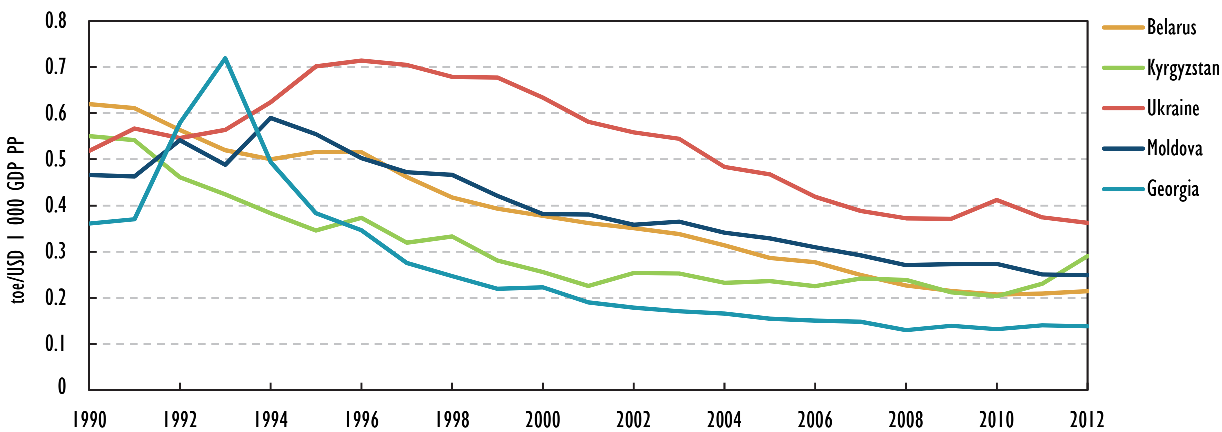
Moldova is heavily reliant on imports for its energy needs as domestic production accounts for only 3% of TPES. Natural gas imports, all from Russia, were 2.4 billion cubic metres in 2013, about 6% less than in 2002. Oil product imports have increased 40% since 2002 to 0.7 Mtoe in 2012, imported from Romania (39%), Russia (18%) and Belarus (12%).

Moldova is reliant on electricity imports from Ukraine which at 1.5 TWh in 2013 accounted for approximately 25% of demand. Imports from Ukraine have been volatile over the past decade, with a high of 3 TWh in 2008 and almost none in 2007 and 2009.

## ENERGY INTENSITY

Moldova's energy intensity, measured as the ratio of TPES to real GDP, was 0.25 tonnes of oil equivalent (toe) per USD 1 000 GDP PPP in 2012. This is a near median level compared with other EECCA countries, behind Turkmenistan, Uzbekistan, Ukraine and Kyrgyzstan (Figure 7.1.5). Since 2002, the level of energy intensity has declined by almost 31%, down from 0.36 toe/USD 1 000 GDP PPP. Moldova's real GDP (USD GDP PPP at 2005 prices) increased by 52% over the ten years to 2012, while TPES grew by about 6%. Overall energy intensity has been declining since the mid-1990s.

**Figure 7.1.5** Energy intensity in Moldova and selected EECCA countries, 1990-2012

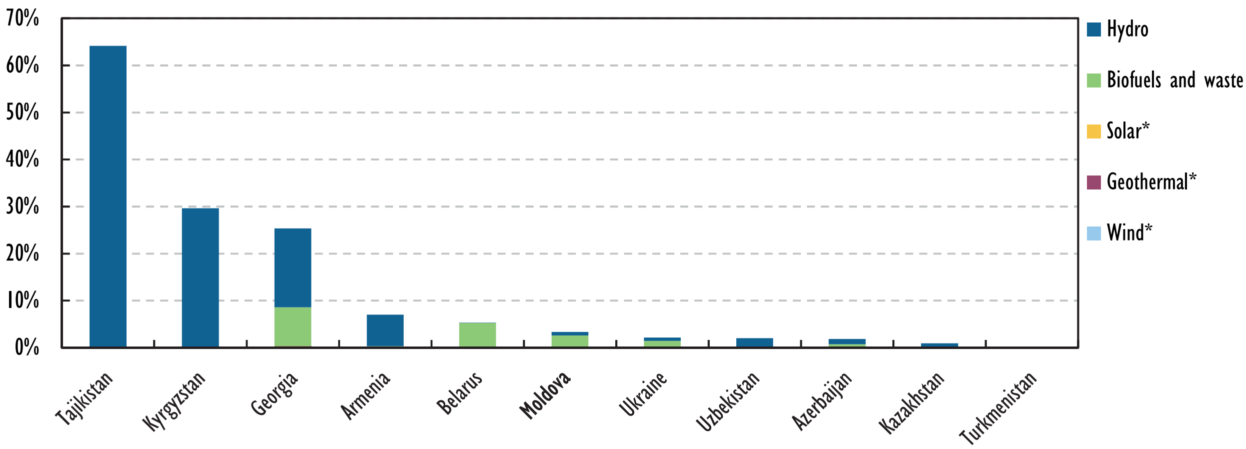



Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## RENEWABLES

Renewable energy accounts for 3.3% of TPES in Moldova, made up of biofuels at 2.6%, mainly used in heating, and hydro at 0.7% for electricity generation. The country has a median level in the renewables share of TPES compared with EECCA countries, behind Tajikistan, Kyrgyzstan, Georgia and Armenia (Figure 7.1.6). This share has remained relatively unchanged over the past decade.

**Figure 7.1.6** Renewable energy as a percentage of TPES in Moldova and other EECCA countries, 2012




* Negligible.

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## ENERGY DATA SOURCES

The figures presented in this report are official energy statistics and balances of the International Energy Agency (IEA) for Moldova and other EECCA countries, based on IEA methodology.

Moldova has shown significant interest in improving energy data collection/reporting. It moved to the IEA format of energy balances during 2013. In April 2013, a Memorandum of Understanding (MoU) on Statistics was signed between the Ministry of Economy and the INOGATE Technical Secretariat. Under the MoU, the country will continue to improve its energy data collection methods and increase the quality and usability of statistics.

During 2014, surveys for household energy consumption were being developed in consultation with INOGATE Programme experts. Plans for improvements to surveys on electricity prices are also underway, as is new data collection on energy efficiency and renewable energy production and consumption.

The National Bureau of Statistics is the government entity responsible for statistics data collection and processing. Its energy data are used by the Ministry of Economy in policy decisions and modelling. It prepares energy balances in co-operation with the Ministry of Economy, the Energy Efficiency Agency (EEA) and the National Agency for Energy Regulation, and the Ministry of Environment. The Bureau also co-operates with the IEA, Eurostat, United Nations Economic Commission for Europe (UNECE), UN Department of Statistics (UNSD), the World Energy Council and other international institutions.

## ENERGY SECTOR DESIGN

### MARKET STRUCTURE

The current market structure features partial unbundling and privatisation in electricity generation, and in natural gas and electricity transmission and distribution system operators. This market restructuring is an ongoing process in Moldova, in accordance with the provisions of the third energy package[3] and EU directives. Most recently, in 2014 the National Agency for Energy Regulation (ANRE) drafted the first Rules of Electricity Markets.

In the electricity sector, the transmission system operator (TSO) and distribution system operators (DSOs) are legally unbundled. DSOs also act as retailers of last resort. There are 12 retail companies. However, according to the government, the level of competition in the electricity market is only 10% for the category of 110 kV and 35 kV customers. A World Bank study is assessing feasible options for a competitive electricity market model in Moldova and the smooth transition into the ENTSO-E network via Romania.

MoldElectrica is the state-owned TSO and also the central dispatcher for the Transnistria region. There are three DSOs on the right bank of the Dniester River, including RED Nord (state-owned), RED Nord-Vest (state-owned) and RED Union Fenosa which covers two-thirds of the country (privately owned). During 2013, RED Nord and RED Nord-Vest were made legally available for privatisation. Electricity distribution in the Transnistria region is carried out by two DSOs, RED Est and RED Sud-Est, both of which operate under the Transnistrian authorities.

The wholesale electricity market is made up of bilateral contracts between producers and suppliers. There are six electricity generation operators in Moldova, four on the right bank of the Dniester River and two in the Transnistrian region.

Moldova's power system is interconnected with Ukraine and the two systems operate in parallel. Energocom, as state-owned company, acts as a single buyer, at non-regulated prices, for imported electricity from Ukraine. Energocom sells to RED Nord and RED Nord-Vest, or directly to eligible customers (Energy Community, 2014a).

Moldova's heat supply and district heating companies are currently being restructured. The restructuring includes the merger of the two operators of combined heat and power plant (CHP)-1 and CHP-2, and Termocom, the state-owned company which owns and operates the district heating network in Chisinau, the capital city. Overwhelming debt and inefficient operators have necessitated consolidation and streamlining of operations.

In the gas sector, the majority of the functions, including transmission, distribution and retail, are performed by the vertically integrated MoldovaGaz. MoldovaGaz was the only gas TSO, through its subsidiary MoldovaTransGaz, until January 2015 when VestMoldTransGaz received a transmission licence. The main gas DSOs in Moldova are 11 of MoldovaGaz's subsidiaries, and 11 smaller DSOs cover less than 2% of gas distribution. Tiraspoltransgaz, also a subsidiary of MoldovaGaz, is the TSO, DSO and retailer in the region of Transnistria (Energy Community, 2014b).

MoldovaGaz is owned by Gazprom (50%), the Moldovan government (36.6%) and the Transnistria administration (13.4%). The company is legally unbundled while the DSOs

**3.** In 2007, the European Commission adopted a third package of legislation for an open single market for gas and electricity. Market proposals include provisions such as the ability for consumers to choose between different suppliers and all suppliers.

are only financially unbundled, and the process is ongoing. By 2020, MoldovaGaz is expected to be fully unbundled under EU directives.

Imminent deadlines for market restructuring include the separation of supply, distribution and retail activities of electricity and gas DSOs by 1 January 2015. This includes the unbundling of MoldovaGaz's 12 subsidiary DSOs; MoldovaGaz would remain in ownership of the companies. By the end of January 2015, it was undisclosed whether unbundling had taken place.

VestMoldTransGaz is a state-owned company that will operate Moldova's section of the new Ungheni-Iasi gas interconnector pipeline. The company was created in June 2014 and received a TSO licence in January 2015. Energocom, a state-owned company that acts as a single buyer of imports, will purchase the gas and sell it to VestMoldTransGaz. Gas distribution will be carried out by MoldovaGaz.

## INSTITUTIONAL FRAMEWORK

**The Ministry of Economy** is in charge of developing and implementing energy policy in Moldova. Its main relevant tasks include the development of strategies and state policies such as the Energy Strategy 2030.

**The Ministry of Regional Development and Construction** is in charge of establishing, monitoring and evaluating the national priorities for regional development, including the promotion of renewable energy and energy efficiency. The Ministry participates in trans-frontier/neighbouring co-operation projects in international programmes. It also participates in the development and construction of publically financed projects, including renewables and efficiency projects.

**The Ministry of Environment** is responsible for developing environmental and natural resource management policies and strategies. The Ministry is responsible for the implementation of international environment treaties.

**The National Agency for Energy Regulation (ANRE)** is an independent regulator in the energy sector. Its main responsibilities include licences, tariff setting and regulation.

**The Energy Efficiency Agency (EEA)** is the implementing agency under the national energy efficiency and renewable energy programmes.

**The Energy Efficiency Fund (EEF)** was established in 2012 to promote investment in energy savings and renewable energy projects, in accordance with the existing government programmes.

## LEGAL FRAMEWORK

The legal framework of Moldova's energy sector was largely developed in 2009 under the EU energy *acquis communautaire*, as an obligation of the Energy Community accession in 2010. The primary legislation includes the Law on Energy (1998), the Law on Electricity (2009), the Law on Natural Gas (2009) and the Law on Petroleum Products (2001). Harmonisation of legislation is continuing with a number of amendments to the laws, and new laws approved in 2013 and 2014.

### Electricity, gas, oil products and heat

Amendments to the Law on Electricity and the Law on Natural Gas, transposing the 2nd Energy Package, were approved by the parliament in March and July 2014, respectively.

The amendments focus on ensuring stable supplies of electricity and gas to final consumers by implementing the EU Directives no. 2005/89/EC and no. 2004/67/EC.

Pending amendments to the Law on Petroleum Products include changes to ease the barriers of entry to new market participants.

Also, the Law on Heat and Cogeneration Promotion was approved by the parliament in May 2014 in accordance with international standards and EU directives. The new law is expected to define the responsibilities of dwelling-owners' associations, consumers and suppliers, and to introduce a binomial tariff for heat.

Secondary legislation was partially harmonised under the Legal Acts Harmonisation Plan for the Energy Sector.

In October 2014, ANRE adopted the Decision on the Approval of the Technological Consumption and Technical Losses of Electricity Distribution Networks, no. 698. During 2014, ANRE developed a draft methodology on price calculation for petroleum products; draft amendments to the methodology on calculations; approval and use of electricity tariffs from renewable energy sources and biofuels; draft methodology on calculation, approval and adjustment of tariffs for distribution service of electricity and regulated tariffs of electricity supply; and draft Rules of Electricity Markets. In previous years, ANRE also approved regulation of customer choice in retail electricity and Rules on Electricity Supply and Consumption.

### Energy efficiency and renewables

Renewables and energy efficiency developments in Moldova are governed by the Law on Renewable Energy (2007), the Law on Energy Efficiency (2010), the Law on Energy Labelling (2014), the Law on Energy Performance in Buildings (2014) and the Law on Eco-design (2014). The Law on Promotion of Renewable Energy was approved by the parliament in the first reading in July 2014 and is expected to be finally approved by the new parliament in 2015. Draft amendments to the Law on Energy Efficiency are under development and will be in accordance with EU directives on energy efficiency.

## KEY POLICIES

Moldova's energy policy focus is on improving integration in regional markets, strengthening energy security, increasing compliance with EU directives, increasing electricity generation capacity and promoting energy efficiency and renewable energy. The country is undergoing significant changes in its energy sector, including institutional, market-related and physical development. It is on a path of integration into the European energy market and is required to harmonise its energy policy and legislation under the Energy Community Treaty. Other binding international treaties include the Energy Charter and the World Trade Organization.

The main energy security-related projects are the development of the Ungheni-Iasi gas interconnection pipeline with Romania and integration into the ENTSO-E network through Romania and the EU electricity market. The Ungheni-Iasi gas interconnection was commissioned in August 2014 and will become operational during 2015, at first supplying small quantities and increasing to supply up to a third of Moldova's gas needs. The government is developing plans to connect the new pipeline to Chisinau, likely to be operational by end-2016. The connection with ENTSO-E is planned by 2020. In 2013, a contract was signed with the European Union for EUR 7.1 million of funding for a feasibility study on the connection of Moldova's and Ukraine's power systems to ENTSO-E.

Moldova introduced the updated National Energy Strategy (NES) 2030 in February 2013. It sets objectives for the energy sector by 2020 with an outlook to 2030. Moldova's energy targets are closely aligned to the requirements under the Energy Community Treaty. The NES exceeds them in some cases: for instance, under the treaty there is a binding target of 17% of renewables in TFC, whereas the NES sets a 20% goal. The NES main targets, all for 2020, are:

- 20% renewable energy sources in TFC
- 10% biofuels in transport
- 10% renewables in electricity generation
- reduce energy intensity by 10%
- reduce losses in transmission and distribution networks by 11% in electricity, 39% in natural gas and 5% for heat
- reduce greenhouse gas (GHG) emissions by 25% from the 1990 level
- reduce energy consumption in buildings by 20% from the 2009 level
- rehabilitate 10% of building stock.

Complementing the NES are the National Energy Efficiency Action Plan (NEEAP) 2013-2015 and the National Renewable Energy Action Plan (NREAP) 2013-2020, both of which were approved in 2013. The NEEAP was designed in accordance with Moldova's commitments under the Energy Community Treaty to reduce TFC in all sectors by 1.8% per year in the period 2013-15 from 2009 levels. The NREAP is linked with the EU directive on the promotion of renewable energy.

## INVESTMENT

Moldova requires sizeable investment as it reforms its energy sector and aligns with the European market. This is a significant challenge for the government, which has indicated in the energy strategy that it will search for external funding for the needed investment in electricity, gas and district heating. This includes financing from international finance institutions (IFIs), grants, the European Neighbourhood Instrument (ENI) and private investment. Part of the renewables and efficiency developments, however, are being funded from the state budget through the EEF.

Investment needs in the electricity sector are mainly for additional generation capacity, including a new combined-cycle gas turbine (CCGT) plant by 2020, new lines and the rehabilitation of old networks. In the gas sector, the construction of the Ungheni-lasi gas interconnector pipeline was completed in August 2014 at the cost of around EUR 26 million (Natural Gas Europe, 2014). Plans for a 100 km extension to Chisianu by end-2016 exist without a full understanding of the total cost at present.

As of mid-2014, the integration into ENTSO-E by 2020 was at the feasibility study phase. Rehabilitation of MoldElectrica's network and systems is expected to require more than EUR 50 million. The network will also require high-voltage line extensions to Romania. A feasibility study was completed for a 400 kV Balti-Suceava line, but further development will depend on the availability of financing.

The NES 2030 includes an 800 MW increase in generation capacity by 2020. The increase will include an additional 1 050 MW which will be offset by the decommissioning of the Chisinau CHP-1 (66 MW) and CHP-2 (240 MW) plants. Approximately 650 MW will come from a new CCGT power plant and will require EUR 620 million of investment. The remaining 400 MW is planned to be renewables-based and will also require substantial investment. New investment in renewable energy is slow at this stage because of a lack of investor confidence about possible returns due to inconsistent and unclear tariff methodologies and a lack of support mechanisms.

Moldova, Armenia and Georgia joined the Eastern Europe Energy Efficiency and Environment Partnership (E5P) in October 2013 to promote support of energy efficiency and emissions reductions. The international donor community is expected to provide more than EUR 60 million to enable projects under the E5P Fund.

### TECHNOLOGY AND INNOVATION

Technology and innovation initiatives in Moldova are at a negligible level. Moldova is not involved in significant energy-related research and development. It is more focused on increasing its overall education rates.

## ASSESSMENT

The review team commends the government of Moldova on developing NES 2030; on measures taken to reform energy policy in line with the Energy Community Treaty and the EU *acquis communautaire*; and on the effort put into adapting its national legislation and supporting programmes.

Moldova is committed to pursuing the changes to its policy necessary to secure energy supply, diversify energy sources, promote sustainable development and increase market competition. To bring the policy changes into the legal framework, the government has approved amendments to the existing legislation, with a number awaiting approval by the parliament. During 2014, the government passed crucial legislation including amendments to the Law on Electricity, the Law on Natural Gas and the Law on Heat, in accordance with EU directives. The Law on Renewable Energy and the Law on Energy Efficiency have been drafted and are yet to be approved. The government also approved its first building code late in 2014 and drafted the Rules of Electricity Markets.

Timely development of the secondary legislation and other required mechanisms is crucial to reaching the objectives set out in the strategy. The government should rapidly develop rules and implementing mechanisms for its policies and to attract needed investment.

During 2014, the Ungheni-lasi gas interconnector pipeline was completed and commissioned, and is expected to become operational in 2015. The pipeline covers around 10 km of Moldovan territory; however, by end-2016 the government plans to extend it by 100 km to Chisinau. Once extended and at full capacity, the pipeline could supply approximately a third of Moldova's gas needs. This will significantly diversify Moldova's gas imports and contribute to a more stable energy supply. However, it remains crucial for Moldova to have sound emergency response mechanisms for supply shocks should they occur with gas transiting Ukraine.

The renewable energy sector is of strategic importance for Moldova as it promises sustainable domestic energy production and helps to reduce GHG emissions. In the near term, the government should develop strong incentives for investment in the renewable energy sector given the ambitious target of 20% and the legally binding of target of 17% by 2020. Priority should be given to the timely adoption of a feed-in tariff based on a comprehensive cost-benefit analysis and provide acceptable returns for international investors.

In order to attract the necessary investment in the energy sector, the government should consider a variety of approaches. This includes the promotion of concrete policies, a strong level of communication between the government and businesses on changes to energy policy, and adoption of all the necessary legislation to make the policy stable and increase investor confidence. Awareness needs to be raised among both the local and international investment communities and a forum should exist where interested parties can be heard.

Moldova has high potential for both supply and demand-side energy efficiency improvements. The energy supply infrastructure is old and losses are moderately high (although improving), while energy consumption in buildings and industry is inefficient. The government has created the EEF for the distribution of funds to the most cost-effective and competitive energy efficiency projects, and to the Moldovan Residential Energy Efficiency Financing Facility (MoREEFF).

While the EEF and MoREEFF are effective in promoting energy efficiency, public awareness of the benefits of energy savings and the availability of incentives for energy efficiency improvements is insufficient. In order for households, businesses and industry to be able to fully reap the benefits of the existing incentives and self-initiate participation in energy savings, more should be done to raise awareness. This is particularly true for households in multi-residential buildings where co-operation on the retrofit of common areas is critical. Public awareness can be raised through a variety of media campaigns and education.

The review team commends the government of Moldova on developments in the field of energy statistics and data collection. It has shown significant interest in improving energy data collection/reporting. As well, it moved to the IEA format of energy balances in 2013. The National Bureau of Statistics is currently working on expanding its surveys and data collection to improve the electricity consumption and prices data. Collection of accurate end-use data will allow Moldova to develop energy efficiency indicators, which will help policy makers to design sound efficiency policies and monitor progress.

To increase transparency in the energy sector and to provide the information needed to underpin investment and other analyses, the government should continue to collect meaningful data, particularly from industry and relative to both energy consumption and efficiency levels. As Moldova is moving to an open energy market model, the improved quality and quantity of energy statistics are crucial to build investor confidence and energy sector transparency.

## *RECOMMENDATIONS*

*The government of Moldova should:*

- ☐ *Continue on the path of energy policy reforms by concluding the legislative packages, including finalisation of the Law on Renewable Energy and the Law on Energy Efficiency. Priority should also be given to the rapid development of secondary legislation which would enable prompt implementation of commitments undertaken under the NES 2030 and the Energy Community Treaty.*

- *Develop feed-in tariffs which will promote renewable energy development and attract private investment. The tariff methodology should be comprehensive and entail a detailed analysis of all costs associated with the investment specific to Moldova and to each technology.*
- *Improve investment opportunities by encouraging a stable and predictable regime through effective policies, well-developed and binding targets, strong incentives and implementation measures. This will enable market-driven investment in state-of-art energy technologies and development projects to provide improved energy security.*
- *Improve awareness of energy saving opportunities and efficiency measures through a variety of targeted information campaigns, particularly in terms of access to incentives available for businesses and households. Better awareness of the benefits of energy savings will increase demand for energy efficiency projects and facilitate co-operation between households in multi-residential buildings.*
- *Continue to develop improved energy statistics and the collection of accurate data relative to consumption, renewable energy production and energy efficiency indicators. Statistics should comply with international standards and provide a comprehensive energy database that would allow for systematic monitoring and for increasing transparency to the industry and potential investors.*

# 7.2. ENERGY SECURITY

## RESOURCE ENDOWMENT

Moldova is considered to be relatively resource poor. It does, however, have some deposits of lignite, phosphorite and gypsum.

Moldova has an extensive hydrologic system with more than 3 000 rivers and streams. The two largest rivers are the Dniester and the Prut, both of which rise in the Carpathian Mountains in Ukraine (EC, 2009). To date, only 7% of the hydropower potential in Moldova has been developed, which is modest compared to other countries with similar endowments (Braga, 2011).

## ENERGY SECURITY AND DIVERSIFICATION

Energy security in Moldova is at acceptable levels at present; however, the country is exposed to gas supply shock risks. Russia supplies all of Moldova's gas via Ukraine and two major supply shocks occurred in 2006 and 2009, due to disputes between Russia and Ukraine. In January 2009, 50 000 were left without gas for a number of weeks (EC, 2009). A similar situation occurred in January 2006, but lasted for a shorter time.

One way to reduce the risk of gas supply shocks has been the government's decision to diversify gas imports. The newly built Ungheni-Iasi interconnector gas pipeline with Romania is expected to supply a third of the country's gas demand when operational (beyond 2016). At present the pipeline only serves the small town of Ungheni; after 2016, however, it should also service Chisinau when an extension pipeline is built. Chisinau accounts for half of the country's gas consumption. Gas imports from Russia are expected to continue, albeit at smaller volumes.

Moldova has no gas storage facilities. Currently the government is considering two sites for possible geologic storage facilities in Zagarancea-Mânzesti-Unghenii de Jos villages and in the Cantemir district. No concrete decisions have been taken on these developments.

The government is also planning to boost its renewable energy production. It is at the beginning of its renewable energy development path, so progress at this point has been limited.

## ENERGY INFRASTRUCTURE AND INVESTMENT

### ELECTRICITY

The electricity network is made up of 4 402 km of transmission and 56 430 km of distribution lines and supplies 1.3 million consumers. The network is made up of 400 kV, 330 kV, 110 kV, 35 kV, 6-10 kV and 0.4 kV lines; interconnections are shown in Table 7.2.1. Moldova's power system operates in parallel with the system in Ukraine. However, the Moldovan system does not operate in parallel to Romania's network, which is part of ENTSO-E. Instead, the two systems operate in island mode.

For Moldova to connect to ENTSO-E by 2020, the cross-border network with Romania will need to be extended by two 400 kV interconnection networks (Suceava-Balti and Straseni-Ungheni-Iasi) and a 110 kV line (Falciu-Gotesti). In addition, existing lines and substations will need to be rehabilitated and modernised as the network is old and inefficient. Some rehabilitation of the network is ongoing, mainly through support from international financial institutions.

**Table 7.2.1** Interconnections between Moldova, Ukraine and Romania

| | Voltage (kV) | Number of lines | Length (km) |
|---|---|---|---|
| **Interconnections with Ukraine** | 330 | 7 | 505 |
| | 110 | 11 | 272 |
| **Interconnections with Romania (operating in island mode)** | 400 | 1 | 59 |
| | 110 | 3 | 37 |

Source: The Ministry of Economy.

Electricity generation capacity in Moldova is approximately 350 MW, of which CHP-1 and CHP-2 account for 300 MW. The government is planning to increase the generation capacity by 1 050 MW by 2020 while decommissioning the aged CHPs. New capacity will include a 650 MW CCGT plant in Chisinau and 400 MW of renewable-based generation. The government is unable to finance these projects and will require substantial private investment for them to be developed.

The district heating sector is being restructured and the two operators are being merged. The government is in negotiations with the World Bank on a USD 40 million loan under the District Heating Efficiency Improvement Project for the rehabilitation of networks under a new district heating company when the merger is finalised.

## NATURAL GAS

In 2012, natural gas transmission and distribution systems served almost 650 000 households and 12 000 businesses through pipelines that totalled 23 685 km (Figure 7.2.1). Approximately 600 km of pipelines are transit transmission pipelines. MoldovaGaz's subsidiaries operate more than 98% of the distribution network. MoldovaGaz owns the portion of the pipelines that are in Moldova, on the right side of the river (Table 7.2.2).

In August 2014, the Ungheni-Iasi gas pipeline from Romania was completed, 43 km long with a potential capacity of 1.5 bcm. The pipeline runs 10 km on Moldovan territory. The government is currently making plans to build a 100 km extension of the pipeline to Chisinau by end-2016.

In 2013, MoldovaGaz built 70 km of pipelines and reconstructed 27 km of mains and 4.4 km of distribution pipelines.

During the period 2008-12, MoldovaGaz built 2 420 km of gas pipelines, including 148 km of mains, 216 km of medium-pressure pipelines and 2 055 km of distribution pipelines in 284 communities to serve 23 200 customers. Natural gas is supplied to 40 communities.

**Figure 7.2.1** Electricity and gas network of Moldova


This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries, and to the name of any territory, city or area.

Source: Energy Community (2013), *Study on the Implementation of the New Regulation (EU) 994/2010 Concerning Measures to Safeguard Security of Gas Supply in the Energy Community, Energy Community*, September, Energy Community, Vienna.

A long-term gas network rehabilitation programme is underway and is partly supported by IFIs. By 2013, nearly 98% of the planned rehabilitation had been implemented. MoldovaGaz's investment programme covers 1 920 km of transmission and distribution gas pipelines, 95 transmission stations, five compressor stations, one metering station, and about 25 000 km of distribution pipelines and associated infrastructure to supply gas to consumers.

**Table 7.2.2** Gas interconnections between Moldova, Ukraine and Romania

| Pipeline | Capacity (bcm) | Length (km) (in Moldovan territory) |
|---|---|---|
| Ananiev – Tiraspol – Izmail | 20 | 63 |
| Razdelinaia – Izmail | 14.6 | 92 |
| Sebelinka – Dnepropetrovsk – Krivoi Rog – Razdelinaia – Izmail | 20 | 92 |
| Ananiev – Cernauti – Bogorodceni | 10 | 185 |

Source: The Ministry of Economy.

## SYSTEM RELIABILITY

The reliability of Moldova's electricity and gas supply systems is moderate. Gas supply shocks have occurred in the past through disputes between the supplier and the transit country (Russia and Ukraine). Domestic disputes are uncommon.

However, Moldova's energy infrastructure is old and efficiency is compromised, reducing supply reliability. The TSOs and DSOs are responsible for annual maintenance programmes which aim at reducing losses. The cost of the maintenance programmes is reflected in the tariffs approved by ANRE. One of ANRE's key goals is to authorise programmes which will result in system reliability improvements at a cost that is reasonable for consumers.

The National Program on Energy Efficiency 2011-2020 has targets to reduce losses in the transmission and distribution networks by 2020 by 11% for electricity, by 39% for natural gas and by 5% for heat. These targets would significantly improve the reliability and efficiency of the systems, particularly in gas.

The electricity sector has strong incentives to reduce losses to align with the quality of supply in the European Union. Losses in the distribution network have been reduced since the installation of the automated SCADA system, which is part of the integration into ENTSO-E. In the electricity sector, transmission losses were 2.8% in 2012 while the distribution losses were just below 12%. Outages were infrequent during the year.

In the gas sector in 2013, transmission losses were 0.18% and distribution losses amounted to 5%. Since 2008, MoldovaGaz has carried out an annual investment programme that aims to provide reliable gas supply to communities with safe and sustainable use of the gas network. The district heating sector in Moldova is the most inefficient, with losses of approximately 20%. The restructuring of the heat sector is expected to result in streamlining of processes and investment in the network which will help improve reliability over time.

## EMERGENCY RESPONSE

The Ministry of Economy is responsible for electricity supply emergency response. It monitors the balance of supply and demand and plans for future demand increases.

In the case of energy supply interruptions, wholesale customers or large independent customers are expected to adjust consumption to available supply. At present, contracts on the provision of emergency assistance are in discussion with Ukrainian wholesale customers.

The Law on Commodity Reserves stipulates that the State Material Reserve agency keep 30 days of consumption in oil stocks, based on the previous year's consumption. However, actual stock holdings are secret (Energy Community, 2014c). The CHPs also have an obligation to establish an emergency fuel (oil) reserve, though they can also borrow fuel from the State Material Reserve. Technical specifications of thermal power stations require that they have fuel reserves equivalent to two weeks' operation at full capacity.

Moldova has a number of emergency measures that it can use in case of a gas supply emergency, according to an Energy Community study (2013). Moldova's plan is to reduce exports to Romania and as a last resort to reduce supply to domestic customers. In case of export reduction, downstream countries such as Romania, Bulgaria and Greece might be affected.

In 2012, Moldova implemented Directive 2009/119/EC on maintaining minimum stocks of crude oil and/or petroleum products, legally binding the country to establish emergency oil stocks by 1 January 2023. In order to implement Directive 2009/119/EC on time, Moldova (along with Ukraine) was invited to submit a draft roadmap to 2023 by early 2013 in order to transpose the directive to national legislation by December 2013 (ENPI, 2012). However, Moldova had not yet amended its legislation by the end of 2014.

# 7.3. MARKET CONVERGENCE

## NATIONAL MARKET STRUCTURE

### ELECTRICITY AND HEAT

The electricity sector in Moldova has legally unbundled the TSO and three DSOs. The DSOs also act as retailers of the last resort, while there are 12 retail companies. According to the government, the level of competition in the electricity market is only 10% for consumers at the 110 kV and 35 kV service level. A World Bank study is assessing feasible options for a competitive electricity market model in Moldova and the smooth transition into the ENTSO-E network via Romania. During 2014, ANRE drafted the Rules of Electricity Markets which will be reviewed in 2015.

MoldElectrica is the state-owned TSO and also a central dispatcher for the Transnistria region. RED Nord (state-owned), RED Nord-Vest (state-owned) and RED Union Fenosa (privately owned) are the DSOs. RED Union Fenosa covers two-thirds of the country. Electricity distribution in the Transnistria region is carried out by two DSOs including RED Est and RED Sud-Est, both of which operate under the Transnistrian authorities.

The wholesale electricity market is based on bilateral contracts between producers and suppliers. Electricity, equivalent to about 14% of supply in 2012, is imported from Ukraine on a synchronised network and is purchased by a single company, Energocom (state-owned). DSOs buy electricity from energy suppliers with whom they have a bilateral contract.

There are six electricity generators in Moldova, four on the right bank of the Dniester River and two in the Transnistrian region. Generators on the right bank include state-owned operators of CHP-1, CHP-2, CHP-North and the Costesti hydropower plant. CHP-1 and CHP-2 also supply heat to district networks. Termocom is the state-owned company which owns and operates the district heating network in the capital city, Chisinau.

In the Transnistrian region, electricity generators include the privately owned operator of the Moldova power plant (Moldavskaya GRES [MGRES]) and the state-owned operator of the Dubasari hydropower plant. Moldova's heat supply and district heating companies are being restructured. This includes the merger of the two operators of CHP-1 and CHP-2 and Termocom. Overwhelming debt and inefficient operators have resulted in necessary consolidation and streamlining of operations.

### NATURAL GAS

In the gas sector, the majority of the functions, including transmission, distribution and retail, are performed by the vertically integrated MoldovaGaz. MoldovaGaz was the only gas TSO, through its subsidiary MoldovaTransGaz, until January 2015 when VestMoldTransGaz received a transmission licence. The main gas DSOs in Moldova are 11 of MoldovaGaz's subsidiaries, and 11 smaller DSOs cover less than 2% of gas distribution. Tiraspoltransgaz, also a subsidiary of MoldovaGaz, is the TSO, DSO and the retailer in the region of Transnistria (Energy Community, 2014c).

MoldovaGaz is owned by Gazprom (50%), the Moldovan government (36.6%) and the Transnistria administration (13.4%). MoldovaGaz is legally unbundled while the DSOs are only financially unbundled. The unbundling process is ongoing, with distribution activities expected to be unbundled during 2015, while MoldovaGaz will remain the owner. By 2020, MoldovaGaz is expected to be fully unbundled under the EU directives.

VestMoldTransGaz is a state-owned company that will operate Moldova's section of the new Ungheni-Iasi gas interconnector pipeline. The company was created in June 2014 and received a TSO licence in January 2015. Energocom, a state-owned company that acts as a single buyer of imports, will purchase the gas and sell it to VestMoldTransGaz. Gas distribution will be carried out by MoldovaGaz.

## REGULATORY FRAMEWORK

ANRE is the independent energy regulator in Moldova. ANRE is responsible for the electricity, gas and heat sectors. Its main tasks include licensing and tariff setting.

### Tariffs

ANRE regulates and approves electricity, gas and heat tariffs in Moldova. Tariff methodologies vary across the DSOs. Tariffs are based on specific technical characteristics of each distribution network and the number of customers per kilometre of line.

One exception is Energocom, a state-owned monopoly for electricity imports, which supplies electricity directly to a cement factory at unregulated prices (Energy Community, 2014a).

Companies present ANRE with annual tariff calculations for the next year based on an approved methodology between ANRE and the company. Tariff calculations include planned operational costs and capital investment for new lines, modernisation, rehabilitation and loss reductions. ANRE then reviews the tariff proposal and sets the appropriate tariff.

Tariffs and methodologies are transparent and are published on ANRE's website.[4] ANRE organises public hearings before tariff approvals to ensure transparency of the approval process.

Regulated electricity tariffs include the costs of metering and investment in SCADA, which has been completed in the electricity sector. Individual meters have been installed for all end users. In 2013, the collection rate was 99% on the right bank of the Dniester River.

In the gas sector, all industrial and commercial customers are metered while 93% of households have individual meters. The remaining households are metered through a common meter for multi-residential properties. MoldovaGaz is progressively switching all consumers to individual meters. The collection rate was 96% in 2013 on the right bank of the Dniester River.

According to the Energy Regulators Regional Association[5], the average household electricity and natural gas prices in the first half of 2014, including taxes, were:

- electricity: USD 0.12/kilowatt hour (kWh)
- natural gas: USD 13.9/gigajoule (GJ).

**4.** www.anre.md.

**5.** www.erranet.org.

In September 2012, ANRE approved a new methodology for district heat tariffs to attract investment to the sector. The district heating network in Moldova is considered to be highly inefficient and requires significant funding for the rehabilitation and modernisation of existing systems as well as new development.

Under the new Law on Heat, ANRE will be able to issue licences and set tariffs for new entrants in the district heating sector. Tariffs are expected to include weighted average cost of capital calculations as a mechanism to stimulate investment. The law is awaiting parliamentary approval.

During 2014, ANRE drafted the methodology for petroleum product prices, electricity tariffs for electricity from renewables and new electricity distribution and transmission tariffs.

### Technical rules

Moldova is well on its way to streamlining electricity and gas standards and harmonising with those of the European Union. The National Standardisation Body develops an annual National Standardisation Programme which includes EU and international standards to be adopted in that year. In the period 2011-13, 689 EU standards were adopted while 478 conflicting standards were removed.

Moldova is a member of the International Standards Organisation (ISO), the International Electrotechnical Commission (IEC), the European Committee of Standardisation (CEN) and the Euro-Asian Council for Standardisation (EASC). In April 2014, it became an affiliate member of CENELEC and an observer of the European Telecommunications Standards Institute (ETSI).

In 2014, standards in the field of gas numbered 1 304:

- 689 European standards (EN, HD, CLC)
- 80 international standards (ISO, IEC)
- 497 GOST standards
- 38 other standards.

## REGIONAL MARKETS AND INTERCONNECTIONS

### ELECTRICITY

The electricity system of Moldova operates synchronously with the Ukrainian electricity system. The two systems are interconnected by 14 lines of 110 kV and 7 lines of 330 kV. Energocom, a state-owned Moldovan company, is the single buyer for imported electricity from Ukraine at unregulated prices. The imported electricity is normally sold to RED Nord and RED Nord-Vest or to eligible customers (Energy Community, 2014a).

Moldova is interconnected with Romania, but the two systems do not operate in parallel. The power system of Romania is part of ENTSO-E and Moldova is currently working towards full synchronisation with the network by 2020. At present, the two power systems operate in island mode. There are two islands, one for the 110 kV interconnection lines and another for the 400 kV interconnection lines.

## NATURAL GAS

Moldova is connected to the Ukrainian gas transportation system that transits all gas imports from Russia to Moldova through a bilateral contract. Moldova also transits gas to Romania, destined for European markets, Turkey and the Balkans.

The construction of the Ungheni-Iasi interconnector gas pipeline to Romania was completed in August 2014 and the pipeline is expected to become operational during 2015. At first, the pipeline will serve only 3% of the population as it only extends to Ungheni. However, government plans include an extension to the pipeline to Chisinau by end-2016, which would maximise its 1.5 bcm capacity to provide up to a third of total gas supply in Moldova.

Moldova's share of the pipeline will be operated by the state-owned VestMoldTransGaz that received a TSO licence in January 2015. The company was created in June 2014 and received a TSO licence in January 2015. Energocom, a state-owned company that acts as a single buyer of imports, will purchase the gas and sell it to VestMoldTransGaz and MoldovaGaz. Gas purchases will be on bilateral contracts.

# 7.4. SUSTAINABLE DEVELOPMENT

## RENEWABLE ENERGY

Renewable energy development in Moldova is at an early stage. Largo hydro is the renewable source currently in use and it represents around 5% of electricity generation.

Hydropower infrastructure has remained from the Soviet era and development of other renewable sources and small hydro has been marginal to date, increasing somewhat in recent years due to rising natural gas prices. Most of the investment has been in the production of biofuels, including ethanol and rapeseed oil, as well as the use of agricultural waste for heat in rural areas.

By the end of 2013, 143 biofuel heating systems (29 MW total boiler capacity) had been installed in public buildings in 126 villages under the Energy and Biomass Project 2011-14, supported by the European Commission and the United Nations Development Programme. Today there are five renewable power plants in operation with tariffs approved by ANRE. Renewables-based generation includes 1.1 MW capacity of wind, 405 kilowatts (kW) of biofuels and 106 kW of solar photovoltaic (PV) (excluding older large hydro). Large hydro has a capacity of 64 MW.[6]

Existing promotional measures include guaranteed purchase obligations for utilities and regulated prices for generators for renewable-based generation. The tariffs are determined by ANRE on a "cost-plus" and case-by-case basis. ANRE estimates costs as an average of international comparisons, which may differ from an investor's cost-effective evaluation and can deter investment. In addition, imported wind generation equipment with capacity above 1 MW is exempt from customs duty until 2016 and PV panels are not subject to customs duty.

As part of its NES 2030, the government has increased its focus on sustainable development, with a specific target of 20% renewable energy by 2020. The government also has a binding target of 17% renewables by 2020 under the Energy Community Treaty.

According to Moldovan statistics, the share of renewables in the energy mix in 2012 was about 4%, mostly from biofuels, which indicates that both targets are ambitious. The NES also has a target for renewables to fuel 10% of transport sector needs by 2020 from today's negligible level. The NREAP 2013-2020 was created in February 2013 to support the NES and is one of the obligations under the Energy Community Treaty. NREAP sets out the measures and their implementation to reach the NES targets. The Ministry of Energy has also drafted amendments to the Law on Renewable Energy (2007), which were pending approval by the parliament as of mid-2014.

Under the NES and NREAP, 400 MW of additional renewable energy capacity is planned before 2020. The increased capacity would cover about 16% of the estimated demand for 2020. It is assumed that investment in renewable technologies will come from the private sector. In order to achieve the desired targets and increase generation capacity,

**6.** www.renewablefacts.com/country/moldova/hydro.

the government will need to send effective signals to investors in terms of favourable tariffs and other incentives.

The Moldovan Sustainable Energy Financing Facility (MoSEFF) is a funding mechanism for renewable and efficiency projects. It was established in 2009 with support from the INOGATE Programme.

## ENERGY EFFICIENCY

Moldova has high potential for both supply and demand-side energy efficiency improvements. The energy supply infrastructure is old. Lack of investment has led to inefficiencies with moderately high supply losses (although improving), and end-use consumption in buildings and industry is inefficient. Old building stock and lack of metering in multi-residential blocks contribute. As set out in the NES 2030, the government aims to increase energy savings and reduce the energy intensity of the economy.

Energy efficiency has been made a priority in regional development plans in Moldova. A number of IFIs are participating in energy efficiency improvement projects, mainly in public buildings such as schools and hospitals. The IFIs are planning further efficiency projects that are aligned with the national targets.

Moldova, Armenia and Georgia joined the E5P in October 2013 to promote energy efficiency and emissions reductions. The international donor community is expected to provide more than EUR 60 million to enable projects under the E5P Fund.

The energy efficiency strategy of Moldova is outlined in the NEEAP 2013-2015 and the National Program on Energy Efficiency for 2011-2020. The Ministry of Energy has also drafted amendments to the Law on Energy Efficiency (2010) to include the latest targets and measures. The draft law was pending parliamentary approval as of mid-2014. In February 2013, Moldova submitted the first National Energy Efficiency Plan 2010-2018 to the Energy Community.

Moldova's national objectives for 2020 for energy efficiency include:

- reducing energy intensity by 10%
- reducing losses in transmission and distribution networks by 11% in electricity, 39% in gas and 5% in heat
- reducing energy consumption in buildings by 20%
- renovating 10% of public buildings.

The EEA is responsible for the approval and implementation of efficiency and renewable energy projects, as well as for taking measures for the national targets to be achieved. In 2013, the Unified Information Centre for investors in renewable energy and energy efficiency was created within the EEA. The agency is considering a number of projects. In 2012, the government created the MoREEFF and the EEF. The MoREEFF provides loans and investment incentives for household efficiency projects with local participating banks. The EEF provides funds to cost-effective and competitive energy efficiency projects.

The EEF provides funding, EUR 10 million allocated in 2014 and EUR 5 million for 2015, on a first-come, first-served basis for efficiency and renewable projects which provide more than 60% energy savings. So far, it only covers refurbishment of public buildings, though there is a plan to open the funding to commercial properties in the near term. Six projects are underway and ten are in the pipeline for consideration out of 90 proposed projects.

To support energy efficiency projects, a number of approaches related to energy auditing were adopted in 2012. Regulations cover the certification of energy auditors and the cost calculation methodology for energy audits. The EEA holds energy auditing training courses.

The Law on Energy Performance of Buildings was approved in 2014. This is the first building code for Moldova. It is expected to cover new buildings and existing ones that are to undergo rehabilitation of more than 25%. The Ministry is preparing the needed secondary legislation in parallel and it is likely to include incentives for efficiency improvements, such as partial government funding for private projects.

The Law on Energy Labelling and the Law on Eco-design were also approved in 2014, and a decree with five regulations on energy labelling was approved in October 2014. The draft Law on Energy Efficiency is still under consideration.

## ENVIRONMENTAL PROTECTION

According to the Law on Environmental Evaluation and Environmental Impact Assessment (1996), environmental evaluation is mandatory for new projects. The law also requires environmental impact assessments for strategic documents relevant to the national economy, including the NES 2030 (UNECE, 2004).

## CLIMATE CHANGE

The NES stipulates a target to reduce GHG emissions by 25% by 2020 from the 1990 level. GHG emissions were 70% lower in 2010 than in 1990 (UNFCCC, 2014). Moldova does not have specific policies aimed at GHG emissions reductions, although its renewables and efficiency policies can deliver reductions in comparison to a business-as-usual scenario.

Moldova ratified the Kyoto Protocol in 2005. A Designated National Authority (DNA) for the Clean Development Mechanism (CDM) was established, and as of mid-2014, nine CDM projects had been registered. The DNA is the Climate Change Office in the Ministry of Environment. It is responsible for the elaboration, promotion and implementation of national policy on climate change. The priorities are to reduce GHG emissions and to adapt to changing climate conditions.

Moldova submitted a pledge of "no less than 25% from base year (1990)" reduction to 2020 "through implementation of global economic mechanisms" under the Copenhagen Accord and acknowledged under the Cancun Agreements. The pledge was made in January 2010, and by November 2013 the country was deemed “inadequate” in its ability to meet the pledge, as emissions are expected to rise by 2020.[7]

GHG emissions in Moldova were 13.3 million tonnes of carbon dioxide equivalent ($MtCO_2$-eq) in 2010 (the last year data is available), which is 74.9% lower than in 1990. GHG emissions in Moldova have been increasing since the late 1990s along with economic growth and increased demand for energy. Energy-related emissions of $CO_2$ totalled 7.6 Mt in 2012, representing approximately 57% of total GHG emissions in 2012. In Moldova, the power generation sector accounts for 46.6% of energy-related $CO_2$ emissions, followed by households (19.6%), transport (13.9%), manufacturing (13.4%) and the commercial and services sector (6.5%).

**7.** http://climateactiontracker.org/countries/moldova.html.

# 7.5. INVESTMENT ATTRACTION

## INVESTMENT CLIMATE

The investment climate in Moldova has received a boost in recent years through co-operation with the European Union and decisive government actions aimed at attracting private investment. The government is strengthening energy legislation to further align its energy sector with that of the European Union and, in this regard, it receives strong support from donor communities. The government is also working to reduce barriers to business development and private investment in the country's economy. For instance, in late 2013 a law was approved that includes a number of favourable provisions for business and investors, including tax breaks and deductions.[8] The changes are expected to ease the tax burden on existing and new investors, and attract more capital.

Nonetheless, challenges persist. Moldova's economy is highly reliant on remittances from nationals working outside the country, which adds to an unstable economic environment. The country is considered one of the poorest in Europe – making it a big challenge to attract foreign investment. In addition, Moldova's bureaucratic burden is high and the country is perceived to be corrupt.

According to the World Bank's "ease of doing business" indicator, Moldova was ranked 63rd among 189 countries in 2014. This is an improvement compared to 2013, when it was ranked 78th. The index measures how conducive the regulatory environment is to starting and operating a local firm. Moldova's ranking is similar to that of Romania. Moldova has improved its ranking in recent years through an easing in credit availability, investment protection and simplified tax procedures.

According to the Corruption Perceptions Index (CPI) prepared by Transparency International, Moldova was ranked 103rd among 175 countries in 2014, with a score of 35 out of 100 (where 100 represents no corruption). This score has remained relatively unchanged over the past five years. The government has introduced a National Anti-corruption Strategy for 2011-2015 (2011) in order to fight corruption.

## INVESTMENT FRAMEWORK

Moldova began the privatisation of public enterprises in 1994 and the process is ongoing. During 2007, the parliament passed a privatisation law with an aim to increase the economic efficiency of the process. In the energy sector, private companies do exist, but the state has the overwhelming majority share in the market. In 2013, the state-owned DSOs, RED Nord and RED Nord-Vest, were made available for privatisation and were not yet sold at the end of 2014.

The principal laws affecting foreign investment in Moldova have been adopted in the last 10 to 15 years. In 2010, national legislation was developed to provide more favourable

**8.** Law on Amending and Supplementing Certain Acts.

conditions to attract investment, including the development of business parks and a law on public-private partnerships. In 2013, the government created an Integrated Information Centre with the EEA for investors in renewables and energy efficiency, to facilitate co-operation between investors, central and local public authorities. There are, however, few direct incentives for foreign investment.

Starting in 2006, regulatory reform was undertaken by the government in order to reduce the administrative burden, remove obsolete regulations and fight corruption. As a result, all regulation and governmental decisions related to business activity are published in a business registry to increase transparency. In 2012, the Law on State Control was adopted to streamline procedures of state controls over businesses.

The government has also introduced regulatory impact assessments for all draft laws and acts relevant to business activity. The government vetted 100 laws to reduce payments to regulatory and control bodies, and to streamline business licensing procedures and economic controls.

In December 2013, the government approved a programme to facilitate planning, implementation and management of state-funded capital investments. The programme establishes working groups for public capital investments and the regulation of the working group activities, as well as the capital investment projects. This programme is expected to assist in removing corruption in public spending and increasing the effectiveness of state-funded investment.

## INVESTMENT PLANNING

The Strategy for Attraction of Investment and Promotion of Exports for 2006-2015 is the principal state policy on investment attraction. The NES 2030 is also a tool for investment planning, as it outlines the funding necessary for the realisation of government policies and binding agreements in the energy sector.

The government is currently developing a strategy for investment attraction for 2020-30. In the energy sector, the funding needed is significant and a targeted approach will be required to gain investor interest. The NES indicates that external funding is critical for the necessary investment in electricity, gas and district heating to 2020. This includes financing from IFIs, grants, the ENPI and private investment. There is some funding for renewable and energy efficiency projects through the state-funded EEF.

## References

Braga, D. (2011), "The dynamic of using river energy from Republic of Moldova territory", http://aerapa.conference.ubbcluj.ro/2011/PDF/dianabraga.pdf.

Energy Community (2014a), "Moldova areas of work: Electricity", Energy Community, www.energy-community.org (accessed 23 June 2014).

Energy Community (2014b), "Moldova areas of work: Gas", Energy Community, www.energy-community.org (accessed 23 June 2014).

Energy Community (2014c), "Annual implementation report", Energy Community, Vienna.

Energy Community (2013), *Study on the Implementation of the New Regulation (EU) 994/2010 Concerning Measures to Safeguard Security of Gas Supply in the Energy Community*, September, Energy Community, Vienna.

EC (European Commission) (2009), "Gas dispute: EU activates civil protection mechanism in gas deprived Moldova during crisis", Press release, EC, 12 January, Brussels.

ENPI (European Union Neighbourhood Policy Initiative) (2012), "Energy Community: Parties agree to establish minimum oil stocks", Press release, ENPI Info Centre, 23 November.

IEA (International Energy Agency) (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

Natural Gas Europe (2014), "The Fairytale That Wasn't: The Iasi-Ungheni Gas Interconnector", Natural Gas Europe, 18 November, www.naturalgaseurope.com.

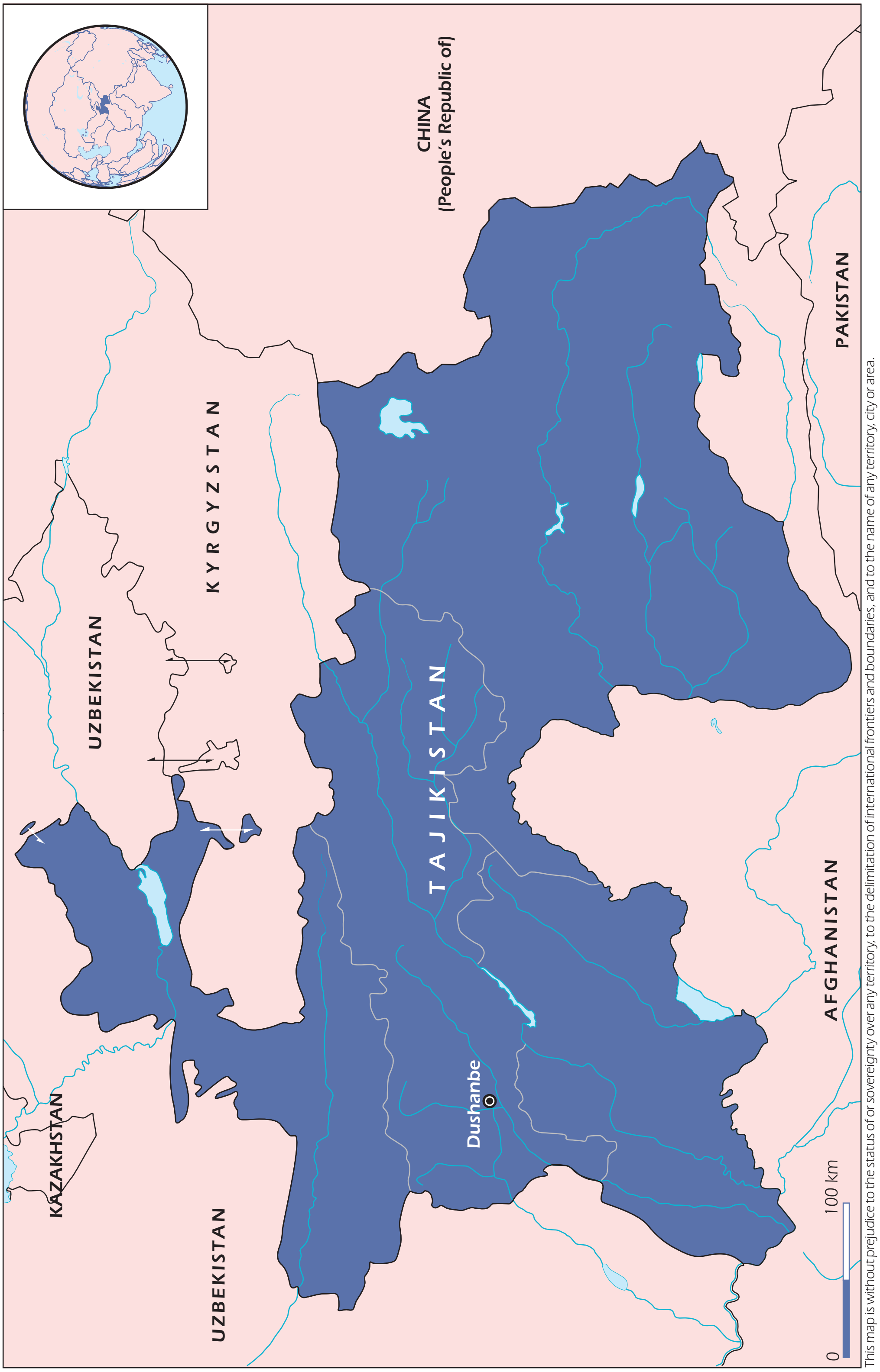
UNECE (United Nations Economic Commission for Europe) (2004), "Country review: Capacity building needs assessment for the implementation of the UNECE strategic environmental assessment protocol. Republic of Moldova", draft report, UNECE, www.unece.org/fileadmin/DAM/env/eia/documents/SEA_CBNA/RepublicofMoldova_needs_en.pdf.

UNFCCC (United Nations Framework Convention on Climate Change) (2014), "GHG emission profiles", UNFCCC, http://unfccc.int/ghg_data/ghg_data_unfccc/ghg_profiles/items/3954.php (accessed 23 June 2014).

World Bank (2014), "Moldova overview", World Bank website, www.worldbank.org/en/country/moldova/overview (accessed 7 July 2014).

## TAJIKISTAN

**Figure 8.1.1** Map of Tajikistan



# 8.1. GENERAL ENERGY POLICY

**Key data (2012)**

**TPES:** 2.3 Mtoe (hydro 64%, oil 24.8%, coal 8%, natural gas 5.2%), +6.5% since 2002

**TFC:** 2 Mtoe (electricity 58.2%, oil 27.3%, coal 9.2%, natural gas 4.8%, heat 0.5%), +13.5% since 2002

**TFC per sector:** industry 26.7%, agriculture 16.1%, residential 11.2%, transport 5.4%, commercial and public services 4.1%, other non-specified 36.6%

**Electricity generation:** 17 TWh (hydro 99.6%, natural gas 0.4%), +10.9% since 2002

**Heat generation:** 0.4 PJ (natural gas 100%), -88.1% since 2002

**Energy intensity:** 0.14 toe/USD 1 000 GDP PPP, -48.7% since 2002

## COUNTRY OVERVIEW

The Republic of Tajikistan (Tajikistan) is located in Central Asia, bordered by Afghanistan to the south, Kyrgyzstan to the north, Uzbekistan to the west and China to the east. The country is approximately 143 000 $km^2$ in size with a population of 8 million.

Tajikistan's economy performed strongly in the decade following the civil war that ended in 1997. The agricultural sector is the largest sector of the economy and employs more than 65% of workers. Real gross domestic product (GDP), measured in USD with purchasing power parity (PPP) was USD 16.6 billion in 2012, which is an increase of 108% compared to 2002. Relatively strong economic growth came from favourable prices in the country's main export items of cotton and aluminium. There was also significant growth in remittances from Tajik labourers working abroad. The global financial crisis hit Tajikistan through a drop in exports and remittances; however, the economy has stabilised since through help from the international community (World Bank, 2014).

Tajikistan is endowed with abundant water potential and hydropower is the main source of energy in the country. It is home to the largest hydro power plant (HPP) in the former Soviet Union, the Nurek HPP, and it is almost exclusively reliant on hydro for its electricity generation. Other fuel sources include oil and gas imports for residential and industrial use, as well as modest but growing coal production. The full energy resource endowment in Tajikistan is relatively unexamined and unexplored; however, of coal, oil and gas deposits are estimated to be moderate.

Despite reasonable energy potential, Tajikistan's energy sector is prone to supply shocks. Electricity shortages during the winter months are standard due to the seasonal availability of water resources, with some end users experiencing shortages up to 70% of the time when conditions are extreme. The country was cut off from the Central Asia Power Grid connection by Uzbekistan's disconnection in 2009 and gas supplies from Uzbekistan to Tajikistan ceased in 2013, amplifying the energy supply concern.

The government's energy policy is primarily focused on providing uninterrupted access to all end users while improving regional co-operation. It is currently seeking financing for the continuation of the Rogun HPP which began in the 1980s (and has been suspended since the war), with a capacity to double its hydropower output and eliminate winter shortages, as well as allow for exports to electricity-hungry southern markets. The construction of Rogun was deemed feasible by the World Bank study in late 2014, and is likely to go ahead in the near future if financing is secured.

Before Rogun is built, which could take decades, the country is committed to improving the efficiency of its energy sector through network rehabilitation, the restructuring (but not yet unbundling) of the state-owned vertically integrated single electricity provider Barqi Tojik, increasing the production of domestic energy sources (including renewables) and a progressive removal of tariff subsidies. These measures will tackle some of the existing energy sector challenges such as ageing infrastructure, inefficient operations, mounting debt, and tariffs below cost (among the lowest in the world).

During 2014, Sangtuda HPP 2 (210 megawatts [MW]) became operational, as did the first unit of the coal-fired combined heat and power (CHP) Dushanbe-2 plant (100 MW). Another 300 MW of Dushanbe CHP 2 is expected to become operational by end-2017. Additional capacity will assist in winter power shortages and diversify the energy fuel mix. Investment in small HPPs by domestic and foreign investors has been the most successful renewable energy source (RES) project in Tajikistan, adding more than 130 MW of capacity in less than five years.

To continue developing the energy sector, significant domestic and foreign investment will be required. The government has eased investment barriers in order to improve the climate over the past decade. However, perceived corruption and lack of experience with Tajik authorities is stalling foreign investment.

## KEY ENERGY DATA

### SUPPLY

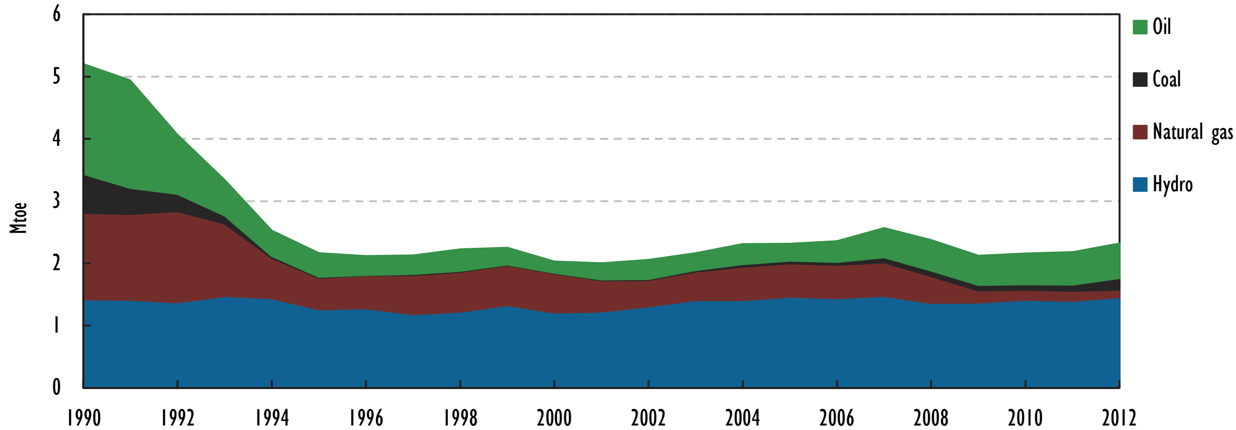
Total primary energy supply (TPES)[1] in Tajikistan was 2.3 million tonnes of oil-equivalent (Mtoe) in 2012. The energy supply has increased by 6.5% since 2002, despite a contraction during the global financial crisis in 2008-09 (Figure 8.1.2).

Hydropower is the main source of energy in Tajikistan. It accounted for 64% of TPES in 2012. Oil and coal represented 24.8% and 8% of TPES, respectively, while the remainder was accounted for by natural gas (5.2%). Over the past decade, gas supply in Tajikistan has declined by 72.2% while the supply of oil has increased by 78.7%. Coal use has surged over the same period, with the coal supply increased 100 times from negligible levels in 2002 to 0.2 Mtoe in 2012. Hydropower has increased by 11.4% from 2002 to 2012.

Around 74% of Tajikistan's energy supply is produced in the country, namely 1.7 Mtoe in 2012. Around 87% of total production is from hydro. The remainder comes from coal (10.7%), oil (1.8%) and natural gas (0.5%). Energy production has increased by 22.9% since 2002, which is a faster rate of growth than that of TPES. Coal production has boomed and is expected to continue to grow as Tajik industry switches from other fuels to coal use. The production of oil has increased by 87.5% while natural gas production declined by 64.9%.

**1.** TPES is made up of production + imports - exports - international marine bunkers - international aviation bunkers ± stock changes. This equals the total supply of energy that is consumed domestically, either in transformation (for example, refining) or in final use.

**Figure 8.1.2** TPES, Tajikistan, 1990-2012



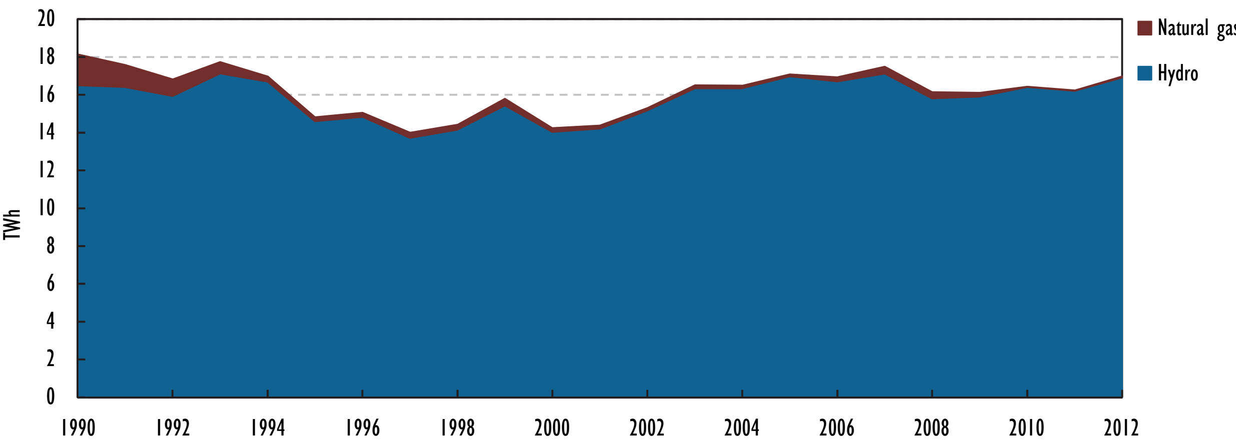

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## ELECTRICITY GENERATION

Electricity generation in Tajikistan totalled 17 terawatt hours (TWh) in 2012, which is 10.9% higher compared to 2002 (Figure 8.1.3). The electricity supply has experienced volatility from one year to the next, with average generation of 16.6 TWh over the ten years from 2002 to 2012. Since the mid-1990s, the peak in electricity generation was 17.5 TWh in 2007, after which generation plateaued for four years before a 4.5% increase in 2012. Nearly all electricity is from hydropower, with only 0.4% from natural gas in 2012.

Tajikistan produced around 0.4 petajoules (PJ) of heat in 2012, which is 88.1% lower compared to ten years ago. Heat was produced from natural gas before gas supplies from Uzbekistan were cut off in 2013. Since then, heat has been generated from coal in smaller volumes. Total heat supply in Tajikistan has been declining since 1990.

**Figure 8.1.3** Electricity generation by source, Tajikistan, 1990-2012




Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## IMPORT AND EXPORT

Tajikistan is reliant on imports of fossil fuels for around a quarter of its energy mix. Net imports were 0.6 Mtoe in 2012 or 26% of TPES. Imports are oil products (82.1%) and natural gas (15%), while Tajikistan's main export is electricity (70%), followed by oil products (23%). Tajikistan used to import gas from Uzbekistan, but Uzbekistan stopped delivering gas to Tajikistan in 2013.

Tajikistan exports electricity to Kyrgyzstan and Afghanistan. Tajikistan's trade with Kazakhstan and Uzbekistan ceased in 2009 when Uzbekistan cut off its connection to the Central Asia Power Grid. From 2009 to 2012, electricity trade volumes have fallen from 4 TWh for both imports and exports, to negligible imports and exports of 0.1 TWh in 2012. However, trade has been increasing since the interconnector to Afghanistan became operational in 2012, with electricity exports increasing to 1.3 TWh in 2014 (according to the Tajik government).

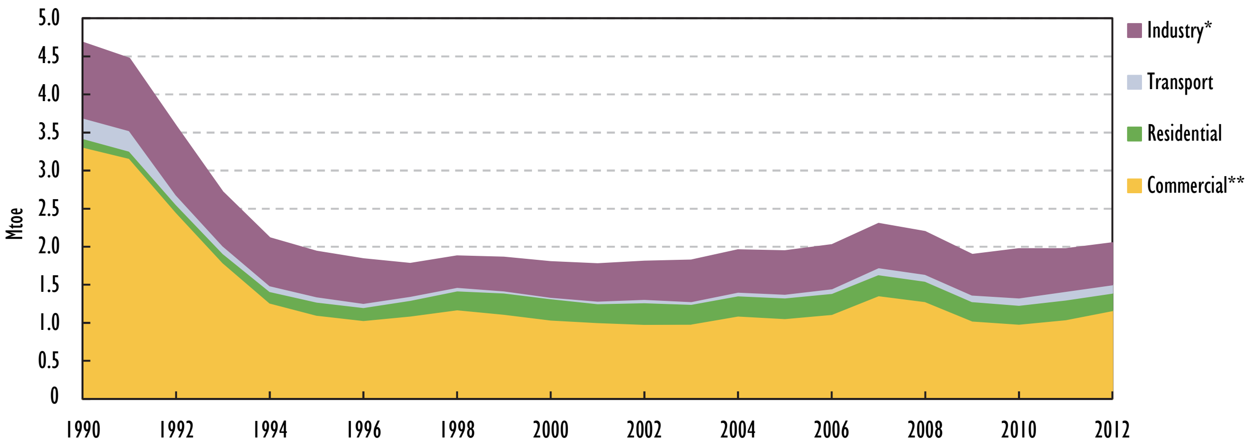
## DEMAND

Total final consumption (TFC)[2] of energy was 2 Mtoe in 2012. TFC has increased by 13.5% since 2002, with some annual volatility (Figure 8.1.4). Around 58% of TFC is electricity, while oil accounts for 27.3%. Coal, natural gas and heat represent 9.2%, 4.8% and 0.5% of TFC, respectively. Final consumption of natural gas and heat has contracted by 56.7% and 88.1%, respectively, over the ten years to 2012. Conversely, the use of coal and oil has increased by 992.2% and 78.6%, respectively. Demand for electricity has increased by a moderate 2.1% over the same period.

Industry is the largest consuming sector and accounts for 26.7% of TFC, followed by agriculture at 16.1%, residential at 11.2%, transport at 5.4% and commercial and public services at 4.1%. However, the data include non-specified consumption, which is significant at 36.6%. Non-specified consumption includes all fuel use not elsewhere specified in data collection. Non-specified consumption is most likely in rural areas.

The industry sector (mainly the aluminium industry), agriculture and the residential sectors are the main consumers of electricity, and coal, gas and oil are mainly consumed in commercial services and transport.

**Figure 8.1.4** TFC by sector, Tajikistan, 1990-2012




Note: Reporting on residential consumption changed in 2005.

* *Industry* includes non-energy use.

** *Commercial* includes commercial and public services, agriculture/fishing, forestry and non-specified consumption.

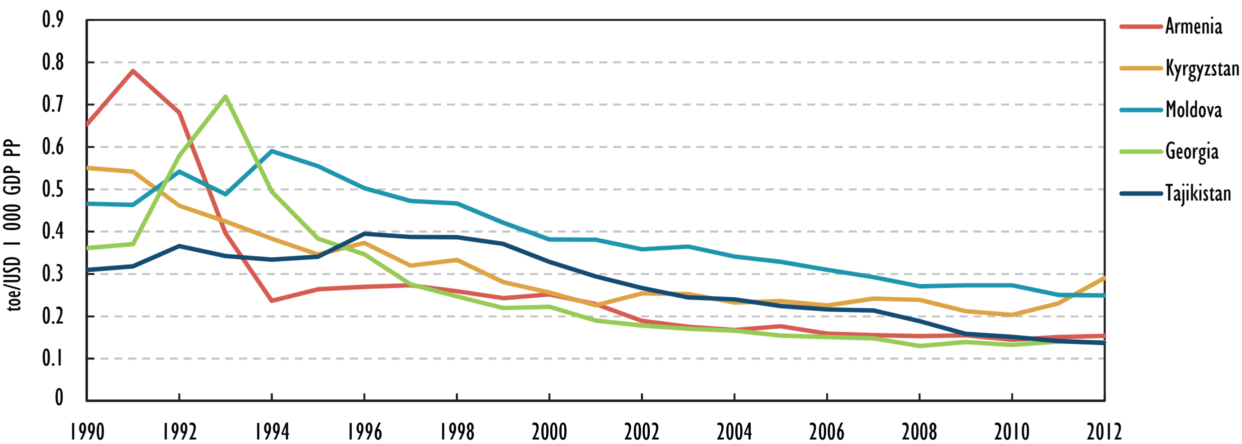
Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

**2.** TFC is the final consumption by end users, i.e. in the form of electricity, heat, gas, oil products, etc. TFC excludes fuels used in electricity and heat generation and other energy industries (transformations) such as refining.

## ENERGY INTENSITY

Tajikistan's energy intensity, measured as the ratio of TPES to real GDP, was 0.14 toe/ USD 1 000 GDP PPP in 2012 (Figure 8.1.5). This is the second-lowest level of intensity among the EECCA countries, higher than Azerbaijan only. Since 2002, energy intensity in Tajikistan has declined by 48.7%, down from 0.27 toe/USD 1 000 GDP PPP. Real GDP growth in Tajikistan was faster than the relatively subdued growth in TPES over the ten years, leading to a decline in energy intensity of the economy.

**Figure 8.1.5** Energy intensity in Tajikistan and other selected EECCA countries, 1990-2012

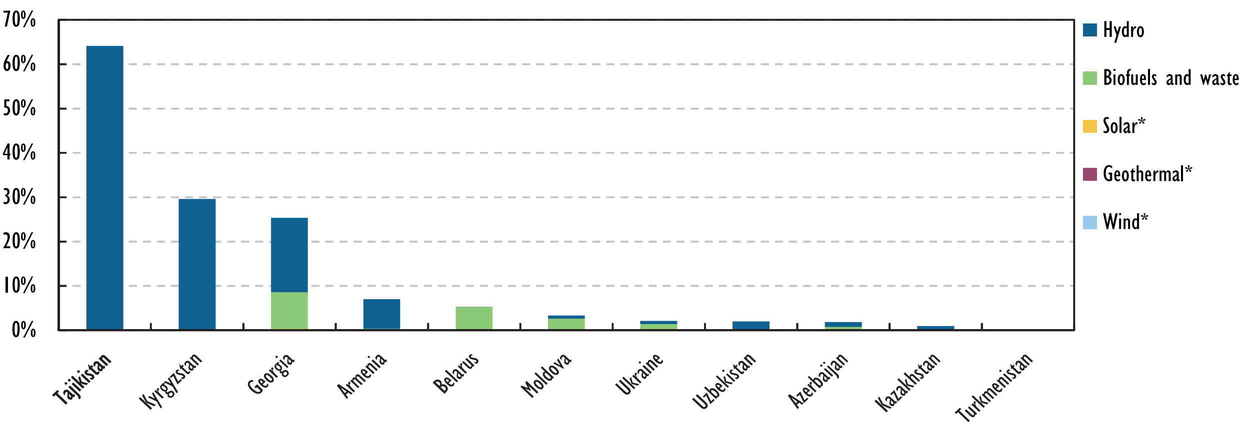



Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## RENEWABLES

Renewable energy in Tajikistan is in the form of hydropower, which accounts for 64.1% of TPES, 86.9% of energy produced and 99% of electricity generation. Tajikistan has the highest share of renewables in TPES among EECCA countries, followed by Kyrgyzstan's similar energy mix. Hydropower generation has increased by 11.4% since 2002, increasing its share in TPES from 61.3% in 2002 to 64.1% in 2012 (Figure 8.1.6).

**Figure 8.1.6** Renewable energy as a percentage of TPES in Tajikistan and other EECCA countries, 2012




* Negligible.

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## ENERGY DATA SOURCES

The figures presented in this report are official energy statistics and balances of the International Energy Agency (IEA) for Tajikistan and other EECCA countries, based on IEA methodology.

The Statistics Agency (TAJSTAT) is an independent government institution that conducts data collection and statistics publication. TAJSTAT works in accordance with the Law on State Statistics (2010) and conducts population censuses, household surveys, demographic statistics, and a wide range of micro- and macro-economic and industry-specific statistics.

Energy statistics are collected by the Office of Industry and Investment in Construction (production data) and the Office of Trade and Services (export, import and consumption), within TAJSTAT. TAJSTAT produces annual energy balances including production, losses, sectoral electricity consumption and electricity trade. However, no data is available on the availability of energy resources.

The Ministry of Energy and Water Resources and the Ministry of Trade and Economic Development use energy data for sectoral analysis and in policy development. Data is available online.[3]

In April 2013, the government approved the National Energy Statistics Action Plan for 2012-14, developed with the support of the INOGATE Technical Secretariat and under the INOGATE Programme. The action plan outlines the necessary legal and institutional framework for the improvement of energy statistics and the necessary capacity building over the long term. During 2014, TAJSTAT worked with the INOGATE Technical Secretariat in assessing international standards on energy statistics, discussing steps towards development of a reporting system based on the international standards and on energy balance compilation. Consultants from Croatia were in the country to assist and instruct the ministry on the best methodology for statistics collection and manipulation. The Tajik government aims to adopt the IEA energy balance format once all training is complete.

In October 2014, the government approved the Programme on Statistics for 2015.

# ENERGY SECTOR DESIGN

## MARKET STRUCTURE

### Electricity

The electricity sector is mostly owned and operated by Barqi Tojic, a vertically integrated state-owned company that is the main electricity generator, the transmission system operator (TSO), the distribution system operator (DSO), the retailer and the dispatch unit.

The company is financially and legally unbundled from the government. Over the past decade, the government has considered restructuring it to improve management, reduce inefficiencies and reduce high indebtedness. In August 2011, the government signed the Approval on the Restructuring Plan of the Individual Open Joint Stock Holding Company Barqi Tojik for 2011-18, with a grant from the ADB in conjunction with a grant for the rehabilitation of the transmission network. Under the restructuring plan, the government expects to separate the generation, transmission and distribution (and

**3.** www.stat.tj.

retail) functions of Barqi Tojik by 2018. By the end of 2014, the government and the donor community were still in negotiations over the possible approaches and conditions of the planned restructuring.

There are a number of independent power producers, mainly in the small HPP sector. Sangtuda HPP 1 (670 MW) is 75% owned and operated by a Russian company, while Sangtuda HPP 2 is owned and operated by Iranian companies (under a 12-year agreement). Approximately two-thirds of small hydropower plants are privately owned and operated.

Electricity distribution in the autonomous Gorno-Badakshan region is carried out by Pamir Energy, a private-public partnership established in 2002.

### Oil and natural gas

The oil and natural gas sector is fully state-owned and -operated. The State Committee for Oil and Gas carries out exploration and production activities for the sector. It has production sharing agreements with a number of foreign investors. TajikNefteProduct imports and distributes oil products. TajikTransGas imports and transmits natural gas and operates the central dispatch unit, while TajikGas carries out gas distribution and retail.

### Coal

Some 18 private enterprises or private-public partnerships operate the 14 coal deposits in Tajikistan. Coal production is regulated and prices are approved by the Antimonopoly Commission, based on yearly submissions on work. The sector is expected to develop over the next decade as demand for coal in Tajikistan increases through fuel switching in industry, and because of the availability of resources.

## INSTITUTIONAL FRAMEWORK

Energy policy is approved by the president and the government of Tajikistan following consultations with the **Ministry of Energy and Water Resources**, the **Ministry of Economic Development and Trade**, the **Ministry of Finance**, the **Ministry of Justice**, and other ministries. The Ministry of Energy and Water Resources is responsible for implementing energy policy, including licensing and regulation of renewable energy sources. The ministry was restructured in 2013 from the Ministry of Energy and Industry.

Tariff approvals are the responsibility of the **Antimonopoly Committee**, under the Ministry of Economic Development and Trade.

## LEGAL FRAMEWORK

Primary energy legislation of Tajikistan consists of the Law on Energy (2000), the Law on Renewable Energy Sources (2010) and the newly adopted Law on Energy Efficiency and Energy Saving (2013) which replaced the Law on Energy Saving from 2002. Other primary laws include the Concession Law (2011), the Law on Hydro-technical Installation Safety (2010) and the Law on Foreign Investment (2007).

The Law on Energy stipulates that the government or government agencies are the principal agents for the management of the energy sector. It also legislates the monitoring of energy companies, consumer rights, tariff setting and the establishment of a government authority for the approval of concession agreements over energy facilities, including concessions to foreign investors.

The Law on Energy Efficiency and Energy Saving provides the legislative framework for the introduction of energy-efficient appliances and technologies. It has provisions for mandatory energy audits and requirements for buildings and household appliances, among other aspects. It stipulates methods for the establishment of the National Fund for Renewable Energy Sources, Energy Saving and Energy Efficiency (Energy Charter, 2013).

The Law on Renewable Energy Sources introduced incentives for investment in the renewable sector, including rules for obligatory purchases by Barqi Tojik, and set out the methodology for green tariffs for small HPP operators.

The Law on Concessions and the Law on Foreign Investment include provisions for third-party access in the electricity sector under specific investor conditions.

The legislative framework for the gas and oil sector is under the Law on Licensing Certain Types of Activities (2005), Law on Subsoil (1994) and the Resolution of the Government of Tajikistan, the Order of Competition on the Use of Mineral Resources (March 2013) (UNECE, 2013). A draft Law on Gas, in accordance with EU principles, was developed in 2013. The draft law was still awaiting government approval at the end of 2014.

Secondary legislation in Tajikistan has been updated over the past five years, albeit only partially, with the introduction of new laws on renewable energy and energy efficiency. The by-laws are weak in terms of clear and transparent rules on third-party access, tariff methodology and structure (including green tariffs), and all secondary legislation regarding the new Law on Energy Efficiency and Energy Saving. Recent by-laws introduced over that past five years include:

- approval of Measures for Implementation of Priority Projects in the Energy Sector for 2010-2015 (May 2010)
- approval of the Rules of Attraction, Use, Coordination and Monitoring of External Assistance (August 2010)
- approval of the Programme for Efficient Use of Power Resources and Energy for 2012-2016 (November 2011)
- Tariffs for Electricity and Heat (March 2012)
- approval of the Draft Agreement Between the Ministry of Energy and Industry and the International Finance Corporation of the Presentation of Financial Advisory Services (September 2012)
- State Program of Investment Grants and Capital Construction for 2013-2015 (November 2012)
- formation of the Supervisory Council on the Implementation and Monitoring Progress of the Restructuring of the Open Joint Stock Holding Company Barqi Tojik (May 2012).

## KEY POLICIES

Energy policy in Tajikistan primarily aims to ease the annual seasonal winter shortages and provide non-interrupting access to energy to its population. The approach to the crisis has varied over the decades, depending on the political situation in the country and relationships with its neighbours. At present, the government plans to diversifying energy sources (including the introduction of non-hydro renewable energy), rehabilitate and modernise existing energy infrastructure, improve energy savings and increase regional integration.

The electricity interconnection to the Central Asia Power Grid via Uzbekistan was cut off in 2009 and the gas pipeline from Uzbekistan was cut off in 2013. This threatened energy security in Tajikistan even further, forcing the government to internalise its energy policy and start thinking about developing domestic energy resources while considering co-operation with other neighbours.

The government is still working under the Concept of Development of the Fuel and Energy Complex for 2003-15, which is relevant but expires soon. It lacks medium- to long-term policy in the sector, including a detailed economic analysis of available resources, possible scenarios and attainable targets. The following are the main aspects of its vision for the energy sector:

- increase tariffs to reduce fiscal deficit and to improve investment attractiveness in the energy sector
- continue developing the market for electricity exports to Kyrgyzstan, Afghanistan and Iran
- improve governance and transparency in the energy sector
- develop incentives for investment in natural gas exploration, coal production and the restoration of thermal power plants
- develop a long-term programme of development of the energy sector to 2020, which will identify possible priority use of electricity for domestic purposes.

Tariff increases have been passed over the past few years; however, they still remain among the lowest in the region. The government will continue to raise tariffs to reach cost-reflective levels over time, but it is unclear how long this will take.

The government has been easing legislative and bureaucratic requirements for investors in order to increase attractiveness in all parts of the sector, and has introduced green tariffs for small HPPs and an obligation of purchase from Barqi Tojic. This has resulted in a surge in construction of small HPPs since 2007, with capacity reaching more than 130 MW and above the projected level. Demand for small HPPs continues in Tajikistan; however, only marginal developments have been made in solar and wind power.

In the electricity sector, the largest projects at present are the construction of Rogun HPP on the Vakhsh River and the construction of a 500 kV transmission line connecting Kyrgyzstan, Tajikistan, Afghanistan and Iran, CASA 1 000 project (Central Asia South Asia Electricity Transmission and Trade Project) . When operational, the Rogun station would produce 3 600 gigawatts (GW) at peak capacity and would entirely eliminate winter shortages. The project was deemed feasible by a World Bank study in 2014 and will mostly likely go ahead if financing is secured. Once the first units come on line, Tajikistan will more than double its electricity output and increase electricity exports to Afghanistan, some of which will be sold on to Iran and Pakistan. The security issue in Afghanistan and securing financing for the transmission line remain the largest hurdles at present.

The production of coal in Tajikistan has boomed over the past decade (albeit from very low levels) and will continue to grow as the government rehabilitates thermal power plants and builds new coal-fired generation. Additionally, the government has encouraged industry to switch from natural gas and oil to coal use (where possible), which has resulted in strong demand for coal production in the country and high production growth rates year-on-year.

Tajikistan will have access to gas from Turkmenistan from 2016 via the Line D pipeline of the Central Asia-China pipeline system that began construction in 2014. This will diminish the need to develop its own gas resources at first. Over time, the country may consider developing its resources and exporting via this pipeline. According to the Tajik government, a number of private investors have shown interest in developing oil and gas production in the country in the past few years.

## INVESTMENT

The investment climate in Tajikistan is improving, albeit slowly. The country is one of the poorest in the region and domestic investment is weak while foreign interest is mainly from other countries in the region with political interest and/or ties to Tajikistan (namely Russia, China and Iran). This is especially true in the energy sector, where these three countries have been the main source of investment over the past ten years. Energy investment over the past ten years totalled USD 2.5 billion, including public and private investment.

The government is interested in attracting significantly more private investment over the next decade, looking for funding for the Rogun HPP and other necessary and large projects planned before 2020. It has eased the legislative and bureaucratic requirements for all investors since 2007, with the introduction of the Law on Investment and subsequent supporting legislation. It also created four economic free zones, where investors are exempt from certain categories of taxes and customs duties.

Most recently, in 2014 the construction of the gas pipeline Line D of the Central Asia-China pipeline system began, which will transit gas from Turkmenistan to China. The construction of the 425 km pipeline will cost around USD 6.2 billion in Tajikistan and will be financed by China. The first gas is expected to flow in 2016, which will allow for gas supplies to Tajikistan, and eventually it could allow for Tajikistan gas exports to China depending on contract agreements.

Oil and gas exploration in Tajikistan is still in the early stages of development. The main exploration project underway is conducted by CNPC, Total and Tethys Petroleum who finalised an agreement in June 2013 to develop oil and gas deposits in the Bokhtar field in the east of the Amu Daryia basin. Under the agreement, CNPC and Total hold 33.335% stakes each in the project and Tethys holds a 33.33% stake.

The construction continuation of Rogun HPP is valued at over USD 2 billion. Construction began in the 1980s during the Soviet era, but has been suspended for decades. The project was deemed feasible in 2014 by a World Bank study and is currently awaiting financing. It would be built in four phases over a decade.

Once the Rogun HPP is built and Tajikistan more than doubles its electricity output, it is planning to increase electricity exports to Afghanistan, some of which will be transited to Iran and Pakistan. This is part of the CASA 1 000 project, namely the development of a 500 kV Obi-Garm – Sangtuda – Kunduz – Puli Khumri – Kabul transmission line connecting Kyrgyzstan, Tajikistan, Afghanistan and Iran. An agreement was signed among the countries in 2012 and by the end of 2014 the countries had agreed on tariffs. Security issues in Afghanistan and securing financing remain the largest hurdles at present. The project is expected to cost the Tajik government around USD 270 million (approximately a quarter of the total cost), while other governments will finance the remainder. Some funding may be provided by the World Bank and other financial institutions.

The government is also committed to the USD 122 million transmission rehabilitation project financed by the ADB until 2018, including the construction of two new transmission lines, an upgrade to the supervisory control and data acquisition (SCADA) system and the reconstruction of a substation. A number of other network rehabilitation projects are currently going on around the country, mainly financed by the donor community.

Investment in small HPPs by domestic and foreign investors has been the most successful RES project in Tajikistan, adding more than 130 MW of capacity in less than five years. The project is USD 13.9 million in value and is continuing to date, albeit already exceeding original capacity targets. During 2014, Sangtuda HPP 2 (210 MW) was put into operation, as was the first unit of the coal-fired CHP Dushanbe-2 plant (100 MW). An additional 300 MW of the Dushanbe CHP is expected to become operational by end-2017.

### TECHNOLOGY AND INNOVATION

Technology development and innovation in Tajikistan are minimal and the funding for research and development in the energy sector is negligible. The country is a technology importer, and foreign investors are exempt from duties on equipment imports.

## ASSESSMENT

The energy sector in Tajikistan is under supply stress at present with most of the country experiencing significant supply shortages during autumn/winter, with no power and/or heat for up to 70% of the time when conditions are extreme. Tajikistan has been disconnected from the Central Asian Power Grid since 2009 and gas supplies from Uzbekistan ceased in 2013, forcing the country to internalise its energy policy and putting more pressure on the existing system. This comes at a time of growing population and industrialisation of the country, with demand growth of approximately 2.5 TWh per year according to the Tajik government.

The government is committed to solving the energy crisis and considers that investing in Tajikistan's energy sector is key to alleviating energy poverty and raising the country's living standard. The review team commends the government of Tajikistan for its current energy policy directions: to provide non-interrupting access to energy to its population as its prime objective; diversification of energy sources and the development of renewable energy; the rehabilitation and modernisation of existing energy infrastructure to increase its efficiency and reduce losses; and the development of regional energy markets.

Tajikistan has abundant hydropower reserves, with a technically feasible electricity generation potential of 317 TWh/y, which makes it the eighth-largest country for hydropower potential and one of the top countries for per-capita production worldwide. This potential remains largely untapped; to date the country uses about 5% of its available hydropower potential.

Tajikistan also has around 400 million tonnes (Mt) of proved coal reserves, 2 Mt of oil reserves and 6 bcm of natural gas reserves. With 280-330 sunny days a year, Tajikistan's solar potential is about 25 TWh/y. These resources are largely untapped, as energy policy to date has shown little interest in developing hydrocarbon production and renewable sources, and has focused on hydropower production.

This is set to change over the next decade as the government looks to diversify its energy sources. Coal production has already increased from negligible levels a decade ago, and it will grow substantially in the medium term as fuel switching in industry and power generation increases demand. In the long term, development of natural gas and oil resources is also envisaged. During 2014, 100 MW of coal-fired CHP capacity came on line and 300 MW more is expected by end-2017. Given the push for more fossil fuel use in the sector in the future, it is important that hydrocarbon developments include clean technologies, at the most reasonable costs for investors, including upgrades to existing thermal plants.

As a sound foundation for supporting energy policy developments, the review team believes that the government of Tajikistan should develop a comprehensive strategy for the medium and long term (from 2020 to 2050), including consideration for all energy sectors and both supply and demand measures. On the supply side, the government should focus on increasing energy independence, looking into ways of expanding its energy mix and diversifying the electricity and heat generation sector. The review team suggests that the government commission a geological survey to re-evaluate the country's oil, gas and coal reserves and assess its solar, wind and geothermal potential. Including thermal and renewable sources in the energy mix would improve the reliability of supply, especially in winter, as those sources are more available at times when hydropower is not.

The energy efficiency potential of the country is vast, with Tajik research and academic institutions' estimates of up to 40% potential. The review team commends the government for its efforts to undertake measures for energy efficiency, such as the planned rehabilitation of the aluminium manufacturer TALCO that consumes 40% of electricity supply. However, large energy savings potential remains in both the industrial and buildings sectors.

Maximising gains in energy efficiency and demand management is crucial to resolving the energy crisis. The government should assess the potential for energy savings in all sectors of the economy and set up a legal and institutional framework for demand-side management. It should set up an independent institution with the sole purpose of assessing energy efficiency potential, developing and implementing energy policies on energy efficiency, and attracting the required investment and expertise. Energy efficiency policies and measures require detailed analysis of energy-use data, and should be monitored through the use of energy efficiency indicators, developed through a national statistics database.

Energy savings in electricity, heat and gas supply are also high. Energy infrastructure in Tajikistan is aged, with more than 60% of capacity needing rehabilitation before 2020. The network is inefficient, with losses among the highest in the region. The government has accepted a grant from the ADB for the rehabilitation of the transmission network by 2018, under the condition of Barqi Tojik restructuring. Barqi Tojik is operationally ineffective and highly indebted, adding inefficiencies to the sector. The review team recommends that the government outsource the restructuring of Barqi Tojik in order to get the most objective and effective reorganisation of the company before considering unbundling.

Winter supply shortages are frequent and due to low hydropower capacity during the winter months, without enough capacity from other fuels to cover those months. The construction of the Rogun HPP would allow for increased capacity during the winter months and expanded electricity in the summer months. The government should continue to seek financing for the efficient and timely continuation of Rogun HPP's construction. The government should also consider developing a detailed emergency response plan as soon as possible, and compulsory fuel storage possibilities to secure an uninterrupted energy supply during the winter months until Rogun is constructed.

An important aspect of electricity supply to all households is the ability to supply the most vulnerable customers at affordable prices. The subsidies for electricity usage should be reconsidered so that they are aimed at the most needy customers only, freeing up capital normally spent on subsidising those who can afford it. The additional funds from rearranging subsidies should be spent in the most efficient way possible through measures for curbing demand in the industrial sector, subsidising the emergency stocks for winter, and educating the public on energy savings.

Existing electricity, heat and gas tariffs are some of the lowest in region, and the government has begun progressively bringing them to a cost-reflective level. Prices have increased by 40% over the past two years, but they remain very low. In the medium and long term, the government should develop a comprehensive transparent methodology for electricity and gas tariffs to account for real expenditure in energy supply and allow for future investment. The move to fully cost-reflective tariffs should continue to be a progressive one, in order to gain public acceptance and change in the way electricity is viewed, from a "free public good" to a commodity.

The government of Tajikistan has introduced key primary legislation and amendments in the past few years, to promote the stable development of the energy sector. This includes RES legislation, a key requirement for the introduction of more renewable sources in the energy mix. The review team encourages the government to continue such important legislative steps, including legislation on taxes, customs and land codes. For the primary legislation to be adopted as swiftly as possible, detailed secondary legislation and implementation plans should be developed, to ensure a predictable, stable and transparent environment for investors.

## *RECOMMENDATIONS*

*The government of Tajikistan should:*

- ☐ *Develop a medium- and long-term strategy for the country's energy sector. The strategy should include a detailed consideration of energy supply and demand factors. For diversity of supply and energy security, consider undertaking a geological survey to re-evaluate the country's oil, gas and coal reserves and assess its solar, wind and geothermal potential. Under demand management, the strategy should include an assessment of the potential for energy efficiency gains in all sectors of the economy.*
- ☐ *Provide affordable electricity and deal with winter shortages by:*
  - *developing targeted social programmes for securing affordable electricity for the most vulnerable customers only, especially in remote country areas*
  - *using the remaining subsidies for emergency response mechanisms, such as providing compulsory storage for required stocks/reserves (i.e. diesel, coal) for the thermal power plants*
  - *developing an elaborated plan for demand reduction, including raising public awareness of energy savings.*
- ☐ *Develop a methodology for electricity and gas tariffs. Consider developing a roadmap for progressive tariff increases to a cost-reflective level, while securing affordability for the most vulnerable customers only. This would secure the necessary funds for maintenance and other investment projects, which would in turn manage demand as well as increase reliability.*

- *Continue to develop the Rogun HPP in an environmentally sound and timely manner to increase winter electricity capacity in the medium term and allow for greater electricity exports in the mid- to long term. Continue to foster regional co-operation with neighbouring countries for the development of CASA 1 000 and the realisation of electricity export markets.*
- *Consider an option for tendering the management contract for Barqi Tojik as part of the restructuring programme to ensure the timely and efficient internal reorganisation of the company before taking further steps in unbundling.*
- *Establish a government entity in charge of assessing energy efficiency potential; develop energy efficiency policies and measures; and attract the required investment and expertise to implement the policies. Develop energy efficiency indicators to monitor progress.*
- *Ensure coherence with the key legislation, including tax, customs and land codes, in further developing the policies and measures for the renewable energy sector. Develop detailed secondary legislation and implementation plans to ensure a predictable, stable and transparent environment for investors.*
- *Ensure the application of clean coal technologies, at the most reasonable cost, in upgrading existing and developing new thermal plants.*

# 8.2. ENERGY SECURITY

## RESOURCE ENDOWMENT

### FOSSIL FUELS

Tajikistan has modest fossil fuel resources and is reliant on imports for most of its hydrocarbon energy needs.

Tajikistan has proven reserves of 2 Mt and resources of 60 Mt (BGR, 2013). Most of the resources are located in the northern part of the country in the Leninobod Soghd Region.

Natural gas reserves are estimated at 6 bcm with resources of 100 bcm (BGR, 2013). The Khoja Sartez field in the southern Khatlon Region and the Qizil Tumshuq deposit in the Kolkhozobod District of the southern Khatlon Region are currently in operation.

Hard coal deposits in Tajikistan are estimated at 375 Mt with 3.7 billion tonnes of resources (BGR, 2013). Coal is available in almost all regions of the country, but many of the deposits are located in remote mountainous areas.

### HYDROPOWER

According to the Tajik government, Tajikistan's river system accounts for an estimated 4% of the world's hydropower resources. Tajikistan only uses a small portion of its hydropower potential at present. Its technical potential is 317 gigawatt hours (GWh) of electricity per year while the current generation is around 16 GWh (around 5% of the potential) (Republic of Tajikistan, 2014).

Amu Daryia is the major river system in Tajikistan with hydropower potential. Its major tributaries within Tajikistan include the Panj River along the southern border of Tajikistan with Afghanistan, the Gunt and Bartango rivers in the eastern part of the country, the Syr Daryia and Zarafshan rivers in the north and the Kafirnigan and Vakhsh rivers in central and western Tajikistan. Of these, the Vakhsh River is the most important in terms of hydropower potential.

## ENERGY SECURITY AND DIVERSIFICATION

Energy security in Tajikistan is in a state of a crisis and is therefore of great concern for the government. The country relies on hydropower for nearly all of its electricity needs, but it is volatile from one season to the next – electricity is in surplus in summer months and in shortfall in the winter months. The existing electricity generation capacity does not suffice for winter months and many customers are subject to severe outages, having electricity only a few hours a day. There are also remote parts of the country that have no electricity or heating.

Electricity shortages have existed since independence and the system is under increasing pressure as demand continues to increase. The main response to winter shortages has been the introduction of consumption limitations. These affect mainly rural residents who represent around 70% of the population (Republic of Tajikistan, 2014).

The government also implemented an Energy Emergency Mitigation Action Plan (EEMAP) from 2008 to 2010, making sure that thermal and heat energy supplies were readily available, preparations for the following two winters were carried out and focusing on medium- and long-term policies aimed at improving energy security. During EEMAP, the government invested in new generating capacity, transformers, switchgear, cables, and the prevention of excessive water withdrawal from the Nurek reservoir. As a result, electricity shortages decreased from 5 GWh in the 2006-07 autumn-winter period to 1.6 GWh in autumn-winter 2011-12. However, challenges remain and significant additional capacity is needed to eliminate the shortages entirely.

Additional energy security risks come from aged infrastructure and the fact that most existing generation facilities are reaching the end of their life cycle. Approximately 60% of existing hydropower plants should be rehabilitated by 2020 and close to 80 percent by 2030 in order to maintain existing capacity (Fields et al., 2013). The government is mainly working with the donor community to secure projects and funding for these large-scale rehabilitations.

In addition, deterioration in regional co-operation has worsened energy security in Tajikistan. The electricity interconnection to Uzbekistan and to the Central Asia Power Grid was cut off in 2009 and a gas pipeline from Uzbekistan was cut off in 2013. The country has had to reduce its reliance on gas imports to supplement winter electricity shortages.

Under these conditions, the government's approach to improved energy security focuses on the development of domestic energy resources (including large hydro), improving transmission and distribution networks, and strengthening regional integration with other neighbouring countries.

The construction of the Rogun reservoir on the Vakhsh River is the main government project at present. If built, the Rogun HPP would have the capacity of 3.6 GW and would produce enough electricity to eradicate winter shortages. Construction of the plant began in the 1980s but was interrupted by political instability. Since then, only maintenance activities have been performed and the continuation of the construction is dependent on assessment studies. The World Bank is financing an assessment study for the project and in September 2014 it published a final report which deemed the project as feasible under certain safety conditions.[4]

The government is also planning to develop energy sources other than largo hydro to diversify the fuels in electricity generation and reduce volatility. Barqi Tojic is constructing a new coal-fired power plant, Dushanbe-2, with Chinese foreign investors, 100 MW of which was constructed in 2014 and another 300 MW is planned by end-2017. Small hydro development has experienced the most success at present, with over 130 MW of capacity built by the end of 2014. Other plans include the conversion of heat generation plants from gas to coal and the rehabilitation of existing thermal power plants in order to improve efficiency.

Regional co-operation is also of grave importance, and the government is turning its focus to its southern neighbours. Once Rogun HPP is constructed, there would be enough electricity for domestic consumption and export to Afghanistan and Pakistan in the summer months, as specified under the CASA 1 000 project. If both projects go ahead, Tajikistan is expected to significantly increase regional co-operation and diversify its export markets.

**4.** www.worldbank.org/en/country/tajikistan/brief/final-reports-related-to-the-proposed-rogun-hpp.

## ENERGY INFRASTRUCTURE AND INVESTMENT

### ELECTRICITY AND HEAT

#### Electricity generation

Tajikistan has about 5.2 GW of electricity generation capacity, 94% of which is hydro. The remainder is 318 MW (6%) in thermal power plant capacity (Republic of Tajikistan, 2014). However, during winter months the system's capacity is reduced to 2.3 GW, which is 1.2 GW less than the peak demand of 3.5 GW (Fields et al., 2013).

The majority of Tajikistan's hydropower is produced by the hydro stations on the Vakhsh River, with a total capacity of about 3.8 GW, producing 14 GWh annually. The largest of these is the Nurek hydroelectric facility with a capacity of 3 GW. The Nurek Dam was constructed during the Soviet era between the years of 1961 and 1980. Tajikistan has 11 large and medium HPPs and nearly 300 small power plants (total capacity of 132 MW) (Republic of Tajikistan, 2014).

Hydro generation capacity has expanded over the past decade, with the completion of Sangtuda HPP 1 in 2009 and the smaller Sangtuda HPP 2 in 2014. The two power stations added 900 MW of capacity. The government is also seeking aid from donor communities and foreign investors to rehabilitate the oldest and largest HPPs, to maintain and increase capacity.

Thermal power capacity in Tajikistan represents around 6% of total generation capacity. It is mainly comprised of gas-fired CHP plants that are also used in heat generation and central heating. Barqi Tojik is constructing a 400 MW coal-fired power station, Dushanbe 2, in co-operation with Chinese partners. The first 100 MW were constructed during 2014 with the remainder to become operational by end-2017. Other plans include the conversion of heat generation plants from gas to coal and the rehabilitation of existing thermal power plants in order to improve efficiency.

#### District heating

District heating in Tajikistan is aged and highly inefficient, with a number of heating stations not in operation due to age/condition. Underinvestment in the sector has resulted in deteriorated infrastructure and a falling number of customers, with households switching to electric or gas heating.

The main heat generation facilities have 1.3 GW of capacity, and a transmission and distribution network of 125 km of heat supply mains and 414 km of other piping (Fields et al., 2012).

District heating is available and operational only in Dushanbe. Dushanbe district heating system comprises a CHP plant and a number of large and small boiler houses (several of which are not operational due to age and condition).

The Yavan CHP plant used to provide heating for the Yavan urban area; however, the CHP plant is no longer operational.

#### Transmission and distribution networks

Tajikistan has two separate electrical networks, one in the north of the country and one in the south. To connect the two systems and to supply power from the Rogun HPP and the Sangtuda-1 HPPs to the northern regions, a 500 kV south – north transmission line was constructed in 2011.

Another 500 kV Obi-Garm – Sangtuda – Kunduz - Puli Khumri – Kabul transmission line is planned, under the CASA 1 000 project. CASA 1 000 involves a high-voltage power line grid connecting Kyrgyzstan, Tajikistan, Afghanistan and Pakistan, with a length of 1 200 km (around 585 km will connect Tajikistan and Afghanistan). The project was approved in 2012 by all member countries and construction will likely begin in the next five years. The two exporting countries, Kyrgyzstan and Tajikistan, will generate foreign exchange earnings as a result of the export of surplus summer electricity. The project will also provide the connection of power between the two countries, which will improve the reliability of the high-voltage electricity transmission network in the region. For Afghanistan the project will provide a source of additional net summer electricity that can be used to meet domestic needs and/or for re-export to Pakistan. Afghanistan is also guaranteed a significant income from the transit of electricity. For Pakistan, the lack of electricity is a major constraint to economic growth.

Options are also being considered for construction of a 500 kV Khudjant –Shymkent (Kazakhstan) transmission line and a 500 kV Khudjant – Datka (Kyrgyzstan) transmission line connecting the country to South Kazakhstan and the Urals (Russia). Further proposed transmission lines are the 750 kV Obi-Garm – Khorog – Vakhan Corridor (Afghanistan) – Peshawar (Pakistan) (650 km in length), the 500 kV Obi-Garm – Sangtuda – Kunduz – Herat (Afghanistan) – Mashkhad (Iran) (1 100 km), the 500 kV Obi-Garm – Jirgatal – Sary Tash (Kyrgizstan) – Ulugchay (China) (550 km), and a 500 kV line from Tajikistan to Turkmenistan via Afghanistan.

In the autonomous Gorno-Badakhshan region, the distribution network is owned and operated by Pamir Energy. The public-private partnership has rehabilitated most of the network since 2002, reducing supply shortages and outages to minimal levels, and has constructed a transmission line to Afghanistan, which supplies electricity to a number of villages across the border.[5]

The ADB has granted Tajikistan USD 122 million for the modernisation and rehabilitation of its transmission system for 2010-15. The grant includes the construction of two new 220 kV transmission lines and the rehabilitation of substations. It also includes investment in the SCADA system and a network control centre. Conditional on the grant is the progressive restructuring of Barqi Tojik.

Barqi Tojik is responsible for annual investment in the modernisation, rehabilitation and development of the electricity network. This includes preventive repairs to prepare the systems for the autumn-winter period and to reduce shortages. According to the government, the annual preventive measures have reduced the winter shortages from 5 GWh in the 2006-07 autumn-winter period (when the crisis was at its worst) to 1.6 GWh in autumn-winter 2011-12.

## NATURAL GAS

The gas network is divided into two separate systems. In the north, pipelines total 609 km in length; however, those connected to Uzbekistan were cut off at the border in 2013. Only one pipeline is in use. The southern system includes 412 km of pipelines.

In September 2014, the governments of Tajikistan and China began the construction of the Line D gas pipeline, part of the Central Asia-China pipeline system, which will transit gas from Turkmenistan, via Uzbekistan, Tajikistan and Kyrgyzstan to China. The overall

**5.** www.partnershipsinaction.org/content/pamir-energy.

capacity of exports to China will be 85 bcm (including all four lines). Line D will be about 1 000 km long with 425 km to be built in Tajikistan. The Chinese government will finance the project (Eurasianet, 2014).

TajikTransGas, the TSO, is responsible for maintaining the transmission pipelines and implements an annual maintenance programme. DSOs are responsible for maintenance of the distribution pipelines. There are no specific medium-/long-term maintenance programmes for the gas sector.

Oil and gas exploration in Tajikistan is still in the early stages of development. In June 2013, CNPC, Total and Tethys Petroleum finalised an agreement to develop oil and gas deposits in the Bokhtar field in the east of the Amu Daryia basin. Under the agreement, CNPC and Total hold 33.335% stakes each in the project and Tethys holds a 33.33% stake. Once developed, the gas would be mainly destined for Chinese markets.

### SYSTEM RELIABILITY

System reliability in the electricity sector is very poor, with frequent shortages, outages and high losses. Shortages and outages are mainly in the winter months, while losses are high all year round due to aged and inefficient infrastructure. According to the government, total transmission, distribution and commercial losses are estimated at around 15% (with transmission losses at approximately 4%), a level which has declined slowly from around 20% in the mid-2000s.

The World Bank has financed a project to reduce transmission losses to 12% by 2020, with an interim target of 15% by 2016. The 2013 World Bank report indicates that improvements are minor and that efforts should be accelerated to meet those targets (Fields et al., 2013).

The ADB project on the rehabilitation and modernisation of the transmission network is expected to result in loss improvements after 2015. Another project is in the Sughd region, for 2011-14, with funding from the EIB, EBRD, EC and Barqi Tojik. The project includes the reconstruction of the Kayrakkum HPP, rehabilitation of the Khojent district distribution network and part of the Bobojon Gufarov distribution network, and the purchase and installation of electronic meters for those regions.

Technical and commercial losses are near 17% in the gas sector, which is considered very high by international standards. Most of these losses are in the distribution pipelines. Transmission pipeline losses have now been reduced to close to zero as TajikTransGas has implemented a Loss Reduction Programme for the gas sector. This project has embraced the installation of bulk and individual gas meters to almost all customers. Further project activities have included the introduction of international accounting standards and installation of modern billing systems.

## EMERGENCY RESPONSE

Tajikistan, like its neighbours, has emergency response mechanisms that date back to the Soviet era. Obligatory levels of oil stocks are included under the old legislation, which may or may not be kept by Barqi Tojic, mainly for financial reasons.

However, unlike its neighbours, Tajikistan has significant electricity shortages that are ongoing and will take time to eliminate. The government is responding by including emergency mitigation in energy policies and focusing investment in electricity generation and increasing efficiency. The government developed the EEMAP, with the help of the World Bank, in response to the 2007-08 energy crisis when shortages were around 5 GWh, in order to increase electricity and heat generation at thermal stations through oil supply, and to improve network equipment in preventing excessive water withdrawal from the Nurek reservoir (World Bank, 2010).

The government has since revised the EEMAP to incorporate new challenges brought on by the cut-off from Uzbekistan and the Central Asia Power Grid in 2009. New measures include the construction of the transmission line connecting the north and south electricity networks, construction of Sangtuda-1 and the rehabilitation of the Nurek hydro reservoir. Other measures which are still in slow progress include efforts to reduce losses and to reduce demand by improving energy efficiency and using energy-saving technologies (World Bank, 2010).

# 8.3. MARKET CONVERGENCE

## NATIONAL MARKET STRUCTURE

### ELECTRICITY AND HEAT

Barqi Tojik, a vertically integrated company, operates a large majority of the electricity sector and the whole heat sector. The company produces most electricity and all heat and operates as a TSO, DSO, dispatch centre and retailer. The company is financially and legally unbundled from the government, although is in full state ownership.

Barqi Tojik operates approximately 4 GW of main hydropower capacity, owns 25% of Sangtuda HPP 1, owns and operates around 8 MW of renewable energy capacity and all of thermal power plant capacity in Tajikistan. The remainder is fully or partially owned and operated by foreign investors; for instance, 75% of Sangtuda HPP 1 is owned and operated by Russian investors while Sangtuda HPP 2 is fully owned and operated by Iranian investors for a period of 12 years.

The Tajik government has expressed the desire to restructure Barqi Tojik in a bid to increase its performance, improve management, reduce indebtedness and increase efficiency in the electricity and heat sectors. Restructuring has been planned and agreed with a grant from the ADB under a wider Regional Power Transmission Project and Improving Operations programme. In August 2011, the government signed the Approval on the Restructuring Plan of the Individual Open Joint Stock Holding Company Barqi Tojik for 2011-18. Under the restructuring plan, the government expects to separate the generation, transmission and distribution (and retail) functions of Barqi Tojik by 2018. At the end of 2014, the government and the donor community were still in negotiations over the possible approaches and conditions of the planned restructure.

The electricity and heat sector in Tajikistan is aged and inefficient, and requires substantial investment in rehabilitation and new infrastructure. The government is aware of the need to attract private investors to fully or partially finance most of these projects. As such, it has made efforts to improve investor attractiveness and simplify the business climate in the country in a 2009 Reform Programme, resulting in a significant reduction of bureaucratic procedures and a “one-stop shop” facility for investors. Since then, two major investors have contributed to the construction of new hydro, namely the above-mentioned Sangtuda-1 and Sangtuda-2 hydro plants.

However, investor challenges remain, mainly with regard to clear legislation for third-party access and confidence in investor return, as tariffs are highly subsidised and heavily regulated.

### OIL AND NATURAL GAS

The oil and natural gas sectors are fully state-owned and -operated. The State Committee for Oil and Gas carries out exploration and production activities for the sector. It has production sharing agreements with a number of foreign investors.

The gas sector is state-owned and -operated, through a TSO company and 11 regional DSOs, which are also retailers. TajikTransGas is the gas importer and TSO and it operates the central dispatch. The DSOs have been financially unbundled from TajikTransGas since 2009, and are in state ownership.

The natural gas sector in Tajikistan was cut off from its main import source, Uzbekistan, in 2013. As such, no gas was imported during 2014, with domestic production accounting for around 2% of demand. It is unclear, due to the political situation at present, if and when imports from Uzbekistan will recommence.

The government is planning to privatise the gas sector by selling the DSOs. No companies have been sold to date. Part of the reason for lack of interest is the lack of rules on third-party access.

## COAL

Coal production in Tajikistan has increased substantially over the past decade, and approximately 18 private enterprises operate at 14 coal deposits in Tajikistan. The level of coal production and investment in the sector is expected to continue to increase as industries in Tajikistan are switching from other fuels to coal, with the support and encouragement of the Ministry of Energy and Water Resources.

## REGULATORY FRAMEWORK

Regulation of the energy sector is the responsibility of a number of ministries and an independent regulator does not exist. The Ministry of Energy and Water Resources is responsible for the implementation of energy policies (including renewables) and licensing, as well as technical and safety standards, while the Antimonopoly Committee, established in 2010 under the Ministry of Economic Development and Trade, is responsible for tariff structure and regulation of monopolistic behaviour.

### Tariffs

#### Electricity and heat

Electricity and heat tariffs in Tajikistan are highly subsidised and below cost-reflective levels. Its tariffs are among the lowest in the world, and are kept low to avoid customer dissatisfaction (and possible uprising), and to reduce commercial losses. This includes households and commercial customers, inluding the largest industrial customer, TALCO Tajik Aluminium Company.

However, low tariffs have resulted in underinvestment in the energy sector and consequent inefficiencies and worsening of the already high supply shortages.

The government is therefore committed to increasing electricity and heat tariffs to cost-reflective levels over the medium to long term. In the 2006-11 period, tariffs were increased by 250% on average, albeit from negligible levels (Fields et al., 2013). In the two years to 2012, electricity tariffs were increased by a further 20% per year, and another 15% in 2013, for both residential and commercial customers, in a bid to raise the tariffs from very low levels. The tariffs at present are (Republic of Tajikistan, 2014):

- households: USD 0.0232/kWh
- industrial and non-industrial enterprises: USD 0.0561/kWh

- public and municipal consumers, electric transport and sports facilities: USD 0.0223/kWh
- water wells and pumping stations: USD 0.0004/kWh.

The summer and winter electricity tariffs for TALCO Tajik Aluminium Company were increased to USD 0.014/kWh and USD 0.0220/kWh, respectively (increasing by 40% from 2010).

The tariff structure/methodology is based on Barqi Tojik's cost of generation, transmission and distribution of electricity and heat, as well as allowing for a profit margin. Allowances for bringing tariffs to a cost-reflective level are included in these calculations. Barqi Tojik's Planning Department determines the cost requirements and submits proposed electricity and heat tariffs to the Antimonopoly Committee for approval. The committee considers the proposed tariffs and submits its decision to the government for approval. After approval by the government, Barqi Tojik informs the public through media outlets of the revision of electricity and heat tariffs.

In some cases of public-private partnerships, such as the Pamir Energy partnership in the autonomous region of Gorno-Badakshan, tariffs are established by a government memorandum. According to this memorandum, the tariffs charged by Pamir Energy exceed Barqi Tojik's tariffs.

According to the Law on Energy, all electricity produced by small hydropower stations and other renewable energy sources are under compulsory purchase agreements with agreed tariffs, as is the case with Pamir Energy.

### Natural gas, coal and oil

Natural gas tariffs are based on the imported price of natural gas from Uzbekistan. The methodology behind the domestic prices is confidential and prices are reviewed on a quarterly basis. TajikTransGas sets the national tariffs, which are approved by the Antimonopoly Committee.

Oil tariffs are also based on imported prices, while coal prices are regulated and approved by the Antimonopoly Committee on a case-by-case basis for each entrerprise.

### Connections and metering

Nearly 100% of customers have individual electricity and gas metering. The collection rates in 2013 were 78% for electricity and 100% for gas users. Debts owing to Barqi Tojik and TajikTransGas are significant and accumulated from previous years, and some have been written off by the government.

## Technical rules

Technical rules in Tajikistan are based on the Soviet-era GOST standards in the electricity, heat and gas sectors. The government is considering adopting more European CENELEC standards in electricity and gas to standardise rules across the region. However, implementation is a challenge due to the lack of financial and capacity-building resources.

Tajikistan is a corresponding member of the International Standards Organisation (ISO), the Euro-Asian Cooperation of National Metrological Institutions (COOMET) and of the Euro-Asian Council for Standardisation (EASC).

## REGIONAL MARKETS AND INTERCONNECTIONS

### ELECTRICITY

Tajikistan trades electricity only with Kyrgyzstan and Afghanistan. Tajikistan began exporting electricity to Afghanistan in 2013 and exports grew to 1.4 TWh in 2014.

The connection to Uzbekistan and the Central Asia Power Grid was cut off in 2009. Before the cut-off, imports and exports were at a similar level, at around 25-30% of Tajikistan's generation. During 2009-12, exports fell to below 5% of generation and imports were below 1% of demand. Electricity trade declined significantly as Kyrgyzstan is not equipped to supply Tajikistan with large volumes of electricity during the winter months when it also experiences electricity shortages.

The most relevant proposal for regional integration for Tajikistan is the CASA 1 000 project, a high-voltage power line connecting Kyrgyzstan, Tajikistan, Afghanistan and Pakistan. The feasibility study was approved in 2012 and construction will likely start in the next few years. Kyrgyzstan and Tajikistan, the two exporting countries, will generate foreign exchange earnings for the export of surplus summer electricity. Afghanistan will import electricity during the summer months when its shortages are most prominent, and transit some electricity to Pakistan, which also requires more electricity in the summer.

In 2014, Tajik and Pakistani authorities agreed on an electricity tariff of USD 0.05/kWh, which is more than double the current residential electricity tariff in Tajikistan (Tribune, 2014). Afghanistan and Pakistan also agreed on the tariff in October 2014, which will likely help move the project along. However, challenges remain with regard to security of construction in Afghanistan.

### NATURAL GAS

In the gas sector, Tajikistan was almost fully dependent (98%) on imports from Uzbekistan which ceased in 2013. The remainder is domestically produced, albeit volumes are low and insufficient to cover winter shortages.

Construction of the Line D pipeline of the Central Asia-China pipeline system began in September 2014 with the first gas expected to flow in 2016. This will allow Tajikistan to increase gas imports while also earning revenue from gas transit. The price contract with China is confidential, and the pipeline construction in Tajikistan is financed by the Chinese state-owned CNPC (Eurasianet, 2014).

# 8.4. SUSTAINABLE DEVELOPMENT

## RENEWABLE ENERGY

Tajikistan is endowed with plentiful water resources and it relies on hydropower for most of its energy needs. The development of small hydro has increased in the past few years, reaching 132 MW of capacity by the end of 2013. This is a result of the implementation of the government programme on the construction of small hydro, which began in 2009. The programme originally aimed for the construction of 189 small HPPs by 2020. It was a great success with investors, with nearly 300 constructed by 2013. Many of the small hydro plants are in private ownership or joint ownership with the government. The government envisages up to 3 GW of small hydro capacity over time, particularly for small, remote regions of the country.

Non-hydropower renewable energy sources are undeveloped in Tajikistan. The main reason for lack of investment in solar, wind, biofuels and geothermal is the perceived high cost of these technologies, as well as no strong government incentives or policy decisions to promote other renewables.

The main policy for renewable energy development is set out in the Law on Renewable Energy Sources (2010) and the above-mentioned programme for small hydro development. The Law on Renewable Energy Sources stipulates the rules for the connection to the grid, tariff setting and certain preferential treatment for private investors (including tax breaks). The government offers the guarantee of purchase for electricity from new renewable energy sources; however, connection to the grid and third-party access rules are unclear and challenging at times.

Solar energy has the highest potential in Tajikistan of all non-hydro renewable sources, due to the country's large number of sunny days, estimated at 25 TWh/y. Wind potential is small, mainly in mountainous regions of the country. Electricity from biomass potential is estimated at 2 TWh/y, while geothermal potential is estimated at 45 TWh/y (Reegle, 2014).

The earliest programme on renewable energy was introduced in 2007, the Programme on the Use of Renewable Energy for 2007-2015. The purpose of the programme was to assess different renewable energy technologies and implement changes in the electricity and heat sectors. Besides growth in small hydropower, no other renewable energy technologies have been developed in Tajikistan to date.

## ENERGY EFFICIENCY

Energy efficiency potential in Tajikistan is expected to be significant; however, energy efficiency data availability is limited. The energy infrastructure is aged and losses are high, indicating the level of energy efficiency on the supply side. The demand side is more difficult to calculate, particularly due to the dispersed nature of electricity and heat supply, imposed limits on consumption and significant shortages in the winter months.

Nonetheless, given the existing energy crisis, energy efficiency and demand management measures are paramount. A reduction in the concentration of demand would decrease the need for winter restrictions and slow the trend in population and income-driven demand growth.

A new Law on Energy Efficiency and Energy Saving was adopted in September 2013. The law sets out the legal and institutional framework for energy efficiency in Tajikistan, and provides for the introduction of energy-efficient appliances and technologies. It has provisions for mandatory energy audits and requirements for buildings and household appliances, among other aspects. It also stipulates methods for the establishment of the National Fund for Renewable Energy Sources, Energy Saving and Energy Efficiency (Energy Charter, 2013). Secondary legislation and mechanisms for the implementation of the new law are still under consideration.

One of the major energy efficiency projects for Tajikistan that is expected to significantly reduce demand is the recommended Energy Efficiency Action Plan for TALCO, based on an audit completed by the World Bank. The project includes measures for savings of 1 155 GWh of electricity and 197 GWh of natural gas per year, translating to a 20% cut in electricity and natural gas compared to 2013, or 37% lower than average consumption in 2009-11. This would reduce demand on the grid by 132 MW (Fields et al., 2013).

The government has agreed to implement the project as recommended by the World Bank, in a period of four years.

## ENVIRONMENTAL PROTECTION

According to the UNECE report on green development in Tajikistan, the country's natural resources are showing signs of climate change, including erosion of forest soil from extreme weather changes, deteriorating water quality from melting glacial areas and loss of biodiversity, among others. Including unsustainable resource depletion by local communities, the cost of environmental degradation is an estimated 10% of Tajikistan's GDP (UNECE, 2013).

One of the government's priorities is environmental protection, and it has adopted a number of action plans and programmes in the past decade (UNECE, 2013):

- National Environmental Action Plan, adopted in 2006
- State Forestry Development Programme for 2006–15
- State Ecological Programmes for 1998–08 and 2009–19.

The government has also developed the Environmental Protection Fund, which is operated under the Committee for Environmental Protection, Environmental Protection Activities. The committee implements environmental protection laws and management of preservation, restoration and regeneration of forests, sustainable use of flora and fauna, control of protected areas and natural monuments, water resources and air, and compliance with environmental safety standards (Energy Charter, 2013).

With the fast development of the coal industry, and potential gas extraction in the future, the focus of environmental policy will be on monitoring the environmental impact in the main areas of production and processing of energy resources, as well as solving the problem of the rational use of water resources of the country.

The Ministry for Environment monitors electricity generation for compliance with environmental standards (including $CO_2$ emissions). TajikStandart, following support from the EPMOGI project under the INOGATE Programme, has adopted a set of environmental management standards.

## CLIMATE CHANGE

Tajikistan ratified the Kyoto Protocol on 21 October 2008 and prepared the second National Communication for the United Nations Framework Convention on Climate Change in 2008. In 2009, the government approved the establishment of the Interagency Council for the implementation of Clean Development Mechanisms (CDMs) as well as the procedure for selection and approval of CDM projects. As of April 2011, several CDM projects have been proposed and are under consideration for registration, while one on hydropower generation has been validated.

Energy-related $CO_2$ emissions totalled 2.8 Mt in 2012 in Tajikistan, which is 75% lower compared to 1990. The commercial and public services sector (including agriculture) accounts for 87.3% of emissions, followed by transport at 11%. The power generation sector accounts for only 1.7%.

# 8.5. INVESTMENT ATTRACTION

## INVESTMENT CLIMATE

Although the Tajik government invites foreign investment, the level of private interest has been minimal and the investment climate remains challenging. The president has made numerous public calls for increased foreign investment, particularly in the hydropower sector. However, government administration is yet to implement the key reforms and regulations necessary to create an attractive business climate.

Investment opportunities are often most favourable for governments/private companies with existing ties with the country and those able to understand and manoeuvre within the burdensome bureaucracy. Unsurprisingly, the most investment to date in the energy sector has been from Russia, China and Iran, countries that are dominant in the region and/or have strong political ties with Tajikistan. The donor community has also played a role, while domestic investment is stagnant due to lack of financing and the high perceived level of corruption.

To move its economy forward and create a more favourable investment climate over time, the government has taken the first necessary steps and has made progress in reducing some of the bureaucratic burden and opening the market for a more diverse range of investors.

The key change in investment policy was the introduction of a new Law on Investment in 2007. The law stipulate rules for the privatisation of companies and sales to foreign investors, including rights for land ownership and business relationships with local companies/ authorities. The Consultative Council on Improvement of Investment Climate was also established in 2007 to facilitate public-private dialogue and joint development recommendations to improve the business environment and investment climate in the country.

Tajikistan ratified the Convention on the Recognition and Enforcement of Foreign Arbitral Awards, also known as the New York Convention, in October 2012. Following this decision, the State Program on Improvement of Investment Attractiveness in Mineral Resources for 2012-2015 was adopted. Tajikistan was also approved as a candidate for the Extractive Industries Transparency Initiative in February 2013 (Republic of Tajikistan, 2014).

A number of legislative acts were adopted in support of the Law on Investment in the five years after, including the Law on Privatisation of State Property, the Law on Production Sharing Agreements, the Law on Concessions, the Law on Free Economic Zones, the Law on Credit History, and the Law on Public-private Partnership.

Through this legislative pact, the government has significantly increased investment incentives for domestic and foreign parties. These incentives include a waiver on taxation on initial investment and VAT-free import of equipment and supplies. The government has also introduced the "one-stop-shop" principle for business registration, reduced the required number of licences and permits and reduced the number of inspections and audits, with additional incentives for investors in priority areas of the economy, including exceptions from a large number of taxes for hydropower plant construction and exports from the cotton industry.

Under the Law on Free Economic Zones, four free economic zones (FEZs) were established: Sughd, Panj, Danghara and Iskashim. These zones free any economic activity from customs and import duties, export duties, taxation and labour restrictions. They are designed to attract investment for specific industries, including hydropower projects, manufacturing and the cotton industry. According to the government, economic activity from foreigners has increased in all regions but Panj (Republic of Tajikistan, 2014).

Tajikistan's regulatory system has also been growing more transparent. The Ministry of Justice registers all laws and ensures they are not in conflict with each other. All laws and normative acts are published and available in print and electronic formats from the Ministry of Finance, which also provides an update service. A recent law provides that new legislation cannot prejudice commercial enterprises and agreements set up under earlier conditions. Nonetheless, most laws are lacking in detail and the development of secondary legislation is necessary to improve clarity and transparency.

According to the World Bank's "ease of doing business" indicator, Tajikistan was ranked 166th among 189 countries in 2014. A high ranking on the ease of doing business index means the regulatory environment is more conducive to the start-up and operation of a local firm. This index averages the country's rankings on ten topics, made up of a variety of indicators, giving equal weight to each topic. Tajikistan has the lowest rating among EECCA countries.

According to the Corruption Perceptions Index (CPI) prepared by Transparency International, which measures the level of perceived corruption in the public system, Tajikistan ranks 152nd among 175 countries in 2014, with a score of 23. This is a relatively high score with regards to perceived corruption in the country, as a score of 100 represents no corruption. Tajikistan acceded to the UN Convention against Corruption on 25 September 2006, but is not yet a signatory. It has not signed the OECD Anti-Bribery convention.

## INVESTMENT FRAMEWORK

The investment framework has been updated substantially over the past decade, as the government's policy is to attract more domestic and foreign investment. However, the implementation of current policies and legislation remains challenging due to the high level of perceived corruption in the country and treatment of investors with strong political ties and interests.

Financial support from the donor community remains high in the country, and many projects in the energy sector are financed by the government with aid from donors. During 2002-12, public investment projects with financial support from donors and international financial institutions totalled USD 2.13 billion, of which USD 1.614 billion was in loans; USD 371.5 million in grants; and USD 147 million came from the government (Republic of Tajikistan, 2014). Energy investment totalled USD 882 million over the same period (40% of all investment), USD 5.5 million of which was financed by Barqi Tojik.

Foreign direct investment since independence to 2013 amounted to USD 2.3 billion. This includes investment from: Russia – USD 827.1 million (36.4%), China – USD 319.9 million (14.1%), Iran – USD 302.4 million (13.3%) and the United Kingdom – USD 210.5 million (9.3%) (Republic of Tajikistan, 2014).

The major investment projects in the energy sector over the medium term include the Rogun HPP and the 500 kV Obi-Garm – Sangtuda – Kunduz – Puli Khumri – Kabul transmission line under the CASA 1 000 project. Line D of the Central Asia-China gas pipeline will be fully financed by China.

Construction of the Rogun HPP is estimated at more than USD 2 billion, to be conducted in four stages. The plant has been deemed feasible by a study conducted by the World Bank; however, attracting funding remains a challenge for the government.

The funding for the CASA 1 000 project is expected to be around USD 1 billion and includes funding for the construction of the assets of the four members of the project. Financing needs per country, according to calculations by SNC Lavalin are: USD 300 million for Afghanistan, USD 270 million for Tajikistan, USD 200 million for Kyrgyzstan, and USD 200 million for Pakistan.

Construction of the Line D pipeline of the Central Asia-China pipeline system will attract approximately USD 6.2 billion from CNPC by the end of 2016.

## INVESTMENT PLANNING

The government prepares and approves two-year investment, construction and grant programmes. In 2013, the programme for 2014-16 was approved, including plans for the implementation of 120 investment projects, with 39 projects worth USD 1.3 billion already implemented (Republic of Tajikistan, 2014).

## References


BGR (Federal Institute for Geosciences and Natural Resources) (2013), *Energy Study 2013: Reserves, Resources and Availability of Energy Resources*, Federal Institute for Geosciences and Natural Resources, Hannover, Germany.

Energy Charter (2013), *In-depth Energy Efficiency Review: Tajikistan*, Energy Charter Secretariat, Brussels.

Eurasianet (2014), "Tajikistan, China break ground for landmark gas pipeline", press release, 14 September, http://www.eurasianet.org/node/69976.

Fields, D. et al. (2013), *Tajikistan's Winter Energy Crisis, Electricity Supply and Demand Alternatives*, World Bank, Washington, DC, https://openknowledge.worldbank.org/bitstream/handle/10986/15795/796160PUB0REPL00Box377374B00PUBLIC0.pdf?sequence=1.

Fields, D. et al. (2012), *Tajikistan's Winter Energy Crisis: Electricity Supply and Demand Alternatives*, World Bank, Washington, DC, www.worldbank.org/content/dam/Worldbank/document/TAJ-winter-energy-27112012-Eng.pdf.

IEA (International Energy Agency) (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

Reegle (2014), website, http://www.reegle.info/policy-and-regulatory-overviews/TJ (accessed 19 December 2014).

Republic of Tajikistan (2014), Ministry of Foreign Affairs website, http://mfa.tj/en/energy-sector/the-energy-sector-of-rt.html (accessed 15 November 2014).

Tribune (2014), "CASA-1000 project: Pakistan, Tajikistan agree on electricity tariff", press release, 24 June, http://tribune.com.pk/story/726016/casa-1000-project-pakistan-tajikistan-agree-on-electricity-tariff/.

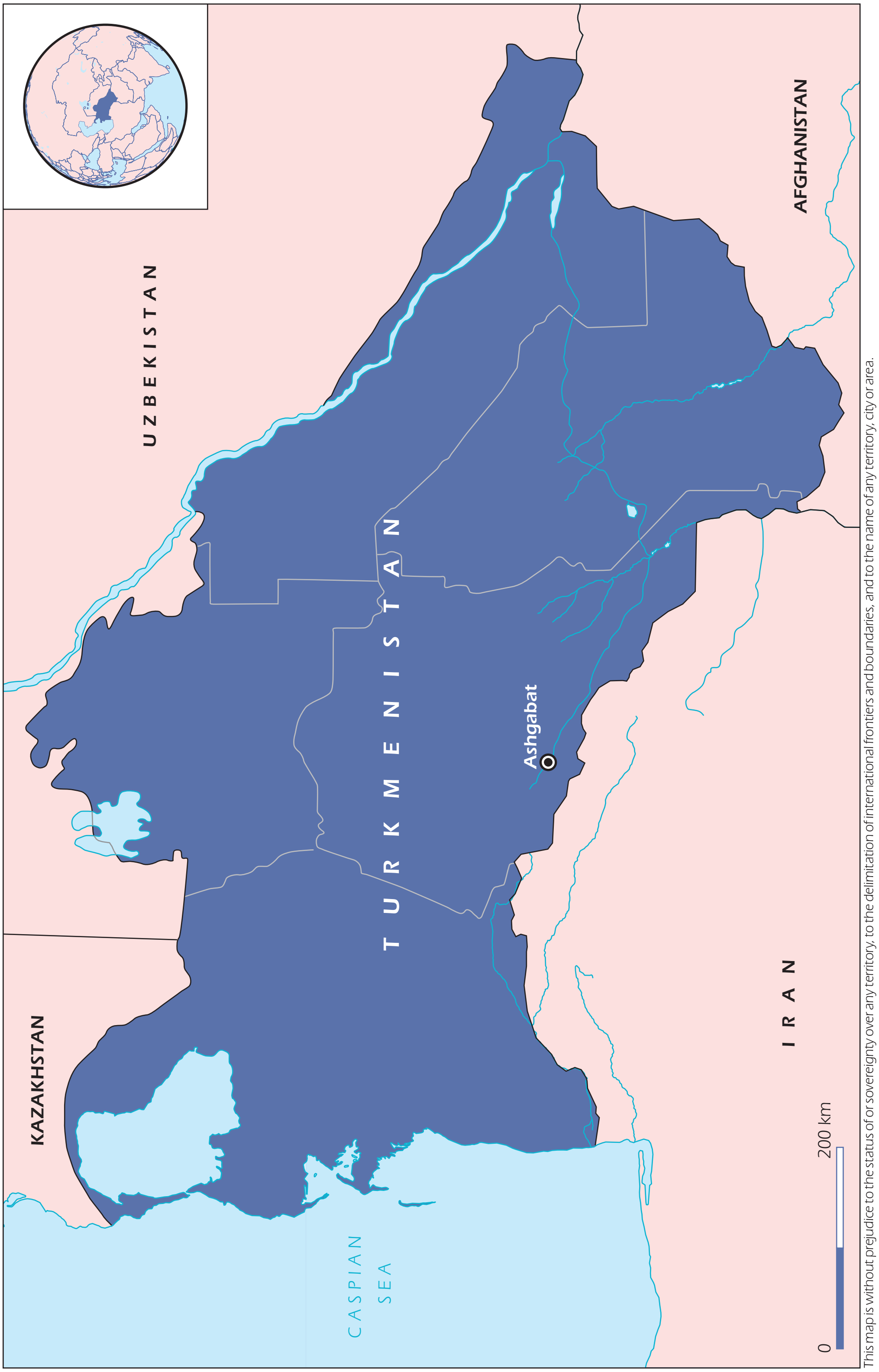
UNECE (United Nations Economic Commission for Europe) (2013), *Promoting Green Innovation Policy Assessment and Recommendations, Tajikistan*, UNECE.

World Bank (2014), *Tajikistan Overview*, World Bank website, www.worldbank.org/en/country/tajikistan/overview (accessed 10 November 2014).

World Bank (2010), *Project Paper on a Proposed Additional Grant in the Amount of SDR 9.9 million (US$15.0 million equivalent) to the Republic of Tajikistan for the Energy Emergency Recovery Assistance Project*, Report No: 52889-TJ, World Bank, www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2010/04/29/000333037_20100429234536/Rendered/PDF/528890PJPR0P121nly10IDAR20101011411.pdf.

# TURKMENISTAN

**Figure 9.1.1** Map of Turkmenistan



# 9.1. GENERAL ENERGY POLICY

**Key data (2012)**

**Energy production:** 68 Mtoe (natural gas 82.6%, oil 17.4%), +27.8% since 2002

**TPES:** 25.6 Mtoe (natural gas 77%, oil 23.9%, electricity net imports -0.9%), +61.7% since 2002

**TFC:** 16.8 Mtoe (natural gas 59.1%, oil 34.8%, electricity 50%, heat 1.2%), +71.9% since 2002

**TFC per sector:** commercial and public services 41.3%, transport 16.2%, industry 13.7%, agriculture 1.6%, residential 1%, other non-specified 26.1%

**Electricity generation:** 17.8 TWh (natural gas 100%), +65.9% since 2002

**Heat generation:** 8.6 PJ (natural gas 100%), +65.9% since 2002

**Energy intensity:** 0.45 toe/USD 1 000 GDP PPP, -36.8% since 2002

## COUNTRY OVERVIEW

Turkmenistan is located on the eastern shore of the Caspian Sea. It is bordered by Iran to the south, Afghanistan to the southeast, and Kazakhstan and Uzbekistan to the north. The country occupies 492 200 $km^2$, 80% of which is desert, with a population of 5.1 million. Turkmenistan has five administrative provinces: Akhal, Balkan, Dashoguz, Lebap and Mary. The capital is Ashgabat, the largest and most populous city in Turkmenistan.

Turkmenistan gained its independence from the Soviet Union on 27 October 1991 and declared “permanent neutrality”, which was formally recognised by the United Nations in 1995. Turkmenistan’s economy is also largely independent and has been so since the beginning of the country’s independence.

Turkmenistan is one of the largest gas resource holder in the Caspian region and has the fourth-largest total offshore and onshore gas reserves in the world, behind Iran, Russia, and Qatar. Turkmenistan also holds significant volumes of recoverable oil. Turkmenistan’s economy depends heavily on gas, oil and petrochemical production and export and, to a lesser degree, on cotton and textiles. Around 85% of total exports are gas and oil. The private sector is underdeveloped, with the government in control of most of the economy and some private businesses in food processing, consumer trade, and service sectors. Foreign investment in the gas and oil sector is through production sharing agreements (PSAs) with the Turkmen government.

Turkmenistan’s real GDP was growing at 9.8% on average from 2002 to 2012, which placed Turkmenistan’s economy among the fastest growing in the world. As a result, the country gained an upper middle-income status in 2012, with a real GDP per capita of USD 11 100 (World Bank, 2014). Strong economic growth has led to investment in physical infrastructure, including energy infrastructure. The government is continuing to invest in the oil and gas sector, including a large project to modernise and expand the electricity and heat sector by 2020. According to the current Oil and Gas Development

Plan to 2030, gas production will increase fourfold to 250 billion cubic metres (bcm) by 2030, with oil production expected to be ten times higher at 110 million tonnes (Mt).

The energy sector is nearly fully subsidised, with free electricity, heat and gas up to a certain level of consumption. The subsidies were brought in after independence and have been guaranteed until 2030. However, the government is taking steps to reduce subsidies before 2030 in order to curb domestic demand and allow for export growth.

A Memorandum of Understanding and Co-operation in the field of Energy between the European Union and Turkmenistan was signed in May 2008. Regional energy co-operation between Turkmenistan and the European Union takes place within the framework of the Baku Initiative, which provides for political dialogue between the European Union and the countries of the littoral states of the Black and Caspian seas and their neighbouring countries.

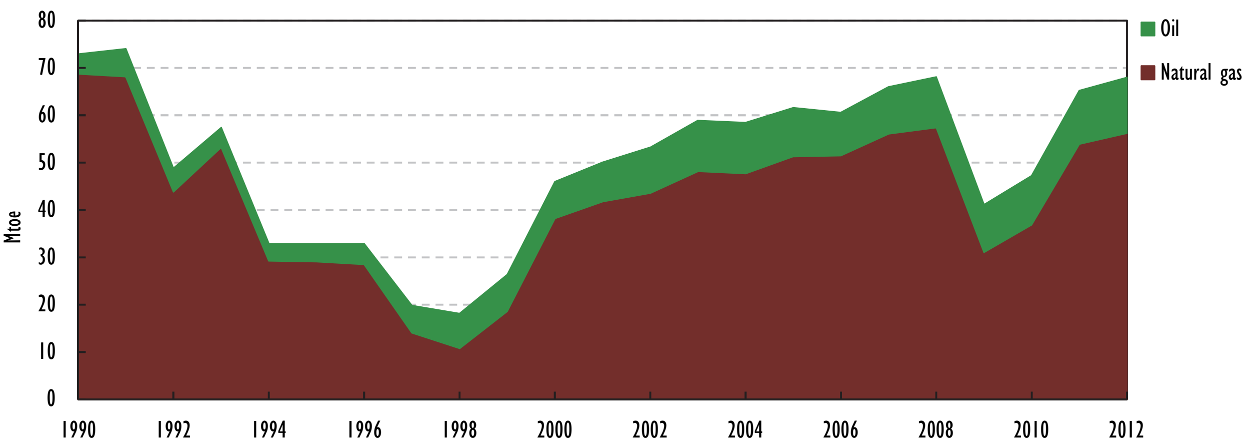
## KEY ENERGY DATA

### SUPPLY

Turkmenistan is ranked fourth-largest in the wold with regard to natural gas reserves, estimated at 10 000 bcm in 2012. Crude oil reserves are estimated 204 Mt (BGR, 2013).

Turkmenistan's natural gas and crude oil production totalled 68 million tonnes of oil-equivalent (Mtoe) in 2012. Energy production grew steadily from 2000 to 2008, before a 40% slump in 2009 during the global financial crisis. Since 2009, production has recovered to 2008 levels (Figure 9.1.2). Gas production increased by around 20% during 2013-14.

**Figure 9.1.2** Energy production by source, Turkmenistan, 1990-2012




* Negligible.

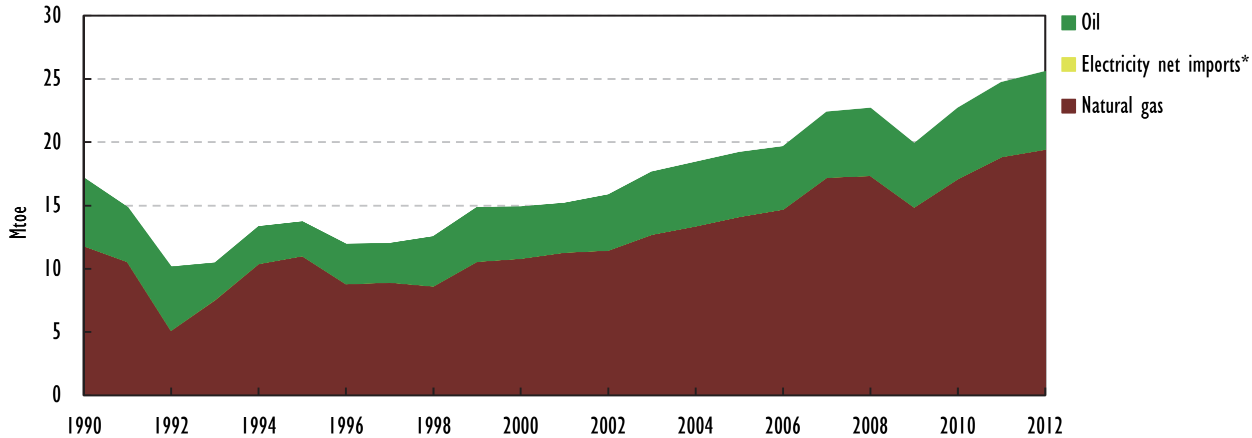
Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

Natural gas production accounted for 82.6% of total production in 2012. In 2013, gas production was 76.1 bcm. This is 41.5% higher compared to 2002 and 7.3% higher than in 2008, before the slump. Production fell 46% to 38.3 bcm in 2009, albeit with a moderate recovery. Gas production grew by 10% during 2013 and is estimated to have increased by a further 10% in 2014.

Crude oil production represented 17.4% of total production in 2012, at 11.8 Mtoe. This is 21.9% higher compared to 2002 and 10.2% higher than in 2008. During 2009, crude oil production decreased by 6.2%. Turkmenistan was also producing marginal hydropower until 1999 when it ceased. Turkmenistan also produces oil products in local refineries, with a total refinery output of 8.1 Mtoe in 2012. Refinery output was 29% higher in 2012 compared to 2002, without a decline in production during 2009.

Total primary energy supply (TPES)[1] was 25.6 Mtoe in 2012, which accounts for 37.6% of energy produced. The majority of domestically produced natural gas, crude oil and oil products are exported. TPES accounts for the energy supplied for domestic purposes, and it has shown an upward trend since the mid-1990s. TPES has increased by 61.7% since 2002, growing at a faster rate than energy production. During 2009, TPES declined by 12.3%, albeit recovering by 14.1% in 2010 and continuing to grow since (Figure 9.1.3).

**Figure 9.1.3** TPES, Turkmenistan, 1990-2012




* Negligible.

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

Two fuels supply all of Turkmenistan's energy needs: natural gas (77% of TPES) and oil (23.9%). Electricity net imports are negative as Turkmenistan is a net exporter of electricity, and they account for -0.9% of TPES. Over the ten years since 2002, the natural gas supply has grown at a faster rate than the supply of oil: natural gas has increased by 70.3% while oil supply has increased by 41.1%. As such, the share of natural gas in TPES is up from 73.1% in 2002. Electricity net exports have nearly tripled since 2002; however, they remain a negligible share of TPES.

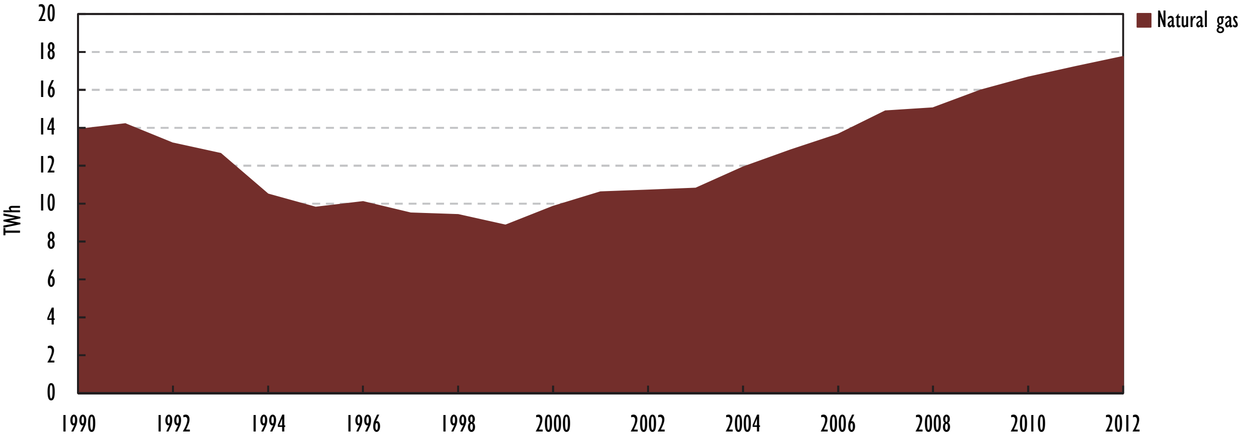
## ELECTRICITY GENERATION

Electricity generation in Turkmenistan reached 17.8 terawatt hours (TWh) in 2012. Electricity supply was 65.9% higher in 2012 compared to 2002 (Figure 9.1.4). Despite a decline in energy production and TPES during 2008, electricity generation grew by a moderate 1.1%. All electricity is generated from natural gas since marginal hydropower generation ceased in 1999.

Heat generation was 8.6 petajoules (PJ) in 2012, also fuelled exclusively by gas. Heat generation has experienced the same level of growth as that of electricity generation since 2002.

**1.** TPES is made up of production + imports - exports - international marine bunkers - international aviation bunkers ± stock changes. This equals the total supply of energy that is consumed domestically, either in transformation (for example, refining) or in final use.

**Figure 9.1.4** Electricity generation by source, Turkmenistan, 1990-2012




Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## IMPORT AND EXPORT

Turkmenistan exports the majority of the energy produced, including natural gas and crude oil as well as oil products. Natural gas exports totalled 45.1 bcm in 2012 while crude oil exports and oil product exports amounted to 3.1 Mtoe and 2.2 Mt, respectively. Exported oil products include gasoline, gas and diesel oil, and fuel oil. According to the Turkmen government, Turkmenistan exports gas to China, Iran, Russia and Turkey through pipelines.

Natural gas exports were 14.2% higher in 2012 compared to 2002, while crude oil exports were 10.3% higher. Exports of oil products remained relatively unchanged. During 2009, natural gas exports declined by 60% and were still 8% lower in 2012 compared to 2008. Crude oil exports decreased by 40% during 2009 and 2010; however, exports surged by 35% in 2012, finishing 30% higher than in 2008. Turkmenistan does not import natural gas or oil and oil products.

Turkmenistan is also an exporter of electricity, with total exports of 2.8 TWh in 2012, which accounts for 16% of electricity generation. Exports have increased by 169% since 2002 when they represented 8.5% of generation. Turkmenistan exports electricity to Iran and Afghanistan, while some electricity is transited to Turkey via Iran.

## DEMAND

Total final consumption (TFC)[2] was 16.8 Mtoe in 2012. Energy demand is dominated by the commercial and public services sector, which accounts for 41.3% of that total. Transport and industry account for 16.2% and 13.7% respectively, while agriculture and the residential sector are marginal consumers at 1.6% and 1.1%, respectively (Figure 9.1.5). However, the data include non-specified consumption, which is significant at 26%.[3] The above-mentioned sectoral breakdown is only for specified consumption. Non-specified consumption is most likely in rural areas.

Energy consumption has increased by 71.9% over the ten years since 2002. Demand from the commercial services sector grew by 124.6% and its energy comes from gas.

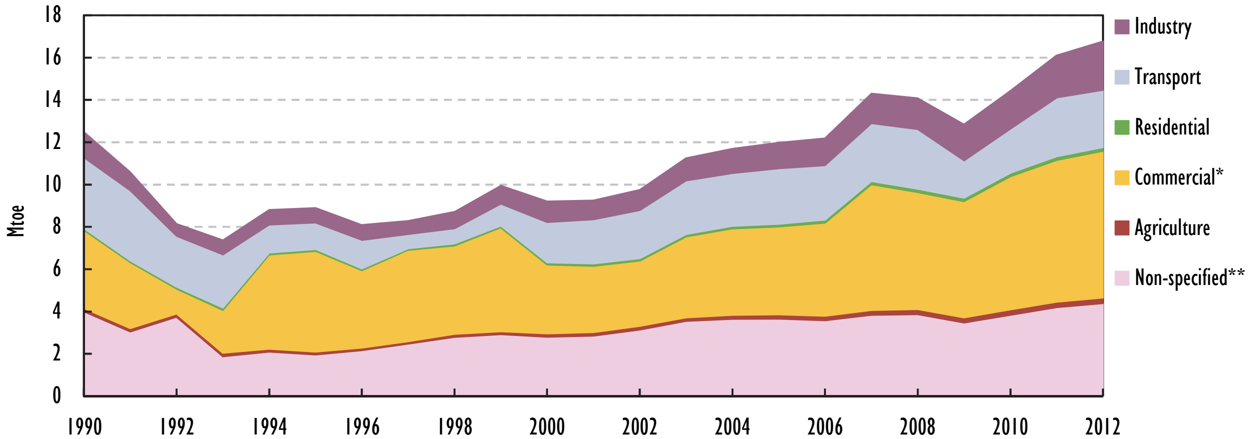
**2.** TFC is the final consumption by end users, i.e. in the form of electricity, heat, gas, oil products, etc. TFC excludes fuels used in electricity and heat generation and other energy industries (transformations) such as refining.

**3.** Non-specified consumption includes all fuel use not elsewhere specified, as well as consumption in categories for which figures have not been provided. Military fuel use for all mobile and stationary consumption is included here.

Industry demand increased by 137.1% over the same period and its main fuels are oil products (44.5%), natural gas (40.9%) and electricity (14.7%). The transport sector has experienced the slowest growth in energy consumption, increasing by 19.2% since 2002. Natural gas is the main fuel used in transport in Turkmenistan (53%), followed by oil products (46.3%) and some electricity (0.7%).

Agriculture and residential sectors consumed mainly electricity, while heat consumption is non-specified in the data.

**Figure 9.1.5** TFC by sector, Turkmenistan, 1990-2012




* *Commercial* includes commercial and public services.

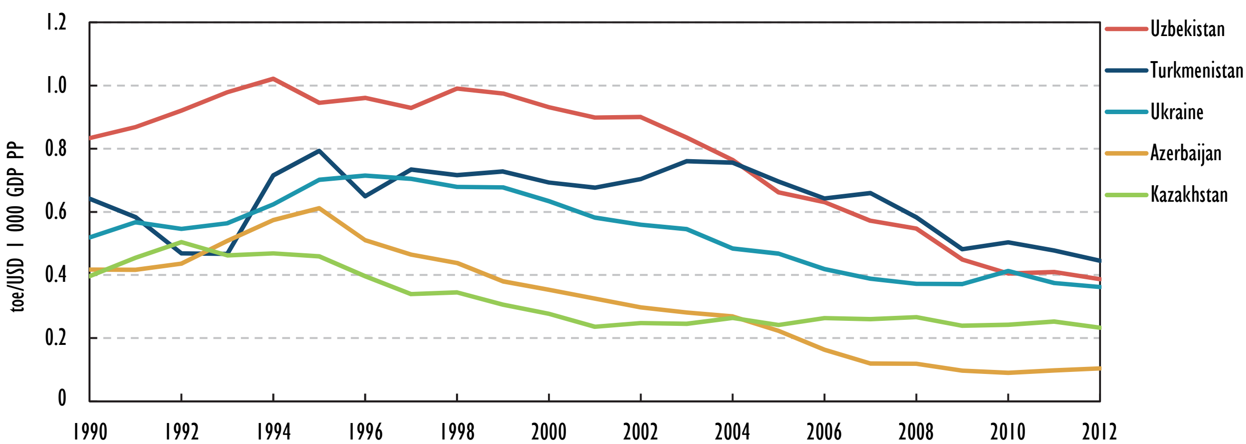
** *Non-specified* includes all consumption not elsewhere specified, as well as consumption in categories for which figures have not been provided. Military fuel use for all mobile and stationary consumption is included here.

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## ENERGY INTENSITY

Turkmenistan's energy intensity, measured as the ratio of TPES to real GDP, was 0.45 toe/USD 1 000 GDP PPP in 2012. This is the highest intensity compared to other EECCA countries (Figure 9.1.6). Since 2002, energy intensity in Turkmenistan has declined by 36.8%, down from 0.7 toe/USD 1 000 GDP PPP. Real GDP growth was 156% over the same period, while TPES increased by 61.7%.

**Figure 9.1.6** Energy intensity in Turkmenistan and other selected EECCA countries, 1990-2012

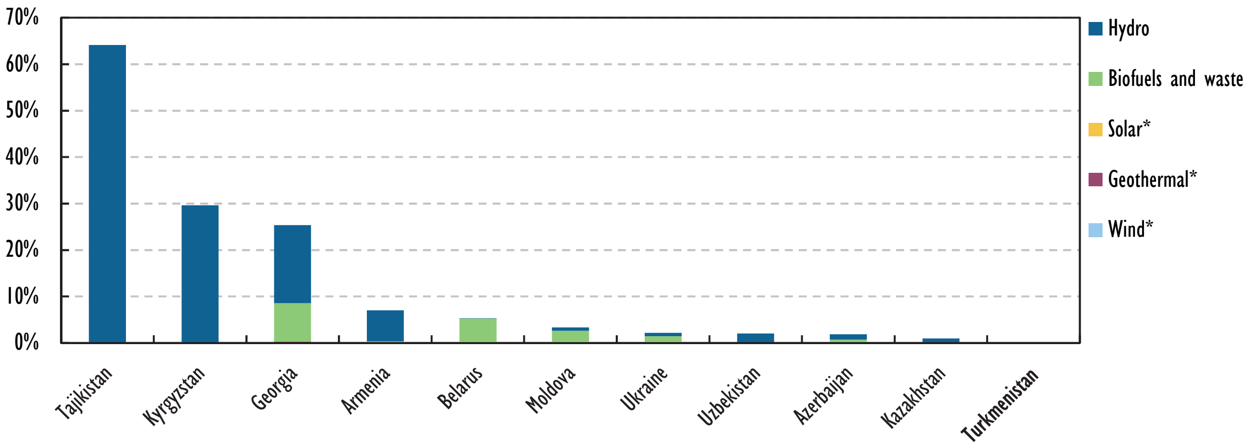



Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## RENEWABLES

Renewable energy in Turkmenistan is considered to be zero at the moment; this is below any other EECCA Country (Figure 9.1.7). However, data on biomass consumption by household for heating are not accurately captured and could be misrepresented.

**Figure 9.1.7** Renewable energy as a percentage of TPES in Turkmenistan and other EECCA countries, 2012




* Negligible.

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## ENERGY DATA SOURCES

The figures presented in this report are official energy statistics and balances of the International Energy Agency (IEA) for Turkmenistan and other EECCA countries, based on IEA methodology.

The State Statistical Committee is the authoritative body in Turkmenistan for the collection and publication of country statistics, including those for the energy sector. Its responsibilities and activities are governed by the Law on State Statistics, approved in 2012.

The INOGATE Programme has worked with the government and assisted in the development of the Energy Statistics Action Plan for 2012-2014. However, the action plan was not approved by the government and it is unclear whether the country is planning to harmonise its statistics with the international community, including the IEA.

# ENERGY SECTOR DESIGN

## MARKET STRUCTURE

The Turkmen government owns and operates the energy sector.

Vertically integrated state-owned company TurkmenEnergo operates the electricity sector, while the Ministry of Energy manages the sector.

The Ministry of Oil and Gas Industry and Mineral Resources manages the oil and gas industry, while:

- TurkmenGeologia develops gas and oil deposits.
- TurkmenNeft produces crude oil.
- TurkmenGaz produces gas.

- TurkmenNefteGaz is involved in downstream oil and gas activities, including processing, transportation and distribution of natural gas and oil products.
- TurkmenNefteGazStroi constructs energy infrastructure.

Several international energy companies operate in Turkmenistan's upstream oil and gas sector through PSAs with the government. These PSAs are limited to offshore oil and gas blocks in the Caspian Sea. The exception is the Bagtyiarlyk onshore natural gas project with China (EIA, 2012).

## INSTITUTIONAL FRAMEWORK

Turkmenistan's energy sector is governed by the executive branch of the government and the Cabinet of Ministers, with a number of ministries responsible for policy implementation and sector management.

**The Ministry of Oil and Gas Industry and Mineral Resources** is responsible for oil and gas deposit development, oil and gas production, transportation and export.

**The State Agency for the Management and Use of Hydrocarbon Resources** is within the Ministry of Oil and Gas Industry and Mineral Resources. Established in 2007, the Agency is responsible for licencing, PSA negotiations and agreements. The Agency also establishes the gas transit tariff.

**The Ministry of Energy** is responsible for electricity generation, transmission, distribution and retail. The Ministry is also responsible for alternative and renewable energy developments.

**The Ministry of National Security** is responsible for emergency response, including the emergency stock holding obligations.

**The Ministry of Finance**, among other responsibilities, is responsible for energy tariff methodology and setting.

## LEGAL FRAMEWORK

Turkmenistan's primary energy legislation has been recently revived, with most legislation passed in the couple of years to end-2014. The passing of more than 60 bills over this period demonstrates the government's current desire to develop the economy and attract private investment. However, with the primary legislation passed only recently, the secondary legislation still needs to be developed and policies implemented.

During 2014, the government passed crucial energy legislation – the Law on Subsoil, the Law on Consumer Rights, the Law on Environmental Assessment and the Law on Electricity – among 30 new legislations. New energy bills in 2013 and 2012 include the Law on Certification (2013), the Law on Denationalisation and Privatisation of State Property (2013), the Law on Hydrocarbon Gas and Gas Supply (2013), the Law on Automobile Transport (2013), the Law on Statistics (2012) and the Law on Standardisation (2012), among others.[4]

The Law on Hydrocarbon Resources (2008) (amended in 2013) is the legislation behind the development of the hydrocarbon extraction industry to date, including the PSAs. The State Agency for the Management and Use of Hydrocarbon Resources is the implementing body of this law.

**4.** http://cis-legislation.com.

The Law on Foreign Investment (2008) (amended in 2013) is the primary legislation for the improvement of the investment climate and foreign investment incentives.

Turkmenistan has no renewable energy or energy efficiency legislation at present.

## KEY POLICIES

Energy policy in Turkmenistan is centred on gas and oil industry development, the diversification of export routes and increasing foreign investment in the sector. This is a change from previous policies since the country's independence, when the economy was extremely closed. Turkmenistan's economy remains centred and closed, tightly controlled by the government and lacking competition. However, the government is opening parts of the energy sector to private investors to boost economic growth.

With this in mind, the government adopted the Oil and Gas Development Plan to 2030 in 2006 and the National Programme for Socio-Economic Development to 2030 in 2011. Projects of strategic interest include the Turkmenistan - Afghanistan - Pakistan - India (TAPI) pipeline, which is in the advanced planning stage and awaiting finance. Discussions with the European Commission and the Caspian Development Corporation on the Trans-Caspian gas pipeline are also active, albeit challenging due to disputes over Caspian Sea regulation. The Central Asia-China pipeline network is already functioning and expanding, with line D talks in progress. In 2013, Turkmenistan and Turkey agreed on connecting Turkmen gas supplies to the Trans-Anatolian Pipeline (TANAP).

Turkmenistan is investing in gas and oil processing, planning to substantially increase its oil product production and exports. In 2013, Turkmenistan began a USD 2 billion project to build a new port on the Caspian Sea designed for oil product exports. A number of other projects and agreements have been signed with foreign investors and the Turkmenbashi oil refineries complex is currently undergoing an expansion project.

While oil and gas sector development has been rapid and profitable, the electricity and heat supply sector has suffered from lack of investment over the past 20 years. Outages are common, particularly during the winter months, and the infrastructure is aged and inefficient, with high losses.

The government's objectives in the electricity and heat sector include meeting growing domestic demand, improving poor system reliability and increasing electricity exports, while providing free or affordable prices.

Turkmenistan's electricity generation is run on natural gas (with the exception of a few small hydro plants), and achieving efficiency improvements in generation would allow for more gas exports. For the same gas-savings reason, as well as to reduce greenhouse gas (GHG) emissions, the government is also starting to express plans to develop renewables and implement energy efficiency measures. However, the dialogue on renewable energy is only beginning in Turkmenistan and no policies have been developed. At the end of 2014 the government was in the process of developing an energy efficiency policy and the Law on Energy Savings. The policy is expected to include measures for improving fuel efficiency in power stations through modernisation and rehabilitation, and increase municipal and industrial energy efficiency along with energy efficiency in buildings (EBRD, 2014).

In 2013 the government adopted the Power Sector Development Programme to 2020 for building new electricity generation capacity, modernising and rehabilitating existing infrastructure and expanding the electricity export network. The programme includes investment plans of USD 5 billion for 14 new gas-fired units, the conversion of gas turbines to combined-cycle turbines, 24 000 new distribution and transmission lines, including new export routes, and combined heat and power (CHP) plant and network rehabilitation. The programme is expected to double electricity production, save 1.5 bcm of gas per year and reduced GHG emissions by 3 Mt per year. It will be carried out in two stages, with the first stage running until end-2016. The first stage includes eight new gas-fired power plants in Akhal, Mary and Lebap provinces, existing generation rehabilitation in Seydi, Balkanabat and Abadan, and transmission network expansion. The second stage to 2020 includes six new gas-fired plants and switching to combined-cycle plants (Shumskaya, 2013).

Turkmenistan's energy prices are among the lowest in the world. All end users receive free electricity, gas and gasoline up to a certain level of consumption. Electricity is free up to 25 kWh per person per month, gas is free up to 50 $m^3$ per person per month and gasoline is free up to 120 litres per vehicle per month. Prices paid over the free threshold are also considered to be very low, averaging to negligible annual costs. Heat and water are also provided for free. Gas, oil and electricity exports, however, are priced based on bilateral agreements between the government and the buyers.

Energy price subsidies were brought in soon after the country's independence and were extended to 2030 by the new president in 2006. However, growing energy demand, inefficient resource allocation and mounting government debt have put pressure on the government to reduce subsidies and change its policy. The free-consumption threshold was reduced from 35 kWh per person per month to 25 kWh per person per month in 2013 while the price of gas over 50 $m^3$ per person per month was inflated by a factor of seven during 2014. The government has started installing gas meters to track consumption, as most properties are not metered at present. Free vehicle fuel was also abolished for trucks and buses in 2012.

The Turkmen government recognises climate change and GHG emissions reductions to be of national importance. Turkmenistan ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 1995 and the Kyoto Protocol in 1998 as a non-Annex I Party. In 2012, the country submitted its National Strategy on Climate Change to 2030 to the UNFCCC, developed with assistance from UN Development Programme (UNDP). As part of the strategy, Turkmenistan created an emissions inventory that was used in identifying key emission reduction projects. However, no projects have been realised to date.

## INVESTMENT

Since independence, Turkmenistan's energy sector investment has been mostly in the upstream oil and gas extraction through PSAs between the Turkmen government and foreign investors. The government restricts foreign investment to offshore projects only, with the exception of the Bagtyiarlyk onshore natural gas project with China (EIA, 2012). The oil and gas sector investment inflow and oil and gas export revenues have driven Turkmenistan's economic growth over the past two decades.

The investment climate in Turkmenistan is still closed, government-controlled and suitable for companies or other governments with strong ties to the Turkmen government. While the Turkmen government is easing its administrative and regulatory foreign investment burdens through new legislation and favourable conditions, the perceived level of corruption is high and the investment climate is challenging. Over the last decade, Turkmenistan has improved relations with foreign partners interested in the country's upstream and midstream developments; however, it requires amplified efforts to ensure sound, predictable and transparent regimes for long-term investment commitments.

Major future energy infrastructure projects include the development of the TAPI gas pipeline, projected to cost USD 8-10 billion; and the potential Trans-Caspian gas pipeline, with an estimated cost of USD 5 billion. Both projects are still seeking investors; however, the TAPI pipeline is in the advanced stages of planning, and construction would begin in 2015 if financing is secured. Ongoing investment projects in the gas sector include the modernisation and rehabilitation of gas facilities and the gas network, and new gas and oil processing facilities.

Turkmenistan has started the construction of a USD 3.4 billion petrochemical complex to produce polypropylene and polyethylene, processing 5 bcm/year of gas, and a USD 1.7 billion gas-to-liquids plant that will transform gas at 1.7 bcm/year. Both will be financed by Japanese investors.

TurkmenEnergo is also investing in the electricity and heat network, as well as in generation capacity rehabilitation, modernisation and expansion to combat the high incidence of outages and losses, and cater for growing demand. The ongoing project is expected to cost around USD 5 billion by 2030 and increase capacity by 800 MW with up to 24 000 km of additional 500 kV, 220 kV and 110 kV lines. This includes additional export infrastructure to Iran and Afghanistan.

### TECHNOLOGY AND INNOVATION

Research on alternative energy in Turkmenistan is conducted by Gyun Research and Production Association, created by the Turkmenistan Academy of Sciences. TurkmenGeologia carries out scientific studies of oil and gas exploration while TurkmenGaz is engaged in gas processing scientific research.

## ASSESSMENT

Turkmenistan has abundant hydrocarbon reserves and is among the world's largest energy producers. The oil and gas sector is the largest in the national economy and drives economic growth by maximising income from energy exports. It is also a guarantee for the country's economic independence and national energy security. In the last decade, Turkmenistan undertook substantial modernisation of the energy infrastructure and construction of additional gas transmission systems, capable of transportation of larger volumes of gas to neighbouring markets.

The government's focus over the last decade has been the diversification of energy export markets and the creation of a reliable and stable system for energy-related investments encouraging the Turkmen gas flows to international markets. Since 2009, Turkmenistan has been exporting gas to China via the Central Asia-China pipeline and exports to Iran have increased through a second Turkmenistan-Iran pipeline. The country has modernised the gas transmission system, including export pipelines, the gas distribution network, control stations and underground gas storage, which has allowed for a steady increase of gas production and export volumes.

By 2030, the Oil and Gas Complex Plan envisages gas and oil production to grow by four and ten times compared to 2011, respectively. The government is looking for investors to participate in the sector and develop alternative gas and oil routes, including the TAPI pipeline and the Trans-Caspian pipeline for the European markets.

Turkmenistan's electricity and heat system, however, has been underdeveloped over the past two decades and has incurred regular shortages and efficiency losses. The infrastructure is aged and inefficient, while there is increasing pressure from growing domestic electricity demand and demand for electricity exports. The Power Sector Development Programme to 2020 includes plans for significant investment in the electricity and heat sector, with the focus on increasing generation capacity and expanding interconnections with Iran and Afghanistan. As part of the programme, existing networks will also be rehabilitated, modernised and expanded to accommodate growing demand.

There is large number of public bodies governing the energy sector; however, there is limited co-ordination among these entities. The energy policy is set by individual ministries and public authorities, without clear co-ordination, assessing the entire potential of the country. Demand for natural gas is growing from domestic and foreign markets, and in order to create a complete picture of supply and demand management the government needs to see the full picture across all sub-sectors. This could be achieved through strong co-operation among the ministries or through the streamlining of responsibilities of the energy sector into a single ministry. Additionally, energy data and statistics should be shared and transparent to all ministries and the public to improve policy-making decisions and increase investor consciousness and confidence.

Turkmenistan is one of the most energy-intensive economies in the region, and free public access to commodities discourages energy savings by end users. Demand management is a new concept in the country' energy policy, and at the end of 2014 the government was in the process of developing an energy efficiency policy and the Law on Energy Savings. The policy is expected to include measures for improving fuel efficiency in power stations through modernisation and rehabilitation, and increase municipal and industrial energy efficiency along with energy efficiency in buildings. The government should approve both supply- and demand-side policies, and pass the primary and secondary legislation promptly to start implementing measures necessary to curb growing demand and distribute gas supplies more effectively to export markets.

Energy tariffs are nearly fully subsidised, with free electricity, gas and heat up to a certain level of consumption. The tariffs charged above the free threshold to eligible customers are still far from cost recovery levels. The financial burden of subsidies on the Turkmen government is growing due to increased population and rising energy demand, while the lost cost to consumers is discouraging energy savings and resulting in inefficient gas consumption. Phasing out subsidies and increasing energy tariffs to cost recovery levels over time would curb demand growth and increase funds available for infrastructure investment and implementation of energy efficiency measures. The government began cutting back subsidies in 2012 despite prolonging them to 2030 in 2006; however, prices remain among the lowest in the world.

Turkmenistan has ample solar and wind potential, and recent government policies envisage developing alternative sources of energy (renewable energy in this case) in a bid to free up more natural gas for export markets, reduce GHG emissions and diversify the domestic supply. However, renewable energy policy targets have not been set nor have investor incentives.

## *RECOMMENDATIONS*

*The government of Turkmenistan should:*

- ☐ *Streamline energy sector governance, encouraging better co-ordination and synergies among the developments of all sources of energy. This includes transparency in statistics and information-sharing among government institutions and with international partners.*

- *Develop robust energy-saving and energy efficiency policies to curb domestic demand growth and allow for increased exports and the diversification of export routes. Encourage the deployment of advanced energy-efficient technologies in all sectors of the economy.*
- *Continue to phase out energy subsidies while protecting the most vulnerable end users.*
- *Develop clear, transparent and reliable mechanisms for encouraging renewable energy investments.*

# 9.2. ENERGY SECURITY

## RESOURCE ENDOWMENT

Turkmenistan is rich in gas and to a lesser extent in oil. The country has 10 000 bcm of estimated economically-viable gas reserves, with 15 000 bcm of gas resources. The reserves place the country as fourth-largest in the world behind Russia, Iran and Qatar in 2012. Crude oil reserves are more modest at 204 Mt in 2012, with 1 700 Mt of crude oil resources, which are below the global top 20 (BGR, 2013).

According to TurkmenGeologia, there are 38 oilfields and 153 gas fields, including 142 onshore gas fields and 11 offshore gas fields in the Caspian Sea. Turkmenistan has several of the world's largest gas fields, including the Amu Daryia basin in the southeast, the Murgab basin and the South Caspian basin in the west.

According to the EIA (2012), the Dauletabad field, located in the Amu Darya basin, is one of the largest and oldest gas-producing fields, with estimated reserves of 1 700 bcm. Yearly production covers annual domestic demand; however, production is declining. The giant Galkynysh field (also known as South Yolotan) in the Murgab Basin was discovered in 2006, with potential reserves up to 13 000 bcm (not all economically viable), which would make it the second-largest field in the world. The field became operational in 2013.

Turkmenistan oil output is concentrated in western areas and offshore in the Caspian Sea, in some disputed areas without agreement between Iran, Azerbaijan and Turkmenistan (EIA, 2012).

Turkmenistan's solar energy potential is vast due to 300 sunny days per year. Wind power potential is also high, with a possible capacity of up to 500 gigawatts (GW) in the long term. This would rival the country's fossil fuel potential in electricity generation (UNECE, 2013). However, renewable energy remains undeveloped due to the accessibility of plentiful fossil fuel resources.

## ENERGY SECURITY AND DIVERSIFICATION

Energy security in Turkmenistan is constant, as the country utilises plentiful gas resources for most of its energy needs. All electricity supply, heating and industry consumption is sourced from natural gas. Transport is reliant on oil products which are also refined locally.

However, Turkmenistan's reliance on mainly one energy source exposes its sector to potential supply interruptions in the future as regional demand grows and gas supplies diminish. A lack of sustainable energy policies and renewable energy sources contributes to the potential supply problems in a time of growing demand and inefficient production. Additionally, highly subsidised energy prices reduce the incentive for efficient energy use, resulting in the unnecessary consumption of gas which could have been exported.

Turkmenistan is a gas and oil net exporter, and export volumes are set to grow considerably over the medium and long term as demand in China, and potentially

Europe, grows. To multiply export volumes while satisfying growing domestic demand, the country is slowly starting to reduce tariff subsidies and restrict local consumption to reduce the supply-shortages risk while increasing sales to the lucrative export market.

Turkmenistan's electricity supply is considered to be reliable, albeit inefficient due to aged infrastructure. The country, however, has the capacity for its domestic supply and around 20% exports. Turkmenistan cut off the connection to the Central Asia Power Grid in 2003; however, it continues to export electricity to Iran and Afghanistan. With export potential, Turkmenistan is planning the construction of two 400 kV high-voltage lines (Mary-Mashhad and Balkanabat-Gonbad) from Turkmenistan to Iran, with the possibility of an additional 500 kV line to Afghanistan.

## ENERGY INFRASTRUCTURE AND INVESTMENT

### ELECTRICITY AND HEAT

All electricity and heat is generated from natural gas. Generation capacity includes ten power stations with 14 steam turbines, 15 gas turbines and three hydro plants (Shumskaya, 2013). There is a very small share of hydropower production, deemed negligible. Electricity and heat supply are available to all the population for free or at prices that are among the lowest in the world.

Electricity generation capacity is estimated at 4 152 MW (UNIDO and ICSHP, 2013). Capacity has increased by 1 700 MW since Turkmenistan's independence in 1991. The Power Sector Development Programme to 2020 estimates an increase in electricity demand from 19 TWh in 2011 to 20 TWh in 2020 and 35.5 TWh in 2030. The strategy therefore plans for an increase in generation capacity with 14 new gas-fired turbines by 2020, carried out in two stages with the first stage to be finalised by end-2016 (Shumskaya, 2013). Additional capacity of 1.5 GW is ultimately projected by 2030. The government is also planning to increase hydropower capacity, with plans for 57 MW of small hydro power plant construction (UNIDO and ICSHP, 2013).

The electricity network is aged, inefficient and poorly maintained, resulting in considerable inefficiency losses. Because of this, TurkmenEnergo is undergoing network modernisation and rehabilitation, as well the modernisation of existing power plants, under the Power Sector Development Programme. Numerous projects are underway. By 2020, Turkmenistan aims to modernise eleven power generation units, increasing capacity by up to 790 MW, and convert existing gas turbines to combined-cycle units, increasing capacity by 720 MW. It also plans to develop its electricity system with new transmission lines and interconnectors for the eastern and western parts of the country. New lines would include up to 24 000 km of 500 kV, 220 kV and 110 kV lines by 2030.

As of September 2014, a 500 kV overhead transmission line from the Mary power station to the Atamurat substation was under construction, while 220 kV Serdar-Farap, Farap-Watan and Atamyrat-Pelvert transmission lines have been constructed, including the rehabilitation of the 220 kV Watan, Farap and Parakhat substations (Hasanov, 2014a).

Ongoing preventive maintenance programmes also exist and are carried out by TurkmenEnergo and the Ministry of Energy.

In 2003, Turkmenistan disconnected from the Central Asia Power Grid, ceasing electricity trade with Kazakhstan, Tajikistan, Kyrgyzstan and Uzbekistan, via Uzbekistan's power grid. Turkmenistan is currently interconnected with Iran's and Aghanistan's electricity systems. Electricity is exported to Iran via a 220 kV line from Balkanabat (Turkmenistan) to Gonbat (Iran), and to Afghanistan via two 220 kV transmission lines: the Imamnazar (Turkmenistan) - Andkhoy (Afghanistan) - Shibirgan (Afghanistan) line and the Serkhetabat (Turkmenistan) to Turgundi (Afghanistan) line.

An additional 220 kV line from Serkhetabat (Turkmenistan) to Herat (Afghanistan) is expected to be commissioned in 2015, while a 200 kV Serakhs (Turkmenistan) to Mashad (Iran) line was also under construction by the end of 2014 (Government of Turkmenistan, 2015). Other interconnection plans include two 400 kV overhead transmission lines to Iran, the Mary-Mashad and the Balkanabad-Aliabad.

The district heating network in Ashgabat had approximately 31 km of transmission lines, 150 km of distribution lines, eight central heating plants and 110 boiler houses in 2010. The network is inefficient with high losses, as infrastructure is aged due to significant underinvestment. It was built mostly in the 1950s and 1960s, with inefficient technology by today's standards and low levels of automation. Energy-saving potential is estimated at 40-50% for both domestic hot water and the heating supply system (Zomov and Behnke, 2010). Under the Power Sector Development Programme to 2020, the government is also rehabilitating heating plants and planning to construct CHP plants.

## NATURAL GAS

Turkmenistan's gas pipeline network constitutes around 7 500 km. Major existing gas pipelines are: Central Asia-Center (CAC) pipeline (Turkmenistan-Russia via Uzbekistan and Kazakhstan); the Bukhara-Urals pipeline (Turkmenistan-Russia), the Korpeje-Kurtkui pipeline (Turkmenistan-Iran); the Dauletabad-Khangiran pipeline (Turkmenistan-Iran); the Central Asia-China pipeline system (Turkmenistan-China); and the East-West pipeline (under construction).

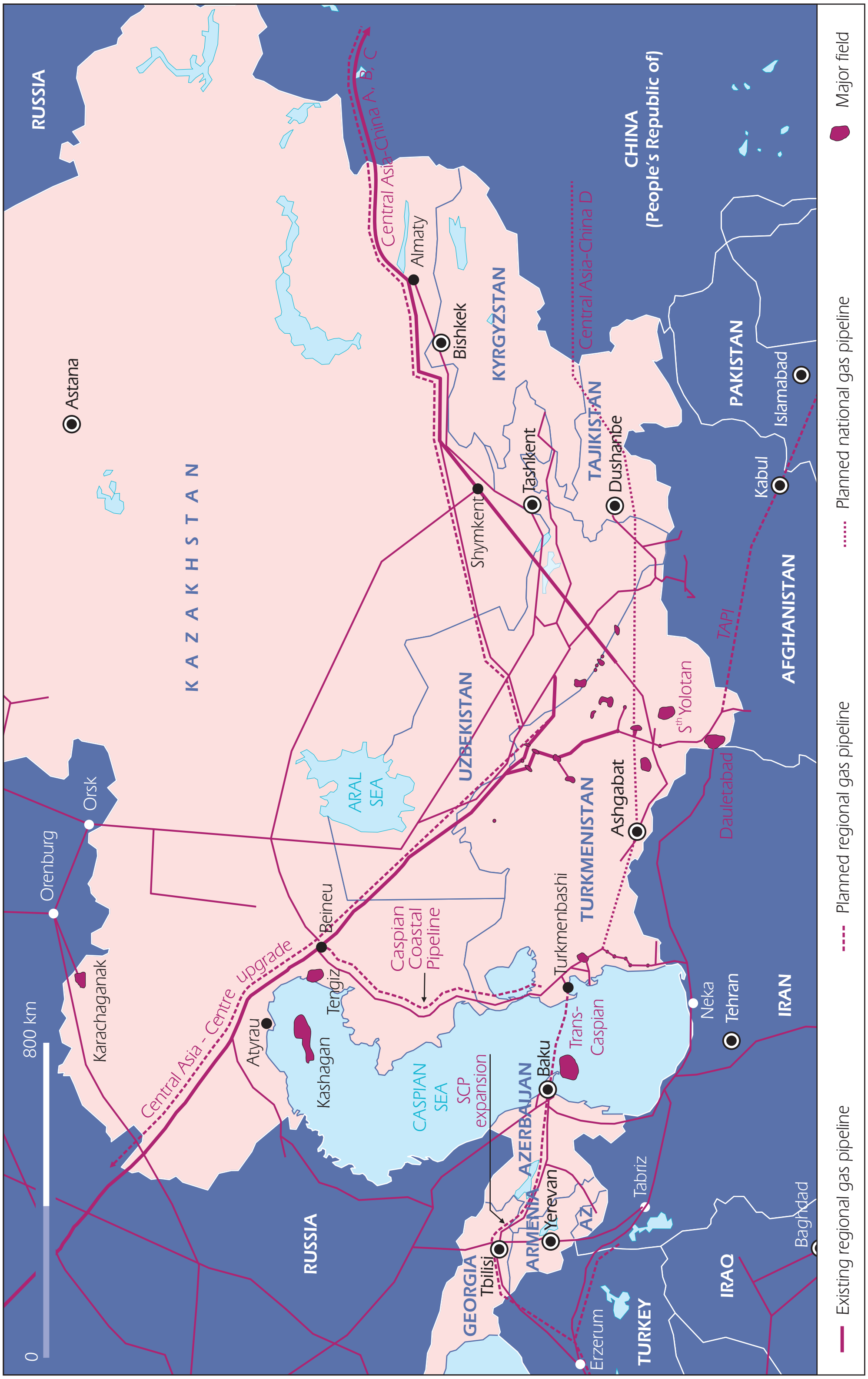
The CAC gas pipeline system runs from Turkmenistan, via Uzbekistan and Kazakhstan, to Russia and is 5 000 km in length. The pipeline's capacity is 80 bcm, with sales of around 11 bcm per year as the pipeline is in poor condition.

The Bukhara-Urals pipeline also runs from Turkmenistan to Russia via Uzbekistan and Kazakhstan. The pipeline was mothballed, however, and reopened in 2011 due to the poor condition and lack of capacity of the CAC pipeline. It also functions at only a quarter of its capacity at 5 bcm (EIA, 2012).

The Korpeje–Kordkuy pipeline is approximately 200 km long and runs from the Korpeje field in western Turkmenistan to Kordkuy in Iran, with a capacity of 8 bcm. The Dauletabad-Khangiran line is the second gas export pipeline from Turkmenistan to Iran, with a capacity of 12 bcm. The pipeline became operational in 2010 (EIA, 2012).

The Central Asia-China pipeline system, which became operational in 2009, includes dual parallel lines, lines A and B, each running for 1 833 km, starting at Gedaim on the border of Turkmenistan and Uzbekistan, through central Uzbekistan and southern Kazakhstan, and ending at Horgos in China's Xinjiang Uygur Autonomous Region. The construction of line A started in July 2008 and became operational in December 2009. Line B became operational in 2010 and the total capacity of 30 bcm was reached in 2011.

**Figure 9.2.1** Central Asia gas pipeline network




This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries, and to the name of any territory, city or area.

Sources: IEA (2010), *World Energy Outlook*, OECD/IEA, Paris; IEA analysis.

The construction of another parallel line, line C, started in March 2012, with a planned capacity of 25 bcm. Gas transmission partially commenced in 2014 and will reach 25 bcm by December 2015, increasing the total Central Asia-China pipeline capacity to 55 bcm.

During 2013 and 2014, negotiations were being drawn up for line D of the Central Asia-China pipeline system, which would not be parallel but rather transport gas from Turkmenistan to China via Uzbekistan, Tajikistan and Kyrgyzstan. The Tajikistan part of the pipeline began construction in 2014, with the pipeline expected to be operational by 2016 with 25 bcm capacity, increasing the overall pipeline system capacity to 80 bcm by 2020.

The East-West pipeline connects Turkmenistan's southeast gas fields to the Caspian Sea. Construction began in 2010 and the pipeline is expected to come on line in 2015 with a capacity of 30 bcm (EIA, 2012).

Turkmenistan is committed to diversifying gas exports and is actively involved in the development of the south-east route of the TAPI. The TAPI gas pipeline (1 735 km) is expected to have an annual capacity of 33 bcm and would supply energy to the hungry markets of Pakistan and India, with potential offtake to Afghanistan. During 2013 and 2014, the Turkmen government signed supply/purchase contracts with the other participating governments and a feasibility study was completed. In November 2014, the TAPI Ltd. enterprise was registered, with the four governments as shareholders, and by the end of 2014 the start of construction of the pipeline was expected in 2015. However, delays are likely due to security threats in Afghanistan.

The government is also involved in active discussions with the European Commission and the Caspian Development Corporation on promoting the Trans-Caspian Gas Pipeline, aiming to export Turkmen gas to Turkey and to Europe via Azerbaijan, Georgia and Turkey. Previous attempts to export Turkmen gas to Europe, taking place in the late 1990s, were not successful; however, the interest and commitment of the government to explore the European market seems higher now than before. In May 2013, Turkmenistan and Turkey agreed on connecting Turkmen gas supplies to the TANAP.

The government is investing some of the gas revenue, in co-operation with foreign investors, into modernising and rehabilitating its gas facilities and network. Projects are underway for the technological modernisation and rehabilitation of compressor stations. Other gas development plans include the construction of new gas processing facilities with the latest technologies, with funding from foreign investors.

Turkmenistan has started the construction of a USD 3.4 billion petrochemical complex to produce polypropylene and polyethylene, processing 5 bcm/year of gas, and a USD 1.7 billion gas-to-liquids plant which will transform gas at a rate of 1.7 bcm/year. Both will be financed by Japanese investors.

## OIL

Turkmenistan's oil pipeline network is 1 501 km long, according to official government data. Turkmenistan's crude oil and oil product exports are much smaller than those of gas. The only cross-border pipeline runs from Uzbekistan's Chardhzou refinery to Turkmenistan. Some crude oil is exported across the Caspian Sea to Azerbaijan and Russia (EIA, 2012).

Turkmenistan has two major refineries, the Seidi (Chardhzou) and Turkmenbashi, with a combined total capacity of 237 000 barrels per day (bbl/d). The government is planning to expand its oil refinery sector, to increase capacity up to 600 000 bbl/d by 2030 (EIA, 2012), with partial funding from foreign investors. During 2013, up to USD 800 million was secured in future oil refining projects, and the Turkmenbashi refinery began an expansion project (Hasanov, 2014b). Increased oil refinery output is expected on the back of oil production expansion, with plans for more than 1.3 million bbl/d in offshore and onshore crude oil production by 2030.

In 2013, Turkmenistan launched a USD 2 billion project to build a new port on the Caspian Sea to boost exports. The port is designed to export oil products, liquefied gas and textiles. Turkmenistan has two liquefied petroleum gas (LPG) plants, while Turkmenbashi also produces LPG. The two plants are located at the Naip gas condensate field, with capacities of 15 000 tonnes and 65 000 tonnes of LPG per year. Turkmenbashi has a capacity of around 220 000 tonnes of LPG per year (CL, 2013).

### SYSTEM RELIABILITY

Electricity and heat system reliability is poor after decades of underinvestment and the use of inefficient technologies. Outages are frequent in certain areas of the country and technical losses in generation, transmission and distribution are estimated to be significant (ADB, 2013). Heat losses were estimated at approximately 25% in 2010 (Zomov and Behnke, 2010). Technical losses are also significant in natural gas transmission and distribution. Losses also occur in gas metering stations, some of which are not modernised.

As a result of poor system reliability, the government approved a power system renovation project in 2012, to be implemented in Ashgabat first, involving the rehabilitation and modernisation of 60 substations and power lines by 2020, costing around USD 10 million (Rakhmatov, 2012). The programme is underway and is expected to result in improved reliability by 2020; however, financing can be difficult if the government keeps prices free or extremely low.

## EMERGENCY RESPONSE

Turkmenistan has emergency response mechanisms that date back to the Soviet era. These include obligatory levels of oil stocks under the old legislation, which may or may not be kept by TurkmenEnergo, mainly for financial reasons. The government also has the right to request that locally produced oil products be prioritised for the purpose of relieving the emergency.

# 9.3. MARKET CONVERGENCE

## NATIONAL MARKET STRUCTURE

### ELECTRICITY AND HEAT

Vertically integrated state-owned company TurkmenEnergo operates the electricity sector through the Ministry of Energy that manages the sector. TurkmenEnergo is composed of eight heating plants, six subsidiaries acting as electricity generators, a subsidiary acting as the electricity network operator, a subsidiary responsible for street lighting in Ashgabat and other auxiliary subsidiaries.

There are no current plans to unbundle the sector and increase market competition.

### OIL AND NATURAL GAS

The Ministry of Oil and Gas Industry and Mineral Resources controls five state-run companies in the oil and gas sector.

- TurkmenGeologia researches and explores hydrocarbon reserves, underground water, minerals and solid minerals.
- TurkmenNeft engages in crude oil production.
- TurkmenGaz develops gas and gas condensate fields.
- TurkmenNefteGaz is involved in downstream oil and gas activities, including the processing, transportation and distribution of natural gas and oil products.
- TurkmeNefteGazStroi is involved in the construction of energy infrastructure, including oil and gas fields, compressor and oil-transfer stations, booster stations, oil and gas pipelines and oil refineries, among others.

Within TurkmenNefteGaz, the Turkmenbashi oil refinery complex accounts for a quarter of the volume of industrial products manufactured in the country. It produces unleaded gasoline, aviation and technical kerosene, jet fuel and diesel, fuel oil, lubricating oil, polypropylene, heating oil, light gas oil, petroleum electrode coke, liquefied gas, construction and road bitumen and synthetic detergents, among others. Third-party access to the gas transportation system is accomplished on a contractual basis with TurkmenGaz, co-ordinating its actions with higher authorities, on a case-by-case basis (EBRD, 2010).

The Turkmen government allows foreign ownership in the country's offshore gas and oil fields in the Caspian Sea. Several international energy companies operate in Turkmenistan’s upstream oil and gas sector through PSAs with the government. The exception to the off-shore restriction is the Bagtyiarlyk onshore natural gas project with China (EIA, 2012).

### REGULATORY FRAMEWORK

There is no independent energy regulatory authority in Turkmenistan. The State Agency for the Management and Use of Hydrocarbon Resources is the energy regulator, under the control of the Ministry of Oil and Gas Industry and Mineral Resources.

## Tariffs

Energy tariffs in Turkmenistan are often referred to as the lowest in the world. Most of the population receives free electricity, up to 25 kWh per person per month, while consumption over that amount is USD 0.00323 per kWh. Up to 50 $m^3$ of gas per person per month is provided for free, while consumption over that threshold is priced at USD 0.007 per $m^3$, for all categories of consumers. Gasoline is also free up to 120 litres per car per month. Subsidies were brought in after the country's independence, with the aim of gradual phase-out by 2015. However, in 2006 the subsidies were extended to 2030.

In August 2014, the president announced a new gas price applicable to consumption over 50 $m^3$ per person per month, which was a six-fold increase. The price rose from USD 0.0012 per $m^3$ in 2013 to USD 0.007 per $m^3$ in 2014, likely to mostly affect rural consumers because of gas heating and gas consumption in agriculture. Consumption up to 50 $m^3$ per person per month remains free.

The price rise comes after a number of government attempts to increase prices in order to curb consumption and increase energy revenues. As both domestic demand and export demand are growing, the government's intention is to curb domestic demand in both electricity and gas to liberate more gas for export (as all electricity is generated from gas). In 2013, it reduced the free monthly quotas for electricity by 10 kW to 25 kW per person. The government is also installing gas meters to track consumption, to encourage consumers to reduce demand and to allow for future price increases.

Until March 2012, all motor vehicle owners were eligible for 120 litres of free gasoline per month. Since March 2012, according to a government decision, free gasoline only applies to car owners, excluding trucks and buses. Energy prices and pricing systems are transparent to the extent that they are publically available and are published by order of the government.

In the electricity sector, meters have been installed for all end users. These meters are in line with EU standards, and obtaining a meter is the responsibility of the consumer. In the gas sector, the government has only started metering domestic consumption. Industrial consumers and export lines have installed gas meters.

## Technical rules

Currently only the old Soviet GOSTs and local Turkmen standards are in use. A programme on the development of standards until the year 2030 was adopted in 2009 and the government has expressed its intention to harmonise electricity and gas standards with those of the European Union; however, this process is only just beginning. Four standards, which were developed by the project on harmonisation of oil and gas standards under the INOGATE Programme, are now being considered. In the electricity sector, the process has not yet begun.

The process of adapting standards can be initiated by any local organisation or company by proposing the draft standards to the state agency TurkmenStandartlary, which is under the Cabinet of Ministers of Turkmenistan. TurkmenStandartlary is responsible for adoption of these standards. Bilateral agreements on standards exist among organisations in different industries.

Turkmenistan is a correspondent member of the ISO (International Standards Organisation) however it is not a member of the CEN (European Committee for Standardisation), or of COOMET (Euro-Asian Cooperation of National Metrological Institutions).

## REGIONAL MARKETS AND INTERCONNECTIONS

### ELECTRICITY

Turkmenistan is interconnected with Iran and Afghanistan, and cross-border trade is based on bilateral agreements and is initiated at the high government level. Exports to both countries are increasing, as Turkmenistan has increased its export infrastructure and continues to do so with ongoing projects.

Turkmenistan also has an agreement with the Turkish government for exports transiting through Iran. In 2014, an agreement was reached between Turkmenistan, Iran and Turkey to double electricity exports in the medium term.[5]

Turkmenistan disconnected from the Central Asia Power Grid in 2003, which comprised Turkmenistan, Uzbekistan, Kyrgyzstan, Kazakhstan and Tajikistan.

### NATURAL GAS

Turkmenistan exports gas to Uzbekistan, Kazakhstan, Russia, China and Iran. Gas export prices are negotiated on bilateral terms. The government is committed to expanding exports and diversifying export routes in order to increase revenue. The TAPI pipeline is in advanced stages of development, with construction expected to begin in 2015 if security risks are lifted. Interest in the Southern Corridor and exporting gas across the Caspian Sea is also strong.

### OIL

Oil export prices are negotiated on bilateral terms; however, oil exports are low. Dragon Oil had an oil-swap deal with Iran from 1998 until 2010, under which Dragon Oil transferred crude oil from Turkmenistan to Iranian refineries in exchange for equal volumes exported from the Persian Gulf. In 2010, the deal ceased due to sanctions on Iran with the exports diverted to Azerbaijan and the Baku-Tbilisi-Ceyhan pipeline (EIA, 2012).

**5.** www.turkmenistan.ru/en/node/3475.

# 9.4. SUSTAINABLE DEVELOPMENT

## RENEWABLE ENERGY

Turkmenistan's renewable energy sector is undeveloped, with only a very small share of hydropower in electricity generation, despite its vast solar and wind power potential. The free supply of electricity, heat and gas to all consumers discourages investment in more expensive renewable energy sources. The development of renewables has traditionally been in the shadow of hydrocarbon development.

In recent years, Turkmenistan has opened the dialogue on reforming its economy and developing a more sustainable and diversified energy sector. The president has indicated that alternative energy sources (meaning renewable energy sources in this case) will play a significant role in the future economic development of the country. The reason for developing renewables in Turkmenistan is two-fold: the government is aiming to reduce GHG emissions and also to free up more gas for exports. As part of its National Strategy on Climate Change adopted in 2012, energy efficiency measures and the development of alternative energy sources are key government priorities.

However, none of the existing government strategies include targeted renewable energy policy measures and there are no incentives for renewable power generation in Turkmenistan. Without these measures, the level of investment in renewables is likely to be sluggish. Existing plans include an increase in hydropower capacity, with plans for 57 MW of small hydropower plant construction (UNIDO and ICSHP, 2013).

### RENEWABLE ENERGY POTENTIAL

According to the International Renewable Energy Agency (IRENA) and the European Bank for Reconstruction and Development (EBRD), Turkmenistan is potentially rich in solar power due to its geographical position and 300 sunny days per year. With more than 70% of its territory as deserts, solar power would be most efficient in sunny, remote areas where connections to the grid and gas pipelines would be expensive (UNECE, 2013).

According to the Renewable Energy and Energy Efficiency Partnership (REEP), wind power potential in Turkmenistan is vast. The Caspian coastline and the large central desert area provide strong and reliable winds. The wind energy potential is estimated at 500 GW, of which 10 GW are technically feasible to be developed in the mid-term. In the Balkanabad area, a government study estimated wind power potential at 200 MW – a potential site for a wind farm (UNECE, 2013).

## ENERGY EFFICIENCY

Turkmenistan's energy efficiency potential is considered to be significant given the age and condition of old Soviet energy infrastructure, although it has not been officially assessed. While energy efficiency has been flagged as a policy priority for the government, no binding targets or policy implementation measures have been set. The government adopted the National Strategy on Climate Change in 2012 including measures for energy savings. At the end of 2014 the government was in the process of developing an energy efficiency policy and the Law on Energy Savings. The policy is expected to include measures for improving fuel efficiency in power stations through modernisation and rehabilitation, and increase municipal and industrial energy efficiency along with energy efficiency in buildings (EBRD, 2014).

The government began its programme of modernisation and rehabilitation of electricity and heat generation and distribution infrastructure in 2012, as part of its Power Sector Development Programme to 2020. The programme is expected to increase capacity by 1.5 GW by 2020, reduce gas consumption by 1.5 bcm per year, and reduce emissions by 3 Mt. While the energy efficiency of the electricity and heat sector is expected to improve by 2020, the overall level of consumption of gas, electricity and heat will continue to grow due to growing living standards and rising population.

Demand-side management is a new concept in Turkmenistan. All sectors of the economy receive electricity, heat and gas for free, or at very low prices after a certain level of consumption. While electricity consumption is metered, the government only began the installation of gas meters in 2012. Consumers are unaware of their level of consumption and have no incentives to curb demand. The price subsidies have been in place since the country's independence and are expected to remain until 2030. These conditions will lead to strong demand growth by 2030, putting additional pressure on aged and inefficient networks.

During 2013 and 2014, the government adjusted down the allowed free consumption of electricity per person per month from 35 kWh to 25 kWh and increased the price of gas over 50 $m^3$ per person per month from USD 0.0012 per $m^3$ to USD 0.007 per $m^3$. While the measures are of significant magnitude, the effect on demand has been minimal to date. The rural population is expected to carry the largest burden of the price increase for gas consumption in the coming years, without significant possibility to adjust its consumption level.

Turkmenistan also has an outdated building code with low energy efficiency standards. During the past decade, the building stock has increased by 50%, yet the building standards have not changed. The increase in the number of dwellings was part of the National Programme for Reshaping the Living Conditions of the Population in Villages, Towns, Cities and District Centres to the year 2020 and was to be undertaken according to the National Strategy for Socio-Economic Development of Turkmenistan to the year 2030. However, according to the UNDP, which works on a number of energy efficiency pilot projects in Turkmenistan, the energy performance of new and older buildings is not assessed (UNECE, 2013).

The UNDP is currently working with the government on developing new building codes for different types of dwellings, developing national standards for energy efficiency and increasing energy audits. At present, no legal requirements for energy audits are in place, nor are there any formal standards or certification procedures at present.

## ENVIRONMENTAL PROTECTION

Turkmenistan's rapid economic growth and hydrocarbon resource extraction pose an environmental challenge for the Turkmen government, particularly as economic developments in the 1990s were largely unlegislated in terms of environmental protection. Lack of strong legislation since independence has resulted in the wasteful use of resources and a lack of public understanding of environmental issues and protection costs and measures.

Turkmenistan's environment-related programmes began after 2000. The National Environmental Action Plan for 2002-2010 was the first implementation plan for environmental strategies. However, the programme largely failed to implement changes and to manage environmental concerns in all sectors of the economy. Turkmenistan's inspections, reporting procedures and compliance assessments are still irregular, without strict criteria, and in many cases ineffective based on the comparison criteria used. Environmental assessments and audits are not required by law and are ambiguous in the current legislation, while pollution fees and fines are too low to provide pollution abatement incentives (UNECE, 2012).

Environmental protection is closely linked to climate change concerns and policies regarding GHG emissions. The government approved the National Strategy on Climate Change in 2012 and has in conjunction introduced the Law on Environmental Assessments, approved in December 2014. The law is expected to strengthen the role and outcomes of environmental assessments and increase public awareness and responsibilities over environmental costs in all sectors of the economy. However, the effect of the law will depend on the development of secondary legislation and implementing measures. Prior to December 2014, the Law on Hydrocarbon Resources provided legal measures for environmental protection.

In March 2013, the president issued a decree requiring individuals or companies performing environmentally hazardous activities to obtain ecological insurance policies with the Ministry of Nature Protection. The insurance premium revenues would be used in environmental protection projects (Annayev, 2013).

Turkmenistan's international involvement in the sphere of the environment includes 11 international environmental treaties. The new Law on Environmental Assessment stipulates Turkmenistan's international treaty obligations, including co-operation with Azerbaijan, Russia, Iran and Kazakhstan. Previous to this legislation, Turkmenistan was largely non-compliant with its multilateral agreements.

## CLIMATE CHANGE

Turkmenistan ratified the UNFCCC in 1995 and the Kyoto Protocol in 1998 as a non-Annex I Party.

In 2012, the country submitted its National Strategy on Climate Change to the UNFCCC, developed with assistance from the UNDP. As part of the strategy, Turkmenistan created an emissions inventory that was used in identifying key emission reduction projects.

Climate change and reducing GHG emission are increasingly recognised as facts of national importance; however, the national strategic framework lacks integrated climate change mitigation or adaptation measures.[6] The UNDP continues to work with the government on the strengthening of climate change policy and legislation, in order to implement the action plan on GHG emissions reduction.

Energy-related $CO_2$ emissions totalled 63.8 Mt in 2012 in Turkmenistan, which is 43.5% higher compared to 1990. The commercial and public services sector (including agriculture) accounts for 44% of emissions, followed by power generation (28.3%), transport (10.9%), manufacturing (8.6%) and refining (8.3%).

**6.** http://procurement-notices.undp.org/view_notice.cfm?notice_id=18603.

A Designated National Authority for the Clean Development Mechanism (CDM) was established in May 2009 by presidential resolution at the Office of Climate Change within the Ministry of Nature Protection and with the assistance of the UNDP. To date, no CDM project has been registered or even validated.

## GAS FLARING

Gas flaring, or the burning of associated petroleum gas (APG) is one of Turkmenistan's main environmental concerns. However, reliable statistics on APG do not exist, nor does a strong legislative framework for its regulation (UNECE, 2012). The State Agency for Managing and Using Hydrocarbon Resources, under the Ministry of Oil and Gas, is in charge of environmental regulation in the oil and gas sector, including gas flaring.

According to a Climate Limits report (2013), the National Oceanic and Atmospheric Administration estimates gas flaring at around 1 bcm/year in Turkmenistan since 2005, from satellite images. Around 57% of flaring is non-associated gas from gas or condensate fields. Most of the flares are at fields developed before 1990. The development of the large South Yolotan field may lead to additional flaring over the years.

The gas extraction sector is mainly operated by the purchasing agreements between the government and the private sector. Dragon Oil, one of the largest operators in gas extraction, is estimated to have contributed 0.4 bcm of flared gas in 2010 from its operations in Turkmenistan. The company is implementing procedures to reduce its gas flaring, including developing a gas treatment plant and transporting unprocessed gas onshore for processing (CL, 2013).

Details of individual company projects are largely unknown. However, Turkmenistan is raising awareness of the need to reduce gas flaring, particularly in light of significant future developments in the Caspian Sea. During 2014, Turkmenistan hosted a conference on the topic of APG reduction (Hasanov, 2014c).

Turkmenistan does not participate in the World Bank Global Gas Flaring Reduction Initiative and the Global Gas Flaring Reduction Public-private Partnership.

# 9.5. INVESTMENT ATTRACTION

## INVESTMENT CLIMATE

Turkmenistan's economy is closed and the investment climate is tailored specifically to each sector. The oil and gas extraction industry is more welcoming to foreign investors, while the remainder of the energy sector is tightly controlled by the government without plans for privatisation. Privatisation is welcome in some other sectors of the economy, particularly in the services and trade sector. The Law on Privatisation was passed in 1992 with the aim of privatising industry and services. However, most enterprises are still in government hands.

Turkmenistan's constitution gives full rights to the president to make any decisions regarding Turkmenistan's economic or political system. The president appoints and dismisses judges without parliamentary review, forms the central election commission, and has the right to issue edicts that are mandatory. The president is also often involved in commercial decision-making, particularly with regard to large oil and gas projects.

The president's level of involvement in commercial decisions and the high level of corruption in other layers of the economy pose a barrier for many investors. Turkmenistan's investors face other challenges, including weak rule of law, inconsistent regulatory practices, unfamiliarity with international business norms, strict controls of foreign exchange flows, weak intellectual property protection and poor transparency.[7]

However, Turkmenistan's gas exploration potential proves an attractive opportunity and numerous large international energy companies have operations in the country, possible only through strong relationships with the government. Companies include China National Petroleum Corporation (CNPC), Dragon Oil, Gazprom and Petronas.

The government is planning to expand its oil and gas upstream industry, opening the sector to other potential partners and particularly trying to attract large oil and gas majors from the United States. As such, part of its National Programme for Socio-Economic Development to 2030 and the Power Sector Development Programme to 2020 includes plans for investor incentives such as free economic zones and investor protection. In 2013, the government approved the Law on Denationalisation and Privatisation of State Property (2013), and the Law on Counteraction of Corruption was approved in 2014.

In May 2010 the government adopted the National Programme for Socio-Economic Development of Turkmenistan for 2010-2030. The programme envisages diversification of the economy, increased competition and market and institutional reforms. In November 2012 the president approved a privatisation programme covering the period 2013-16, accompanied by a list of mostly medium-sized enterprises that were available for privatisation. The energy sector was not included on the list (EBRD, 2013). However, little progress has been made and Turkmenistan remains one of the most closed economies in the region and globally.

Turkmenistan is not listed in the World Bank's "ease of doing business" indicator. It is the only country of the EECCA countries without a rating.

**7.** http://turkmenistan.usembassy.gov/ics.html.

According to the Corruption Perceptions Index (CPI) prepared by Transparency International, which measures the level of perceived corruption in the public system, Turkmenistan ranks 169th among 175 countries in 2014, with a score of 17. This is a high score with regards to perceived corruption in the country, as a score of 100 represents no corruption. Turkmenistan acceded to the UN Convention against Corruption on 28 March 2005, but is not yet a signatory. It has not signed the OECD Anti-Bribery convention.

Turkmenistan has not become a Party to the Convention on the Settlement of Investment Disputes between States and Nationals of Other States (Washington Convention) or the New York Convention of 1958 on the Recognition and Enforcement of Foreign Arbitral Awards or any other internationally recognised arbitration agreement.

Turkmenistan does not participate in the Extractive Industries Transparency Initiative (EITI). There is increasing international support for Turkmenistan signing up to EITI from the United Kingdom, the EBRD and others.

## INVESTMENT FRAMEWORK

The investment framework in the energy sector is mainly focused on the development of the oil and gas extraction industry, including the supporting infrastructure. The government is interested in attracting foreign investors for production partnerships rather than self-financing. Major future infrastructure projects include the development of the TAPI gas pipeline, projected to cost around USD 8-10 billion; and the potential Trans-Caspian gas pipeline, with an estimated cost of USD 5 billion. Both projects are still seeking investors, although the TAPI pipeline is in the advanced stages of planning and construction will begin in 2015 if financing is secured. Ongoing projects in the petrochemical complex include around USD 5.2 billion in polypropylene and polyethylene plants, financed by Japanese investors.

Ongoing investment projects in the gas sector include the modernisation and rehabilitation of gas facilities and the gas network. New gas processing facilities with the latest technologies are in planning with investment from the private sector. The government is also looking to develop its refining industry with foreign investment funds. The Turkmenbashi oil processing plant underwent expansion at the end of December 2014, and additional refineries are planned in the mid-term.

TurkmenEnergo is also investing in the electricity and heat network, as well as in generation capacity rehabilitation, modernisation and expansion to combat frequent outages and losses and to cater to growing demand. The ongoing project is expected to cost around USD 5 billion by 2030 and increase capacity by 800 MW with up to 24 000 km of additional 500 kV, 220 kV and 110 kV lines. This includes additional export infrastructure to Iran and Afghanistan.

Renewable energy developments and investment in energy efficiency are very small-scale and only in early stages of development.

## INVESTMENT PLANNING

Investment planning in Turkmenistan is carried out based on a number of medium- and long-term programmes. Investment in the energy sector depends on the programmes for electricity, heat and gas distribution, and on oil and gas sector development. The National Programme for Socio-Economic Development 2011-2030, the Power Sector Development Programme to 2020 and the Oil and Gas Development Plan 2007-2030 are the main government policies dictating energy sector investment.

## References

ADB (Asian Development Bank) (2013), *Energy Outlook for Asia and the Pacific*, ADB.

Annayev, Dzhumaguly (2013), “Turkmenistan develops environmental strategy”, Central Asia Online, 8 April, http://centralasiaonline.com.

BGR (Federal Institute for Geosciences and Natural Resources) (2013), *Energy Study 2013: Reserves, Resources and Availability of Energy Resources*, Federal Institute for Geosciences and Natural Resources, Hannover, Germany.

CL (Carbon Limits) (2013), *Associated Petroleum Gas Flaring Study for Russia, Kazakhstan, Turkmenistan and Azerbaijan*, Final Report for European Bank for Reconstruction and Development, CL, Oslo.

EBRD (European Bank for Reconstruction and Development) (2014), *Strategy for Turkmenistan*, EBRD, London.

EBRD (2013), *Transition Report 2013*, EBRD, London.

EBRD (2010), *EBRD Energy Sector Investment*, Final Report, EBRD, London.

EIA (US Energy Information Administration) (2012), “Turkmenistan”, *Country Analysis Briefs*, EIA, Washington, DC.

Hasanov, Huseyn (2014a), “Turkmenistan plans to increase electricity export”, Trend, 20 September, http://en.trend.az.

Hasanov, Huseyn (2014b), “Turkmenistan signs major oil refinery contracts”, Trend, 29 November, http://en.trend.az.

Hasanov, Huseyn (2014c), “Associated gas flaring reduction conference underway in Turkmenistan”, Trend, 11 September, http://en.trend.az.

IEA (International Energy Agency) (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

IEA (2010), *World Energy Outlook*, OECD/IEA,Paris.

Rakhmatov, Sabir (2012), “Turkmenistan to tackle power supply problems”, Central Asia Online, 8 August, http://centralasiaonline.com.

Shumskaya, Elita (2013), “Power industry of Turkmenistan – guidelines of development”, Press release, Institute of Strategic Planning and Economic Development of Turkmenistan, 5 May.

Government of Turkmenistan (2015), “An Independent Import Strategy”, Press release of the Cabinet of Ministers of Turkmenistan, www.turkmenistan.ru/en/node/3475.

UNECE (United Nations Economic Commission for Europe) (2013), *Assessment of Clean Infrastructure in Turkmenistan*, United Nations, New York.

UNECE (2012), *Environmental Performance Reviews: Turkmenistan*, Highlights, United Nations, New York.

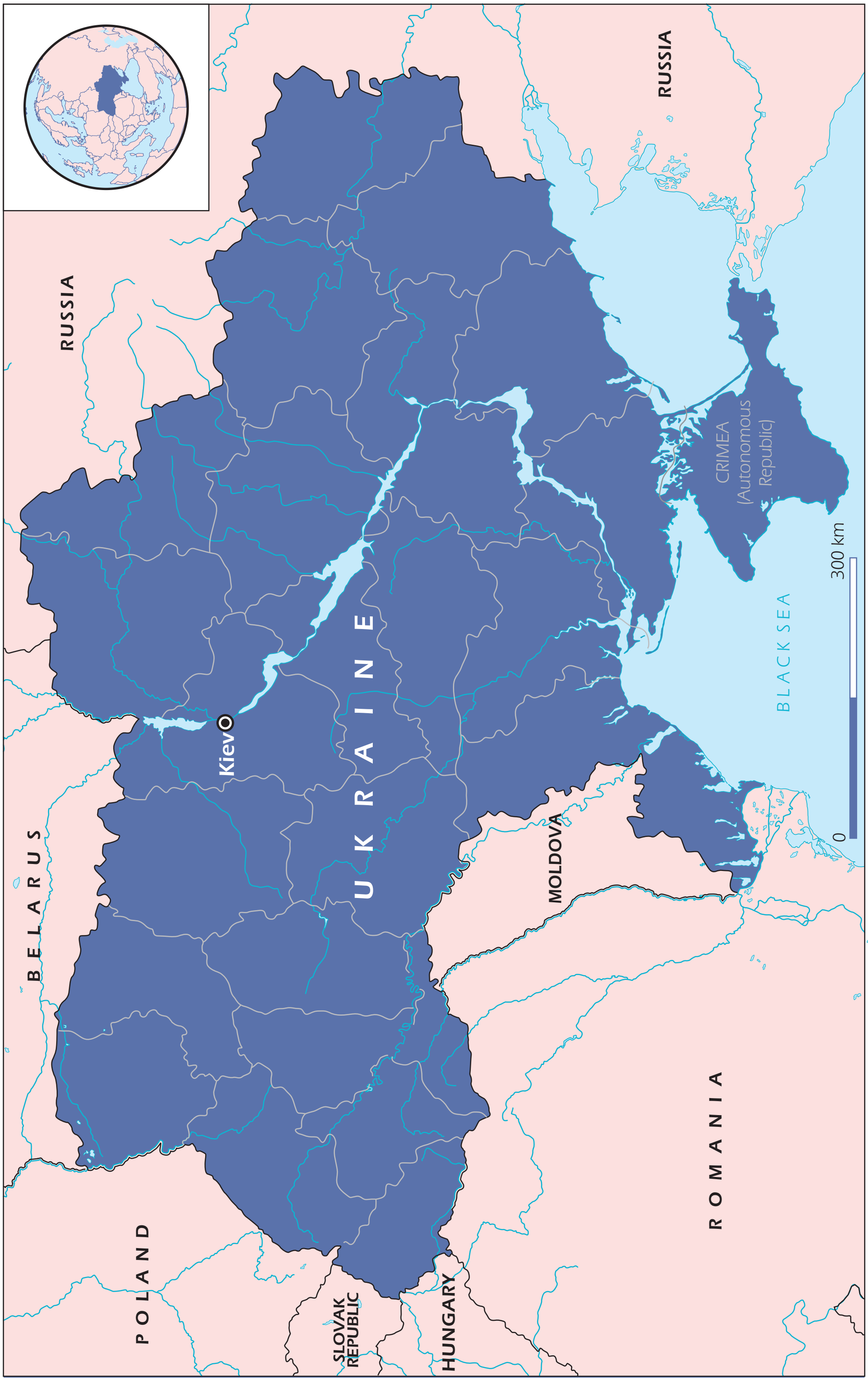
UNIDO (United Nations Industrial Development Organization) and ICSHP (International Center on Small Hydro Power) (2013), *World Small Hydropower Development Report 2013: Turkmenistan*, UNIDO and ICSHP.

World Bank (2014), *Partnership Programme Snapshot – Turkmenistan*, World Bank, Washington, DC.

Zomov, A. and R. Behnke (2010), *Energy Efficiency Challenges in Heating Supply System of Turkmenistan and Potential Solutions*, proceedings of the Tenth International Conference for Enhanced Building Operations, Kuwait, 26-28 October.

# UKRAINE

**Figure 10.1.1** Map of Ukraine




This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries, and to the name of any territory, city or area.

# 10.1. GENERAL ENERGY POLICY

**Key data (2012)**

**Energy production:** 85.4 Mtoe (coal 47%, nuclear 27.7%, natural gas 18%, oil 4%, biofuels and waste 2%, hydro 1.1%, peat 0.1%), +11.3% since 2002

**TPES:** 122.7 Mtoe (natural gas 35.1%, coal 34.7%, nuclear 19.3%, oil 9.5%, biofuels and waste 1.4%, hydro 0.7%, peat 0.01%), -9.5% since 2002

**TFC:** 73.1 Mtoe (natural gas 36.5%, oil 16.6%, electricity 16.2%, heat 16.2%, coal 13.1%, biofuels and waste 1.4%, peat 0.1%), -2.3% since 2002

**TFC per sector:** industry 42.3%, residential 32.1%, transport 15.7%, commercial 9.9%

**Electricity generation**: 198.4 TWh (nuclear 45.4%, coal 40.5%, natural gas 8.1%, hydro 5.3%, oil 0.3%, solar 0.2%, wind 0.1%, biofuels and waste 0.1%), +14.3% since 2002

**Heat generation:** 599.4 PJ (natural gas 81.1%, coal 15%, biofuels and waste 1.7%, nuclear 1.1%, oil 0.9%, peat 0.2%), -22.9% since 2002

**Energy intensity:** 0.36 toe/USD 1 000 GDP PPP, -35.2% since 2002

## COUNTRY OVERVIEW

Ukraine has a population of 45.6 million and is the second-largest country by area in Europe at 603 628 square kilometres ($km^2$). It is located at the crossroads of the European Union, the Russian Federation, and Black Sea and Caspian regions. Ukraine holds abundant mineral resources, including oil, natural gas and coal, as well as a large hydro and biomass potential. With its population and strong energy consumption, it is one of Europe's largest energy markets. It also remains the largest transit country for natural gas in the world and plays a key role for Russian gas deliveries to European markets.

Ukraine experienced a long period of very strong economic growth in 2001-07, driven by low gas prices, a strong national currency (the hryvnia [UAH]), and high foreign steel demand and prices. Ukraine's economy remained open and export-oriented, and it joined the World Trade Organization in 2008.

Nominal GDP was UAH 1 455 billion in 2013 (USD 181.8 billion in 2013 in current USD). Per capita GDP was USD 3 900 (in current USD) in 2013 according to the World Bank. Steel accounts for about 40% of total exports, while other key exports are fertiliser and grain. The share of machinery and manufacturing in total exports is decreasing, as is that of steel. Russia and the European Union are the country's key trade partners, the latter increasingly becoming the key export destination (25% in 2013) and the former's share in exports declining, from 29% in 2011 to 24% in 2013. The country is heavily reliant on oil products and gas imports. Variations in the hryvnia/dollar exchange rate, access to export markets, in particular Russia's, external construction activity in Asia or the Middle East, agriculture, and energy supply and price trends have a substantial impact on its domestic economy.

However, Ukraine has undergone two severe economic crises in the past five years. Due to this exposure to foreign markets, Ukraine has been severely affected by the global economic and financial crises since autumn 2008. Ukraine fell into a deep recession in 2009, with real GDP down by 14.8% and industrial output collapsing almost 22%. The International Monetary Fund (IMF) offered support to Ukraine and agreed to a USD 16.4 billion Stand-by Arrangement in November 2008 to stabilise the banking system and mitigate the impact of the collapse in output. In total, approximately USD 11 billion was released by the IMF under the arrangement, as well as approximately USD 3.4 billion under a second Stand-by Arrangement that was agreed in mid-2010. Ukraine's real GDP recovered by 4.2% during 2010 and a further 5.2% in 2011.

Ukraine entered another recession in mid-2012, with GDP growth falling to 0% in 2013 and an estimated -6.9%recession in 2014. Driven by factors such as insufficient capital investment, lower steel demand, high energy import prices, lack of structural reforms and corruption, the economy never recovered from the 2009 crisis. Following month-long street protests in Kiev, a change in power occurred in March 2014, which was followed by the loss of control over the Autonomous Republic Crimea (Crimea) and the start of a military conflict in Ukraine's eastern regions with severe casualties, significant damages to infrastructure and considerable economic losses. This has resulted in a strong hryvnia depreciation (from UAH 8/USD 1 in December 2013 to UAH 23/USD 1 in mid-March 2015), far lower budget revenues, and a 10% fall in industrial output in 2014. Following a commercial dispute with Gazprom, Russian gas imports were halted in June 2014, with some imports from Russia resuming in November/December of 2014 as part of an EU-brokered winter package agreement valid until 31 March 2015. Coal production and transportation have been severely disrupted in the Donbass region, while electricity generation in combined heat and power (CHP) plants have also been disrupted, especially in the conflict regions. In 2014, the Ukrainian government benefited from another IMF Stand-by Arrangement and the disbursement of two financial tranches of USD 3.6 billion and USD 1.4 billion. The government of Ukraine agreed with the IMF to conduct structural reforms to stabilise its economy and bring it back to a sustainable growth path. In addition to this, strong financial support has been provided by the European Union, World Bank, European Bank for Reconstruction and Development (EBRD) and by several countries on a bilateral level. For example, the European Union agreed to a Macro-Financial Assistance (MFA) programme for Ukraine, which is worth EUR 1.61 billion in total and is conditioned by public finance management and anti-corruption, trade and taxation, energy sector reforms (including provisions for increased and separated social subsidies for the most vulnerable households), and financial sector reforms.

In March 2015, IMF and Ukraine concluded a new Extended Arrangement over USD 17.5 billion, cancelling the previous Stand-By Arrangement. The parties agreed on policies for strengthening public finances, advancing structural reforms and securing financial stability (IMF, 2015).

Ukraine co-operates with the European Union under the Eastern Partnership umbrella, which aims to create the conditions to accelerate political association and deepen economic integration between the European Union and the Eastern Neighbourhood countries, including Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine.

Ukraine became an observer to the Energy Community Treaty in November 2006. Since then, it applied for full membership and committed to implementing the *acquis communautaire* on energy, namely the legislative frameworks for the electricity and gas sectors and in the areas of renewable energy, competition and environment. Ukraine became a member of the Energy Community Treaty in September 2010 and started adopting and implementing a number of provisions of the treaty *acquis*.

The Ukrainian government in 2014 signed and ratified an Association Agreement with the European Union; however, entry into force of the Deep and Comprehensive Free Trade Agreement between Ukraine and the European Union was postponed until 31 December 2015. In the meantime, Ukraine enjoys preferential access to the EU market, which has led to higher exports to the European Union.

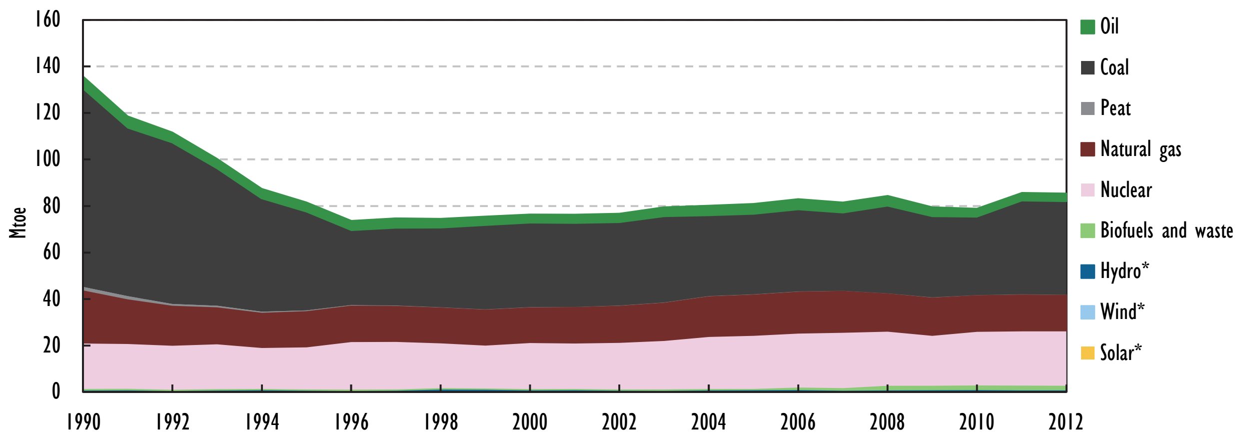
## KEY ENERGY DATA

### SUPPLY

Ukraine is well-endowed with indigenous energy resources, from which 85.4 million tonnes of oil-equivalent (Mtoe) were produced in 2012 (Figure 10.1.2). It is a major coal producer, and ranked 10th in the world in 2012 (BGR, 2013). Coal production of 40.1 Mtoe was 47% of all energy production in 2012. Yet Ukraine's coal is of poor quality and a large part of the production, located in the Donbass region, was subsidised. Other energy sources produced in 2012 include nuclear (27.7% of total), natural gas (18%), oil (4%), biofuels and waste (2%), hydro (1.1%) and peat (0.1%). Solar and wind energy are produced at negligible levels.

Following the conflict in the Donbass region, coal production and supply were severely disrupted. In 2014, according to preliminary data from the Ukrainian Ministry of Energy, there was a 22.4% decline in the production of raw coal to 64.9 million tonnes (Mt). Coking coal output fell by 32.1% in the same year to 16.1 Mt, while production of power-generating coal declined by 18.5% to 48.8 Mt.

**Figure 10.1.2** Energy production by source, Ukraine, 1990-2012




* Negligible.

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

In the years 2002-12 (latest official data available), energy production in Ukraine grew by 11.3%. Coal production grew at a similar rate, and its share of total production has remained relatively unchanged. Nuclear energy and hydropower also grew over these ten years, while oil, peat and natural gas production fell due to depleting resources. Production of biofuels and waste and wind power experienced a boom during the decade, although they still represent a small share of production.

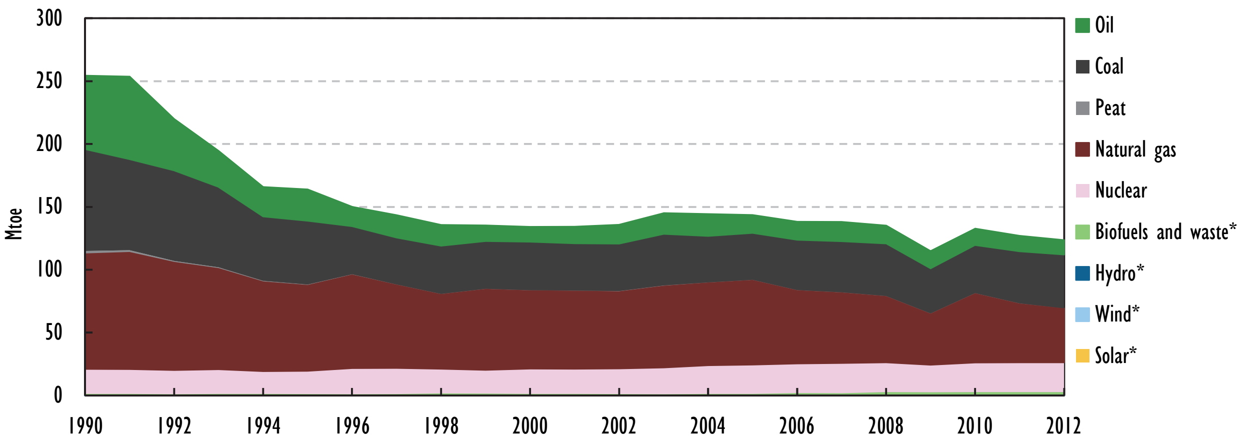
Ukraine's total primary energy supply (TPES)[1] was 122.7 Mtoe in 2012. TPES decreased by 7.5% in the two years after 2010 and was 9.5% lower in 2012 compared with 2002

**1**. TPES is made up of production + imports - exports - international marine bunkers - international aviation bunkers ± stock changes. This equals the total supply of energy that is consumed domestically, either in transformation (for example, refining) or in final use.

(Figure 10.1.3). Energy supply contracted by 15% during the economic recession in 2009 and has not fully recovered since.

Natural gas dominates Ukraine's energy mix at 35.1% of TPES in 2012, down from 45.3% in 2002. The role of natural gas decreased further in 2013 and 2014, following the economic downturn and policy measures to reduce gas consumption. Coal accounted for 34.7% in 2012, compared with 27.7% in 2002. Other contributors to TPES in 2012 included: nuclear at 19.3%; oil 9.5%; biofuels and waste 1.4%; and marginal amounts from hydro, wind, solar and peat. However, the share of renewable energy in the primary energy mix may be slightly higher, as reliable data on heat production from renewables is difficult to collect and official statistics may underestimate biomass consumption.

**Figure 10.1.3** TPES, Ukraine, 1990-2012




* Negligible.

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

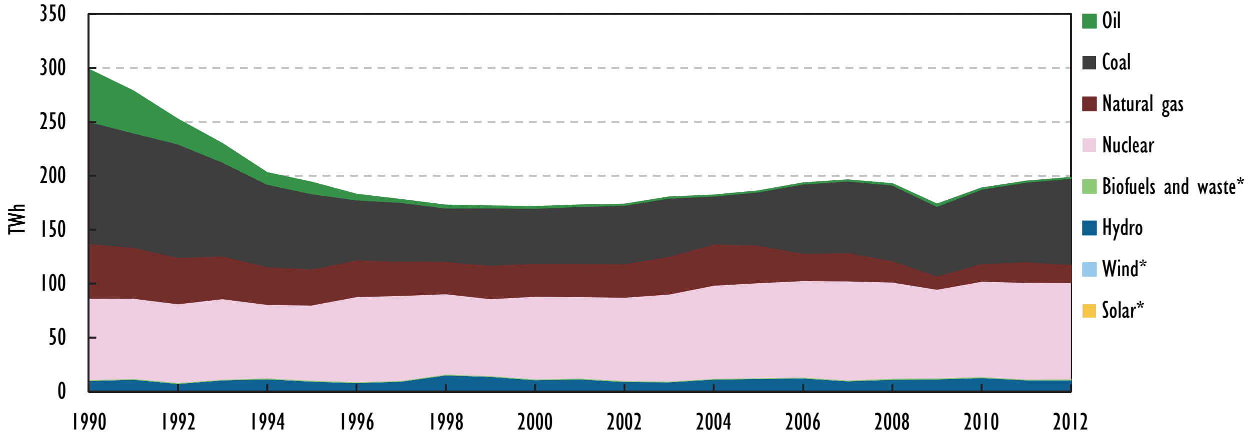
## ELECTRICITY GENERATION

Electricity generation was 198.4 terawatt hours (TWh) in 2012, up from a low of 173.6 TWh in 2009 (Figure 10.1.4). Other than the 2009 economic recession, electricity generation has taken an upward trend since 2002. Nuclear energy is the main source of electricity in Ukraine, accounting for 45.4%, a share largely unchanged since 2002. Coal accounts for 40.5% of total electricity generation, up from 31.5% in 2002. Demand for coal in electricity generation increased 47.2% from 2002 while oil use fell by 34% and natural gas by 47.7%.

Hydro accounted for 5.3% of electricity generation in 2012. Other renewables contribute negligible levels. Wind power was introduced in 1998, biofuels and waste for electricity production in 2008, and solar in 2010. The use of biofuels and waste has fallen by 50% since its introduction, while solar and wind power are developing at a fast rate.

Heat production was 599.4 petajoules (PJ) in 2012, a 5.4% increase from the low during the recession, yet 22.9% lower than 2002. Heat production has experienced a downward trend since 1990. Natural gas accounts for 81.1% of heat production and coal for 15.1%. Other sources of heat production include biofuels and waste (1.7%), nuclear (1.1%), oil (0.8%) and peat (0.2%). As the use of biofuels is often not completely measured, it is expected that biofuels and waste play a larger role in heat generation than indicated.

**Figure 10.1.4** Electricity generation by source, Ukraine, 1990-2012




* Negligible.

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## IMPORT AND EXPORT

Ukraine is a net importer of energy and is highly reliant on fossil fuel imports. Net imports accounted for 31.4% of TPES in 2012, a decline from a share of 43.6% in 2002. Net imports have further decreased in 2014 following the crisis situation.

Natural gas imports were 27.5 billion cubic metres (bcm) in 2013, a decline of 15% compared with 32.4 bcm in 2012, and 37.6% lower than the 44 bcm imported in 2011. Natural gas imports represent 57.2% of all energy imports to Ukraine. Around 92% of gas imports were from Russia, with the remainder coming mainly from Germany, Hungary, Austria and Poland. Prior to 2012, Russia was the sole source of imported gas to Ukraine.

In 2014, gas imports from Russia were halted for a number of months. As of April 2014, Ukraine has progressively ramped up reverse flow imports from European countries, reaching up to 0.9 bcm per month by the end of the year. As a consequence, 2014 marked a fundamental turning point in Ukraine's foreign gas trade: imports from Russia were down to 14.3 bcm, whereas reverse flow imports from the European Union reached 5.1 bcm. Overall, Ukraine reduced its imports to 19.4 bcm in 2014, a historically low figure. For the first time ever, the share of imports in total gas consumption was below 50%.

Crude oil imports were 0.8 Mtoe in 2013, which is half the level imported in 2012 and 96% lower than in 2002. Crude oil imports have been diminishing over the past decade, resulting in a substantial fall in domestic oil products. Crude oil is imported from Russia (67%) and Kazakhstan (33%).

Oil product imports were 7.1 Mtoe in 2013, nearly five times higher compared to 2002. However, imports are not increasing at the speed of decline in production because domestic consumption is falling. Oil products are imported mainly from Belarus (36%) and Russia (31.2%), with the remainder sourced from European and Central Asian countries. Ukraine exported 1.6 Mtoe of oil products in 2013, a level which is a quarter of exports in 2002.

Despite significant production of domestic coal, Ukraine is a net importer. It imported 10.1 Mtoe of hard coal in 2013 and exported 3.4 Mtoe. Coal imports were 150% higher in 2013 compared to 2002, while exports were 50% higher. Coal exports are destined for Bulgaria (28.4%), Turkey (17.1%) and other countries across Europe and Africa, while imports are mainly from Russia (70.2%) and the United States (22.4%).

Ukraine is an electricity net exporter, with exports of 9.9 TWh in 2013 and marginal imports. Main exports in 2013 were to Hungary (43.2%), Belarus (31.3%), Moldova (14.6%) and Poland (10%).

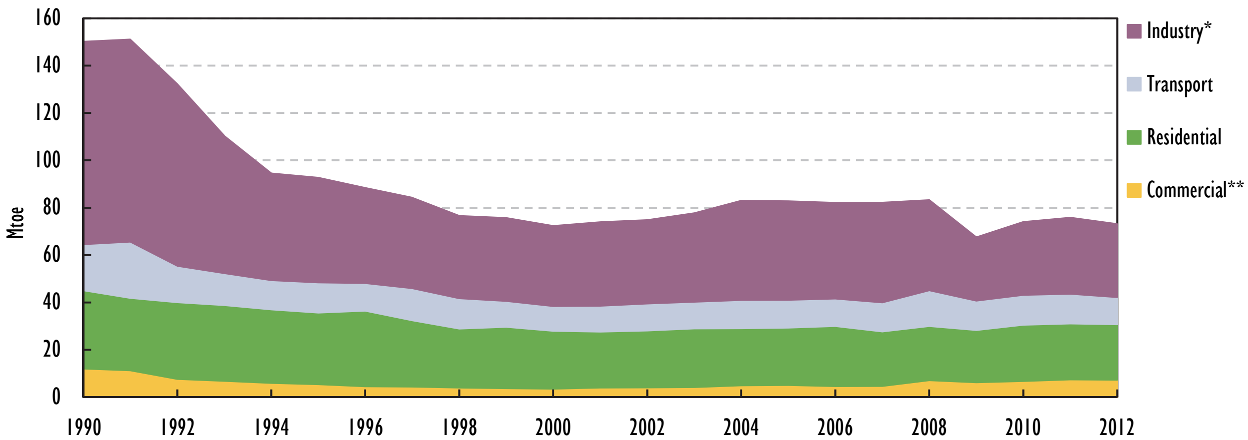
## DEMAND

Total final consumption (TFC)[2] was 73.1 Mtoe in 2012 (Figure 10.1.5). TFC was 2.3% lower in 2012 compared with ten years prior, largely due to a 19% drop during the 2009 recession, without a full recovery since.

Industry is the largest energy-consuming sector at 31 Mtoe in 2012, representing 42.3% of TFC. This share is down from 47.3% in 2002 with depressed industry activity during the recession and a slow recovery. Households accounted for 32.1% of TFC in 2012. Residential energy demand decreased 2.4% in the period from 2002. Conversely, energy demand in transport increased by 0.5% and in the commercial sector by 79.5% since 2002. In 2012, transport accounted for 15.7%, and the commercial sector for 9.9% of TFC.

It is noteworthy that gas consumption has been decreasing in past years to unprecedented low levels. Total gas consumption was 49.5 bcm in 2013, down from 77.6 bcm in 2005, marking a 36.2% decline. That decrease continued in 2014 to reach a historical low of 42.4 bcm (-7.8% year-on-year).This results primarily from lower industrial gas consumption due to the economic slowdown and recession periods, as well as higher import costs, gas savings policies, and the loss of control over parts of the country.

**Figure 10.1.5** TFC by sector, Ukraine, 1990-2012




* *Industry* includes non-energy use.

** *Commercial* includes commercial and public services, agriculture/fishing and forestry.

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## HEAT

Total thermal energy demand in Ukraine is about 130 to 140 million gigacalories per year (Gcal/year). In 2011, total thermal heat supplied by district heating companies amounted to 147 million Gcal, with 97.5 million Gcal produced by heat-only plants in urban and rural areas and mostly supplied to residential users (Table 10.1.1). In 2011, district heating systems' installed capacity was 162 million Gcal/year, with 120 million Gcal/year in heat-only

**2.** TFC is the final consumption by end users, i.e. in the form of electricity, heat, gas, oil products, etc. TFC excludes fuels used in electricity and heat generation and other energy industries (transformations) such as refining.

plants located in urban and rural areas. Heat losses amounted to 13.5 million Gcal in 2011 (Ministry of Regional Development, Construction and Housing, 2011). District heating accounts for a large share of total primary energy use in Ukraine. Its main fuel is natural gas, using about 9 bcm per year, which corresponds to almost 50% of Ukraine's domestic production of natural gas or 23% of total imports in 2011. Several initiatives are underway to convert some district heating systems to use renewable sources for fuel.

**Table 10.1.1** Heat production and supply by heat-only plants in urban and rural areas, Ukraine, 2011 (million Gcal)

| Total thermal power produced | Thermal power supplied for own consumers | including: | | | Supplied to another enterprise |
|---|---|---|---|---|---|
| | | Residential | Municipal | Industrial | |
| 97.5 | 87.5 | 54.7 (62%) | 22.5 (25.8%) | 10.3 (11.8%) | 9.9 |

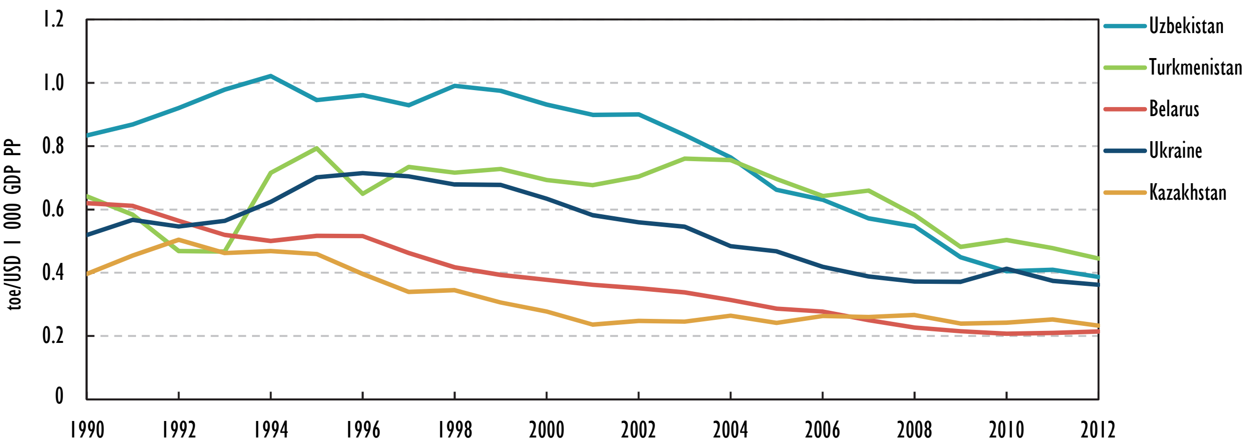
Source: State Statistics Committee of Ukraine.

## ENERGY INTENSITY

Ukraine's economy remains one of the most energy intensive in the region, despite progress in energy efficiency in the industry sector and the closure of some of the most energy-intensive industries in the 1990s. Ukraine's energy intensity, i.e. the ratio of TPES to real GDP, was 0.36 tonnes of oil-equivalent (toe) per USD 1 000 (in PPP terms) in 2012. This ranks Ukraine as the third most energy-intensive among EECCA countries, behind Uzbekistan and Turkmenistan (Figure 10.1.6).

While Ukraine's energy intensity situation improved notably during the 2000s when GDP growth was 1.5 times higher than energy demand, the broad energy intensity indicator has deteriorated in recent years. However, the TPES to GDP ratio may be more favourable if the value of the shadow economy is taken into account. Ukraine's Ministry of Economy estimates that value creation not represented in official data was 34% of GDP in 2012 (Interfax Ukraine, 2012).

**Figure 10.1.6** Energy intensity in Ukraine and selected EECCA countries, 1990-2012



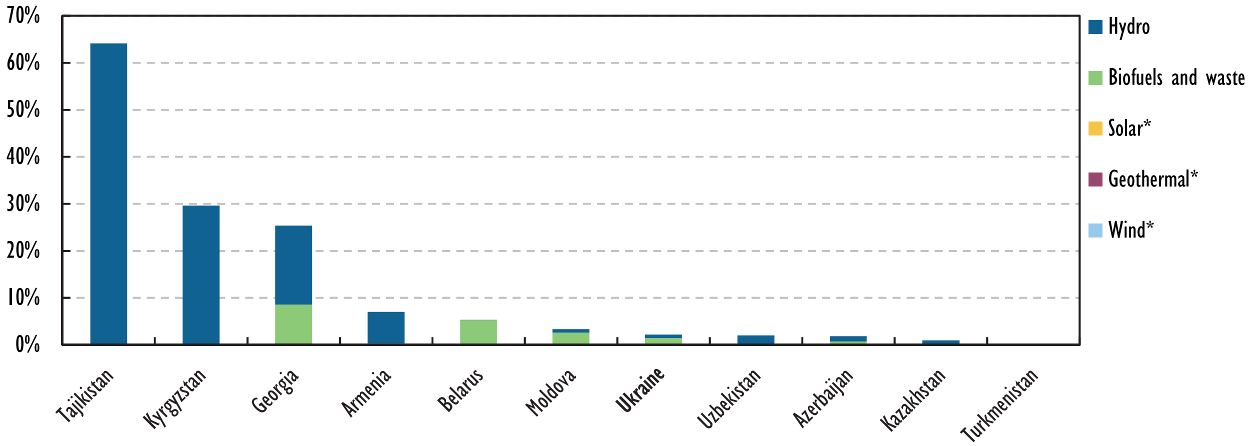

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## RENEWABLES

Renewable energy accounts for 2.2% of TPES, comprised of biofuels and waste at 1.4% and hydro at 0.7%. Wind and solar power generation are in early stages of development and contribute negligible amounts to TPES.

In the period since 2002, the hydropower share of TPES has increased slightly while the share of biofuels and waste has increased substantially from a small base. Ukraine has the fifth-lowest share of renewables in TPES among EECCA countries (Figure 10.1.7).

**Figure 10.1.7** Renewable energy as a percentage of TPES in Ukraine and other EECCA countries, 2012




* Negligible.

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## ENERGY STATISTICS

The State Statistical Service of Ukraine (Ukrstat) is an entity responsible for publishing country's official statistics data. On the energy side, it is actively engaged in working with a number of international agencies on improving energy data and it has started producing energy balances using IEA methodology from 2010, with the assistance of the IEA. Ukraine has comprehensive data on energy supply and trade, but additional efforts are required for streamlining demand-side data and collecting additional consumption and renewable energy use data. Maintaining or enhancing energy data collection capabilities rests within the State Statistical Service; however, greater commitment from the government is required to undertake necessary data surveys to enable data collection and processing. The government also lacks the analytical segment required for data analysis to enable data-based informed policy decisions by decision makers and to track progress.

The figures and charts presented in this report are based on the Ukrainian energy balance, based on IEA methodology (Annex A).

# ENERGY SECTOR DESIGN

## MARKET STRUCTURE

### Electricity

Ukraine's electricity sector is comprised of separate generation, wholesale market, transmission system operation and distribution entities. The distribution and retail elements are bundled.

The wholesale electricity market (WEM), created in 1996, is operated by the state-owned company Energorynok as a sole wholesale trader under a single buyer model since 2000. It also acts as a settlement centre for all payments. Wholesale prices and tariffs are calculated as weight average wholesale price and set by the National Energy and Communal Services Commission (NECSC). All market players (with the exception of small electricity generation companies) are legally bound to become members of the WEM; at the end of 2014, the WEM had over 370 members.

UkrEnergo, the Ukrainian National Electricity Company, is a state entity which owns and operates United Energy System of Ukraine (UES), including transmission networks and interconnections with neighbouring countries. UkrEnergo also provides technical and information support to Energorynok.

The electricity sector has experienced several stages of reform. It was mostly unbundled and partially privatised in the 1990s while state-owned assets were consolidated in 2004. Most thermal generation plants have been partially or fully privatised, with the private company DTEK controlling the bulk of the market. In 1995 regional distribution and retail companies (*oblenergos*) were created, one for each administrative region. Since then there have been several rounds of privatisations. By 2014, several *oblenergos* were privately owned by domestic or foreign investors. Ukrenergoatom is the state-owned operator of nuclear power plants.

### Natural gas and oil

The National Joint Stock Company NaftoGaz, which is state-owned, is the largest company in Ukraine. NaftoGaz is a vertically integrated company engaged in the full cycle of operations in gas and oil exploration, drilling, development and production; transport, refinery and storage; and the supply of natural gas and liquefied petroleum gas (LPG) to consumers. NaftoGaz and its 11 subsidiaries account for the largest share of all the oil and natural gas produced in Ukraine. The company is subordinated to the Ministry of Energy and Coal Industry.

State participation in oil and gas exploration and production activities is carried out by the National Joint Stock Company Nadra Ukrayny (NJSC Nadra Ukrayny). NJSC Nadra Ukrayny conducts geological surveys, provides resource and economic estimates and enters into joint venture agreements with private investors. UkrGazVydobyvannya is the affiliated company responsible for gas production and LPG/CNG production and extracts about 15 bcm per year, which is 75% of total production. A number of independent oil and gas producers are operating in Ukraine, and their share of oil and gas production was just under 10% in 2013. UkrTransNafta, another subsidiary of NaftoGaz, operates the oil pipeline system. The state-owned UkrNafta, but in practice controlled by a private company, is the main oil producer, which also produces a small amount of gas.

UkrTransGaz, the gas transmission subsidiary of NaftoGaz, operates the gas transmission trunk lines as well as the gas storage facilities. Oblgazes, the regional gas distribution companies, hold permits from UkrTransGaz to transport gas through main and regional transmission pipelines and is responsible for gas distribution.

### Heat

Ukraine has around 900 local heat supply companies, called TeploKomunEnerhos (TKEs), that operate heat plants (mostly boilers) and district heating networks. TKEs are mainly owned and managed by local governments. The TKEs supply heat to final consumers. Municipal service companies, known as ZheKs, handle billing and collection in most cases.

More than 8 000 enterprises produce heat in Ukraine. CHP plants account for about 22% of all heat production. Out of about 250 CHP plants, five are very large and 200 are small industrial facilities. CHP plants are fuelled by natural gas (76% to 80%), fuel oil (8% to 15%) and coal (5% to 6%). NaftoGaz holds shares in large CHP plants as well as smaller CHP plants that are typically controlled by regional electricity distribution companies or industrial customers.

Heat-only plants account for about 60% of heat production. There are over 35 000 heat-only boiler facilities, about 60% of which are in urban areas and 40% in rural areas. About 85% of installed capacity is located in urban areas. The majority, about 64%, use natural gas and about 30% use coal, and most have a production capacity lower than 3 Gcal/year. A very marginal amount of heat is produced by nuclear power plants (0.01%). Individual units at the household level represent about 10% of total heat generated.

### Coal

Ukraine is endowed with large coal resources and most mines are located in the Donbass region. Ukraine has about 300 mines, of which a large number of profitable mines were privatised, the predominant majority by DTEK. The remaining mines, requiring subsidisation, remain in the ownership of state-controlled companies. The largest mining region of Ukraine is in its east, which has been severely affected by the recent political instability. Moreover, there are hundreds of illegal, often smaller mines which are in operation mainly in the eastern regions.

## INSTITUTIONAL FRAMEWORK

The Cabinet of Ministers, the ultimate decision-making body, is the institution responsible for policy co-ordination and the oversight of state energy companies. Energy policy is high on its political agenda, with the parliament and the president also involved in the decision-making process. The following are the main national-level institutions with energy policy responsibilities:

- The **Ministry of Energy and Coal Industry** is responsible for most energy supply policies and for co-ordinating energy policy across government and providing advice to parliament.
- The **Ministry of Ecology and Natural Resources** is responsible for licensing and production sharing agreements for hydrocarbon development and for climate change policy. The co-ordination and implementation of all climate policy-related measures defined by this ministry falls under the responsibility of the State Agency for Energy Efficiency and Energy Saving.
- The **State Environmental Investment Agency of Ukraine** has overall responsibility for the implementation of the provisions of the Kyoto Protocol and the UNFCCC Convention.
- The **Ministry of Finance** is responsible for taxation relevant to the energy sector.
- The **Ministry of Economy and Trade Development** has the lead for energy efficiency policies, but responsibilities for implementation are shared among numerous ministries and agencies.
- The **State Agency on Energy Efficiency and Energy Saving (SAEE)**, under the Ministry of Economy and Trade Development, is the central governmental body responsible for advancing energy efficiency and renewable energy developments and promoting the deployment of energy efficient and renewable energy technologies.

- The **Ministry of Regional Development, Construction and Housing** develops policy and programmes relevant at local levels.
- The **National Commission for State Regulation of Energy and Public Utilities (NKREKP)**[3] supervises the natural gas and electricity markets as well as the heat sector. The NKREKP replaced the National Commission for the Regulation of State Energy Markets (NKRE)[4] and the National Commission for the Regulation of Municipal Services Markets. The Commission is subordinated to the President of Ukraine and is accountable to the Parliament of Ukraine.
- The **Anti-Monopoly Committee** is responsible for the prevention of excessive concentration of market power.
- The **State Nuclear Regulatory Inspectorate** has regulatory responsibility for the operation of nuclear facilities, including uranium mining, radioactive waste storage and decommissioning at Chernobyl.

## LEGAL FRAMEWORK

Ukraine has a large body of legislation relevant to energy, which is currently being streamlined to support urgently needed energy sector reforms and to liberalise electricity, natural gas and heat markets in the country, in compliance with the Energy Community Treaty membership undertakings. The progress of legislative changes, however, has been slow and halted by numerous changes in governmental structures and political instability.

The 1997 Law on Electricity Industry was amended by a new Law on Operating Principles of the Electricity Market, adopted in October 2013, aimed at liberalising the WEM. These changes provide a legal framework, dealing with regulatory oversight, management and development of infrastructure, licensing, and operations of companies in the transmission, distribution and supply under-regulated prices. It also deals with security of system operation, allocation of cross-border transmission capacity and development of the network. The Law on the Electricity Market aims at progressively switch from the single buyer model to liquid bilateral trading and establish a day-ahead market by 2017. It also introduces balancing procedures, third-party access and rules for cross-border transmission capacities, and the establishment of an electronic auctioning platform. It also introduces a system of cross-subsidies between different types of generation in order to subsidise households, renewables and CHP plants. This system works through the establishment of an Allocation Fund.

The natural gas sector is regulated by a number of laws, including the Law on Principles of Functioning of the Natural Gas Market, the Law on Oil and Gas, the Law on Pipeline Transport, the Law on State Regulation in Energy and the Law on Natural Monopolies.

The Law on Principles of Functioning of the Natural Gas Market was adopted in 2010 to align Ukrainian legislation with EC Directive 2003/55. It requires further revisions and the development of a set of secondary legislation for full alignment of Ukraine's gas market legislation and regulations with the EU's Second Energy Package. The law provides the basis for opening the gas market, with consumer choice of gas supplier, starting with industrial customers from 1 January 2012, public institutions and organisations from 1 January 2013, the heat industry from 1 January 2014, and was extended to all categories of consumers, including residential, from 1 January 2015. The regulatory framework for third-party access to the Gas Transportation System was adopted in April 2012.

**3.** Established by Presidential Decree no. 715/2014 on 10 September 2014.

**4**. Liquidated by Presidential Decree no. 693/2014 in August 2014.

The reform of NaftoGaz and its network of companies, in line with Ukraine's Energy Community commitments and EU Directive 2003/55/EC, has made progress as the Law on Pipeline Transport has been amended to establish an independent transmission system operator (TSO). This includes the unbundling of gas transportation, storage, production and distribution activities, and ensuring the financial viability and greater transparency of the company and its subsidiaries. The TSO must be unbundled legally and functionally and have independent management, financial autonomy and ownership of the dispatching functions; this was still unclear at the time of writing. Legal and functional unbundling of the oblgazes (initially proposed by 2015) were not put in place at the time of writing.

**Box 10.1.1** NaftoGaz reform

In April 2012, the parliament adopted a framework for the restructuring of NaftoGaz in line with Energy Community requirements, particularly for unbundling and corporatisation of UkrTransGaz.

In June 2012, the government passed a Resolution on Restructuring of Subsidiary Companies of the NJSC NaftoGaz instructing the Ministry of Fuel and Coal Industry and NaftoGaz to reform the subsidiary companies UkrTransGaz (gas transportation and storage) and UkrGazVydobyvannya (gas production). The shares of these two companies were to remain with NaftoGaz. There have been further discussions and preparations on different options for restructuring the company and the possibility to privatise it partially, requiring legislative changes allowing for such a privatisation. The Ministry of Energy and Coal Industry on 2 December 2013 (Order No. 882) assigned functional responsibilities of the United Gas Transportation System of Ukraine operator to UkrTransGaz.

This reform process was further accelerated in 2014 as part of a reform commitment under the IMF Stand-by Arrangement. A law on the restructuring of NaftoGaz was passed, foreseeing the unbundling of NaftoGaz into separate transmission, storage, oil production and gas production activities. The Law No. 4116 "On the reforms of the management system of the unified gas transmission system of Ukraine" provides for unbundling in line with the International Standards Organization (ISO) model and privatisation via Initial Public Offering (IPO) or lease of assets: UkrGazVydobyvannya (15% in 2015), gas storage facilities in one specific entity, and the gas transmission system in another legal entity (49%). Moreover, UkrNafta needs to be restructured into independent companies in line with the Third Energy Package/Energy Community Treaty. The law stresses in particular that any investor into the transmission company should have a minimum of ten years' experience as a TSO, be registered in the European Union, the United States or Energy Community countries, and provide full transparency on ownership.

The successful partial privatisation of NaftoGaz transmission and storage facilities would certainly depend on clarification of future gas transit volumes, the competitive and transparent regulatory environment and the transposal of the EU *acquis*.

* Amendments to the Law of Ukraine on Pipeline Transport with Regard to the Reform of the Oil and Gas Complex (No. 9429-1), www.w1.c1.rada.gov.ua/pls/zweb_n/webproc4_1?id=&pf3511=41861 (accessed 12 July 2012).

A new draft Gas Law, transposing the Third Energy Package was prepared with the assistance of the Energy Community Secretariat and presented to the government for further discussion in April 2014. The proposed draft details procedures for the functional unbundling of UkrTransGaz and NaftoGaz, as well as a definition of exemptions to third-party access and references to firm or interruptible third-party access services and capacity access on an annual basis. The draft gas law was further elaborated with the support of the Energy Community Secretariat and was adopted by the Parliament in March 2015. This marked a major step towards the reform of the Ukrainian gas market, NaftoGaz as well as the adoption of Third Energy Package regulation in Ukraine. Further steps are required for adopting related secondary legislation and regulation.

Ukraine is required to build oil stocks in line with Directive 2009/119/EC and preparations for drafting the relevant legal framework, including the draft Law on Oil stocks, started in 2012, with a deadline for having the necessary legislation in place by July 2015. The deadline for holding stocks is 2022, and Ukraine requires immediate action to achieve this target; the building of initial volumes for required oil reserves are envisaged from the Lysytchansk refinery.

On energy efficiency, Ukraine needs to comply with Directive 2006/32/EC on end-use efficiency and energy services, energy management, energy audits, labelling, etc. A new Law on Efficient Use of Fuel and Energy Resources and a draft Law on Energy Audits as well as the Energy Efficiency Action Plan were drafted in line with the Directive, but by the end of 2014 the adoption of these laws was still pending. The country is currently operating from the dated Law on Energy Conservation from 1994. The current draft package of legislation envisages improving Ukraine's energy efficiency by 20% in 2020 compared with 2010 levels. Regulation on energy labelling, which is under the responsibility of the Ministry of Regional Development, Building and Housing, is insufficient yet partly entered into force in April 2014, alongside legislation and regulation on construction. A draft Law on Energy Efficiency in Public and Residential Buildings transposing Directive 1020/31/EU has not been adopted yet. Ukraine also needs to adopt a Law on Energy Service Companies.

Ukraine's legislative framework relative to renewable energy sources (RES) consists of ten laws, including those on alternative energy sources, the power industry and energy savings. In July 2012, the parliament adopted draft Amendments to the Law on Electric Power Industry. It envisages extending green tariffs to biogas and municipal waste, and introduces differentiated coefficients for electricity produced at small hydropower stations in accordance with their installed capacity.

Ukraine, as part of its Energy Community Treaty membership, is expected to develop, on a voluntary basis, plans to implement EU directives on the promotion of electricity from RES (2001/77/EC) and biofuels or other renewable fuels for transport (2003/30/EC). In August 2011, the Cabinet of Ministers signed a resolution on the planned measures to meet Ukraine's obligations regarding the Energy Community Treaty and tasked the SAEE with the development of proposed measures to comply with the directives. The SAEE planned to develop a National Renewable Energy Action Plan in accordance with the Energy Community's template by the end of 2012, yet this was only realised in October 2014. Moreover, discussions on the adoption of Directive 2009/28/EC on the promotion of renewable energy, including the setting of mandatory targets for all contracting parties, advanced in 2014 as the government adopted a National Renewable Energy Action Plan[5] with a target of 11% RES in gross final energy consumption in 2020.

**5.** Decree by the Cabinet of Ministers of Ukraine "On the National Renewable Energy Action Plan through 2020" # 902–p from 1 October 2014.

## KEY POLICIES

Ukraine's government launched a process of energy sector reform to address challenges identified in the Programme of Economic Reforms for 2010-2014 a few years ago. This process has been slow but was decisively accelerated in 2014 following the change of government and the urgent need to address Ukraine's geopolitical and energy crises. The 2010 programme recognises that Ukraine's energy sector is in poor condition owing to ageing assets, inefficient power generation and transmission, inept management of public companies, market opaqueness, inconsistency of regulation, price distortions, subsidies and lack of incentives for energy efficiency investments. Fostering energy efficiency through price signals and improving the competitiveness and reliability of the power sector were the main objectives of the economic reform programme in the energy sector.

The Updated Energy Strategy of Ukraine for the Period to 2030 was adopted in July 2013 following lengthy consultative and approval processes. Although the updated strategy is a step in the right direction, it remains largely dominated by supply-side policies and measures. Energy efficiency, requiring prominent emphasis, has been left out of the strategy. The absence of demand-side management and policy directions, or a concept for emergency response measures for dealing with supply shortages, made this updated strategy appear outdated soon after its adoption. Therefore, the strategy will require substantial revisions to address key policy directions in view of the new economic and geopolitical realities, and work on a draft new energy strategy had started in late 2014. Such a strategy would need to promote a substantial increase in domestic gas production; the development of an integrated and effective regulatory framework to facilitate more competition, deregulation and diversity in energy supply sources; the increased development of domestic energy resources; measures to drive energy efficiency; cost-reflective pricing; and improved conditions to attract private investment.

The Ukrainian government's steps towards transforming the energy sector include:

- Progress in incorporating and implementing some Energy Community Treaty provisions into legislation to foster competition in the electricity and natural gas sectors, notably through preparations for the restructuring of NaftoGaz and third-party access to the infrastructure.
- Reform of the upstream oil and natural gas regimes where there have been open consultations with interested market participants and steps to develop Ukraine's domestic gas production potential. Tender procedures for conventional and unconventional gas exploration were held in 2012, which attracted interest from major international oil companies whose technologies and experience are necessary to boost domestic gas production. This marked an important step and opened the way in particular for production sharing agreements signed with Shell and Chevron for shale gas blocks. However, these projects were halted in 2014 for reasons including the close proximity of some of the shale gas concessions to the conflict zones.
- Increased efforts to diversify gas supplies via interconnections with European markets and reverse pipeline flows; and pledges to modernise the gas transmission system in co-operation with European institutions. Reverse flows started in 2012 and have been ramped up since September 2014 after a key connecting infrastructure with Slovakia was built.
- Simplification of the tax code to support investments in the energy sector.

- Reduction in gas consumption, such as from district heating systems. Implementation of the following targeted policy measures, as well as economic slowdown and weather-related factors have contributed to lower imports of Russian gas:
  - coal switching at some thermal power plants
  - improved metering
  - governmental budget support to switch boilers to alternative fuels where a UAH 440 million envelope has been devoted to providing grants for district heating boilers in order to cover 20-30% of costs[6]
  - modernisation of compressor stations.
- Development of a comprehensive framework for the development of RES through the National Renewable Energy Action Plan, which aims at achieving a 11% share in final consumption by 2020.

In other important policy areas, such as restructuring the coal sector and the phasing out of subsidies in the gas and electricity sectors, progress had been slower until 2014. For example, the 2010 Programme of Economic Reforms 2010-2014 called for increasing regulated consumer prices. Indeed, there was a 50% rise in tariffs for district heating systems and residential consumers in 2010.

A key policy step has been the adoption of an action plan to improve the heat supply sector in 2012.[7] This aims to support the transparency, quality of operation and investment attractiveness of heat supply companies. Envisaged measures include achieving full metering of the heat and water supply, development of tariff incentives to finance the deployment of meters, and special budget support measures for heat generation companies and consumers to conduct energy efficiency modernisation investments, provided that full metering is in place.

Ukraine has significant greenhouse gas (GHG) emissions mitigation potential, mainly in the energy supply sector, industry and energy used in buildings and appliances in the residential and commercial sectors. Little of this potential has been tapped, owing to a number of regulatory, economic, technical and institutional barriers. In addition, the lack of systematic planning, monitoring, and evaluation of programmes and measures at the national and sectoral levels is a challenge that needs to be addressed in order to tap this mitigation potential (UNFCCC, 2011).

Policy framework and cross-sectoral measures addressing climate change issues include the following key documents:

- National Plan for the Implementation of Provisions of the United Nations Framework Convention on Climate Change (UNFCCC) and Kyoto Protocol (2005, updated 2009)
- Strategy of National Policy for Environmental Protection to 2020 (2010)
- National Action Plan on Environmental Protection for 2011-2015
- State Environmental Monitoring Programme for 2008-2012

**6.** http://tek.rbc.ua/ukr/kabmin-vydelit-440-mln-grn-na-kompensatsiyu-investitsiy-v-stroitelstvo-08102014123400.

**7.** Action Plan for Regulatory Support to the Implementation of the Energy Efficient Heat Consumption Policy and Modernisation of the Heat Supply Sector (Resolution of the Cabinet of Ministers No. 588, 30 July 2012).

- Strategy on Sustainable Development of Ukraine 2020, which was adopted on 12 January 2015 by the Presidential Decree no. 5/2015 and which states the energy independence of Ukraine as one of the key priority programmes.[8]

These objectives were further asserted by the new government in 2014, which adopted as a key objective the need to ensure energy security and transition to efficient power consumption and generation through energy savings and the introduction of innovative technologies. Main objectives of a state policy include: a decrease in power consumption of gross domestic product (by 20% by the end of 2020) by seeking a 100% mandatory commercial accounting of consumption of energy resources (energy and fuel); a transition to effective technologies and equipment, including via service companies; implementation of projects with use of alternative energy sources; ensuring the broadest diversification of routes and sources of primary energy resources, in particular oil, natural gas, coal and nuclear fuel; increasing production of domestic energy resources; introduction of transparent, competitive rules and liberalisation of the markets of electric and thermal energy, coal and gas; integration of a power supply system of Ukraine with a continental European power supply system of ENTSO-E; and reorganisation of public joint stock company NaftoGaz.

Following the parliamentary elections in October 2014, six parties elected in the parliament (Rada) formed the coalition European Ukraine, which on 21 November 2014 signed a Coalition Agreement detailing the country's development prospectives and programme for urgent reforms. The Energy Chapter (Chapter VIII) of this agreement is dedicated to energy industry reforms, leading to enhanced energy security, market liberalisation and self-sufficiency in energy terms.[9]

The main directions of the energy chapter, entitled "Energy Industry and Energy Independence Reform" include:

- energy markets' reorganisation and European energy legislation implementation in accordance with Energy Community Treaty
- stage-by-stage elimination of cross-subsidising and equalising natural gas and electricity prices
- ensuring energy markets' transparency and increasing their effectiveness
- bringing the oil and gas extraction tax burden into compliance with best international practices
- improving legislation and the regulatory framework to attract more private investors into the energy industry
- coal mining industry reform, including the end of all subsidies and closure of ineffective mines
- imported primary energy sources and fuel for nuclear power plants' source diversification.

With clear deadlines and programmes of work, this energy pact is indeed a solid way forward to the government's commitments to swift reforms in the energy sector, including energy sector restructuring and the reorganisation of NAK NaftoGaz; maximising energy efficiency gains; raising energy tariffs to cost-recovery level; and liberalising electricity, gas and coal markets.

**8.** www.president.gov.ua/en/news/32046.html.

**9.** http://solydarnist.org/wp-content/uploads/2014/11/the_coalition_agreement_1.pdf.

## INVESTMENT

The Updated Energy Strategy to 2030, published in 2013, sets out the scale of the investment challenge in broad terms for the energy sector. It estimates that over the period 2012-30 Ukraine needs to invest UAH 1 700 billion (in 2010 prices), at a rate of about UAH 90 billion per year. This amount is split among the energy sectors: electricity and heat – UAH 720 billion; oil and gas – UAH 510 billion; nuclear power – UAH 390 billion; and coal – UAH 80 billion. This amount represents a significant financial challenge that will require foreign and private investment, as well as a strategic reallocation of budget support measures.

Energy efficiency improvements will require significant investment across all sectors. The 2010 Energy Efficiency Programme for 2010-2015 foresees investment needs of USD 43 billion for the five-year period. It is estimated that the state budget will only be able to cover a small amount of these energy investments; other sources of financing are needed. In 2012, UAH 502 million was allocated in the state budget for energy efficiency measures. Private investment, both domestic and foreign, or in the form of private-public partnership arrangements, is thus essential.

There is considerable donor support for the implementation of energy efficiency measures in Ukraine. In 2012, it was estimated that UAH 324.8 million of EU budget support is earmarked for energy efficiency projects in Ukraine.[10] A number of international financing institutions (IFIs) such as EBRD, the World Bank and Global Climate Partnership Fund are active in Ukraine.

Moreover, the upstream oil and gas segments, the district heating segment, and the electricity generation and transmission segment will require large investments in the coming years.

### TECHNOLOGY AND INNOVATION

Energy-related research and development (R&D) activities in Ukraine are dedicated to the nuclear sector, where a high level of R&D activity is required in the areas of nuclear safety, material science and simulation tools, among others. This is particularly important for its safety upgrade programmes and extension plans for existing nuclear reactors. R&D requires the use of costly experimental facilities such as research reactors, irradiation facilities and hot cells. International collaboration is one of the recommended means to optimise the effort, offer multinational access to experimental faculties and share expertise. The European Commission has considerable experience fostering such activities under the Euratom framework programme among EU and other countries on the basis of co-funded research. Ukraine is also participating in the International Atomic Energy Agency (IAEA) Project on Innovative Nuclear Reactors and Fuel Cycle (INPRO).

As in other countries that have a long history of nuclear energy use, the need to educate and train skilled workers for employment in the nuclear sector is significant as ageing engineers, scientists and technicians retire.

Ukraine has a large number of academic institutions, universities and nuclear research institutions. The Kiev Polytechnic Institute, the Sevastopol National University of Nuclear Energy and Industry, and the Odessa National Polytechnic University annually produce about 140 master's students in the field of nuclear energy. However, that may not be enough as newly qualified engineers and technicians may prefer to work in other economic sectors or relocate to countries that can offer higher salaries. Worth noting is the establishment of

**10.** State Agency on Energy Efficiency and Energy Savings, www.saee.gov.ua/en/archives/4275 (accessed 24 March 2012).

a National Training Centre for Energoatom Personnel, which is partially funded by the European Union (EUR 14 million, representing one-third of the cost of the project). The centre, opened in late 2012, will provide training in nuclear maintenance, management and safety.

There are a number of research programmes related to energy technology development under various academic institutions and universities, but state funding in energy technology R&D remains scarce and more efforts both in professional training and research segments of R&D are required.

## ASSESSMENT

Ukraine is confronted with unprecedented challenges as it faces geopolitical, economic, financial, humanitarian and energy crises at the same time. The government of Ukraine put in place emergency response measures to manage energy shortfalls for the 2014-15 winter period, but more robust policies and measures will be required to address possible gas, coal and electricity supply disruption risks in the short to medium term. At the same time, the government is urged to develop, conduct and implement a fundamental reform of its energy sector. Mindful of the country's energy security being in jeopardy, the government set up a Crisis Management Centre under the office of the prime minister to address existing and foreseen emergencies, involving key public and private energy stakeholders. Leading electricity and gas market stakeholders have prepared detailed plans for dealing with an emergency situation and have developed strategies for various possible scenarios including fuel switching options. Due to the economic recession and implementation of measures, gas consumption decreased noticeably in 2014.

Facing such multiple crises leaves Ukraine with no choice but to urgently save energy and reform its energy sector. Despite the need for addressing the immediate, most urgent challenges, the government is also taking measures to continue and sustain the work required for structural reforms. The intended multifold increase of utility tariffs remains to be considered as one of the most powerful drivers for fostering energy efficiency in the residential sector, especially if accompanied by targeted social policies, and for improving the economic and financial situation of NaftoGaz and reducing budget spending on energy subsidies. A comprehensive, well-coordinated and strategic approach to identifying and addressing Ukraine's immediate and structural energy security challenges, and – first and foremost – a strong and sustained political will, are essential for stabilising the situation during the winter and rapidly bringing change to the energy sector to foster economic and social recovery.

Ukraine's non-governmental sector is highly mobilised, has long experience and deep knowledge in technical, economic, regulatory and market challenges, and is seeking to engage the government to support it. Ukraine's domestic and foreign investors in the energy sector are also actively engaged and offering their support. And the entire international donor and support community (the European Union, the United States, World Bank, the EBRD, the IEA, the OECD, as well as bilateral partners of Ukraine) is mobilised with its expertise and funds to assist with this effort.

Long-needed energy sector restructuring has seen slow progress over the years, further exacerbated by multiple political standstills and changes in the country's governance structures. There are strong expectations from all sides for the new government to urgently tap into the large and urgent scope for fostering immediate policy measures, accelerating work on structural reforms, removing political and institutional barriers and making the implementation process more effective. Support for this deep reform process is vital and can only be secured if there is full accountability, transparency and a focus on clear and tangible outcomes. It is also essential to seize the massive potential and willingness offered by the non-governmental sector and the international community for helping the government to rapidly advance its policy planning and implementation and address the country's risks and potential threats.

Ukraine needs to transform its energy sector into a more efficient, secure and sustainable energy system. This review has observed a number of energy sector challenges that limit Ukraine's economic and social development and energy security.

- **High energy intensity and poor efficiency**: Energy-intensive industries are crippled by ageing capital stock throughout the energy supply chain. District heating systems that supply half of the heat used in industry and space heating to some 55% of households are in dire need of refurbishment and need a tariff system that is consumption-based and fully cost-reflective. The building stock is of poor quality. Attracting investments to modernise assets and improve energy efficiency is a key challenge.
- **Declining production of domestic natural gas resources**: Ukraine's domestic oil and gas production is stagnating, if not declining, whereas the country has untapped conventional and unconventional gas resources. The country has the potential to meet its gas consumption with domestic production by 2030. Yet without comprehensive reforms and foreign investment, it will not be able to increase domestic gas production and significantly increase Ukraine's security of energy supply.
- **Energy security at stake**: Ukraine's gas import dependency and severely affected coal production and disrupted transportation remain key contributors to rising energy security concerns. Contributing factors to this include: commercial disputes with Gazprom over prices, debts and take-or-pay and ship-or-pay obligations; lower transit volumes; and commercial and economic challenges to sustain high levels of reverse flow imports. Gas shortages are severely affecting centralised heat production, while coal shortages heavily impact electricity generation capabilities and stability of grids, especially in times of peak demand. Rising energy import costs and a remaining strong dependency on gas imports lead to additional energy security challenges; due to depreciation of the hryvnia, oil and gas import costs labelled in US dollars have increased by over 50% in 2013 dollar terms. These are nonetheless expected to decrease again following the fall in oil prices. Moreover, although huge improvement was achieved over past years, Ukraine still needs to import about 50% of its gas consumption. This is a particular challenge given that gas imports have to be pre-paid and that domestic regulated price levels have not been sufficiently increased to match these rising import costs.
- **Energy consumption subsidies**: The high level of public expenditure to subsidise gas, heat and electricity consumption is unsustainable, especially since budget subsidies increased to a record level in 2014 following the hryvnia's depreciation, rising import costs and insufficient increases in regulated tariffs. NaftoGaz is not economically viable and, overall, energy sector companies have insufficient incentives for investment. The challenge is to mobilise political and public support to move to market-based prices in a socially acceptable manner that supports the most vulnerable consumers while providing full transparency and accountability for the utilisation of the revenues. Another related challenge is to foster trust from consumers that higher energy bills can be offset by lower consumption and that payments are used in a transparent manner.
- **Market and regulatory framework**: Ukraine's oil, gas and electricity providers are dominated by state entities. Current energy markets are designed to maintain their

predominance and to subsidise energy consumption in the household and public sectors. The challenge is to design and implement an effective regulatory framework that increases competition, strengthens the efficiency of markets and is attractive to investors. Third-party access, greater transparency of markets and strong and fair regulatory oversight are key in this regard.

- **Investment climate**: Ongoing concerns over transparency in the energy sector, poor metering of energy flows, limited accountability and controls, weak implementation of the rule of law and price regulations have impeded foreign and domestic investment. Improving good governance is a necessary framework condition for attracting investment.
- **Reducing environmental impact of fuel combustion**: Ukraine has huge potential for GHG emissions reductions through expanded access to international carbon finance. Moreover, Ukraine is committed to implementing the EU Large Combustion Plant Directive by 2018, with 24 plants of a total 29 368 megawatts (MW) affected by this legislation. Making progress on these fronts also underscores the importance of attracting investment.
- **Institutional capacity**: As in many transition economies, Ukraine's current institutional setting favours supply-side policies. The challenge is to adjust the institutional structure to improve the formulation, co-ordination and effective implementation of demand-side policies, especially in the energy efficiency and district heating segments.
- **Attracting investments**: Ukraine's energy infrastructure requires large capital investments as the infrastructure is severely ageing. This is particularly the case for the gas transmission system, centralised district heating systems, power transmission and distribution networks.

## *RECOMMENDATIONS*

*The government of Ukraine should:*

- ☐ *Rethink short-, medium- and long-term energy strategies, taking into account new realities, the consequences of severely impaired energy infrastructure and energy-intensive industries, and their implications for the short- and medium-term energy outlook, as well as considering the possible redesign of energy markets. Formulate new energy policies and measures aimed at revitalising the sector, focusing on self-sufficiency and sustainability in energy by scaling up domestic gas production, renewable energy sources and maximising energy efficiency gains. Such policies should focus on efficient, open and transparent procedures and governance structures across the sector, capable of rapid reforms and urgent market restructuring. Ensure the adequate and timely reflection of such policies in national legislation, in line with the Energy Community Treaty undertakings and warrant the rule of law.*
- ☐ *Foster the financial sustainability of the energy sector. Increase regulated tariffs for gas and heat to full cost-recovery levels through transparent and progressive steps, with tariff incentives for consumption reductions, and develop social policy measures to protect the most vulnerable consumers. Further strengthen payment discipline and ease procedures for debt recovery. Progressively phase out subsidies for coal production and reform the coal sector, starting with the closure of the mines that incur the highest losses, and related social support programmes.*

- *Undertake energy market reform. Encourage the speedy establishment of gas, electricity and heat markets in line with the Energy Community Treaty undertakings. Authorise the financial and political independence of the recently restructured Energy and Communal Services Regularity Commission to allow its maximum resilience to political interferences. Pursue vigorous electricity, heat and natural gas sector reforms. Unbundle oblgazes, increase the transparency of their operations and launch NaftoGaz restructuring, privatisation and gas transmission system modernisation. Secure system operability and ensure sustainability of transit flows in line with existing internal or external commitments. Determine optimal gas entry routes and install new metering stations at entry points on the Ukrainian side of the border.*

- *Enhance domestic gas production. Boost upstream sector developments by elaborating clear, transparent and fair procedures for tendering existing and new blocks for upstream oil and gas development, including fiscal incentives for enhanced recovery and development of depleted fields. Remove dual pricing for domestically produced gas and ensure taxation, regulatory stability and clarity merit investor confidence. Rapidly prepare new tenders for new blocks.*

- *Intensify measures for maximising energy efficiency gains potential in all sectors of the economy. Pay particular attention to demand-side management. Encourage the reduction of energy use in housing (both public and residential) and transport sectors. Employ widespread information campaigns at the national, regional and municipal levels on energy efficiency benefits and existing opportunities on energy efficiency technology deployment. Empower home-owner associations, strengthen energy management, application of energy consumption labelling and appliance standards, and implementation of building codes; impose mandatory energy audits for the public and industrial sectors which are conducive to investments. Enhance demand-side data collection and develop energy efficiency indicators to measure consumption, as well as aid in policy design and tracking progress. Develop mechanisms that can rapidly ensure the deployment of building-level metering and regulation stations.*

- *Boost development of Ukraine's renewable potential. Adapt green tariffs to the changes in technological costs and local content requirements to different technologies in order to reduce deployment costs. Streamline licensing procedures and ensure local content requirement compliance with the Energy Community Treaty undertakings. Revise the fiscal incentives scheme (including green tariffs) for various solar technologies, to encourage their wider deployment for household energy and water heating needs. Revise the regulatory regime for biomass use and develop green tariffs or fiscal incentive schemes. Develop the country's biogas potential and utilise agricultural waste potential for energy transformation/use. Accelerate the development of small hydro potential and the instalment of additional large hydro accumulation projects on the Dnestr river.*

- *Develop emergency response mechanisms for energy supply shortages, with a clear indication of the priorities for demand restraint management and authorities in charge of overseeing the process.*

- *Improve energy data collection and use. Ensure that an accurate energy balance is a cornerstone of energy strategy and policy directions, so future trends in energy production, supply and consumption can be developed with clear policies for reaching targets and allow for international comparison.*

# 10.2. ENERGY SECURITY

## RESOURCE ENDOWMENT

Ukraine has a century-long history of oil and gas production and holds substantial hydrocarbon reserves, conventional and unconventional, estimated at 9 billion tonnes of oil-equivalent (Btoe). Natural gas reserve estimates are at 5.4 trillion cubic metres (tcm), with proven reserves of 1.1 tcm of natural gas, more than 400 Mt of gas condensate and 850 Mt of oil reserves. Following the loss of control over Crimea, natural gas reserves would need to be revised downwards because waters off the shore of Crimea, no longer accessible to Ukraine, hold significant gas resources.

Hydrocarbon resources in Ukraine are concentrated in three regions: the Carpathian region in the west; the Dnipro-Donetsk region in the east; and the Black Sea-Azov Sea region in the south (Figure 10.2.1). The Dnipro-Donetsk region accounts for 80% of proven reserves and approximately 90% of gas production. The Carpathian region has 13% of proven reserves and accounts for 6% of production. The remaining 6% of proven reserves are located in the southern region, where production is conducted both onshore and offshore in the shallow shelf of the Black and Azov seas. The aggregate production in this region is 5% of Ukraine's total oil and gas production.

Ukraine has considerable unconventional gas potential in the form of coalbed methane in the main coal mining areas of eastern Ukraine and in two shale gas basins: a portion of the Lublin Basin, which extends into Poland, and the Dnieper-Donets Basin in the east. Coalbed methane resources are estimated at close to 3 tcm, and technically recoverable shale gas resources at 1.2 tcm.[11] The Ukrainian section of the Lublin Basin is large and reportedly has a higher average total organic content than the Polish section and lower average depth. The Dnieper-Donets Basin, which provides most of Ukraine's conventional oil, gas and coal production, also has high organic content, but is deeper. However, due the armed conflict in the Donbass region and challenging economic and geological situations, the future shale gas developments led by Shell in the east and Chevron in the west appear to be uncertain.

Ukraine is endowed with abundant coal reserves, which account for more than 90% of the country's fossil fuel reserves. They include the full range of coal types, from anthracite to lignite, including thermal and coking coal. Reserves of anthracite and bituminous coal are estimated to be about 32 gigatonnes (Gt), with 49 Gt of resources, ranking Ukraine sixth in the world for hard coal reserves, after the United States, China, Russia, Australia and South Africa. Reserves of sub-bituminous coal and lignite are estimated to be about 2 Gt (15th in global ranking of lignite reserves) with another 5 Gt of resources. Government estimates are 117 Gt of hard coal reserves (including sub-bituminous) and 8.6 Gt of lignite. Recoverable reserves at existing mines are estimated by the government at more than 6 Gt, around 75 years of peak production levels.

**11.** www.iss.europa.eu/uploads/media/Brief_11.pdf; www.globalsecurity.org/military/world/ukraine/energy.htm.

Most coal in Ukraine is located in the Donbass region (Donetsk Coal Basin) in eastern Ukraine in the regions of Donetsk, Luhansk and Dnipropetrovsk. There are two other smaller basins, the Lviv-Volyn Coal Basin in western Ukraine (this basin continues into Poland) and the Dnieper Coal Basin, a lignite basin in central Ukraine. Intensive mining for more than a century in the Donetsk region has exhausted the best deposits.

Ukraine has substantial renewable energy potential, including significant biomass resources and waste management potential, which remains largely untapped.

## ENERGY SECURITY AND DIVERSIFICATION

Ukraine's energy security was seriously challenged in 2014, following prolonged gas price negotiation standstills with Russia, military actions in the eastern part of the country and the loss of control over Crimea. Ukraine is facing possible natural gas, coal and electricity supply shortfalls, and disruption risks in the short to medium term. It urgently requires sound policies and measures to overcome this crisis.

Coal production in the Donbass basin has been severely halted. Damage caused by military action to the coal mining and energy-intensive industries in this region is immense, leaving a large number of flooded mines and severely destroyed energy and transport infrastructure, and subsequent logistical problems. Coal supplies from the Donbass region to the central parts of Ukraine or to the thermal power plants almost entirely stalled from mid-2014 due to discontinued rail operations and damaged or destroyed roads and bridges. These developments pose a major level of irreversible damage for the coal and industry sectors, and its impact on the country's energy and economic outlook remains to be fully assessed. Facing these challenges, the government has been working on several options, including coal imports from South Africa and Russia; imports of mazout from Belarus and increased fuel switchability at key flexible power plants; electricity imports from Russia; and organised electricity supply cut-offs to key city areas, administrative districts and regions.

Ukraine is actively seeking to reduce its gas import dependency and to diversify its supply sources and routes. The government has put in place numerous emergency measures for reducing gas demand, increasing domestic gas production and expanding reverse flow import capacities from more competitive supplies from European markets. There is large scope to further develop domestic gas resources, of which estimates for natural gas production are 27-30 bcm by 2025. However, UkrGazVydobuvaniya would require substantial investment capacity to stabilise and possibly increase its own production (as about 75% of its current fields are being depleted) using capital-intensive modern technology and equipment. Therefore, changes to the current price structure for domestically produced gas (currently set at UAH 419/thousand cubic metres (kcm), substantially lower than the price on imported gas) is paramount to enable the required investments. Such pricing changes were being implemented in early 2015 as part of the agreement with the IMF and should enable UkrGazVydobuvaniya to invest in new drilling rigs. The regulated price for gas produced by UkrGazVydobuvaniya was increased to to UAH 1 590/kcm.

In the area of nuclear fuel supplies, traditionally provided by the Russian company TVEL, Energoatom has signed contracts with Westinghouse for the supply of fuel assemblies for some Ukrainian nuclear power reactors as a part of the nuclear fuel supply diversification policy. At the same time, co-operation with TVEL is continuing.

Ukraine remains a key transit country and an important player for European energy security, and in turn benefits from substantial transit revenues. Having the largest gas transit infrastructure in the world, Ukraine currently transits about 75-85 bcm per year of Russian gas to European markets, while a record low level of 60 bcm was observed in 2014. However, Ukraine's role in the transit of Russian gas to Europe is down from about 120 bcm in the mid-2000s and is challenged by several factors, including stagnating demand in Europe and Gazprom's effective strategy to diversify its export routes. In consequence, Gazprom has reduced the role of Ukraine from over 65% of total Russian gas exports to Europe by 2007 to below 50% in 2014. Gazprom in particular is rerouting part of its supplies to its German, French and Belgian customers away from Ukraine via Nord Stream. In addition, Gazprom's purchase of 100% of Gazprom-TransGaz, the gas transmission company in Belarus, at the end of 2011 should also give the Russian supplier additional incentive to load the Belorussian Yamal or the Northern Lights routes, as transportation costs would be lower. The Slovakian TSO, Eustream, is planning for reduced volumes of Russian gas in transit, as is the Czech system operator. If the proposed South Stream pipeline materialises, be it in its initial version or reconfigurated through Turkey, with two lines of 31.5 bcm or three or four lines totalling a maximum capacity of 63 bcm/year, Russian gas volumes in transit through Ukraine are likely to be further significantly reduced. This would create serious challenges to the economic and technical operation of the system as it is today. Investment in the reconfiguration of the entire gas transmission system would be required to enable Ukraine to handle much lower gas transit volumes and continue supplying all regions of Ukraine in an efficient manner. The current Gazprom-NaftoGaz gas transit contract terminates on 31 December 2019.

## ENERGY INFRASTUCTURE AND INVESTMENT

### ELECTRICITY

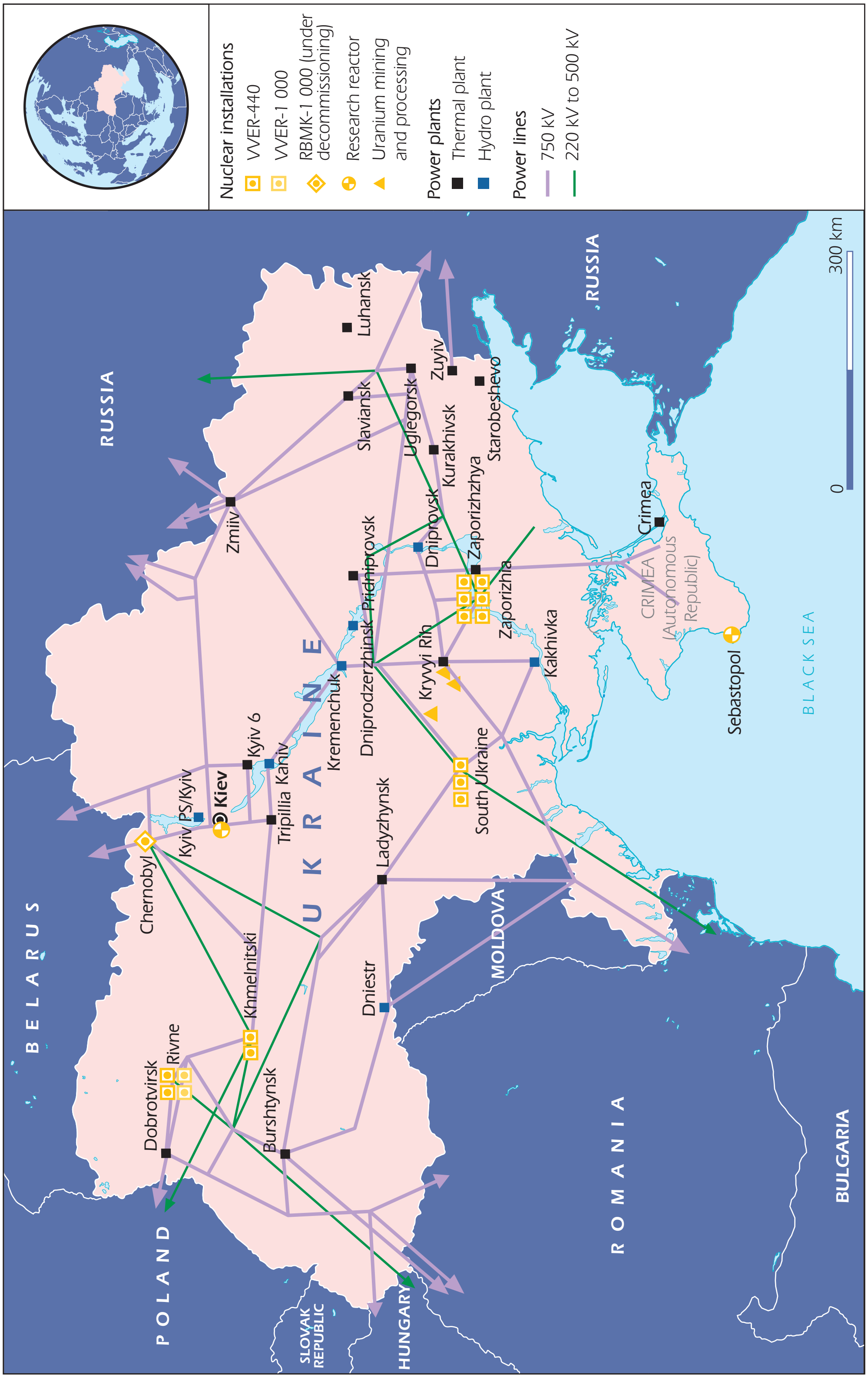
The length of the transmission network of 220 kilovolt (kV) to 750 kV lines is more than 22 000 km. The distribution networks are more than 1 million kilometres in length. Total installed generation capacity was 56 GW in 2013, 64% of which was thermal power plants, 25% nuclear and 10% hydro. The remainder, offset by some hydro storage plants, is accounted for by solar, wind and other small generators.

Most of the thermal plants burn coal. A portion of the thermal capacity, about 5.4 GW, burns gas or oil and is used in times of peak demand. Four nuclear plants with 15 units account for 13.8 GW of installed capacity. Several large run-of-the-river and pumped storage hydropower stations with capacity of 5.6 GW along the Dnieper and the Dniester rivers play an important role in the operation of the electricity system due to a lack of flexibility in old thermal plants (IMEPower, 2008).

Ukraine's electricity sector is in need of large investments to modernise the generation capacity, in particular hydro and thermal power plants, to remove bottlenecks in high-voltage transmission capacity, and to reduce losses in distribution systems.

In the hydro sector, the World Bank is playing a long-standing role to support the modernisation and expansion of Ukraine's large hydro capacity. UkrHydroEnergo, which manages the Ukrainian power grid, is increasing the safety and efficiency of its hydroelectric plants as well as their capacity. The state-owned company operates nine hydroelectric stations on the Dnieper and Dniester rivers with a total capacity of 3 900 MW.

**Figure 10.2.1** Electricity infrastructure of Ukraine




This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries, and to the name of any territory, city or area.

Source: country submission.

The World Bank is supporting UkrHydroEnergo in the modernisation and/or expansion of the Dnepr and Dniester plants, replacing turbines and considering supporting the construction of a hydro accumulation plant, including a new project 120 km south of Kiev on the Dnepr. The extension of the Dniestrovski hydropower plant on the Dniester River is being realised and should be ready by 2017, adding 300 MW of capacity. A second hydropower plant could also be built on the Dniester. In total, up to 2 000 MW capacity could be further added in this sector if financing is available. Moreover, there is still an approximate 600 MW of small hydro potential in Ukraine which could be developed.

Decisions related to the construction of new nuclear units are expected in the period 2015-18. EnergoAtom has indicated that it would select a standard Generation III/III+ design from a competitive tender among international vendors. A high share of the supply chain is expected to be allocated to Ukrainian industry.

## DISTRICT HEATING

Ukraine has 33 122 km of heat transmission and distribution networks. Transmission pipes constitute about 3 500 km (pipes with diameter 125 millimetres [mm] to 1 400 mm). Distribution pipelines (diameter 50 mm to 800 mm) are owned by municipalities and constitute about 20 800 km. In addition, industrial pipeline networks are about 12 400 km.[12]

District heating systems in Ukraine are characterised by excessive capacity, and inefficient and outdated technologies: the capital stock is in a critical state, with most assets close to or beyond the end of their design life. Energy losses are considerable – hence much gas is wasted – and operating costs are high, largely due to inadequate maintenance.

Due to overcapacity, lack of maintenance and insufficient investment in system upgrades, losses are considerable. Most boilers have low efficiency factors, resulting in heat losses of 10% to 15%. While there is insufficient metering to calculate accurately, losses in the distribution network, mainly due to leaks and lack of pipe insulation, are estimated in the range of 17%, but could be considerably higher. Leaks also lead to the need to add additional water more frequently, which constitutes an extra cost for the heat supplier. In modern networks of comparable size, losses are typically less than 10%. Breakdowns are frequent in Ukraine's district heating systems and are estimated to exceed 1.6 breakdowns per km of network in operation, which is approximately ten times higher than in well-maintained modern systems. In addition, up to 70% of delivered heat is lost in the end-use phase because of insufficient building insulation and the inability to adjust heat delivery to consumer requirements.

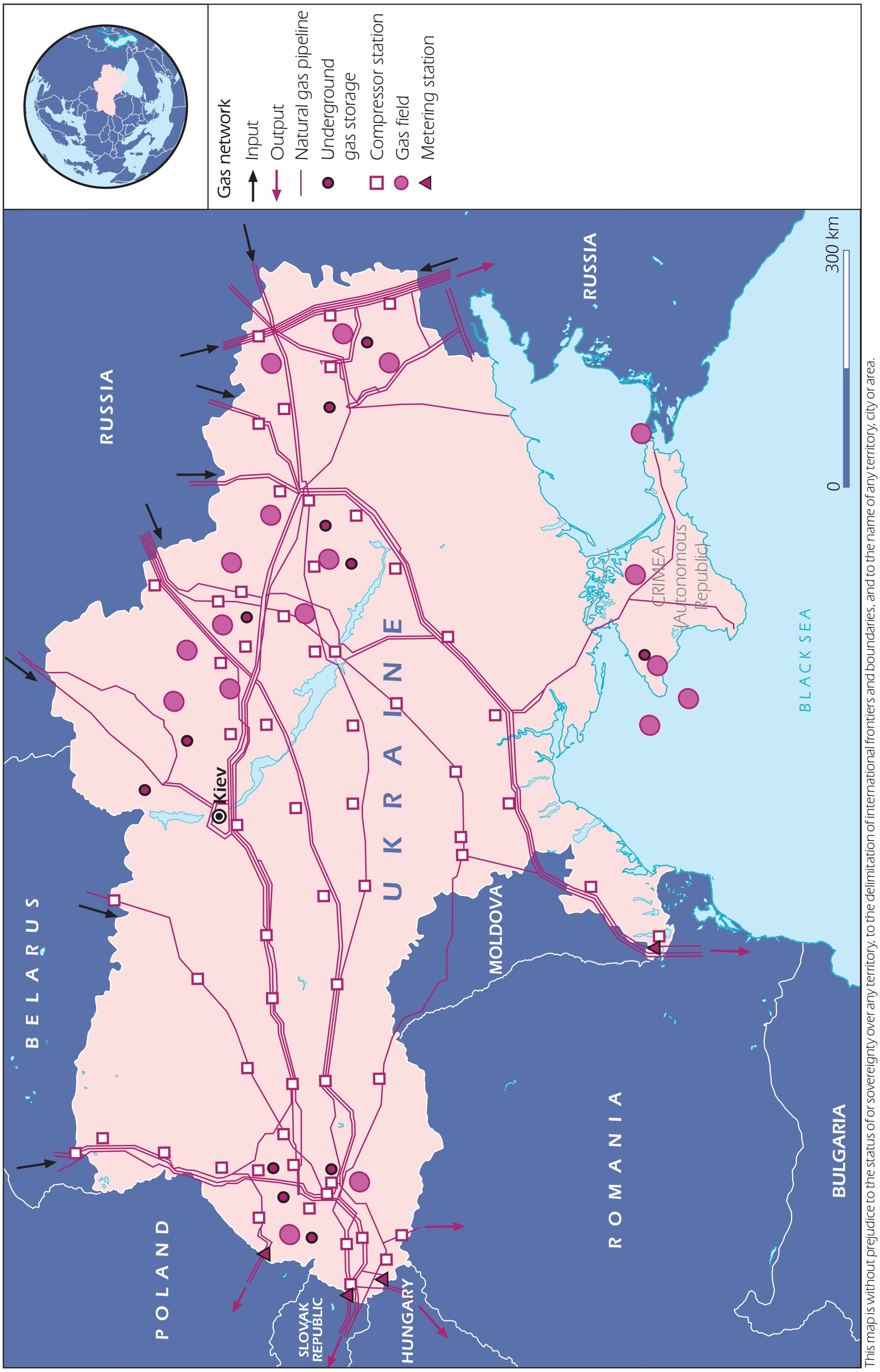
## NATURAL GAS

When gaining its independence from the Soviet Union in 1991, Ukraine inherited a gas transportation system with unique characteristics, such as a dense network of multiple primary and secondary pipelines coupled with major storage facilities which enable the diversion of gas flows through other pipelines should an accident or failure occur (Figure 10.2.2).

The system encompasses a total 38 600 km of pipelines, with 22 200 km of main transmission pipelines and 16 400 km of distribution pipelines. It is powered by 72 compressor stations, with a total capacity of 5 443 MW. The gas transportation system can transport up to 80 bcm/year for domestic gas consumption from indigenous and imported sources and can transit up to 142.5 bcm/year of gas from Russia and Belarus to European countries.

**12.** Ministry of Regional Development, Construction and Housing of Ukraine, statistical data, State Statistics Committee of Ukraine.

**Figure 10.2.2** Natural gas infrastructure of Ukraine




Source: NaftoGaz.

Ukraine's gas transportation system has the second-largest storage capacity in Europe, after Russia. Storage plays a key role for the secure and stable operation of domestic supply operations, as well as a critical role for the operation of the gas transit system. The 13 underground gas storage facilities have a total working capacity of 30.9 bcm/year. UkrTransGaz operates 12 of them while Chornomorneftegaz operates the facility in Crimea.

Ukraine holds sizeable untapped reserves of unconventional oil and gas. The government has pursued vigorous legislative changes to amend existing regulations to make these reserves attractive for investors. For example, it has streamlined production sharing agreements.

In June 2012, it offered tenders for the Oleska and Yuzivska blocks and the Foros and Skifska areas of the Black Sea shelf under this regime, allowing for the exploration and production of natural gas, shale gas, tight gas, coalbed methane, crude oil and oil and gas condensates for a 50-year period. In August 2012, the government selected ExxonMobil and Royal Dutch Shell to lead development of the Skifska deep-water natural gas field offshore in the Black Sea, together with Romania's OMV Petron and NJSC Nadra Ukrayny. No bids were submitted for the development of the Foros field. The Oleska block, located in the western part of Ukraine, covers an area of 6 324 $km^2$. The minimum investments required at the exploration stage of this field are estimated to be USD 163 million, and for the commercial production stage USD 3.13 billion. Offshore projects have been halted due to the loss of control over Crimea. The Yuzivska block is in the eastern part of Ukraine with an area of 7 886 $km^2$. The minimum investments required during the exploration stage are estimated at USD 200 million and for the commercial production stage, USD 3.7 billion. The Foros and Skifska areas are oil and gas fields on the Black Sea shelf, near the Ukrainian-Romanian border and Crimea respectively. Estimated recoverable gas reserves are 3 bcm/year to 4 bcm/year at Skifska and 2-3 bcm/year at Foros. Tenders for these fields were announced in 2012 and Production Sharing Agreements signed in 2013. Due to events in Crimea, all these offshore projects have no prospect for being continued.

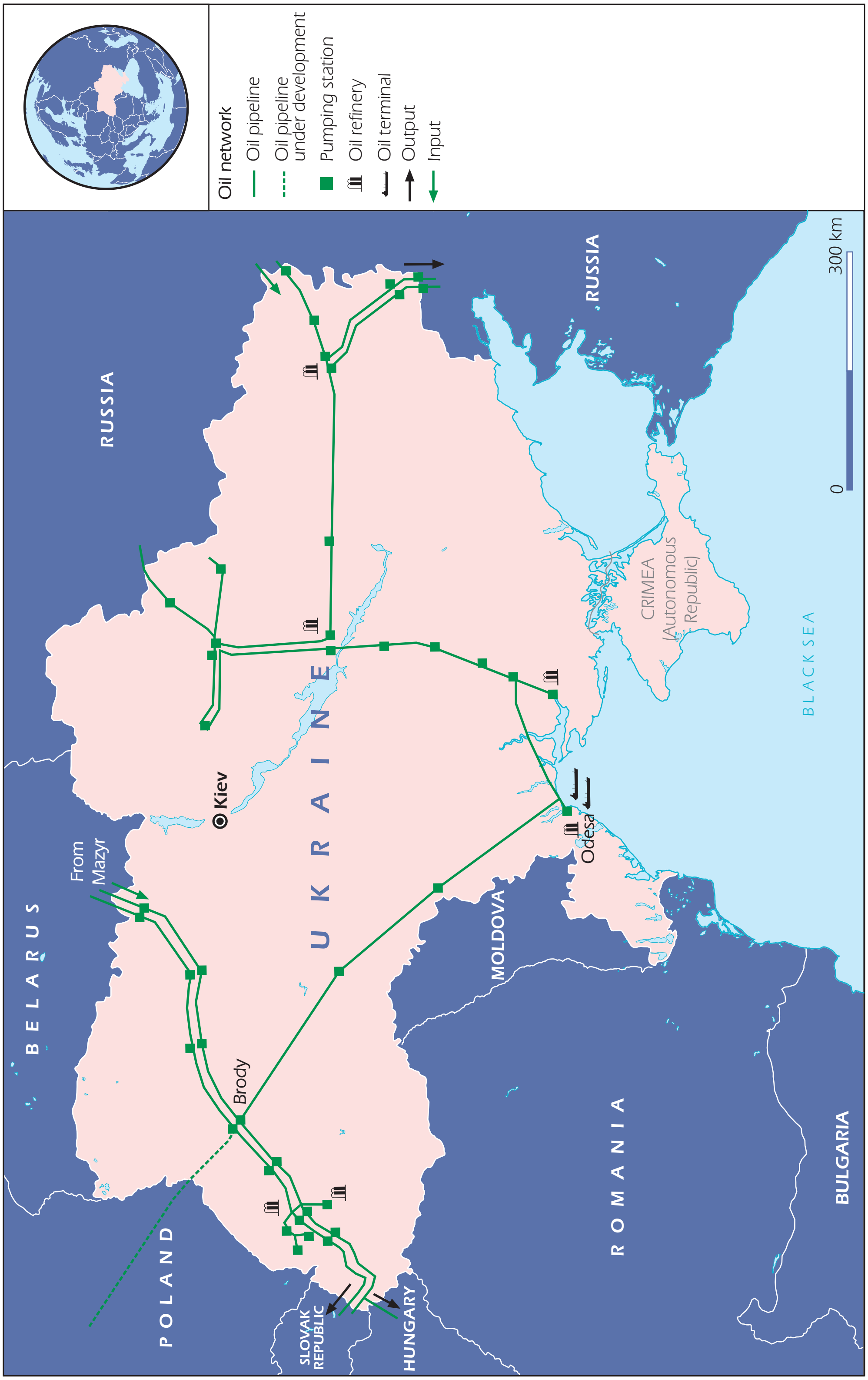
## OIL

Ukraine's main oil transportation system consists of 4 767 km of pipelines with a diameter of up to 1 220 mm, 51 pump stations and 11 tank farms of 79 tanks with a cumulative rated capacity of about 1 million cubic metres (mcm) (Table 10.2.1). Pumping stations have 176 units with a capacity of up to 12 500 mcm/hour and electric drive capacity of 356.5 MW. The throughput capacity is 114 Mt/year at the inlet and 56.3 Mt/year at the outlet. About 65% of the pipelines are between 30 and 40 years old: 27% over 40 years; 6% between 20 and 30 years; and only 2% between 10 and 20 years. In addition, there are about 4 625 km of smaller oil product pipelines, mostly privately owned, though their technical stage of operation is unclear.

Ukraine has seven refineries with a design capacity of 50.4 Mt/year, which is about four times larger than Ukraine's oil product market. Information on refinery product yields is poor, for example gasoline production as a share of crude oil intake. In 2014, only one large refinery was operational and in activity, the Krementchouk refinery.

Ukraine has three maritime oil terminals: Pivdenny, Feodossia and Yuzhnyi. The Pivdenny terminal is equipped with tanks that can store up to 200 000 $m^3$ of oil. The terminal can receive large oil tankers with a maximum deadweight of 150 000 tonnes and maximum draught of 12.5 m. The Pivdenny port is designed to accept and discharge crude oil, which is transported by trunk pipelines. Oil terminal capacity is 25.5 Mt/year of crude oil and oil products.

**Figure 10.2.3** Oil pipeline system of Ukraine




This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries, and to the name of any territory, city or area.

Sources: UkrTansNafta; Razumkov Centre (2007), *National Security and Defence*, No. 4 (88), Ukrainian Centre for Economic and Political Studies, Kiev.

The Eurasian Oil Transportation Corridor (EAOTC) project has been under consideration for about a decade on the basis of the Odessa-Brody oil pipeline and its proposed extension to Plotsk (about 371 km) and Gdansk to supply Polish refineries. The direct-mode use of the Odessa-Brody pipeline has revived this concept and Sarmatia, a Polish registered pipeline company, was designated to develop the extension. Sarmatia has gathered five shareholders to form a project consortium: Azerbaijan's SOCAR, the Georgian Oil and Gas Corporation, Lithuania's Klaipedos Nafta, Poland's PERN Przyjazn S.A. and Ukraine's Ukrtransnafta.

**Table 10.2.1** Main oil pipeline characteristics, Ukraine

| Pipeline/route | Diameter (mm) | Distance (km) | Design capacity (Mt/year) | 2010 capacity (Mt/year) |
|---|---|---|---|---|
| Samara (Russia)-Lysychansk | 1 220 | 164.7 | 90 | 62 |
| Michurinsk (Russia)-Kremenchuk | 720 | 355 | 18 | 18 |
| Mozyr (Belarus)-Brody (two lines) | 720 | 727.3 | 34 | 28 |
| Snihurivka-Odessa | 720/1 020 | 249.7 | 13.2 | 13.2 |
| Lysychansk-Tikhoretsk (RF*) (two lines) (directed to Novorossiysk ) | 720 | 413.8 | 30 | 16.8 |
| Brody-Uzhgorod (two lines) | 530/720 | 325 | 25 | 25 |
| Odessa-Brody | 1 020 | 673.7 | 14.5 | 14.5 |

Sources: Gonchar, M., A. Duleba and M. Oleksandr (2007), *Ukraine and Slovakia in a Post-Crisis Architecture of European Energy Security*, Research Center of the Slovak Foreign Policy Association, Bratislava, Slovak Republic; RC SFPA (2011), *Prospects for Transport of Hydrocarbons and Bilateral Co-operation*, RC SFPA, Bratislava; Razumkov Centre (2007), *National Security and Defence*, No. 4 (88), Ukrainian Centre for Economic and Political Studies, Kiev.

## CROSS-BORDER INFRASTRUCTURE

### Electricity

Ukraine's electricity network is fully integrated and interconnected with other neighbours in the region and runs in a parallel regime with the Russian system. The exception is Burshtyn Island in the western part of the country, which is synchronised with the Central European grids and facilitates direct exports to Slovakia, Hungary and Romania.

### Gas

The gas transmission system has many large entry points on the Russian-Ukrainian border, allowing both Russian transit gas and gas shipped for domestic consumption to be dispatched to Ukraine's eastern regions. Gas is then added in the transit pipelines from Ukraine's storage sites to the remaining gas shipped from east to west to make up for the gas taken out for domestic supply. Storage facilities hold both gas from domestic production and imported from Russia. Domestic and imported gas is injected into Ukraine's storage facilities between approximately 15 April to 15 October, and is withdrawn during the winter months. During winter peak times, Ukraine's five storage sites at the western border can supply up to 40% of daily transit volumes. On average during this period, Ukraine imports about 120-130 mcm/day, produces about 55 mcm/day from its own fields, extracts between 85 mcm and 100 mcm/day from storage, with peak capacity of about 140 mcm/day.

### Oil

Russian and Kazakh companies can transit crude oil through Ukraine via three pipelines: the southern branch of the Druzhba pipeline, which enters Ukraine from Belarus

(Atyrau-Samara-Unecha-Mozyr-southern Druzhba); the Samara-Lisichansk pipeline; and the Nizhnevartovsk-Lisichansk-Kremenchuk-Odessa pipeline. Volumes of oil in transit through Ukraine have been steadily decreasing in recent years.

## SYSTEM RELIABILITY

Outages in Ukraine's electricity sector were rare, mainly taking place in rural areas as a result of unfavourable weather conditions and/or deteriorated distribution grids. In recent years Ukraine's TSO and regional distribution system operators have taken measures, such as the construction of reserve lines and switching to ring connection schemes, to eliminate electricity outages for end users.

Electricity transmission and distribution losses are around 13%on average, but have reached nearly 20% in some years. Losses in generation, transmission and distribution are expected to increase absent sufficient and timely investments. Each licensee reports to the National Electricity and Communal Services Regulatory Commission on losses and outages on a regular basis. Quality-of-service standards related to outages have not yet been developed by the regulator.

Natural gas transmission line losses have been estimated to be in the range of 2% to 3% of total transmission volumes. Losses on UkrTransGaz's main pipelines are in a range of 0.2%, which is a very good record. Technical losses in the electricity sector amount to 12%. Losses in the gas sector are assessed at 2.3% of the total. Reporting on losses and outages is done by NaftoGaz to the regulator and to the Ministry of Energy and Coal Industry on a regular basis.

Data on losses can vary considerably. For instance, network district heat losses on average are 15%, but losses of 50% have been noted. District heating systems in Ukraine are characterised by excessive capacity, and inefficient and outdated technologies: the capital stock is in a critical state, with most assets close to or beyond the end of their design lifetime. Energy losses are considerable and operating costs are high, largely due to inadequate maintenance. About 13 bcm of natural gas was consumed for heat production in 2013, of which almost 9 bcm was for district heating systems, including 1.9 bcm used by Kyivenergo, a major CHP plant. Owing to insufficient investment needed to modernise the district systems and improve end-use energy efficiency, more than half of the input fuel is wasted, which corresponds to a value of about USD 2 billion at a gas import price of USD 400/tcm. Heat losses amounted to 13.5 million gigacalories (Gcal) in 2011. Gas consumption by district heating systems was down to 7 bcm in 2014 due to severe heat supply restrictions and savings measures.

Currently, out of 175 000 buildings only 48 000 are equipped with water meters, 8 500 for heat supplies and only 31% of buildings have heat regulators. There is a need to install 220 000 meters, including 115 178 cold water meters (UAH 3 500 each), 31 006 hot water meters (UAH 12 000 each) and 72 120 for heat (UAH 40 000 each). Total costs are estimated at UAH 3.8 billion, plus the costs for 14 000 kindergartens, 20 000 schools and 6 000 hospitals. These costs are to be covered by local governments.

## EMERGENCY RESPONSE

Emergency response policies and measures in Ukraine had been dealt with by the Ministry of Emergency Situations until the country commited under the Energy Community Treaty to build up a minimum reserve of crude oil and petroleum products 2020. This commitment is in line with EU Directive 2009/119/EC. Ukraine's downstream oil sector is fully liberalised and the government has no right to interfere with the oil businesses. It cannot distribute oil products produced by the refineries, which are marketed at their owners' discretion. Ukraine is reported to have only small oil stocks, the levels of which are a state secret, and there is no oil emergency supply legislation in place that would regulate the use of strategic oil stocks in the case of supply disruptions. At present, stocks are managed by Derzhkomreserv, the State Committee of Material Reserve.

Recent developments in Ukraine, which prompted multiple layers of energy supply disruptions, triggered the establishment of a Crisis Management Group under the prime minister's office to address electricity and gas supply emergency preparedness, preparation of emergency scenarios, the definition of interruptible consumers and the realisation of stress tests under different scenarios.

**Box 10.2.1** Policies and measures addressing the 2014 energy crisis situation, Ukraine

Policies and measures taken by the government for reducing gas consumption and fostering electricity supply security during the winter of 2014-15 include:

- gas supply limitations to industrial gas consumers, and district heating and power plants to achieve 30% reduction in consumption, based on consumption levels during the 2013-14 heating season
- 10% reduction in supplies to households
- reduction of average district heating temperature by 2°C for households, to 18°C
- hot water cuts and temporary electricity cuts in parts of some major cities
- lower electricity exports from Burshtyn Island
- preparations for switching from coal to mazout for some power plants, and mandatory building up of 20 days' mazout storage at thermal power plants (compared with 45 days in Soviet times), and related imports of mazout
- coal imports from South Africa and Russia to offset disruptions of gas and from domestic coal production in the Donbass region
- interruptible reverse flow gas imports via Poland, Hungary and Slovakia; maximise reverse flow import capacities where possible
- preparation for tariff optimisation to reflect changes in economic conditions of electricity and heat generation
- preparation of support measures and incentives to encourage households to switch to electric accumulative individual boilers
- setting targets to improve the energy efficiency of the economy by 10% by 2020, compared with 2010
- preparations for tendering 60 gas fields for operation
- efforts for reducing gas consumption by the district heating sector in supporting switching to alternative sources of energy, in particular biomass
- preparations for mandatory heat, hot and cold water metering: Minregionstroy prepared a draft law, "On commercial metering of heat energy, water and drainage of communal services", which states that from 1 January 2016, central water can only be supplied if meters are installed, and from 1 January 2017 mandatory metering for heat and hot water supplies also be installed.

# 10.3. MARKET CONVERGENCE

## NATIONAL MARKET STRUCTURE

### ELECTRICITY AND HEAT

The electricity market is organised according to a single buyer model. Hydro, nuclear, CHP and renewables generators are paid fixed prices set by the National Energy and Communal Services Regulatory Commission, while thermal plants compete for the remaining demand in an energy-only market. The regulator sets a cap for the thermal marginal price and generator bids are above the cap for some hours. The regulator then calculates the weighted-average price, adds transportation and other costs (including the cross-subsidy) to arrive at a final price paid by non-residential customers. Prices paid to generators can also include an "investment component" for NKREKP-approved investment projects. Generator bids are assessed by the market operator Energorynok as to whether they are in line with its estimates of variable costs.

Ukraine's electricity sector is comprised of separate generation, wholesale market and TSO entities. The distribution and retail elements are bundled. The electricity wholesale market was created in 1996 and is operated by Energorynok, a state-owned company. It acts as a single buyer from all generators and settles payments. Prices and tariffs are calculated and set by the regulator. Ukrenergo, a state entity, owns and operates the transmission network, including interconnections with neighbouring countries. All nuclear plants are operated by Energoatom, a state-owned entity.

The electricity sector has experienced several stages of reform. It was mostly unbundled and partially privatised in the 1990s, while state-owned assets were consolidated in 2004. A further phase of privatisation and restructuring is underway as part of the Programme of Economic Reforms for 2010-2014, which covers many sectors of the economy.

In line with the National Action Plan for 2012, a proposal for a new law governing the wholesale market was submitted to the parliament in June 2012. The proposed market design emphasises bilateral contracts for the wholesale market. It is expected that they would be long-term contracts in order to ensure supply and provide incentives to invest in generation capacity. The current wholesale price formation mechanism is based on the weighted-average price of generation calculated from the competitive marginal price of thermal plants and feed-in tariffs of other technologies.

### DISTRICT HEATING

Ukraine has about 17.5 million households, of which about 43% (7.5 million households) are connected to district heating networks. The remaining households have individual heat supply systems, such as individual gas and electric boilers. Additional heat is produced by autonomous and individual boilers for 25% of households and the rest by stoves.

The Law on Heat Supply (2005) and several other legislative and policy documents envisage competition in the heat market and provide consumer choice of supply (where possible).

The law provides for equal access to heat transmission lines and requires district heating operators to purchase heat from other sources, based on competitive bidding organised by local authorities. If a heat transmission company also owns heat generation assets, by law it must participate in the bidding process. It is not clear, however, whether the competitive process is being implemented in practice. International experience shows that this type of competition can stimulate more efficient production performance.

## NATURAL GAS AND OIL

The natural gas and oil sector in Ukraine is owned and operated by NaftoGaz, a state-owned entity. NaftoGaz is a vertically integrated company engaged in the full cycle of operations in gas and oil exploration, drilling, development and production; transport and storage; and the supply of natural gas and LPG to consumers. NaftoGaz has 11 subsidiaries.

State participation in oil and gas exploration and production activities is carried out by the NJSC Nadra Ukrayny. In 2012, 17 independent oil and gas producers were operating in Ukraine, with a total share of oil and gas production at just under 10%. Ukraine's oil pipeline system is operated by UkrTransNafta, a state-owned company and an affiliate of NaftoGaz.

UkrTransGaz, the gas transmission subsidiary of NaftoGaz, operates the gas transmission trunk lines, gas storage and supplies to consumers. Reform of the subsidiary companies UkrTransGaz (gas transit) and UkrGazVydobyvannya (gas production) into public joint stock companies was called for in mid-2012.[13] The shares of these two companies are to remain with NaftoGaz.

Ukraine has 53 regional gas transmission companies (oblgazes). NaftoGaz holds shares in 48 of them (though it is often reported that most of them are controlled by one businessman).[14] According to a 2011 government decree, all shares held by NaftoGaz in the 48 oblgazes had to be transferred to the State Property Fund for privatisation (share value reported to be about USD 1.5 billion). The decree mandated that NaftoGaz would either sell shares to retain a maximum of 25%, or sell all its interests in oblgazes in which it owns less than 25%.[15]

While a hundred companies have licences to distribute gas, Ukraine counts about 20 gas companies which effectively produce, buy and sell some very limited amounts of gas.

Ukraine adopted legislation in 2010 to align itself with EC Directive 2003/55.[16] It began providing consumer choice of gas supply from 1 January 2012, mainly for industrial consumers, and to all consumers from 1 January 2015. Changes in secondary legislation were required. NKREKP, the regulatory authority, adopted a resolution that set out the schedule for the consumer choice: industrial users from 1 May 2012; public institutions and organisations from 1 January 2013; businesses that produce heat from 1 January 2014; and residential consumers from 1 January 2015.

**13.** Cabinet of Ministers Resolution on Restructuring of Subsidiary Companies of the NJSC NaftoGaz (No. 360-p, June 2012).

**14.** *Offshore Fog*, Krimov, Energobiznes, 15 May 2012.

**15.** Interfax Ukraine, 7 February 2012.

**16.** Law on the Principles for Functioning of the Natural Gas Market.

## COAL

Ownership patterns are changing as Ukraine restructures its coal sector. DTEK, the biggest private coal producer, obtained the concession of Sverdlovanthracite, a state-owned company with five mines and three preparation plants, and Rovenkianthracite, another state-owned company with six mines and three preparation plants. DTEK controls around 50% of total coal production, while production at public mines is about one-third.

## REGULATORY FRAMEWORK

As of December 2014, Ukraine still lacked an independent regulator capable of fulfilling its duties in line with Energy Treaty requirements. This includes its independent financing (not from the state budget, as is currently the case), sufficient staffing and salaries (currently limited), and lack of political interferences (in setting tariffs, for example), as well as capacities to enforce competition, carry out investigations, and issue and collect penalties. The regulator should be able to set full cost-recovery tariffs, especially for the public sector; set the gas transmission tariff for transit flows and align it with internal transmission; ensure fair and non-discriminatory access to pipelines and storage; and effectively regulate the TSO. Nevertheless, the regulator until recently had a fairly transparent and clear website, but not in English.

Two regulatory commissions, in charge of energy (National Energy Regulatory Commission) and communal services (National Commission for the Regulation of Municipal Services Markets), were merged into the National Commission for State Regulation of Energy and Public Utilities (NKREKP) in August 2014. The new regulatory body has been in charge of regulation of both energy and communal services.[17] It is responsible for the economic regulation of the market and for its transparent, predictable, non-discriminatory and efficient functioning. The Commission is subordinate to the Ukrainian president, who appoints its head and is accountable to parliament.

The Ministry of Energy and Coal Industry is responsible for regulating the downstream oil sector and gathering statistics. It also establishes a price range, known as a "corridor", for oil products in which retailers set their prices. Although the market determines the price, and the government has no direct price-setting role, there is a view within the industry that setting prices outside the corridor may draw the attention of the Anti-Monopoly Committee or the state tax administration. Tariffs for international transit are set in intergovernmental agreements.

The former State Nuclear Regulatory Committee was renamed the State Nuclear Regulatory Inspectorate of Ukraine (SNRIU) in 2010. This body has regulatory responsibility for the operation of nuclear power plants and two research reactors; decommissioning of the Chernobyl Nuclear Power Plant (Units 1 to 3) and construction of the New Safe Confinement for Chernobyl Unit 4; two spent fuel storage facilities and one under construction at Chernobyl; radioactive waste storage facilities; uranium mining; radioactive material transportation; and production and use of ionising radiation sources. The SNRIU also informs the public about the safety of the country's nuclear installations through its website and public consultation meetings.

**17.** The authority was reorganised in 2011 and was previously called the National Electricity Regulatory Commission.

## Tariffs

According to the Energy Regulators Regional Association,[18] average residential prices in 2012, including taxes, for electricity and gas were:

- electricity: EUR 0.02 per kilowatt hour (KWh)
- natural gas: EUR 2.1 per gigajoule.

The average residential payment for heat in Ukraine was EUR 24.4/Gcal/month including VAT in 2013 and had remained largely unchanged since 2010.

Ukraine's Power Industry Law sets a feed-in tariff, known as the "green tariff", for electricity produced using RES, excluding hydropower plants with capacity over 10 MW and biogas plants. The procedures for setting the feed-in tariff were established in 2009.[19] The government guarantees that the green tariff support scheme will apply to power plants which are fully commissioned in the period to 2030. The feed-in tariff rates decline progressively by 10% after 2014, 20% after 2020, and 30% after 2024 for new plants or those significantly upgraded.

In early 2015, the National Commission for State Regulation of Energy and Public Utilities decreased green tariffs at which Energorynok buys renewable electricity. It was reduced on 31 January 2015 by 20% for solar power stations, and by 10% for other RES. On 27 February 2015, it was decreased by further 55% for solar power stations and 50% for all other alternative energy generation.

Regulated gas tariffs were increased in 2015. The National Commission for State Regulation of Energy and Public Utilities increased the gas tariff for heat supply companies by 2.2 times to UAH 2 934.30/kcm. This is an important step that should reduce the deficit of NaftoGaz. However, heat tariffs remain to be adjusted to reduce the vast indebtedness of district heating companies.

Gas tariffs for households are expected to increase by 280% from April 2015 for consumption up to 2 500 $m^3$/year, with compensation for most vulnerable customer through social programmes. This should enable NaftoGaz' upstream companies invest into field maintenance and new drilling rigs and maintain current production levels in the medium term. Gas sold to district heating companies at regulated tariffs has already triggered a 67% raise in tariffs.

The National Commission for State Regulation of Energy and Public Utilities has also approved a five-stage increase in the electricity price for households. Household prices are expected to grow by 3.5 times from April 2017, reaching UAH 122.83/kWh.

## Third-party access

In the electricity sector, Ukraine has not yet implemented a fully transparent system of third-party access to the transmission and distribution networks, which can be applied objectively and without discrimination between system users in accordance with the EU principles for energy markets. Private companies can enter the electricity market as generators and distribution system operators.

**18.** The Energy Regulators Regional Association is a voluntary organisation comprised of independent energy regulatory bodies primarily from the Central European and Eurasian region, with affiliates from Africa, Asia, the Middle East and the United States.

**19.** Resolution of the National Energy Regulatory Commission on Approval of Procedures for Setting, Re-Setting and Repealing of Green Tariff for Business Entities No. 32.

In the gas sector, a 2012 resolution addresses third-party access to the gas transmission system.[20] It is a major step forward, but leaves open a number of key questions and potential problems of compatibility with the EU *acquis communautaire* (Directives 1775/2005 and 715/2009). These include provisions pertaining to non-discriminatory access to pipelines (the resolution gives priority to public sector supplies), pipeline capacity allocation mechanisms, physical balance and security measures, and the transparency of information, registration and capacity booking. Further, it is unclear where dispatch functions will be placed and how they will be controlled.

Access to other portions of the energy sector include a joint venture or consortium with a state-owned company that holds a special permit or joint activity agreement, commonly referred to as a farm-in agreement, and joint field operation with NaftoGaz subsidiaries or NJSC Nadra Ukrayny. The benefits of such arrangements include access to existing licensed areas and geological information, local knowledge and experience, and co-operation of government authorities. Incorporated companies, in which the state holds a stake of 25% or more, are allowed to bypass auctions for oil and gas special permits. However, a discouraging factor for joint developments is that companies in which the state holds an interest of 50% or more have a mandatory domestic gas supply obligation. Therefore, gas has to be sold to NaftoGaz at a price set by the regulator that is substantially lower than the price for imported gas.

### Technical rules

Ukraine is a member of the ISO and an affiliated member of European Standardization Organisations: the European Committee for Standardization (CEN) and the European Committee for Electrotechnical Standardization (CENELEC). Ukraine is also a member of the Euro-Asian Cooperation of National Metrological Institutions and the Euroasian Council for Standardisation (EASC).

EU electricity equipment suppliers who have adopted voluntary standards may be the only entities in Ukraine that satisfy the term “EU compliant standards”. At the government level, the development of new technical standards in the electricity sector is underway. Ukraine has attempted to harmonise its standards with EU technical specifications for transformers and transmission lines, but the process was halted for budgetary reasons and very few documents were formally adopted.

## REGIONAL MARKETS AND INTERCONNECTIONS

### ELECTRICITY

Ukraine’s electricity network is fully integrated and interconnected with other neighbours in the region. The exception is Burshtyn Island in the western part of the country, which is synchronised with Central European grids and facilitates direct exports to Slovakia, Hungary and Romania. Energoatom is leading discussions with Polish electricity companies for possible electricity exports from the Khmelnitsiki nuclear power plants to EU countries.

### NATURAL GAS

Ukraine is a significant transit route for Russian gas exports to Europe, for which Ukraine gains substantial transit fees. Russian gas transit volumes through Ukraine have fallen

**20.** Resolution on Approving the Procedure for Accessing the Unified Gas Transit System (April 2012).

progressively since the opening of the Blue Stream pipeline to Turkey in 2006 and the full commissioning of the Nord Stream pipeline (line 1 in 2011 and line 2 in 2012). Ukraine transit volumes were down from 137.1 bcm in 2004 to 60 bcm in 2014.

If the proposed South Stream pipeline is built, with a capacity of 63 bcm/year, Russian gas volumes in transit through Ukraine are likely to be further reduced. The Updated Energy Strategy of Ukraine to 2030 forecasts that South Stream will be built with a 30 bcm/year capacity (two pipelines) and transit on average 20 bcm/year by 2030. Ukraine would then still transit about 70 bcm/year to 80 bcm/year; however, such an assumption can no longer be considered realistic given gas market developments in Europe and Gazprom's drive to re-configure the South Stream project, which, if realised according to released statements, would much further reduce volumes in transit through Ukraine. A key issue will be to tailor the modernisation of Ukraine's pipeline system to the future transit flows and imports to make sure that the system will operate in an efficient manner.

# 10.4. SUSTAINABLE DEVELOPMENT

## RENEWABLE ENERGY

Ukraine has made significant progress in the area of renewable energy over the last several years. The development of RES is one of the declared priorities of the Ukrainian government because of their potential to reduce dependence on natural gas and to enhance energy security. Recently adopted legislation has introduced very attractive guaranteed feed-in tariffs, known as green tariffs, as well as other fiscal incentives for electricity produced from RES.

These policy developments have started to attract private investment. In 2011 and 2012 several major renewable energy projects were implemented, including large wind and solar power plants, bringing the total renewable-based installed generation capacity to more than 1 182 MW by the end of 2013 and excluding large hydro. This includes 334 MW for wind, 748 MW in solar photovoltaic (PV), 75 MW in small hydro, 17 MW in biomass CHP plants and 11.5 MW in biogas. The installed capacity of facilities generating heat energy from RES constitutes 520 MW (mostly through the use of biomass). Wind deployment has further accelerated in 2014: according to the Ukrainian Wind Energy Association, during the first half of 2014 new 126.5 MW wind capacities were added in the country, bringing its total up to 497.6 MW (including 87.7 MW in Crimea) by 30 June 2014.

Much more wind and solar capacity is expected to come on line in the period 2013 to 2016. Despite these achievements, the share of renewable energy in TPES and in electricity generation remains relatively low in Ukraine compared to the IEA average.

The National Renewable Energy Action Plan was adopted in October 2014 in line with the European Community Treaty undertakings, which set specific targets and support measures. The declared target is to achieve an 11% renewable energy share in final energy consumption by 2020, and UAH 300 million in budget support measures have been allocated to meet this target.

The draft Updated Energy Strategy of Ukraine to 2030 sets a renewable energy target of 10% of installed electricity generating capacity. The strategy estimates that between 11 TWh and 16 TWh of electricity will be produced from renewable and unconventional energy sources by 2030. Adding generation for large hydropower brings the renewables projection from 23 TWh to 28 TWh by 2030. It foresees a nearly twenty-fold increase in biofuel production between 2010 and 2030.

In addition to the energy strategy, which is the energy sector's general guiding policy document, Ukraine has more specific sectoral programmes. The National Targeted Economic Programme on Energy Efficiency and Renewable and Unconventional Energy for the period 2010-15 sets a target to increase the share of renewable and alternative energy in primary energy supply to 10% by 2015.[21]

**21.** Cabinet of Ministers Decree No. 243 (March 2010).

As part of its accession to the Energy Community Treaty, Ukraine is expected to implement on a voluntary basis EU directives on the promotion of electricity from RES (2001/77/EC) and biofuels or other renewable fuels for transport (2003/30/EC). In August 2011, the Cabinet of Ministers signed a resolution on the planned measures to meet Ukraine's Energy Community Treaty obligations and tasked the SAEE with the development of proposed measures to comply with the directives.

The National Renewable Energy Action Plan was adopted in 2014 in accordance with the Energy Community undertakings. The ambitious goals set in the National Renewable Energy Action Plan would require about UAH 60-70 billion (USD 3.5-4.3 billion), according to the SAEE. This sum would be needed to increase the wind energy capacity of the country up to 2.28 GW by the year 2020 – which represents a 500% increase on the current figure of 410 MW. Solar energy would increase from 450 MW to 2 300 MW. Small hydro would increase from 120 MW to 150 MW. Last, but not least, the installed capacity of biomass-generated electricity is to increase 40 times, from 24 MW to 950 MW. Overall, the plan intends to increase by more than five times the current installed capacity (excluding large hydro), from 1 024 MW to 5 700 MW.

Ukraine has defined green tariffs in support for RES as well as a number of the following other fiscal incentives, approved by the Cabinet of Ministers, most of which are tax-related:

- exemption from corporate profit tax until 2020 on income from: production of electricity and/or heat from biofuels; sale of electricity generated from RES; sale of biofuels; and production and reconstruction of power plants, vehicles and agricultural machinery that use biofuels
- tax reduction of 75% for land used for renewable energy facilities
- exemption from the surcharge on electricity and heat tariffs for electricity generated from renewable sources
- exemption from excise duties and VAT until 2019 for the import of equipment for generating electricity from renewable energy provided that similar goods are not manufactured in Ukraine
- reduction of 80% in the corporate profit tax for five years for the sale of equipment that operates on RES and/or that is used for producing alternative fuels
- import duty exemption for certain types of renewable energy equipment
- the list of goods that can benefit from the 80% reduction in the corporate profit tax and the exemption from excise duty and VAT.

Ukraine's Electricity Law of 2009 tasks the regulator to approve feed-in tariffs, known as the green tariff, for electricity produced using RES for each generator of renewable electricity, excluding hydropower plants with capacity over 10 MW and biogas plants. The procedures for setting the feed-in tariff were established in 2009, defining a green coefficient depending on capacity and type of RES.[22] The Electricity Law sets minimum feed-in tariff rates that are applicable until 1 January 2030. They are calculated on the basis of electricity prices for retail consumers[23] in January 2009, multiplied by an

**22.** Resolution of the National Energy Regulatory Commission on Approval of Procedures for Setting, Re-Setting and Repealing of Green Tariff for Business Entities (No. 32), 2009.

**23.** Consumers connected to distribution grids with the voltage below 35 kV.

established coefficient.[24] The premium tariff for solar and hydropower has an additional multiplier – a peak-time coefficient.

Amendments to the Electricity Law in 2013 and in 2014 also extended this support measure to electricity produced from biomass or animal origin, industrial and household waste, biogas and small hydropower. Green coefficients for solar PV (the largest) were reduced for projects commissioned after April 2013.

The regulator approves feed-in tariff rates on a case-by-case basis. Green tariffs can only be obtained upon the completion of a power plant. The approved renewable-based generators are shielded from EUR/UAH exchange rate fluctuations because the fixed minimal green tariff rates are converted to euros at a fixed exchange rate of 10.86 (based on the 1 January 2009 rate). The regulator can apply the exchange rate that is effective on the date of establishing the green tariffs only if it higher than 10.86.

In 2014, it also became allowable for households to sell electricity produced from solar PV directly to energy suppliers via feed-in tariffs if their production is lower than 10 KWh. Finally, the Electricity Law states that grid connection fees are to be shared 50-50 between the network operator and the applicant for connection.

However, the Energy Community Secretariat states that the legislation on the mandatory use of local content in constructing renewable energy facilities is considered a violation of the *acquis*. Moreover, there are still quite complex administrative authorisation procedures and the regulation on the use of RES in the transportation sector still suffers from gaps, such as an effective certification system.

## ENERGY EFFICIENCY

There are numerous estimates of energy efficiency potential in Ukraine. However, disaggregated energy end-use data are not yet available, which makes reliable projections difficult. The draft Updated Energy Strategy to 2030 proposes a reduction of energy intensity of 30% to 35% by 2030 and foresees an increase in energy consumption.

The National Targeted Economic Programme on Energy Efficiency and Development of the Sphere of Energy Production from Renewable Energy Sources and Alternative Fuels for 2010-2015 was approved in April 2011 and contains a five-year investment programme with total expenditures of about USD 43 billion. In order to deliver this initiative, energy efficiency programmes which include regular assessment mechanisms have been developed for 15 sector branches, 27 regional levels and 56 public institutions.

The projected results by 2015 from 2008 levels include:

- 20% decrease in the energy intensity ratio
- 20% reduction in natural gas consumption
- 20% reduction of the energy intensity of gas transportation, storage and distribution
- 15% to 20% reduction of harmful emissions
- 50% decrease in the national budget expenditures for energy supply to public organisations such as schools and hospitals.

**24.** Article 17-1 of Power Industry Law.

A National Energy Efficiency Action Plan (NEEAP) has been finalised, and is still pending approval. It is designed to identify energy efficiency investments, barriers to implementation, and agencies responsible for implementation.

According to the Ministry of Regional Development, Construction and Building, about 3 bcm/year of gas could be saved by modernisation of the district heating systems and energy efficiency measures. This is worth USD 1.2 billion at a USD 400 per 1 000 cubic metres (tcm) gas import price.

As part of the Energy Community Accession Protocol, Ukraine is required to align the principles of its energy policy with those of the European Union and to achieve a reduction of energy demand of 9% by 2020. To fulfil its commitments under the protocol, the SAEE developed a draft plan to implement some of the EU directives on energy efficiency. These include:

- Energy End-use Efficiency and Energy Services Directive (2006/32/EC) (transposition deadline 31 December 2011)
- Energy Performance of Buildings Directive (2010/31/EC) (transposition deadline 30 September 2012)
- Labelling and Standard Product Information on the Consumption of Energy and Other Resources by Energy-related Products Directive (2010/30/EC) (transposition deadline 31 December 2012).

While deadlines have been missed, some transposition work is underway, and some crucial tasks remain: the Law on Energy Conservation of 1994 needs to be updated to reflect the changing energy policy objectives, the Energy Labelling Regulation of 2010 requires amendments and the draft Law on Efficient Utilisation of Fuel and Energy Resources of 2010 has yet to be adopted. Ukraine submitted a final draft national plan to the Energy Community Secretariat in mid-2012. According to the SAEE, there are also plans to align policies with the European Ecodesign Directive, but the time frame has not been established.

In April 2011, the SAEE replaced the National Agency of Ukraine on Ensuring of Efficient Use of Energy Resources. The SAEE is tasked with the dual role of promoting energy efficiency and renewable energy deployment. Responsibility for energy efficiency was moved from the Cabinet of Ministers to the Ministry of Economy and Trade, which must approve draft legislation developed by SAEE. Due to the reorganisation, there was a standstill in much of the energy efficiency work. Currently, an evaluation of government institutions is underway, so it is possible that agency responsibility for energy efficiency may again be subject to change.

In 2010, the Interagency Commission on Energy Development was formed. Among other objectives, the Commission is tasked with organising work to improve the ratios of the national energy balance and establish positive economic conditions for attracting domestic and foreign investors to the energy sector.

Each relevant ministry also has its own energy efficiency programme and local authorities are developing regional energy efficiency programmes. Co-ordination related to energy efficiency is mainly on an ad hoc basis – no formalised structure for ongoing co-ordination and information-sharing has been established.

## ENVIRONMENTAL PROTECTION

Ukraine has a large body of environmental legislation, including extensive rules, regulations and standards in the field of efficient use of energy resources, energy conservation and renewable energy. There are about 50 national standards, including energy efficiency issues such as method definition, construction and analysis of energy balances, regulation of specific consumption and loss of fuel, energy labelling of household electrical equipment, energy auditing and management, and energy performance standards for certain types of equipment. These standards will have to be successively aligned with EU standards in accordance with the Energy Community Treaty.

## CLIMATE CHANGE

Ukraine is an Annex I party to the UNFCCC. Under the UNFCCC Kyoto Protocol, Ukraine committed to keeping its GHG emissions at the base year (1990) level during the first commitment period, 2008-12. GHG emissions in 2012 were 401.5 million tonnes of carbon dioxide-equivalent ($MtCO_2$-eq), which is 57.3% lower than in 1990.

Ukraine's energy-related emissions of $CO_2$ totalled 281.1 Mt in 2012. This is 59.1% lower compared to 1990, mainly due to a strong decline after the breakup of the Soviet Union. In Ukraine, the power generation sector accounts for 46.9% of energy-related $CO_2$ emissions, followed by manufacturing (25.3%), households (12.5%), transport (10.7%), commercial and other services (2.3%) and other energy sectors (2.3%).

Ukraine has made significant progress in setting up the necessary legal and institutional frameworks and in implementing two Kyoto Protocol mechanisms: Joint Implementation (JI) and international emissions trading of Assigned Amount Units (AAUs). Ukraine is one of the most active countries in the JI market. Ukraine still has large potential for GHG emissions abatement. The government and industry must make more efforts to realise this potential through power sector modernisation and energy efficiency improvements, which also contribute to energy security.

Carbon capture and storage (CCS) has significant potential in Ukraine. Coal has been exploited for many decades, and the existence of a well-established coal industry and technical expertise are factors that may catalyse future efforts. Current priorities related to clean coal approaches are focused on technologies for increasing coal-fired plant efficiency and emissions reductions rather than on CCS.

# 10.5. INVESTMENT ATTRACTION

## INVESTMENT CLIMATE

The number of regulations, required certificates and inspection regimes in Ukraine represents a regulatory burden for private enterprises. While the time and costs related to business registration have been reduced, the government requires enterprises to obtain numerous permits to conduct business. The 2006 Law on Permits System in Economic Activity streamlined more than half of the required permits and increased the number of locations for obtaining permits. The government also tried to expand “One-stop Registration Shops”. Laws and regulations are vague, with considerable room for interpretation, providing officials at every level ample opportunity for rent-seeking. Corruption remains a problem.

The ongoing institutional reforms aim to consolidate public finances, restore the soundness of the banking system and develop a more robust monetary policy framework. Changes to be introduced will involve tax and expenditure policies, pension and energy sector reforms, and measures to strengthen central bank independence and rehabilitate the banking system. Strict adherence to these policies will enhance market access and facilitate transition from state-funded financial support.

Ukrainian parliament approved its new economic reform programme in December 2014, supported by an Extended Fund Facility from the IMF, as well as by additional resources from the international community.

Confidence and fiscal sustainability is to be restored by reducing the general government deficit, and in particular the NaftoGaz deficit, by 2017. According to the World Bank’s “ease of doing business” indicator, Ukraine was ranked 96th among 189 countries in the ease of doing business category in 2014. A high ranking on the ease of doing business index means the regulatory environment is more conducive to the start-up and operation of a local firm. This index averages the country’s rankings on ten topics, made up of a variety of indicators, giving equal weight to each.

According to the Corruption Perceptions Index (CPI), prepared by Transparency International, which measures the level of perceived corruption in public systems, Ukraine ranked 142nd among 175 countries in 2014, with a score of 26.

Ukraine has announced its intent to implement the Extractive Industries Transparency Initiative (EITI). Ukraine formed an EITI multi-stakeholder group consisting of representatives from the government, industry and civil society in October 2012. This group prepared the EITI application that was submitted to the EITI International Secretariat in July 2013. Ukraine was accepted as an EITI candidate country on 17 October 2013.

## INVESTMENT FRAMEWORK

The principal law on investment in Ukraine provides for equal treatment of foreign and Ukrainian-owned businesses, with some restrictions in broadcasting and weapons manufacturing.[25] The State Property Fund oversees the privatisation process. Privatisation rules generally apply to both foreign and domestic investors. Few major privatisations have been concluded since the privatisation rush of 2004.

Ukraine's banking system has grown rapidly in recent years, mostly based on strong foreign borrowing. There are 197 banks registered in Ukraine, including 50 with foreign equity participation. The five largest banks control 30% of the market, representing the lowest market concentration level in Central and Eastern Europe. Foreign banks now account for approximately 31% of bank capital in Ukraine.

Currently there is no single institution in the Ukrainian government with the mandate to help resolve business and investment disputes involving foreign companies. The Ukrainian Centre for Foreign Investment Promotion, a state body commonly known as Invest Ukraine, has attempted to take on this role but has lacked the necessary authority within the government. In May 2010, Invest Ukraine was transferred to the management of the State Agency of Ukraine for Investments and Development, with the objective of enabling it to realise state investment policy in practice but without any mandate on dispute settlements.

Commercial contracts may permit parties to use international arbitration or specified foreign courts to settle disputes. Though Ukrainian legislation recognises international arbitration decisions, in practice such decisions can be very difficult to enforce. In early 2000, Ukraine ratified the Washington Convention, providing for use of the International Centre for Settlement of Investment Disputes (ICSID), an internationally recognised mechanism for resolving investment disputes between investors and the government of Ukraine. Corruption continues to be an issue in many investor disputes.

Ukraine established the legal basis for green electricity tariffs in 2008. It guarantees grid access for renewable energy producers (small hydro up to 10 MW, wind, biomass, PV, and geothermal). The feed-in tariffs for renewable power producers are set by NKREKP, the national regulator. In case of significant fluctuations of the national currency against the euro, the feed-in tariff is adjusted to reflect the changes.

## INVESTMENT PLANNING

The draft Updated Energy Strategy to 2030 sets out the scale of the investment challenge in broad terms for the energy sector. It estimates that over the period 2012 -30 Ukraine needs to invest UAH 1 700 billion (at 2010 prices), at a rate of about UAH 90 billion per year. This amount is split among the energy sectors: electricity and heat – UAH 720 billion; oil and gas – UAH 510 billion; nuclear power – UAH 390 billion; and coal – UAH 80 billion. This represents a significant financial challenge that will require foreign and private investment, as well as a strategic reallocation of budget support measures.

**25.** Law on the Foreign Investment Regime (1996).

## References

BGR (German Federal Institute for Geosciences and Natural Resources) (2013), *Energy Resources 2013: Reserves, Resources and Availability of Energy Resources*, BGR, Hannover, Germany.

Gonchar, M., A. Duleba and M. Oleksandr (2007), *Ukraine and Slovakia in a Post-Crisis Architecture of European Energy Security*, Research Center of the Slovak Foreign Policy Association, Bratislava, Slovak Republic.

IEA (International Energy Agency) (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

IMEPower (2008), *Ukraine Thermal Power Stations Rehabilitation: Assessment of Needs, Costs and Benefits,* IMEPower, Kiev.

IMF (International Monetary Fund) (2015), "Ukraine", IMF Country Report No. 15/69, IMF website, www.imf.org/external/pubs/ft/scr/2015/cr1569.pdf.

Interfax Ukraine (2012), "Economy Ministry: Level of shadow economy in Ukraine grows by 0.4% in the first quarter of 2012", 21 August, Interfax Ukraine.

Ministry of Regional Development, Construction and Housing of Ukraine (2011), *Concept for the Program of Modernisation and Development of Heat Supply Systems of Ukraine for the Period 2012-2022*, Government of Ukraine, Kiev.

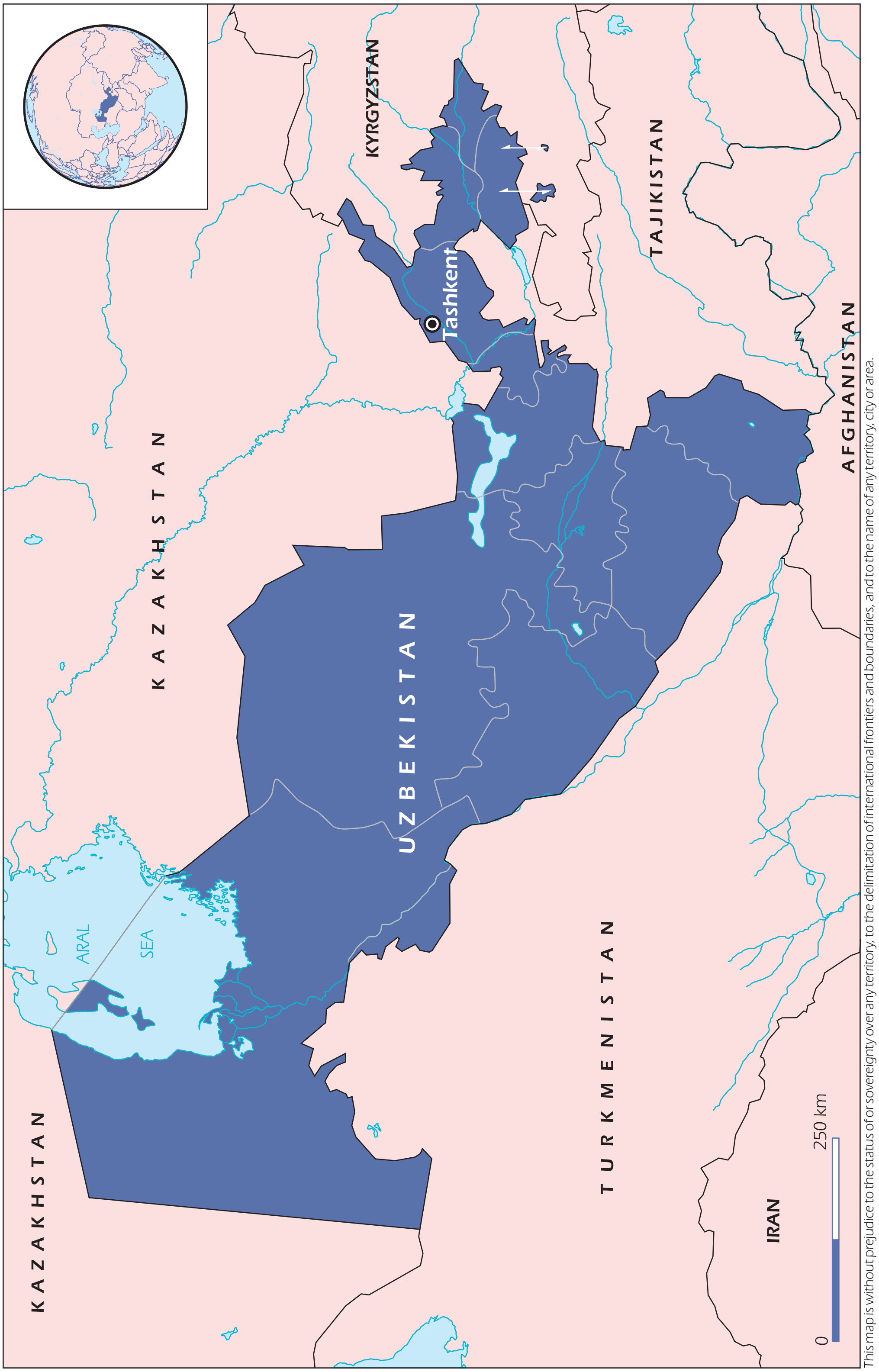
UNFCCC (United Nations Framework Convention on Climate Change) (2011), *Report of the In-depth Review of the Fifth National Communication of Ukraine*, FCCC/IDR.5/UKR, 27 September, UNFCCC, Bonn, Germany.

Razumkov Centre (2007), *National Security and Defence,* No. 4 (88), Ukrainian Centre for Economic and Political Studies, Kiev.

RC SFPA (Research Centre of the Slovak Foreign Policy Association) (2011), *Prospects for Transport of Hydrocarbons and Bilateral Co-operation*, RC SFPA, Bratislava.

UZBEKISTAN

**Figure 11.1.1** Map of Uzbekistan



## 11.1. GENERAL ENERGY POLICY

**Key data (2012)**

**Energy production:** 56.7 Mtoe (natural gas 90%, oil 5.9%, coal 2.4%, hydro 1.7%), +0.9% since 2002

**TPES:** 48.3 Mtoe (natural gas 88.7%, oil 6.5%, coal 2.9%, hydro 2%), -9.2% since 2002

**TFC:** 35.5 Mtoe (natural gas 73.3%, electricity 10.5%, oil 8.1%, heat 6.8%, coal 1.2%), -10.2% since 2002

**TFC per sector:** residential 42%, industry 27.3%, commercial and other services 22.1%, transport 8.6%

**Electricity generation:** 52.5 TWh (natural gas 73.8%, hydro 21.4%, coal 4.1%, oil 0.7%), +6.5% since 2002

**Heat generation:** 100.9 PJ (natural gas 94.4%, coal 4.7%, oil 0.8%), -9.2% since 2002

**Energy intensity:** 0.39 toe/USD 1 000 GDP PPP, -57% since 2002

### COUNTRY OVERVIEW

The Republic of Uzbekistan (Uzbekistan) is situated in Central Asia between the Amudarya and the Syrdarya rivers. The territory is approximately 447 400 km$^2$ and it borders Afghanistan, Kazakhstan, Kyrgyzstan, Tajikistan, and Turkmenistan. Uzbekistan is home to 29.98 million people and the capital is Tashkent with a population of 222 700 (Republic of Uzbekistan, 2014).

Uzbekistan is rich in natural gas resources and is the third-largest gas producer in the region, behind Russia and Turkmenistan. The energy sector accounts for around 7% of gross domestic product (GDP) and 25% of industrial output; energy exports (predominantly gas) account for 25% of total commodity exports (Kochnakyan et al., 2013). Other significant exports include gold, copper and cotton. Real GDP, measured in USD with purchasing power parity (PPP) at 2005 prices, increased by 112% from 2002 to 2012, with a 62% increase since 2005. The economy has been improving without a recession since the mid-1990s.

Despite energy self-sufficiency, Uzbekistan's ageing electricity infrastructure and network underinvestment have led to electricity shortages, poor efficiency, high losses and lack of reliability. At the same time, growing domestic demand and growing demand for gas and oil exports have put pressure on the country to increase production and speed up investment in export pipelines, increasing the need for foreign direct investment. Uzbekistan requires substantial investment to improve the efficiency of its existing infrastructure while increasing the productivity and profitability of the natural gas and oil sectors.

The investment climate in the country has improved over the past decade through legislative packages that benefit private investors. However, challenges remain. Investment attraction efforts include privileges, financial incentives and guarantees for foreign investors, including special investment zones and tax breaks. Investor challenges include bureaucratic barriers, unfavourable currency regulation, state interference and corruption. Energy legislation is lacking clear and transparent rules, as well as independent agencies dedicated to regulation and consumer and business protection.

Energy sector development plays a significant role in Uzbekistan's long-term goal to become an industrialised middle-income economy by 2040. To reform the economy and attract the necessary investment, the country is developing an overall state policy, Vision 2030, which includes provisions for a transition to a market-oriented economy. Priorities for the energy sector over the next 15-20 years include: energy efficiency improvements in the energy, transport and agriculture sectors, decentralisation of businesses and increased competition, economy diversification through industrialisation, and improved education, health and other social services (World Bank, 2014). The Vision 2030 strategy, drafted by the government with support from the donor community, was under review at the end of 2014.

## KEY ENERGY DATA

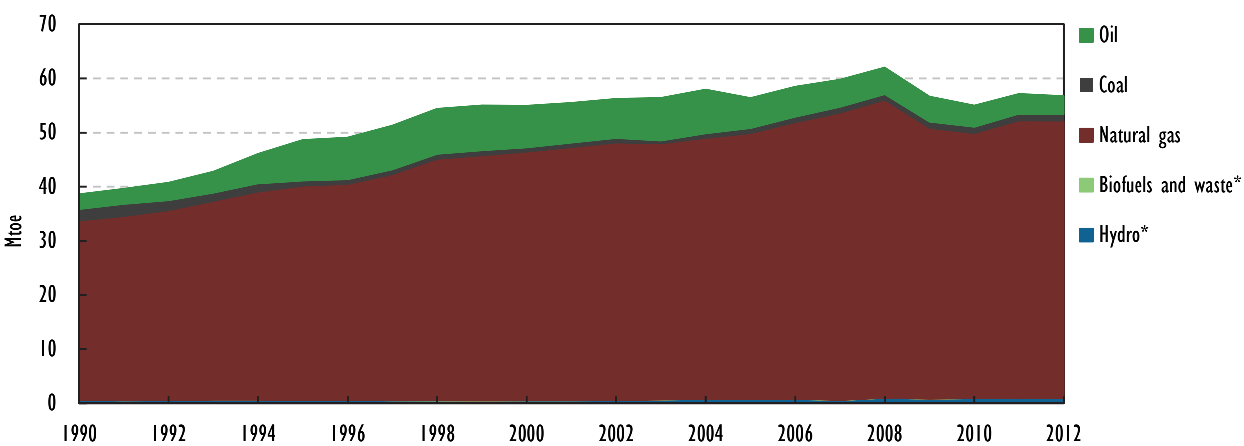
### SUPPLY

Uzbekistan's energy production totalled 56.7 million tonnes of oil-equivalent (Mtoe) in 2012. Energy production grew steadily for decades before a sharp fall during the global economic crisis in 2009 and 2010. Production declined by 12% during the two years. It recovered by only 3.9% in 2011 before levelling off in 2012 (Figure 11.1.2).

Natural gas accounted for around 90% of total production (62.7 billion cubic metres [bcm]). Other energy production was crude oil (5.9% of the total in 2012), coal (2.4%) and hydro (1.7%). Biofuels and waste are produced at negligible levels.

Since 2002, the production of natural gas and coal has increased while the production of crude oil has fallen due to depleting resources. Energy from coal has increased by 41.4%, energy from natural gas by 7.7%, while energy from crude oil has contracted by 54.3%.

**Figure 11.1.2** Energy production by source, Uzbekistan, 1990-2012




* Negligible.

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

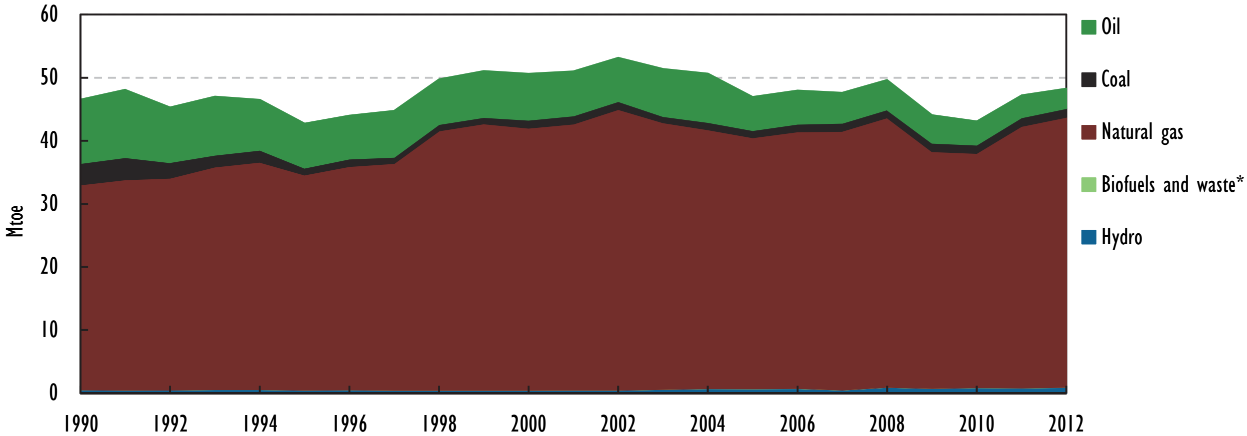
Total primary energy supply (TPES)[1] in Uzbekistan was 48.3 Mtoe in 2012. The overall trend in energy supply over the past decade has been a declining one; TPES has

**1.** TPES is made up of production + imports - exports - international marine bunkers - international aviation bunkers ± stock changes. This equals the total supply of energy that is consumed domestically, either in transformation (for example, refining) or in final use.

decreased by 9.2% since 2002. This is mainly due to a slump during the global financial crisis, as TPES fell by 13.5% in 2009-10, without a full recovery in the following two years.

Natural gas accounted for 88.7% of TPES in 2012. Oil represented 6.5% of TPES in the same year, while the remainder was from coal (2.9%) and hydro (2%) (Figure 11.1.3).

**Figure 11.1.3** TPES, Uzbekistan, 1990-2012




* Negligible.

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

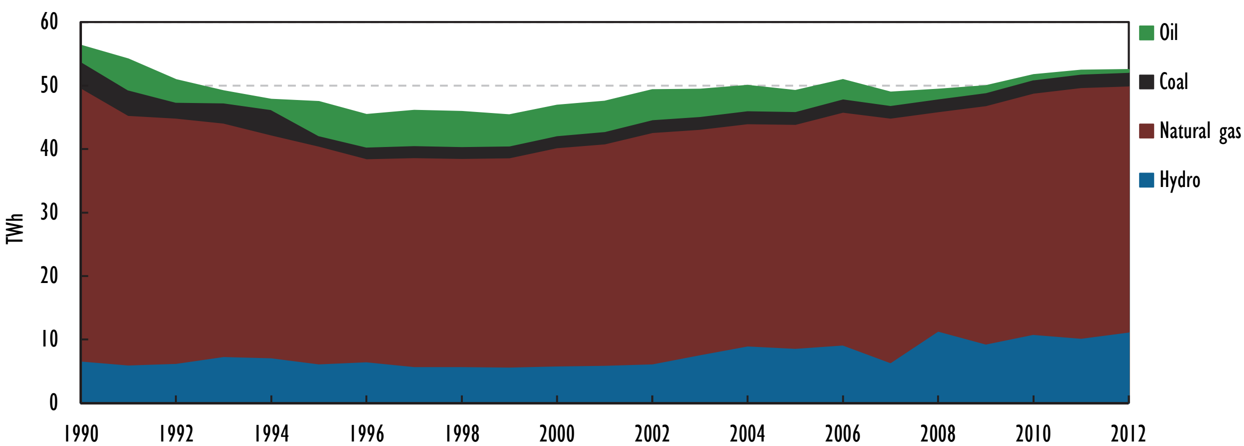
## ELECTRICITY GENERATION

Electricity generation was 52.5 terawatt hours (TWh) in 2012 (Figure 11.1.4), a marginal increase of 0.2% from 2011 and a level of generation that is 6.5% higher compared to 2002.

Electricity generation has grown due to an increase in capacity. Total generation capacity was 12.5 GW in 2012, increasing by 600 megawatts (MW) since 2002, mainly in gas-fired generation capacity (EIA, 2014a).

Natural gas is the source of 73.8% of generation while hydro accounts for 21.4%. Coal represents 4.1% while the use of oil in generation has almost diminished, accounting for 0.7% in 2012. The share of oil in generation has declined from 9.4% in 2002, replaced by growing gas-fired generation and increasing hydropower production.

**Figure 11.1.4** Electricity generation by source, Uzbekistan, 1990-2012




Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## IMPORT AND EXPORT

Uzbekistan is a net energy exporter. Net exports totalled 8.5 Mtoe in 2012, or 17.5% of TPES, made up of 9.6 Mtoe of exports and 1.1 Mtoe of imports. Net exports have grown since 2002 as domestic production has expanded in times of falling demand, increasing from 5.7% of TPES in 2002.

Uzbekistan trades natural gas, oil products and electricity. Natural gas exports were 10.1 bcm in 2013, or 16.2% of production, with no gas imports. Exports were 36.5% higher compared to ten years prior in 2003, while production has increased by 8%. As such, the share of exports in production has increased from 13%. Gas is exported to Russia, Kyrgyzstan, Kazakhstan and China; exports to Tajikistan were cut off in 2013. Uzbekistan also transits gas from Turkmenistan to China via Kazakhstan, on Lines A, B and C of the Central Asia-China gas pipeline.

Uzbekistan is oil self-sufficient. It refines domestically produced crude in three refineries and 94% of refined products are consumed locally with the remainder exported. Oil product exports amounted to 0.2 Mtoe in 2012 and were half that level in 2002. The decline in exports is mainly due to falling crude oil production and declining refinery output.

Uzbekistan's power system was part of the Central Asia Power Grid before its disconnection in 2009. Interconnections still exist with Kazakhstan, Kyrgyzstan, Tajikistan and Turkmenistan; however, electricity exports are only to Afghanistan under bilateral contracts. Uzbekistan imports electricity from Kyrgyzstan under an intergovernmental agreement on exchange of water for electricity. The total trade of electricity was around 12 TWh in 2012 in both directions, and the volume of trade has remained relatively constant over the past decade.

## DEMAND

Total final consumption (TFC)[2] was 35.5 Mtoe in 2012. Energy demand was 10.2% lower in 2012 compared to ten years prior, falling from a peak of 39.5 Mtoe in 2002. Demand has declined due to lower energy affordability in the country, as well as the contraction of the industry sector. The strongest fall in demand was 16.6% during the global financial crisis in 2009 and 2010 (Figure 11.1.5).

The residential sector is the largest consuming sector in Uzbekistan, accounting for 42% of TFC in 2012. The industry sector accounts for 27.3%, the commercial and other services sector for 22.1% and transport for 8.6%. The biggest decline in energy demand over the past decade has been in transport: 21.9% lower in 2012 compared to 2002. Consumption in industry has declined by 9.3% over the same period and by 7.8% in the residential sector.

Natural gas is the principal fuel in final energy consumption (73.3% of TFC). Of that, households use 53% for cooking and heating, industry uses 31%, commercial and other services (including agriculture) use 11% and transport consumes the remaining 5%. Demand for natural gas in final consumption has decreased by 7.8% since 2002.

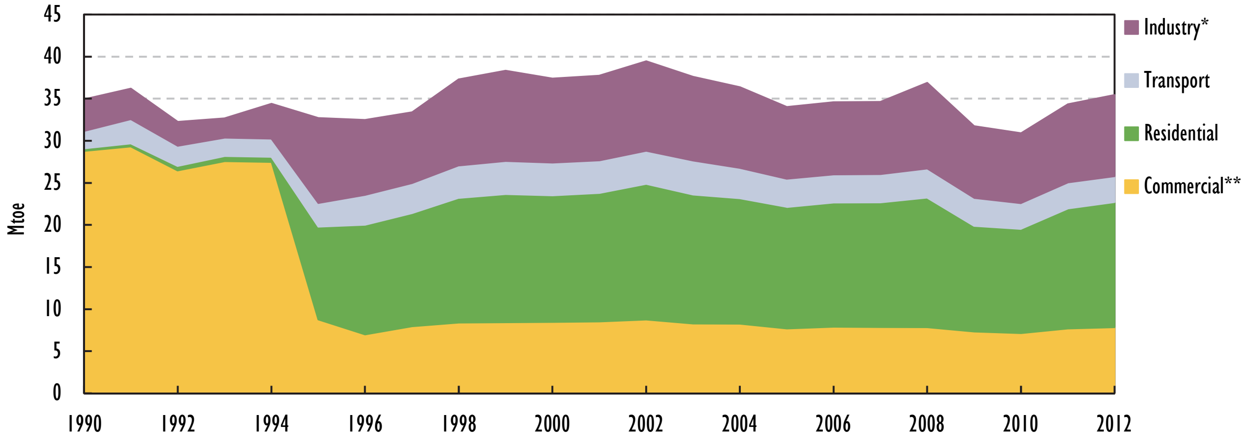
Oil accounts for 8.1% of TFC, and half of its use is in transport while the other half is in industry and residential/commercial sectors. Oil use in all sectors has declined by 38.9% since 2002, due to declining crude oil production and declining refinery output.

**2.** TFC is the final consumption by end users, i.e. in the form of electricity, heat, gas, oil products, etc. TFC excludes fuels used in electricity and heat generation and other energy industries (transformations) such as refining.

The transport sector in Uzbekistan is not almost exclusively reliant on oil as is the case in most countries. Oil accounts for 52% of energy used in transport (down from 60% in 2002), natural gas for 45% and electricity for 4%.

Electricity and heat amounted to 10.5% and 6.8% of TFC in 2012, respectively. Approximately half the electricity use is in industry, while the other half and all heat consumption are in the residential and commercial sectors.

**Figure 11.1.5** TFC by sector, Uzbekistan, 1990-2012




Note: Reporting on residential consumption changed in 1995.

* *Industry* includes non-energy use.

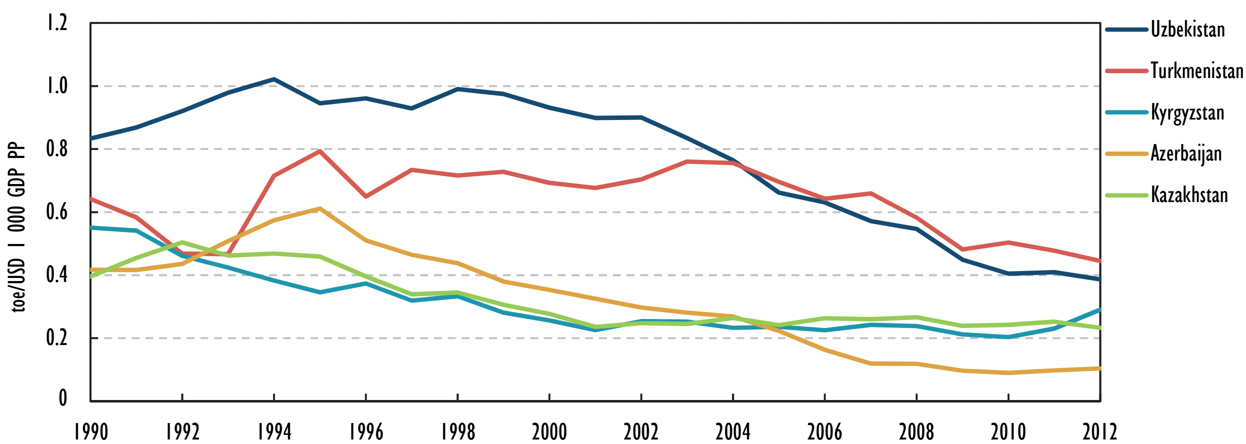
** *Commercial* includes commercial and public services, agriculture/fishing, forestry and non-specified consumption.

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## ENERGY INTENSITY

Uzbekistan's energy intensity, measured as the ratio of TPES to real GDP, was 0.39 toe/ USD 1 000 GDP PPP in 2012. This is the second-highest intensity compared to other EECCA countries, behind Turkmenistan. Since 2002, energy intensity in Uzbekistan has declined by 57%, down from 0.9 toe/USD 1 000 GDP PPP, as real GDP (USD GDP PPP at 2005 prices) has increased by 111.3% while TPES has declined (Figure 11.1.6).

**Figure 11.1.6** Energy intensity in Uzbekistan and other selected EECCA countries, 1990-2012



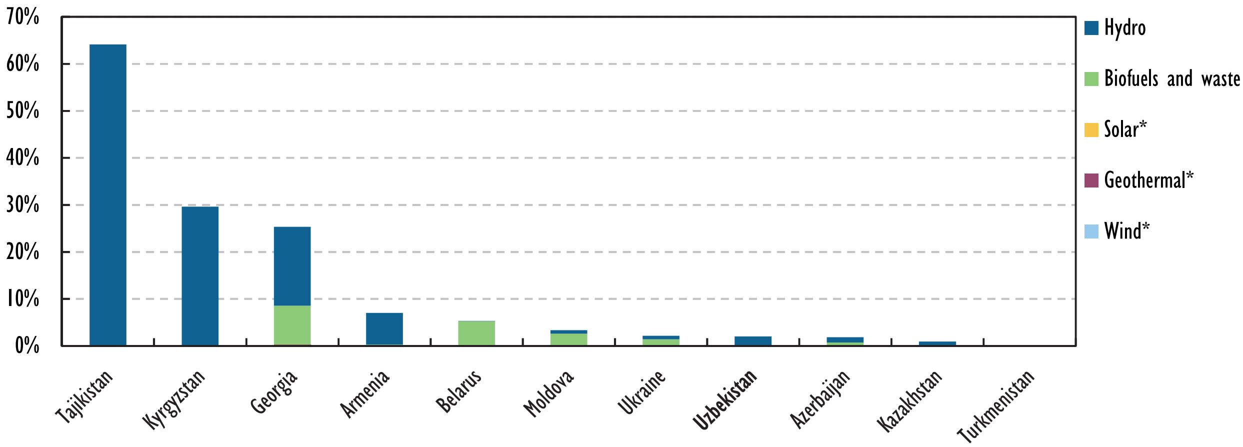

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## RENEWABLES

Uzbekistan's energy mix is dominated by fossil fuels, and renewable energy accounts for 2% of TPES (mainly hydro and negligible amounts of biofuels and waste). The country has the fourth-lowest share of renewables in TPES among EECCA countries, higher than Turkmenistan, Kazakhstan and Azerbaijan (Figure 11.1.7).

Energy from hydropower has increased by 81.2% since 2002, which is the strongest increase in supply from any fuel in Uzbekistan. As such, the prominence of hydro in TPES has increased from 1% in 2002 to 2% in 2012. Hydropower accounted for 21.4% of electricity generation in 2012, which is double the share of 2002.

**Figure 11.1.7** Renewable energy as a percentage of TPES in Uzbekistan and other EECCA countries, 2012




* Negligible.

Source: IEA (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

## ENERGY DATA SOURCES

The figures presented in this report are official energy statistics and balances of the International Energy Agency (IEA) for Uzbekistan and other EECCA countries, based on IEA methodology.

The State Statistics Committee is a government institution responsible for the collection, validation and publication of all country statistics in Uzbekistan. Statistics are designed for use by ministries, public institutions, private organisations and individuals. Data are published in a summarised form in quarterly and annual reports. Many raw data, however, are not available publicly and are only available for government authorities.

The INOGATE Technical Secretariat assisted the country in developing an Energy Statistics Action Plan (ESAP) for 2012-14 that was adopted by the government.

# ENERGY SECTOR DESIGN

## MARKET STRUCTURE

### Electricity and heat

UzbekEnergo is the state-owned operator of most of the electricity sector. Through 53 subsidiaries, the company operates 97% of electricity generation units, the electricity transmission network, the distribution network, central dispatch and electricity retail. The company also operates all of heat production and distribution as well as coal production. UzElektroSet (Uzbek Electricity Networks) is the single transmission system operator (TSO) and there are 14 distribution system operators (DSOs). For power generation, the TSO and DSOs are legally and financially unbundled. EnergoSotish is the single wholesale electricity purchaser and supplier.

UzSuvEnergo is a state-owned company that develops and operates small hydropower plants (HPPs) and is managed by the Ministry of Agriculture and Water Resources. Small HPPs and other independent power producers account for approximately 3% of electricity generation.

Boiler houses are the main heat suppliers in Uzbekistan, accounting for 75% of heat production. Regional and local municipalities own and operate the boiler houses. UzbekEnergo's combined heat and power (CHP) plants account for the remaining 25% of heat production.

The Law on Electricity (2009) stipulates rules for gradual unbundling and transitioning to market principles. Since 2009, the government has legally and financially unbundled transmission and distribution and privatised parts of UzbekEnergo's companies. However, UzbekEnergo still holds the controlling stakes in these companies and controls all sectors of the industry. The government plans to progressively restructure UzbekEnergo and gradually introduce market-related elements in the electricity sector.

### Oil, coal and natural gas

State-owned UzbekNefteGaz owns and operates oil and gas extraction in Uzbekistan. A number of private foreign companies are also active through production partnership agreements.

UzbekCoal, a subsidiary of UzbekEnergo, undertakes coal mining in Uzbekistan through nine subsidiaries (Kochnakyan et al., 2013).

UzbekNefteGaz's subsidiary UzTransGaz is the gas TSO and six other subsidiaries operate as regional gas DSOs. Gas transmission and distribution are legally and financially unbundled. UzTransGaz distributes gas directly to large industrial customers. UzTransGaz and the DSOs are legally and financially unbundled.

## INSTITUTIONAL FRAMEWORK

There is no single ministry in Uzbekistan governing the energy industry. The energy sector governance is carried out by the Cabinet of Ministers, through its Department on Fuel and Energy Complex. The policy decisions, made by the Cabinet of Ministers are implemented by a large number of ministries and public authorities, including: the Ministry of Economy, the Ministry of Finance, the Ministry of Foreign Economic Relations, Investment and Trade; the Ministry of Agriculture and Water Resources, the State Oil Products and Natural Gas Consumption Inspection, the State Control of the Power Industry Inspection, the State Architecture and Construction Committee, the State Antimonopoly Committee, and the State Committee on Privatisation, Demonopolisation and Development of Competition.

**The Ministry of Economy** is responsible for macroeconomic planning and forecasting. The Ministry prepares the annual Public Investment Plan (PIP) that includes a list of high-priority projects, such as energy projects. The Ministry of Economy is also responsible for UzbekEnergo, UzbekNefteGaz and their subsidiaries.

**The Ministry of Finance** is in charge of tariff-setting for electricity, heat and gas, among other functions.

**The Ministry of Foreign Economic Relations, Investment and Trade** is responsible for the development of a favourable investment climate for foreign investors as well as implementation of policy on trade.

**The Ministry of Agriculture and Water Resources** manages water reservoirs and irrigation canals and is responsible for UzSuvEnergo.

**The State Architecture and Construction Committee** is responsible for construction licensing and drafting laws related to construction and planning.

**The State Antimonopoly Committee** monitors competition and customer protection in the energy sector.

**The State Committee on Privatisation, Demonopolisation and Development of Competition** is responsible for implementing economic reforms aimed at faster privatisation and investment attraction.

## LEGAL FRAMEWORK

The first change from Soviet-type governance came in 2001 when the president approved the Decree on Deepening Economic Reforms in the Energy Sector, opening the sector for partial privatisation, foreign investment in generation assets, progressive unbundling and deregulation.

Uzbekistan's primary energy legislation at present comprises the Law on Gas Supply (2012), the Law on Electricity (2009), the Law on Production Sharing Agreements (2006), the Law on Subsoil (2002), the Law on Natural Monopolies (1999) and the Law on Rational Energy Use (1997) (amended in 2003).

In March 2013, the president approved the Decree on Measures to Boost Alternative Energy Sources that outlined specifications of a new bill on alternative energy. The government drafted a Law on Alternative Energy later in 2013, which was still awaiting approval at the end of 2014. The draft law includes investment incentives in renewable energy.

The government adopted the Law on Gas Supply in 2012, the first law specific to gas supply. The law regulates conditions of gas supply and consumption in the country, and bans transport of liquefied natural gas via road transport.[3] Secondary legislation was to be under consideration by the end of 2014.

The Law on Electricity defines the electricity regulation framework and private investment incentives. The law includes provisions for on-site energy generation without licensing, as well as connection to the grid, and establishes basic requirements for independent operators of electricity distribution systems (Kochnakyan et al., 2013). The Cabinet of Ministers adopted the main secondary legislation in the electricity sector, Rules for Electricity and Heat Use, in 2009, for the implementation of financial unbundling of electricity generation, transmission and distribution.

The Law on Rational Energy Use stipulates third-party access to the grid for independent power producers and priority access for renewable energy plants, under certain conditions. It also allows for tariff increases in order to fund investment in the sector. The law was amended in 2003 to legislate the Energy Saving Programme to 2010 that was adopted by the government in 2002.

**3.** http://old.cacianalyst.org/?q=node/5905.

The Law on Subsoil is the main mining legislation and governs exploration and development of all subsoil resources, including oil, gas and coal. It stipulates licensing requirements and generation conditions for mining. The Law on Production Sharing Agreements legislates joint ventures and agreements between the government and private investors, mainly in the oil and gas extraction sector.

The Law on Natural Monopolies legislates activities of natural and government monopolies in the country, including hydrocarbon extraction, oil and gas transportation, and electricity and gas transmission and distribution, among others.

## KEY POLICIES

Uzbekistan's energy policy priorities include uninterrupted reliable energy supply, greenhouse gas (GHG) reduction, energy efficiency improvements and economic growth through oil and gas production and export.

To achieve the mentioned goals, the government has approved the Industrial Modernisation and Infrastructure Development Programme for 2011-15, including USD 34 billion of investment in the energy sector. Of that, USD 5 billion is for the rehabilitation and modernisation of the electricity sector (the Power Sector Development Programme), and more than USD 20 billion in oil and gas exploration. Other measures taken by the government in the past few years include reduced subsidies and periodic tariff increases, mandated energy efficient technologies in new thermal power projects and energy-heavy industries, as well as drafted legislation and investment incentives for renewable energy development (World Bank, 2014).

Ongoing energy sector reforms include (Republic of Uzbekistan, 2014):

- progressive deregulation and de-monopolisation of the energy sector, including privatisation and provision of third party access to the grid
- diversification of the electricity generation fuel mix, including increased coal use and development of renewable energy sources
- attracting foreign investments in rehabilitation, modernisation and expansion of power generation assets and the network
- management, operations and performance improvement of energy companies.

In the electricity sector, UzbekEnergo is carrying out a Power Sector Development Programme for 2011–15 aimed at the rehabilitation of power generation assets and transmission infrastructure.

Key priority areas in oil and gas exploration include: expanding production partnerships with foreign investors and development of new fields; gas and oil production and processing modernisation; reduction of gas flaring; legal and regulatory framework enhancement to attract more investment; and gas generation energy efficiency (Kochnakyan et al., 2013). The new Law on Gas Supply (2012) stipulates rules for domestic gas supply and consumption.

Uzbekistan's energy demand is growing through solid economic growth and a rising standard of living. The country is expected to have significant supply shortages by 2020 at the current rate of demand growth, 3-5% per year. According to UzbekEnergo, demand will increase from 53 TWh in 2012 to 65 TWh in 2020 if solid economic growth continues. Similarly, demand for gas exports from neighbouring countries and China is set to grow over the same period, presenting an opportunity for higher government revenues.

Uzbekistan's gas is currently mainly consumed domestically in power generation. The government plans to increase coal in power generation and improve gas consumption efficiency in industry in order to increase lucrative gas exports. In 2013, the government approved the Programme of Development of the Coal Industry for 2013-18. The programme includes plans for modernisation of outdated coal mining equipment and aged coal-fired electricity generation, as well as the construction of new coal-fired generation capacity.

The government is also working towards attracting investment in the renewables sector and has plans to increase the share of renewables to 20% by 2030 (from around 2% in 2012). In March 2013, the President approved the Decree on Measures to Boost Alternative Energy Sources and drafted the Law on Alternative Energy Sources, which was still being reviewed by the government at the end of 2014. The Decree and the draft law include provisions for priority access to the grid for renewables (with conditions), analysis of renewable energy potential and tax and customs incentives.

The Decree approves the construction of a 100 MW solar photovoltaic (PV) plant in the Samarkand region. The funding for the project has been secured with the Asian Development Bank (ADB) and Uzbekistan's Reconstruction and Development Fund. UzbekEnergo announced a tender for the construction of the plant in November 2014. Other renewable projects include the construction of small HPPs, under the Ministry of Agriculture and Water Resources' 2008 Programme for Development of Small Hydro, to construct 15 new small hydro power plants with a total capacity of 420 MW.

Uzbekistan is one of the most energy-intensive countries in the region, and energy efficiency potential is high. This is true for both the supply and the demand side. Aged generation and network infrastructure, and insufficient investment over the past 20 years, have led to electricity losses of around 20%, while the industry sector is deemed to be highly inefficient using outdated technologies.

Since 2009, the government has approved and is implementing two major medium-term projects on energy efficiency: on Promoting Energy Efficiency in Public Buildings in Uzbekistan for 2009-14 and on Energy Efficiency Facility for Industrial Enterprises for 2010-16. Additionally, UzbekEnergo is implementing a five-year Advanced Electricity Metering Project for 2011-14, installing one million smart meters to households and small businesses. All programmes are co-funded by international donors, the main investors in energy efficiency in Uzbekistan.

Renewable energy and energy efficiency measures are also important to the Uzbek government in order to reduce GHG emissions. The effects of climate change are already visible in Uzbekistan in the reduction in areas of snow, increasingly erratic climate patterns, the drying up of the Aral Sea and higher water losses through evaporation (UNECE, 2010b). The government is committed to reducing the effects of climate change; however, it has not set binding targets for reducing GHG emissions.

## INVESTMENT

The investment climate in Uzbekistan is challenging, albeit improving through concentrated government efforts and incentives. These include the creation of several special investment zones, tax breaks and customs waivers, fewer bureaucratic barriers and new and updated energy legislation, including the Law on Foreign Investments, the Law on Guarantees and Measures of Protection of Foreign Investor's Rights, the Law on Guarantees of the Freedoms of Entrepreneurial Activity and the Law on Production Sharing Agreements.

Remaining investment challenges include heavy bureaucratic procedures, a high level of perceived corruption, political preferences and motivation, poor currency and unlawful interference with business activities (DOS, 2014).

In 2013, the government began the development of Vision 2030 with World Bank and UNDP, the plan for structural economic reform to 2030. Discussions were focused on the creation of a favourable business environment, institutional development, the reduction of state control, and budget management, among other topics. The final version of reform plans was presented to the government in May 2014, for approval that is still pending (World Bank, 2014). If accepted, the gradual economic reform is expected to improve the investment climate and attract more foreign investment.

Foreign investment is crucial to Uzbekistan's energy sector, as existing electricity and gas tariffs are not sufficient for the large investment requirements. The government's public investment programme for 2011-15 is USD 42 billion, including USD 34 billion or 72% for the energy sector. This includes approximately USD 5 billion in electricity and coal and more than USD 20 billion in oil and gas production investment. Financing is expected to come from the government and foreign direct investment in the joint ventures and production sharing agreements. According to the World Bank report (2014), the programme is currently being implemented.

### TECHNOLOGY AND INNOVATION

The Industrial Modernisation and Infrastructure Development Programme for 2011-15 includes actions for increasing research and development (R&D) activities in Uzbekistan. In 2011, the government developed eight priorities of development of science and technology for 2012-20, of which energy saving and resources was one. Other recent decisions on improving R&D in the whole economy include the Decree on Creation of High Technologies Centre in Tashkent with participation Cambridge University of Great Britain (2011) and the Decree on Measures to Further Optimisation and Improvement of Activities of the Academy of Sciences (2012).[4]

In 2013, the International Institute of Solar Energy was founded at the "Physics-Sun" Scientific-Production Association with funding from the ADB and other international financial institutions. The Institute was established to study solar energy technologies, research possible applications in Uzbekistan and expand studies on high-temperature materials.[5]

Despite the increased focus on R&D in Uzbekistan, innovation and productivity of technological developments are low. Companies prefer to import technologies, and intellectual property rights are underdeveloped (Zakhidov, 2012).

## ASSESSMENT

Uzbekistan is the third-largest producer of natural gas in the region, behind Russia and Turkmenistan, and produces enough oil and coal for its needs. Natural gas accounts for nearly 90% of energy supply, and production has increased over the past 15 years. As a country with substantial hydrocarbon resources, Uzbekistan is a net exporter of gas and oil.

However, the country faces important challenges. Electricity infrastructure is aged and inefficient with high losses and poor reliability. Hydropower accounts for approximately

**4.** www.increast.eu/en/1211.php.

**5.** www.press-service.uz/en/news/4873/.

20% of generation and capacity is reduced during winter months, resulting in supply shortage and outages. Demand is growing domestically and within the region. At the same time, depletion of existing oil and gas fields is tightening the supply and creating the need to explore more fields.

The government has the task of improving the reliability of its energy supply, at a reasonable cost to consumers, while expanding its resource industry to meet growing demand. To modernise and expand the industry, the government has approved the USD 42 billion Industrial Modernisation and Infrastructure Development Programme for 2011-15, including USD 34 billion of investment in the energy sector. Investment plans include the rehabilitation and modernisation of electricity, heat and gas, energy efficient technologies in power generation and energy-heavy industries, as well as an increase in coal and gas production.

A comprehensive medium- to long-term energy policy is needed to specify the energy sector objectives and targets, and evaluate measures to overcome challenges. The government should develop a target-based energy strategy that encompasses all aspects of the sector, including different fuels and energy efficiency measures, and looks toward 2020 and 2030. The policy should include an analysis of various scenarios of Uzbekistan's potential development. A clear and transparent strategy can work as a strong signal to foreign investors to secure the necessary funding for the development of the energy sector.

In order to conduct most accurate analysis of the sector, national energy statistics need to be comprehensive, consistent and comparative. At present, the raw data collected by the Statistics Committee are mainly only privy to government authorities, and not harmonised to international standards. To gain more investor confidence and more business interest, the government should expand its statistics collection processes, increase regional and global co-operation on statistics and make data more available.

Uzbekistan's major energy policy concern is unreliable electricity supply, due to insufficient capacity and aged networks, in times of growing demand. UzbekEnergo has been implementing annual programmes of rehabilitation and modernisation of generation and transmission facilities as part of its 2011-15 investment programme. The programme is expected to increase overall generation capacity by 2.7 GW and decrease transmission losses. All generation facilities are expected to have the latest technologies which would improve the efficiency of production. At the same time, the company is rolling out electric meters to previously unmetered customers, and smart meters to one million households and small businesses, to reduce commercial losses and improve efficiencies.

The investment programme is designed to eliminate winter shortage and allow for demand increases on an already overloaded system. However, financing for the programme has been slow, with approximately 50% of the funding secured by 2013. Without the full necessary investment, Uzbekistan is likely to have worse shortages by 2020 if demand continues to grow at the same rate as in the past decade.

Part of the reason full financing has not been secured is the low electricity and gas tariffs. Similar to other countries in the region, tariffs are subsidised by the government and are significantly below cost. The government has set a policy of progressive tariff increases in order to bring tariffs to a cost-reflective level, including capital investment in the long term. However, tariff increases have not made a large impact. Gas prices have risen at a faster rate over the past few years, as domestic prices are up to three times lower than export prices, yet they are still below cost. The government should remove all subsidies and increase tariffs in the medium term to secure the necessary funding for infrastructure investment, while making sure that the most vulnerable end users are protected.

If the necessary investment in domestic electricity infrastructure and gas extraction is not reached by 2020, Uzbekistan will need to either reduce exports of natural gas or increase imports of electricity to meet growing demand. Given the increasing arrangements for export of gas to China and other countries, Uzbekistan has a great need to curb demand growth and implement energy efficiencies along the chain. The government has indicated that there is great potential for energy efficiency improvements across all aspects of the electricity industry, from generation to transmission, distribution and final consumption.

Energy efficiency measures in the supply chain are being implemented by UzbekEnergo through modernisation, rehabilitation and use of new technologies. However, demand-side management is lacking and public understanding of energy savings potential and benefits is weak. Building standards are outdated and there are no schemes aimed at reducing energy consumption by households and businesses. At the same time, subsidised electricity tariffs reduce the need to save energy, and demand from consumers will continue to grow at a rapid pace. A phase-out in tariff subsidies would reduce demand growth, and additional funds could be redirected towards incentive schemes which will improve energy efficiency in buildings and transport. The government should also develop a building code for new buildings and retrofits, and establish a dedicated independent agency for the implementation of all energy efficiency policies.

The Uzbek government is developing alternative energy resources in order to diversify energy supplies and improve electricity reliability while increasing gas exports. Alternative energy sources include coal as a replacement for gas, as well as renewable energy. Coal production has been growing for a decade and is expected to increase substantially before 2020 as gas-fired power stations are switched to coal and new coal-fired power stations are built (as part of UzbekEnergo's investment programme). Under the coal development programme to 2018, the government is investing in the newest technologies and modernising existing aged coal infrastructure, which is commendable.

In March 2013, a Decree on Measures to Encourage the Alternative Sources of Energy was signed by the president, including wide-ranging measures to improve the use of alternative energy and support research work in the energy sector. The draft Law on Alternative Energy Sources was also presented to the government in 2013, but has not yet been approved. The decree and the draft law include provisions for priority access to the grid for renewable energy generation and other financial investment incentives. The government should prioritise approving the Law on Alternative Energy Sources with clear renewables targets and passing the related secondary legislation, in order to attract investment in a timely manner.

Development of renewable energy sources has been in hydropower to date, albeit solar energy is receiving growing attention in the country. UzbekEnergo secured funding for a 100 MW solar PV plant in 2014 and construction is expected to begin in 2015. As a country with 300 days of sun, Uzbekistan should explore its solar energy potential further and incorporate plans for the development of solar technology on a large scale, as well as in off-grid remote areas.

Part of the government's existing investment programme includes funding for R&D; however, Uzbekistan's technology and innovation spending is unproductive. Companies prefer to import technologies, and intellectual property rights and the sharing of innovation are weak. The government should develop a directed R&D plan for the energy sector, targeting funding where it is needed the most. The oil and gas exploration sector's innovation spending should consider conventional and unconventional resources, in order to research all alternative forms of energy.

## *RECOMMENDATIONS*

*The government of Uzbekistan should:*

- *Develop a comprehensive energy strategy with clear targets and actions for medium- and long-term development of the energy sector, including all fuels and energy efficiency. The strategy should include the analysis of various scenarios for economic development.*
- *Consider easing the internal procedures for statistics data disclosure outside of government structures and for co-operation with other international public bodies working on energy statistics, to ensure accurate recording and portrayal of the country's impressive energy sector developments.*
- *Take more aggressive actions for rehabilitation and replacement of the ageing energy infrastructure, with primary focus on electricity and heating networks, to maintain a robust energy network and avoid failure of the country's complex and tightly interconnected heating and natural gas distribution networks. Prioritise critical areas; consider reinvesting income from rehabilitated areas in subsequent stages of system upgrade/rehabilitation.*
- *Consider developing a well-balanced social programme, allowing a staged phasing out of energy subsidies, with a gradual move to cost-effective electricity, heat and natural gas tariffs, allowing for financial a greater level of support to maintaining the energy infrastructure intact. Improve investment climate and elaborate on modalities for government investment programmes.*
- *Continue focusing on reducing energy intensity in all sectors of the economy and provide measurable incentives for maximising the energy efficiency gains. Elaborate on national policies and institutional set-up, promoting development of energy efficiency and renewable energy on a larger scale, with clear targets and workable programmes.*
- *Elaborate on a building code for new constructions and with tangible requirements for retrofitting old buildings.*
- *Continue development of the country's vast solar potential; assess the developments of off-grid solar in remote areas.*
- *Continue application of the latest technologies for enhanced oil and gas recovery, opening up new fields for oil and gas exploration and production; assess the country's shale oil and gas potential and encourage foreign direct investment in the country's upstream oil and gas sectors.*
- *Promote R&D activities on the most pertinent aspects of conventional, alternative or unconventional energy resources, to encourage smart investments in the country's conventional and alternative energy developments.*

# 11.2. ENERGY SECURITY

## RESOURCE ENDOWMENT

Uzbekistan is rich in fossil fuel deposits and is one of the main energy producers in the region. Deposits of natural gas, hard coal and crude oil are the most significant, but it also has substantial reserves of uranium. Data on reserves and resources are extracted from the Federal Institute for Geosciences and Natural Resources (BGR) report (BGR, 2013), unless otherwise stated.

Natural gas reserves in Uzbekistan were 1 661 bcm in 2012, with resources of 1 500 bcm and remaining potential of 3 161 bcm. This accounts for a share of 2.6% of total reserves among the EECCA countries as well as Russia, 0.9% of total resources and 1.3% of remaining potential. Uzbekistan holds 0.8% of global natural gas reserves and it was ranked 50th among global natural gas producers in 2012. Uzbekistan produces natural gas from 52 fields with 12 major deposits. These deposits are concentrated on the Uzbek side of the Amu Darya Basin in the south-eastern region, and in the Central Ustyurt plateau near the Aral Sea in the western region of the country (EIA, 2014b).

Hard coal reserves were 1 375 Mt in 2012, which represents 1.1% of total coal from EECCA countries and Russia, while resources were 9 477 Mt and 0.3% of the total. Remaining potential stands at 10 852 Mt. As a percentage of global reserves, Uzbekistan holds 0.2% of hard coal and has the fifteenth-largest resources in the world. Coal is mined at three deposits: Angren, Shargun and Baysun.

Crude oil reserves in Uzbekistan were 81 Mt in 2012, with resources of 400 Mt and remaining potential of 481 Mt. Reserves account for 0.5% of the total among EECCA countries and Russia, while the resources account for 1%. The majority of the known oil reserves in Uzbekistan are in the Bukhara-Khiva region in the southeast of the country, and most fields are small apart from the sizeable Kokdumalak field. Other oil- and gas-rich areas are the Ustyurt Plateau/Aral Sea region, Southwest Gissar, Surkhan-Darya, and the Ferghana Valley (EIA, 2014b).

Uzbekistan also has significant deposits of uranium, and is seventh among only a few countries in the world that produce it. In the region, Kazakhstan, Ukraine and Russia are the only other producers, with Kazakhstan being the largest producer in the world. Uzbekistan has 47 kilotonnes (kt) of reserves of uranium and 74 kt of resources, with 121 kt of remaining potential. Reserves account for 12.3% of the total of these four countries and 2.2% of the world total reserves (seventh in the world).

Uzbekistan has significant potential for solar, as well as wind, biomass, and small and largo hydropower. However it only utilises 0.3% of its hydro potential.

## ENERGY SECURITY AND DIVERSIFICATION

Uzbekistan is a significant energy producer, and its natural gas, coal and oil supplies are stable. However, ageing infrastructure and underinvestment in electricity and gas systems have led to electricity shortages, inefficiencies, high losses and lack of reliability. Most of the generation capacity infrastructure is 40 to 50 years old and operating 30% below original capacity. More than 60% of the transmission network will need replacement in the next ten years. Insufficient capacity and overloaded transmission results in regular outages, with the most severe outages occurring in autumn-winter periods in the Fergana valley area, in Samarkand-Bukhara and in Surhanddaryia. Some 1 000 rural communities in Uzbekistan still have no access to electricity and are not connected to the grid.

The country is also under pressure to expand its gas export market in order to raise revenue, including increasing gas production and investing in export pipelines. Gas exports come at the cost of domestic demand, which is growing steadily with rising living standards. The existing base load electricity generation infrastructure is largely gas-fired, which means that gas is used for electricity rather than exports and the plants are operating at lower efficiencies than they would be as peaking plants. In order to increase exports in this time of growing domestic demand, the government has started converting some generation units from gas to coal. This is expected to continue over time as coal production increases and gas export infrastructure improves.

There is also a high potential for renewables (hydro, solar and wind), especially in remote off-grid areas. The government has indicated its focus on the development of alternative energy sources, to combat rising demand at a sustainable pace while allowing for more exports of hydrocarbons. On 1 March 2013, a Decree on Measures to Encourage Alternative Sources of Energy was approved. However, significant investment will be required to develop large-scale renewable energy production over the medium to long term, and will call for co-operation between the government and foreign investors.

## ENERGY INFRASTRUCTURE AND INVESTMENT

### ELECTRICITY AND HEAT

Uzbekistan's electricity generation capacity is 12.5 GW. Thermal power stations (10 in total) account for 10.6 GW, with the remainder in hydropower capacity. The infrastructure is aged and inefficient, with around 40% of capacity approaching or past its life cycle (Kochnakyan et al., 2013) (Tables 11.2.1).

Capacity is expected to increase by more than 2.1 GW by 2020, with the completion of three gas-fired units of 1.7 GW in capacity and approximately 400 MW of small HPPs (Republic of Uzbekistan, 2014).

The power transmission system is 243 000 km long, with approximately 10 000 km of 110 – 500 kV lines and the remainder of 0.4 – 110 kV lines (UzbekEnergo, 2014). The length of 500 kV lines has increased by more than 400 km over the past decade, with three new lines: the Syrdaryinskaya TPP – Sogdiana line of 218 km; the Guzar-Surhan line of 197 km; and the Novo-Angrenskaya TPP line.

The transmission network is interconnected with Afghanistan via a 220 kV line with 300 MW of capacity, and to Turkmenistan, Tajikistan and Kyrgyzstan through a 500 kV transmission system of the Central Asia Power Grid.

UzbekEnergo carries out regular maintenance and system rehabilitation on its generation and network assets. However, investment to date has not been sufficient to improve generation efficiency, decrease losses or allow for a full increase in consumer demand. Uzbekistan's generation, transmission and distribution infrastructure is aged and inefficient.

Around 20% is past its life cycle and this share is expected to increase to 40% by 2017. Some 6% percent of 500 kV lines and 50% of 500 kV and 220 kV substations will approach the end of their life cycle by 2025 and are highly overloaded (Kochnakyan et al., 2013).

**Table 11.2.1** Generation capacity, Uzbekistan, 2012

| Plant | Fuel | Installed capacity (MW) |
|---|---|---|
| Talimardjan TPP | Gas | 800 |
| Sirdarya TPP | Gas | 3 000. |
| Novo-Angren TPP | Gas/coal | 2 100 |
| Tashkent TPP | Gas | 1 860 |
| Navoi TPP | Gas | 1 250 |
| Tachiatash TPP | Gas | 730 |
| Angren TPP | Gas/coal | 484 |
| Fergana CHPP | Gas | 305 |
| Mubarek CHPP | Gas | 60 |
| Tashkent CHPP | Gas | 30 |
| Other TPPs | Gas | 41 |
| **Total thermal** | | **10 660** |
| Urta-Chirchik HPP cascade | Hydro | 906 |
| Chirchik HPP Cascade | Hydro | 191 |
| Kadyrin HPP Cascade | Hydro | 45 |
| Tashkent HPP Cascade | Hydro | 29 |
| Lower Bozsui HPP Cascade | Hydro | 51 |
| Farchad HPP | Hydro | 126 |
| Fergana Valley HPPs | Hydro | 28 |
| HPPs in Samarkant region | Hydro | 41 |
| HPPs under the control of UzSuvEnergo | Hydro | 393 |
| **Total HPPs** | | **1 810** |
| **Total** | | **12 470** |

Source: Kochnakyan et al. (2013), *Uzbekistan Energy/Power Sector Issues Note*, International Bank for Reconstruction and Development/ World Bank, Washington, DC.

Since 2011, UzbekEnergo has been implementing its investment plan to 2015, expected to increase generation capacity by 2.7 GW (thermal, combined cycle and hydro) and the transmission network by 933.4 km. According to Kochnakyan et al. (2013), most of the projects have secured financing; however, only 1.7 MW and 250 km of transmission lines are under construction.

District heating reaches approximately 80% of households. Similar to electricity generation and networks, district heating infrastructure is aged and inefficient and requires substantial investment to reduce losses and curb growing domestic demand. Rehabilitation of the district heating infrastructure is included in UzbekEnergo's programmes.

## NATURAL GAS

The natural gas pipeline system in Uzbekistan is vast, including 122 000 km of high-pressure pipeline and 14 000 km of medium- and low-pressure. Gas is exported or transited through the following major pipelines.

The Central Asia-Centre (CAC) pipeline is an export pipeline that connects gas from Turkmenistan through Uzbekistan, via Kazakhstan, and delivers to the Russian natural gas system. The pipeline is approximately 5 000 km long with 100 bcm/y capacity (the actual capacity is only half that due to poor conditions). Uzbekistan signed an agreement with Gazprom in late 2008 for renovation of the CAC's eastern section and construction of a new parallel pipeline, adding up to 30 bcm/y of capacity (EIA, 2014b). In the past few years, sections of the pipeline have been rehabilitated.

The Bukhara-Urals pipeline runs from Turkmenistan through the Bukhara gas region in Uzbekistan, via Kazakhstan to Russia. The pipeline capacity is 55 bcm/y; however, it operates at only a quarter of its capacity. The pipeline was mothballed but has been reopened since 2001 due to lack of capacity in the CAC pipeline (EIA, 2014b). Sections of this pipeline have been rehabilitated in the past few years.

The Gazli-Kagan and the Gazli-Nukus pipelines connect Usturt and Buhkar-Khivin oil and gas regions with the CAC and Bukhara-Urals pipelines. Gazli-Kagan is approximately 71 km long, while Gazli-Nukus is 247 km. Sections of both pipelines have been rehabilitated in the past few years.

The Central Asia-China pipeline (operated by CNPC) is an export pipeline that has been in operation since 2009. The pipeline connects Turkmenistan to China via Uzbekistan and Kazakhstan. The pipeline has three lines in parallel, each with a length of 1 833 km and capacity of 30 bcm/y. Lines A and B are operational, with line C under construction. Line C is the largest line, with a total capacity of 25 bcm/y and a diameter of 1 219 mm, 152 mm larger than Lines A and B. Once Line C is fully completed by the end of 2015, total capacity will be up to 55 bcm.

Line D of the Central Asia-China pipeline is also in the works. It will transport gas from Turkmenistan via Uzbekistan, Tajikistan and Kyrgyzstan. The inter-governmental agreement on the construction of the line was signed in 2013, and construction began in late 2014 on the Tajikistan leg of the line. Line D will be 1 000 km in total, with about 200 km crossing Uzbekistan’s territory and with a capacity of 30 bcm. The Central Asia-China pipeline system will have total capacity of 85 bcm at the completion of Line D (CNPC, 2014).

The Bukhara-Tashkent- Bishkek-Almaty pipeline is the main Uzbek-owned and -operated pipeline, and runs from eastern Uzbekistan and northern Kyrgyzstan to southern Kazakhstan with the capacity of 3.2 bcm/y (EIA, 2014b). The pipeline is the main source of gas for Kyrgyzstan and southern Kazakhstan.

The Mubarek-Shurabad-Dushanbe gas pipeline connects Uzbekistan and Tajikistan. The pipeline was not in use as of December 2014, as gas supplies to Tajikistan ceased in 2013.

There are three gas storages in operation. Kodzhaabad is an underground storage with 1 bcm capacity, located in the Andijan region. Two smaller underground storages are Bukhara and Kokand. The main gas processing plants are the Mubarek and Shurtan Gas Processing Plants, processing 24 bcm/y and 20 bcm/y, respectively (Kochnakyan et al., 2013).

The existing natural gas infrastructure in Uzbekistan is ageing and is in poor condition, causing capacity to fall and resulting in high losses. The older pipelines are not sufficiently equipped for a significant increase in exports should Uzbekistan decide to export more. The new Central Asia-China pipeline provides more opportunities for Uzbek exports; however, this will depend on contracts with CNPC.

Uzbekistan is researching new gas deposits and plans for the increase in gas reserves in the Gazli and the Kashkadarya regions. This will be carried out through production sharing agreements (PSAs) with foreign investors.

### OIL

The oil infrastructure in Uzbekistan is small, as the country is self-sufficient on crude oil, and oil product exports are carried out by rail or ground vehicles.

Uzbekistan has three oil refineries, located in Ferghana, Alty-Arik, and Bukhara, with a total capacity of 224 000 barrels per day (bbl/d). The refineries operate below capacity due to falling oil production.

Two pipelines exist, linking the Ferghana and Alty-Arik refineries and linking the Kazakh Shymkent refinery to the Chardzhou refinery in north-eastern Turkmenistan. Uzbekistan's only current option to export crude oil is to reverse an existing pipeline that brings oil from Omsk, Russia, to Uzbek refineries (EIA, 2014c).

### SYSTEM RELIABILITY

Electricity system reliability in Uzbekistan is poor. End users experience frequent shortages and outages due to insufficient generation capacity and overloaded transmission. Problems are acute during autumn/winter months when demand is high and water availability for hydropower is low. The southern and western regions experience the most problems, with outages of 2-6 hours per day during winter months (Kochnakyan et al., 2013).

Energy demand in Uzbekistan is set to grow steadily over the medium to long term, as living standards rise. It is unlikely that investment in new infrastructure will grow at the same speed, due to lack of resources and capabilities. This will put more pressure on the overloaded system and result in more supply shortages. Supply shortages are estimated to reach 20% of estimated consumption by 2020 if necessary investment is delayed (Kochnakyan et al., 2013).

Electricity Transmission and distribution losses are around 14% per year, with approximately a quarter in transmission and the remainder in distribution. This is a relatively high level of losses, albeit within the legally allowed 14.5%. Commercial losses account for some 6%, with total losses in the electricity system adding up to 20%.

Technical losses in the gas sector are caused by pipeline corrosion and outdated components. A gas leakage database and statistical reporting methodology were developed by the INOGATE Programme for UzbekNefteGaz in 2009, under the Technologies and Methodologies for Reducing Gas Losses of the Central Asian Gas Transit System at Central Asia project. As a result, a reporting system has been in place since. In 2011, gas losses in the gas transmission pipelines were 1.2% and 3.7% in the distribution networks.

## EMERGENCY RESPONSE

Uzbekistan is earthquake prone, with earthquakes in the eight- to ten-point range occurring relatively frequently. The country ranked 24th on the Hot-Spot Countries list of the Global Facility for Disaster Reduction and Recovery Programme in 2007 (UNDP, 2014). As such, the highest emergency risk is through natural disasters. The country is energy self-sufficient and supply shock risks are low.

The UNDP's Strengthening Disaster Risk Management Capacities in Uzbekistan project assisted the Ministry of Emergency Situations to develop sustainable mechanisms for disaster management and risk reduction. The project provided the ministry with equipment and modern simulators as well as increased public awareness on improving earthquake preparedness, among other initiatives (UNDP, 2014).

# 11.3. MARKET CONVERGENCE

## NATIONAL MARKET STRUCTURE

### ELECTRICITY AND HEAT

State-owned UzbekEnergo is the owner and operator of most of the electricity sector. The company owns a majority share in 53 companies, encompassing most of the electricity generation, all electricity transmission and distribution, and the coal industry. The share of power plants that are not part of UzbekEnergo is less than 3% (320 MW). This includes UzSuvEnergo – a developer and operator of small HPPs that is managed by the Ministry of Agriculture and Water Recourses.

UzbekEnergo's subsidiary UzElektroSet (Uzbek Electricity Networks) is the TSO, and 14 other subsidiaries operate as local DSOs and retailers. The TSOs and DSOs are legally and financially unbundled. UzbekEnerog's subsidiary EnergoSotish is the single wholesale electricity purchaser and supplier.

Heat and hot water are mainly supplied by boiler houses that are owned by local and regional municipalities. Boiler houses account for 75% of heat production while the remainder is supplied by UzbekEnergo's Fergana, Mubarek and Tashkent CHPs.

The Law on Electricity (2009) stipulates rules for gradual unbundling and transitioning to market principles. Since 2009, the government has legally and financially unbundled transmission and distribution and privatised parts of UzbekEnergo's companies. However, UzbekEnergo still holds the controlling stakes in these companies and controls all sectors of the industry. The government plans to progressively restructure UzbekEnergo and gradually introduce market-related elements in the electricity sector.

According to the Law on Electricity, access to the grid is granted for electricity generators of TPPs, CHPPs and renewable energy sources (RESs) other than HPPs.

### OIL AND NATURAL GAS

UzbekNefteGaz owns and operates the entire oil and gas sector in Uzbekistan. A number of private foreign companies operate in the sector through PSAs with the government. Uzbekneftegez has six subsidiaries: Uzgeoburneftegaz (oil and gas exploration); Uzneftegazdobycha (production of oil and gas); UzTransGaz (gas transportation and storage); Uznefteproduct (refining, processing); Uzneftegazmash (production of technological equipment for the industry); and Uzneftegazstroyinvest (capital investment projects). Uzbekneftegez is majority state-owned with parts of each subsidiary privatised.

Gas transmission and distribution are operated by UzTransGaz with six regional enterprises that act as DSOs. UzTransGaz and the DSOs are legally and financially unbundled. UzTransGaz sells directly to large industrial consumers.

Third-party access to gas pipelines is not legislated; however, enterprises with PSAs in hydrocarbon production can negotiate access with UzbekNefteGaz.

## COAL

Coal mining is undertaken by UzbekCoal, a subsidiary of UzbekEnergo. UzbekCoal has nine subsidiaries in exploration, mining, operations and repair and maintenance, among others (Kochnakyan et al., 2013).

## REGULATORY FRAMEWORK

There is no independent energy regulator or one government institution dedicated to energy regulation. The responsibilities of energy regulation are divided horizontally among municipalities, as well as among government bodies. UzbekEnergo and UzbekNefteGaz play a significant role in regulation of the electricity and gas sector, and are the implementing bodies for all government decisions.

Licences are issued by the State Inspection of Control in Power Industry and the State Inspectorate for Control of Using Oil Products and Gas. The licensing procedures are defined by the Law on Licensing of Some Separate Activities and the Cabinet Regulation on Licensing of Activities Related to Exploration, Processing and Sales of Oil, Gas and Gas Condensate, Design, Construction, Operation and Repair of Main Oil, Gas and Oil Product Pipelines.

UzEnergoNadzor is in charge of technical regulation in the electricity sector.

### Tariffs

The Ministry of Finance sets electricity, heat, gas, oil and coal tariffs. Cross-border electricity tariffs are defined by inter-governmental agreements and relevant export/ import contracts between UzbekEnergo and foreign electricity companies.

Electricity, heat and gas tariff methodology takes into account operational costs plus a profit margin that allows for future capital investment. Tariffs are drafted by UzbekEnergo and Uzbekaneftegaz and approved by the Ministry of Finance. Tariff methodologies are not made public.

There are 11 different types of end-user electricity tariffs, based on customer types and consumption quantity. The average electricity tariff is USD 0.05/kilowatt hour (kWh), without a significant increase for at least five years. The tariff is cost-reflective; however, it is not sufficient to fund the investment needed to substantially improve supply reliability. It is 50% lower than the estimated long-run cost of supply of USD 0.11/kWh (Kochnakyan et al., 2013).

There are four types of end-user gas tariffs, including a breakdown of households with or without gas meters, industrial customers and the district heating units (wholesale consumers). Each consumer category has a range of tariffs based on the type of appliances they use. More than 95% of households have gas meters.

The average gas tariff for households with gas meters was USD 0.075/cubic metre ($m^3$) as of December 2014, and USD 0.13/$m^3$ for households without gas meters and with gas hot water units (UzbekNefteGaz, 2014). The tariffs are subsidised and are significantly below export prices. UzbekNefteGaz raised household and industry prices by 45% during 2013 and a further 10% in 2014 in order to reduce the gap. Even after the significant increase, prices were still below a third of the export price to Kyrgyzstan (Eurasianet, 2013).

### Technical rules

Soviet GOST and national O'z DSt standards are used in the electricity sector, with a small number harmonised to International Organization for Standardization (ISO) standards.

Approximately 60% of gas sector standards are GOST. Most were developed in 2008-09 and are harmonised with relevant ISO and European standards. Uzbek Standards are also used, some of which are harmonised with ISO and GOST and adopted for use in Uzbekistan.

The new Law on Technical Regulation was adopted in Uzbekistan in 2009. The law complies with EU principles of technical regulation. In particular, it introduces the principle of use of voluntary standards and mandatory minimum requirements for workers' health and safety. In accordance to the law, the following governmental agencies are responsible for technical regulation and standardisation: the agency Uzstandart, the Ministry of Health, the State Committee for Nature Protection, the State Committee on Architecture and Construction, and the Ministry of Defence.

Uzbekistan is an ISO member, a member of the Eurasian Standardization Council (EASC) and a member of COOMET, but not an affiliate of European CEN/CENELEC.

## REGIONAL MARKETS AND INTERCONNECTIONS

### ELECTRICITY

Uzbekistan was a part of the Central Asian Power Grid high-voltage transmission network and the regional dispatch centre until 2009. The transmission network included Turkmenistan, Uzbekistan, Tajikistan, Kyrgyzstan and Kazakhstan, and the infrastructure dated back to the Soviet Union. Turkmenistan was the first to leave the network in 2003. Both Turkmenistan and Uzbekistan left the grid looking to internalise electricity supply. Uzbekistan's disconnection also disconnected Tajikistan from the grid.

Uzbekistan exports electricity in small volumes to Afghanistan. It imports electricity from Kyrgyzstan under an inter-governmental agreement on irrigation that provides for the exchange of water for electricity.

### NATURAL GAS

Uzbekistan trades gas with Russia, China, Kyrgyzstan and Kazakhstan based on bilateral agreements. Uzbekistan was also exporting gas to Tajikistan until 2013. Supplies were cut off in 2013 because of payment issues and political disputes.

Uzbekistan is an important transit country for Turkmen gas. Gas has been transiting from Turkmenistan to Russia since 2005 and from Turkmenistan to China since 2009.

Uzbek gas sales to Russia and an agreement on gas transit via Uzbekistan are contracted with Gazprom until 2015, based on an agreement signed at the end of 2012. The new agreement is an extension to the original contract for 2002-12, with agreed volumes remaining around 7.5 bcm.

Uzbekneftagaz and China's CNPC signed the first agreement on gas export and gas transit from Turkmenistan in 2010. Under the agreement, China's Eximbank was to provide USD 74 million to modernise Uzbekistan's gas distribution network to facilitate the flows to China (EIA, 2014b). In 2014, the companies formed a joint venture which will invest in Line D of the Central Asia Power Grid. CNPC is also involved in gas exploration and production in Uzbekistan under PSAs with the government.

# 11.4. SUSTAINABLE DEVELOPMENT

## RENEWABLE ENERGY

Uzbekistan's renewable energy potential is high, yet the country only utilises partial hydropower potential. Traditionally, it has relied on plentiful hydrocarbon resources for most of its energy needs. In recent years, the government has raised the importance of diversifying its energy sources to reduce climate change impact, maximise efficiencies in energy production and free up more gas for export in times of growing domestic demand.

Hydropower generation in Uzbekistan accounts for approximately 20% of electricity supply and only 2% of TPES. Other renewable sources include negligible amounts of biofuels, albeit statistics on total consumption of wood and other biomass products by households are likely incomplete. At times of electricity shortages and for remote communities, wood is the main source of energy.

As of December 2014, the government was considering approval of a new Law on Alternative Energy Sources that was drafted in 2013. The law includes tax and other investment incentives for various renewable energy technologies, including renewable technology manufacturing and import. The current legislation and regulation on renewables is provided in the Law on Electricity (2009) which stipulates rules for renewable energy plant construction, financing, commissioning and decommissioning. The Law on the Rational Use of Energy (1997) (amended in 2003) stipulates third-party access to the grid for private generators and priority access for renewable energy plants, under certain conditions. It also allows for tariff increases to account for necessary investment.

In March 2013, the president approved a Decree on Measures to Encourage the Alternative Sources of Energy, including measures and incentives to promote alternative energy use and support renewable energy research. The programme has no set targets for renewables; however, the government is working towards a non-binding target of 20% renewable energy by 2030. The largest potential is solar energy, as the country is sunny for 300 days per year. The potential for solar energy is up to 2 058 TWh/y (Kochnakyan et al., 2013).

The Decree approves the construction of a 100 MW solar photovoltaic (PV) plan in the Samarkand region. The solar plant would provide more than 150 gigawatt hours (GWh) of electricity per year, with savings of 40 million cubic metres (mcm) of natural gas and more than 200 000 tonnes of GHGs (Republic of Uzbekistan, 2014). In November 2014, UzbekEnergo announced a tender for the construction of the USD 110 million plant, to be funded by ADB and the Fund for Reconstruction and Development of Uzbekistan.

Other ongoing renewables projects include the construction of 15 small HPPs with a capacity of 420 MW, under the Ministry of Agriculture and Water Resources' 2008 Programme for Development of Small Hydro, for electricity supplies in rural areas. UzbekEnergo commissioned a German consultancy in 2014 to estimate the potential of wind power in the country.

## RENEWABLE ENERGY POTENTIAL

Uzbekistan also has significant potential for solar, as well as wind, biomass and small and largo hydropower, solar and wind (Table 11.4.1). Uzbekistan currently utilises only 0.3% of its hydro potential, which is estimated at 120 Mtoe of energy (UNECE, 2010a).

**Table 11.4.1** Estimated technical potential for renewable energy resources, Uzbekistan

| Resource | Technical potential (GWh/y) | Utilised potential (GWh/y) |
|---|---|---|
| Solar | 2 058 000 | 0 |
| Large and medium hydro | 20 934 | 1 650 |
| Small hydro | 5 931 | 200 |
| Wind | 4 652 | 0 |
| Biomass | 1 496 | 0 |

Source: Kochnakyan, A., S.K. Khosla, I. Buranov, K. Hofer, D. Hankinson and J. Finn (2013), *Uzbekistan Energy/Power Sector Issues Note*, International Bank for Reconstruction and Development/ World Bank, Washington, DC.

## ENERGY EFFICIENCY

Uzbekistan is an energy-intensive country, with the level of energy supply per unit of GDP only lower than that of Turkmenistan among EECCA countries. Energy intensity is high due to hydrocarbon production and inefficient consumption. Energy efficiency potential in Uzbekistan is estimated to be high, as the country's energy infrastructure is aged and inefficient, and demand-side management measures are weak in all sectors of the economy. Improving efficiencies in the supply and demand sides can significantly contribute to eradicating winter supply shortages.

According to the World Bank report (Kochnakyan et al., 2013), major energy efficiency challenges are:

- demand-side energy efficiency, particularly in industry and agriculture, the most inefficient sectors of the economy. Industry uses outdated technologies while the irrigation system used in agriculture is inefficient.
- efficiency of gas-fired power plants, which are 40% less efficient than modern thermal plants
- efficiency of electricity networks, with losses up to 20%.

The Law on the Rational Use of Energy (1997) (amended in 2003) is the main body of legislation regarding energy consumption. It was adopted after the European Energy Charter Treaty was signed and the Energy Charter Protocol on Energy Efficiency was adopted. The protocol requires each party to prepare a strategy for energy conservation. In 2002, the Cabinet of Ministers adopted an energy savings programme in accordance with the protocol, and the legislation was amended to account for the programme.

However, Uzbekistan does not have energy efficiency targets or dedicated agencies to implement the programme. Energy efficiency implementation is the responsibility of UzbekEnergo through annual and five-yearly modernisation and rehabilitation investment programmes. UzbekEnergo is also investing USD 5 billion in its infrastructure over the five years 2011-15 under the programme for the industrial development of Uzbekistan. This investment will improve reliability and reduce losses, but more is needed to eradicate winter shortages.

Projects targeting energy efficiency in demand management are mainly through international donors.

In 2009, the Promoting Energy Efficiency in Public Buildings for 2009-2014 was introduced, funded by the Global Environment Facility (GEF), the UNDP and the Uzbek government. The project targets healthcare and educational sectors to improve building standards, demonstrate building designs and develop local capacity for design, construction and maintenance. The programme is expected to deliver 10.8 million $m^2$ of new and reconstructed space by 2015 (Reegle, 2012).

In 2010, the World Bank financed USD 35 million for the Energy Efficiency Facility for Industrial Enterprises Programme for 2010-16. The programme's objective is to improve energy efficiency in industry through financing mechanisms for energy savings investments, by assisting the Ministry of Economy in developing an energy efficiency strategy for industry, and in establishing a co-ordinating unit for the implementation of the programme. In 2013, the bank expanded its funding by USD 100 million for a District Heating Energy Efficiency Project in Andijan and Chirchick (World Bank, 2014).

In 2011, the ADB financed a five-year Advanced Electricity Metering Project aimed at increasing the energy efficiency of the sector. The programme includes installations of smart meters to one million residential and small commercial end users in the cities of Bukhara, Jizzakh and Samarkand. The project is estimated at USD 200 million, with completion in December 2014 (ADB, 2011).

## ENVIRONMENTAL PROTECTION

The National Sustainable Development Strategy (1997) serves as a backbone for government strategy in the energy sector and the rest of the economy. However, the strategy is mainly concerned with social and economic aspects of development, with little focus on the environment (UNECE, 2010b).

The government approved the Law on Nature Conservation in 2002, including Regulations for National Environmental Monitoring (2003) and the Environmental Monitoring Program for 2006-2010. Uzbekistan is party to the United Nations Economic Commission for Europe (UNECE) programme, Environment for Europe (UNDP, 2008).

In 2005, the State Committee for Nature Protection, along with UNDP and a number of ministries, began the implementation of the Environmental Indicators for Environmental State Assessment in Uzbekistan project. Jointly, they developed an indicator database, with indicators based on UNECE and European Environmental Agency (EEA) criteria to allow for national, regional and district-level analysis (UNDP, 2008).

In its review in 2008, UNDP assessed the environmental indicators and found problems regarding water quality, unfavourable drinking water supply, soil deterioration and erosion, increased salinity level, and air pollution in areas of industrial agglomerations and heavy traffic. Land desertification is on the rise, and indicators show that the area of new deserts in Central Asia is increasing.

The review also found that the Cabinet of Ministers is most concerned about environmental protection, while local authorities pay less attention to it when making decisions. The waste management sector and the energy sector were found to be fields where environmental concerns are either not taken into consideration or barely so.

However, the level of environmental awareness and effects brought on by climate change are increasingly infiltrating energy policies across the world and also in Uzbekistan. The country is on a path of renewable energy development and increasing energy savings, which will help improve the environmental situation. The State Committee for Nature Protection has prioritised measures to improve the environment, particularly in times of growing population: ecological standards to reduce pollution; immediate measures for the ecological catastrophe zone of Priaralye (near the Aral Sea); cleaner drinking water; ecological monitoring; and strengthening global communication on environmental protection (UNDP, 2008).

## CLIMATE CHANGE

Uzbekistan's environment has been affected by economic and social developments over decades, including population growth and construction, water management and energy policies, as well as the industrialisation of the country. Evidence of climate change includes a reduction in areas of snow, increasingly erratic climate patterns, the drying up of the Aral Sea and higher water losses through evaporation (UNECE, 2010b).

The government is committed to reducing GHG emissions through renewable energy development and energy efficiency measures. It also participates in the United Nations Framework Convention on Climate Change (UNFCCC) as a non-Annex I party by providing Clean Development Mechanism (CDM) projects, and in the Kyoto Protocol as a non-Annex B party.

The Kyoto Protocol was signed in November 1998, ratified in October 1999 and enforced in February 2005. As of January 2012, 13 CDM projects were registered in the Executive Council of the UNFCCC. These provide for an emissions reduction of 6 273 $MtCO_2$-eq per year. Six of the projects deal with reductions of $N_2O$ emissions, while the remainder cover landfill gas usage and natural gas leak reduction.

Energy-related $CO_2$ emissions totalled 111.1 Mt in 2012 in Uzbekistan, which is 80% lower compared to 1990. The power generation sector accounts for 32.8% of emissions, followed by manufacturing (17.5%), commercial and agriculture (9.3%), transport (7%), other energy industries (3.4%) and households (3%).

## GAS FLARING

Uzbekistan is among the top 20 in the world for gas flaring, totalling 1.8 bcm in 2011. It cost the government an estimated USD 500 million (1.1% of GDP) in 2011 in losses or foregone sales. Flaring losses have declined over the past decade, however (Kochnakyan et al., 2013).

UzbekNefteGaz became a partner of the World Bank Group-led Global Gas Flaring Reduction Partnership (GGFR) in June 2008. Gas flaring reduction measures in Uzbekistan include (World Bank, 2013):

- Installation of gas flaring reduction facilities at the Kokdumulak oil and gas field that saved 5.5 bcm/y and 1.5 $MtCO_2$-eq in emissions. UzbekNefteGaz received the 2012 GGFR Excellence Award for its progress in flaring reduction.
- Development of a CDM project for the use of associated gas at Umid, Kruk, Western Kruk, Sarikum and Yangi Darbaza oil and gas fields (Kochnakyan et al., 2013).

# 11.5. INVESTMENT ATTRACTION

## INVESTMENT CLIMATE

The investment climate in Uzbekistan has improved over the past decade; however, several crucial factors still impede investment in the country.

The government has taken measures to ease the burden on potential foreign investors by creating several special investment zones, tax breaks and customs waivers, among other incentives. Regulation on domestic and foreign investment has improved with stronger rules for businesses' protection. New or amended legislation includes the Law on Foreign Investments, the Law on Guarantees and Measures of Protection of Foreign Investors' Rights, the Law on Guarantees of the Freedoms of Entrepreneurial Activity and the Law on Production Sharing Agreements.

In 2013, the government began the development of Vision 2030 with World Bank and the UNDP, the plan for structural economic reform by 2030. Discussions included the creation of a favourable business environment, institutional development, the reduction of state control and budget management. The final version of reform plans was presented to the government in May 2014, for approval that is still pending (World Bank, 2014). If accepted, the gradual economic reform is expected to improve the investment climate and attract more foreign investment.

In 2011, the president issued a decree on the Programme of Measures to Deepen and Extend the Reforms in the Economy for 2011-15, on Identification and Implementation of the System of Criteria and Assessments for Formation of the Business Climate in the country. The programme aims to modernise and diversify the business climate to stimulate domestic and foreign investments, by attracting modern innovative technologies. The Decree on Additional Measures for Further Reduction of Audits and Improvement of the System of Organization of Control over Activities of Subjects of Entrepreneurship was also issued in 2011 and the Law on Introduction of Changes and Amendments into Some Legislative Acts in Connection with Reduction of Audits of Activities of Subjects of Entrepreneurship came into force.

A new Tax Code was introduced in 2008 that consolidated many different normative acts and provided for tax breaks and incentives for foreign investors. For example, companies under PSAs in oil and gas exploration are exempt from all taxes in Uzbekistan. Preferences also exist for joint ventures involving foreign participation that engage in oil and gas production. Russia's Lukoil, Gazprom and China's CNPC are among the largest investors in PSAs and joint ventures in the oil and natural gas sector in Uzbekistan.

Despite significant efforts by the government, roadblocks to investment attraction remain and include heavy bureaucratic procedures, perceived corruption, political preferences and motivation, poor currency management, punitive customs laws and taxation (DOS, 2014). Additional measures are required for further improvement of the investment climate, removal of the existing bureaucratic barriers and unlawful interference in the activities of enterprises with foreign investments.

According to the World Bank's "ease of doing business" indicator, Uzbekistan was ranked 141st among 189 countries in 2014. A high ranking on the ease of doing business index means the regulatory environment is more conducive to the starting and operation of a local firm. This index averages the country's rankings on ten topics, made up of a variety of indicators, giving equal weight to each topic. Uzbekistan has the second lowest rating among EECCA countries, only higher than that of Tajikistan.

According to the Corruption Perceptions Index (CPI) prepared by Transparency International, which measures the level of perceived corruption in the public system, Uzbekistan ranked 166th among 175 countries in 2014, with a score of 18. This is a high score with regard to perceived corruption, as a score of 100 represents no corruption.

Uzbekistan joined the UN Convention Against Corruption (UNCAC) in July 2008 and set up an Inter-institutional Working Group to align legislation with that of the UNCAC. Anti-Money-Laundering and Combating the Financing of Terrorism Legislation Act was amended in 2009, as were 16 other amendments to various laws. Uzbekistan also joined the Istanbul Anti-Corruption Action Plan of the Anti-Corruption Network for Eastern Europe and Central Asia (ACN) in March 2010 (Uzbekistan Embassy, 2014). The Uzbek government has recognised the importance of fighting corruption; however, progress has been slow and Uzbekistan is still perceived as corrupt.

## INVESTMENT FRAMEWORK

The investment framework in the energy sector is mainly concentrated on the rehabilitation and modernisation of ageing infrastructure and expanding generation capacity and high-voltage line networks, as well as improving export opportunities for its hydrocarbon industry. Additionally, the country has recently begun to focus on developing alternative energy sources with a focus on renewables such as wind and solar. However, investment in renewables other than hydro is lagging.

In the electricity sector, UzbekEnergo is implementing the investment programme for the rehabilitation, modernisation and upgrading of existing infrastructure. The programme is in accordance with the Industrial Modernisation and Infrastructure Development Program for 2011-15 adopted in December 2010. The programme includes a Power Sector Development plan which consists of 48 projects with a total budget of USD 5 billion.

Renewable energy investment in 400 MW of small HPPs is ongoing and funded by the Ministry of Agriculture and Water Resources. UzbekEnergo has secured USD 110 million for a 100 MW solar PV plant in the Samarkand region, with a loan from the ADB and funds from the Reconstruction and Development Fund of Uzbekistan (Republic of Uzbekistan). In November 2014, UzbekEnergo opened a tender for the construction of the plant.

At the end of 2010, Uzbekistan announced its gas development programme for the five years to 2015. The programme called for more than USD 23 billion to cover 37 projects, financed principally by UzbekNefteGaz with some foreign investment.

Part of the gas expansion plan includes exports to the Asia-Pacific region with special attention to China. In 2013, Uzbeknefegaz and CNPC created a joint venture for the production of gas, with initial production estimated at 1.5 bcm. The two companies also collaborated to build Uzbekistan's segments of Lines A, B and C of the Central Asia-China gas pipeline that entered into service during 2009-14, and will continue to do so on Line D in 2015.

The coal sector is gaining importance in the country, as it is a readily available, low-cost substitute for gas that is more lucrative when exported. Therefore, the government is looking to significantly increase coal production over the medium term. Investment in coal is mainly in newest technologies, in order to mine efficiently with minimal losses.

## INVESTMENT PLANNING

The Ministry of Economy prepares the annual PIP which lists high-priority projects to meet the government's strategies and objectives. The government's public investment programme for 2011-15 is valued at USD 42 billion. The energy sector accounts for USD 34 billion, or 72%. This includes approximately USD 5 billion in electricity and more than USD 20 billion in oil and gas production investment. Financing is expected to come from the government and foreign direct investment in the joint ventures and PSAs. According to the World Bank report (2014), the programme is currently under implementation.

# References

ADB (Asian Development Bank) (2011), "ADB funds smart electricity meters to boost energy efficiency in Uzbekistan", news release, 20 September, ADB website, www.adb.org/news/adb-funds-smart-electricity-meters-boost-energy-efficiency-uzbekistan.

BGR (German Federal Institute for Geosciences and Natural Resources) (2013), *Energy Study 2013: Reserves, Resources and Availability of Energy Resources*, BGR, Hannover.

CNPC (China National Petroleum Corporation) (2014), "Flow of natural gas from Central Asia", CNPC website, www.cnpc.com.cn/en/FlowofnaturalgasfromCentralAsia/FlowofnaturalgasfromCentralAsia2.shtml (accessed 18 December 2014).

DOS (US Department of State) (2014), "2014 investment climate statement: Uzbekistan", DOS website, www.state.gov/e/eb/rls/othr/ics/2014/index.htm.

EIA (US Energy Information Administration) (2014a), "International energy statistics", DOE/EIA website, www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=1&pid=1&aid=24# (accessed 16 December 2014).

EIA (2014b), "Uzbekistan overview", EIA website, www.eia.gov/countries/cab.cfm?fips=UZ (accessed 17 December 2014).

EIA (2014c), "Uzbekistan country analysis note", EIA website, www.eia.gov/countries/country-data.cfm?fips=uz (accessed 18 December 2014).

Eurasianet (2013), "Uzbekistan ups domestic gas tariffs again, but still fraction of export price", press release, www.eurasianet.org/node/67572.

IEA (International Energy Agency) (2014), *Energy Balances of Non-OECD Countries*, OECD/IEA, Paris.

Kochnakyan, A. et al. (2013), *Uzbekistan Energy/Power Sector Issues Note*, International Bank for Reconstruction and Development/ World Bank, Washington, DC.

Reegle (2012), "Uzbekistan 2012", Reegle website, www.reegle.info/policy-and-regulatory-overviews/UZ (accessed 19 December 2014).

Republic of Uzbekistan (2014), "Energy resources of Uzbekistan", Governmental portal of the Republic of Uzbekistan, http://gov.uz/en/helpinfo/energy/10004 (accessed 17 December 2014).

Trend (2014), "Uzbekistan completes modernization of hydraulic unit at hydroelectric power plant", press release, 15 August, http://en.trend.az/business/energy/2303193.html.

UNDP (United Nations Development Programme) (2014), "Strengthening disaster risk management capacities in Uzbekistan", UNDP website, www.uz.undp.org/content/uzbekistan/en/home/operations/projects/environment_and_energy/strengthening-disaster-risk-management-capacities-in-uzbekistan.html (accessed 19 December 2014).

UNDP (2008), *Environmental Profile of Uzbekistan Based on Indicators*, State Committee of National Protection of Uzbekistan, UNDP and Environmental Information System Uzbekistan, Tashkent, aoa.ew.eea.europa.eu/tools/virtual_library/bibliography-details-each-assessment/answer_6007963651/w_assessment-upload/index_html?as_attachment:int=1.

UNECE (United Nations Economic Commission of Europe) (2010a), "Development of renewable power sector in Uzbekistan", presentation, www.unece.org/fileadmin/DAM/energy/se/pp/eneff/Astana_EEForum_Sep2010/d2s2_6_Zakhidov.pdf.

UNECE (2010b), *Environmental Performance Reviews: Uzbekistan, Second Review*, UNECE, New York and Geneva, www.unece.org/fileadmin/DAM/env/epr/epr_studies/uzbekistan%20II%20e.pdf.

UzbekEnergo (2014), UzbekEnergo website, www.uzbekenergo.uz/ru/about/uzbekenergo/ (accessed 17 December 2014).

Uzbekistan Embassy to the United States (2014), *Anti-Corruption and Anti-Money-Laundering Policy*, website, www.uzbekistan.org/social_issues/anti_corruption (accessed 19 December 2014).

UzbekNefteGaz (2014), UzbekNefteGaz website, www.ung.uz/ru/business/tarifs (accessed 19 December 2014).

World Bank (2014), *World Bank Group – Uzbekistan Partnership: Country Profile Snapshot*, October, www.worldbank.org/content/dam/Worldbank/document/Uzbekistan-Snapshot.pdf.

World Bank (2013), "Uzbekistan: The economics of efficiency. Uzbekistan pushes to reduce energy consumption in industry", press release, 30 April, www.worldbank.org/en/results/2013/04/30/uzbekistan-the-economics-of-efficiency.

Zakhidov, E.A. (2012), "Innovation system of Uzbekistan", presentation, IncoNET EECA Workshop Innovating Innovation Systems, Vienna, 14 May, http://rp7.ffg.at/upload/medialibrary/07_Zakhidov.pdf.

# ANNEXES

# ANNEX A:
# ENERGY BALANCES

# Armenia

## 2012

Thousand tonnes of oil equivalent

| SUPPLY AND CONSUMPTION | Coal | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Production | - | - | - | - | 602 | 200 | - | 9 | - | - | 811 |
| Imports | 1 | - | 417 | 1983 | - | - | - | - | 8 | - | 2410 |
| Exports | - | - | - | -56 | - | - | - | - | -146 | - | -202 |
| Intl. marine bunkers | - | - | - | - | - | - | - | - | - | - | - |
| Intl. aviation bunkers | - | - | -48 | - | - | - | - | - | - | - | -48 |
| Stock changes | - | - | - | - | - | - | - | - | - | - | - |
| **TPES** | **1** | **-** | **369** | **1927** | **602** | **200** | **-** | **9** | **-137** | **-** | **2971** |
| Transfers | - | - | - | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | - | - | - | - | - |
| Electricity plants | - | - | - | - | -602 | -200 | - | - | 399 | - | -404 |
| CHP plants | - | - | - | -609 | - | - | - | - | 292 | 2 | -315 |
| Heat plants | - | - | - | - | - | - | - | - | - | - | - |
| Blast furnaces | - | - | - | - | - | - | - | - | - | - | - |
| Gas works | - | - | - | - | - | - | - | - | - | - | - |
| Coke/pat.fuel/BKB/PB plants | - | - | - | - | - | - | - | - | - | - | - |
| Oil refineries | - | - | - | - | - | - | - | - | - | - | - |
| Petrochemical plants | - | - | - | - | - | - | - | - | - | - | - |
| Liquefaction plants | - | - | - | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - | - | - | - |
| Energy industry own use | - | - | - | - | - | - | - | - | -29 | -2 | -31 |
| Losses | - | - | - | - | - | - | - | - | -84 | - | -84 |
| **TFC** | **1** | **-** | **369** | **1318** | **-** | **-** | **-** | **9** | **440** | **-** | **2137** |
| **INDUSTRY** | **-** | **-** | **-** | **283** | **-** | **-** | **-** | **-** | **101** | **-** | **385** |
| Iron and steel | - | - | - | - | - | - | - | - | 2 | - | 2 |
| Chemical and petrochemical | - | - | - | - | - | - | - | - | 6 | - | 6 |
| Non-ferrous metals | - | - | - | - | - | - | - | - | 9 | - | 9 |
| Non-metallic minerals | - | - | - | - | - | - | - | - | 13 | - | 13 |
| Transport equipment | - | - | - | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - | 1 | - | 1 |
| Mining and quarrying | - | - | - | - | - | - | - | - | 48 | - | 48 |
| Food and tobacco | - | - | - | - | - | - | - | - | 18 | - | 18 |
| Paper pulp and printing | - | - | - | - | - | - | - | - | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | 283 | - | - | - | - | 3 | - | 286 |
| **TRANSPORT** | **-** | **-** | **143** | **377** | **-** | **-** | **-** | **-** | **11** | **-** | **531** |
| Domestic aviation | - | - | - | - | - | - | - | - | - | - | - |
| Road | - | - | 143 | 377 | - | - | - | - | - | - | 520 |
| Rail | - | - | - | - | - | - | - | - | 6 | - | 6 |
| Pipeline transport | - | - | - | - | - | - | - | - | - | - | - |
| Domestic navigation | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - | 5 | - | 5 |
| **OTHER** | **1** | **-** | **159** | **658** | **-** | **-** | **-** | **9** | **328** | **-** | **1154** |
| Residential | 1 | - | - | 492 | - | - | - | - | 171 | - | 665 |
| Comm. and publ. services | - | - | - | 41 | - | - | - | - | 80 | - | 121 |
| Agriculture/forestry | - | - | - | - | - | - | - | - | 12 | - | 12 |
| Fishing | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | - | - | 159 | 124 | - | - | - | 9 | 64 | - | 357 |
| **NON-ENERGY USE** | **-** | **-** | **66** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **66** |
| in industry/transf./energy | - | - | 38 | - | - | - | - | - | - | - | 38 |
| *of which: chem./petrochem.* | - | - | - | - | - | - | - | - | - | - | - |
| in transport | - | - | 28 | - | - | - | - | - | - | - | 28 |
| in other | - | - | 1 | - | - | - | - | - | - | - | 1 |
| **Electricity and Heat Output** | | | | | | | | | | | |
| **Electr. generated - GWh** | **-** | **-** | **-** | **3399** | **2311** | **2322** | **4** | **-** | **-** | **-** | **8036** |
| *Electricity plants* | - | - | - | - | *2311* | *2322* | *4* | - | - | - | *4637* |
| *CHP plants* | - | - | - | *3399* | - | - | - | - | - | - | *3399* |
| **Heat Generated - TJ** | **-** | **-** | **-** | **90** | **-** | **-** | **-** | **-** | **-** | **-** | **90** |
| *CHP plants* | - | - | - | *90* | - | - | - | - | - | - | *90* |
| *Heat plants* | - | - | - | - | - | - | - | - | - | - | - |

# Armenia

## 2011

Thousand tonnes of oil equivalent

| SUPPLY AND CONSUMPTION | Coal | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Production | - | - | - | - | 664 | 214 | 1 | 9 | - | - | 887 |
| Imports | - | - | 403 | 1671 | - | - | - | - | 18 | - | 2092 |
| Exports | - | - | - | -86 | - | - | - | - | -132 | - | -218 |
| Intl. marine bunkers | - | - | - | - | - | - | - | - | - | - | - |
| Intl. aviation bunkers | - | - | -45 | - | - | - | - | - | - | - | -45 |
| Stock changes | - | - | - | - | - | - | - | - | - | - | - |
| **TPES** | **-** | **-** | **358** | **1585** | **664** | **214** | **1** | **9** | **-114** | **-** | **2716** |
| Transfers | - | - | - | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | - | - | 21 | - | 21 |
| Electricity plants | - | - | - | - | -664 | -214 | -1 | - | 434 | - | -445 |
| CHP plants | - | - | - | -402 | - | - | - | - | 206 | 9 | -188 |
| Heat plants | - | - | - | - | - | - | - | - | - | - | - |
| Blast furnaces | - | - | - | - | - | - | - | - | - | - | - |
| Gas works | - | - | - | - | - | - | - | - | - | - | - |
| Coke/pat.fuel/BKB/PB plants | - | - | - | - | - | - | - | - | - | - | - |
| Oil refineries | - | - | - | - | - | - | - | - | - | - | - |
| Petrochemical plants | - | - | - | - | - | - | - | - | - | - | - |
| Liquefaction plants | - | - | - | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - | - | - | - |
| Energy industry own use | - | - | - | - | - | - | - | - | -26 | -1 | -26 |
| Losses | - | - | - | - | - | - | - | - | -78 | - | -78 |
| **TFC** | **-** | **-** | **358** | **1182** | **-** | **-** | **-** | **9** | **443** | **8** | **2001** |
| **INDUSTRY** | **-** | **-** | **-** | **254** | **-** | **-** | **-** | **-** | **93** | **5** | **352** |
| Iron and steel | - | - | - | - | - | - | - | - | 1 | - | 1 |
| Chemical and petrochemical | - | - | - | - | - | - | - | - | 6 | - | 6 |
| Non-ferrous metals | - | - | - | - | - | - | - | - | 12 | - | 12 |
| Non-metallic minerals | - | - | - | - | - | - | - | - | 14 | - | 14 |
| Transport equipment | - | - | - | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - | 2 | - | 2 |
| Mining and quarrying | - | - | - | - | - | - | - | - | 39 | - | 39 |
| Food and tobacco | - | - | - | - | - | - | - | - | 17 | - | 17 |
| Paper pulp and printing | - | - | - | - | - | - | - | - | 1 | - | 1 |
| Wood and wood products | - | - | - | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | 254 | - | - | - | - | - | 5 | 259 |
| **TRANSPORT** | **-** | **-** | **172** | **338** | **-** | **-** | **-** | **-** | **10** | **-** | **521** |
| Domestic aviation | - | - | - | - | - | - | - | - | - | - | - |
| Road | - | - | 172 | 338 | - | - | - | - | - | - | 511 |
| Rail | - | - | - | - | - | - | - | - | 6 | - | 6 |
| Pipeline transport | - | - | - | - | - | - | - | - | - | - | - |
| Domestic navigation | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - | 5 | - | 5 |
| **OTHER** | **-** | **-** | **146** | **590** | **-** | **-** | **-** | **9** | **340** | **4** | **1088** |
| Residential | - | - | - | 442 | - | - | - | - | 165 | 4 | 610 |
| Comm. and publ. services | - | - | - | 37 | - | - | - | - | 78 | - | 114 |
| Agriculture/forestry | - | - | - | - | - | - | - | - | 10 | - | 10 |
| Fishing | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | - | - | 146 | 112 | - | - | - | 9 | 87 | - | 353 |
| **NON-ENERGY USE** | **-** | **-** | **40** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **40** |
| in industry/transf./energy | - | - | 11 | - | - | - | - | - | - | - | 11 |
| *of which: chem./petrochem.* | - | - | - | - | - | - | - | - | - | - | - |
| in transport | - | - | 28 | - | - | - | - | - | - | - | 28 |
| in other | - | - | 1 | - | - | - | - | - | - | - | 1 |

**Electricity and Heat Output**

| | Coal | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Electr. generated - GWh** | **-** | **-** | **-** | **2390** | **2548** | **2489** | **6** | **-** | **-** | **-** | **7433** |
| *Electricity plants* | - | - | - | - | *2548* | *2489* | *6* | - | - | - | *5043* |
| *CHP plants* | - | - | - | *2390* | - | - | - | - | - | - | *2390* |
| **Heat Generated - TJ** | **-** | **-** | **-** | **375** | **-** | **-** | **-** | **-** | **-** | **-** | **375** |
| *CHP plants* | - | - | - | *375* | - | - | - | - | - | - | *375* |
| *Heat plants* | - | - | - | - | - | - | - | - | - | - | - |

# Azerbaijan

## 2012

Thousand tonnes of oil equivalent

| SUPPLY AND CONSUMPTION | Coal | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Production | - | 43633 | - | 14844 | - | 157 | - | 98 | - | - | 58732 |
| Imports | - | - | 44 | - | - | - | - | - | 12 | - | 56 |
| Exports | - | -36931 | -1780 | -5554 | - | - | - | - | -58 | - | -44324 |
| Intl. marine bunkers | - | - | -88 | - | - | - | - | - | - | - | -88 |
| Intl. aviation bunkers | - | - | -381 | - | - | - | - | - | - | - | -381 |
| Stock changes | - | -38 | -19 | -247 | - | - | - | 1 | - | - | -303 |
| **TPES** | **-** | **6664** | **-2224** | **9043** | **-** | **157** | **-** | **98** | **-46** | **-** | **13692** |
| Transfers | - | -51 | 55 | - | - | - | - | - | - | - | 4 |
| Statistical differences | - | -321 | -72 | -29 | - | - | - | - | -7 | - | -429 |
| Electricity plants | - | - | -22 | -2712 | - | -157 | - | - | 1208 | - | -1683 |
| CHP plants | - | - | -76 | -2043 | - | - | - | - | 769 | 30 | -1320 |
| Heat plants | - | - | -1 | -112 | - | - | - | - | - | 89 | -24 |
| Blast furnaces | - | - | - | - | - | - | - | - | - | - | - |
| Gas works | - | - | - | - | - | - | - | - | - | - | - |
| Coke/pat.fuel/BKB/PB plants | - | - | - | - | - | - | - | - | - | - | - |
| Oil refineries | - | -6292 | 6104 | - | - | - | - | - | - | - | -188 |
| Petrochemical plants | - | - | - | - | - | - | - | - | - | - | - |
| Liquefaction plants | - | - | - | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - | - | - | - |
| Energy industry own use | - | - | -508 | -370 | - | - | - | - | -310 | -20 | -1208 |
| Losses | - | - | - | -747 | - | - | - | - | -290 | -15 | -1052 |
| **TFC** | **-** | **-** | **3255** | **3030** | **-** | **-** | **-** | **98** | **1324** | **85** | **7792** |
| **INDUSTRY** | **-** | **-** | **76** | **828** | **-** | **-** | **-** | **0** | **260** | **-** | **1164** |
| Iron and steel | - | - | 1 | 33 | - | - | - | - | 37 | - | 72 |
| Chemical and petrochemical | - | - | - | 212 | - | - | - | - | 28 | - | 239 |
| Non-ferrous metals | - | - | - | 4 | - | - | - | - | 75 | - | 80 |
| Non-metallic minerals | - | - | 1 | 188 | - | - | - | - | 20 | - | 209 |
| Transport equipment | - | - | - | 7 | - | - | - | - | 0 | - | 7 |
| Machinery | - | - | - | 18 | - | - | - | - | 8 | - | 26 |
| Mining and quarrying | - | - | 4 | 8 | - | - | - | - | 7 | - | 19 |
| Food and tobacco | - | - | 11 | 291 | - | - | - | 0 | 30 | - | 332 |
| Paper pulp and printing | - | - | - | 1 | - | - | - | - | 1 | - | 2 |
| Wood and wood products | - | - | - | 2 | - | - | - | - | 1 | - | 2 |
| Construction | - | - | 59 | 38 | - | - | - | 0 | 43 | - | 140 |
| Textile and leather | - | - | - | 4 | - | - | - | - | 6 | - | 10 |
| Non-specified | - | - | - | 21 | - | - | - | - | 5 | - | 26 |
| **TRANSPORT** | **-** | **-** | **2153** | **-** | **-** | **-** | **-** | **0** | **45** | **-** | **2198** |
| Domestic aviation | - | - | 112 | - | - | - | - | - | - | - | 112 |
| Road | - | - | 2002 | - | - | - | - | - | - | - | 2002 |
| Rail | - | - | 2 | - | - | - | - | 0 | 37 | - | 40 |
| Pipeline transport | - | - | - | - | - | - | - | - | 7 | - | 7 |
| Domestic navigation | - | - | 38 | - | - | - | - | - | - | - | 38 |
| Non-specified | - | - | - | - | - | - | - | - | - | - | - |
| **OTHER** | **-** | **-** | **404** | **2173** | **-** | **-** | **-** | **98** | **1019** | **85** | **3778** |
| Residential | - | - | 56 | 2005 | - | - | - | 78 | 559 | 58 | 2757 |
| Comm. and publ. services | - | - | 9 | 135 | - | - | - | 19 | 383 | 27 | 573 |
| Agriculture/forestry | - | - | 339 | 32 | - | - | - | 1 | 76 | - | 449 |
| Fishing | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - | - | - | - |
| **NON-ENERGY USE** | **-** | **-** | **622** | **30** | **-** | **-** | **-** | **-** | **-** | **-** | **652** |
| in industry/transf./energy | - | - | 580 | 30 | - | - | - | - | - | - | 609 |
| *of which: chem./petrochem.* | *-* | *-* | *330* | *30* | *-* | *-* | *-* | *-* | *-* | *-* | *360* |
| in transport | - | - | 42 | - | - | - | - | - | - | - | 42 |
| in other | - | - | - | - | - | - | - | - | - | - | - |

**Electricity and Heat Output**

| | Coal | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Electr. generated - GWh** | **-** | **-** | **503** | **20664** | **-** | **1821** | **-** | **-** | **-** | **-** | **22988** |
| *Electricity plants* | *-* | *-* | *92* | *12134* | *-* | *1821* | *-* | *-* | *-* | *-* | *14047* |
| *CHP plants* | *-* | *-* | *411* | *8530* | *-* | *-* | *-* | *-* | *-* | *-* | *8941* |
| **Heat generated - TJ** | **-** | **-** | **36** | **4968** | **-** | **-** | **-** | **-** | **-** | **-** | **5004** |
| *CHP plants* | *-* | *-* | *-* | *1277* | *-* | *-* | *-* | *-* | *-* | *-* | *1277* |
| *Heat plants* | *-* | *-* | *36* | *3691* | *-* | *-* | *-* | *-* | *-* | *-* | *3727* |

# Azerbaijan

## 2011

Thousand tonnes of oil equivalent

| SUPPLY AND CONSUMPTION | Coal | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Production | - | 45909 | - | 13723 | - | 230 | - | 97 | - | - | 59959 |
| Imports | - | - | 27 | - | - | - | - | - | 11 | - | 38 |
| Exports | - | -39216 | -2181 | -5722 | - | - | - | - | -69 | - | -47188 |
| Intl. marine bunkers | - | - | -79 | - | - | - | - | - | - | - | -79 |
| Intl. aviation bunkers | - | - | -436 | - | - | - | - | - | - | - | -436 |
| Stock changes | - | -59 | 17 | 311 | - | - | - | -0 | - | - | 268 |
| **TPES** | **-** | **6634** | **-2652** | **8311** | **-** | **230** | **-** | **97** | **-58** | **-** | **12561** |
| Transfers | - | -64 | 69 | - | - | - | - | - | - | - | 5 |
| Statistical differences | - | -147 | -72 | -21 | - | - | - | - | -11 | - | -250 |
| Electricity plants | - | - | -5 | -2276 | - | -230 | - | - | 1141 | - | -1370 |
| CHP plants | - | - | -76 | -1596 | - | - | - | - | 604 | 32 | -1037 |
| Heat plants | - | - | -1 | -111 | - | - | - | - | - | 77 | -35 |
| Blast furnaces | - | - | - | - | - | - | - | - | - | - | - |
| Gas works | - | - | - | - | - | - | - | - | - | - | - |
| Coke/pat.fuel/BKB/PB plants | - | - | - | - | - | - | - | - | - | - | - |
| Oil refineries | - | -6423 | 6236 | - | - | - | - | - | - | - | -187 |
| Petrochemical plants | - | - | - | - | - | - | - | - | - | - | - |
| Liquefaction plants | - | - | - | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - | - | - | - |
| Energy industry own use | - | - | -462 | -342 | - | - | - | - | -193 | -21 | -1018 |
| Losses | - | - | - | -749 | - | - | - | - | -342 | -14 | -1105 |
| **TFC** | **-** | **-** | **3037** | **3215** | **-** | **-** | **-** | **97** | **1141** | **74** | **7564** |
| **INDUSTRY** | **-** | **-** | **85** | **622** | **-** | **-** | **-** | **0** | **183** | **-** | **890** |
| Iron and steel | - | - | 2 | 28 | - | - | - | - | 31 | - | 61 |
| Chemical and petrochemical | - | - | - | 185 | - | - | - | - | 30 | - | 215 |
| Non-ferrous metals | - | - | 1 | 2 | - | - | - | - | 14 | - | 17 |
| Non-metallic minerals | - | - | 1 | 161 | - | - | - | - | 14 | - | 176 |
| Transport equipment | - | - | - | 6 | - | - | - | - | 1 | - | 7 |
| Machinery | - | - | 1 | 12 | - | - | - | - | 10 | - | 23 |
| Mining and quarrying | - | - | 6 | 6 | - | - | - | - | 7 | - | 19 |
| Food and tobacco | - | - | 13 | 181 | - | - | - | 0 | 23 | - | 217 |
| Paper pulp and printing | - | - | - | 1 | - | - | - | - | 0 | - | 1 |
| Wood and wood products | - | - | - | 2 | - | - | - | - | 0 | - | 2 |
| Construction | - | - | 62 | 21 | - | - | - | 0 | 42 | - | 125 |
| Textile and leather | - | - | - | 3 | - | - | - | - | 5 | - | 8 |
| Non-specified | - | - | - | 13 | - | - | - | - | 5 | - | 18 |
| **TRANSPORT** | **-** | **-** | **1952** | **-** | **-** | **-** | **-** | **0** | **47** | **-** | **1999** |
| Domestic aviation | - | - | 105 | - | - | - | - | - | - | - | 105 |
| Road | - | - | 1809 | - | - | - | - | - | - | - | 1809 |
| Rail | - | - | 3 | - | - | - | - | 0 | 38 | - | 41 |
| Pipeline transport | - | - | - | - | - | - | - | - | 9 | - | 9 |
| Domestic navigation | - | - | 35 | - | - | - | - | - | - | - | 35 |
| Non-specified | - | - | - | - | - | - | - | - | - | - | - |
| **OTHER** | **-** | **-** | **408** | **2568** | **-** | **-** | **-** | **96** | **911** | **74** | **4057** |
| Residential | - | - | 63 | 2440 | - | - | - | 77 | 509 | 49 | 3137 |
| Comm. and publ. services | - | - | 9 | 105 | - | - | - | 19 | 338 | 25 | 496 |
| Agriculture/forestry | - | - | 336 | 24 | - | - | - | 1 | 64 | - | 424 |
| Fishing | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - | - | - | - |
| **NON-ENERGY USE** | **-** | **-** | **592** | **26** | **-** | **-** | **-** | **-** | **-** | **-** | **618** |
| in industry/transf./energy | - | - | 550 | 26 | - | - | - | - | - | - | 576 |
| *of which: chem./petrochem.* | *-* | *-* | *339* | *26* | *-* | *-* | *-* | *-* | *-* | *-* | *364* |
| in transport | - | - | 42 | - | - | - | - | - | - | - | 42 |
| in other | - | - | - | - | - | - | - | - | - | - | - |

**Electricity and Heat Output**

| | Coal | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Electr. generated - GWh** | **-** | **-** | **338** | **17280** | **-** | **2676** | **-** | **-** | **-** | **-** | **20294** |
| *Electricity plants* | *-* | *-* | *19* | *10575* | *-* | *2676* | *-* | *-* | *-* | *-* | *13270* |
| *CHP plants* | *-* | *-* | *319* | *6705* | *-* | *-* | *-* | *-* | *-* | *-* | *7024* |
| **Heat generated - TJ** | **-** | **-** | **34** | **4502** | **-** | **-** | **-** | **-** | **-** | **-** | **4536** |
| *CHP plants* | *-* | *-* | *-* | *1328* | *-* | *-* | *-* | *-* | *-* | *-* | *1328* |
| *Heat plants* | *-* | *-* | *34* | *3174* | *-* | *-* | *-* | *-* | *-* | *-* | *3208* |

# Belarus

## 2012

Thousand tonnes of oil equivalent

| SUPPLY AND CONSUMPTION | Coal* | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Production | 651 | 1668 | - | 181 | - | 6 | 1 | 1610 | - | - | 4117 |
| Imports | 321 | 21777 | 6469 | 16809 | - | - | - | - | 894 | - | 46270 |
| Exports | -144 | -1653 | -17634 | - | - | - | - | - | -241 | - | -19672 |
| Intl. marine bunkers | - | - | - | - | - | - | - | - | - | - | - |
| Intl. aviation bunkers | - | - | - | - | - | - | - | - | - | - | - |
| Stock changes | -85 | -10 | -65 | -56 | - | - | - | - | - | - | -217 |
| **TPES** | **743** | **21782** | **-11230** | **16933** | **-** | **6** | **1** | **1610** | **654** | **-** | **30499** |
| Transfers | - | - | - | - | - | - | - | - | - | - | - |
| Statistical differences | 0 | -7 | - | - | - | - | - | - | - | - | -7 |
| Electricity plants | - | - | -56 | -2502 | - | -6 | -1 | -0 | 1004 | - | -1561 |
| CHP plants | -34 | - | -208 | -6669 | - | - | - | -95 | 1644 | 3600 | -1762 |
| Heat plants | -99 | - | -174 | -2607 | - | - | - | -587 | - | 2842 | -625 |
| Blast furnaces | - | - | - | - | - | - | - | - | - | - | - |
| Gas works | - | - | - | - | - | - | - | - | - | - | - |
| Coke/pat.fuel/BKB/PB plants | -5 | - | - | - | - | - | - | -5 | - | - | -10 |
| Oil refineries | - | -21775 | 21476 | - | - | - | - | - | - | - | -299 |
| Petrochemical plants | - | - | - | - | - | - | - | - | - | - | - |
| Liquefaction plants | - | - | - | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | -5 | - | - | -5 |
| Energy industry own use | -13 | - | -1047 | -224 | - | - | - | -26 | -397 | -520 | -2228 |
| Losses | -29 | - | -3 | -120 | - | - | - | - | -293 | -561 | -1006 |
| **TFC** | **562** | **-** | **8758** | **4812** | **-** | **-** | **-** | **891** | **2613** | **5360** | **22995** |
| **INDUSTRY** | **268** | **-** | **185** | **1468** | **-** | **-** | **-** | **62** | **1148** | **1647** | **4778** |
| Iron and steel | 15 | - | 3 | 114 | - | - | - | 1 | 180 | 5 | 319 |
| Chemical and petrochemical | - | - | 10 | 155 | - | - | - | 0 | 284 | 504 | 954 |
| Non-ferrous metals | - | - | - | 5 | - | - | - | - | 2 | 0 | 7 |
| Non-metallic minerals | 216 | - | 8 | 875 | - | - | - | 8 | 105 | 91 | 1302 |
| Transport equipment | 6 | - | 4 | 29 | - | - | - | 1 | 56 | 52 | 148 |
| Machinery | 19 | - | 10 | 102 | - | - | - | 3 | 168 | 129 | 432 |
| Mining and quarrying | - | - | 4 | 16 | - | - | - | 0 | 21 | 36 | 77 |
| Food and tobacco | 9 | - | 14 | 83 | - | - | - | 7 | 135 | 480 | 727 |
| Paper pulp and printing | - | - | 1 | 4 | - | - | - | 0 | 41 | 99 | 145 |
| Wood and wood products | - | - | 5 | 22 | - | - | - | 31 | 18 | 46 | 123 |
| Construction | 2 | - | 123 | 22 | - | - | - | 6 | 26 | - | 179 |
| Textile and leather | 0 | - | 1 | 36 | - | - | - | 1 | 53 | 95 | 187 |
| Non-specified | 0 | - | 1 | 5 | - | - | - | 3 | 60 | 110 | 179 |
| **TRANSPORT** | **11** | **-** | **3594** | **331** | **-** | **-** | **-** | **5** | **135** | **-** | **4077** |
| Domestic aviation | - | - | - | - | - | - | - | - | - | - | - |
| Road | - | - | 3379 | 11 | - | - | - | 5 | - | - | 3396 |
| Rail | 9 | - | 215 | - | - | - | - | - | 52 | - | 276 |
| Pipeline transport | - | - | - | 320 | - | - | - | - | 52 | - | 372 |
| Domestic navigation | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | 2 | - | - | - | - | - | - | - | 31 | - | 33 |
| **OTHER** | **265** | **-** | **861** | **1725** | **-** | **-** | **-** | **824** | **1329** | **3713** | **8716** |
| Residential | 211 | - | 106 | 1575 | - | - | - | 511 | 544 | 2337 | 5285 |
| Comm. and publ. services | 50 | - | 108 | 50 | - | - | - | 244 | 649 | 1211 | 2312 |
| Agriculture/forestry | 4 | - | 647 | 99 | - | - | - | 69 | 135 | 165 | 1119 |
| Fishing | - | - | - | - | - | - | - | 0 | 1 | 0 | 1 |
| Non-specified | - | - | - | - | - | - | - | - | - | - | - |
| **NON-ENERGY USE** | **18** | **-** | **4118** | **1288** | **-** | **-** | **-** | **-** | **-** | **-** | **5424** |
| in industry/transf./energy | 18 | - | 4118 | 1288 | - | - | - | - | - | - | 5424 |
| *of which: chem./petrochem.* | - | - | - | *1288* | - | - | - | - | - | - | *1288* |
| in transport | - | - | - | - | - | - | - | - | - | - | - |
| in other | - | - | - | - | - | - | - | - | - | - | - |
| **Electricity and Heat Output** | | | | | | | | | | | |
| **Electr. generated - GWh** | **20** | **-** | **789** | **29787** | **-** | **70** | **6** | **127** | **-** | **-** | **30799** |
| *Electricity plants* | - | - | *265* | *11338* | - | *70* | *6* | - | - | - | *11679* |
| *CHP plants* | *20* | - | *524* | *18449* | - | - | - | *127* | - | - | *19120* |
| **Heat generated - TJ** | **3909** | **-** | **10253** | **236204** | **-** | **-** | **-** | **19388** | **-** | **-** | **269754** |
| *CHP plants* | *1018* | - | *4441* | *142693* | - | - | - | *2594* | - | - | *150746* |
| *Heat plants* | *2891* | - | *5812* | *93511* | - | - | - | *16794* | - | - | *119008* |

* The column of coal also includes peat.

# Belarus

## 2011

Thousand tonnes of oil equivalent

| SUPPLY AND CONSUMPTION | Coal* | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Production | 686 | 1690 | - | 184 | - | 4 | 0 | 1575 | - | - | 4139 |
| Imports | 127 | 20538 | 4164 | 16598 | - | - | - | - | 799 | - | 42226 |
| Exports | -125 | -1684 | -15498 | - | - | - | - | - | -319 | - | -17625 |
| Intl. marine bunkers | - | - | - | - | - | - | - | - | - | - | - |
| Intl. aviation bunkers | - | - | - | - | - | - | - | - | - | - | - |
| Stock changes | -110 | 45 | 272 | 398 | - | - | - | - | - | - | 605 |
| **TPES** | **578** | **20589** | **-11062** | **17180** | **-** | **4** | **0** | **1575** | **480** | **-** | **29345** |
| Transfers | - | - | -117 | - | - | - | - | - | - | - | -117 |
| Statistical differences | 0 | -13 | -632 | - | - | - | - | - | - | - | -645 |
| Electricity plants | - | - | -27 | -3276 | - | -4 | -0 | -0 | 1280 | - | -2027 |
| CHP plants | -29 | - | -91 | -6352 | - | - | - | -94 | 1490 | 3417 | -1658 |
| Heat plants | -98 | - | -170 | -2578 | - | - | - | -542 | - | 2798 | -590 |
| Blast furnaces | - | - | - | - | - | - | - | - | - | - | - |
| Gas works | - | - | - | - | - | - | - | - | - | - | - |
| Coke/pat.fuel/BKB/PB plants | -3 | - | - | - | - | - | - | -6 | - | - | -9 |
| Oil refineries | - | -20576 | 20262 | - | - | - | - | - | - | - | -315 |
| Petrochemical plants | - | - | - | - | - | - | - | - | - | - | - |
| Liquefaction plants | - | - | - | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | -5 | - | - | -5 |
| Energy industry own use | -13 | - | -952 | -225 | - | - | - | -26 | -385 | -487 | -2088 |
| Losses | -38 | - | -2 | -111 | - | - | - | - | -293 | -557 | -1002 |
| **TFC** | **397** | **-** | **7210** | **4638** | **-** | **-** | **-** | **902** | **2571** | **5172** | **20890** |
| **INDUSTRY** | **98** | **-** | **220** | **1553** | **-** | **-** | **-** | **60** | **1170** | **1685** | **4786** |
| Iron and steel | 16 | - | 2 | 110 | - | - | - | 0 | 178 | 6 | 313 |
| Chemical and petrochemical | - | - | 15 | 168 | - | - | - | 0 | 297 | 531 | 1011 |
| Non-ferrous metals | - | - | - | 4 | - | - | - | - | 1 | 0 | 6 |
| Non-metallic minerals | 46 | - | 9 | 954 | - | - | - | 10 | 103 | 101 | 1223 |
| Transport equipment | 6 | - | 5 | 31 | - | - | - | 1 | 64 | 57 | 164 |
| Machinery | 18 | - | 13 | 93 | - | - | - | 6 | 158 | 105 | 393 |
| Mining and quarrying | - | - | 3 | 18 | - | - | - | 0 | 21 | 34 | 76 |
| Food and tobacco | 10 | - | 18 | 91 | - | - | - | 6 | 135 | 488 | 749 |
| Paper pulp and printing | - | - | 1 | 3 | - | - | - | 1 | 29 | 88 | 122 |
| Wood and wood products | - | - | 7 | 16 | - | - | - | 24 | 30 | 61 | 137 |
| Construction | 1 | - | 139 | 25 | - | - | - | 6 | 31 | - | 203 |
| Textile and leather | 0 | - | 6 | 35 | - | - | - | 2 | 55 | 98 | 197 |
| Non-specified | - | - | 1 | 4 | - | - | - | 4 | 67 | 116 | 192 |
| **TRANSPORT** | **11** | **-** | **3506** | **290** | **-** | **-** | **-** | **8** | **144** | **-** | **3959** |
| Domestic aviation | - | - | - | - | - | - | - | - | - | - | - |
| Road | - | - | 3268 | 12 | - | - | - | 8 | - | - | 3288 |
| Rail | 9 | - | 238 | - | - | - | - | - | 52 | - | 299 |
| Pipeline transport | - | - | - | 278 | - | - | - | - | 58 | - | 336 |
| Domestic navigation | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | 2 | - | - | - | - | - | - | - | 35 | - | 37 |
| **OTHER** | **273** | **-** | **861** | **1539** | **-** | **-** | **-** | **834** | **1257** | **3487** | **8251** |
| Residential | 220 | - | 118 | 1406 | - | - | - | 537 | 525 | 2225 | 5033 |
| Comm. and publ. services | 49 | - | 95 | 46 | - | - | - | 234 | 597 | 1097 | 2118 |
| Agriculture/forestry | 3 | - | 648 | 86 | - | - | - | 63 | 134 | 165 | 1100 |
| Fishing | - | - | - | - | - | - | - | 0 | 1 | 0 | 1 |
| Non-specified | - | - | - | - | - | - | - | - | - | - | - |
| **NON-ENERGY USE** | **16** | **-** | **2622** | **1256** | **-** | **-** | **-** | **-** | **-** | **-** | **3893** |
| in industry/transf./energy | 16 | - | 2622 | 1256 | - | - | - | - | - | - | 3893 |
| *of which: chem./petrochem.* | *-* | *-* | *-* | *1256* | *-* | *-* | *-* | *-* | *-* | *-* | *1256* |
| in transport | - | - | - | - | - | - | - | - | - | - | - |
| in other | - | - | - | - | - | - | - | - | - | - | - |

**Electricity and Heat Output**

| | Coal* | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Electr. generated - GWh** | **19** | **-** | **394** | **31639** | **-** | **42** | **1** | **105** | **-** | **-** | **32200** |
| *Electricity plants* | *-* | *-* | *125* | *14712* | *-* | *42* | *1* | *-* | *-* | *-* | *14880* |
| *CHP plants* | *19* | *-* | *269* | *16927* | *-* | *-* | *-* | *105* | *-* | *-* | *17320* |
| **Heat generated - TJ** | **3743** | **-** | **7599** | **230679** | **-** | **-** | **-** | **18258** | **-** | **-** | **260279** |
| *CHP plants* | *854* | *-* | *1662* | *137935* | *-* | *-* | *-* | *2656* | *-* | *-* | *143107* |
| *Heat plants* | *2889* | *-* | *5937* | *92744* | *-* | *-* | *-* | *15602* | *-* | *-* | *117172* |

* The column of coal also includes peat.

# Georgia

## 2012

Thousand tonnes of oil equivalent

| **SUPPLY AND CONSUMPTION** | Coal | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Production | 107 | 49 | - | 4 | - | 621 | 11 | 307 | - | - | 1099 |
| Imports | 2 | - | 1033 | 1643 | - | - | - | - | 53 | - | 2731 |
| Exports | - | -37 | -2 | - | - | - | - | - | -45 | - | -85 |
| Intl. marine bunkers | - | - | - | - | - | - | - | - | - | - | - |
| Intl. aviation bunkers | - | - | -38 | - | - | - | - | - | - | - | -38 |
| Stock changes | - | -3 | 1 | - | - | - | - | - | - | - | -2 |
| **TPES** | **109** | **9** | **994** | **1648** | **-** | **621** | **11** | **307** | **7** | **-** | **3706** |
| Transfers | - | - | - | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | - | - | -1 | - | -1 |
| Electricity plants | - | - | - | -485 | - | -621 | - | - | 834 | - | -273 |
| CHP plants | - | - | - | - | - | - | - | - | - | - | - |
| Heat plants | - | - | - | - | - | - | -2 | - | - | 1 | -1 |
| Blast furnaces | - | - | - | - | - | - | - | - | - | - | - |
| Gas works | - | - | - | - | - | - | - | - | - | - | - |
| Coke/pat.fuel/BKB/PB plants | - | - | - | - | - | - | - | - | - | - | - |
| Oil refineries | - | -9 | 7 | - | - | - | - | - | - | - | -2 |
| Petrochemical plants | - | - | - | - | - | - | - | - | - | - | - |
| Liquefaction plants | - | - | - | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - | - | - | - |
| Energy industry own use | - | - | - | -80 | - | - | - | - | -44 | - | -124 |
| Losses | - | - | - | -56 | - | - | - | - | -94 | - | -150 |
| **TFC** | **109** | **-** | **1001** | **1026** | **-** | **-** | **9** | **307** | **702** | **1** | **3155** |
| **INDUSTRY** | **81** | **-** | **6** | **307** | **-** | **-** | **-** | **-** | **247** | **-** | **642** |
| Iron and steel | - | - | - | 61 | - | - | - | - | 124 | - | 185 |
| Chemical and petrochemical | - | - | - | 186 | - | - | - | - | 62 | - | 248 |
| Non-ferrous metals | - | - | - | - | - | - | - | - | - | - | - |
| Non-metallic minerals | 79 | - | - | 32 | - | - | - | - | 28 | - | 139 |
| Transport equipment | - | - | - | - | - | - | - | - | 3 | - | 3 |
| Machinery | - | - | - | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - | 9 | - | 9 |
| Food and tobacco | - | - | - | 12 | - | - | - | - | 14 | - | 26 |
| Paper pulp and printing | - | - | - | - | - | - | - | - | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - | - | - | - |
| Construction | - | - | 5 | - | - | - | - | - | - | - | 5 |
| Textile and leather | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | 2 | - | 1 | 16 | - | - | - | - | 8 | - | 27 |
| **TRANSPORT** | **-** | **-** | **804** | **21** | **-** | **-** | **-** | **-** | **35** | **-** | **860** |
| Domestic aviation | - | - | 18 | - | - | - | - | - | - | - | 18 |
| Road | - | - | 779 | 14 | - | - | - | - | - | - | 794 |
| Rail | - | - | - | - | - | - | - | - | 35 | - | 35 |
| Pipeline transport | - | - | - | 7 | - | - | - | - | - | - | 7 |
| Domestic navigation | - | - | 6 | - | - | - | - | - | - | - | 6 |
| Non-specified | - | - | - | - | - | - | - | - | - | - | - |
| **OTHER** | **28** | **-** | **112** | **550** | **-** | **-** | **9** | **306** | **420** | **1** | **1426** |
| Residential | 7 | - | 30 | 459 | - | - | 5 | 257 | 290 | 1 | 1049 |
| Comm. and publ. services | 13 | - | 2 | 44 | - | - | 4 | 39 | 96 | - | 198 |
| Agriculture/forestry | - | - | 80 | 42 | - | - | - | - | 34 | - | 156 |
| Fishing | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | 8 | - | - | 5 | - | - | - | 11 | - | - | 24 |
| **NON-ENERGY USE** | **-** | **-** | **79** | **148** | **-** | **-** | **-** | **-** | **-** | **-** | **227** |
| in industry/transf./energy | - | - | 79 | 148 | - | - | - | - | - | - | 227 |
| *of which: chem./petrochem.* | *-* | *-* | *-* | *148* | *-* | *-* | *-* | *-* | *-* | *-* | *148* |
| in transport | - | - | - | - | - | - | - | - | - | - | - |
| in other | - | - | - | - | - | - | - | - | - | - | - |

**Electricity and Heat Output**

| | Coal | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Electr. generated - GWh** | **-** | **-** | **-** | **2472** | **-** | **7223** | **-** | **-** | **-** | **-** | **9695** |
| *Electricity plants* | *-* | *-* | *-* | *2472* | *-* | *7223* | *-* | *-* | *-* | *-* | *9695* |
| *CHP plants* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* |
| **Heat Generated - TJ** | **-** | **-** | **-** | **-** | **-** | **-** | **36** | **-** | **-** | **-** | **36** |
| *CHP plants* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* |
| *Heat plants* | *-* | *-* | *-* | *-* | *-* | *-* | *36* | *-* | *-* | *-* | *36* |

# Georgia

## 2011

Thousand tonnes of oil equivalent

| SUPPLY AND CONSUMPTION | Coal | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Production | 59 | 51 | - | 4 | - | 679 | 11 | 315 | - | - | 1119 |
| Imports | 4 | 8 | 1044 | 1507 | - | - | - | - | 41 | - | 2604 |
| Exports | - | -59 | -2 | - | - | - | - | - | -80 | - | -141 |
| Intl. marine bunkers | - | - | - | - | - | - | - | - | - | - | - |
| Intl. aviation bunkers | - | - | -36 | - | - | - | - | - | - | - | -36 |
| Stock changes | - | - | 3 | -4 | - | - | - | - | - | - | -1 |
| **TPES** | **63** | **-** | **1009** | **1507** | **-** | **679** | **11** | **315** | **-39** | **-** | **3544** |
| Transfers | - | - | - | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | - | - | - | - | - |
| Electricity plants | - | - | -12 | -427 | - | -679 | - | - | 877 | - | -241 |
| CHP plants | - | - | - | - | - | - | - | - | - | - | - |
| Heat plants | - | - | - | - | - | - | -2 | - | - | 1 | -1 |
| Blast furnaces | - | - | - | - | - | - | - | - | - | - | - |
| Gas works | - | - | - | - | - | - | - | - | - | - | - |
| Coke/pat.fuel/BKB/PB plants | - | - | - | - | - | - | - | - | - | - | - |
| Oil refineries | - | - | - | - | - | - | - | - | - | - | - |
| Petrochemical plants | - | - | - | - | - | - | - | - | - | - | - |
| Liquefaction plants | - | - | - | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - | - | - | - |
| Energy industry own use | - | - | - | -72 | - | - | - | - | -44 | - | -116 |
| Losses | - | - | - | -53 | - | - | - | - | -98 | - | -151 |
| **TFC** | **63** | **-** | **997** | **956** | **-** | **-** | **9** | **315** | **696** | **1** | **3036** |
| **INDUSTRY** | **55** | **-** | **25** | **308** | **-** | **-** | **-** | **-** | **255** | **-** | **643** |
| Iron and steel | - | - | - | 59 | - | - | - | - | 106 | - | 165 |
| Chemical and petrochemical | - | - | - | 189 | - | - | - | - | 41 | - | 230 |
| Non-ferrous metals | - | - | - | - | - | - | - | - | - | - | - |
| Non-metallic minerals | 50 | - | - | 38 | - | - | - | - | 30 | - | 118 |
| Transport equipment | - | - | - | - | - | - | - | - | 2 | - | 2 |
| Machinery | - | - | - | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - | 11 | - | 11 |
| Food and tobacco | - | - | - | 10 | - | - | - | - | 15 | - | 25 |
| Paper pulp and printing | - | - | - | - | - | - | - | - | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - | - | - | - |
| Construction | - | - | 8 | - | - | - | - | - | - | - | 8 |
| Textile and leather | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | 4 | - | 17 | 12 | - | - | - | - | 50 | - | 83 |
| **TRANSPORT** | **-** | **-** | **763** | **13** | **-** | **-** | **-** | **-** | **32** | **-** | **809** |
| Domestic aviation | - | - | 18 | - | - | - | - | - | - | - | 18 |
| Road | - | - | 745 | 9 | - | - | - | - | - | - | 754 |
| Rail | - | - | - | - | - | - | - | - | 32 | - | 32 |
| Pipeline transport | - | - | - | 4 | - | - | - | - | - | - | 4 |
| Domestic navigation | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - | - | - | - |
| **OTHER** | **8** | **-** | **130** | **414** | **-** | **-** | **9** | **315** | **409** | **1** | **1286** |
| Residential | 2 | - | 52 | 345 | - | - | 5 | 265 | 286 | 1 | 956 |
| Comm. and publ. services | 6 | - | 2 | 23 | - | - | 4 | 34 | 92 | - | 161 |
| Agriculture/forestry | - | - | 76 | 40 | - | - | - | - | 31 | - | 146 |
| Fishing | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | 6 | - | - | - | 16 | - | - | 22 |
| **NON-ENERGY USE** | **-** | **-** | **78** | **220** | **-** | **-** | **-** | **-** | **-** | **-** | **299** |
| in industry/transf./energy | - | - | 78 | 220 | - | - | - | - | - | - | 299 |
| *of which: chem./petrochem.* | - | - | - | *220* | - | - | - | - | - | - | *220* |
| in transport | - | - | - | - | - | - | - | - | - | - | - |
| in other | - | - | - | - | - | - | - | - | - | - | - |
| **Electricity and Heat Output** | | | | | | | | | | | |
| **Electr. generated - GWh** | **-** | **-** | **7** | **2297** | **-** | **7890** | **-** | **-** | **-** | **-** | **10194** |
| *Electricity plants* | - | - | *7* | *2297* | - | *7890* | - | - | - | - | *10194* |
| *CHP plants* | - | - | - | - | - | - | - | - | - | - | - |
| **Heat Generated - TJ** | **-** | **-** | **-** | **-** | **-** | **-** | **36** | **-** | **-** | **-** | **36** |
| *CHP plants* | - | - | - | - | - | - | - | - | - | - | - |
| *Heat plants* | - | - | - | - | - | - | *36* | - | - | - | *36* |

# Kazakhstan

## 2012

Thousand tonnes of oil equivalent

| SUPPLY AND CONSUMPTION | Coal | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Production | 52763 | 82608 | - | 28550 | - | 657 | 0 | 59 | - | - | 164638 |
| Imports | 645 | 6030 | 2468 | 3647 | - | - | - | - | 366 | - | 13155 |
| Exports | -14292 | -71217 | -6425 | -8993 | - | - | - | - | -252 | - | -101179 |
| Intl. marine bunkers | - | - | - | - | - | - | - | - | - | - | - |
| Intl. aviation bunkers | - | - | -202 | - | - | - | - | - | - | - | -202 |
| Stock changes | -1260 | -89 | -316 | 106 | - | - | - | - | - | - | -1559 |
| **TPES** | **37856** | **17333** | **-4476** | **23309** | **-** | **657** | **0** | **59** | **113** | **-** | **74853** |
| Transfers | - | -1105 | 1203 | - | - | - | - | - | - | - | 98 |
| Statistical differences | 2124 | 356 | -11 | -1003 | - | - | - | - | 129 | - | 1595 |
| Electricity plants | - | - | - | - | - | -657 | -0 | - | 657 | - | - |
| CHP plants | -19755 | - | -185 | -3294 | - | - | - | - | 7187 | 9984 | -6063 |
| Heat plants | - | - | - | - | - | - | - | - | - | - | - |
| Blast furnaces | -667 | - | - | - | - | - | - | - | - | - | -667 |
| Gas works | - | - | - | - | - | - | - | - | - | - | - |
| Coke/pat.fuel/BKB/PB plants | -1145 | - | - | - | - | - | - | - | - | - | -1145 |
| Oil refineries | - | -14979 | 13635 | - | - | - | - | - | - | - | -1344 |
| Petrochemical plants | - | - | - | - | - | - | - | - | - | - | - |
| Liquefaction plants | - | - | - | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - | - | - | - |
| Energy industry own use | -440 | -488 | -798 | -14890 | - | - | - | - | -1521 | -2332 | -20470 |
| Losses | -1669 | -708 | -47 | -1105 | - | - | - | - | -614 | -986 | -5130 |
| **TFC** | **16304** | **409** | **9321** | **3018** | **-** | **-** | **-** | **59** | **5951** | **6666** | **41727** |
| **INDUSTRY** | **12540** | **398** | **1726** | **1563** | **-** | **-** | **-** | **-** | **4287** | **2375** | **22888** |
| Iron and steel | 4313 | - | 716 | 653 | - | - | - | - | 1948 | 1556 | 9185 |
| Chemical and petrochemical | 49 | 64 | 343 | 189 | - | - | - | - | 244 | 136 | 1024 |
| Non-ferrous metals | 614 | - | 66 | 166 | - | - | - | - | 108 | 14 | 969 |
| Non-metallic minerals | 11 | - | 207 | - | - | - | - | - | - | - | 217 |
| Transport equipment | 1 | - | 2 | 1 | - | - | - | - | 4 | 8 | 16 |
| Machinery | 12 | - | 9 | 11 | - | - | - | - | 38 | 35 | 104 |
| Mining and quarrying | 1000 | 12 | 312 | 371 | - | - | - | - | 541 | 211 | 2447 |
| Food and tobacco | 41 | - | 21 | 127 | - | - | - | - | 109 | 175 | 472 |
| Paper pulp and printing | - | - | 2 | 3 | - | - | - | - | 6 | 11 | 22 |
| Wood and wood products | - | - | 1 | 1 | - | - | - | - | 2 | 3 | 6 |
| Construction | 37 | - | 45 | 38 | - | - | - | - | 114 | 56 | 291 |
| Textile and leather | 2 | - | 2 | 4 | - | - | - | - | 8 | 2 | 18 |
| Non-specified | 6461 | 322 | - | - | - | - | - | - | 1165 | 169 | 8117 |
| **TRANSPORT** | **53** | **-** | **4936** | **-** | **-** | **-** | **-** | **-** | **288** | **-** | **5277** |
| Domestic aviation | - | - | 121 | - | - | - | - | - | - | - | 121 |
| Road | - | - | 4564 | - | - | - | - | - | - | - | 4564 |
| Rail | 6 | - | 229 | - | - | - | - | - | 60 | - | 295 |
| Pipeline transport | - | - | - | - | - | - | - | - | - | - | - |
| Domestic navigation | 0 | - | 5 | - | - | - | - | - | - | - | 5 |
| Non-specified | 47 | - | 17 | - | - | - | - | - | 228 | - | 291 |
| **OTHER** | **3712** | **-** | **2207** | **1266** | **-** | **-** | **-** | **59** | **1376** | **4291** | **12910** |
| Residential | 1563 | - | 1455 | 838 | - | - | - | 48 | 872 | 2184 | 6960 |
| Comm. and publ. services | 678 | - | 82 | 418 | - | - | - | - | 465 | 884 | 2527 |
| Agriculture/forestry | 175 | - | 444 | 10 | - | - | - | - | 38 | 180 | 848 |
| Fishing | - | - | - | - | - | - | - | - | 0 | 0 | 0 |
| Non-specified | 1295 | - | 226 | - | - | - | - | 12 | - | 1043 | 2576 |
| **NON-ENERGY USE** | **-** | **11** | **452** | **189** | **-** | **-** | **-** | **-** | **-** | **-** | **651** |
| in industry/transf./energy | - | 11 | 452 | 189 | - | - | - | - | - | - | 651 |
| *of which: chem./petrochem.* | - | - | - | *189* | - | - | - | - | - | - | *189* |
| in transport | - | - | - | - | - | - | - | - | - | - | - |
| in other | - | - | - | - | - | - | - | - | - | - | - |
| **Electricity and Heat Output** | | | | | | | | | | | |
| **Electr. generated - GWh** | **69421** | **-** | **735** | **13411** | **-** | **7637** | **3** | **-** | **-** | **-** | **91207** |
| *Electricity plants* | - | - | - | - | - | *7637* | *3* | - | - | - | *7640* |
| *CHP plants* | *69421* | - | *735* | *13411* | - | - | - | - | - | - | *83567* |
| **Heat generated - TJ** | **413425** | **-** | **4656** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **418081** |
| *CHP plants* | *413425* | - | *4656* | - | - | - | - | - | - | - | *418081* |
| *Heat plants* | - | - | - | - | - | - | - | - | - | - | - |

# Kazakhstan

## 2011

Thousand tonnes of oil equivalent

| SUPPLY AND CONSUMPTION | Coal | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Production | 50896 | 83308 | - | 25306 | - | 678 | - | 79 | - | - | 160267 |
| Imports | 540 | 4607 | 1300 | 3789 | - | - | - | - | 224 | - | 10459 |
| Exports | -13454 | -70413 | -5852 | -5096 | - | - | - | - | -156 | - | -94971 |
| Intl. marine bunkers | - | - | -19 | - | - | - | - | - | - | - | -19 |
| Intl. aviation bunkers | - | - | -162 | - | - | - | - | - | - | - | -162 |
| Stock changes | -210 | 1129 | 427 | 417 | - | - | - | - | - | - | 1763 |
| **TPES** | **37770** | **18631** | **-4307** | **24416** | **-** | **678** | **-** | **79** | **68** | **-** | **77336** |
| Transfers | - | -1337 | 1337 | - | - | - | - | - | - | - | - |
| Statistical differences | 1426 | -12 | -410 | -586 | - | - | - | - | 39 | - | 456 |
| Electricity plants | - | - | - | - | - | -678 | - | - | 678 | - | - |
| CHP plants | -18956 | - | -156 | -1950 | - | - | - | - | 6768 | 9681 | -4612 |
| Heat plants | - | - | - | - | - | - | - | - | - | - | - |
| Blast furnaces | -760 | - | - | - | - | - | - | - | - | - | -760 |
| Gas works | - | - | - | - | - | - | - | - | - | - | - |
| Coke/pat.fuel/BKB/PB plants | -1180 | - | - | - | - | - | - | - | - | - | -1180 |
| Oil refineries | - | -14718 | 13708 | - | - | - | - | - | - | - | -1010 |
| Petrochemical plants | - | - | - | - | - | - | - | - | - | - | - |
| Liquefaction plants | - | - | - | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - | - | - | - |
| Energy industry own use | -669 | -430 | -596 | -17556 | - | - | - | - | -1437 | -1907 | -22596 |
| Losses | -1495 | -620 | -30 | -968 | - | - | - | - | -548 | -1073 | -4732 |
| **TFC** | **16135** | **1514** | **9547** | **3355** | **-** | **-** | **-** | **79** | **5569** | **6702** | **42901** |
| **INDUSTRY** | **12894** | **1514** | **1729** | **1531** | **-** | **-** | **-** | **-** | **3816** | **2372** | **23857** |
| Iron and steel | 3858 | - | 653 | 290 | - | - | - | - | 1785 | 1549 | 8135 |
| Chemical and petrochemical | 46 | - | 14 | 350 | - | - | - | - | 292 | 148 | 850 |
| Non-ferrous metals | 739 | - | 63 | 196 | - | - | - | - | 104 | 12 | 1114 |
| Non-metallic minerals | - | - | 101 | - | - | - | - | - | - | - | 101 |
| Transport equipment | 0 | - | 1 | 0 | - | - | - | - | 3 | 8 | 13 |
| Machinery | 11 | - | 16 | 12 | - | - | - | - | 34 | 67 | 141 |
| Mining and quarrying | 884 | - | 347 | 507 | - | - | - | - | 512 | 141 | 2391 |
| Food and tobacco | 29 | - | 35 | 110 | - | - | - | - | 33 | 93 | 300 |
| Paper pulp and printing | - | - | 3 | 3 | - | - | - | - | 4 | 10 | 20 |
| Wood and wood products | - | - | 1 | 1 | - | - | - | - | 1 | 2 | 5 |
| Construction | 26 | - | 57 | 61 | - | - | - | - | 36 | 115 | 294 |
| Textile and leather | 2 | - | 2 | 3 | - | - | - | - | 5 | 1 | 12 |
| Non-specified | 7299 | 1514 | 436 | - | - | - | - | - | 1007 | 226 | 10482 |
| **TRANSPORT** | **-** | **-** | **4594** | **-** | **-** | **-** | **-** | **-** | **339** | **-** | **4933** |
| Domestic aviation | - | - | 171 | - | - | - | - | - | - | - | 171 |
| Road | - | - | 4245 | - | - | - | - | - | - | - | 4245 |
| Rail | - | - | 173 | - | - | - | - | - | 55 | - | 228 |
| Pipeline transport | - | - | - | - | - | - | - | - | - | - | - |
| Domestic navigation | - | - | 5 | - | - | - | - | - | - | - | 5 |
| Non-specified | - | - | - | - | - | - | - | - | 285 | - | 285 |
| **OTHER** | **3241** | **-** | **2858** | **1662** | **-** | **-** | **-** | **79** | **1413** | **4330** | **13582** |
| Residential | 2276 | - | 1119 | 1108 | - | - | - | 60 | 810 | 2177 | 7549 |
| Comm. and publ. services | 788 | - | 969 | 540 | - | - | - | - | 551 | 926 | 3776 |
| Agriculture/forestry | 177 | - | 482 | 13 | - | - | - | - | 52 | 204 | 928 |
| Fishing | - | - | - | - | - | - | - | - | 0 | 0 | 0 |
| Non-specified | - | - | 288 | - | - | - | - | 19 | - | 1022 | 1329 |
| **NON-ENERGY USE** | **-** | **-** | **366** | **162** | **-** | **-** | **-** | **-** | **-** | **-** | **528** |
| in industry/transf./energy | - | - | 366 | 162 | - | - | - | - | - | - | 528 |
| *of which: chem./petrochem.* | *-* | *-* | *-* | *162* | *-* | *-* | *-* | *-* | *-* | *-* | *162* |
| in transport | - | - | - | - | - | - | - | - | - | - | - |
| in other | - | - | - | - | - | - | - | - | - | - | - |

**Electricity and Heat Output**

| | Coal | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Electr. generated - GWh** | **70220** | **-** | **543** | **7940** | **-** | **7883** | **-** | **-** | **-** | **-** | **86586** |
| *Electricity plants* | *-* | *-* | *-* | *-* | *-* | *7883* | *-* | *-* | *-* | *-* | *7883* |
| *CHP plants* | *70220* | *-* | *543* | *7940* | *-* | *-* | *-* | *-* | *-* | *-* | *78703* |
| **Heat generated - TJ** | **401495** | **-** | **3912** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **405407** |
| *CHP plants* | *401495* | *-* | *3912* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *405407* |
| *Heat plants* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* |

# Kyrgyzstan

## 2012

Thousand tonnes of oil equivalent

| SUPPLY AND CONSUMPTION | Coal | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Production | 422 | 79 | - | 24 | - | 1219 | - | 4 | - | - | 1749 |
| Imports | 628 | 6 | 1787 | 332 | - | - | - | - | 15 | - | 2769 |
| Exports | -5 | - | -82 | - | - | - | - | - | -158 | - | -246 |
| Intl. marine bunkers | - | - | - | - | - | - | - | - | - | - | - |
| Intl. aviation bunkers | - | - | -52 | - | - | - | - | - | - | - | -52 |
| Stock changes | - | -6 | -82 | - | - | - | - | - | - | - | -88 |
| **TPES** | **1045** | **79** | **1571** | **356** | **-** | **1219** | **-** | **4** | **-143** | **-** | **4132** |
| Transfers | - | - | - | - | - | - | - | - | - | - | - |
| Statistical differences | - | 5 | 2 | - | - | - | - | - | -21 | - | -14 |
| Electricity plants | - | - | - | - | - | -1219 | - | - | 1219 | - | - |
| CHP plants | -388 | - | -53 | -70 | - | - | - | - | 85 | 323 | -102 |
| Heat plants | - | - | - | - | - | - | - | - | - | - | - |
| Blast furnaces | - | - | - | - | - | - | - | - | - | - | - |
| Gas works | - | - | - | - | - | - | - | - | - | - | - |
| Coke/pat.fuel/BKB/PB plants | - | - | - | - | - | - | - | - | - | - | - |
| Oil refineries | - | -84 | 80 | - | - | - | - | - | - | - | -4 |
| Petrochemical plants | - | - | - | - | - | - | - | - | - | - | - |
| Liquefaction plants | - | - | - | - | - | - | - | - | - | - | - |
| Other transformation | - | - | -1 | - | - | - | - | - | - | - | -1 |
| Energy industry own use | - | - | -1 | -3 | - | - | - | - | -26 | -77 | -107 |
| Losses | - | - | -15 | -70 | - | - | - | - | -289 | - | -374 |
| **TFC** | **657** | **-** | **1584** | **213** | **-** | **-** | **-** | **4** | **825** | **247** | **3529** |
| **INDUSTRY** | **282** | **-** | **34** | **105** | **-** | **-** | **-** | **-** | **171** | **15** | **607** |
| Iron and steel | - | - | - | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | 2 | - | - | - | - | - | - | - | 2 |
| Non-ferrous metals | - | - | 2 | - | - | - | - | - | - | - | 2 |
| Non-metallic minerals | - | - | 1 | 15 | - | - | - | - | - | - | 16 |
| Transport equipment | - | - | - | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | 2 | - | - | - | - | - | - | 2 |
| Food and tobacco | - | - | 1 | - | - | - | - | - | - | - | 1 |
| Paper pulp and printing | - | - | - | - | - | - | - | - | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - | - | - | - |
| Construction | - | - | 14 | - | - | - | - | - | 4 | - | 18 |
| Textile and leather | - | - | 1 | 6 | - | - | - | - | - | - | 7 |
| Non-specified | 282 | - | 13 | 82 | - | - | - | - | 167 | 15 | 558 |
| **TRANSPORT** | **-** | **-** | **1327** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **1327** |
| Domestic aviation | - | - | - | - | - | - | - | - | - | - | - |
| Road | - | - | 1327 | - | - | - | - | - | - | - | 1327 |
| Rail | - | - | - | - | - | - | - | - | - | - | - |
| Pipeline transport | - | - | - | - | - | - | - | - | - | - | - |
| Domestic navigation | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - | - | - | - |
| **OTHER** | **375** | **-** | **142** | **107** | **-** | **-** | **-** | **4** | **654** | **232** | **1514** |
| Residential | - | - | 20 | 88 | - | - | - | - | 449 | 187 | 743 |
| Comm. and publ. services | - | - | - | - | - | - | - | - | 182 | 45 | 227 |
| Agriculture/forestry | - | - | 73 | 2 | - | - | - | - | 19 | - | 95 |
| Fishing | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | 375 | - | 49 | 18 | - | - | - | 4 | 4 | - | 449 |
| **NON-ENERGY USE** | **-** | **-** | **81** | **1** | **-** | **-** | **-** | **-** | **-** | **-** | **82** |
| in industry/transf./energy | - | - | 60 | 1 | - | - | - | - | - | - | 60 |
| *of which: chem./petrochem.* | - | - | - | - | - | - | - | - | - | - | - |
| in transport | - | - | - | - | - | - | - | - | - | - | - |
| in other | - | - | 21 | - | - | - | - | - | - | - | 21 |

**Electricity and Heat Output**

| | Coal | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Electr. generated - GWh** | **728** | **-** | **180** | **81** | **-** | **14179** | **-** | **-** | **-** | **-** | **15168** |
| *Electricity plants* | *-* | *-* | *-* | *-* | *-* | *14179* | *-* | *-* | *-* | *-* | *14179* |
| *CHP plants* | *728* | *-* | *180* | *81* | *-* | *-* | *-* | *-* | *-* | *-* | *989* |
| **Heat Generated - TJ** | **11484** | **-** | **-** | **2050** | **-** | **-** | **-** | **-** | **-** | **-** | **13534** |
| *CHP plants* | *11484* | *-* | *-* | *2050* | *-* | *-* | *-* | *-* | *-* | *-* | *13534* |
| *Heat plants* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* |

# Kyrgyzstan

## 2011

Thousand tonnes of oil equivalent

| SUPPLY AND CONSUMPTION | Coal | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Production | 301 | 77 | - | 22 | - | 1216 | - | 4 | - | - | 1620 |
| Imports | 458 | 14 | 1300 | 256 | - | - | - | - | 15 | - | 2043 |
| Exports | -13 | -2 | -105 | - | - | - | - | - | -245 | - | -365 |
| Intl. marine bunkers | - | - | - | - | - | - | - | - | - | - | - |
| Intl. aviation bunkers | - | - | -52 | - | - | - | - | - | - | - | -52 |
| Stock changes | - | 6 | 59 | - | - | - | - | - | - | - | 65 |
| **TPES** | **746** | **95** | **1201** | **278** | **-** | **1216** | **-** | **4** | **-230** | **-** | **3310** |
| Transfers | - | - | - | - | - | - | - | - | - | - | - |
| Statistical differences | - | -3 | -3 | - | - | - | - | - | -8 | - | -14 |
| Electricity plants | - | - | - | - | - | -1216 | - | - | 1216 | - | - |
| CHP plants | -360 | - | -66 | -54 | - | - | - | - | 88 | 320 | -73 |
| Heat plants | - | - | - | - | - | - | - | - | - | - | - |
| Blast furnaces | - | - | - | - | - | - | - | - | - | - | - |
| Gas works | - | - | - | - | - | - | - | - | - | - | - |
| Coke/pat.fuel/BKB/PB plants | - | - | - | - | - | - | - | - | - | - | - |
| Oil refineries | - | -92 | 89 | - | - | - | - | - | - | - | -3 |
| Petrochemical plants | - | - | - | - | - | - | - | - | - | - | - |
| Liquefaction plants | - | - | - | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - | - | - | - |
| Energy industry own use | - | - | - | - | - | - | - | - | -25 | -76 | -100 |
| Losses | - | - | -2 | -38 | - | - | - | - | -291 | - | -331 |
| **TFC** | **386** | **-** | **1219** | **186** | **-** | **-** | **-** | **4** | **749** | **244** | **2788** |
| **INDUSTRY** | **61** | **-** | **50** | **70** | **-** | **-** | **-** | **-** | **172** | **17** | **370** |
| Iron and steel | - | - | - | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | - | - | - | - | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - | - | - | - |
| Non-metallic minerals | - | - | - | - | - | - | - | - | - | - | - |
| Transport equipment | - | - | - | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - | - | - | - |
| Paper pulp and printing | - | - | - | - | - | - | - | - | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - | - | - | - |
| Construction | - | - | 7 | - | - | - | - | - | 5 | - | 13 |
| Textile and leather | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | 61 | - | 42 | 70 | - | - | - | - | 167 | 17 | 357 |
| **TRANSPORT** | **-** | **-** | **928** | **6** | **-** | **-** | **-** | **-** | **-** | **-** | **934** |
| Domestic aviation | - | - | - | - | - | - | - | - | - | - | - |
| Road | - | - | 928 | 6 | - | - | - | - | - | - | 934 |
| Rail | - | - | - | - | - | - | - | - | - | - | - |
| Pipeline transport | - | - | - | - | - | - | - | - | - | - | - |
| Domestic navigation | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - | - | - | - |
| **OTHER** | **325** | **-** | **162** | **109** | **-** | **-** | **-** | **4** | **577** | **227** | **1403** |
| Residential | - | - | 12 | 91 | - | - | - | - | 391 | 183 | 676 |
| Comm. and publ. services | - | - | - | - | - | - | - | - | 159 | 44 | 203 |
| Agriculture/forestry | - | - | 83 | - | - | - | - | - | 22 | - | 106 |
| Fishing | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | 325 | - | 67 | 18 | - | - | - | 4 | 5 | - | 418 |
| **NON-ENERGY USE** | **-** | **-** | **79** | **1** | **-** | **-** | **-** | **-** | **-** | **-** | **80** |
| in industry/transf./energy | - | - | 60 | 1 | - | - | - | - | - | - | 61 |
| *of which: chem./petrochem.* | - | - | - | - | - | - | - | - | - | - | - |
| in transport | - | - | - | - | - | - | - | - | - | - | - |
| in other | - | - | 19 | - | - | - | - | - | - | - | 19 |

**Electricity and Heat Output**

| | Coal | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Electr. generated - GWh** | **635** | **-** | **231** | **153** | **-** | **14139** | **-** | **-** | **-** | **-** | **15158** |
| *Electricity plants* | *-* | *-* | *-* | *-* | *-* | *14139* | *-* | *-* | *-* | *-* | *14139* |
| *CHP plants* | *635* | *-* | *231* | *153* | *-* | *-* | *-* | *-* | *-* | *-* | *1019* |
| **Heat Generated - TJ** | **11801** | **-** | **-** | **1588** | **-** | **-** | **-** | **-** | **-** | **-** | **13389** |
| *CHP plants* | *11801* | *-* | *-* | *1588* | *-* | *-* | *-* | *-* | *-* | *-* | *13389* |
| *Heat plants* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* |

# Moldova

## 2012

Thousand tonnes of oil equivalent

| SUPPLY AND CONSUMPTION | Coal | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Production | - | 11 | - | 0 | - | 23 | - | 90 | - | - | 124 |
| Imports | 105 | - | 763 | 2241 | - | - | - | 0 | 73 | - | 3182 |
| Exports | - | - | -26 | - | - | - | - | -1 | - | - | -26 |
| Intl. marine bunkers | - | - | - | - | - | - | - | - | - | - | - |
| Intl. aviation bunkers | - | - | -15 | - | - | - | - | - | - | - | -15 |
| Stock changes | 4 | - | 11 | -0 | - | - | - | -4 | - | - | 11 |
| **TPES** | **109** | **11** | **734** | **2241** | **-** | **23** | **-** | **86** | **73** | **-** | **3276** |
| Transfers | - | 6 | -6 | - | - | - | - | - | - | - | 1 |
| Statistical differences | -0 | - | 6 | - | - | - | - | - | - | - | 6 |
| Electricity plants | - | - | - | -1138 | - | -23 | - | - | 422 | - | -740 |
| CHP plants | - | - | -11 | -273 | - | - | - | - | 77 | 170 | -37 |
| Heat plants | -2 | - | -1 | -87 | - | - | - | -5 | - | 90 | -6 |
| Blast furnaces | - | - | - | - | - | - | - | - | - | - | - |
| Gas works | - | - | - | - | - | - | - | - | - | - | - |
| Coke/pat.fuel/BKB/PB plants | - | - | - | - | - | - | - | - | - | - | - |
| Oil refineries | - | -17 | 17 | - | - | - | - | - | - | - | 0 |
| Petrochemical plants | - | - | - | - | - | - | - | - | - | - | - |
| Liquefaction plants | - | - | - | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - | - | - | - |
| Energy industry own use | - | - | - | - | - | - | - | - | -45 | -0 | -46 |
| Losses | - | - | -3 | -39 | - | - | - | -0 | -108 | -42 | -192 |
| **TFC** | **107** | **-** | **736** | **703** | **-** | **-** | **-** | **80** | **418** | **218** | **2262** |
| **INDUSTRY** | **29** | **-** | **29** | **363** | **-** | **-** | **-** | **1** | **170** | **44** | **636** |
| Iron and steel | - | - | - | - | - | - | - | - | 0 | - | 0 |
| Chemical and petrochemical | - | - | - | 0 | - | - | - | - | 3 | 0 | 4 |
| Non-ferrous metals | - | - | - | - | - | - | - | - | - | - | - |
| Non-metallic minerals | 28 | - | 21 | 39 | - | - | - | - | 12 | 0 | 100 |
| Transport equipment | - | - | - | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | 0 | - | - | - | - | 4 | 0 | 5 |
| Mining and quarrying | - | - | 1 | - | - | - | - | - | 1 | - | 2 |
| Food and tobacco | 2 | - | 2 | 15 | - | - | - | 0 | 29 | 40 | 88 |
| Paper pulp and printing | - | - | - | 1 | - | - | - | - | 1 | 1 | 3 |
| Wood and wood products | - | - | - | 0 | - | - | - | 1 | 6 | 0 | 7 |
| Construction | - | - | 5 | 1 | - | - | - | - | 1 | - | 7 |
| Textile and leather | - | - | - | 0 | - | - | - | 0 | 3 | 2 | 6 |
| Non-specified | - | - | - | 306 | - | - | - | - | 108 | - | 414 |
| **TRANSPORT** | **-** | **-** | **348** | **2** | **-** | **-** | **-** | **-** | **5** | **-** | **354** |
| Domestic aviation | - | - | - | - | - | - | - | - | - | - | - |
| Road | - | - | 332 | 2 | - | - | - | - | - | - | 333 |
| Rail | - | - | 14 | - | - | - | - | - | - | - | 14 |
| Pipeline transport | - | - | - | - | - | - | - | - | 1 | - | 1 |
| Domestic navigation | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | - | - | 2 | - | - | - | - | - | 3 | - | 5 |
| **OTHER** | **78** | **-** | **305** | **338** | **-** | **-** | **-** | **79** | **244** | **174** | **1217** |
| Residential | 54 | - | 259 | 226 | - | - | - | 70 | 158 | 118 | 886 |
| Comm. and publ. services | 23 | - | 3 | 109 | - | - | - | 8 | 72 | 50 | 265 |
| Agriculture/forestry | - | - | 39 | 3 | - | - | - | 1 | 4 | 1 | 48 |
| Fishing | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | 1 | - | 3 | 1 | - | - | - | 0 | 9 | 4 | 18 |
| **NON-ENERGY USE** | **-** | **-** | **54** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **54** |
| in industry/transf./energy | - | - | 46 | - | - | - | - | - | - | - | 46 |
| *of which: chem./petrochem.* | *-* | *-* | *12* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *12* |
| in transport | - | - | 6 | - | - | - | - | - | - | - | 6 |
| in other | - | - | 2 | - | - | - | - | - | - | - | 2 |
| **Electricity and Heat Output** | | | | | | | | | | | |
| **Electr. generated - GWh** | **-** | **-** | **16** | **5517** | **-** | **269** | **-** | **-** | **-** | **-** | **5802** |
| *Electricity plants* | *-* | *-* | *2* | *4636* | *-* | *269* | *-* | *-* | *-* | *-* | *4907* |
| *CHP plants* | *-* | *-* | *14* | *881* | *-* | *-* | *-* | *-* | *-* | *-* | *895* |
| **Heat generated - TJ** | **52** | **-** | **405** | **10260** | **-** | **-** | **-** | **159** | **-** | **-** | **10876** |
| *CHP plants* | *-* | *-* | *364* | *6764* | *-* | *-* | *-* | *-* | *-* | *-* | *7128* |
| *Heat plants* | *52* | *-* | *41* | *3496* | *-* | *-* | *-* | *159* | *-* | *-* | *3748* |

# Moldova

## 2011

Thousand tonnes of oil equivalent

| SUPPLY AND CONSUMPTION | Coal | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Production | - | 13 | - | - | - | 30 | - | 79 | - | - | 123 |
| Imports | 103 | - | 828 | 2256 | - | - | - | 0 | 57 | - | 3244 |
| Exports | - | - | -15 | - | - | - | - | -0 | - | - | -15 |
| Intl. marine bunkers | - | - | - | - | - | - | - | - | - | - | - |
| Intl. aviation bunkers | - | - | -13 | - | - | - | - | - | - | - | -13 |
| Stock changes | -5 | -1 | -11 | -1 | - | - | - | 3 | - | - | -15 |
| **TPES** | **98** | **12** | **788** | **2255** | **-** | **30** | **-** | **83** | **57** | **-** | **3324** |
| Transfers | - | 9 | -8 | - | - | - | - | - | - | - | 1 |
| Statistical differences | - | - | 7 | - | - | - | - | -0 | - | 0 | 7 |
| Electricity plants | - | - | - | -1104 | - | -30 | - | - | 417 | - | -717 |
| CHP plants | - | - | -14 | -281 | - | - | - | - | 80 | 178 | -37 |
| Heat plants | -1 | - | -1 | -91 | - | - | - | -10 | - | 94 | -9 |
| Blast furnaces | - | - | - | - | - | - | - | - | - | - | - |
| Gas works | - | - | - | - | - | - | - | - | - | - | - |
| Coke/pat.fuel/BKB/PB plants | - | - | - | - | - | - | - | - | - | - | - |
| Oil refineries | - | -21 | 19 | - | - | - | - | - | - | - | -2 |
| Petrochemical plants | - | - | - | - | - | - | - | - | - | - | - |
| Liquefaction plants | - | - | - | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - | - | - | - |
| Energy industry own use | - | - | -1 | - | - | - | - | - | -48 | -0 | -49 |
| Losses | - | - | -3 | -41 | - | - | - | -0 | -105 | -40 | -189 |
| **TFC** | **96** | **-** | **786** | **739** | **-** | **-** | **-** | **73** | **403** | **232** | **2328** |
| **INDUSTRY** | **33** | **-** | **9** | **373** | **-** | **-** | **-** | **1** | **159** | **49** | **624** |
| Iron and steel | - | - | - | - | - | - | - | - | 0 | - | 0 |
| Chemical and petrochemical | - | - | - | 0 | - | - | - | - | 3 | 1 | 4 |
| Non-ferrous metals | - | - | - | - | - | - | - | - | - | - | - |
| Non-metallic minerals | 31 | - | 1 | 43 | - | - | - | - | 14 | 0 | 89 |
| Transport equipment | - | - | - | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | 1 | - | - | - | 0 | 4 | 0 | 5 |
| Mining and quarrying | - | - | 1 | - | - | - | - | - | 1 | - | 2 |
| Food and tobacco | 2 | - | 2 | 14 | - | - | - | 0 | 26 | 43 | 87 |
| Paper pulp and printing | - | - | - | 1 | - | - | - | - | 1 | 1 | 3 |
| Wood and wood products | - | - | - | 0 | - | - | - | 1 | 6 | 0 | 7 |
| Construction | - | - | 5 | 1 | - | - | - | - | 1 | 0 | 7 |
| Textile and leather | - | - | - | 1 | - | - | - | 0 | 3 | 2 | 6 |
| Non-specified | - | - | - | 314 | - | - | - | - | 100 | - | 414 |
| **TRANSPORT** | **-** | **-** | **364** | **2** | **-** | **-** | **-** | **-** | **4** | **-** | **370** |
| Domestic aviation | - | - | - | - | - | - | - | - | - | - | - |
| Road | - | - | 351 | 2 | - | - | - | - | - | - | 352 |
| Rail | - | - | 13 | - | - | - | - | - | - | - | 13 |
| Pipeline transport | - | - | - | - | - | - | - | - | 1 | - | 1 |
| Domestic navigation | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - | 4 | - | 4 |
| **OTHER** | **63** | **-** | **377** | **364** | **-** | **-** | **-** | **72** | **239** | **183** | **1298** |
| Residential | 42 | - | 320 | 251 | - | - | - | 64 | 156 | 128 | 961 |
| Comm. and publ. services | 17 | - | 5 | 109 | - | - | - | 6 | 71 | 48 | 257 |
| Agriculture/forestry | - | - | 42 | 2 | - | - | - | 1 | 5 | 1 | 50 |
| Fishing | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | 4 | - | 10 | 2 | - | - | - | 0 | 8 | 5 | 30 |
| **NON-ENERGY USE** | **-** | **-** | **36** | **0** | **-** | **-** | **-** | **-** | **-** | **-** | **36** |
| in industry/transf./energy | - | - | 9 | - | - | - | - | - | - | - | 9 |
| *of which: chem./petrochem.* | *-* | *-* | *9* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *9* |
| in transport | - | - | 6 | - | - | - | - | - | - | - | 6 |
| in other | - | - | 22 | 0 | - | - | - | - | - | - | 22 |
| **Electricity and Heat Output** | | | | | | | | | | | |
| **Electr. generated - GWh** | **-** | **-** | **20** | **5414** | **-** | **352** | **-** | **-** | **-** | **-** | **5786** |
| *Electricity plants* | *-* | *-* | *3* | *4496* | *-* | *352* | *-* | *-* | *-* | *-* | *4851* |
| *CHP plants* | *-* | *-* | *17* | *918* | *-* | *-* | *-* | *-* | *-* | *-* | *935* |
| **Heat generated - TJ** | **48** | **-** | **563** | **10633** | **-** | **-** | **-** | **158** | **-** | **-** | **11402** |
| *CHP plants* | *-* | *-* | *507* | *6952* | *-* | *-* | *-* | *-* | *-* | *-* | *7459* |
| *Heat plants* | *48* | *-* | *56* | *3681* | *-* | *-* | *-* | *158* | *-* | *-* | *3943* |

# Tajikistan

## 2012

Thousand tonnes of oil equivalent

| SUPPLY AND CONSUMPTION | Coal | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Production | 180 | 30 | - | 9 | - | 1453 | - | - | - | - | 1672 |
| Imports | 11 | - | 594 | 109 | - | - | - | - | 10 | - | 723 |
| Exports | -1 | -5 | -22 | - | - | - | - | - | -67 | - | -95 |
| Intl. marine bunkers | - | - | - | - | - | - | - | - | - | - | - |
| Intl. aviation bunkers | - | - | -34 | - | - | - | - | - | - | - | -34 |
| Stock changes | - | - | - | - | - | - | - | - | - | - | - |
| **TPES** | **190** | **25** | **538** | **118** | **-** | **1453** | **-** | **-** | **-57** | **-** | **2267** |
| Transfers | - | - | - | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | - | - | 14 | - | 14 |
| Electricity plants | - | - | - | - | - | -1453 | - | - | 1453 | - | - |
| CHP plants | - | - | - | -20 | - | - | - | - | 6 | 10 | -4 |
| Heat plants | - | - | - | - | - | - | - | - | - | - | - |
| Blast furnaces | - | - | - | - | - | - | - | - | - | - | - |
| Gas works | - | - | - | - | - | - | - | - | - | - | - |
| Coke/pat.fuel/BKB/PB plants | - | - | - | - | - | - | - | - | - | - | - |
| Oil refineries | - | -25 | 22 | - | - | - | - | - | - | - | -3 |
| Petrochemical plants | - | - | - | - | - | - | - | - | - | - | - |
| Liquefaction plants | - | - | - | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - | - | - | - |
| Energy industry own use | - | - | - | - | - | - | - | - | -14 | - | -14 |
| Losses | - | - | - | - | - | - | - | - | -210 | - | -210 |
| **TFC** | **190** | **-** | **560** | **98** | **-** | **-** | **-** | **-** | **1193** | **10** | **2049** |
| **INDUSTRY** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **546** | **-** | **546** |
| Iron and steel | - | - | - | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | - | - | 14 | - | 14 |
| Non-ferrous metals | - | - | - | - | - | - | - | - | 497 | - | 497 |
| Non-metallic minerals | - | - | - | - | - | - | - | - | - | - | - |
| Transport equipment | - | - | - | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - | 3 | - | 3 |
| Mining and quarrying | - | - | - | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - | 7 | - | 7 |
| Paper pulp and printing | - | - | - | - | - | - | - | - | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - | 5 | - | 5 |
| Textile and leather | - | - | - | - | - | - | - | - | 19 | - | 19 |
| Non-specified | - | - | - | - | - | - | - | - | - | - | - |
| **TRANSPORT** | **-** | **-** | **96** | **11** | **-** | **-** | **-** | **-** | **3** | **-** | **110** |
| Domestic aviation | - | - | - | - | - | - | - | - | - | - | - |
| Road | - | - | 96 | 11 | - | - | - | - | - | - | 107 |
| Rail | - | - | - | - | - | - | - | - | 3 | - | 3 |
| Pipeline transport | - | - | - | - | - | - | - | - | - | - | - |
| Domestic navigation | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - | - | - | - |
| **OTHER** | **190** | **-** | **463** | **86** | **-** | **-** | **-** | **-** | **644** | **10** | **1392** |
| Residential | - | - | - | - | - | - | - | - | 229 | - | 229 |
| Comm. and publ. services | - | - | - | - | - | - | - | - | 85 | - | 85 |
| Agriculture/forestry | - | - | - | - | - | - | - | - | 330 | - | 330 |
| Fishing | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | 190 | - | 463 | 86 | - | - | - | - | - | 10 | 749 |
| **NON-ENERGY USE** | **-** | **-** | **1** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **1** |
| in industry/transf./energy | - | - | - | - | - | - | - | - | - | - | - |
| *of which: chem./petrochem.* | - | - | - | - | - | - | - | - | - | - | - |
| in transport | - | - | - | - | - | - | - | - | - | - | - |
| in other | - | - | 1 | - | - | - | - | - | - | - | 1 |
| **Electricity and Heat Output** | | | | | | | | | | | |
| **Electr. generated - GWh** | **-** | **-** | **-** | **74** | **-** | **16900** | **-** | **-** | **-** | **-** | **16974** |
| *Electricity plants* | *-* | *-* | *-* | *-* | *-* | *16900* | *-* | *-* | *-* | *-* | *16900* |
| *CHP plants* | *-* | *-* | *-* | *74* | *-* | *-* | *-* | *-* | *-* | *-* | *74* |
| **Heat Generated - TJ** | **-** | **-** | **-** | **405** | **-** | **-** | **-** | **-** | **-** | **-** | **405** |
| *CHP plants* | *-* | *-* | *-* | *405* | *-* | *-* | *-* | *-* | *-* | *-* | *405* |
| *Heat plants* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* |

# Tajikistan

## 2011

Thousand tonnes of oil equivalent

| SUPPLY AND CONSUMPTION | Coal | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Production | 102 | 28 | - | 15 | - | 1393 | - | - | - | - | 1538 |
| Imports | 7 | - | 559 | 147 | - | - | - | - | 15 | - | 727 |
| Exports | -10 | -5 | -20 | - | - | - | - | - | -17 | - | -52 |
| Intl. marine bunkers | - | - | - | - | - | - | - | - | - | - | - |
| Intl. aviation bunkers | - | - | -32 | - | - | - | - | - | - | - | -32 |
| Stock changes | - | - | - | - | - | - | - | - | - | - | - |
| **TPES** | **99** | **23** | **507** | **162** | **-** | **1393** | **-** | **-** | **-2** | **-** | **2182** |
| Transfers | - | - | - | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | - | - | 5 | - | 5 |
| Electricity plants | - | - | - | - | - | -1393 | - | - | 1393 | - | - |
| CHP plants | - | - | - | -16 | - | - | - | - | 3 | 9 | -3 |
| Heat plants | - | - | - | - | - | - | - | - | - | - | - |
| Blast furnaces | - | - | - | - | - | - | - | - | - | - | - |
| Gas works | - | - | - | - | - | - | - | - | - | - | - |
| Coke/pat.fuel/BKB/PB plants | - | - | - | - | - | - | - | - | - | - | - |
| Oil refineries | - | -23 | 20 | - | - | - | - | - | - | - | -3 |
| Petrochemical plants | - | - | - | - | - | - | - | - | - | - | - |
| Liquefaction plants | - | - | - | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - | - | - | - |
| Energy industry own use | - | - | - | - | - | - | - | - | -13 | - | -13 |
| Losses | - | - | - | - | - | - | - | - | -195 | - | -195 |
| **TFC** | **99** | **-** | **527** | **146** | **-** | **-** | **-** | **-** | **1190** | **9** | **1972** |
| **INDUSTRY** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **555** | **-** | **555** |
| Iron and steel | - | - | - | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | - | - | 14 | - | 14 |
| Non-ferrous metals | - | - | - | - | - | - | - | - | 505 | - | 505 |
| Non-metallic minerals | - | - | - | - | - | - | - | - | - | - | - |
| Transport equipment | - | - | - | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - | 3 | - | 3 |
| Mining and quarrying | - | - | - | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - | 8 | - | 8 |
| Paper pulp and printing | - | - | - | - | - | - | - | - | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - | 6 | - | 6 |
| Textile and leather | - | - | - | - | - | - | - | - | 19 | - | 19 |
| Non-specified | - | - | - | - | - | - | - | - | - | - | - |
| **TRANSPORT** | **-** | **-** | **89** | **11** | **-** | **-** | **-** | **-** | **14** | **-** | **115** |
| Domestic aviation | - | - | - | - | - | - | - | - | - | - | - |
| Road | - | - | 89 | 11 | - | - | - | - | - | - | 101 |
| Rail | - | - | - | - | - | - | - | - | 14 | - | 14 |
| Pipeline transport | - | - | - | - | - | - | - | - | - | - | - |
| Domestic navigation | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - | - | - | - |
| **OTHER** | **99** | **-** | **437** | **135** | **-** | **-** | **-** | **-** | **622** | **9** | **1302** |
| Residential | - | - | - | - | - | - | - | - | 257 | - | 257 |
| Comm. and publ. services | - | - | - | - | - | - | - | - | 43 | - | 43 |
| Agriculture/forestry | - | - | - | - | - | - | - | - | 322 | - | 322 |
| Fishing | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | 99 | - | 437 | 135 | - | - | - | - | - | 9 | 680 |
| **NON-ENERGY USE** | **-** | **-** | **1** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **1** |
| in industry/transf./energy | - | - | - | - | - | - | - | - | - | - | - |
| *of which: chem./petrochem.* | - | - | - | - | - | - | - | - | - | - | - |
| in transport | - | - | - | - | - | - | - | - | - | - | - |
| in other | - | - | 1 | - | - | - | - | - | - | - | 1 |

**Electricity and Heat Output**

| | Coal | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Electr. generated - GWh** | **-** | **-** | **-** | **38** | **-** | **16200** | **-** | **-** | **-** | **-** | **16238** |
| *Electricity plants* | - | - | - | - | - | *16200* | - | - | - | - | *16200* |
| *CHP plants* | - | - | - | *38* | - | - | - | - | - | - | *38* |
| **Heat Generated - TJ** | **-** | **-** | **-** | **387** | **-** | **-** | **-** | **-** | **-** | **-** | **387** |
| *CHP plants* | - | - | - | *387* | - | - | - | - | - | - | *387* |
| *Heat plants* | - | - | - | - | - | - | - | - | - | - | - |

# Turkmenistan

## 2012

Thousand tonnes of oil equivalent

| SUPPLY AND CONSUMPTION | Coal | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Production | - | 11805 | - | 56223 | - | - | - | - | - | - | 68028 |
| Imports | - | - | - | - | - | - | - | - | - | - | - |
| Exports | - | -3115 | -2147 | -36536 | - | - | - | - | -234 | - | -42032 |
| Intl. marine bunkers | - | - | - | - | - | - | - | - | - | - | - |
| Intl. aviation bunkers | - | - | -426 | - | - | - | - | - | - | - | -426 |
| Stock changes | - | - | - | - | - | - | - | - | - | - | - |
| **TPES** | **-** | **8690** | **-2573** | **19687** | **-** | **-** | **-** | **-** | **-234** | **-** | **25570** |
| Transfers | - | -615 | 675 | - | - | - | - | - | - | - | 60 |
| Statistical differences | - | - | - | - | - | - | - | - | -1 | - | -1 |
| Electricity plants | - | - | - | - | - | - | - | - | - | - | - |
| CHP plants | - | - | - | -7722 | - | - | - | - | 1527 | 205 | -5991 |
| Heat plants | - | - | - | - | - | - | - | - | - | - | - |
| Blast furnaces | - | - | - | - | - | - | - | - | - | - | - |
| Gas works | - | - | - | - | - | - | - | - | - | - | - |
| Coke/pat.fuel/BKB/PB plants | - | - | - | - | - | - | - | - | - | - | - |
| Oil refineries | - | -8075 | 7894 | - | - | - | - | - | - | - | -181 |
| Petrochemical plants | - | - | - | - | - | - | - | - | - | - | - |
| Liquefaction plants | - | - | - | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - | - | - | - |
| Energy industry own use | - | - | -166 | -2060 | - | - | - | - | -267 | - | -2492 |
| Losses | - | - | - | - | - | - | - | - | -191 | - | -191 |
| **TFC** | **-** | **-** | **5830** | **9905** | **-** | **-** | **-** | **-** | **834** | **205** | **16774** |
| **INDUSTRY** | **-** | **-** | **1094** | **910** | **-** | **-** | **-** | **-** | **301** | **-** | **2304** |
| Iron and steel | - | - | - | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | - | - | 98 | - | 98 |
| Non-ferrous metals | - | - | - | - | - | - | - | - | - | - | - |
| Non-metallic minerals | - | - | - | - | - | - | - | - | - | - | - |
| Transport equipment | - | - | - | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - | - | - | - |
| Paper pulp and printing | - | - | - | - | - | - | - | - | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | - | - | 1094 | 910 | - | - | - | - | 203 | - | 2206 |
| **TRANSPORT** | **-** | **-** | **1218** | **1472** | **-** | **-** | **-** | **-** | **22** | **-** | **2711** |
| Domestic aviation | - | - | - | - | - | - | - | - | - | - | - |
| Road | - | - | 1218 | - | - | - | - | - | - | - | 1218 |
| Rail | - | - | - | - | - | - | - | - | 22 | - | 22 |
| Pipeline transport | - | - | - | 1472 | - | - | - | - | - | - | 1472 |
| Domestic navigation | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - | - | - | - |
| **OTHER** | **-** | **-** | **3519** | **7524** | **-** | **-** | **-** | **-** | **511** | **205** | **11758** |
| Residential | - | - | - | - | - | - | - | - | 175 | - | 175 |
| Comm. and publ. services | - | - | - | 6930 | - | - | - | - | - | - | 6930 |
| Agriculture/forestry | - | - | - | - | - | - | - | - | 265 | - | 265 |
| Fishing | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | - | - | 3519 | 594 | - | - | - | - | 71 | 205 | 4388 |
| **NON-ENERGY USE** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| in industry/transf./energy | - | - | - | - | - | - | - | - | - | - | - |
| *of which: chem./petrochem.* | - | - | - | - | - | - | - | - | - | - | - |
| in transport | - | - | - | - | - | - | - | - | - | - | - |
| in other | - | - | - | - | - | - | - | - | - | - | - |

**Electricity and Heat Output**

| | Coal | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Electr. generated - GWh** | **-** | **-** | **-** | **17750** | **-** | **-** | **-** | **-** | **-** | **-** | **17750** |
| *Electricity plants* | - | - | - | - | - | - | - | - | - | - | - |
| *CHP plants* | - | - | - | *17750* | - | - | - | - | - | - | *17750* |
| **Heat Generated - TJ** | **-** | **-** | **-** | **8567** | **-** | **-** | **-** | **-** | **-** | **-** | **8567** |
| *CHP plants* | - | - | - | *8567* | - | - | - | - | - | - | *8567* |
| *Heat plants* | - | - | - | - | - | - | - | - | - | - | - |

# Turkmenistan

## 2011

Thousand tonnes of oil equivalent

| SUPPLY AND CONSUMPTION | Coal | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Production | - | 11334 | - | 53910 | - | - | - | - | - | - | 65245 |
| Imports | - | - | - | - | - | - | - | - | - | - | - |
| Exports | - | -2311 | -2688 | -34823 | - | - | - | - | -219 | - | -40042 |
| Intl. marine bunkers | - | - | - | - | - | - | - | - | - | - | - |
| Intl. aviation bunkers | - | - | -493 | - | - | - | - | - | - | - | -493 |
| Stock changes | - | - | - | - | - | - | - | - | - | - | - |
| **TPES** | **-** | **9023** | **-3181** | **19087** | **-** | **-** | **-** | **-** | **-219** | **-** | **24710** |
| Transfers | - | -549 | 602 | - | - | - | - | - | - | - | 54 |
| Statistical differences | - | - | - | - | - | - | - | - | - | - | - |
| Electricity plants | - | - | - | - | - | - | - | - | - | - | - |
| CHP plants | - | - | - | -7467 | - | - | - | - | 1481 | 198 | -5787 |
| Heat plants | - | - | - | - | - | - | - | - | - | - | - |
| Blast furnaces | - | - | - | - | - | - | - | - | - | - | - |
| Gas works | - | - | - | - | - | - | - | - | - | - | - |
| Coke/pat.fuel/BKB/PB plants | - | - | - | - | - | - | - | - | - | - | - |
| Oil refineries | - | -8474 | 8289 | - | - | - | - | - | - | - | -185 |
| Petrochemical plants | - | - | - | - | - | - | - | - | - | - | - |
| Liquefaction plants | - | - | - | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - | - | - | - |
| Energy industry own use | - | - | -177 | -2054 | - | - | - | - | -260 | - | -2491 |
| Losses | - | - | - | - | - | - | - | - | -188 | - | -188 |
| **TFC** | **-** | **-** | **5533** | **9566** | **-** | **-** | **-** | **-** | **814** | **198** | **16112** |
| **INDUSTRY** | **-** | **-** | **890** | **818** | **-** | **-** | **-** | **-** | **294** | **-** | **2002** |
| Iron and steel | - | - | - | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | - | - | 95 | - | 95 |
| Non-ferrous metals | - | - | - | - | - | - | - | - | - | - | - |
| Non-metallic minerals | - | - | - | - | - | - | - | - | - | - | - |
| Transport equipment | - | - | - | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - | - | - | - |
| Paper pulp and printing | - | - | - | - | - | - | - | - | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | - | - | 890 | 818 | - | - | - | - | 198 | - | 1906 |
| **TRANSPORT** | **-** | **-** | **1291** | **1474** | **-** | **-** | **-** | **-** | **21** | **-** | **2785** |
| Domestic aviation | - | - | - | - | - | - | - | - | - | - | - |
| Road | - | - | 1291 | - | - | - | - | - | - | - | 1291 |
| Rail | - | - | - | - | - | - | - | - | 21 | - | 21 |
| Pipeline transport | - | - | - | 1474 | - | - | - | - | - | - | 1474 |
| Domestic navigation | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - | - | - | - |
| **OTHER** | **-** | **-** | **3353** | **7275** | **-** | **-** | **-** | **-** | **499** | **198** | **11325** |
| Residential | - | - | - | - | - | - | - | - | 171 | - | 171 |
| Comm. and publ. services | - | - | - | 6701 | - | - | - | - | - | - | 6701 |
| Agriculture/forestry | - | - | - | - | - | - | - | - | 259 | - | 259 |
| Fishing | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | - | - | 3353 | 574 | - | - | - | - | 69 | 198 | 4195 |
| **NON-ENERGY USE** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| in industry/transf./energy | - | - | - | - | - | - | - | - | - | - | - |
| *of which: chem./petrochem.* | - | - | - | - | - | - | - | - | - | - | - |
| in transport | - | - | - | - | - | - | - | - | - | - | - |
| in other | - | - | - | - | - | - | - | - | - | - | - |

**Electricity and Heat Output**

| | Coal | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Electr. generated - GWh** | **-** | **-** | **-** | **17220** | **-** | **-** | **-** | **-** | **-** | **-** | **17220** |
| *Electricity plants* | - | - | - | - | - | - | - | - | - | - | - |
| *CHP plants* | - | - | - | *17220* | - | - | - | - | - | - | *17220* |
| **Heat Generated - TJ** | **-** | **-** | **-** | **8311** | **-** | **-** | **-** | **-** | **-** | **-** | **8311** |
| *CHP plants* | - | - | - | *8311* | - | - | - | - | - | - | *8311* |
| *Heat plants* | - | - | - | - | - | - | - | - | - | - | - |

# Ukraine

## 2012

| SUPPLY AND CONSUMPTION | Coal* | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Thousand tonnes of oil equivalent | | | | | | | | | | |
| Production | 40256 | 3414 | - | 15403 | 23653 | 901 | 53 | 1738 | - | - | 85420 |
| Imports | 9926 | 1625 | 8370 | 26590 | - | - | - | 1 | 8 | - | 46520 |
| Exports | -5192 | -66 | -1679 | - | - | - | - | -75 | -994 | - | -8007 |
| Intl. marine bunkers | - | - | - | - | - | - | - | - | - | - | - |
| Intl. aviation bunkers | - | - | -306 | - | - | - | - | - | - | - | -306 |
| Stock changes | -2272 | 77 | 174 | 1024 | - | - | - | 31 | - | - | -966 |
| **TPES** | **42718** | **5050** | **6559** | **43018** | **23653** | **901** | **53** | **1695** | **-987** | **-** | **122661** |
| Transfers | - | 304 | -269 | - | - | - | - | - | - | - | 35 |
| Statistical differences | 7 | -192 | 1187 | -242 | - | - | - | - | - | -74 | 687 |
| Electricity plants | -20422 | - | -73 | -396 | -23490 | -901 | -53 | -26 | 15580 | - | -29782 |
| CHP plants | -2300 | - | -88 | -5802 | -163 | - | - | -404 | 1479 | 4949 | -2329 |
| Heat plants | -1017 | - | -93 | -8569 | - | - | - | -50 | - | 9366 | -364 |
| Blast furnaces | -4578 | - | - | - | - | - | - | - | - | - | -4578 |
| Gas works | -10 | - | - | - | - | - | - | - | - | - | -10 |
| Coke/pat.fuel/BKB/PB plants | -2747 | - | - | - | - | - | - | - | - | - | -2747 |
| Oil refineries | - | -5176 | 5346 | - | - | - | - | - | - | - | 170 |
| Petrochemical plants | - | - | - | - | - | - | - | - | - | - | - |
| Liquefaction plants | - | - | - | - | - | - | - | - | - | - | - |
| Other transformation | -58 | 36 | - | - | - | - | - | -185 | - | - | -207 |
| Energy industry own use | -1769 | -3 | -413 | -920 | - | - | - | -0 | -2391 | -1513 | -7009 |
| Losses | -219 | -10 | -2 | -483 | - | - | - | - | -1842 | -862 | -3419 |
| **TFC** | **9604** | **9** | **12154** | **26605** | **-** | **-** | **-** | **1030** | **11839** | **11865** | **73107** |
| **INDUSTRY** | **8310** | **-** | **1246** | **5272** | **-** | **-** | **-** | **46** | **5427** | **4543** | **24845** |
| Iron and steel | 6843 | - | 178 | 3132 | - | - | - | - | 2029 | 1130 | 13312 |
| Chemical and petrochemical | 59 | - | 114 | 395 | - | - | - | 2 | 489 | 1361 | 2420 |
| Non-ferrous metals | 13 | - | 5 | 136 | - | - | - | - | 86 | 246 | 486 |
| Non-metallic minerals | 606 | - | 75 | 556 | - | - | - | 19 | 239 | 78 | 1573 |
| Transport equipment | 1 | - | 30 | 137 | - | - | - | 0 | 174 | 112 | 454 |
| Machinery | 28 | - | 41 | 219 | - | - | - | 1 | 369 | 159 | 816 |
| Mining and quarrying | 7 | - | 316 | 335 | - | - | - | - | 871 | 90 | 1620 |
| Food and tobacco | 35 | - | 156 | 274 | - | - | - | 9 | 398 | 1051 | 1921 |
| Paper pulp and printing | - | - | 8 | 26 | - | - | - | 0 | 95 | 156 | 285 |
| Wood and wood products | - | - | 14 | 19 | - | - | - | 15 | 55 | 64 | 166 |
| Construction | 4 | - | 262 | 31 | - | - | - | 1 | 87 | 26 | 411 |
| Textile and leather | - | - | 3 | 8 | - | - | - | - | 34 | 29 | 74 |
| Non-specified | 714 | - | 45 | 5 | - | - | - | 1 | 500 | 41 | 1306 |
| **TRANSPORT** | **12** | **-** | **8588** | **2050** | **-** | **-** | **-** | **-** | **798** | **-** | **11448** |
| Domestic aviation | - | - | 12 | - | - | - | - | - | - | - | 12 |
| Road | - | - | 8394 | 44 | - | - | - | - | - | - | 8438 |
| Rail | 11 | - | 124 | - | - | - | - | - | 618 | - | 753 |
| Pipeline transport | - | - | 6 | 2003 | - | - | - | - | 80 | - | 2089 |
| Domestic navigation | - | - | 50 | - | - | - | - | - | - | - | 50 |
| Non-specified | 1 | - | 1 | 3 | - | - | - | - | 99 | - | 105 |
| **OTHER** | **890** | **-** | **1512** | **14375** | **-** | **-** | **-** | **984** | **5615** | **7322** | **30698** |
| Residential | 715 | - | 71 | 13760 | - | - | - | 936 | 3303 | 4682 | 23466 |
| Comm. and publ. services | 161 | - | 78 | 463 | - | - | - | 27 | 1980 | 2328 | 5037 |
| Agriculture/forestry | 14 | - | 1356 | 153 | - | - | - | 20 | 329 | 312 | 2184 |
| Fishing | - | - | 8 | 0 | - | - | - | - | 3 | 0 | 11 |
| Non-specified | - | - | - | - | - | - | - | - | - | - | - |
| **NON-ENERGY USE** | **391** | **9** | **808** | **4908** | **-** | **-** | **-** | **-** | **-** | **-** | **6116** |
| in industry/transf./energy | 391 | 9 | 707 | 4908 | - | - | - | - | - | - | 6015 |
| *of which: chem./petrochem.* | *44* | *-* | *182* | *4832* | *-* | *-* | *-* | *-* | *-* | *-* | *5058* |
| in transport | - | - | 25 | - | - | - | - | - | - | - | 25 |
| in other | - | - | 76 | - | - | - | - | - | - | - | 76 |
| | **Electricity and Heat Output** | | | | | | | | | | |
| **Electr. generated - GWh** | **80418** | **-** | **535** | **16039** | **90137** | **10479** | **621** | **134** | **-** | **-** | **198363** |
| *Electricity plants* | *77740* | *-* | *282* | *1794* | *90137* | *10479* | *621* | *111* | *-* | *-* | *181164* |
| *CHP plants* | *2678* | *-* | *253* | *14245* | *-* | *-* | *-* | *23* | *-* | *-* | *17199* |
| **Heat generated - TJ** | **91424** | **-** | **4943** | **486272** | **6805** | **-** | **-** | **9985** | **-** | **-** | **599429** |
| *CHP plants* | *52699* | *-* | *1508* | *137591* | *6805* | *-* | *-* | *8635* | *-* | *-* | *207238* |
| *Heat plants* | *38725* | *-* | *3435* | *348681* | *-* | *-* | *-* | *1350* | *-* | *-* | *392191* |

* The column of coal also includes peat.

# Ukraine

## 2011

Thousand tonnes of oil equivalent

| SUPPLY AND CONSUMPTION | Coal* | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Production | 40345 | 3407 | - | 15528 | 23672 | 941 | 10 | 1763 | - | - | 85668 |
| Imports | 8340 | 5783 | 7750 | 36179 | - | - | - | - | 3 | - | 58055 |
| Exports | -5587 | - | -4172 | - | - | - | - | -65 | -544 | - | -10368 |
| Intl. marine bunkers | - | - | - | - | - | - | - | - | - | - | - |
| Intl. aviation bunkers | - | - | -246 | - | - | - | - | - | - | - | -246 |
| Stock changes | -1607 | -90 | 29 | -4865 | - | - | - | -17 | - | - | -6551 |
| **TPES** | **41490** | **9100** | **3360** | **46842** | **23672** | **941** | **10** | **1682** | **-541** | **-** | **126557** |
| Transfers | - | 530 | -471 | - | - | - | - | - | - | - | 59 |
| Statistical differences | -0 | 180 | 368 | -6 | - | - | - | - | - | -158 | 384 |
| Electricity plants | -19115 | - | -88 | -419 | -23519 | -941 | -10 | -30 | 15132 | - | -28990 |
| CHP plants | -2050 | - | -128 | -6440 | -153 | - | - | -374 | 1633 | 4662 | -2850 |
| Heat plants | -1096 | - | -94 | -9224 | - | - | - | -47 | - | 9867 | -594 |
| Blast furnaces | -4865 | - | - | - | - | - | - | - | - | - | -4865 |
| Gas works | -12 | -2 | - | - | - | - | - | - | - | - | -14 |
| Coke/pat.fuel/BKB/PB plants | -2893 | - | - | - | - | - | - | - | - | - | -2893 |
| Oil refineries | - | -9828 | 9856 | - | - | - | - | - | - | - | 27 |
| Petrochemical plants | - | - | - | - | - | - | - | - | - | - | - |
| Liquefaction plants | - | - | - | - | - | - | - | - | - | - | - |
| Other transformation | -69 | 42 | - | - | - | - | - | -190 | - | - | -217 |
| Energy industry own use | -1767 | -1 | -561 | -885 | - | - | - | -1 | -2373 | -1571 | -7159 |
| Losses | -221 | -10 | -4 | -680 | - | - | - | - | -1828 | -849 | -3593 |
| **TFC** | **9402** | **11** | **12237** | **29188** | **-** | **-** | **-** | **1040** | **12023** | **11951** | **75852** |
| **INDUSTRY** | **7928** | **-** | **1403** | **6572** | **-** | **-** | **-** | **44** | **5409** | **4880** | **26236** |
| Iron and steel | 6524 | - | 219 | 4135 | - | - | - | - | 2081 | 1204 | 14162 |
| Chemical and petrochemical | 73 | - | 174 | 452 | - | - | - | 1 | 505 | 1478 | 2684 |
| Non-ferrous metals | 24 | - | 7 | 210 | - | - | - | - | 146 | 281 | 669 |
| Non-metallic minerals | 819 | - | 77 | 737 | - | - | - | 21 | 265 | 91 | 2009 |
| Transport equipment | 1 | - | 23 | 67 | - | - | - | 0 | 128 | 109 | 329 |
| Machinery | 4 | - | 44 | 233 | - | - | - | 1 | 376 | 172 | 829 |
| Mining and quarrying | 19 | - | 314 | 377 | - | - | - | - | 875 | 98 | 1684 |
| Food and tobacco | 41 | - | 138 | 268 | - | - | - | 4 | 384 | 1103 | 1938 |
| Paper pulp and printing | 1 | - | 9 | 26 | - | - | - | 0 | 97 | 160 | 293 |
| Wood and wood products | - | - | 13 | 23 | - | - | - | 15 | 53 | 83 | 187 |
| Construction | 7 | - | 296 | 35 | - | - | - | 1 | 95 | 73 | 507 |
| Textile and leather | - | - | 2 | 9 | - | - | - | - | 37 | 27 | 75 |
| Non-specified | 417 | - | 85 | - | - | - | - | 2 | 368 | - | 872 |
| **TRANSPORT** | **26** | **-** | **8422** | **3312** | **-** | **-** | **-** | **-** | **850** | **-** | **12611** |
| Domestic aviation | - | - | 14 | - | - | - | - | - | - | - | 14 |
| Road | - | - | 8175 | 44 | - | - | - | - | - | - | 8219 |
| Rail | 26 | - | 173 | - | - | - | - | - | 638 | - | 837 |
| Pipeline transport | - | - | 7 | 3262 | - | - | - | - | 106 | - | 3375 |
| Domestic navigation | - | - | 52 | - | - | - | - | - | - | - | 52 |
| Non-specified | 1 | - | - | 6 | - | - | - | - | 106 | - | 113 |
| **OTHER** | **892** | **-** | **1599** | **14659** | **-** | **-** | **-** | **995** | **5764** | **7071** | **30980** |
| Residential | 708 | - | 84 | 14060 | - | - | - | 937 | 3308 | 4507 | 23604 |
| Comm. and publ. services | 167 | - | 121 | 423 | - | - | - | 42 | 2148 | 2228 | 5129 |
| Agriculture/forestry | 16 | - | 1386 | 177 | - | - | - | 16 | 305 | 336 | 2236 |
| Fishing | - | - | 7 | 0 | - | - | - | - | 3 | 0 | 10 |
| Non-specified | - | - | - | - | - | - | - | - | - | - | - |
| **NON-ENERGY USE** | **556** | **11** | **814** | **4645** | **-** | **-** | **-** | **-** | **-** | **-** | **6025** |
| in industry/transf./energy | 556 | 11 | 725 | 4645 | - | - | - | - | - | - | 5936 |
| *of which: chem./petrochem.* | *48* | *-* | *95* | *4575* | *-* | *-* | *-* | *-* | *-* | *-* | *4718* |
| in transport | - | - | 36 | - | - | - | - | - | - | - | 36 |
| in other | - | - | 53 | - | - | - | - | - | - | - | 53 |

**Electricity and Heat Output**

| | Coal* | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Electr. generated - GWh** | **74494** | **-** | **555** | **18451** | **90248** | **10946** | **119** | **134** | **-** | **-** | **194947** |
| *Electricity plants* | *72289* | *-* | *335* | *1894* | *90248* | *10946* | *119* | *122* | *-* | *-* | *175953* |
| *CHP plants* | *2205* | *-* | *220* | *16557* | *-* | *-* | *-* | *12* | *-* | *-* | *18994* |
| **Heat generated - TJ** | **77284** | **-** | **5401** | **510275** | **6403** | **-** | **-** | **9067** | **-** | **-** | **608430** |
| *CHP plants* | *41929* | *-* | *2107* | *136905* | *6403* | *-* | *-* | *7889* | *-* | *-* | *195233* |
| *Heat plants* | *35355* | *-* | *3294* | *373370* | *-* | *-* | *-* | *1178* | *-* | *-* | *413197* |

* The column of coal also includes peat.

# Uzbekistan

## 2012

Thousand tonnes of oil equivalent

| SUPPLY AND CONSUMPTION | Coal | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Production | 1354 | 3338 | - | 51088 | - | 964 | - | 4 | - | - | 56748 |
| Imports | 46 | 10 | - | - | - | - | - | - | 1048 | - | 1103 |
| Exports | -14 | - | -215 | -8283 | - | - | - | - | -1055 | - | -9567 |
| Intl. marine bunkers | - | - | - | - | - | - | - | - | - | - | - |
| Intl. aviation bunkers | - | - | - | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - | - | - | - |
| **TPES** | **1386** | **3348** | **-215** | **42805** | **-** | **964** | **-** | **4** | **-8** | **-** | **48284** |
| Transfers | - | - | - | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | - | - | - | - | - |
| Electricity plants | -501 | - | -48 | -5846 | - | -964 | - | - | 2904 | - | -4455 |
| CHP plants | -432 | - | -61 | -5977 | - | - | - | - | 1611 | 1280 | -3579 |
| Heat plants | -2 | - | -9 | -1749 | - | - | - | - | - | 1129 | -631 |
| Blast furnaces | - | - | - | - | - | - | - | - | - | - | - |
| Gas works | - | - | - | - | - | - | - | - | - | - | - |
| Coke/pat.fuel/BKB/PB plants | - | - | - | - | - | - | - | - | - | - | - |
| Oil refineries | - | -3254 | 3281 | - | - | - | - | - | - | - | 27 |
| Petrochemical plants | - | - | - | - | - | - | - | - | - | - | - |
| Liquefaction plants | - | - | - | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - | - | - | - |
| Energy industry own use | -2 | -7 | -124 | -1664 | - | - | - | - | -386 | - | -2184 |
| Losses | -13 | -34 | - | -1561 | - | - | - | - | -397 | - | -2005 |
| **TFC** | **436** | **53** | **2824** | **26007** | **-** | **-** | **-** | **4** | **3725** | **2409** | **35458** |
| **INDUSTRY** | **93** | **-** | **171** | **6200** | **-** | **-** | **-** | **-** | **1427** | **-** | **7891** |
| Iron and steel | - | - | - | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | - | - | - | - | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - | - | - | - |
| Non-metallic minerals | - | - | 1 | - | - | - | - | - | - | - | 1 |
| Transport equipment | - | - | - | - | - | - | - | - | - | - | - |
| Machinery | - | - | 3 | - | - | - | - | - | - | - | 3 |
| Mining and quarrying | - | - | - | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - | - | - | - |
| Paper pulp and printing | - | - | - | - | - | - | - | - | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - | - | - | - |
| Construction | - | - | 139 | - | - | - | - | - | - | - | 139 |
| Textile and leather | - | - | 11 | - | - | - | - | - | - | - | 11 |
| Non-specified | 93 | - | 17 | 6200 | - | - | - | - | 1427 | - | 7737 |
| **TRANSPORT** | **-** | **-** | **1574** | **1363** | **-** | **-** | **-** | **-** | **123** | **-** | **3059** |
| Domestic aviation | - | - | 136 | - | - | - | - | - | - | - | 136 |
| Road | - | - | 1384 | 60 | - | - | - | - | - | - | 1444 |
| Rail | - | - | 54 | - | - | - | - | - | 15 | - | 69 |
| Pipeline transport | - | - | - | 1302 | - | - | - | - | 78 | - | 1381 |
| Domestic navigation | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - | 29 | - | 29 |
| **OTHER** | **343** | **-** | **789** | **16992** | **-** | **-** | **-** | **4** | **2176** | **2409** | **22712** |
| Residential | 16 | - | 154 | 14035 | - | - | - | - | 675 | - | 14880 |
| Comm. and publ. services | - | - | - | 2807 | - | - | - | - | 289 | - | 3096 |
| Agriculture/forestry | 5 | - | 502 | 150 | - | - | - | - | 1212 | - | 1869 |
| Fishing | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | 322 | - | 132 | - | - | - | - | 4 | - | 2409 | 2867 |
| **NON-ENERGY USE** | **-** | **53** | **290** | **1452** | **-** | **-** | **-** | **-** | **-** | **-** | **1796** |
| in industry/transf./energy | - | 53 | 231 | 1452 | - | - | - | - | - | - | 1737 |
| *of which: chem./petrochem.* | - | - | - | - | - | - | - | - | - | - | - |
| in transport | - | - | - | - | - | - | - | - | - | - | - |
| in other | - | - | 59 | - | - | - | - | - | - | - | 59 |

**Electricity and Heat Output**

| | Coal | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Electr. generated - GWh** | **2145** | **-** | **383** | **38762** | **-** | **11210** | **-** | **-** | **-** | **-** | **52500** |
| *Electricity plants* | *1407* | - | *186* | *20964* | - | *11210* | - | - | - | - | *33767* |
| *CHP plants* | *738* | - | *197* | *17798* | - | - | - | - | - | - | *18733* |
| **Heat Generated - TJ** | **4767** | **-** | **851** | **95257** | **-** | **-** | **-** | **-** | **-** | **-** | **100875** |
| *CHP plants* | *4716* | - | *666* | *48227* | - | - | - | - | - | - | *53609* |
| *Heat plants* | *51* | - | *185* | *47030* | - | - | - | - | - | - | *47266* |

# Uzbekistan

## 2011

Thousand tonnes of oil equivalent

| SUPPLY AND CONSUMPTION | Coal | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Production | 1351 | 3744 | - | 51194 | - | 881 | - | 4 | - | - | 57173 |
| Imports | 35 | 10 | - | - | - | - | - | - | 1046 | - | 1090 |
| Exports | -14 | - | -228 | -9745 | - | - | - | - | -1053 | - | -11040 |
| Intl. marine bunkers | - | - | - | - | - | - | - | - | - | - | - |
| Intl. aviation bunkers | - | - | - | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - | - | - | - |
| **TPES** | **1372** | **3753** | **-228** | **41449** | **-** | **881** | **-** | **4** | **-8** | **-** | **47223** |
| Transfers | - | - | - | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | - | - | - | - | - |
| Electricity plants | -499 | - | -68 | -5954 | - | -881 | - | - | 2860 | - | -4542 |
| CHP plants | -431 | - | -87 | -6087 | - | - | - | - | 1646 | 1308 | -3651 |
| Heat plants | -2 | - | -12 | -1723 | - | - | - | - | - | 1095 | -643 |
| Blast furnaces | - | - | - | - | - | - | - | - | - | - | - |
| Gas works | - | - | - | - | - | - | - | - | - | - | - |
| Coke/pat.fuel/BKB/PB plants | - | - | - | - | - | - | - | - | - | - | - |
| Oil refineries | - | -3647 | 3657 | - | - | - | - | - | - | - | 11 |
| Petrochemical plants | - | - | - | - | - | - | - | - | - | - | - |
| Liquefaction plants | - | - | - | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - | - | - | - |
| Energy industry own use | -2 | -7 | -141 | -1576 | - | - | - | - | -385 | - | -2111 |
| Losses | -13 | -39 | - | -1479 | - | - | - | - | -396 | - | -1927 |
| **TFC** | **424** | **60** | **3122** | **24629** | **-** | **-** | **-** | **4** | **3718** | **2403** | **34360** |
| **INDUSTRY** | **92** | **-** | **181** | **5872** | **-** | **-** | **-** | **-** | **1424** | **-** | **7569** |
| Iron and steel | - | - | - | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | - | - | - | - | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - | - | - | - |
| Non-metallic minerals | - | - | 1 | - | - | - | - | - | - | - | 1 |
| Transport equipment | - | - | - | - | - | - | - | - | - | - | - |
| Machinery | - | - | 3 | - | - | - | - | - | - | - | 3 |
| Mining and quarrying | - | - | - | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - | - | - | - |
| Paper pulp and printing | - | - | - | - | - | - | - | - | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - | - | - | - |
| Construction | - | - | 145 | - | - | - | - | - | - | - | 145 |
| Textile and leather | - | - | 12 | - | - | - | - | - | - | - | 12 |
| Non-specified | 92 | - | 19 | 5872 | - | - | - | - | 1424 | - | 7407 |
| **TRANSPORT** | **-** | **-** | **1675** | **1290** | **-** | **-** | **-** | **-** | **122** | **-** | **3088** |
| Domestic aviation | - | - | 152 | - | - | - | - | - | - | - | 152 |
| Road | - | - | 1467 | 57 | - | - | - | - | - | - | 1524 |
| Rail | - | - | 56 | - | - | - | - | - | 15 | - | 71 |
| Pipeline transport | - | - | - | 1233 | - | - | - | - | 78 | - | 1312 |
| Domestic navigation | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - | 29 | - | 29 |
| **OTHER** | **332** | **-** | **941** | **16092** | **-** | **-** | **-** | **4** | **2171** | **2403** | **21943** |
| Residential | 16 | - | 275 | 13291 | - | - | - | - | 674 | - | 14256 |
| Comm. and publ. services | - | - | - | 2658 | - | - | - | - | 288 | - | 2947 |
| Agriculture/forestry | 5 | - | 525 | 142 | - | - | - | - | 1210 | - | 1881 |
| Fishing | - | - | - | - | - | - | - | - | - | - | - |
| Non-specified | 311 | - | 141 | - | - | - | - | 4 | - | 2403 | 2859 |
| **NON-ENERGY USE** | **-** | **60** | **325** | **1375** | **-** | **-** | **-** | **-** | **-** | **-** | **1761** |
| in industry/transf./energy | - | 60 | 259 | 1375 | - | - | - | - | - | - | 1694 |
| *of which: chem./petrochem.* | - | - | - | - | - | - | - | - | - | - | - |
| in transport | - | - | - | - | - | - | - | - | - | - | - |
| in other | - | - | 66 | - | - | - | - | - | - | - | 66 |

**Electricity and Heat Output**

| | Coal | Crude oil | Oil products | Natural Gas | Nuclear | Hydro | Geotherm. solar etc. | Biofuels & Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Electr. generated - GWh** | **2140** | **-** | **544** | **39476** | **-** | **10240** | **-** | **-** | **-** | **-** | **52400** |
| *Electricity plants* | *1404* | *-* | *264* | *21350* | *-* | *10240* | *-* | *-* | *-* | *-* | *33258* |
| *CHP plants* | *736* | *-* | *280* | *18126* | *-* | *-* | *-* | *-* | *-* | *-* | *19142* |
| **Heat Generated - TJ** | **4758** | **-** | **1204** | **94657** | **-** | **-** | **-** | **-** | **-** | **-** | **100619** |
| *CHP plants* | *4707* | *-* | *943* | *49117* | *-* | *-* | *-* | *-* | *-* | *-* | *54767* |
| *Heat plants* | *51* | *-* | *261* | *45540* | *-* | *-* | *-* | *-* | *-* | *-* | *45852* |

## COUNTRY NOTES FOR ENERGY BALANCES

### ARMENIA

Data for Armenia are available starting in 1990. Prior to that, they are included in Former Soviet Union.

Data provided by Armenia are mainly supply side data except for electricity. IEA secretariat assumptions are used to estimate consumption data.

Sources 1992 to 2012:

- Direct communication with National Statistical Service, Yerevan.
- Joint IEA/Eurostat/UNECE annual energy questionnaires on Coal, Electricity and heat, Natural gas, Oil.
- *Forestry Statistics,* FAO.
- IEA secretariat estimates.

Sources 1990 to 1991:

- IEA secretariat estimates.

Sources for biofuels and Waste:

- *Forestry Statistics,* FAO and IEA secretariat estimates.

### AZERBAIJAN

Data for Azerbaijan are available starting in 1990. Prior to that, they are included in Former Soviet Union.

Production of natural gas for 2012 may differ from the Azerbaijan national energy balance because natural gas used for production of electricity by the oil and gas extraction industry is included by the IEA secretariat in the definition of natural gas production. Breaks in time series appear for inputs and outputs of electricity, CHP and heat plants in Azerbaijan between 2006 and 2007 due to an improved data collection methodology in the country from 2007 onwards.

For the purpose of calculating $CO_2$ emissions, an allocation between domestic and international aviation consumption of jet kerosene was estimated by the IEA secretariat for 1990-2006 based on total aviation consumption reported by Azerbaijan and the 2007 allocation.

Sources 1990 to 2012:

- Direct communications with the State Committee of Statistics and the Ministry of Economics of Azerbaijan, Baku.
- Joint IEA/Eurostat/UNECE annual energy questionnaires, 1992 to 2012, Oil, Natural gas, Electricity and heat, Renewables.

Sources for biofuels and waste:

- Joint IEA/Eurostat/UNECE annual energy questionnaires, Renewables, 2000-2012.
- Before 2000: IEA secretariat estimates.

## BELARUS

Data for Belarus are available starting in 1990. Prior to that, they are included in Former Soviet Union.

In 2010, Belarus became a member of a Customs Union with Russia and Kazakhstan. Breaks in trade time series and statistical differences appear from 2009 to 2011 as the Customs progressively shifted from one accounting system to another.

Data on jetfuel production are confidential and included in other products.

Breaks in time series appear in gas/diesel and fuel oil between 2011 and 2012 as a result of a new classification of industrial products (heating oil re-classified under high sulphur fuel oil).

Methane produced as a by-product during the petrochemical transformation of naphtha was re-classified by Belarus from industrial waste to refinery gas. This may lead to breaks in time series.

Belarus reports all inputs and outputs to CHP and heat autoproducer plants including those corresponding to own use of heat.

Sources 1990 to 2012:

- Direct communication with the National Statistical Committee of Belarus, Minsk.
- Joint IEA/Eurostat/UNECE annual energy questionnaires, 1990 to 2011, Oil, Natural gas, Coal, Renewables, Electricity and heat.

Sources for biofuels and waste:

- Joint IEA/Eurostat/UNECE annual energy questionnaires for Renewables and IEA secretariat estimates.

## GEORGIA

Data for Georgia are available starting in 1990. Prior to that, they are included in Former Soviet Union.

Heat production has stopped in 2011 due to the shutdown of combined heat and power plants.

Time series data from 1990 to 2012 for coal were revised due to the reclassification of sub-bituminous coal to lignite based on newly available information.

Data on international marine bunkers for Georgia are not currently available, however upcoming local surveys are planned and should make this information available in future years.

Sources 2008 to 2012:

- Direct communication with the Energy Efficiency Centre Georgia, Tbilisi.
- Joint IEA/Eurostat/UNECE annual energy questionnaires. Oil, Natural gas, Coal, Electricity and heat, Renewables, submitted by the National Statistics Office of Georgia, Tbilisi.
- IEA secretariat estimates.

Sources 1990 to 2008:

- *Official Energy Balance of Georgia 1990-1999*, *2000-2008*, Ministry of Economy and Ministry of Energy, Tbilisi.
- IEA secretariat estimates.

## KAZAKHSTAN

Data for Kazakhstan are available starting in 1990. Prior to that, they are included in Former Soviet Union.

As a result of important work done by the Statistical Office of Kazakhstan, the IEA secretariat was able to switch to the Joint IEA/Eurostat/UNECE questionnaires as a primary source for Kazakhstan's 2012 data. Breaks in time series may appear between 2011 and 2012 as a result of this change.

In 2010, Kazakhstan became a member of a Customs Union with Russia and Belarus. Breaks in trade time series appear from 2009 to 2012 as the Customs shifted from one accounting system to another.

Natural gas production excludes re-injection but, due to data limitations, may include gas vented or flared.

In order to be consistent with the Customs Union agreements between Russia and Kazakhstan, natural gas production and exports include raw gas production from the Karachaganak field (not marketable gas as per IEA definition).

Own use may include gas vented or flared.

Kazakhstan includes jet kerosene with other kerosene for confidentiality reasons. The split between jet kerosene and other kerosene, as well as the split between domestic and international aviation are estimated by the IEA secretariat.

Kazakhstan does not publish a breakdown between coking coal and bituminous coal. This split is estimated by the IEA secretariat.

Sources for 2012:

- Direct communication with the Agency on Statistics of the Republic of Kazakhstan, Astana.
- Joint IEA/Eurostat/UNECE annual energy questionnaires 2012.
- IEA secretariat estimates.

Sources 1993 to 2011:

- Direct communication with the Agency on Statistics of the Republic of Kazakhstan, Astana.
- *Fuel and Energy Balance of Kazakhstan Republic,* Agency on Statistics of the Republic of Kazakhstan, Astana, various editions up to 2010.
- Joint IEA/Eurostat/UNECE annual energy questionnaires, 1993, 1995, 1997 to 2009.
- *Statistical Yearbook "Kazakhstan in 2009",* Agency on Statistics of the Republic of Kazakhstan, Astana, 2010.
- IEA secretariat estimates.

Sources 1990 to 1992:

- IEA secretariat estimates.

Sources for Biofuels and waste:

- *Fuel and Energy Balance of Kazakhstan Republic,* Agency on Statistics of the Republic of Kazakhstan, Astana, various editions up to 2010.
- *Forestry Statistics*, FAO, Rome, 2000 and IEA secretariat estimates.

## KYRGYZSTAN

Data for Kyrgyzstan are available starting in 1990. Prior to that, they are included in Former Soviet Union.

In this edition, time series data for electricity, oil products, and coal products for 2005 to 2011 were revised based on newly available information. This may lead to breaks in the time for some products.

Sources 2007 to 2012:

- Direct communication with the National Statistical Committee of Kyrgyzstan, Bishkek.
- Joint IEA/Eurostat/UNECE annual energy questionnaires for 2012.
- Direct communication with the Interstate Statistical Committee of the Commonwealth of Independent States, Moscow.
- *The UN Energy Statistics Database*.
- *CIS and East European Energy Databook*, Eastern Bloc Research Ltd, Tolsta Chaolais, 2008 to 2013.
- *Natural Gas Vehicles Statistics,* International Association for Natural Gas Vehicles, online database: www.iangv.org.
- IEA secretariat estimates.

Sources 1993 to 2006:

- Joint IEA/Eurostat/UNECE annual energy questionnaires, 1993 to 2006.
- *CIS and East European Energy Databook*, Eastern Bloc Research Ltd, Tolsta Chaolais, various editions up to 2007.
- Asian Development Bank.
- IEA secretariat estimates.

Sources 1990 to 1992:

- IEA secretariat estimates.

Sources for biofuels and waste:

- The UN Energy Statistics Database.

## REPUBLIC OF MOLDOVA

Data for Moldova are available starting in 1990. Prior to that, they are included in Former Soviet Union.

Official figures on natural gas imports, natural gas inputs to power plants, electricity production and consumption are modified by the IEA secretariat to include estimates for supply and demand for the autonomous region of Stînga Nistrului (also known as the Pridnestrovian Moldavian Republic or Transnistria). Other energy production or consumption from this region is not included in the Moldovan data. This may lead to breaks in the time series for some products.

In 2013, the National Bureau of Statistics revised data submitted through Joint IEA/ Eurostat/UNECE questionnaires from 2005 based on the International Recommendations for Energy Statistics. This may lead to breaks in time series for some products and differences in trends in comparison to previous editions.

Sources 2008 to 2012:

For Moldova, excluding Transnistria:

- Direct communication with the National Bureau of Statistics of the Republic of Moldova, Chisinau.
- Joint IEA/Eurostat/UNECE annual energy questionnaires on Coal, Oil Natural gas, Electricity and heat and Renewables

For natural gas imports:

- Direct communication with State Statistics Service of Ukraine.

For Transnistria electricity production:

- Website of Ministry of Economic Development of Transdniestrian Moldovian Republic, www.mepmr.org.
- IEA secretariat estimates.

Sources 1992 to 2008:

- Joint IEA/Eurostat/UNECE annual energy questionnaire on Electricity and heat, 1991 to 2008.
- Joint IEA/Eurostat/UNECE annual energy questionnaire on Natural gas, 1991 to 2008.
- Joint IEA/Eurostat/UNECE annual energy questionnaire on Coal, 1992 to 2008.
- Joint IEA/Eurostat/UNECE annual energy questionnaire on Oil, 1993 to 1998, 2001 to 2008.
- Direct communication with the Ministry of Industry and Energy, July 1992.
- *CIS and East European Energy Databook*, Eastern Bloc Research Ltd, Tolsta Chaolais, various editions up to 2011.
- IEA secretariat estimates.

Sources 1990 to 1991:

- IEA secretariat estimates.

Sources for Biofuels and waste:

- Joint IEA/Eurostat/UNECE Renewable questionnaire.
- *The UN Energy Statistics Database*.
- IEA secretariat estimates.

## TAJIKISTAN

Data for Tajikistan are available starting in 1990. Prior to that, they are included in Former Soviet Union.

Sources 1990 to 2012:

- *Online statistics,* Statistical Agency under the President of the Republic of Tajikistan.
- *Tajikistan in Figures*, Statistical Agency under the President of Tajikistan, various editions up to 2013.

- Energy and Communal Services in Kyrgyzstan and Tajikistan: A Poverty and Social Impact Assessment. UNDP Bratislava Regional Centre 2011
- *CIS and East European Energy Databook*, Eastern Bloc Research Ltd, Tolsta Chaolais, various editions up to 2013.
- Asian Development Bank Statistics, various editions up to 2013.
- Direct communication with the State Committee on Statistics, Republic of Tajikistan, Dushanbe.
- Joint IEA/Eurostat/UNECE annual energy questionnaires, 1991 to 2007.
- *Natural Gas Vehicles Statistics,* International Association for Natural Gas Vehicles, online database: www.iangv.org.
- IEA secretariat estimates.
- *Industry of Tajikistan, Statistics,* the State Committee on Statistics of the Republic of Tajikistan, 2004.

## TURKMENISTAN

Data for Turkmenistan are available starting in 1990. Prior to that, they are included in Former Soviet Union.

Sources up to 2012:

- *CIS and East European Energy Databook*, Eastern Bloc Research Ltd, David Cameron Wilson, various editions up to 2013.
- Asian Development Bank online database.
- *Natural Gas in the World,* Cedigaz, Paris, various editions up to 2013.
- IEA secretariat estimates.
- Direct communication with the National Institute on Statistics and Forecasting of Turkmenistan, November 1999 and January 2001.

## UKRAINE

Data for Ukraine are available starting in 1990. Prior to that, they are included in Former Soviet Union.

The IEA secretariat and State Statistics Committee of Ukraine are working closely and intensively on the improvement of data quality. Therefore, breaks in time series may occur between 2007 and 2008.

The data for the stock draw and statistical difference of natural gas in 2010 are a consequence of the accounting method chosen by the Ukrainian administration to reflect the ruling of the Stockholm Arbitration Tribunal of March 30, 2010.

For the period 2008 to 2012 the transparency of data may be reduced because of confidentiality issues. For instance: peat includes lignite; other kerosene includes aviation fuels (aviation gasoline, gasoline-type jet fuel and kerosene-type jet fuel); other products include petroleum coke.

Large statistical differences still exist for some oil products such as transport fuels and LPG. These are due to identified reporting issues in Ukraine. The Ukraine State Statistical Committee continues to work with data reporters to try and resolve these issues.

Information on electricity used for pumped hydro is available from 2012 only.

Charcoal production includes pyrolysis and calculated traditional methods of production from 2008.

Due to a plant closure in 2008, a stock of lignite/peat became available, without details about its consumption. This may lead to breaks in time series and high statistical difference for 2008.

Official Ukrainian coal statistics refer to unwashed and unscreened coal prior to 1995. IEA statistics normally refer to coal after washing and screening for the removal of inorganic matter. Therefore, the IEA revised Ukrainian coal supply and demand statistics downward to reflect levels of washed coal.

Sources 2008 to 2012:

- Direct communication with the State Statistics Committee of Ukraine, Kiev
- Joint IEA/Eurostat/UNECE annual energy questionnaire on Coal Oil, Natural Gas, Electricity and Heat and Renewables.

Sources 1992 to 2007:

- IEA secretariat estimates.
- Joint IEA/Eurostat/UNECE annual energy questionnaire on Coal Oil, Natural Gas, Electricity and Heat and Renewables.
- Direct communication with the Ministry of Statistics, the Coal Ministry, the National Dispatching Company, 1995.
- Coal: Direct communications with the State Mining University of Ukraine, 1995, 1996.
- Natural gas: Direct communication with Ukrgazprom, February 1995.
- Direct communication with the Ministry of Statistics of the Ukraine, July 1994.
- *Ukraine in 1992, Statistical Handbook,* Ministry of Statistics of the Ukraine, Kiev, 1993.
- *Ukraine Power Demand and Supply Options,* The World Bank, Washington, 1993.
- *Power Industry in Ukraine,* Ministry of Power and Electrification, Kiev, 1994.
- *Energy Issues Paper*, Ministry of Economy, March 1995.
- *Ukraine Energy Sector Statistical Review 1993, 1994, 1995, 1996, 1997,* The World Bank Regional Office, Kiev, 1994, 1995, 1996, 1997, 1998.
- *Global Energy Saving Strategy for Ukraine,* Commission of the European Communities, TACIS, Madrid, July 1995.

Sources 1990 to 1991:

- IEA secretariat estimates.

Sources for Biofuels and waste:

- Statistical Office in Kiev, The World Bank and IEA secretariat estimates.

## UZBEKISTAN

Data for Uzbekistan are available starting in 1990. Prior to that, they are included in Former Soviet Union.

Sources 1990 to 2012:

- Asian Development Bank online database.
- *CIS and East European Energy Databook*, Eastern Bloc Research Ltd, Tolsta Chaolais, various editions up to 2012.
- IEA secretariat estimates.
- Direct communication with the Interstate Statistical Committee of the Commonwealth of Independent States.
- Direct communications to the IEA secretariat from the Institute of Power Engineering and Automation, Academy of Sciences of Uzbekistan 1994, 1996, 1998 to 2003.
- Joint IEA/Eurostat/UNECE annual energy questionnaires, 1995 to 1997.

# ANNEX B: INOGATE PROGRAMME

INOGATE was established in 1996 as an energy co-operation programme among the European Union and the littoral states of the Black and Caspian seas and their neighbouring economies. After the break-up of the Soviet Union, the centralised system of energy production, transport and distribution became fragmented, putting the whole region at a high risk for energy crises. There was an urgent need to establish new ways of working together and the European Union was well placed to provide the necessary support and know-how through the INOGATE Programme.

Initially, the Programme focused on the energy security of Partner Countries and facilitated energy trade between the European Union and Partner Countries. Over time, however, the scope of the INOGATE Programme has changed and expanded.

Nearly two decades on, the INOGATE Programme continues to support energy co-operation between the European Union and INOGATE Partner Countries. Its aims are enhanced energy security, market convergence, sustainable energy and increased investment attraction, implemented within the framework of the European Neighbourhood Policy. In addition, the INOGATE Programme supports Eastern European objectives under the Energy Security Platform and assists countries that have signed the EU Energy Community Treaty (Ukraine and Moldova: members; Georgia: candidate; Armenia: observer) to integrate into the Energy Community.

The current vision of the Programme was shaped at the Energy Ministerial Conference held in Baku on 13 November 2004, in connection with the launch of the European Neighbourhood Policy. The conference was the start of a two-year process of updating the INOGATE Programme, known as the “Baku Initiative.”

As a result of the Baku Initiative, the Astana Energy Ministerial Declaration was signed on 30 November 2006, referred to as the “Astana Road Map.” The Astana Road Map formalises the INOGATE Programme’s objectives and was adopted by all the countries involved. The programme’s objectives include developments in four main areas: energy security, market convergence, sustainable energy and investment attraction.

With the launch of the Eastern Partnership initiative in 2008, INOGATE also became the main instrument to support the objectives of the Energy Security Platform. Furthermore, INOGATE is assisting countries who have signed the EU Energy Community Treaty to make the necessary reforms and to integrate into the Energy Community.

INOGATE

ENERGY COOPERATION BETWEEN THE EU, THE LITTORAL STATES OF THE BLACK & CASPIAN SEAS AND THEIR NEIGHBOURING COUNTRIES

PROGRAMME FUNDED BY THE EU

# ANNEX C: REVIEW CRITERIA

The energy policy reviews of eleven countries in Eastern Europe, the Caucasus and Central Asia (Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Tajikistan, Turkmenistan, Ukraine and Uzbekistan [INOGATE Partner Countries]) were conducted by the International Energy Agency (IEA) under the European Union-funded INOGATE Programme, in co-operation with the INOGATE Technical Secretariat and the governments of the INOGATE Partner Countries.

The reviews have been conducted according to the following benchmarking criteria (indicators), agreed between the European Commission and the INOGATE Partner Countries under the Astana Roadmap.

## 1st Priority Area: Energy Market Convergence

- Third Party Access as defined by the EU Acquis.
- Unbundling as defined by the EU Acquis.
- Independent energy regulators as defined by the EU Acquis.
- Harmonisation of energy standards with those of the EU.
- Integrated Regional Market: this includes any action plan for the creation of an integrated energy market that is under implementation or preparation, or any potential governmental decision to facilitate the preparation of such action plan.

## 2nd Priority Area: Energy Security

- Development of Maintenance strategy, guidelines, training programmes and recording systems.
- Adoption and implementation of long and medium term energy infrastructure rehabilitation/upgrading programmes, including appropriate financial provision, as well as the development of outage and loss reporting systems and statistics.
- Development of new energy infrastructures: this includes the status of negotiations with neighbouring countries for future development of energy infrastructures; legislative framework; any actual or potential cooperation with relevant EU agencies; incentives for energy infrastructure investment; and any cooperation agreements with INOGATE Partner Countries for energy transit protocols and cross-border metering.
- Metering and billing (use of end-user metering facilities).

## 3rd Priority Area: Sustainable Development

- Policy commitment to promote sustainable energy development or adopted strategies or policies that support such development.
- EE/RES framework: development of legal, institutional and financial frameworks which will promote and foster energy efficiency and renewable energy in the country.

- EE/RES action plans and measures: existence of any programme and/or action plans, including information campaigns, and training and awareness rising on best practices, (including measures to promote convergence with EU standards and norms).
- Creation of energy agencies: information on the establishment and the operation of energy agencies including set-up, efficient operation, training programmes and other measures that support their efficient and independent operation.
- Environmental assessments and Environmental standards: implementation of environmental assessments, assessments of renewable sources potential by relevant industries/ institutions and environmental standards for energy utilities approaching progressively closer to EU levels.
- Energy auditing: including records on the of such audit results.
- Kyoto Protocol mechanisms: development of the Kyoto Protocol mechanisms (CDM, JIP, emissions trading) and realization or planning of projects under this framework.
- Gas flaring reduction: gas flaring reduction measures, as well as "methane to market" measures.

### 4th Priority Area: Investment Attraction

- Investment framework: status of legal and regulatory framework development; stability, transparency and adequacy of this framework, progress of the privatisation process, and relevant institutional reforms are the criteria for determining the development of a favourable investment framework.
- Investment climate: development of taxation system (adequacy, simplification, transparency, corruption), of financial and banking system (privatisation, transparency, stability), of disputes settlement system (adequacy, bureaucracy, corruption) and also the extent to which production tariffs and energy pricing system favour investments.
- Investment planning: development of investment strategy and planning (either existing or in preparation), any negotiations with neighbouring countries for future development of common projects, agreements of intent and/or cooperation with other countries.

### Status Reports

Following the adoption of the Astana Road Map, the INOGATE Technical Secretariat developed review criteria which were agreed upon by the INOGATE Partner Countries during the country co-ordinators' meeting held in Tbilisi in October 2010. The review criteria include indicators for all four areas of co-operation, which were set to assess the developments and monitor progress across the region on an annual basis. The INOGATE Technical Secretariat has developed further questionnaires, elaborating on the agreed criteria for an annual review cycle, referred to as "Status Reports." The first Status Report was prepared by the INOGATE Technical Secretariat on the basis of questionnaire submissions from the INOGATE Partner Countries in 2011. This work was undertaken as a desk study, with the active participation of the INOGATE Country Experts.

The INOGATE Technical Secretariat published the Status Report for the year 2011, assessing the developments under the agreed review criteria (including the explanation of the criteria). The publication was released in October 2012 and can be found at http://www.inogate.org.

**Box A.1** IEA-led peer reviews of INOGATE Partner Countries' energy policy developments

IEA-led energy policy reviews were conducted as peer reviews, with the participation of INOGATE Partner Countries and the INOGATE Technical Secretariat, from February 2013 to June 2014. The reviews were focused on INOGATE Partner Countries' developments related to national policies and measures for improving overall energy security, promoting domestic and regional market convergence, sustainable energy and attracting necessary investments.

The IEA-introduced peer review format, based on coupling countries with similar aspirations and developmental traits, has encouraged INOGATE Partner Country government participation in the review process. The outcomes of these reviews greatly benefited from peer-government deliberations throughout the review process.

Major changes to the review process introduced by the IEA include:

- introduction of detailed questionnaires, requiring the active participation of the INOGATE Partner Country governments in the review process, and transformation of the review process into a peer-review format, increasing peer support
- enhanced co-operation with INOGATE Partner Country governments in preparation of peer review team visits and appointments with key public and private energy stakeholders, for establishing far-reaching and unbiased views
- review meetings with private and non-governmental sectors under Chatham House Rules,* with the aim of ensuring open and constructive discussions, as well as exposing the views of all energy sector players
- presentation of the preliminary findings and recommendations to the host country government officials at the end of each Peer Review Team visit.

The IEA also introduced an overall assessment of the energy policies with key recommendations, prepared by the peer review teams during their review visits and presented to the government officials at the end of each visit.

The reviews also include analyses of key energy statistics and energy balances of the Partner Countries in the IEA format.

During the second review cycle, peer reviewers from the INOGATE Partner Countries acted as Peer Review Team Leaders.

Note: Details of the composition of peer review teams, as well as the organisations they met with during the Peer Review Missions, are provided in Annex D.

* "When a meeting, or part thereof, is held under the Chatham House Rule, participants are free to use the information received, but neither the identity nor the affiliation of the speaker(s), nor that of any other participant, may be revealed." http://www.chathamhouse.org/about/chatham-house-rule.

# ANNEX D: ORGANISATION OF THE REVIEW

## REVIEW TEAM

### Composition of the review teams

The Peer-Review Team members were:

- Thea Khitarishvili, International Energy Agency
- Sonja Lekovic, International Energy Agency
- Sylvia Elisabeth Beyer, International Energy Agency
- Marc-Antoine Eyl-Mazzega, International Energy Agency
- Mr. Andrii Mitsai, INOGATE Technical Secretariat
- Ms. Lemlem Said Issa, INOGATE Technical Secretariat
- Mr. Vladimir Ternytskyi, INOGATE Technical Secretariat
- Ms. Anna Petrus, INOGATE Technical Secretariat
- Ms. Svetlana Timshina, INOGATE Technical Secretariat
- Mr. Sergey Abrahamyan, Peer Reviewer, Ministry of Energy of Armenia
- Mr. Zaur Mamadov, Peer Reviewer, Ministry of Energy of Azerbaijan
- Mr. Andrew Molochko, Peer Reviewer, Ministry of Energy, Belarus
- Mr. David Sharikadze, Peer Reviewer, Ministry of Energy of Georgia
- Ms. Maryash Zhakupova, Peer Reviewer and INOGATE Country Expert, Kazakhstan
- Ms. Galyna Parsian, Peer Reviewer, Ministry of Economy of Moldova
- Ms. Ruslan Orozaliev, Peer Reviewer, Ministry of Energy of Kyrgyzstan
- Mr. Timur Valamat-Zade, Peer Reviewer, Ministry of Energy of Tajikistan
- Mr. Levon Vardanyan, INOGATE Country Expert, Armenia
- Mr. Irakli Vardigoreli, INOGATE Country Expert, Georgia
- Ms. Ludmila Burlui, INOGATE Country Expert, Moldova
- Ms. Maigul Kuanyshkaliyeva, INOGATE Country Expert, Kazakhstan
- Ms. Gulsara Kasymova, INOGATE Country Expert, Kyrgyzstan
- Ms. Svetlana Timshina, INOGATE Country Expert, Ukraine
- Ms. Larisa Tashkhodzaeva, INOGATE Country Expert, Uzbekistan

## ORGANISATIONS MET

### Armenia

- Ministry of Energy and Natural Resources
- Ministry of Environmental Protection
- Public Services Regulatory Commission
- National Statistic Services
- Technical Standards Laboratory, Scientific and Research Institute for Power Engineering
- National Standards Institute (SARM)
- National Renewables and Energy Efficiency Fund
- CJSC Electric Networks of Armenia (ENA)
- CJSC Power Grid Operator
- CJSC High Voltage Power Grids
- JSC Billing Centre
- JSC Gazprom-Armenia
- ARMESCO Association
- TechnoEco LLC
- SPARE Coordinator in Armenia/NGO Eco Club "Tapan"
- Eco Team/Energy and Environment NGO
- Contact-A LLC
- INCRIPT LLC (IT consulting service)
- European Union (EU) Delegation
- European Bank for Reconstruction and Development (EBRD)
- United States Agency for International Development (USAID)
- Kreditanstalt fuer Wiederaufbau (KfW)
- German-Armenian Fund (GAF)

### Azerbaijan

- Ministry of Industry and Energy
- Energy, Household and Water Supply Services Division, Tariff Council
- Ministry of Ecology and Natural Resources
- Ministry of Taxes
- Ministry of Economy and Industry
- EU Delegation
- United Nations Development Programme (UNDP)

- NGO Climate Change
- International Energy Academy
- NGO Ecological Union of Azerbaijan
- Energy Efficiency Center
- International Environmental Academy
- National Academy of Science
- State Committee on Statistics
- JSC AzerEnergy
- JSC Azerustilikmahizat
- AzeriGaz Production Union
- State Committee on Standardisation, Metrology and Patent
- State Agency on Alternative and Renewable Energy Resources
- ACE Consultants
- Caspian Technology
- Recycling Company
- Learning of Economic Resources Social Union
- Azerbaijan Republic Energy and Ecology Public Union
- Towards Healthy Life Ecology Social Union
- Center of Local Economic Development Social Union
- "Umid" Support to Social Development Public Union
- Clean Production and Energy Efficiency Center
- Fund on Assistance to Ownership and Development of Market Economy
- Ecological Stability Social Union
- Association Fovghal
- Ecolife Social Union
- Ecological Enlightenment and Monitoring Social Union

**Belarus**

- Ministry of Energy
- Ministry of Environment
- State Standards Agency
- SPA BelTopGaz
- OJSC BelTransGaz
- SPA BelEnergo
- Central Dispatch Unit (RUE ODU)

- Belarusian State Statistics Agency
- International Energy Company
- EBRD
- EU Delegation

## Georgia

- Ministry of Energy and Natural Resources/Ministry of Energy
- Ministry of Environment
- State Agency of Natural Resources
- Georgian National Investment Agency
- Georgian National Energy and Water Supply Regulatory Commission
- National Statistics Office of Georgia (GEOSTAT)
- Georgian Oil and Gas Corporation (GOGC)
- Georgian Gas Transportation Company (GGTC)
- Georgian State Electric System (GSE)
- Electricity System Commercial Operator, JSC (ESCO)
- Engury Hydropower Company 'Engurhesi'
- Energy Efficiency Centre
- Centre for Energy Efficiency and Environmental Protection (VAP Georgia)
- NGO International Center for Environmental Research
- Caucasus Environmental NGO Network (CENN)
- Energy Studies, World Experience for Georgia (WEG)
- The Greens Movement of Georgia/ Friends of the Earth Georgia
- Georgian Society of Nature Explorers Orchis
- International Financial Institutions Monitoring Programme, Green Alternative
- Energy and Environment Associates
- Blake Oil and Gas Company
- EU Delegation
- KfW
- EBRD
- UNDP

## Kazakhstan

- Ministry of Energy and New Technologies (former)
- Ministry of Environmental Protection (former)

- Ministry of Oil and Gas (former)
- National Chamber of Housing and Communal Services of Kazakhstan
- Market Regulator (KOREM)
- Energy Regulator (AREM)
- Antimonopoly Committee
- National Statistics Agency
- Kazakhstan Electricity Grid Operating Company (KEGOC)
- Regional Energy Company (REC) Mangistau
- SamrukEnergo
- KazEnergyExpertise
- ThermalElectroStation
- Astana Energy Distribution Company (AstanaEnergosbit)
- Ekibastus Thermal Power Station
- Akmolyn regional (Oblast) distribution company (Akmolynskaya REC)
- Association Atamiken
- National Oil and Gas Company 'KazMunaiGas'
- KazTransGas
- Intergas Central Asia
- EU Delegation
- Kazakhstan Oil and Gas Industry Association 'KazEnergy'
- Kazakhstan Electric Power Energy Association
- Representatives of the bilateral embassies and representations of the following EU countries: Hungary, Spain, Germany, Romania, and Bulgaria
- UNDP
- USAID
- Organization for Security and Cooperation of Europe (OSCE)
- World Bank

### Kyrgyzstan

- Ministry of Energy and Industry
- Environmental Protection Agency
- Ministry of Finance
- State Agency on Environment Protection and Forestry
- Coordination Commission for Climate Change Issues
- State Department on Tariff Regulation

- Kyrgyz Institute of Earthquake-Resistant Construction
- “Energy” The Kyrgyz Scientific and Technical Center
- National Statistics Committee
- State Technical Inspection
- JSC National Electrical Grid of Kyrgyzstan
- State Enterprise KyrgyzZhilkommunsoyuz
- Kant PTS
- JSC KyrgyzNefteGas
- JSC Jalalabat Electro
- OJSC KyrgyzGaz
- OJSC SeverElectro
- Utility Company BishkekTeploEnergo
- OJSC VostokElectro
- OJSC BishkekTeploSet
- KyrgyzsSandart
- JSC Kommunsouz
- JSC Dzhalalabadelectro
- JSC Vostokelectro
- JSC Oshelectro
- JSC BishkekElectro
- JSC KyrgyzComyr (Kyrgyz Coal)
- Electrosila LLC
- Dordoy Energy LLC
- Jogorku Kenesh Executive Office
- Association of Entrepreneurs of the Energy Complex
- Ecological Movement BIOM
- EU Delegation
- EU-funded CASEP Project
- ADB
- KfW
- World Bank
- International Monetary Fund (IMF)
- Japan International Cooperation Agency (JICA)
- USAID

- Swiss Embassy
- Tetratech
- UNDP

## Moldova

- Ministry of Economy
- Ministry of Environment
- Climate Change Office, Ministry of Environment
- Ministry of Regional Development and Construction
- National Bureau of Statistic
- National Energy Regulatory Agency (ANRE)
- Moldovan National Institute of Standardisation and Metrology
- Energy Efficiency Agency (EEA)
- Energy Efficiency Fund (EEF)
- TA-SPSP Energy Project
- SA MoldovaGaz
- SRL MoldovaTransGaz
- SE MoldElectrica
- RED GasNatural Fenosa
- SRL Chişinau-Gaz
- Red-Nord Electrica
- SA RED NORD-VEST
- S.A. Horus
- SRL MoldCablu
- ICS Euroterm Group SRL
- Yedina Kuchka
- Solartech Energy
- Saryly Garmagroup
- NGO DINA
- Sudzuker Moldova
- Green Farm Ltd.
- NGO Pro-Energy
- NGO Gutta-Club
- NGO Expert-Group

- BEMOL SRL
- Petrom SA
- Import Competrol
- SRL Laiola
- SRL Polimer Gaz Conducte
- NGO Cleaner Production and Energy Efficiency Centre
- NGO Gutta-Club (Republican Children and Youth Centre)
- NGO Alliance for Energy Efficiency and Renewables
- EU Delegation
- Embassy of Sweden to Moldova
- USAID Moldova
- World Bank
- Gesellschaft für Internationale Zusammenarbeit (GIZ)
- UNDP

### Tajikistan

- Ministry of Energy and Industry/Ministry of Energy and Water Resources
- Ministry of Industry and New Technologies
- State Committee of Environmental Protection
- State Committee on Standardisation (TajikStandart)
- National Statistics Agency
- Antimonopoly Agency
- Production Scheduling Department, CJSC (EnergoRemont)
- Department of the State Unitary Enterprise (Naftugas va Angisht)
- RES Centre of the Academy of Sciences
- Tajik Technical University
- Association of Power Engineers
- Environmental Specialist Association
- National Energy Company Barki Tojik (TSO and DSO)
- JSC Pamirenergo (DSO)
- JSC TajikTransGas (TSO and DSO)
- Shirkati Tizorati Soyod (coal company)
- Petroleum Sugd LLC
- Private oil and gas company

- LLC “Silovsin” Law Firm (energy sector)
- CJSC Khasan and C
- Gaffor Aliev LLC
- TajHydro (Tajik-Norwegian Fund)
- EU Delegation
- UNDP
- JICA
- ADB
- EBRD
- USAID
- Tetratech

## Ukraine

- Ministry of Energy
- State Statistics Service
- State Enterprise Energorynok
- Electricity Generating Company TsentrEnergo
- Electricity Generating Company UkrGidroEnergo
- National Nuclear Generating Company EnergoAtom
- Natinal Electricity TSO UKRENERGO
- Kiev city DSO KyivoblEnergo
- National Energy and Communal Services Regulatory Commission
- NAK NaftoGas
- National gas TSO UkrTransGas
- JSC UkrNafta
- Boyarka Metrology Center
- State Agency on Energy Efficiency and Energy Saving
- World Bank (Energy Sector and Development Programme)
- EU Delegation
- Swiss Agency for Development and Cooperation (SDC)
- UNDP
- EBRD
- European Business Association
- American Chamber of Commerce in Ukraine

- Royal Dutch Shell Plc
- Ukrainian Wind Energy Association
- Center for Energy Initiatives
- Private gas production company "Bukros"
- Poltava District Heating Company
- EnCoG Energy Consulting Group
- IMEPOWER
- The Deane Group - Ukraine
- VANCO Prykerchenska Ltd.
- Slavutich SC
- ENERGY XXII LLC
- Institute of Energy Efficiency and Energy Saving within the NTUU "KPI"
- National Environmental Centre of Ukraine
- DiXi Group

### Uzbekistan

- EU Coordination Centre
- National Statistics Committee
- UzbekEnergo
- UzbekNefteGas

### Turkmenistan

Various bilateral meetings.

## ACKNOWLEDGEMENTS

The individual country reviews were led by the IEA and co-ordinated by the INOGATE Technical Secretariat. The authors of this publication are Sonja Lekovic and Thea Khitarishvili, with inputs from Sylvia Beyer (Armenia and Azerbaijan) and Marc-Antoine Eyl-Mazzega (Ukraine).

The IEA would like to express its sincere gratitude to the INOGATE Technical Secretariat, and to Mr. Andrii Mitsai in particular for invaluable support in organising the country review missions, for co-ordinating the work with country experts and for his valuable contribution to the country review missions. Further thanks are extended to Ms. Gloria Aguinaldo, Ms. Lemlem Said Issa, Mr. Vladimir Ternytskyi and Ms. Anna Petrus at the INOGATE Technical Secretariat for their valuable work and contributions during the two-year cycle of reviews, and to Ms. Irina Aryshchenko for organisational support.

The IEA and the INOGATE Technical Secretariat thank the INOGATE country experts, Mr. Levon Vardanyan (Armenia), Mr. Zaur Mamadov (Azerbaijan), Mr. Andrew Molochko (Belarus), Mr. Irakli Vardigoreli (Georgia), Ms. Ludmila Burlui (Moldova), Ms. Maryash

Zhakupova (Kazakhstan), Ms. Maigul Kuanyshkaliyeva (Kazakhstan), Ms. Gulsara Kasymova (Kyrgyzstan), Mr. Timur Gafarovich Valamat-Zade (Tajikistan), Ms. Svetlana Timshina (Ukraine) and Ms. Larisa Tashkhodzaeva (Uzbekistan), for their excellent co-operation in supporting the questionnaire submissions by their respective countries and in organising the review visits. The IEA would like to thank the representatives of key energy stakeholders, including the responsible ministry/government structures for energy; relevant public and private energy enterprises; regulatory structures/authorities; the non-governmental sector and donor communities (listed above) which the peer review team met for open and frank discussions that contributed immensely to forming an independent opinion on energy sector developments in each review country. The review cycles during 2013-14 included the active participation of the governments of Armenia, Belarus, Moldova, Kazakhstan, Kyrgyzstan and Tajikistan, with representatives from these countries acting as Team Leaders in the 2014 reviews. The IEA also thanks the following country co-ordinators for hosting the peer review missions and for their participation in the organisation of review visits, communication with government authorities and for providing valuable information: the late Mr. Hrachik Tsughunyan, Ministry of Energy and Natural Resources of Armenia; Mr. Ramiz Rzayev and Mr. Iftikhar Huseynov, Ministry of Energy of Azerbaijan; Mr. Andrej Zorich, Ministry of Energy of Belarus; Ms. Nana Pirtskhelani, Ministry of Energy of Georgia; Mr. Baurzhan Sarsenov and Ms. Gulzhan Uisimbayeva, Ministry of Energy of Kazakhstan; Mr. Ruslan Orozaliev and Mr. Tuleguen Sadabayev, Ministry of Energy and Industry of Kyrgyzstan; Ms. Galina Parsian, Ministry of Economy of Moldova; Mr. Nurmahmad Holnazarov, Ministry of Energy and Industry of Tajikistan; Mr. Jamshed Shoimov, Ministry of Energy and Water Resources of Tajikistan; Mr. Oleg Shevchenko, Ministry of Energy and Coal Industry of Ukraine; and Mr. Ibragim Tashkentbayev, Cabinet of Ministers of Uzbekistan.

The IEA wishes to express particular gratitude to the European Commission for the European Union’s financial assistance through the European Neighbourhood and Partnership Instrument. The European Commission’s support throughout the duration of the project has been instrumental to its outcomes. The IEA would like to express its sincere gratitude to Ms. Simone Rave, Ms. Marta Navarrete-Moreno, Mr. Mathieu Bousquet, Ms. Natalja Miolato and Ms. Viola Calabrese for overall management of the programme and for their support in communicating with the partner governments, and Mr. Federico Tarantini for his participation in the Georgia review mission. The IEA would also like to extend special thanks to Mr. Gerhard Schumann-Hitzler and Ms. Mechthild Wörsdörfer in acknowledgement of their commitment to the promotion of this publication.

This publication is published under the special authority of the IEA Executive Director, Ms. Maria van der Hoeven. During the drafting of the publication at the IEA, the content was reviewed and improved upon by IEA colleagues, including Marc-Antoine Eyl-Mazzega, Lorcan Lyons, Melanie Slade, Sarah Pasquier, Stephen Gallogly, Kijune Kim, Keisuke Sadamori and Rebecca Gaghen. Sonja Lekovic prepared the energy data analysis, figures and the publication’s layout. Bertrand Sadin reproduced the maps. Pierre Boileau and Claire Morel provided support on energy statistics and Aidan Kennedy provided support on $CO_2$ statistics. A selection of chapters was edited by Debra Justus and the publication was copy-edited by Kristine Douaud, with assistance and co-ordination from Therese Walsh. Muriel Custodio, Astrid Dumond and Angela Gosmann managed the editing and production process.

# ANNEX E: GLOSSARY AND LIST OF ABBREVIATIONS

In this report, abbreviations and acronyms are substituted for a number of terms used within the International Energy Agency. While these terms generally have been written out on first mention, this glossary provides a quick and central reference for the abbreviations used.

| | |
|---|---|
| AAU | assigned amount units |
| ACG | Azeri-Chirag-Deepwater Guneshli |
| ACN | Anti-Corruption Network |
| ADB | Asian Development Bank |
| AGRI | Azerbaijan-Georgia-Romania-Hungary Interconnector |
| AGRP | associated gas recovery plan |
| AGT | Azerbaijan-Georgia-Turkey Power Bridge |
| AIOC | Azerbaijan International Operating Company |
| AMDAS | automated metering and data acquisition system |
| ANAS | Azerbaijan National Academy of Sciences |
| ANRE | National Agency for Energy Regulation |
| APG | associated petroleum gas |
| bbl/d | barrels per day |
| bcm | billion cubic metres |
| BSTN | Black Sea Transmission Network |
| Bt | billion tonnes |
| BTC | Baku-Tbilisi-Ceyhan |
| CAC | Central Asia-Center |
| CBD | Convention on Biological Diversity |
| CCGT | combined-cycle gas-fired turbines |
| CCS | carbon capture and storage |
| CDM | clean development mechanism (under the Kyoto Protocol) |
| CEN | European Committee for Standardisation |
| CENELEC | European Committee for Electrotechnical Standardisation |
| CES | common economic space |
| CHP | combined production of heat and power |
| CITES | Convention on International Trade in Endangered Species of Wild Fauna and Flora |
| CIS | Commonwealth of Independent States |
| CJSC | Closed Joint Stock Company |
| CL | Carbon Limits |
| CMS | Convention on Migratory Species |
| CNPC | China National Petroleum Corporation |
| $CO_2$ | carbon dioxide |
| COOMET | Organisation of the Euro-Asian Cooperation of National Metrological Institutions |

| | |
|---|---|
| COP | Conference of the Parties |
| CPC | Caspian Pipeline Consortium |
| CPI | Corruption Perceptions Index |
| CPURER | Centre on the Problems of Using Renewable Energy Resources |
| CRNMPC | Committee for Regulation of Natural Monopolies and Protection of Competition |
| | |
| DCFTA | Deep and Comprehensive Free Trade Area |
| DNA | Designated National Authority |
| DSO | distribution system operator |
| | |
| E5P | Eastern Europe Energy Efficiency and Environment Partnership |
| EAOTC | Eurasian Oil Transportation Corridor |
| EASC | Eurasian Interstate Council for Standardization, Metrology and Certification |
| EBRD | European Bank for Reconstruction and Development |
| EC | European Commission |
| EE | energy efficiency |
| EEA | Energy Efficiency Agency |
| EEC | Eurasian Economic Commission |
| EECCA | Eastern Europe, the Caucasus and Central Asia |
| EED | Energy Efficiency Department |
| EEF | Energy Efficiency Fund |
| EEMAP | Energy Emergency Mitigation Action Plan |
| EEU | Eurasian Economic Union |
| EIA | United States Energy Information Administration |
| EIB | European Investment Bank |
| EITI | Extractive Industries Transparency Initiative |
| ENI | European Neighbourhood Instrument |
| EPMOGI | Enhancement of Environmental Protection Measures in the Oil and Gas Industry of Central Asia |
| EPP | Electric Power Plants |
| ERRA | Energy Regulators Regional Association |
| ESAP | Energy Statistics Action Plan |
| ESCO | Electricity System Commercial Operator |
| ETM | electricity trading mechanism |
| ETS | emissions trading scheme |
| ETSI | European Telecommunications Standards Institute |
| EU | European Union |
| EUR | euro |
| | |
| FDI | foreign direct investment |
| FEZ | free economic zones |
| | |
| Gcal | gigacalories |
| GDP | gross domestic product |
| GEDF | Georgian Energy Development Fund |
| GEF | Global Environment Fund/Global Environment Facility |
| GGFR | Global Gas Flaring Reduction |
| GGTC | Georgian Gas Transportation Corporation |

| | |
|---|---|
| GHG | greenhouse gas |
| GIG | Georgian Industrial Group |
| GIZ | German Gesellschaft für Internationale Zusammenarbeit GmbH |
| GJ | gigajoule |
| GmbH | *Gesellschaft mit beschränkter Haftung,* limited liability company |
| GNERC | Georgian National Energy and Water Supply Regulatory Commission |
| GNIA | Georgian National Investment Agency |
| GOGC | Georgian Oil and Gas Corporation |
| GPA | Government Procurement Agreement |
| GSE | Georgian State Electric |
| GTPP | gas-turbine power plants |
| GW | gigawatts |
| GWh | gigawatt-hours |
| | |
| HIPP | Hydro Investment Promotion Project |
| HPP | hydro power plant |
| | |
| IAEA | International Atomic Energy Agency |
| ICSHP | International Center on Small Hydro Power |
| ICSID | International Centre for the Settlement of Investment Disputes |
| IEA | International Energy Agency |
| IEC | International Electro-technical Commission |
| IFI | international financial institutions |
| IFK | Investment Fund of Kazakhstan |
| IMF | International Monetary Fund |
| INOGATE | EU funded programme for Energy Cooperation between the EU, the Littoral States of the Black and Caspian Seas and their Neighbouring Countries (formerly **IN**terstate **O**il and **GA**s **T**ransportation to **E**urope) |
| INPRO | Innovative Nuclear Reactors and Fuel Cycle |
| IPC | Investment Promotion Centre |
| IPO | initial public offering |
| IRENA | International Renewable Energy Agency |
| ISO | International Standards Organization |
| | |
| JI | Joint Implementation |
| JICA | Japanese International Cooperation Agency |
| JSC | Joint Stock Company |
| | |
| kb/d | thousand barrels per day |
| kcm | thousand cubic metres |
| KCTS | Kazakhstan Caspian Transportation System |
| KEGOC | Kazakhstan Electricity Grid Operating Company |
| KfW | *Kreditanstalt für Wiederaufbau*, German Development Bank |
| KKPIK | Coordinating Commission on Climate Change |
| km | kilometres |
| KMG | KazMunayGas |
| KOREM | Kazakhstan Operator of the Electricity Market |
| KPO | Karachaganak Petroleum Operating |
| KSTC | Kyrgyz Scientific and Technical Centre |

| | |
|---|---|
| kt | kilotonnes |
| kV | kilovolt |
| kW | kilowatts |
| kWh | kilowatt-hours |
| | |
| LLC | limited liability company |
| LLP | limited liability partnership |
| LNG | liquefied natural gas |
| LPG | liquefied petroleum gas |
| LULUCF | Land Use, Land-Use Change and Forestry |
| | |
| $m^3$ | cubic metres |
| m/s | metres per second |
| mcm | million cubic metres |
| MENR | Ministry of Energy and Natural Resources |
| MFA | Macro-Financial Assistance |
| MGRES | Moldavskaya GRES |
| mm | millimetres |
| MoREEFF | Moldovan Residential Energy Efficiency Financing Facility |
| MoSEFF | Moldovan Sustainable Energy Financing Facility |
| MoU | Memorandum of Understanding |
| Mt | million tonnes |
| Mtoe | million tonnes of oil-equivalent |
| $MtCO_2$ | million tonnes of $CO_2$ |
| $MtCO_2$-eq | million tonnes of $CO_2$ equivalent |
| MW | megawatts |
| MWh | megawatt-hours |
| | |
| NATELI | New Applied Technology Efficiency and Lighting Initiative |
| NCOC | North Caspian Operating Company |
| NECSC | National Energy and Communal Services Commission |
| NEEAP | National Energy Efficiency Action Plan |
| NES | National Energy Strategy |
| NGO | non-government organisation |
| NISM | National Institute of Standards and Metrology |
| NJSC | National Joint Stock Company |
| NKRE | National Commission for the Regulation of State Energy Markets |
| NKREKP | National Commission for State Regulation of Energy and Public Utilities |
| NNSA | National Nuclear Security Administration |
| NREAP | National Renewable Energy Action Plan |
| NREP | Northern Route Export Pipeline |
| NSC | Nazstatkom |
| NSS | National Statistical Service |
| | |
| OECD | Organisation for Economic Co-operation and Development |
| OJSC | Open Joint Stock Company |
| OSCE | Organization for Security and Cooperation |

| | |
|---|---|
| PCI | projects of common interest |
| PGI | Power and Gas Infrastructure |
| PIP | Public Investment Plan |
| PJ | petajoules |
| PPA | purchasing power agreements |
| PPP | purchasing power parity |
| PSA | production sharing agreements |
| PSRC | Public Services Regulatory Commission |
| PV | photovoltaic |
| | |
| R2E2 | Energy Saving and Renewable Energy Fund |
| R&D | research and development |
| RD&D | research, development and deployment |
| REC | regional energy company |
| RED | regional electricity distribution |
| REEP | Renewable Energy and Energy Efficiency Partnership |
| REK | electricity distribution company |
| RES | renewable energy source |
| | |
| SAARES | State Agency on Alternative and Renewable Energy Resources |
| SAEE | State Agency on Energy Efficiency and Energy |
| SAM | Center for Strategic Studies |
| SCADA | Supervisory control and data acquisition |
| SCP | South Caucasus Pipeline |
| SDPP | state district power plant |
| SEZ | special economic zones |
| SGC | Southern Gas Corridor Closed Joint Stock Company |
| SIDA | Swedish International Development Cooperation Agency |
| SNRIU | State Nuclear Regulatory Inspectorate of Ukraine |
| SOCAR | State Oil Company of Azerbaijan Republic |
| SRL | *Societate cu Răspundere Limitată*, limited liability company |
| STI | science, technology and innovation |
| | |
| TAJSTAT | Statistical Agency (Tajikistan) |
| TALCO | Tajik Aluminium Company |
| TANAP | Trans-Anatolian Pipeline |
| TAP | Trans Adriatic Pipeline |
| TAPI | Turkmenistan-Afghanistan-Pakistan-India |
| TBT | technical barriers to trade |
| tce | tonnes of coal-equivalent |
| tcm | trillion cubic metres |
| TCO | Tengizchevroil |
| TFC | total final consumption |
| TJ | terajoules |
| TKE | TeploKomunEnerhos |
| toe | tonnes of oil-equivalent |
| TPES | total primary energy supply |
| TPP | thermal power plant |
| TSO | transmission system operator |
| TWh | terawatt-hours |

| | |
|---|---|
| UNCAC | UN Convention Against Corruption |
| UNDP | United Nations Development Programme |
| UNECE | United Nations Economic Commission for Europe |
| UNESCO | United Nations Educational, Scientific and Cultural Organization |
| UNFCCC | United Nations Framework Convention on Climate Change |
| UNIDO | United Nations Industrial Development Organization |
| UNSD | United Nations Department of Statistics |
| UNSTAT | United Nations Statistics Division |
| USAID | United States Agency for International Development |
| USD | United States dollar |
| USEA | United States Energy Association |
| VAT | value-added taxes |
| WB | World Bank |
| WEG | World Experience for Georgia |
| WEM | wholesale electricity market |
| WREP | Western Route Export Pipeline |
| WTO | World Trade Organization |

This publication has been produced under the authority of the Executive Director of the International Energy Agency (IEA) with European Union financial assistance provided through the European Neighbourhood and Partnership Instrument. This publication reflects the views of the IEA Secretariat, but does not necessarily reflect those of the IEA member countries or of the European Union.



IEA Publications
9, rue de la Fédération, 75739 Paris cedex 15

Printed in France by ISI Print, April 2015

(612015021E1) ISBN 9789264228719; ISSN 23070889

Cover design: IEA. Photo credits: © GraphicObsession.

# Eastern Europe, Caucasus and Central Asia

Conveniently located near the world's fastest growing energy markets, the resource-rich and transit countries of Eastern Europe, Caucasus and Central Asia contribute significantly to world energy security. However, shared challenges across the region include aged infrastructure, high energy intensity, low energy efficiency, untapped alternative energy potential and poorly functioning regional energy markets.

This publication highlights the energy policies and sector developments of Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Tajikistan, Turkmenistan, Ukraine and Uzbekistan during 2013-14 and provides a summary of key recommendations for policy makers in the region.

Energy policy analysis is conducted in line with the INOGATE Programme's four main pillars of energy development: energy market convergence, energy security, sustainable development and investment attraction. Started in 1996, the INOGATE Programme is one of the longest running energy technical assistance programmes funded by the European Union and works within the policy frameworks of the Baku Initiative and the Eastern Partnership. The INOGATE Programme co-operates with 11 Partner Countries to support reduction in their dependency on fossil fuels and imports, to improve the security of their energy supply and to mitigate overall climate change. It also supports the Eastern Partnership, a joint initiative between the European Union, EU Member States, and the Eastern European and Caucasus countries. Launched in 2009, the Eastern Partnership aims at advancing political association and economic integration.

This publication has been produced with European Union financial assistance provided through the European Neighbourhood and Partnership Instrument.

9 789264 228719

(61 2015 02 1E1)
978-92-64-22871-9 €60