International Energy Agency

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Kyrgyzstan 2022

Energy Sector Review

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INTERNATIONAL ENERGY AGENCY

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Foreword

The International Energy Agency (IEA) has been conducting in-depth peer reviews of energy policies of its member countries – and of other countries – since 1976, and it recently modernised these reviews to focus on some of the countries' key energy transition and security challenges. As the IEA has opened its doors to emerging economies, in-depth reviews have come to play an increasingly prominent role in bilateral collaborations.

Kyrgyzstan is one of the focus countries of the EU4Energy programme, which is being implemented by the IEA, along with the Energy Community and the Energy Charter, and which includes Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Tajikistan, Turkmenistan, Ukraine and Uzbekistan. The programme was designed to support the goals and aspirations of the 11 focus countries to implement sustainable energy policies and foster regional co-operation on energy sector development. One of the key ways the programme does this is by conducting in-depth policy reviews of individual countries, updating and extending the analysis from the IEA 2015 regional review, *Energy Policies Beyond IEA Countries: Eastern Europe, Caucasus and Central Asia*. Due to the Covid-19 pandemic, Kyrgyzstan's energy policy review was conducted in the form of a desk study.

Since the 2015 review, a number of energy sector reforms have taken place in Kyrgyzstan, and the country has made noticeable steps forward in developing non hydro sources of renewable energy, while setting clear targets to increase the share of variable renewable energy in the energy mix.

This review aims to guide Kyrgyzstan as it works to develop a comprehensive long-term energy with an outlook to 2050 based on holistic analysis of supply-demand trends and scenario-based modelling, which uses reliable and transparent data and assumptions. This long-term outlook should help the government provide affordable, secure and clean energy to its population, while strengthening power system security.

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1. Executive summary

Country overview

The Kyrgyz Republic is a landlocked country in Central Asia, located in the western and central part of the Tien Shan mountain system and Pamir-Alai. In the north it borders on Kazakhstan; in the west, Uzbekistan; in the southwest, Tajikistan; and in the east and southeast, the People's Republic of China (hereafter, "China"). The area of the country is 199 951 square kilometres (km²); the population is 6.71 million, 1.05 million of which live in the capital, Bishkek. Mountains occupy 94% of the territory of Kyrgyzstan.

The World Bank states that the Kyrgyz Republic sits at the crossroads of the large Chinese, South Asian and Russian markets, with unfettered access to the Eurasian Economic Union (EAEU) (of which it is a member) and could thus attract significant investments from the immediate region. Regional export potential is especially strong in hydro energy, and promising possibilities exist in trade transit in roads and railways. Given the right socio-political and policy conditions, the country could attract massive cross-regional energy and transport investments (World Bank, 2019).

Kyrgyzstan's gross domestic product (GDP) per capita in 2020 was USD 1 176 (World Bank, 2021). The World Bank classifies Kyrgyzstan as a lower-middle-income country, in the same category as neighbouring Tajikistan. In recent years, the largest contribution to GDP has come from trade and services, followed by industry and agriculture. Garment manufacturing and mining are important components of the industry.

While the country has had consistent economic growth since gaining independence in 1991, 25.3% of its population (ADB, 2021) still lives below the poverty line. Since independence, economic growth has been uneven, characterised by declines caused by political upheavals (i.e. the revolutions of 2005, 2010 and 2020) and occasional years or short periods of high growth.

The Kyrgyz Republic's plentiful water resources make hydropower the most important energy source; it also has significant deposits of coal, but oil and natural gas resources are marginal. The country is dependent on the import of natural gas, oil and oil products.

Domestic energy production is mainly from hydroelectric power plants and coal mining. The residential sector is the largest energy-consuming sector in the country, followed by transport and industry. Citizens enjoy universal access to electricity and one of the lowest residential electricity tariffs in the world.

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Key policy directions

The Kyrgyz government adopted its long-term Sustainable Development Strategy for 2018-2040 (SDS) and the accompanying medium-term National Development Program (NDP) until 2026.

In these policy documents the government unveiled its vision of the national development goals and laid out the following goals for the energy sector:

- Increase the share of renewable energy sources (small hydropower plants, solar systems, wind and biogas plants) to 10% in the total energy balance of the country.
- Reduce the country's dependence on hydrocarbon energy sources through more large-scale development of hydropower and the transition to alternative energy.
- Continue exploiting the hydropower potential of the Naryn River basin to build several promising large hydroelectric power plants.
- Continue a gradual increase in tariffs coupled with social protection measures to achieve the sustainability of the sector.
- Develop autonomous boiler houses using natural gas, coal and other energy resources).
- Apply efficiency technologies in all new construction.
- Implement large-scale programmes on energy-efficient reconstruction of old residential and non-residential buildings.
- Implement gradual electrification of transport (electric cars, electric trucks, high-speed electric trains, trolleybuses and electric trains) and develop a network of high-speed electric charging stations for accumulators and batteries.

As regional integration is one of its major energy policy directions, Kyrgyzstan participates in the Central Asia-South Asia power project (CASA-1000), the most significant project on regional integration, consisting of a 500 kilovolt (kV) Datka-Khodjent-Sangtuda alternating current (AC) transmission line connecting Kyrgyzstan and Tajikistan, and a 500 kV direct current (DC) transmission line connecting Tajikistan, Afghanistan and Pakistan. The project was approved in 2012 by all member countries and in 2019 a subcontractor was selected and construction started. The Kyrgyz component is planned to be completed in 2023.

Kyrgyzstan is a member of the EAEU and participates in the development of the EAEU common electricity market which is planned to start operations by 2025.

However, the country lacks a long-term integrated energy sector development strategy. The National Energy Program for Developing the Fuel and Energy Complex for 2008-2010 and strategy for the energy sector development up to 2025 spells out the government’s vision for maintaining energy security, increasing domestic production and promoting sustainable development. However, 14 years after its adoption, the policy has not been implemented as designed.

There is no long-term policy for energy sector development with clearly specified strategic goals based on solid economic and technical analysis.

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The government is finalising a draft Concept for the Development of the Fuel and Energy Complex of the Kyrgyz Republic until 2030. These are laudable efforts, but the country could benefit from a longer-term vision for the comprehensive and integrated policy framework based on clear strategic goals and in-depth planning for each energy subsector.

Energy sector governance and regulation

The key institutions with roles and responsibilities over the energy sector include:

- The Ministry of Energy (MoE), which is responsible for formulating strategic energy sector policy.
- The Department for the Regulation of the Fuel and Power Complex within the MoE, which is responsible for energy sector regulation. Until February 2021, the State Agency for Regulation of the Fuel and Energy Sector (Energy Regulator) had autonomous administrative status under the government. After the governmental institutional reform, the Energy Regulator's administrative status was lowered and it was placed under the ministry.
- The Technical Safety Service within the MoE, which is responsible for supervising and regulating compliance with safety requirements.
- Two state-owned enterprises, KyrgyzKomur and Kyrgyzteploenergo, are now under the MoE. KyrgyzKomur was established in 2012 and acts as an umbrella organisation for about 30 small and medium-sized enterprises operating in the coal sector; some of these companies engage only in seasonal coal production during the autumn-winter period. Kyrgyzteploenergo manages 136 boilers in 23 field offices over the country.
- Joint Stock Company (JSC) National Energy Holding was established in 2016 to support efforts to improve corporate governance and managerial efficiency within the main state-owned generation and network enterprises. It exercises the government's controlling stake in key enterprises operating in the electricity sector.
- JSC Kyrgyz Electricity Settlement Center was established in August 2015 with the objective of streamlining transactions, improving efficiency and increasing overall financial transparency in the electricity sector.
- The National Statistical Committee (NSC) is the main provider of energy-related data and statistics.

In a recent sector restructuring, four distribution companies were merged into one company and further consolidated with the National Electric Grid of Kyrgyzstan. The national generation company Open Joint-Stock Company (OJSC) Electric Stations was merged with the Bishkek district heating distribution company (OJSC Bishkekteploset). JSC Chakan GES (cascade of small hydros) remained separate. Therefore, there are only three companies in the power sector now.

This could be viewed as a retrograde step from the perspective of establishing a more liberalised power sector characterised by greater efficiency, competition and transparency.

Lowering the status of the Energy Regulator and putting it under supervision of the MoE constrict the Energy Regulator's ability to carry out autonomous economic regulation of the energy sector. The sector consolidation creates regulatory challenges in performance monitoring and implementing best practice forms of incentive regulation.

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Regional market integration

Kyrgyzstan is part of the Central Asian Power System (CAPS) operating as a united power system connecting Uzbekistan, Kyrgyzstan, Tajikistan and Kazakhstan.

Kyrgyzstan has cross-border electricity trade with Kazakhstan (export and import), Uzbekistan (export) and Tajikistan (import in small quantities). In 2021, due to the low water level in the Toktogul reservoir and the resulting power deficit, Kyrgyzstan imported electricity from Kazakhstan, Uzbekistan and Turkmenistan.

Under the framework of CAPS, Kyrgyzstan's hydropower system was designed not only to produce electricity, but to provide major ancillary services, frequency regulation and operating reserves for the regional power system. However, these functions are not fully operational due to the lack of agreement among the neighbouring power systems on pricing mechanisms for such services.

The government also prioritises regional electricity market development to improve energy security, intensify market competition and increase exports of Kyrgyz electricity. Kyrgyzstan participates in the CASA-1000 project, which would connect Kyrgyzstan with Tajikistan via 500 kV Datka-Khodjent transmission line to export power to Afghanistan and Pakistan.

Kyrgyzstan is a member of the EAEU, which plans to create common EAEU gas and electricity markets by 2025.

Security of supply

Kyrgyzstan's energy system is subject to supply security threats as well as other challenges. The network is aged and inefficient, and losses are significant. In addition, hydro-based electricity production is susceptible to seasonal and weather-related fluctuations; electricity supply is therefore less reliable due to lower water inflows and high demand during the winter months.

The challenge is further amplified by rapidly growing electricity demand, fuelled by unsustainably low regulated electricity prices. Furthermore, while demand centres are in the north, more than 80% of hydropower capacity is in the south. Old transmission connections are a further handicap.

Electricity supply is also constrained by the regional water-energy nexus. The Kyrgyz major hydropower source, the Toktogul reservoir, was constructed in the Soviet times to provide more dependable water supply for downstream irrigated agriculture and to generate hydropower. In the last years Kyrgyzstan exports electricity to neighbouring countries under bilateral contracts; however, such contractual supplies are seasonal and subject to hydrological fluctuations. Volumes of bilateral trade even in high-water years do not generate enough funds to procure fuel for winter power generation by co-generation[1] plants.

[1] Co-generation refers to the combined production of heat and power.

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The government's primary focus is 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 implementation. Reconstruction of heating networks in Bishkek and Osh as well as reconstruction of substations and improvement of power regulation and water management at the Toktogul reservoir are being implemented.

The Cabinet of Ministers is also planning to continue elaborating on Rosatom's proposal for construction of a low-power nuclear power plant. Kyrgyzstan expressed interest in studying the RITM-200 reactor. Such a reactor has a capacity of 55 megawatts (MW) and can be operated for about 50 years. It also could be built in blocks. If necessary, the initial capacity can be increased and expanded to 300 MW by adding up to six separate units.

The government's initiatives to address these challenges have focused on addressing the longer-term adequacy dimensions of power system reliability. However, relatively little attention has been given to addressing the more immediate power system security challenges facing the Kyrgyz power system. Opportunities exist to implement a range of policies that could help to strengthen power system security in the shorter term, especially during periods of water shortage when power system reliability and resilience are likely to be under greatest stress.

Energy data management and use

Energy statistics in Kyrgyzstan are generally publicly available. The NSC regularly collaborates with the main (government) users of the data, building trust and knowledge of the available data. The NSC also co-operates and regularly exchanges energy data with state and international organisations, including the International Energy Agency (IEA) and the United Nations Statistics Division (UNSD).

The NSC also disseminates its energy statistics data internationally to the IEA through the joint annual United Nations Economic Commission for Europe (UNECE)/IEA/Eurostat questionnaire. However, Kyrgyzstan does not yet report monthly data to the Joint Organisations Data Initiative (JODI).

Kyrgyzstan has achieved great progress in strengthening energy statistics data collection: the NSC has submitted joint annual questionnaires to the IEA since 2014, and for 2015 the breakdown of natural gas consumption by sector had improved.

The NSC continued strengthening energy statistics data collection and by its decrees also approved the methodological recommendations:

- for estimated calculations of electricity production obtained from solar energy (approved on 18 January 2019)
- for calculating the national indicator Sustainable Development Goal 7.2.1.1 "Share of renewable energy sources in total energy consumption" (approved on 21 May 2021).

Future goals include improved reporting on residential biomass use data, which are currently unavailable, and conducting a full accounting of renewable energy sources to calculate the energy balance in accordance with international standards (hydropower, solar and wind energy, biogas, etc.).

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In May 2022 the Council on Statistics of the Kyrgyz Republic was established by decree of the president of the Kyrgyz Republic to provide strategic recommendations to producers of official statistics.

The Council on Statistics was established to increase participation of civil society in the process of developing strategic recommendations to producers of official statistics.

Electricity and heat

Hydro-based electricity production is susceptible to seasonal and weather-related fluctuations: electricity supply is therefore less reliable due to lower water inflows and high demand during the winter months.

Consumption has reached generation capacity and the country can barely meet the domestic demand. Kyrgyzstan went from being a net exporter to net importer.

Investments in new generating capacity and in modernisation of networks will be needed to address looming electricity supply shortages. The power sector is unable to generate sufficient cash flow to fund necessary maintenance and refurbishment, or to finance new investment in a timely and efficient manner.

Demand for electricity and heat is increasing, but the systems are aged and inefficient. Investment in rehabilitation and expansion is inadequate. The sector suffers from a substantial revenue shortfall because of tariffs that are below cost recovery and because of high (by international standards) technical and non-technical losses.

Residential customers account for 82.1% of the total consumption. Growth in residential consumption has been driven by low tariffs, which have been set well below the cost of production.

Large industrial consumers and non-residential consumers are paying higher tariffs and are cross-subsidising residential consumers. Residential electricity tariffs and heating tariffs are cross-subsidised. The recent merge of JSC Electric Power Plants and JSC Bishkekteploset does not solve the cross-subsidy problem.

Supply-side and demand-side management measures are not yet planned for design and implementation.

The country lacks a long-term policy for electricity sector development with clearly specified strategic goals based on solid economic and technical analysis.

Current energy policy aims to improve energy security by developing indigenous energy sources (mainly hydro and coal) and rehabilitating and expanding transmission and distribution networks. Development of autonomous boiler houses using natural gas, coal and other energy resources is a priority due to the exhausted potential of the district heating systems in large cities for further development of heating networks.

Developing solar energy recently became a priority, but there is no planning process for integration of new variable capacity additions to avoid any unintended consequences that have the potential to worsen overall reliability of supply.

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Improving energy efficiency is also a priority. Energy efficiency technologies must be applied in all new construction, and the government plans to implement large-scale programmes on energy-efficient reconstruction of old residential and non-residential buildings and introduce energy efficiency passports for all buildings.

Coal

Coal is Kyrgyzstan's second-most-important source of domestically produced energy. Kyrgyzstan has substantial coal reserves. Coal production has more than quadrupled since 2010, driven by the government decision to boost coal production to decrease dependence on imported coal, foster decentralised heating supply and minimise use of electricity for heating purposes by households.

Production currently exceeds the demand, and export to neighbouring countries increases. Local coal is mainly used by households during the heating season, and use of coal in technological processes is very limited.

Most of the companies operating in the coal industry are small and do not have financial resources to invest in new technologies and modernisation of production equipment.

Coal prices are not regulated.

There are a number of mothballed coal deposits which the government is planning to reactivate to increase coal supply for domestic consumers to encourage use of coal for heating and thus to reduce the load on the electric system during the heating season.

Building a 1 200 MW coal plant at Kara-Keche coal mine makes sense in terms of adding baseload to the system currently overdependent on hydro generation. However, the plant should meet the world-class standards for high efficiency and pollution control.

Oil and gas

Kyrgyzstan’s oil and gas resources are marginal.

The self-sufficiency of the country in oil products and natural gas is less than 5% and is completely dependent on external supplies of oil products and natural gas. Over 80% of total imports of oil and oil products come from the Russian Federation (hereafter, “Russia”).

Most oil and gas deposits have been exploited for more than 70 years and have produced approximately 70% of their economically viable capacity. About 80% of the remaining oil reserves are difficult to extract. Their development requires additional costs and the use of special technologies.

Attracted investment into oil refineries allowed the increased production of gasoline, fuel oil and diesel fuel; however, these refineries also use imported raw materials. Quality of the domestic oil products is not high. Modernisation of local refineries’ equipment is required to reach Euro-4 and Euro-5 standards.

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Due to reconstruction and development of the natural gas network and new investment in the system, the overall level of gasification of the country has increased from 22% in 2014 to 35% by the end of 2020.

Import of oil products is completely privatised and there is no government process for planning imports and domestic sales of oil products.

Renewables

The Kyrgyz Republic has a fairly large renewable energy potential, including the energy of the sun, small watercourses, biofuels, geothermal and wind energy. However, despite the huge potential, the practical use of renewable energy sources (RES) is currently insignificant, and in the country's energy balance it is no more than 1%.

The government policies in the area of renewable energy focused on development of small hydropower plants until 2018.

The National Development Strategy of the Kyrgyz Republic for 2018-2040 sets a target of the share of renewables to be least 10% of the country's total energy balance. However, currently there is no economic and technical analysis of how to achieve the stated 10%. Neither is there a clear implementation plan supported by technical studies to identify any risks to the reliability of the national power system.

A number of solar and wind projects are being planned for implementation, but the country lacks rules for integration of new variable capacity additions to the national power system. Transparent rules and procedures for integration of new renewable energy facilities could help avoid any unintended consequences that have the potential to worsen overall reliability of supply.

Electricity tariffs do not yet reach cost recovery level, and planned tariff reform is restrained. The law provides for a preferential feed-in tariff for renewable energy that is high compared with the purchase prices in the domestic market, and end users' tariffs are still below costs.

Energy efficiency

Overarching energy efficiency legislation has been in place in Kyrgyzstan for more than two decades. The government is now finalising a new Energy Savings Law and the Energy Efficiency Law, which could be adopted by 1 July 2022. However, sector coverage is limited, and there are significant gaps in terms of secondary legislation, implementation and enforcement.

Minimum energy performance standards (MEPS) are in place for new construction in the buildings sector, although there are issues in terms of implementation. No significant legislation or programmes are in place to improve the energy efficiency of existing buildings.

MEPS are being developed for appliance and energy-using products as part of Kyrgyzstan's membership in the EAEU.

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Policies are currently lacking in the transport sector, with no measures such as fuel economy standards or efficiency-based import restrictions in place.

Except for industry, where electricity tariffs were increased significantly in 2016 and in 2021, tariffs for electricity remain well below costs of power generation. This limits investments in new generation capacity and creates disincentives for investments in end-use energy efficiency improvements.

Tariffs are particularly low in the buildings sector, both for electricity and for district heat, limiting available funds to upgrade and scale up district heating infrastructure as an alternative to electricity as the main fuel for heating residential and public buildings in municipalities.

In addition to the need for tariff reform, there are gaps in terms of more comprehensive efforts to increase financing and investment for energy efficiency improvements across the economy. The completion of an Energy Savings Fund (the Revolving Fund), as well as reforms to energy supplier obligations and public procurement, are needed.

Energy, the environment and climate change

Kyrgyzstan ratified the Kyoto Protocol in February 2003, and the Paris Agreement on climate change in November 2019.

Kyrgyzstan prepared the First (2004), Second (2008) and Third (2016) National Communications on Climate Change. Preparation of the Fourth National Communication on Climate Change and the First Biennial Update Report on the United Nations Framework Convention on Climate Change (UNFCCC) will be completed in 2022.

Kyrgyzstan's greenhouse gas (GHG) emissions are small but the country demonstrated its commitment to fulfilling its obligations under the Paris Agreement by presenting the Updated Nationally Determined Contribution (NDC) in April 2021.

In April 2021, the Kyrgyz government approved an Updated NDC until 2030, setting the overall mitigation goal of the Kyrgyz Republic to unconditionally reduce GHG emissions by 16.63% by 2025 and by 15.97% by 2030, under the business-as-usual scenario. Should international support be provided, GHG emissions will be reduced by 2025 by 36.61% and by 2030 by 43.62%, under the business-as-usual scenario.

Around 60% of all GHG emissions in Kyrgyzstan are created by the energy sector. A decrease in the consumption of fossil fuels and an increase in renewable energy is planned, as well as the modernisation of energy supply systems. The promotion of activities to increase energy efficiency will also contribute to GHG emissions reduction.

The Kyrgyz Republic recognises the importance of the adoption of the Low-Carbon Development Strategy and the National Adaptation Policy.

Even though most of the mitigation measures proposed by the Updated NDC are aligned with the effective national development strategies and government policies, there is still a need to more explicitly address climate change issues in the long-term strategies for integrated energy sector development. The key climatic impacts, and changes in the gross hydropower potential of rivers, should be carefully assessed as part of sector planning to

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address the growing demand. In addition, the proposed non-hydro renewable energy developments should be carefully assessed and aligned with the transmission and distribution plans.

Research, development and innovation

Researchers in the energy sector, as in other sectors, face challenges that include low levels of state funding. Kyrgyzstan spends a relatively small amount on scientific research and spreads its limited funding across a number of institutions and subjects.

Given the lack of state funding, the main institutions involved in energy-related research are primarily self-financed, with most funding coming from policy-related studies and/or feasibility studies. In majority these are donor-funded project-based contracts with international organisations and are never related to energy research and innovation.

Private-sector participation in energy research is negligible and almost absent.

There is a general lack of interface among universities, research institutes and industry, as well as a lack of government support mechanisms for innovation in industry.

Key recommendations

The government of Kyrgyzstan should:

- ☐ Strengthen the country's long-term energy strategy by:
  - > Developing a comprehensive long-term strategy for all energy sectors development with an outlook to 2050.
  - > Establishing clear targets in line with national socio-economic development goals and energy security objectives, based on solid analysis of supply-demand trends and alternative scenario models that apply reliable data and sound assumptions.
  - > Addressing all types of energy, including fossil fuels and renewable energy (solar, wind, biogas etc.), in policy coverage.
  - > Incorporating an analysis of options for the diversification of generation and exploration of opportunities in solar and wind resources, including a clear understanding of associated cost and available incentives. Sector planning should include a least-cost generation plan as well transmission and distribution plans.
  - > Setting energy savings targets covering all key sectors of the economy and with a particular focus on heating in public and residential buildings, which constitute the largest share of growing energy demand.

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- Assessing the pros and cons of building a low-power nuclear power plant and a coal-fired power plant, making certain they would meet the highest environmental and safety standards. If meeting such standards is not feasible, consider alternatives for providing baseload to the power system.
- Applying solid economic analysis to gas network extensions in remote and mountainous areas, such as in Naryn and Issyk-Kul regions (where there is no gasification at all).
- Ensuring clear links among the country's energy strategy and sustainable development strategies as well as the country's commitments under the UNFCCC.
- Introducing a robust action plan and monitoring mechanisms to track progress and adjust implementation schemes if needed.

- ☐ Develop relevant legal and regulatory framework to enable implementation of the new country's long-term energy strategy to 2050.
- ☐ Develop and implement mechanisms for technical and economic integration of variable RES, particularly for the introduction of solar and wind energy, in order to ensure the power system's secure and cost-effective operation.
- ☐ Adopt measures for strengthening power system security, especially during low water periods, (see the IEA energy policy roadmap on Strengthening power system security for Kyrgyzstan [IEA, 2022]). Opportunities exist to implement a range of policies that could help to strengthen power system security in the shorter term, especially during periods of water shortage when power system reliability and resilience are likely to be under greatest stress.
- ☐ Continue to improve the collection of national energy statistics to inform policy decisions and develop new indicators and reporting requirements, such as energy efficiency indicators, and improved reporting requirements for renewable energy sources to calculate the energy balance in accordance with international standards (hydropower, solar and wind energy, biogas, etc.).
- ☐ Continue tariff reform. 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. Careful review should be given to cross-subsidies between residential electricity tariffs and heating tariffs. Cross-subsidies remain insufficient for full cost recovery in either sector. Tariff reforms should be accompanied by communication and outreach.
- ☐ Consider restoring the autonomous status of the Energy Regulator and strengthening its functions in licensing, setting service standards, and ensuring that investments are used efficiently and optimally. Clear licensing requirements and obligations are especially important in the new consolidated structure of the power sector.
- ☐ Develop and implement demand-side measures. Such measures will help managing daily, weekly and seasonal periods of peak consumption that create tight supply-demand conditions that could threaten power system security.

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- Develop a detailed strategy, including implementation and enforcement mechanisms, to improve energy efficiency, leveraging work already begun in this area. Improve institutional arrangements and governance to ensure energy efficiency policies and measures are fully developed and implemented.
- Develop a programme for introduction of clean coal technologies and introduce mandatory clean coal standards.
- Strengthen the links and co-operation between policy makers, scientific research institutions and industry, e.g. through establishing working groups and conducting regular roundtables to address the concrete challenges in the energy sector requiring scientific research and innovation.
- Formulate an energy research, development and innovation (RDI) strategy, including the setting of clear priorities within thematic areas and applied research, to ensure that priorities are linked with those of the new country's long-term energy strategy to 2050.

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2. General energy policy

Key data

(2020)

TES: 3.8 Mtoe (oil 33.4%, hydro 31.8%, coal 27.1%, natural gas 7.5%), +37.3% since 2010

TES per capita: 0.57 toe/person (world average 2019: 1.9 toe/person)

TES per unit of GDP: 139 toe/million USD PPP* (world average: 114 toe/million USD PPP)

Energy production: 2.3 Mtoe (hydro 53.0%, coal 37.4%, oil 8.6%, natural gas 0.9%), +83.0% since 2010

TFC: 3.2 Mtoe (oil 37.2%, electricity 32.7%, coal 15.4%, district heat 9.4%, natural gas 5.2%), +41% since 2010

Prices are converted into USD based on the exchange rate USD 1 = KGS 84.7009 (Kyrgyzstani som). One tyiyn is 1/100th of a som.

* Purchasing power parity

Country overview

The Kyrgyz Republic (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 6.71 million people. Its plentiful water resources make hydropower the most important energy source; it also has significant deposits of coal, but oil and natural gas resources are marginal.

Agriculture is the largest sector of the economy, its main products being cotton, tobacco, wool and meat. Industrial exports include gold, mercury, agricultural products and electricity.

Kyrgyzstan has been a member of the World Trade Organization since 1998, and it joined the EAEU in 2015.

The energy sector represents 4% of GDP and 16% of industrial production, and hydropower accounts for two-thirds of energy production. Kyrgyzstan exploits coal and some oil and gas, but most hydrocarbons are imported. In fact, it relies on oil and gas imports for more than half of its energy needs, particularly during the winter months when hydropower production is low. For this reason, regional integration with neighbouring countries is important.

Kyrgyzstan is part of CAPS connecting Uzbekistan, Kyrgyzstan, Tajikistan and Kazakhstan. New integration plans include CASA-1000, which will connect the electricity-exporting countries of Kyrgyzstan and Tajikistan with Afghanistan and Pakistan to supply them with electricity. The project is in the advanced stages of planning and could be operational after 2023.

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Figure 2.1 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.

The energy system of Kyrgyzstan depends primarily on hydroelectric power, oil, coal and natural gas.

Kyrgyzstan has reserves of energy resources and is able to meet its needs to a large extent, but at present, the potential of the fuel and energy complex is not being realised sufficiently. The efficiency of many energy companies' functioning has declined, the industry is experiencing financial and economic difficulties. Overall, energy self-sufficiency has improved in recent years due to increased coal production, which reached roughly two-thirds of energy supply in 2020, compared to the 10-year average of 50%. Still, the country must import around 90% of its oil and natural gas demand.

Domestic energy production consists mainly of hydroelectricity and coal mining, topped with limited oil and gas extraction.

In 2020, the total energy supply (TES) amounted to 3.8 million tonnes of oil equivalent (Mtoe) (+37% since 2010), of which about one-third was covered by imports.

Total final consumption (TFC) in 2020 was 3.2 Mtoe, of which 37% was oil, 33% electricity, 15% coal 9% district heat and 5% natural gas.

The residential sector accounted for 47% of the TFC, followed by the transport sector (34%). The remaining amount was reportedly consumed by industry (9%), and services and other sectors (11%). Data collection on energy consumption is not fully compatible with international definitions, therefore sectoral consumption shares may not be fully

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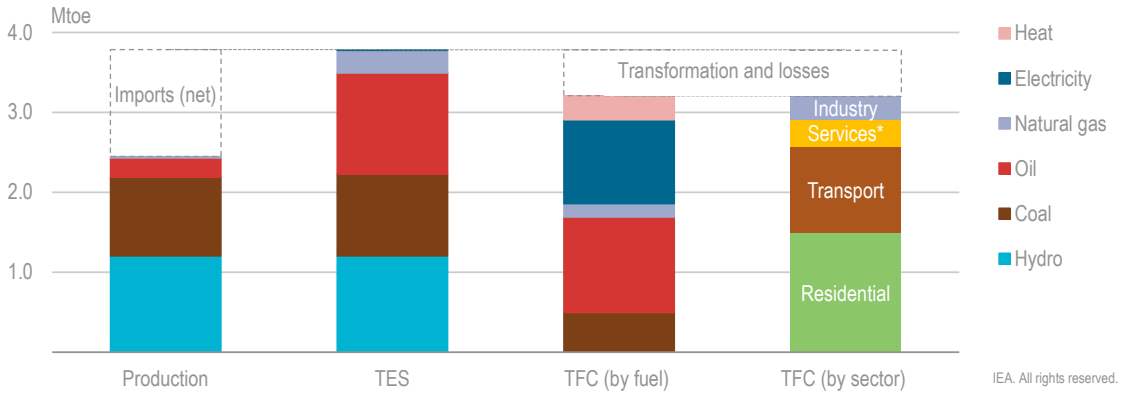
comparable with other countries. For the purposes of this study, notable quantities of road fuel consumption reported in the residential sector are allocated to transport.

Figure 2.2 Overview of Kyrgyzstan's energy system by fuel and by sector, 2020



Bunker fuels of around 0.01 Mtoe are not included in TES. Consumption of solid biofuels not quantified and therefore not present in the figure.

* includes commercial and public services, agriculture and forestry and unspecified energy consumption.

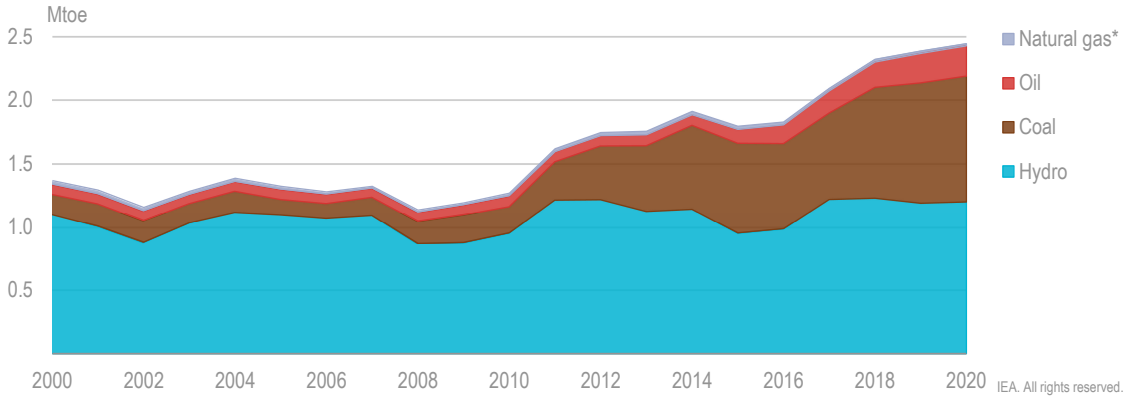
Note: Mtoe = million tonnes of oil equivalent.

Source: IEA (2022), World Energy Statistics and Balances (database), https://www.iea.org/data-and-statistics

Primary energy production in Kyrgyzstan amounted to 2.4 Mtoe in 2020. This mainly composed of hydroelectricity (49% in 2020) and coal (40%). Hydroelectric power generation has remained stable over the past years, changing only due to changes in the water level in the reservoir. Coal production has seen almost a five-fold increase since 2010.

Total self-sufficiency was about 50% of the TES.

Figure 2.3 Primary energy production by source, 2000-2020



* not visible at this scale.

Source: IEA (2022), World Energy Statistics and Balances (database), https://www.iea.org/data-and-statistics

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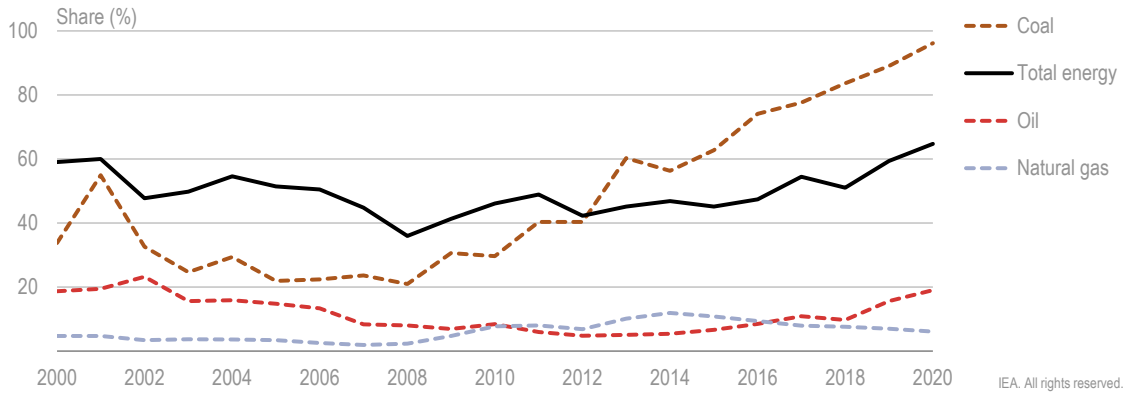
Figure 2.4 Self-sufficiency (production/TES) by energy source, 2000-2020

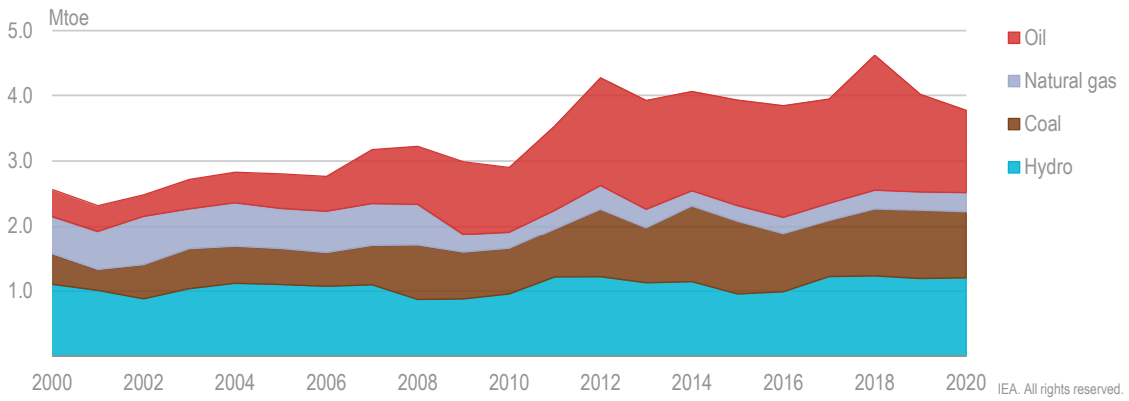


Note: Self-sufficiency is calculated as domestic production in relation to TES. A value below 100% indicates that the country produces less than it consumes, making it a net energy importer.

Source: IEA (2022), World Energy Statistics and Balances (database), https://www.iea.org/data-and-statistics

TES stood at 3.8 Mtoe in 2020, an increase of 37% since 2010. Oil and oil products accounted for 33% of TES, hydroelectricity for 32% and coal for 27%. Natural gas virtually covered the rest with an 8% share in 2020. Except for hydro, the contribution of renewables is negligible, although studies to quantify the energy consumption of biomass have not been conducted.

Figure 2.5 Total energy supply by source, 2000-2020



Source: IEA (2022), World Energy Statistics and Balances (database), https://www.iea.org/data-and-statistics

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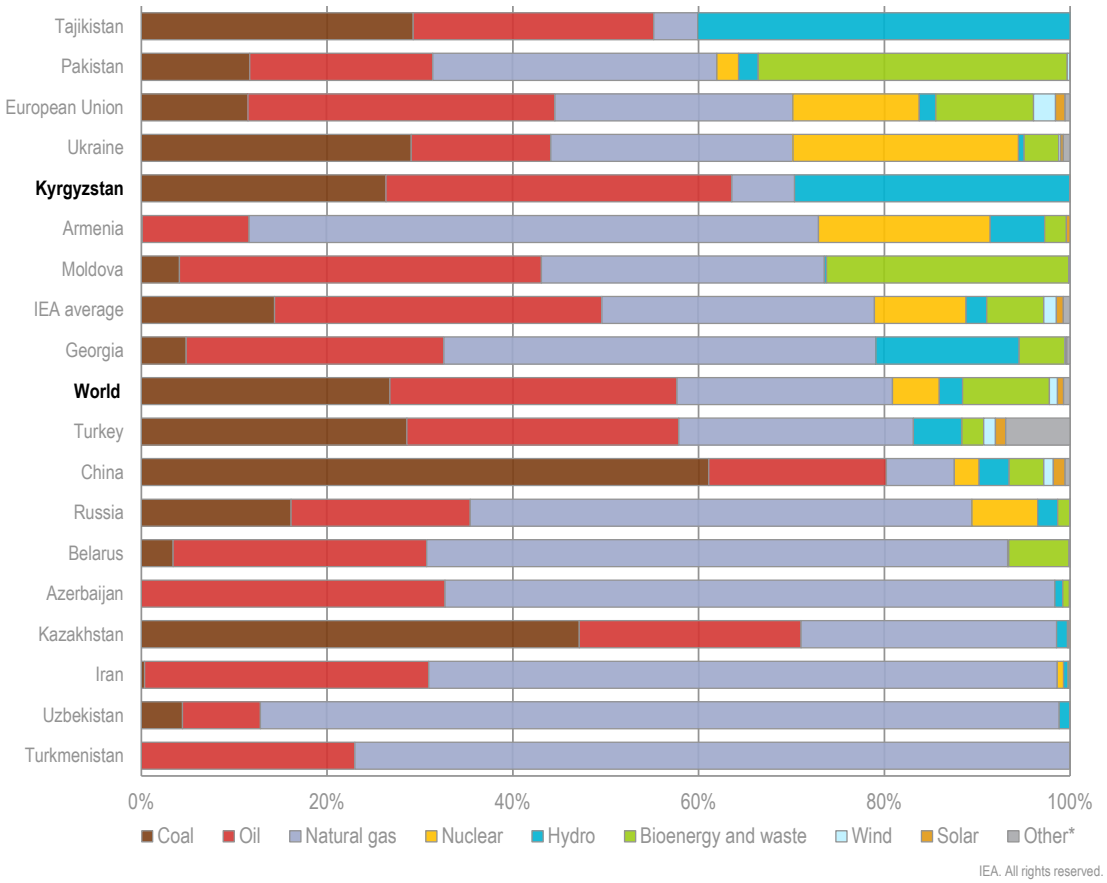
Figure 2.6 Breakdown of total energy supply in selected countries, 2019



Source: IEA (2022), World Energy Statistics and Balances (database), https://www.iea.org/data-and-statistics

Compared with most other countries of the former Soviet Union, Kyrgyzstan does not heavily dependy on natural gas, but instead on coal and oil I for its energy supply. The share of fossil fuels in Kyrgyzstan's TES is also well below the world average (68% vs. 81% of TES in 2019).

Energy consumption

The TFC in Kyrgyzstan amounted to 3.2 Mtoe in 2020. The residential sector has the largest consumption with 47%, followed by transport (34%), industry (9%) and other sectors (11%).

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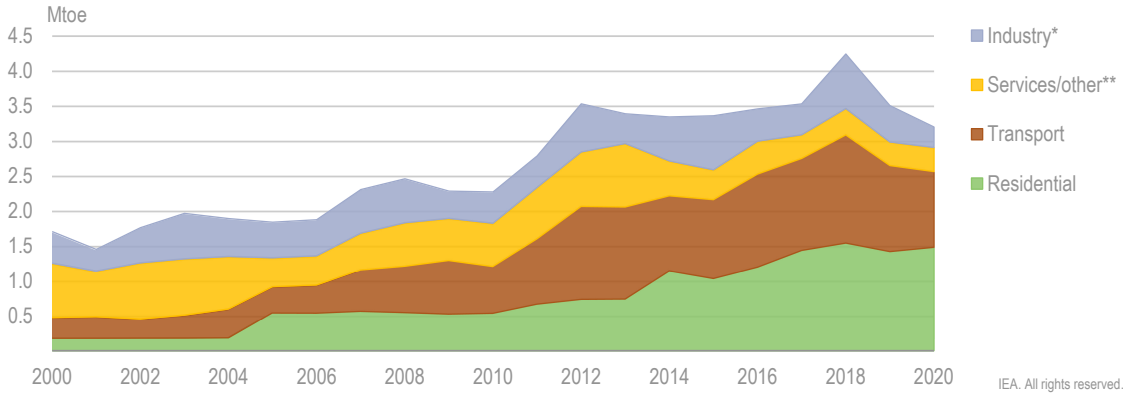
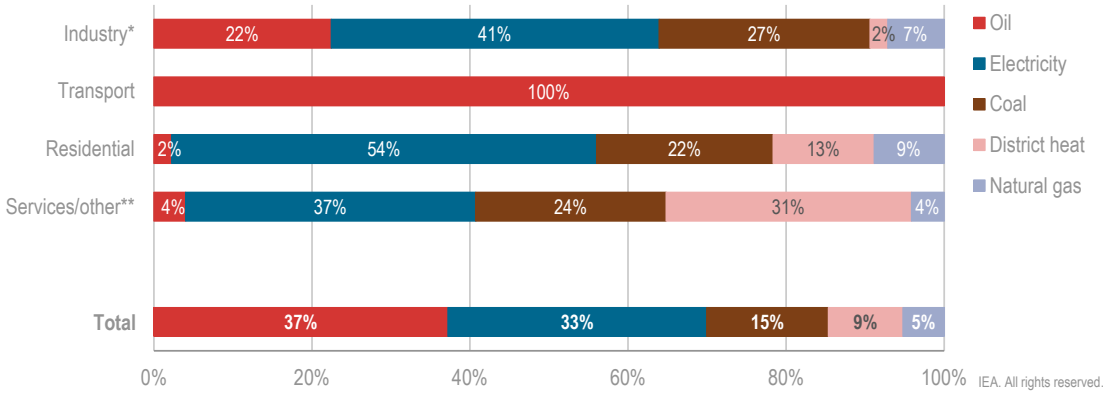
Figure 2.7 Total final consumption by sector, 2000-2020



Note: For the purposes of the study, officially reported road fuel consumption in residential sector was reallocated to transport sector.
* includes non-energy consumption.
** includes commercial and public services, agriculture and forestry as well as unspecified energy consumption.
Source: IEA (2022), World Energy Statistics and Balances (database), https://www.iea.org/data-and-statistics

Figure 2.8 Total final consumption by source and sector, 2020



Note: Data for biomass (mainly solid biofuels) consumption is not available.
* includes non-energy consumption.
** includes commercial and public services, agriculture and forestry as well as unspecified energy consumption.
Source: IEA (2022), World Energy Statistics and Balances (database), https://www.iea.org/data-and-statistics

Energy sector governance and regulation

Executive

The government of the Kyrgyz Republic defines energy policy and monitors its implementation in accordance with the Energy Law and subsequent legislation.

Until February 2021, the State Committee on Industry, Energy and Subsoil Use (State Committee) served as the authorised state body to develop energy policy. At the end of 2020, the government initiated administrative reforms that resulted in a new governmental structure and re-established the Ministry of Energy and Industry (MEI) in February 2021. The MEI was assigned with development and implementation of state policies in the fuel and energy sector, industry (excluding the food industry), geology, subsoil, and industrial safety.

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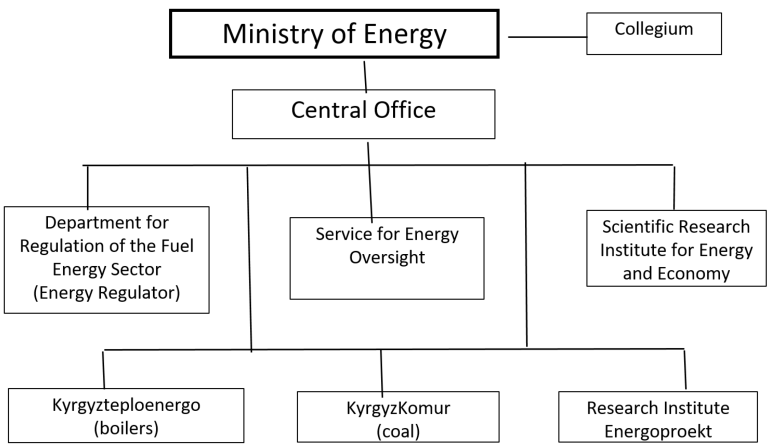
In October 2021 the government narrowed functions of the MEI to the energy sector only and transferred policy functions over industry to the Ministry of Economy and Commerce and policy functions over geology and subsoil use to the Ministry of Natural Resources, Ecology and Technical Oversight. The MEI was renamed the Ministry of Energy (MoE).

The MoE's functions, among other things, include the following:

- Develop and implement a unified state policy for the fuel and energy sector and energy security.
- Develop and implement strategies, programmes, plans and contracts to effectively develop the energy sector, as within the competencies of the ministry.
- Create conditions to introduce and use RES.
- Develop mechanisms for the rational use of the Kyrgyz Republic's water and energy resources.
- Develop incentives for energy efficiency (EE), energy conservation and use of RES.
- Act on behalf of the state as the manager of state shares in the National Energy Holding Company (NEHC).

The current structure of the MoE of the Kyrgyz Republic is shown below.

Figure 2.9 Structure of the Ministry of Energy



Source: Kyrgyz Republic, Decree of the Cabinet of Ministers No. 247 dated 15 November 2021.

Two state-owned enterprises KyrgyzKomur and Kyrgyzteploenergo are now under the MoE. KyrgyzKomur was established in 2012 and acts as an umbrella organisation for supply of coal for about 30 small and medium-sized enterprises operating in the coal sector; some of these companies engage only in seasonal coal production during the autumn-winter period. Kyrgyzteploenergo manages 136 boilers in 23 field offices over the country.

Regulatory

Until February 2021, the State Agency for Regulation of the Fuel and Energy Sector (Energy Regulator) had autonomous administrative status under the government. After the governmental institutional reform, the Energy Regulator's administrative status was lowered and it was placed under the ministry.

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The Energy Regulator's functions, among others, include the following:

- Issue licences and monitor compliance with licensing requirements for the following activities:
  - Generation, transmission, distribution, sale, export and import of electricity. Exceptions are the generation of electricity from RES and entities that generate electricity for their own use from any sources of energy with capacities below 1 000 kilowatts.
  - Production, transmission, distribution and sale of thermal energy. Exceptions are the production of either thermal energy from RES or thermal energy from any energy source for their own use.
  - Processing of oil and natural gas, with the exception of industrial production of bioethanol from plant raw materials and its implementation.
  - Production, transmission, distribution and sale of natural gas.
- Calculate and set tariffs for electricity, thermal energy and natural gas.
- Develop methodology for calculating tariffs for electricity, thermal energy and natural gas.
- Develop methodology for calculating a fee for technological connection to electric, thermal and gas networks.
- Develop and conclude performance agreements with energy companies, conduct compliance reviews to implement the requirements and conditions established in the agreements, and issue orders to eliminate violations on the outcomes of inspections and complaints.
- Consider complaints and applications from consumers and energy sector companies.
- Consider cases of non-compliance with rules or standards applicable in the energy sector and determine penalties.
- Organise public hearings, conferences, seminars and other activities to raise awareness among energy consumers on the tariff policy approved by the government and how it will be implemented in the Kyrgyz Republic.

Legislative

The Kyrgyz parliament adopts primary legislation according to the procedure laid out in the constitution and Kyrgyz legislation. New laws or amendments to existing legislation can be initiated by the president, the chairman of the Cabinet of Ministers, members of parliament, the People's Kurultai and citizens when an initiative has at least 10 000 supporters.

Draft laws submitted to the parliament are deemed accepted if they pass three readings with a majority of deputies' votes. After a law has been accepted by the parliament, it is sent within 14 days to the president for signing. The president must sign the law no later than one month after receiving it, or return it with objections to the parliament for re-examination. Laws signed by the president are published and come into force ten days from their promulgation if not otherwise stipulated in the law itself or in the law on the procedure for its entry into force.

The parliamentary Committee on Fuel and Energy Complex, Subsoil Use and Industrial Policy oversees energy sector developments through regular or topical hearings with the participation of the MoE and other stakeholders.

Secondary legislation (regulations, decrees, orders, etc.) is initiated and passed by the Cabinet of Ministers of the Kyrgyz Republic and/or the relevant executive bodies (ministries).

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Energy statistics

The National Statistical Committee (NSC) of the Kyrgyz Republic is responsible for collection, verification and dissemination of official energy statistics The NSC issues annual energy statistics relating to the production, transformation and consumption of energy products, as well as foreign trade of energy products. It also produces monthly short-term energy statistics on the supply of energy goods. The NSC receives and processes data from a number of government agencies, including the MoE, the Ministry of Economy and others.

Energy data are collected through five different surveys sent to enterprises, and annual energy data are generally available in the public domain in Excel-format[1]. The NSC regularly collaborates with the main (government) users of the data, building trust and knowledge of the available data. The NSC also co-operates and regularly exchanges energy data with state and international organisations, including with the IEA (since 2014) and the UNSD.

Annual data follow the layout of the fuel energy balance in accordance with the Methodology for Calculating the Fuel and Energy Balances, approved by the Decree of the National Statistical Committee of the Kyrgyz Republic No. 29 dated 10 October 2007 (NSC, 2007).

Monthly data on electricity and fossil fuel energy production and trade are also collected. However, as of 2021, Kyrgyzstan does not report monthly data to Joint Organisations Data Initiative (JODI).

The review team commends the efforts of the NSC to make data easily accessible online. Furthermore, the ongoing digitalisation of the data collection is strongly supported. This will potentially allow for amending the data collection forms more easily when new data needs arise. Also, data processing and validation can be automated, freeing scarce staff resources.

To further strengthen energy statistics data collection, the NSC recently approved the methodological recommendations:

- for estimated calculations of electricity production obtained from solar energy (approved on 18 January 2019 [NSC,2019])
- for calculating the national indicator Sustainable Development Goal (SDG) 7.2.1.1 "Share of renewable energy sources in total energy consumption" (approved on 21 May 2021, NSC [2021]).

[1] National Statistical Committee of the Kyrgyz Republic, Fuel and Energy Balance, http://www.stat.kg/en/publications/toplivno-energeticheskij-balans

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Future goals of the NSC include improved reporting on residential biomass use data, which are currently unavailable. This could be conducted together with full accounting of renewable energy sources to calculate the energy balance in accordance with international standards (hydropower, solar and wind energy, biogas, etc.). The review team fully supports these initiatives.

The Council on Statistics of the Kyrgyz Republic was established by the Decree of the President of the Kyrgyz Republic No. 149 dated 11 May 2022. The composition and regulations on the council are approved by the president of the Kyrgyz Republic.

The Council on Statistics of the Kyrgyz Republic is an advisory deliberative body on the strategic development of official statistics. Its main objective is to provide strategic recommendations to producers of official statistics.

The Council on Statistics was established to increase participation of civil society in the process of developing strategic recommendations to producers of official statistics. Its role is to increase the relevance of official statistics and promote the principles of transparency and accountability of the national statistical system. The council also provides an opportunity for users to directly influence the strategic planning, monitoring and content of statistical data.

The review team recommends the Council on Statistics consider further harmonising the national energy statistics collection and reporting with the International Recommendations for Energy Statistics[2]. Among other benefits, this would greatly support the calculation of the energy-related SDGs and the energy module of the greenhouse gas inventory.

The review team also suggests that the Council advocate for proper resources in order to conduct further statistical work related to energy data, potentially including the development of energy efficiency indicators[3].

Key policy directions

Strategic policy making

Kyrgyzstan does not have a long-term energy sector development strategy. The effective **National Energy Program** for 2008-2010 (NEP), with its integrated plan for fuel-energy complex development to 2025, was approved in 2008 and remains the government's main long-term policy document.

The government prioritises energy security, efficiency and sustainable development in its policies. Improving energy security and efficiency is important due to fluctuations in hydropower production, reliance on hydrocarbon imports, and aged, inefficient infrastructure that incurs high losses (NEP, 2008).

[2] United Nations Statistics Division, Energy Statistics, https://unstats.un.org/unsd/energystats/methodology/ires/
[3] As per the IEA methodology, see https://www.iea.org/reports/energy-efficiency-indicators-essentials-for-policy-making

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The NEP aims to:

- Ensure reliable electricity and heat supply.
- Liberalise the electricity market and adopt the legislation necessary to define market rules.
- Improve the energy efficiency of production, transmission and distribution of electricity and heat through modernisation and new technologies.
- Increase hydro and coal-fired generation capacity to augment the national electricity supply and expand exports.
- Actively participate in regional electricity market development within the sphere of the EAEU.

The NEP was not implemented as designed and now requires a significant update to align the policy to the changes that took place in the country and the Central Asian region as well as worldwide.

Elements of strategic vision for the energy sector development could be found in other policy documents. In particular:

The National Development Strategy of the Kyrgyz Republic for 2018-2040 (NDS) requires energy efficiency technologies to be applied in all new construction, and the government plans to implement large-scale programmes on energy-efficient reconstruction of old residential and non-residential buildings and introduce energy efficiency passports for all buildings (NDS, 2018).

The NDS sets the target for the share of clean energy sources (small hydropower plants, solar and wind power plants, solar collectors, heat pumps, use of biogas, etc.) to be at least 10% of the total energy balance of the country, and the indicators of energy and resource saving will correspond to the indicators of the countries of the Organisation for Economic Co-operation and Development.

The **green economy concept** sets out introduction of low-carbon renewable energy sources and improving energy efficiency as absolute priorities (GEC, 2018).

The GEC also outlines the tasks of developing small hydropower, stimulating the development of solar and wind energy, determining the resources of RES (small hydropower plants, solar systems, wind and biogas plants) for each district of the Kyrgyz Republic and developing legislative initiatives to stimulate the development of distributed energy production by small hydropower plants, solar systems, wind and biogas plants ro reduce network lses and network load.

The GEC also provides for the development of a vision, strategy and plan for the development of the energy sector until 2040, taking into account the country's obligations under the Sustainable Development Goals to increase the share of renewable energy sources (small hydropower plants, solar systems, wind and biogas plants) to 10% of total electricity generation.

The **National Development Program** until 2026 (NDP) established priorities for economic development of the energy sector, which among other things include reduction of the country's dependence on hydrocarbon energy sources through more large-scale development of hydropower and the transition to alternative energy, taking into account changes in the structure of internal energy consumption and technological modernisation of the economy, especially climate change processes (NDP, 2021).

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To meet the growing demand in the medium and long term, the hydropower potential of the Naryn River basin should be realised, taking into account the priority and efficiency of the construction of promising hydroelectric power plants (HPPs) (Kambaratinskaya HPP-1, the Upper Naryn cascade of HPPs, the Suusamyr-Kokomeren cascade of HPPs, the Kazarmansky cascade of HPPs and others). An accelerated reconstruction and modernisation of existing capacities at the Cascade of Toktogul HPPs is also planned (NDP, 2021).

The NDP envisages development of export through new markets, such as CASA-1000 and planned common electricity market of the EAEU member states. The NDP also relies on small hydropower development, allowing for 300 MW to 400 MW of additional capacity to be added to the system.

The NDP acknowledges that the energy sector is in critical financial condition and remains unattractive for investors and calls for a gradual increase in tariffs coupled with social protection measures to achieve the sustainability of the sector.

The NDP recognises that district heating systems in large cities have exhausted the potential for further development of heating networks and has shown their unprofitability. It also proposes developing autonomous boiler houses using natural gas, coal and other energy resources), including environmentally friendly ones. The programme also envisages gradual electrification of transport (electric cars, electric trucks, high-speed electric trains, trolleybuses and electric trains) and development of a network of high-speed electric charging stations for accumulators and batteries.

Box 2.1 Priority projects determined by the National Development Program of the Kyrgyz Republic until 2026

The NDP of the Kyrgyz Republic until 2026 identifies the following priority projects:

- construction of large hydropower facilities (Kambarata HPP-1, Upper Naryn HPP cascade, Suusamyr-Kokomeren HPP cascade, Kazarman HPP cascade, etc.)
- construction of small hydropower plants
- implementation of the CASA-1000 project
- phased transition of the state motor transport fleet to electric vehicles
- implementation of the project on energy efficiency of buildings
- development of alternative energy sources (solar and wind energy).

In order to develop conceptual approaches for the development of the energy sector for the long term, a **draft Concept for the Development of the Fuel and Energy Complex of the Kyrgyz Republic until 2030** has been prepared. The draft concept defines the main goals as the sustainable development of the fuel and energy complex, the energy security of the country and regions, the energy efficiency of the real sector of the economy, and the availability of energy carriers for each consumer with a decrease in man-made impact on the environment. The draft concept recognises that the energy policy of the Kyrgyz Republic in the context of sustainable development should ensure the energy, economic, environmental and national security of the country as a whole, as well as progress towards sustainable development.

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The set goals shall be achieved through:

- sustainable development of the fuel and energy complex and ensuring energy security
- managing the demand for energy carriers in the real sector and regions to achieve economic growth, as well as the formation of a rational structure of the fuel and energy balance of the country and regions
- international co-operation and strengthening of foreign energy policy
- energy efficiency and energy conservation with a reduction in the impact of energy on the environment and public health, as well as progress towards sustainable development of the country and regions
- institutional reforms: strengthening strategic management, management and innovative development of the energy sector
- financial recovery: tariff policy, ensuring financial stability and efficiency of power companies and energy companies.

The government also plans to attract private investment in the coal sector. As coal is currently the most cost-effective and readily available fuel, the government plans to increase production in existing fields from 450 kilotonnes (kt) in 2010 to 3 Mt by 2025 (in 2018, coal production was 2.395 Mt).

In the oil and gas sector, policies are directed at improving the fiscal regime of minerals management and attracting 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 implementing a programme for gasification based on the commitments under the Kyrgyz-Russian intergovernmental agreement “On cooperation in the field of transportation, distribution and supply of natural gas” signed in 2013.

Kyrgyzstan ratified the Kyoto Protocol in February 2003, and a number of Clean Development Mechanism (CDM) projects have been identified but not yet registered. 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 have submitted sectoral adaptation programmes for government approval.

Kyrgyzstan’s Third National Communication under the UNFCCC was approved by the Kyrgyz government in October 2016.

Furthermore, in November 2019 Kyrgyzstan ratified the Paris Agreement on climate change.

In 2021, Kyrgyzstan presented the Updated Nationally Determined Contribution to the reduction of GHG emissions

Preparation of the Fourth National Communication on Climate Change and the First Biennial Update Report on the UNFCCC will be completed in 2022.

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Recent developments

In April 2022 the press service of the Cabinet of Ministers reported that several documents on solar development were signed:

1. The Cabinet of Ministers signed an agreement on the construction of a 1 000 MW solar power plant in the Issyk-Kul region with Chinese investors (the Chinese energy consortium as part of China Power International Development Limited [CPID] and China Railway 20 Bureau Group Corporation [CR20G]).
2. The Cabinet of Ministers signed a memorandum of understanding (MoU) on the construction of a solar power plant and a 260 MW hydroelectric power station with Spanish energy company EcoEner.
3. The Ministry of Energy signed an MoU with Masdar (United Arab Emirates) on construction of a solar power plant with a capacity of 500 MW.

The Cabinet of Ministers is also planning to continue elaborating on Rosatom's proposal for construction of a small modular reactor (SMR) nuclear power plant. Kyrgyzstan expressed interest in studying the RITM-200 reactor. Such a reactor has a capacity of 55 MW and can be operated for about 50 years. It also could be built in blocks. If necessary, the initial capacity can be increased and expanded to 300 MW by adding up to six separate units.

Energy prices

Electricity

End-user electricity tariffs are set by the Energy Regulator based on the Mid-Term Tariff Policy (MTTP) approved by the government.

In the effective Electricity MTTP for 2021-2025, the government kept a two-tiered residential tariff, which was introduced in 2015. Residential consumers pay a low socially oriented tariff on all consumption up to 700 kilowatt-hours (kWh) (the social tariff threshold), and a higher tariff on all additional consumption (Electricity MTTP, 2021).

Tariffs for residential consumers have not changed and have remained at 2015 levels. The two-tier tariff regime is kept at the current level of KGS 0.77 ith consumption of up to 700 kWh and KGS 2.16 (Kyrgyzstani som) for consumption above the threshold. (Electricity MTTP, 2021).

The step-up coefficient of 2.0 has been introduced for industrial customers, except for cement plants (coefficient of 1.3) and for foundries, smelting workshops of electrothermal metal processing (step-up coefficient of 1.5). Therefore, the tariff of 252 tyiyn/kWh (USD 0.0298/kWh) multiplied by the step-up coefficient results in 504 tyiyn/kWh (USD 0.0596/kWh) for industrial customers.

The Electricity MTTP provides for annual adjustment of end-user electricity tariffs to the level of actual inflation for the previous year starting 1 June 2022.

New tariff increases for industrial customers have resulted in more cross-subsidisation between customer groups. Large and non-residential users are still carrying the weight of the tariff increases, while the lower residential tariff has not increased.

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On 6 December 2021 by virtue of decree of the president starting 1 January 2022, the electricity tariff for low-income families with children under 16 years receiving the state allowance was decreased from 77 tyiyn to 50 tyiyn for consumption under 700 kWh per month.

Thermal energy

End-user tariffs for thermal energy are set by the Energy Regulator based on the MTTP approved by the government.

The effective MTTP for Thermal Energy and Hot Water for 2021-2025 was approved by the Cabinet of Ministers on 30 September 2021.

The government is planning a gradual introduction of the principles of self-sufficiency for the heat and power industry and the phased elimination of cross-subsidies in tariff setting in order to achieve cost recovery in the medium term (Thermal Energy MTTP, 2021).

The government plans a 10% annual increase of heating tariffs for residential customers, starting from KGS 1 134.76 per gigacalorie (Gcal) in 2021 and reaching KGS 1 661/Gcal by 1 June 2024. Hot water tariffs for residential customers are also planned to be increased on an annual basis (about 14% a year) starting from KGS 981.76/Gcal in 2021 and reaching KGS 1 661/Gcal by 1 June 2024 (Thermal Energy MTTP, 2021). The MTTP provides for annual adjustment to the level of actual inflation for the previous year.

Effective tariffs for heating and hot water were approved by the Energy Regulator on 15 October 2021.

Gas

The tariff setting for natural gas is primarily based on the bilateral agreement between the governments of the Kyrgyz Republic and the Russian Federation “On cooperation in the field of transportation, distribution and supply of natural gas”, signed on 26 July 2013.

According to the agreement the authorised body of the Kyrgyz Republic sets the price of gas at the level of the costs incurred for purchase, transportation, storage and other associated costs plus the rate of return in real terms (excluding inflation) for 25 years (starting from 2013). The agreement also guarantees a regular (at least once a year) review of prices (tariffs) for natural gas sold by the Energy Regulator.

The Energy Regulator sets the upper price limit excluding a certain part of the costs from the tariff structure using the Methodology for Determining Costs for Calculating Natural Gas Tariffs approved by the Energy Regulator’s Order No. 5 dated 6 December 2016. This methodology is mainly used to calculate the permitted income of Gazprom Kyrgyzstan LLC’s operations. The methodology does not contain any provisions regarding the calculation of (subsidised) tariffs for consumers.

At the moment, despite the clause of the above intergovernmental agreement on setting the tariff at the level of all costs of the Gazprom Kyrgyzstan LLC plus the rate of return, the tariff is set at 11% below the cost. The deficit of the expenditure part of the budget and the cost of the payroll fund are subsidised directly by Russia’s Gazprom.

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Coal

Prices are not regulated. However, the government may set the retail price ceiling for the heating season (up to 90 days) in order to restrain price increases during the winter period and to facilitate the stable supply of coal. Please see Chapter 4 for further details.

Oil

The oil market is competitive and prices are not regulated. Virtually all oil products are imported from Russia by private petroleum traders under the agreement between the governments of Russia and the Kyrgyz Republic on co-operation in the supply of oil and petroleum products signed on 6 June 2016. Please see Chapter 5 for further details.

Regional integration

The water and energy resources of the Central Asian Republics are abundant, but distributed unevenly across the region. Kazakhstan is endowed with significant oil, gas and coal resources; Uzbekistan has primarily gas, but also oil and coal; and Turkmenistan has substantial amounts of natural gas. In contrast, the Kyrgyz Republic and Tajikistan have negligible amounts of commercially exploitable fossil fuels, but both enjoy abundant water resources and the potential for significant development of hydropower.

Between the 1960s and 1990s, the Soviet system addressed this “unevenness” of Central Asia's natural endowments and use of resources by developing an integrated water and power system. Very large storage reservoirs were constructed in the mountainous upstream countries to provide more dependable water supply for downstream irrigated agriculture and to generate hydropower. Across the geography of Soviet Central Asia, the high-voltage integrated Central Asian power transmission system balanced the seasonal hydro energy produced in the eastern regions with the output of thermal plants located in the western regions.

CAPS has operated as a united power system since 1961. Initially the system comprised five national power systems – Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan – that were interconnected by 110 kV and 220 kV radial transmission lines and a ring of 500 kV transmission lines.

The basis for CAPS’ co-ordinated operation is a multilateral agreement on parallel operation that was signed by the five national power systems at the end of 1990s. In 2003 Turkmenistan disconnected from the united system and in 2009 Tajikistan was disconnected from the regional power system by Uzbekistan.

Kyrgyzstan’s electricity grid is connected to the CAPS; although trade volumes are much lower in recent years, Kyrgyzstan still has cross-border electricity trade with Kazakhstan (export and import), Uzbekistan (export) and Tajikistan (import in small quantities). In 2021 due to the low water level in the Toktogul reservoir and the resulting power deficit, Kyrgyzstan imported electricity from Kazakhstan, Uzbekistan and Turkmenistan.

Under the framework of CAPS, Kyrgyzstan’s hydropower system was designed not only to produce electricity, but to provide major ancillary services, frequency regulation and operating reserves for the regional power system. However, these functions are not fully operational due to the lack of agreement among the neighbouring power systems on pricing mechanisms for such services.

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As regional integration is one of its major energy policy directions, Kyrgyzstan participates in the CASA-1000 project, which would connect Kyrgyzstan with Tajikistan via the 500 kV Datka-Khodjent transmission line to export power to Afghanistan and Pakistan.

Gas is imported to Kyrgyzstan via the Central Asian Bukhara-Tashkent-Bishkek-Almaty pipeline. The imports through this pipeline provide for 92% of the country's gas needs and the remaining 8% is covered from own reserves.

In 2014, Kyrgyzstan approved a feasibility study for a new gas pipeline to transit gas from Turkmenistan to China via Tajikistan and Kyrgyzstan: Line D of the Central Asia-China gas pipeline network. Construction of Kyrgyzstan’s share has not started yet, but it will become a transit country for 25 billion cubic metres (bcm) to 30 bcm of gas per year and will collect gas transit revenue. This could open its market to diverse sources of gas imports, depending on contract agreements with suppliers and purchasers.

Kyrgyzstan is a member of the EAEU, which plans to create common EAEU gas and electricity markets by 2025. Realisation of these ambitious goals will require close co-operation and co-ordination among different institutions to achieve regulatory coherence and eliminate possible contradictions and conflicts.

Assessment

Kyrgyzstan has reserves of energy resources to meet its needs to a large extent. Kyrgyzstan depends on the import of natural gas and heavily on oil for its energy supply, and is relatively independent of electricity and coal.

Domestic energy production is mainly from hydroelectric power plants and coal mining. Hydroelectric power generation has remained stable over the past years, depending on the water level in the Toktogul reservoir. Coal production has increased by more than 12% since 2006.

The government is planning to continue elaborating on Rosatom’s proposal for construction of a low-power nuclear power plant. Kyrgyzstan expressed interest in studying the RITM-200 reactor. Such a reactor has a capacity of 55 MW and can be operated for about 50 years.

A number of solar and wind projects are being planned for implementation, but the country lacks rules for integration of new variable capacity additions to the national power system. Transparent rules and procedures for the integration of new renewable energy facilities could help avoid any unintended consequences that have the potential to worsen overall reliability of supply.

Kyrgyzstan does not have a long-term comprehensive energy sector development strategy. The effective NEP was adopted in 2008 and intended to cover the period to 2025.

Elements of strategic vision for energy sector development can be found in other policy documents, such the National Development Strategy of the Kyrgyz Republic for 2018-2040, the Green Economy Concept and the NDP until 2026. These strategies and programmes proclaim priorities for economic development of the energy sector, which include, among others, reduction of the country's dependence on hydrocarbon energy sources through more large-scale development of hydropower and the transition to alternative energy. However, they cannot substitute for a long-term integrated vision for energy sector development.

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The draft Concept for the Development of the Fuel and Energy Complex of the Kyrgyz Republic until 2030 calls for energy efficiency and energy conservation with a reduction in the impact of energy on the environment and public health, as well as recognises a need for ensuring financial stability and efficiency of energy companies and the overall financial recovery of the energy sector.

Recent institutional reforms include re-establishment of the MoE and changing the Energy Regulator's administrative status. Re-creation of a government agency focusing on the energy sector policy is commendable progress. Lowering the status of the Energy Regulator and putting it under supervision of the MoE constrict the Energy Regulator's ability to carry out autonomous economic regulation of the energy sector.

Cross-subsidies remain among customer groups and between sectors. Large industrial consumers and non-residential consumers are paying higher tariffs and are cross-subsidising residential consumers. Residential electricity tariffs and heating tariffs are cross-subsidised.

Kyrgyzstan has achieved great progress in strengthening energy statistics data collection and recently established the Council on Statistics, a high-level advisory body established by the president of the Kyrgyz Republic to provide strategic recommendations to producers of official statistics. The composition of the Council on Statistics was also approved by the president, but there are no representatives of the energy sector on the council.

Recommendations

The government of Kyrgyzstan should:

- Strengthen the country's long-term energy strategy by:
  - Developing a comprehensive long-term strategy for energy sector development with an outlook to 2050.
  - Establishing clear targets in line with national socio-economic development goals and energy security objectives, based on solid analysis of supply-demand trends and alternative scenario models that apply reliable data and sound assumptions.
  - Addressing all types of energy, including fossil fuels and renewable energy (solar, wind, biogas etc.) in policy coverage.
  - Incorporating an analysis of options for the diversification of generation and exploration of opportunities in solar and wind resources, including a clear understanding of associated cost and available incentives. The sector planning should include a least-cost generation plan as well transmission and distribution plans.
  - Ensuring clear links among the country's energy strategy and sustainable development strategies as well as the country's commitments under the UNFCCC.
  - Introducing a robust action plan and monitoring mechanisms to track progress and adjust implementation schemes if needed.

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- Develop and implement mechanisms for technical and economic integration of variable RES, particularly for the introduction of solar and wind energy, in order to ensure the power system's secure and cost-effective operation.
- Continue to improve the collection of national energy statistics to inform policy decisions:
  - Maintain the close cooperation between ministries and NSC and continue using official energy statistics as the foundation for analysis in strategic documents and in drafting new legislation.
  - Expedite the digitalisation of the data collection procedures to reduce burden on respondents and free up staff resources.
  - Further harmonise national energy data collection and reporting with international standards, particularly for the energy balance.
  - Encourage NSC to include energy statistics in its strategic statistics development plan in order to ensure continuous improvement of energy statistics.
  - Provide sufficient resources (human and financial) for NSC to conduct household energy consumption surveys at regular intervals (e.g. every five years) in order to develop energy efficiency indicators to monitor the results of energy efficiency policies in the residential sector and to increase the level of data disaggregation.
- Continue tariff reform. 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. Careful review should be given to cross-subsidies between residential electricity tariffs and heating tariffs. Cross-subsidies remain insufficient for full cost recovery in either sector. Tariff reforms should be accompanied by communication and outreach.
- Consider restoring the autonomous status of the Energy Regulator and strengthening its functions in licensing, setting service standards, and ensuringthat investments are used efficiently and optimally. Clear licensing requirements and obligations are especially important in the new consolidated structure of the power sector.
- Develop and implement demand-side measures. Such measures will help managing daily, weekly and seasonal periods of peak consumption that create tight supply-demand conditions that could threaten power system security.
- Develop a detailed strategy, including implementation and enforcement mechanisms to improve energy efficiency, leveraging work already begun in this area. Improve institutional arrangements and governance to ensure that energy efficiency policies and measures are fully developed and implemented.

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3. Electricity and heat

Key data

(2020)

Total generation: 15.4 TWh, +27.3% since 2010 (hydroelectricity 90.9%, co-generation plant 9.1%)

Installed capacity: 3.9 GW

Electricity net imports: 0.05 TWh (imports 0.35 TWh, exports 0.30 TWh)

Electricity consumption: 12.3 TWh (residential 76.0, industry 11.5%, services 9.0%, agriculture 1.5%, transport 0.1% and others 1.8%)

Prices are converted into USD based on the average exchange rate (2021) USD 1 = KGS 71.2634 (Kyrgyzstani som) (NBKR, 2021).

One tyiyn is 1/100th of a som.

Overview

Kyrgyzstan's power sector is relatively small with total generating capacity of around 3.9 gigawatts (GW), producing around 15.4 terawatt-hours (TWh) in 2020.

Electric energy in the Kyrgyz Republic is supplied by a hydroelectric system and by a thermal generation system. The hydroelectric system consists of several power plants which, in their majority, operate with water released from the Toktogul reservoir and are known as the Naryn Cascade. The storage capacity of Toktogul allows regulation of the flow of the Naryn River between the wet spring and summer months and the dry winter months as well as allowing some mitigation of longer-term dry and wet hydrology cycles. The thermal system consists of co-generation plants which supply electricity to the power grid and hot water and steam to the municipal heating network.

Thermal power plants in Kyrgyzstan are coal-fired, with 68.5% of inputs produced locally and 31.5% imported from Kazakhstan.

Natural gas is imported from Uzbekistan; the relevant pipeline infrastructure is operated by a subsidiary of the Russian Gazprom and currently about 12% of the total imported natural gas is used in the thermal power plants in Bishkek and Osh, together with small volumes of locally refined fuel oil.

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Figure 3.1 Map of the Kyrgyz power system and neighbouring networks

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: IEA (2021), Cross-Border Electricity Trading for Tajikistan: A Roadmap, https://iea.blob.core.windows.net/assets/b066e0be-9a3f-49ca-b932-38a1e81bda2a/Cross-BorderTradingforTajikistan_ARoadmap.pdf

Supply and demand

The Kyrgyz energy system provides a stable electricity supply to domestic consumers, despite the annual 3-5% growth in demand. Electricity generation fluctuates between 13 TWh and 15 TWh depending on the inflow of water and the amount of water accumulated in the Toktogul reservoir. A typical example is 2008 and 2009, when due to an abnormally low inflow, generation decreased to 10.3 TWh on average over two years. In 2020, the country produced 15.4 TWh and domestic demand was 12.3 TWh.

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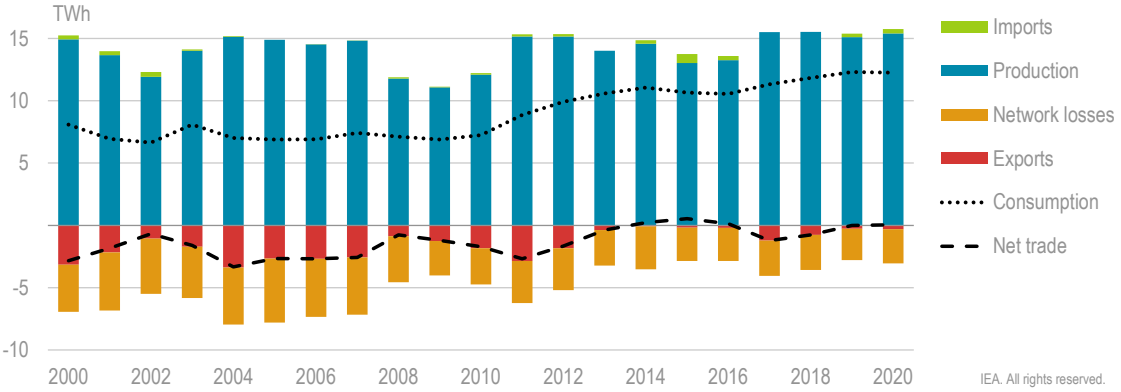
Kyrgyzstan has traditionally been a net exporter of electricity, but the export margin has diminished in the last decade due to increased domestic demand (Figure 3.2). Additionally, during low water periods, electricity must be imported from neighbouring countries.

Significant investments in the power grid resulted in a decrease of transmission and distribution network losses over the past decade, from about 28% in 2010 to about 18% in 2020.

Figure 3.2 Electricity supply in Kyrgyzstan, 2000-2020



Note: TWh = terawatt-hour, equals billion kWhs
Source: IEA (2022), World Energy Statistics and Balances (database), https://www.iea.org/data-and-statistics

Generation

The total available generating capacity in 2020 was 3.9 GW, compared with about 3.6 GW in 2010. About 83.2% of the capacity was built during the Soviet era, and 16.8% has been put into operation since the sovereignty of the Kyrgyz Republic. Modernisation of the Bishkek co-generation plant allowed an additional 300 MW (with the takedown of 154 MW of capacity).

Small hydropower plants (up to 30 MW) accounted for about 1.1% of total capacity in 2020, of which 1.0% was installed during the Soviet era and 0.1% since independence.

Table 3.1 Installed electrical capacity (MW)

Energy source	2005	2010	2017	2018	2019	2020	2021
Hydro	2 910	3 030	3 030	3 030	3 030	3 030	3 030
Thermal	716	716	862	862	862	862	862
Small hydro	40	42	49	56	56	56	60
Total capacity	3 666	3 788	3 941	3 948	3 948	3 948	3 952

Source: NSC (2020)

In 2020, 89.6% of electricity was produced at large hydropower plants, 9.1% at the co-generation plants and 1.3%.at the small hydropower plants.

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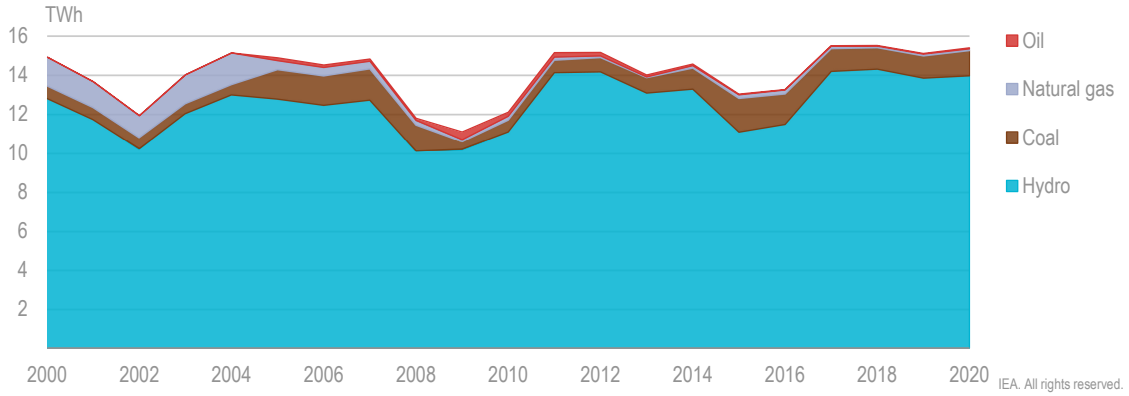
Figure 3.3 Electricity generation by source, 2000-2020



Source: IEA (2022), World Energy Statistics and Balances (database), https://www.iea.org/data-and-statistics

Table 3.2 Power plants in the Kyrgyz Republic (as of 1 January 2022)

№	Name	Year of commissioning	Installed capacity (MW)	Designed annual production (GWh)
1	Toktogul HPP	1975	1 200	4 400
2	Kurpsai HPP	1982	800	2 630
3	Tash-Kumyr HPP	1987	450	1 698
4	Shamaldy-Sai HPP	1995	240	902
5	Uchkurgan HPP	1962	180	820
6	Kambarata 2 HPP	2010	120	1 141
7	Atbashy HPP	1970	40	147
	Total hydro		**3 030**	**11 738**
8	Bishkek co-generation	1961	812	1 740
9	Osh co-generation	1966	50	-
	Total thermal		**862**	**1 740**
	Total for JSC power plants		**3 892**	**13 478**
10	JSC Chakan GES (9 small HPPs)	1928-1958	38.5	160.7
11	Private small HPPS (11 small HPPs)	1954-2021	21.8	102.6
	Total small hydro		**60.3**	**263.3**
	Total for the Kyrgyz system		**3 952.3**	**13 74.1**

Source: MoE (2021)

Demand for electricity is increasing, but the system is aged and inefficient. Investment in rehabilitation and expansion is inadequate.

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Table 3.3 Average age of power generation infrastructure

Company	Total wear of the equipment
JSC Power Plants (HPPs and co-generation plants)	79.8%
JSC Chakan GES (cascade of small HPPs)	100%

Source: NEHC (2020)

Imports and exports

The majority of cross-border electricity trading is conducted in accordance with intergovernmental agreements. These provide a framework from which bilateral agreements are negotiated. In practice volumes and prices in the bilateral agreements do not differ or deviate negligibly from the volumes and prices in the intergovernmental agreements.

Kyrgyzstan still has cross-border electricity trade with Kazakhstan (export and import), Uzbekistan (export) and Tajikistan (import in small amounts). Historically, cross-border trade took place during vegetation period. However, during the winter of 2014/15, Kyrgyzstan imported electricity from Kazakhstan to deal with potential shortages in the winter months due to the low water level at the Toktogul reservoir. Therefore, in 2014, Kyrgyzstan went from being a net exporter to net importer, but wetter and warmer weather kept imports lower than expected in 2016.

Table 3.4 Electricity trade by country, 2015-2020

Unit: GWh	2015	2016	2017	2018	2019	2020	2021
Exports							
Kazakhstan	182.3	197.8	0.3	269.3	-	300.0	300.0
Uzbekistan	-	-	1 142.9	752.2	-	-	246.2
Imports							
Kazakhstan	400.7	133.2	-	-	269.3	52.6	681.0
Tajikistan	146.6	-	-	-	-	-	-
Uzbekistan	-	-	-	-	-	-	504.4
Turkmenistan	-	-	-	-	-	-	498.2
Net trade	**365.0**	**-64.6**	**-1 143.2**	**-1 021.5**	**269.3**	**-247.4**	**134.8**

Source: KESC (2022), Annual electricity balances (database)

Electricity consumption

Electricity consumption in 2020 amounted to 12.3 GWh. Residential customers account for the largest share of consumption – 76%, and almost three times more than in 2010. Industry, dominated by manufacturing and some mineral extraction, accounted for 12% (down by 20%). Services covered 9% of demand in 2020. Agriculture accounted for 1.5% with reported consumption having declined by half since 2010. The transport sector

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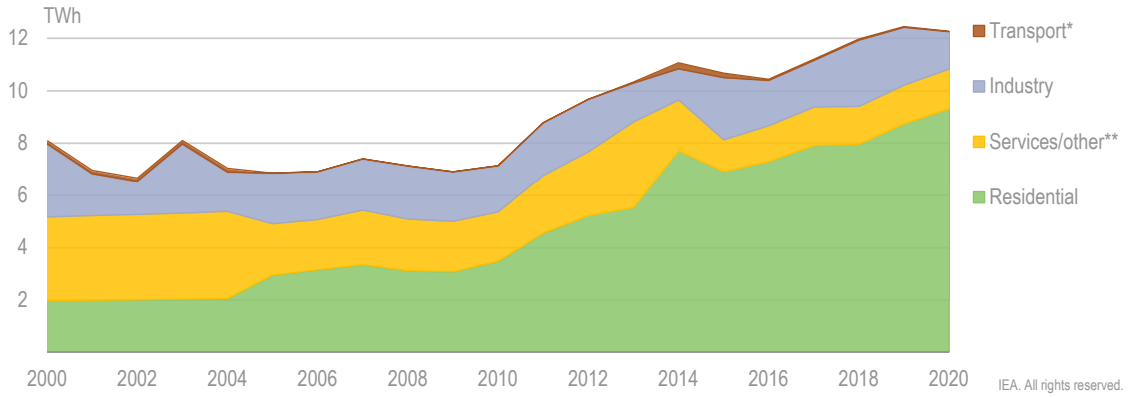
consumed only about 0.1%, although its share is likely to grow in the coming years in response to the Cabinet of Ministers' promotion of electric vehicles, in particular through the elimination of value-added tax (VAT) on their imports.

Figure 3.4 Electricity consumption by sector, 2000-2020

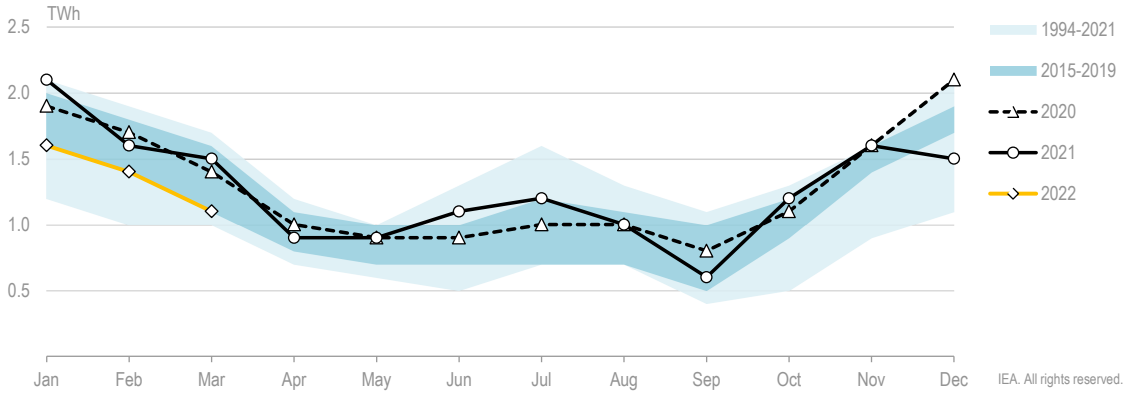


* not visible at this scale; ** includes commercial and public services, agriculture, energy sector own use and unspecified consumption.
Source: IEA (2022), World Energy Statistics and Balances (database), https://www.iea.org/data-and-statistics

Consumption patterns vary significantly by season. The minimum summer load is less than three times of the winter maximum load. Daily peak demand varies from 1 500 MW in summer to 3 000 MW in winter. The generating capacity reserve is within 10%. However, this reserve can be significantly reduced if several units are put out of operation at the same time, for example, for modernisation. Even putting one large unit out of operation may lead to losing the necessary reserve.

Monthly electricity consumption peaks around January, with the peak having increased notably in the last decade. A local peak is observed also in July, mostly due to irrigation and cooling needs (Figure 3.4). Domestic consumption has reached the available generation capacity.

Figure 3.5 Monthly electricity supply, January 1994-March 2022



Source: NSC (2022), Industry production (database), http://www.stat.kg/media/files/5478b6f2-2b62-45dc-b3dd-d8a45c188799.xls

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Growth in residential consumption was driven largely by the increased use of electricity for heating. This was triggered by a combination of low electricity tariffs (under USD 0.01) and rising fossil fuel prices.

Electricity sector structure

State-owned KyrgyzEnergo, which owned and operated the electricity and heat production sector, was restructured and unbundled in 2002, spawning seven companies operating in generation, transmission and distribution.

State-owned JSC Electric Power Plants is the largest electricity generator, and JSC NESK is the state-owned transmission system operator (TSO) that also operates the national dispatch service. The distribution and retail functions of the power sector are still bundled, and distribution system operators (Discos) are obligated to provide retail services in their territories. Until spring 2022, there were four electricity Discos in Kyrgyzstan:

- Sever Electro serves Bishkek, Talas 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 and the Osh and Batken regions, and accounts for 26% of distribution.
- Jalal-Abad Electro serves the Djalal-Abad region and accounts for 14% of distribution.

All are joint stock companies, owned 83% by the state and 17% by minority shareholders. In January 2016, the Kyrgyz government approved the establishment of OJSC NEHC, and the transfer of state shares in these power and heat companies to the charter capital of the NEHC was approved by both parliament and government. Additionally, state shares in the 100% government-owned companies JSC Chakan GES and JSC Kyrgyz Electricity Settlement Center (established in 2015) were transferred to the NEHC.

The parliament also resolved that none of the NEHC's shares may be sold, pledged or exchanged to repay the country's external debt, and these shares were transferred to trust management. The property of the NEHC therefore cannot be subject to alienation, including indirect forms.

Reform of the power sector structure

The Cabinet of Ministers approved the Concept of Restructuring Energy Sector Management System on 8 February 2022.

The concept provides for a number of measures designed to address and mitigate the following challenges in the power sector:

- deficit of generating capacities due to high growth rates of domestic electricity consumption
- lack of funding for energy companies
- delays in repair, modernisation and reconstruction of power equipment
- high debt of energy companies
- political decision-making through improvement of corporate governance and implementation of an effective personnel policy
- low level of automation of business processes.

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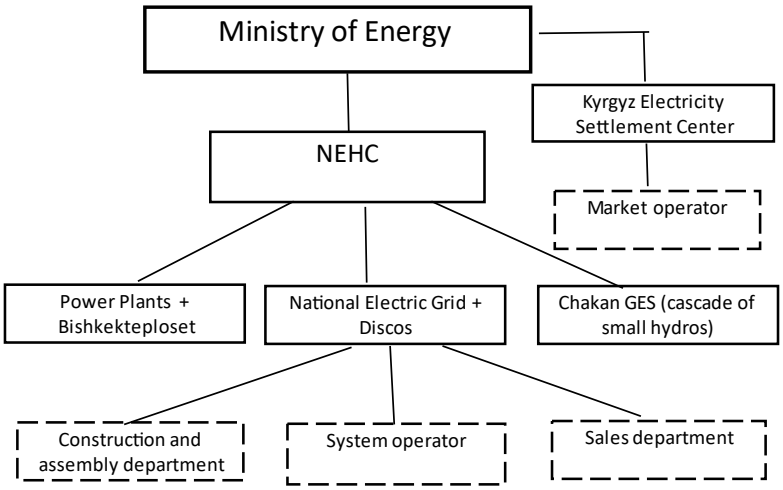
Restructuring of the energy sector management structure will be implemented through:

1. Merger of the four distribution companies (Severelectro OJSC, Vostokelectro OJSC, Oshelectro OJSC and Jalalabatelectro OJSC).
2. Merger of the national generation company OJSC Electric Stations and Bishkek district heating distribution company (OJSC Bishkekteploset).
3. Consolidation of the assets of OJSC National Electric Grid of Kyrgyzstan and the united distribution companies with the spin-off of the electricity retail sale department.

The new structure of the power sector governance is shown below.

Figure 3.6 Post-restructuring electricity sector's governance structure



* Discos = distribution system operators with distribution and retail functions.
Source: CoM (2022).

Infrastructure

Transmission and distribution system

Kyrgyzstan is part of CAPS connecting Uzbekistan, Kyrgyzstan, Tajikistan and Kazakhstan. New integration plans include CASA-1000, which will connect the electricity-exporting countries of Kyrgyzstan and Tajikistan with Afghanistan and Pakistan to supply them with electricity. The project is in the advanced stages of planning and could be operational after 2023.

Due to geographical features, the energy system of the Kyrgyz Republic is clearly divided into northern and southern parts. Both parts are connected by a 500 kV line Toktogul HPP-Frunzenskaya and a 500 kV line Datka-Kemin, as well as through CAPS.

OJSC National Electric Grid of Kyrgyzstan (JSC National Grid) operates the power transmission system of 35-110-220-500 kV and 197 substations of 110 kV to 500 kV. The total length of high-voltage lines of 110 kV to 500 kV is 7 548 km.

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About 80% of the hydro capacity is in the south, connected by a 500 kV line to the northern regions that account for 60% of electricity consumption.

Total wear of the JSC National Grid' s equipment is 36% for high-voltage lines 110-220-500 kV and 69% for substations 110-220-500 kV.

The distribution system is operated by four distribution companies, namely JSC Severelectro, JSC Oshelectro, JSC Jalalabadelectro and JSC Vostokelectro. These companies operate over 70 000 km of 35-10-6-0.4 kV transmission lines and over 25 000 km of 35-10-6-0.4 kV substations.

Table 3.5 Average wear of distribution networks infrastructure

Company		Total wear of the equipment (%)
JSC Severelectro		
	0.4-6-10-35-kV lines	62.0
	35 kV substation, transformer substations (6-10/0.4 kV)	58.0
JSC Oshelectro		
	0.4-6-10-35-kV lines	71.5
	35 kV substation, transformer substations (6-10/0.4 kV)	68.7
JSC Jalalabadelectro		
	0.4-6-10-35-kV lines	49.3
	35 kV substation, transformer substations (6-10/0.4 kV)	46.5
JSC Vostokelectro		
	0.4-6-10-35-kV lines	56.7
	35 kV substation, transformer substations (6-10/0.4 kV)	45.6

Source: NEHC (2020)

Rehabilitation projects

Since independence, the Kyrgyz Republic has implemented a number of projects for the construction and reconstruction of substations and power lines.

In order to improve the reliability of the Kyrgyz energy system and the quality of power supply to consumers, the following projects have been implemented:

- construction of a 110 kV Aigultash-Samat transmission line with a length of 142 km and a 110 kV Samat substation
- construction of a 500 kV Datka system substation, reconstruction of 220 kV substations (Uzlovaya, Alai, Oktyabrskaya, Kristall) and construction of a 220 kV transmission line with a total length of 248 km
- construction of a 500 kV Kemin system substation and a 405 km Datka-Kemin power transmission line, reconstruction of a 220 kV double-circuit overhead line 42 km long, and also replacement of two existing autotransformers with a capacity of 125 megavolt amperes (MVA) with two 200 MVA transformers at the 220 kV Ala-Archa substation to cover consumption in Bishkek

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- construction of a 110 kV overhead line with a length of 51 km, a 110 kV substation Razzakova and reconstruction of a 110 kV substation Arka
- construction of the 110 kV Ak-Ordo substation, construction of a double-circuit 110 kV overhead line with a length of 8.3 km.

The Asian Development Bank (ADB) is financing rehabilitation of the Toktogul Dam: the first phase (USD 55 million) and the second (USD 250 million) are currently being implemented. The second 120 MW unit at Kambarata-2 HPP (360 MW) is also being installed with a USD 138 million loan from the Eurasian Development Bank. Another generation facility, At-Bashy HPP, is being rehabilitated with Swiss government support of USD 22.2 million. Construction of the Upper Naryn cascade (237 MW) started in 2014 but it was suspended, and planned construction of the Kambarata-1 Plant (1 860 MW) never started, due to denunciation of the intergovernmental agreement with Russia.

Two new 500 kV substations, Datka and Kemin, were commissioned and the 500 kV Datka-Kemin north-south connecting line was completed in 2015; financing for rehabilitation projects in the transmission subsector comes from the ADB (USD 44.8 million) and the Islamic Development Bank (USD 16.25 million). The electricity distribution network also requires significant investment to decrease losses and improve reliability: several distribution network rehabilitation projects are being implemented with support from the KfW Development Bank (EUR 35 million), the World Bank (USD 25 million) and the Islamic Development Bank (USD 16.25 million).

A 500 kV Datka-Khodjent AC transmission line (200 km) is planned under the CASA-1000 project. The Kyrgyz component of the transmission line will be funded by the World Bank (USD 45 million), the European Investment Bank (EUR 70 million) and the Islamic Development Bank (USD 50 million).

Security of supply

Kyrgyzstan's energy system is subject to supply security threats as well as other challenges. The network is aged and inefficient, and losses are significant. In addition, hydro-based electricity production is susceptible to seasonal and weather-related fluctuations; electricity supply is therefore less reliable due to lower water inflows and high demand during the winter months. Furthermore, while demand centres are in the north, more than 80% of hydropower capacity is in the south. Old transmission connections are a further handicap.

Electricity supply is also constrained by the regional water-energy nexus. The major Kyrgyz hydropower source, the Toktogul reservoir, was constructed in the Soviet times to provide more dependable water supply for downstream irrigated agriculture and to generate hydropower. After the collapse of the Soviet Union, Central Asian countries began bartering for the exchange of fuel, electricity and water resources, which led to disagreements among countries. In the last years Kyrgyzstan exports electricity to neighbouring countries under bilateral contracts; however, such contractual supplies are seasonal and subject to hydrological fluctuations. Volumes of bilateral trade even in high-water years do not generate enough funds to procure fuel for winter power generation by co-generation plants.

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The government's primary focus is 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 way. Reconstruction of heating networks in Bishkek and Osh as well as reconstruction of substations and improvement of power regulation and water management at the Toktogul reservoir are being implemented.

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, which has resulted in a serious lag in modernisation and expansion of the electricity, heat and gas systems. Growing demand and insufficient investment do not augur well for Kyrgyzstan's energy security.

Prices and tariffs

Electricity tariffs are set by the Energy Regulator based on the Mid-Term Tariff Policy (MTTP) approved by the government.

The effective Electricity MTTP for 2021-2025 was approved by the Cabinet of Ministers on 30 September 2021. Tariffs for residential consumers have not changed and remained at the level of 2015. The two-tier tariff regime is kept at the current level of 0.77 som (0.9 US cents) with consumption of up to 700 kWh and 2.16 som (2.75 US cents) or the consumption above the threshold (Electricity MTTP, 2021).

The step-up coefficient of 2.0 has been introduced for industrial customers, except for cement plants (coefficient of 1.3) and for foundries and smelting workshops of electrothermal metal processing (step-up coefficient of 1.5). Therefore, the tariff of 252 tyiyn/kWh (USD 0.0298/kWh) multiplied by the step-up coefficient results in 504 tyiyn/kWh (USD 0.0596/kWh) for industrial customers.

Table 3.6 End-user electricity tariff for 2021-2025 (exclusive of VAT)

#	Customer group	Unit	2021	1 June 2022	1 June 2023	1 June 2024	1 June 2025
1.	Residential						
1.1	Consumption less than 700 kWh per month (excluding the residents of high mountain and remote areas for the period 1 October to 1 May)	tyiyn/kWh (USD cents/kWh)	77.0 (0.9)	Tariff + inflation	Tariff + inflation	Tariff + inflation	Tariff + inflation
	Growth	%	--	Rate of inflation	Rate of inflation	Rate of inflation	Rate of inflation
1.2	Consumption above 700 kWh per month (excluding the residents of high mountain and remote areas for the period 1 October to 1 May)	tyiyn/kWh (USD cents/kWh)	216.0 (2.75)	Tariff + inflation	Tariff + inflation	Tariff + inflation	Tariff + inflation
	Growth	%	--	Rate of inflation	Rate of inflation	Rate of inflation	Rate of inflation

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#	Customer group	Unit	2021	1 June 2022	1 June 2023	1 June 2024	1 June 2025
1.3	Residents of high mountain and remote areas	tyiyn/kWh (USD cents/kWh)	77.0 (0.9)	Tariff + inflation	Tariff + inflation	Tariff + inflation	Tariff + inflation
	Growth	%	--	Rate of inflation	Rate of inflation	Rate of inflation	Rate of inflation
2	Pump stations	tyiyn/kWh (USD cents/kWh)	109.5 (1.29)	128.7 (1.52)	148.0 (1.75)	Tariff + inflation	Tariff + inflation
	Growth	%	40.6	17.5	15.0	Rate of inflation	Rate of inflation
3	Electric transport	tyiyn/kWh (USD cents/kWh)	168.0 (1.98)	Tariff + inflation	Tariff + inflation	Tariff + inflation	Tariff + inflation
	Growth	%	6.3	Rate of inflation	Rate of inflation	Rate of inflation	Rate of inflation
4	Children's boarding schools, social inpatient and semi-stationary institutions for disabled and/or elderly citizens	tyiyn/kWh (USD cents/kWh)	168.0 (1.98)	Tariff + inflation	Tariff + inflation	Tariff + inflation	Tariff + inflation
	Growth	%	6.3	Rate of inflation	Rate of inflation	Rate of inflation	Rate of inflation
5	Religious organisations	tyiyn/kWh (USD cents/kWh)	168.0 (1.98)	Tariff + inflation	Tariff + inflation	Tariff + inflation	Tariff + inflation
	Growth	%	-	Rate of inflation	Rate of inflation	Rate of inflation	Rate of inflation
6	Budget-funded consumers	tyiyn/kWh (USD cents/kWh)	252.0 (2.98)	Tariff + inflation	Tariff + inflation	Tariff + inflation	Tariff + inflation
	Growth	%	12.5	Rate of inflation	Rate of inflation	Rate of inflation	Rate of inflation
7	Agriculture	tyiyn/kWh (USD cents/kWh)	252.0 (2.98)	Tariff + inflation	Tariff + inflation	Tariff + inflation	Tariff + inflation
	Growth	%	12.5	Rate of inflation	Rate of inflation	Rate of inflation	Rate of inflation
8	Industry	tyiyn/kWh (USD cents/kWh)	252.0 (2.98)	Tariff + inflation	Tariff + inflation	Tariff + inflation	Tariff + inflation
	Growth	%	12.5	Rate of inflation	Rate of inflation	Rate of inflation	Rate of inflation
9	Other consumers	tyiyn/kWh (USD cents/kWh)	252.0 (2.98)	Tariff + inflation	Tariff + inflation	Tariff + inflation	Tariff + inflation
	Growth	%	12.5	Rate of inflation	Rate of inflation	Rate of inflation	Rate of inflation
10	Cryptocurrency companies	tyiyn/kWh (USD cents/kWh)	252.0 (2.98)	Tariff + inflation	Tariff + inflation	Tariff + inflation	Tariff + inflation
	Growth	%	12.5	Rate of inflation	Rate of inflation	Rate of inflation	Rate of inflation
	Step-up coefficient:		2.0	2.0	2.0	2.0	2.0

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#	Customer group	Unit	2021	1 June 2022	1 June 2023	1 June 2024	1 June 2025
11	Gold extraction plants	tyiyn/kWh (USD cents/kWh)	252.0 (2.98)	Tariff + inflation	Tariff + inflation	Tariff + inflation	Tariff + inflation
	Growth	%	12.5	Rate of inflation	Rate of inflation	Rate of inflation	Rate of inflation
	Step-up coefficient		2.0	2.0	2.0	2.0	2.0
12	Foundries, smelting workshops of electrothermal metal processing	tyiyn/kWh (USD cents/kWh)	252.0 (2.98)	Tariff + inflation	Tariff + inflation	Tariff + inflation	Tariff + inflation
	Growth	%	12.5	Rate of inflation	Rate of inflation	Rate of inflation	Rate of inflation
	Step-up coefficient		1.5	1.5	1.5	1.5	1.5
13	Cement plants	tyiyn/kWh (USD cents/kWh)	252.0 (2.98)	Tariff + inflation	Tariff + inflation	Tariff + inflation	Tariff + inflation
	Growth	%	12.5	Rate of inflation	Rate of inflation	Rate of inflation	Rate of inflation
	Step-up coefficient		1.3	1.3	1.3	1.3	1.3
14	Alcohol companies	tyiyn/kWh (USD cents/kWh)	252.0 (2.98)	Tariff + inflation	Tariff + inflation	Tariff + inflation	Tariff + inflation
	Growth	%	12.5	Rate of inflation	Rate of inflation	Rate of inflation	Rate of inflation
	Step-up coefficient		2.0	2.0	2.0	2.0	2.0

Note: Exchange rate USD 1 = KGS 84.7009 (Kyrgyzstani som). One tyiyn is 1/100th of a som.
Source: Energy Regulator (2021)

Large residential consumers and non-residential consumers are paying higher tariffs and are cross-subsidising residential consumers.

On 6 December 2021 by virtue of decree of the president starting 1 January 2022, the electricity tariff for low-income families with children under 16 years receiving the state allowance was decreased from 77 tyiyn to 50 tyiyn for consumption under 700 kWh per month.

Heat

Heating sector structure

Four cities have district heating: Bishkek (85% of households), Osh (35-40%), Kyzyl-Kiya (60%) and Kara-Kul (26%). Electric boilers are the main heat source for the district systems, with approximately 3 000 boilers in operation.

Currently, district heating is provided by several organisations:

- OJSC Bishkekteploset supplies customers in Bishkek (from the Bishkek co-generation plant).
- Municipal enterprise Oshteplosnabzhenie in Osh (from Osh co-generation plant).
- Communal enterprise Bishkekteploenergo.

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- State enterprise Kyrgyzteploenergo (23 field offices).
- Boiler houses in the cities of Kara-Kul and Shamaldy-Sai.

The main source of heating for residential consumers in rural areas, including those outside Bishkek, are stoves, which are mainly fuelled by coal, wood and electricity. To quantify this, Kyrgyzstan should conduct a household energy consumption survey. Such stoves are in most cases inefficient, and indoor air pollution is a problem. The World Bank notes that Kyrgyzstan is comparable to India in terms of mortality caused by indoor air pollution.

In October 2021 Kyrgyzteploenergo was put under the MoE.

Table 3.7 Main sources of heat supply in the Kyrgyz Republic, 2020

Source of heat supply	Number and type of boilers	Customers		Heat production	Losses
		Total	Non-residential	Gcal	%
Bishkekteploset (Bishkek co-generation plant)	Coal and gas	131 480	4 464	2 076.3	25.2
Osh co-generation plant	Mazut	17 631	391	136.3	24.0
Kyzyk Kiya co-generation plant	Coal	1 428	19	23.2	24.1
Boiler (Kara-Kul town)	Electricity	3 141	80	71.9	62.9
Boiler (Shamaldy-Sai town)	Electricity	107	6	1.5	0.3
Kyrgyzteploenergo	136 boilers: • 21 gas • 27 mazut • 57 coal • 31 electricity	45 849	982	455.6	24.5
Bishkekteploenergo	66 boilers: • 31 gas • 11 electricity • 24 coal	18 972	300	218.9	15.9
Oshteplosnabzhenie	88 boilers: • 19 electricity • 69 coal	13 922	22	98.8	17.0
Total		**232 530**		**3 082.5**	**25.0**

Source: MoE (2021)

Supply and demand

Thermal energy production amounted to 0.3 Mtoe (3.1 million Gcal) in 2020. According to the available data, heat demand has grown over 25% since 2010. Losses of thermal energy in 2020 amounted to to 0.8 million Gcal or 25% of the output. The high level of losses is due to the significant deterioration of heating networks, as well as the operation of outdated equipment.

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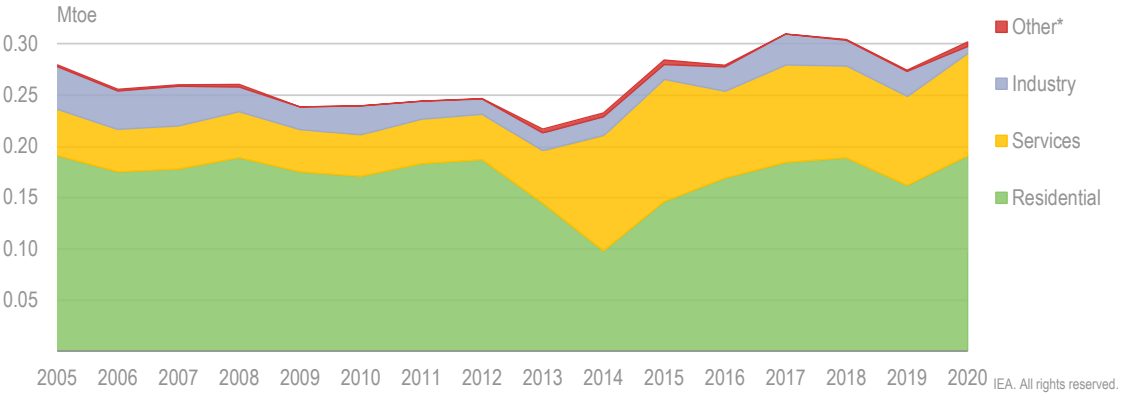
Figure 3.7 Heat consumption, 2005-2020



* includes agriculture, energy sector own use and unspecified consumption
Notes: 0.1 Mtoe = million gigacalories (Gcal)
Source: IEA (2022), World Energy Statistics and Balances (database), https://www.iea.org/data-and-statistics

In 2020, about 97% of the heat energy provided by centralised district heating systems in the country was consumed by municipal needs, i.e. households and services. The total production of thermal energy supplied by centralised district heating systems has decreased by 13% over the last 15 years. This is due to a decrease in demand from industrial consumers, the deterioration of the centralised district heating networks and the underdevelopment of centralised district heating networks.

Residents of the city of Bishkek can have access to hot water all year round, with the exception of one summer month, when boiler houses are closed for maintenance. Residents in other regions of the republic have access to centralised hot water supply only in winter. The main reason is that the provision of such services during the summer period is economically unattractive for district heating companies. Boiler systems are old and inefficient due to insufficient cost recovery over the years, as well as very low efficiency at light load, which is typical during the summer months.

Table 3.8 Boilers by type of fuel

Location	Number of boilers	Fuel			
		Gas	Mazut	Coal	Electricity
Bishkek	67	31		25	11
Osh Oblast	95		1	75	19
Chui Oblast	43	15	15	10	3
Talas Oblast	5		1	4	
Jalal-Abad Oblast	31	8	8	12	3
Issy Kul Oblast	32		3	21	8
Naryn Oblast	21			6	15
Batken Oblast	1			1	
Total	**295**	**54**	**28**	**154**	**59**

Source: MoE (2021)

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The district heating system uses four types of fuel: coal, fuel oil, electricity and natural gas. The table above shows that 295 boiler houses are operated by district heating companies, more than half of which are coal-fired. Currently, a number of projects are being implemented for the construction and transition of boiler houses from coal, fuel oil and electricity to natural gas. The main reason is the increased availability of gas after the purchase of Kyrgyzgaz by Gazprom.

Since Kyrgyzstan's independence, the structure of the country's domestic electricity consumption has changed dramatically and rapidly. The government encouraged the use of electricity for heating and cooking in order to reduce dependence on imports of gas and oil products. As a result, residential consumption rose from 16% in the early 1990s to the current level of 63% of total supply. In new residential areas electricity is used for space heating, hot water and cooking, thus increasing the load on the electricity grid. The use of electricity for heating aggravates the seasonal imbalance — winter electricity consumption is three times higher than summer, due to the use of electric heaters for space heating.

Considering that at present every building and household in the country is connected to power supply, out of about 1.5 million consumers of electricity, only 232 500 consumers of thermal energy, or 16%, are connected to district heating.

Heat supply is vialble mainly for customers Bishkek and Osh, the largest cities in Kyrgyzstan, and insignificant heat supply is provided throughout the country, except for two regions in the country namely Talas and Batken, where people have no heat supply at all. Due to low electricity tariffs and inavailability of heat supply people use electricity for heating.

Tariffs for thermal energy

Tariffs for thermal energy are set by the Energy Regulator based on the MTTP approved by the government. The effective Mid-Term Tariff Policy for Thermal Energy and Hot Water for 2021-2025 was approved by the Cabinet of Ministers on 30 September 2021.

The government aims to gradually introduce the principles of self-sufficiency of the heat and power industry to achieve cost recovery in the medium term and implement the phased elimination of cross-subsidies in tariff formation (Thermal Energy MTTP, 2021).

The Thermal Energy MTTP is based on the following principles:

- Tariffs should cover all costs of heat supply enterprises for the production, transmission, distribution and sale of thermal energy, as well as the cost of debt servicing, capital investments and others.
- The growth rate of tariffs should be gradual and not cause sudden economic difficulties for consumers.
- Cross-subsidisation between consumers of electricity and heat should be gradually eliminated. At the same time, in the medium term until 2025, it will not be possible to completely eliminate subsidies in the thermal power industry, as this will cause an excessive increase in the tariff for thermal energy for the population.

The government plans a 10% annual increase of heating tariffs for residential customers, starting from KGS 1 134.76/Gcal in 2021 and reaching KGS 1 661 /Gcal by 1 June 2024.

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Hot water tariffs for residential customers are also planned to be increased on an annual basis (about 14% a year) starting from KGS 981.76 /Gcal in 2021 and reaching KGS 1 661/Gcal by 1 June 2024 (Thermal Energy MTTP, 2021).

Effective tariffs for heating and hot water were approved by the Energy Regulator on 15 October 2021.

Table 3.9 End-user tariffs for thermal energy and hot water effective from 15 October 2021

No.	Customer groups	Unit	Tariff
	Thermal energy tariffs for heating		
1	Residential*	KGS/Gcal	1 134.76
2	Industrial**	KGS/Gcal	1 802.00
3	Budget**	KGS/Gcal	1 802.00
4	Other customers**	KGS/Gcal	1 802.00
	Hot water tariffs		
1	Residential (for thermal energy in hot water)*	KGS/Gcal	981.76
	Residential (for hot water based on meters)	KGS/m^3	64.38
2	Residential (for hot water based on consumption norms per person)	KGS/month	309.03
3	All other customers (for thermal energy in hot water)**	KGS/Gcal	1 802.00
4	Industrial	KGS/m^3	103.00
5	Budget	KGS/m^3	103.00
6	Other customers	KGS/m^3	103.00
	Thermal energy tariffs for steam		
1	Residential *	KGS/Gcal	1 134.76
2	Industrial **	KGS/Gcal	1 802.00

* The above tariffs for thermal energy and hot water are applied to residential customers by all heat supply enterprises (with the exception of local private heating boiler houses that provide heat supply to newly commissioned multistorey buildings).
** These tariffs for thermal energy and hot water are applied only to non-domestic consumers supplied by OJSC Bishkekteploset.
Source: Energy Regulator (2021)

Calculation of tariffs for thermal energy is based on the **"**Methodology for determining the prime cost of production and tariff setting for thermal energy", approved by order of the Energy Regulator dated 14 March 2016, No. 2.

The methodology applies to the activities of OJSC Electric Stations, OJSC Bishkekteploset, KP Bishkekteploenergo, State Enterprise Kyrgyzteploenergo and other heat supply enterprises. The main purpose of this methodology is to determine the principles for determining prime cost of production of heat supply enterprises and the establishment of tariffs for thermal energy, i.e. the technical justification of production costs, the reflection of the real economic value of products, the expression of general principles and rules for determining the cost of thermal energy.

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Centralised heat supply in Bishkek is provided by JSC Bishkekteploset, and all thermal energy is generated by Bishkek co-generation plant. Thus, JSC Bishkekteploset does not incur any cost for generation of thermal energy (except for cases related to technological needs). The Energy Regulator sets the purchase price for both Bishkekteploset and end-user tariffs. Therefore, cost of primary resources does not affect JSC Bishkekteploset, and JSC Electric Power Plants, the national generation company that owns and operates Bishkek co-generation plant, subsidises thermal energy. The subsidy is mainly covered through electricity export revenues. In low export years JSC Electric Power Plants incurs high losses. In February 2022 a decision was made to merge JSC Electric Power Plants and JSC Bishkekteploset as part of the reform of the energy sector structure.

Despite the fact that the methodology provides for tariffs that reflect real costs, the current tariffs for heat energy for the population do not cover the actual costs. Residential heat tariffs are partly subsidised by industrial consumers, local governments and cross-subsidies between electricity and heat tariffs.

As a result, heat supply organisations financed from the national budget (namely, Kyrgyzteploenergo, Bishketeploenergo and Oshteplosnabzhenie) often have debts for electricity, gas and coal to their suppliers due to untimely financing.

Approximately 25% of heat energy consumption is based on metering devices, and normative tariffs are used for customers without meters. Normative tariffs are based on a number of standard provisions (the area of the heated premises, the number of residents, the period of service). Unfortunately, tariffs for non-metered consumers provide neither a price signal for efficient energy use nor an incentive to install meters to reduce expenses on heating. Residential electricity and district heating tariffs have not reached full cost recovery levels.

Assessment

A mix of hydroelectric and thermal plants provide electricity supply in the Kyrgyz Republic.

Hydroelectric plants dominate the sector and most of them (the Naryn Cascade) are located on the Naryn River and operate using water released from the Toktogul reservoir. Toktogul's multi-year storage capacity allows for conservation of water in the wet season, for use during the winter heating season. Thermal generators include two co-generation plants, which provide electricity, and heat and hot water.

Demand centres are in the north; more than 80% of hydropower capacity is in the south. The north consumes about 70% of the total consumption.

The main vulnerability of the Kyrgyz power system is dependence on the volume of water stored in the Toktogul reservoir for electricity generation by the stations of the Cascade of Toktogul HPPs.

Hydro-based electricity production is susceptible to seasonal and weather-related fluctuations; electricity supply is therefore less reliable due to lower water inflows and high demand during the winter months.

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Electricity supply is also constrained by the regional water-energy nexus. Kyrgyzstan's major hydropower source, the Toktogul reservoir, was constructed in Soviet times to provide a more dependable water supply for downstream irrigated agriculture as well as to generate hydropower. In the summer Kyrgyzstan has to release water for sanitary and irrigation purposes for the downstream countries.

Consumption has reached generation capacity and there is almost no generation capacity in winter. Power consumption on some days in winter reaches 93% of the available capacity. In 2014, Kyrgyzstan went from being a net exporter to net importer.

Investments in new generating capacity and in modernisation of networks will be needed to address looming electricity supply shortages.

Residential customers account for 82.1% of the total consumption. Growth in residential consumption has been driven by low tariffs, which have been set well below the cost of production. Kyrgyzstan still has one of the lowest residential tariffs in the world.

Large residential consumers and non-residential consumers are paying higher tariffs and are cross-subsidising residential consumers.

Residential electricity tariffs and heating tariffs are cross-subsidised. The recent merger of JSC Electric Power Plants and JSC Bishkekteploset does not solve the cross-subsidy problem.

Demand for electricity and heat is increasing, but the systems are aged and inefficient. Investment in rehabilitation and expansion is inadequate. Increased electricity consumption leads to an overload of equipment.

The sector suffers from a substantial revenue shortfall because of tariffs that are below cost recovery and because of high technical and non-technical losses. Although the government reports significant reductions in distribution network losses over the last five years, they still remain relatively high by international standards

The power sector is unable to generate sufficient cash flow to fund necessary maintenance and refurbishment, or to finance new investment in a timely and efficient manner.

Falling exports reduced cash flows into the power sector, which further aggravates the financial instability and inability to invest in reliable sector operation and development.

The National Energy Program for Developing the Fuel and Energy Complex for 2008-2010 and strategy for the energy sector development up to 2025 spell out the government's vision for maintaining energy security, increasing domestic production and promoting sustainable development. However, 14 years since its adoption, the policy has not been implemented as designed.

There is no long-term policy for electricity sector development with clearly specified strategic goals based on solid economic and technical analysis.

There is no planning process for integration of new variable capacity additions to avoid any unintended consequences that have the potential to worsen overall reliability of supply.

Demand-side management measures are not yet planned for design and implementation. In Kyrgyzstan typically a mandatory emergency intervention was implemented when power system security is under threat and all available supply options have been exhausted.

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Recommendations

The government of Kyrgyzstan should:

- Adopt measures for strengthening power system security, especially during periods of water scarcity. The IEA Roadmap for strengthening power sector security suggests opportunities to implement a range of policies that could help to strengthen power system security in the shorter term, especially during periods of water shortage when power system reliability and resilience are likely to be under greatest stress (IEA, 2022).
- Develop a long-term comprehensive and integrated policy framework based on clear strategic goals and in-depth sector planning to address the growing winter demand gap. It should also include an analysis of options for the diversification of generation and exploration of opportunities in solar and wind resources, including a clear understanding of associated costs and available incentives. The sector planning should include a least-cost generation plan as well transmission and distribution plans. The policy framework should also define a set of measures enabling policy and regulatory framework for demand-side energy efficiency.
- Continue the tariff reform. Tariffs should reflect the actual cost of the production and delivery of the energy, while providing suitable means for protecting the most vulnerable in society. Careful review should be given to cross-subsidies between residential electricity tariffs and heating tariffs. Cross-subsidies remain insufficient for full cost recovery in either sector. Tariff reforms should be accompanied by communication and outreach.
- Continue rehabilitation and plan new generation. Progress has been made in the rehabilitation of the Toktogul plant, Bishkek co-generation plant and other old generation. However, demand is growing and new supply is needed to avoid imports.
- Continue loss-reduction measures. Such measures will reduce the generation needed to meet demand, thereby improving supply adequacy and reducing the probability of outages.
- Develop and implement demand-side measures. Such measures will help managing daily, weekly and seasonal periods of peak consumption that create tight supply-demand conditions that could threaten power system security.

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4. Coal

Key data

(2020)

Coal production: 2.7 Mt (0.99 Mtoe) (0.5 Mt hard coal, 2.2 Mt brown coal), +366% since 2010

Net exports*: 0.05 Mt (0.94 Mt imports, 0.99 Mt exports) (net imports 1.1 Mt in 2010)

Share of coal: 40.3% of domestic energy production, 27.1% of TES, 8.4% of electricity generation, 15.3% of TFC

Coal consumption: 2.6 Mt (0.97 Mtoe) (electricity and heat generation 48.7%, residential 34.2%, industry 8.0%, services/other 9.1%), +38.7% since 2010

* Data estimated by the IEA secretariat

Average exchange rate (2021) USD 1 = KGS 71.2634. (Kyrgyzstani som) (NBKR, 2021). One tyiyn is 1/100th of a som.

Overview

Kyrgyzstan has significant coal reserves and ranks fourth in terms of coal reserves among the countries of the former USSR after Russia, Kazakhstan and Ukraine. The total reserves and predicted resources are estimated at 5.7 billion tonnes (Bt) of coal. During the Soviet times Kyrgyzstan produced about 4 Mt of coal and exported coal to Uzbekistan and Tajikistan.

The bulk of the existing coal industry is concentrated in the south-western part of the country, peripheral to the Fergana Valley, in the Batken oblast. There is also an existing coal industry in the central and north-eastern parts of Kyrgyzstan, in the Naryn oblast. The majority of coal deposits are difficult to exploit.

The coal of Kyrgyzstan is mostly of good quality, but only of medium rank (and medium heating value). Coals of higher rank, some with coking qualities, are present only in the Uzgen region. Many deposits of coal are known but undeveloped because the valleys and mountains of Kyrgyzstan are physiographically and geologically complex, transportation infrastructure is poorly developed, and population is sparse in many areas.

About 70 deposits and coal occurrences are currently known on the territory of the republic. They are grouped into four basins: Kavak (Kok-Moinok, Minkush, Kara-Keche), South Fergana (Sulukta, Kyzyl-Kiya, Beshburkhan, Abshir, Almalyk), North Fergana (Tash-Kumyr, Kara-Tut, Tegenek) and Uzgen (Kok-Yangak, Kumbel, Zindan), and three coal-bearing regions: Alai, Alabuka-Chatyr-Kul and South Issyk-Kul.

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Figure 4.1 Coal deposits 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.

Supply and demand

Industrial coal reserves are estimated at 1.3 Bt, distributed in the following parts of the country:

- Jalal-Abad region: 233.7 Mt
- Osh region :166.1 Mt
- Batken region: 349.9 Mt
- Issyk-Kul region: 22.0 Mt
- Naryn region: 555.2 Mt.

By types of coal in the explored reserves of the republic, brown coals prevail with more than 55%; hard coals account for about 40%, and coking coals for about 5%, concentrated mainly in deep horizons and requiring additional geological study and significant capital expenditures for development.

The coal industry of Kyrgyzstan is one of the leading basic sectors of the national economy. It serves as a source of production of electrical and thermal energy and an indispensable technological raw material for other industries.

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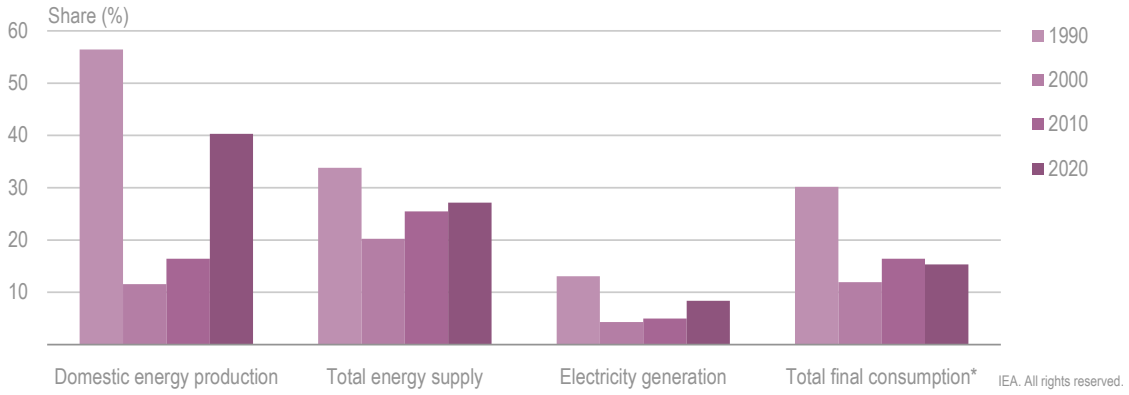
Figure 4.2 Share of coal in Kyrgyzstan's energy system, 1990-2020



* includes non-energy use

Source: IEA (2022), World Energy Statistics and Balances (database), https://www.iea.org/data-and-statistics

The share of coal in total energy supply (TES) is growing, and stood at 27% of the total in 2020. While still low, the share in electricity generation has almost doubled in the last decade. In some regions of the country, such as Naryn and Batken, coal plays an important role and its share among fuel and energy resources reaches 35.6% in Naryn and 30.2% in Batken.

In the period from 1990 to 1995, coal production decreased by more than eight times, or from 3.7 Mt to less than 0.5 Mt, and remained stagnant until 2008. The decline in coal production and use was caused by the following factors:

- high costs of production and transportation
- transition to the use of electricity for heating due to low electricity tariffs and availability of the power supply
- out-of-date production technology
- physical wear and obsolescence of fixed production assets, reaching 95%
- shortage of working capital associated due to late payments by consumers
- inefficiency of most coal companies due to reduced coal demand.

Starting in 2010, the government took several steps to increase coal production and gradually transfer the boiler houses of heat supply organisations to local solid fuel, which was stated in the annual government decrees on preparation for the autumn-winter period.

In 2012, the state enterprise KyrgyzKomur was created, and it started operating as an umbrella organisation for smaller private companies to supply coal to boiler houses and residential customers during the autumn-winter period.

Since 2011, there has been an upward trend in coal production, and in 2020 production reached 2.7 Mt – almost five times the level of production in 2010. It should be noted that in 2007-2012 there were constant problems with gas supplies from Uzbekistan to Kyrgyzstan and it also contributed to increased consumption of coal. Over half of the country's coal is produced in the Naryn region (oblast).

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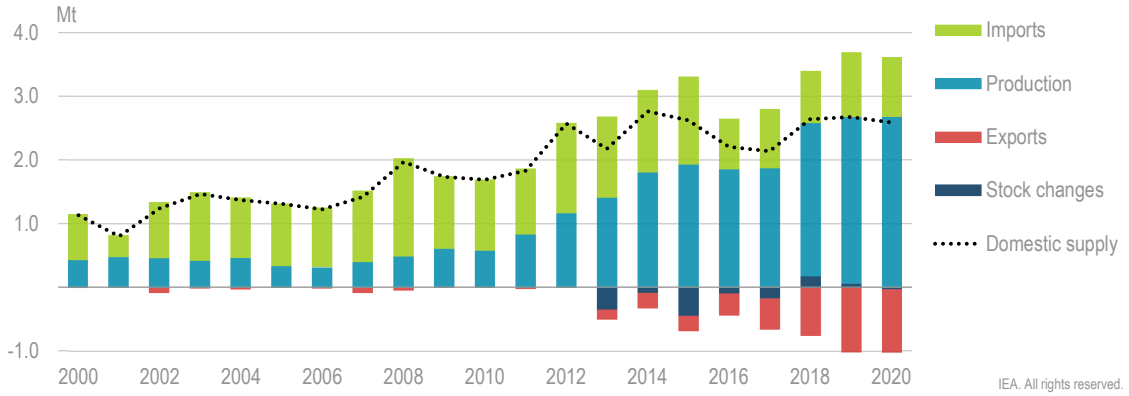
Figure 4.3 Coal supply in Kyrgyzstan, 2000-2020



Source: IEA (2022), World Energy Statistics and Balances (database), https://www.iea.org/data-and-statistics.

The largest consumers of coal in the republic are:

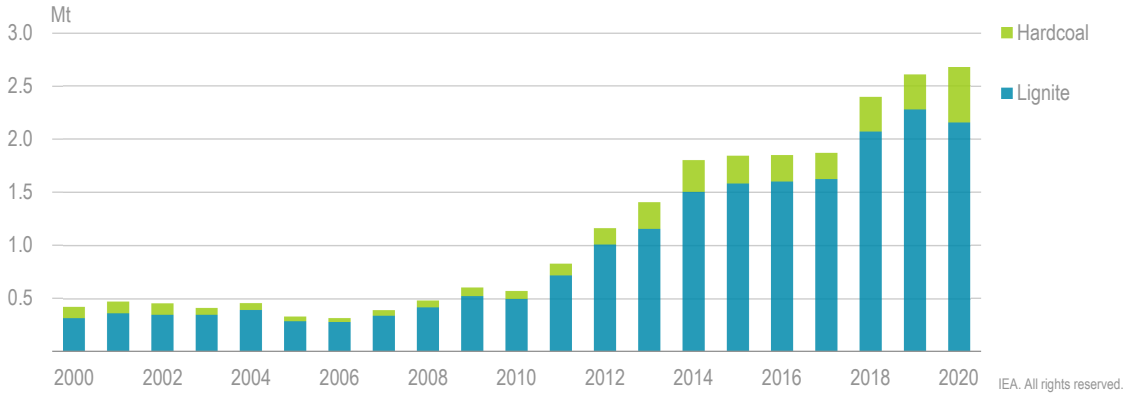
- households (48-50% of total coal consumption)
- co-generation plant in Bishkek (40-43%)
- other heat-generating enterprises (boilers) (10-13%).

The largest consumer of solid fuels, the Bishkek co-generation plant, has an annual demand of 1 000 kt to 1 500 kt (taking into account weather conditions and calorific value of coal). Local brown and hard coal make up about 25-35% of the total. The rest is imported from Kazakhstan.

At the same time, due to its own production, the Kyrgyz Republic increased coal supplies to the domestic market from a fifth of its needs to half, fulfilling the main task of import substitution of products.

Until now, the main share of the mined coal in the country has been used for heating. Therefore, in the summer, its production and sale are sharply limited, and the absence of consumers for fine coal (boiler houses) leads to the accumulation of significant amounts of stock at coal supply enterprises. Over the past five years, the amount of unsold coal at the end of the year has been about 1 800 kt to 2 000 kt.

Figure 4.4 Coal production, 2000-2020



Source: IEA (2022), World Energy Statistics and Balances (database), https://www.iea.org/data-and-statistics.

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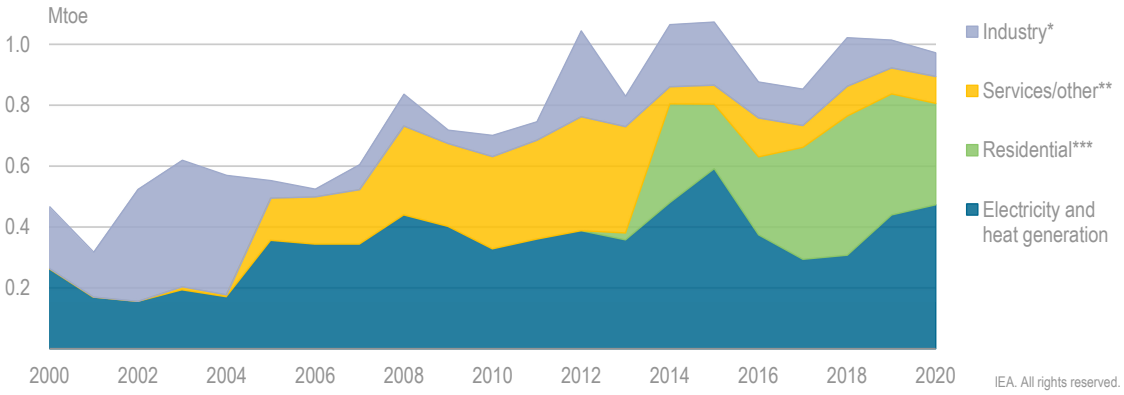
Figure 4.5 Coal consumption by sector, 2000-2020



* includes non-energy use; ** includes commercial and public services, agriculture, energy sector own use and unspecified consumption; *** residential consumption available since 2014, previously included in services/other.
Source: IEA (2022), World Energy Statistics and Balances (database), https://www.iea.org/data-and-statistics

Coal market structure

Since 2012 the coal sector has been managed by the state-owned KyrgyzKomur, which acts as an umbrella organisation for about 30 small and medium-sized enterprises operating in the coal sector, some of which companies engage only in seasonal coal production during the autumn-winter period.

KyrgyzKomur operates only the Kara-Keche mine and also manages the Issyk-Kul Shipping Company. In autumn of 2021 KyrgyzKomur was put under the MoE.

The sector has been liberalised and currently most of the coal mines are operated under licences for coal deposit operation issued by the government. Since autumn of 2021, the MoE has been responsible for licensing.

Policy

The latest government programme for development of the coal industry was developed in April 2009 and covered the period until 2015.

The effective National Energy Program for 2008-2010 (NEP) with its integrated plan for fuel-energy complex development to 2025 stated the government's plans to reform the coal sector by privatising it and increasing competition and phasing out financial support to the sector to attract private investment.

The main objectives of the government's coal sector reform were 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.

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The NEP planned for an increase in hydro and coal-fired generation capacity to augment the national electricity supply and expand exports. The 1 200 MW Kara-Keche thermal power plant at the Kara-Keche Coal Deposit in Naryn oblast was named as the main coal-fired power project.

The government also planned to increase production in existing fields from 450 kt in 2010 to 3 Mt by 2025 (in 2020, coal production was 2.7 Mt). Growth was planned to come from a 30% increase in the existing mines of Kara-Keche, Besh-Burhan, Zhergalan, Sulukta and Tash-Kumyr (NEP, 2008).

Box 4.1 Government plans for a coal-fired power plant

An initial Kara-Keche power plant proposal was for a 1 200 MW coal plant using coal from the Kavak brown coal deposits (Kara-Keche and Min-Kush).

The government estimated that if production from the Kara-Keche coal mine were increased, it would provide enough coal for the proposed 1.2 GW coal-fired plant requiring at least 2.5 Mt of coal per year. The Kara-Kechenskaya thermal power plant is proposed to supply baseload power in northern Kyrgyzstan (NEP, 2008).

The government is seeking investors for the project through an international bidding process. In March 2016, the Kyrgyzstan government announced an investment competition for mining development of the brown coal deposits in Kara-Keche, as well as the construction of the 1 200 MW coal plant and connecting railway.

As of spring 2022, the government continues to search for investors for the proposal.

The National Development Strategy of the Kyrgyz Republic for 2018-2040 requires energy efficiency technologies to be applied in all new construction and the government plans to implement large-scale programmes on energy-efficient reconstruction of old residential and non-residential buildings and introduce energy efficiency passports for all buildings (NDS, 2018).

The National Development Program until 2026 established priorities for economic development of the energy sector, which include among other things reduction of the country's dependence on hydrocarbon energy sources through more large-scale development of hydropower and the transition to autonomous boiler houses using alternative energy sources (natural gas, coal and other energy resources), including environment-friendly energy sources (NDP 2021).

In spring of 2022, President Sadyr Japarov announced a plan to put previously mothballed coal deposits into operation. The president emphasised that a significant increase in the production of local coal is required to provide residential customers and the Bishkek co-generation plant with additional coal to mitigate the impact of the energy crisis in the country caused by the low volume of water in the Toktogul reservoir. KyrgyzKomur started preparations for reactivating previously mothballed coal deposits. Two coal deposits of total commercial reserves of 183 Mt are planned for reactivation.

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Coal prices and taxes

Every year, the State Agency for Anti-monopoly Regulation sets wholesale selling prices for coal for coal mining enterprises.

Depending on the distance and the method of transportation from the place of production to the place of sale, the retail sale price exceeds the purchase price. For example, in 2020, the selling price for coal from the Kara-Keche open pit in the Naryn region was only KGS 1 330 per tonne. The retail price of this coal upon delivery to various regions of the country ranged from KGS 2 500 to KGS 5 500.

The Kyrgyz government several times has introduced state regulation of coal prices for 90 days to restrain the growth of prices during the winter period and facilitate the stable supply of coal. The state regulation may cover selected mines or set the retail price ceiling for different types of coal for each region and for Bishkek and Osh cities.

Assessment

Coal is Kyrgyzstan's second-most-important source of domestically produced energy.

Kyrgyzstan has substantial coal reserves. Explored coal reserves amount to 1.3 Bt. Kyrgyzstan ranks 15th-highest in the world for hard coal resources; the government estimates that commercial reserves are about 2.3 Bt.

Many deposits of coal are known but undeveloped because the majority of coal deposits are difficult to exploit due to the physiographically and geologically complex terrain of Kyrgyzstan.

Many deposits of coal are located in sparsely populated areas with poorly developed transportation infrastructure, which complicates transportation. In most regions coal is mainly transported by truck.

Depletion of reserves in old mine areas together with obsolete and worn-out equipment and out-of-date production technologies hamper further exploitation of existing mines under operation.

Most of the companies operating in the coal industry are small and do not have financial resources to invest in new technologies and modernisation of production equipment.

The coal of Kyrgyzstan is mostly of medium heating value and therefore has limited application for existing thermal generation. Bishkek co-generation plant was designed for higher-ranking coal from Kazakhstan, and any additional increase in coal consumption at the Bishkek plant may be associated with costs for converting some of the plant's equipment for use of local coal.

All these factors make further development of the coal industry without significant investments into the exploitation and transportation almost impossible.

Coal prices are not regulated. However, the government introduces state regulation of coal prices for 90 days during the winter heating period to restrain growth of prices and facilitate stable supply of coal.

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Production currently exceeds the demand and export to neighbouring countries increases.

Local coal is mainly used by households during the heating season. Over the past five years, the amount of unsold coal at the end of the year was about 1 800 kt to 2 000 kt.

There are a number of mothballed coal deposits which the government is planning to reactivate to increase coal supply for domestic consumers to encourage use of coal for heating and thus to reduce the load on the electric system during the heating season.

Building a 1 200 MW coal plant at Kara-Keche coal mine makes sense in terms of adding baseload to the system currently overdependent on hydrogeneration. However, the plant should meet the world-class standards for high efficiency and pollution control.

The latest government programme for developing the coal industry was devised in April 2009 and covered the period until 2015. Since then, no official government statement of government vision for development of the sector has been released.

Coal is mainly used by households for heating and cooking, and use of coal in technological processes is very limited.

Recommendations

The government of Kyrgyzstan should:

- Develop a comprehensive long-term strategy for coal sector development with an outlook to 2050. The new strategy should include a detailed assessment of overall energy security concerns and consider coal sector development based on clean technologies and sustainable development objectives. It should also include an estimate of the necessary investment requirements and possible approaches to attract investment.
- Assess the pros and cons of building a coal-fired power plant, making certain it would meet the highest environmental and safety standards. If meeting such standards is not feasible, consider alternatives for providing baseload to the power system.
- Evaluate potential for increased use of local coals use in co-generation and, if economical, ensure it could be done in a sustainable manner with clean coal technologies.
- Develop a programme for the introduction of clean coal technologies and introduce mandatory clean coal standards.
- Include mandatory clean coal standards in the tender conditions for development of the brown coal deposits in Kara-Keche, as well as the construction of the 1 200 MW coal plant and connecting railway.
- Create incentives for use of coal in the technological processes of cement, ferroalloys, and gypsum board products.

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5. Oil and natural gas

Key data

(2020)

Domestic natural gas production: 22 mcm, -2.6% since 2010

Net imports of natural gas: 318 mcm, +16.9% since 2010

Share of natural gas: 0.7% of domestic energy production, 7.5% of TES, 0.5% of electricity generation, 5.2% of TFC

Gas consumption by sector: 340 mcm (residential 46.4%, electricity and heat generation 33.7%, other energy 7.6%, industry 7.3%, services/other 4.9%), +9.9% since 2010

Domestic crude oil production: 0.24 Mt, +188% since 2010

Crude oil net exports: 0.05 Mt, none in 2010

Oil product net imports: 1.20 Mt (1.31 Mt imports, 0.15 Mt exports), +2.7% since 2010

Share of oil: 9.8% of domestic energy production, 33.4% of TES, 0.3% of electricity generation, 37.3% of TFC

Consumption by sector: 1.20 Mt (transport 88.7%, industry 4.1%, electricity and heat generation 2.8%, residential 2.7%, services/other 1.6%), -3.0% since 2010

Average exchange rate (2021) USD 1 = KGS 71.2634. (Kyrgyzstani som) (NBKR, 2021). One tyiyn is 1/100th of a som.

Overview

Kyrgyzstan's oil and gas resources are marginal. The share of natural gas in Kyrgyzstan's energy system is low, below 10% in TES (Figure 5.1). In contrast, oil has the highest share at one third in 2020, despite having decreased in recent years. Over 90% of the oil products (mainly diesel and motor gasoline) and natural gas are imported. The most important trading partners for oil and gas are Russia and Kazakhstan.

Oilfields in Kyrgyzstan are located in the south of the Jalal-Abad region and in the north of the Batken region.

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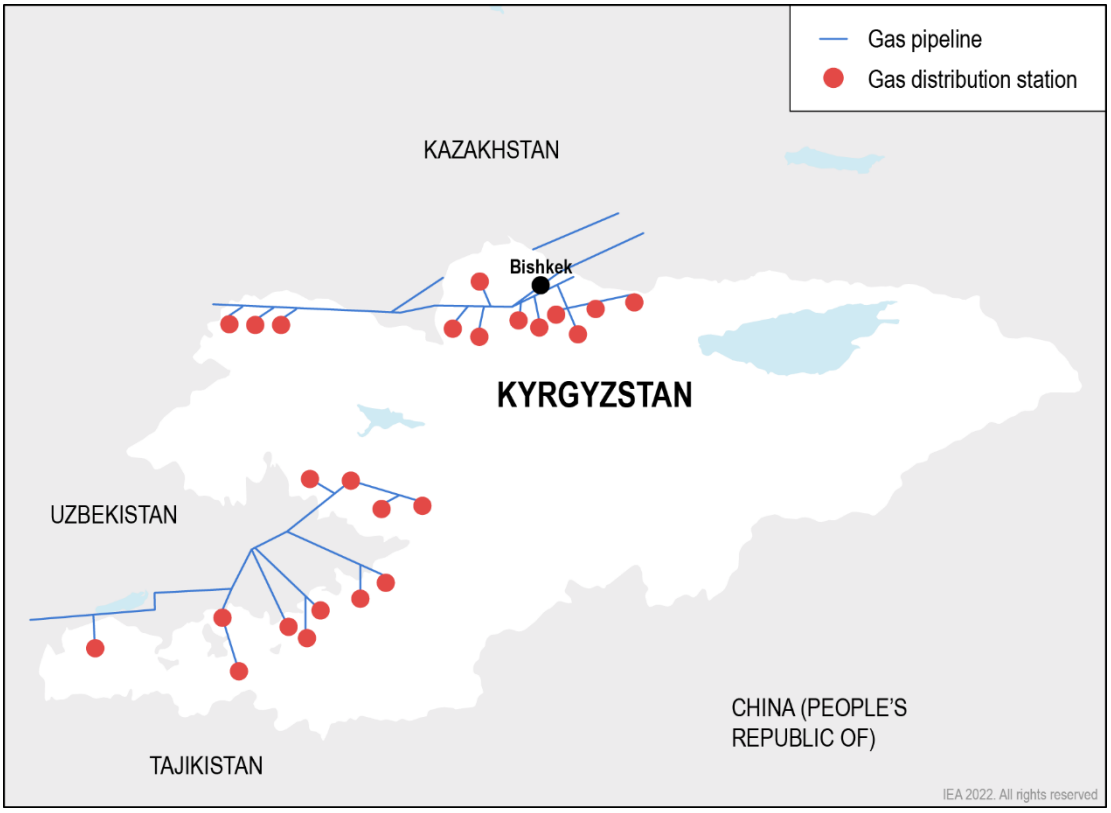
Industrial oil reserves are insignificant and amount to about 88.5 Mt, with 11.2 Mt recoverable, and are concentrated in the south of the country in Jalal-Abad and Batken regions. All geological resources of oil and natural gas occurring in the bowels of the Kyrgyz Republic are the exclusive property of the state in accordance with the Constitution of the Kyrgyz Republic, the Law of the Kyrgyz Republic on Subsoil and other regulatory legal acts of the Kyrgyz Republic. Oil contains dissolved petroleum gas and helium in most of the fields. The level of development of oil reserves is extremely low – 0.1%, which is due to the lack of funds for production drilling. In 2020, OJSC Kyrgyzneftegaz reported 326 idle oil wells on the company's balance sheet.

Most oil and gas deposits have been exploited for more than 70 years and have produced approximately 70% of their economically viable capacity. In addition, newer oil wells dating from 1992 have depreciated by 30%, so between resource depletion and ageing equipment, oil and gas production has declined considerably since the early 1990s. The government therefore plans to exploit new well sites in the future, with potential recognised in the Ferghana Valley, the Alai Valley, the Naryn Basin, the Issyk-Kul Basin and the eastern Chuy Basin.

Natural gas is imported via the Bukhara-Tashkent-Bishkek-Almaty pipeline in the north, which transports gas from Uzbekistan to the main Kazakhstan population centres. The supply to Kyrgyzstan is approximately 340 million cubic metres (mcm) per year.

Figure 5.1 Map of gas networks 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.

In 2012, Kyrgyzstan agreed with China to construct part of the 2 000 km gas pipeline network in Kyrgyzstan. The Central Asia-China pipeline network runs from Turkmenistan to China, and includes Lines A, B and C via Uzbekistan and Kazakhstan (first launched in

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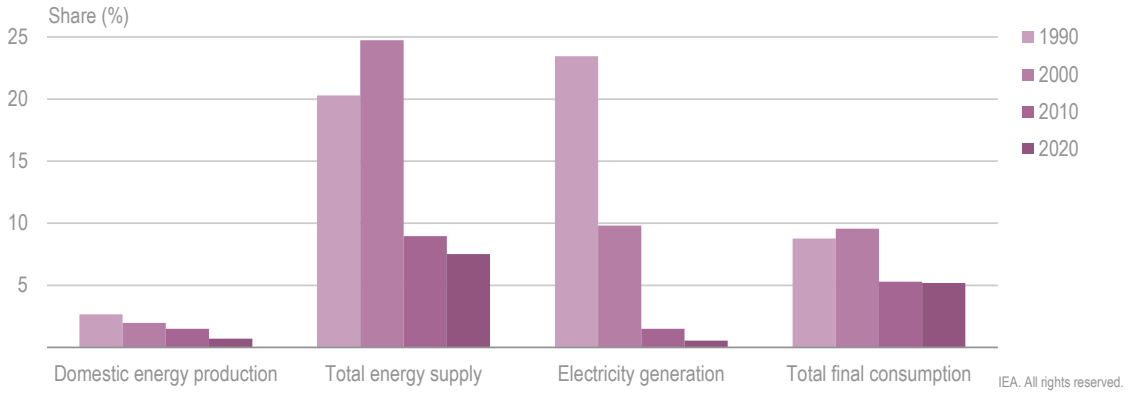
2009). In May 2014, Kyrgyzstan approved a feasibility study on its section of Line D. Construction on Kyrgyzstan's portion of the network has not yet begun and land allocation process for the pipeline is ongoing.

Natural gas supply and demand

Figure 5.2 Share of natural gas in Kyrgyzstan's energy system, 1990-2020

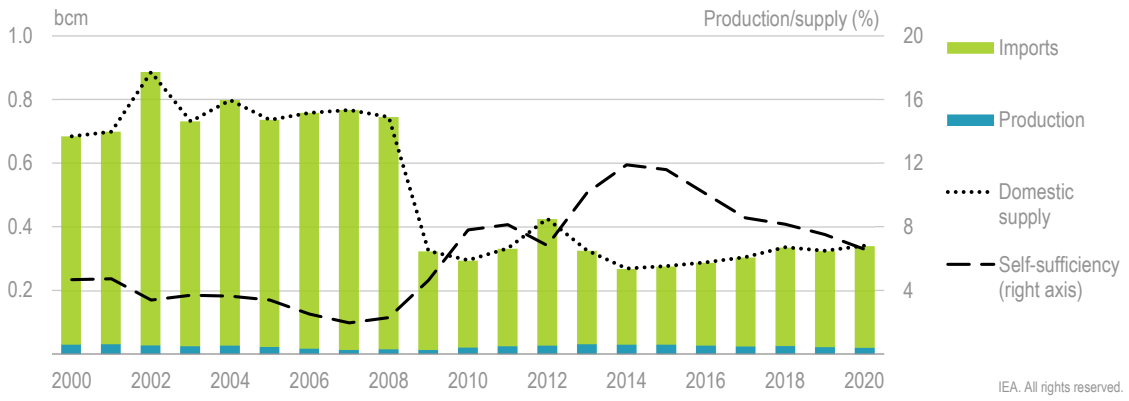


Source: IEA (2022a), World Energy Statistics and Balances (database), https://www.iea.org/data-and-statistics

The share of natural gas in the TES is low, below 10%. This is in stark contrast to most former Soviet Union Republics. Supply fell by almost 60% between 2008 and 2009 due to regular problems with the import of natural gas from Uzbekistan. Since 2014 consumption has continued to increase.

According to the National Statistical Committee of the Kyrgyz Republic, in 2020 natural gas consumption amounted to 340 mcm, including 22 mcm of domestic production and 318 mcm of imports.

Figure 5.3 Natural gas supply by source, 2000-2020



Note: 1 bcm = 1000 mcm
Source: IEA (2022a), World Energy Statistics and Balances (database), https://www.iea.org/data-and-statistics

Consumption of natural gas

Intensive gasification works during 2015-2020 resulted in an increase in natural gas consumption by 4.3% per year on average. The natural gas is used by households (66.2%)

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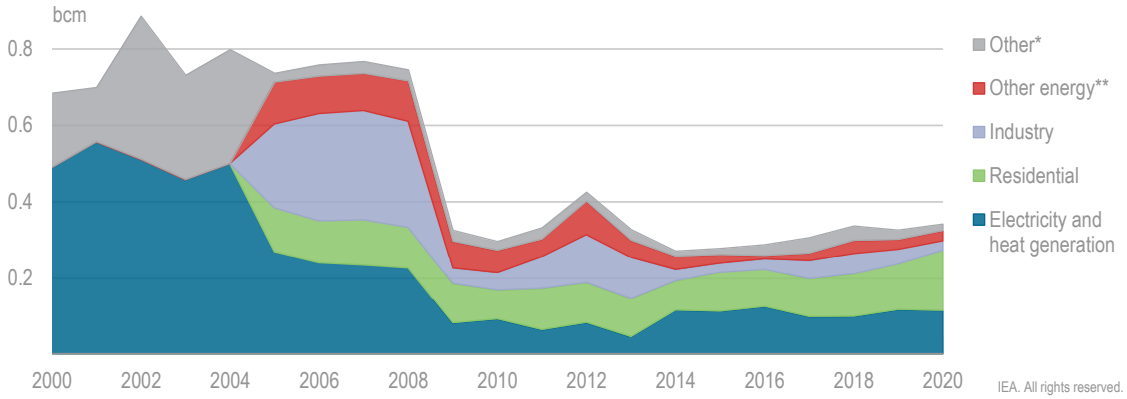
for cooking and heating water. Natural gas is in demand among the population of the Kyrgyz Republic due to its ease of use in everyday life.

Natural gas is supplied to 39 settlements of the Kyrgyz Republic. The total number of consumers is 297 300, including:

- residential – 294 600
- public utilities – 2 600
- industrial enterprises – 70.

Level of gasification in Bishkek and Osh is increasing. Three regions in Kyrgyzstan are not gasified, namely Talas, Issyk-Kul and Naryn. Gas supply in other regions is insignificant.

Figure 5.4 Consumption of natural gas, 2000-2020



* includes transport, services, agriculture and unspecified consumption, for which the share is notable until 2005.;
** includes oil and gas extraction and distribution losses.
Source: IEA (2022a), World Energy Statistics and Balances (database), https://www.iea.org/data-and-statistics

Gas sector structure

Gazprom is the owner and operator of the gas transmission and distribution system in Kyrgyzstan through its subsidiary Gazprom Kyrgyzstan.

In December 2013, Kyrgyzstan sold its gas network to Russia's Gazprom for USD 1 in exchange for taking over USD 38 million of debt and pledging to invest USD 600 million to improve Kyrgyzstan's gas network over a 25-year period. Before December 2013, KyrgyzGaz owned and operated the network, with more than 83% in government ownership.

Prior to the sale, on 26 July 2013, the governments of the Kyrgyz Republic and Russia signed the intergovernmental agreement "On cooperation in the field of transportation, distribution and supply of natural gas". By virtue of this agreement Gazprom Kyrgyzstan LLC was appointed as the gas operator for supplying natural gas to Kyrgyzstan, its distribution and sale within the country.

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Gazprom Kyrgyzstan LLC operates the republic's gas transmission and distribution networks and also has a monopoly on imports of natural gas. The total length of gas pipelines is 4 195 km, including:

- major pipelines – 796 km
- medium-pressure pipelines – 817 km
- low-pressure pipelines – 2 582 km.

The gas infrastructure in Kyrgyzstan needs significant refurbishment, as it is more than 35 years old. From 2014-2020, Gazprom Kyrgyzstan LLC invested about KGS 28 billion in the development and renovation of the gas infrastructure, including paying off the debt obligations of OJSC Kyrgyzgaz in the amount of KGS 3.2 billion, and implemented the following major projects:

- reconstruction and construction of 112 km of the main Bukhara-Tashkent-Bishkek-Almaty gas pipeline which, among other things, provides transportation of natural gas to the Alma-Ata region of the Republic of Kazakhstan
- full reconstruction of gas control stations and three large gas distribution stations
- construction of distribution networks in Bishkek and Chui region with a length of over 875 km (43 residential areas or 36 000 houses were supplied with gas).

The overall level of gasification of the country has increased from 22% in 2014 to 35% at the end of 2020. By 2030, Gazprom Kyrgyzstan LLC plans to reach the level of gasification of 60%.

Gas prices

Gazprom Kyrgyzstan LLC is included in the register of natural monopolies and the company's activities are regulated by the anti-monopoly authority and the Department for Regulation of the Fuel and Energy Complex of the MoE of the Kyrgyz Republic (the Energy Regulator).

The tariff-setting for natural gas is primarily based on the bilateral agreement between the governments of the Kyrgyz Republic and Russia “On cooperation in the field of transportation, distribution and supply of natural gas”, signed on 26 July 2013.

According to the agreement, the authorised body of the Kyrgyz Republic sets the price of gas at the level of the costs incurred for purchase, transportation, storage and other associated costs plus the rate of return in real terms (excluding inflation) for 25 years, starting from the date of registration of the ownership right to a 100% share in the authorised capital of the company by the authorised organisation of the Russian party. The agreement also guarantees a regular (at least once a year) review of prices (tariffs) for natural gas sold by the company in the Kyrgyz Republic, by the authorised body of the Kyrgyz Republic taking into account the above conditions.

The Energy Regulator sets the upper price limit excluding a certain part of the costs from the tariff structure using the Methodology for Determining Costs for Calculating Natural Gas Tariffs approved by the Energy Regulator’s Order No. 5 dated 6 December 2016. This methodology is mainly used to calculate the permitted income of Gazprom Kyrgyzstan LLC’s operations. The methodology does not contain any provisions regarding the calculation of (subsidised) tariffs for consumers.

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The current end-user natural gas tariffs include the following components:

- the price of purchased gas at the border of the Kyrgyz Republic (currently USD 150 per thousand m^3)
- allowable "normative" losses of natural gas
- the income necessary to ensure operation
- expenses for the operation of equipment and the sale of gas
- monthly adjustment of tariffs depending on the exchange rate of KGS-USD
- VAT and sales taxes applicable to consumer categories.

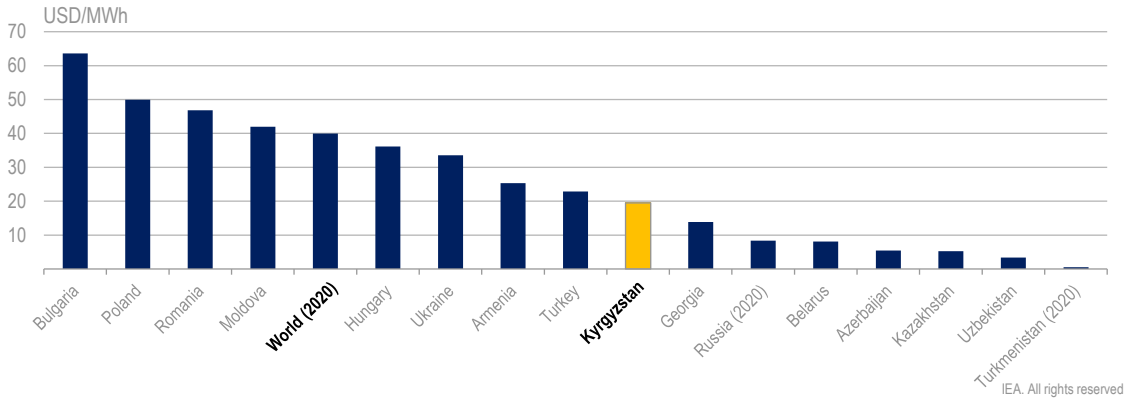
The Energy Regulator obligated Gazprom Kyrgyzstan LLC to recalculate monthly natural gas tariffs for end users in terms of purchase price, "normative" losses based on the official exchange rate of the national currency against the US dollar, approved by the National Bank of the Kyrgyz Republic on the first day of the month.

In 2020, due to the socio-economic situation associated with the Covid pandemic, Gazprom Kyrgyzstan LLC kept tariffs for March-June (KGS 15.59/m^3) at the level of March 2020 despite the official increase in the dollar exchange rate from 69.8 to 75.9.

Even though the intergovernmental agreement provides for setting the end-user tariff at the cost recovery level plus the agreed rate of return, the tariff is set at 11% below the cost. The resulting deficit and the labour costs are subsidised directly by Russia's Gazprom. For example, in 2020, the difference between the set tariff per $1m^3$ and the full cost was KGS 2.2.

Among the countries importing natural gas in the post-Soviet space, Kyrgyzstan's annual consumption is the smallest (317.9 mcm). The current gas tariff for residential customers (USD 212) is the lowest among these countries.

Figure 5.5 Residential natural gas prices in selected countries, 2021



Source: IEA (2022b), World Energy Prices (database), https://www.iea.org/data-and-statistics/data-products?filter=prices

Tariffs for 2022 set by the Energy Regulator are shown below.

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Table 5.1 Natural gas tariffs as of 1 March 2022

Customer group	Tariff (KGS/m^3)
Residential	18.76
Non-residential (without taxes)	19.99
Non-residential (with VAT)	22.39

Notes: Based on the exchange rate of the national bank (USD 1 = KGS 93.29). Gazprom Kyrgyzstan LLC must recalculate natural gas tariffs on a monthly basis, taking into account the official exchange rate of the national currency against the US dollar.
Source: Energy Regulator (2022)

Policy

In the oil and gas sector, policies are directed at increasing domestic production of oil and oil products, continuing gasification of the country and diversifying sources for import.

The National Development Strategy of the Kyrgyz Republic for 2018-2040 (NDS**)** states that Kyrgyzstan's high dependence on imports of fuels and lubricants and the lack of sufficient own hydrocarbon reserves necessitate a policy of encouraging the growth of production and the production of fuel of high environmental quality standards.

The NDS gives priority to the transition to the use of high-quality fuels in combination with the expansion of the use of alternative energy sources, as well as to diversification of energy supplies for the needs of the country's economy.

The NDS also states the following policy priorities:

- Continue gasification of the country.
- Transition from centralised district heating to autonomous gas-fired facilities for heating of households and administrative buildings.
- Introduce modern technical solutions for gasification.
- Develop competitive production of high-quality petroleum products.
- Increase refinery production capacities.
- Improve quality of the refinery to transit from the existing Euro-2 standard to Euro-4 and Euro-5 standards.
- Diversify energy supplying countries.

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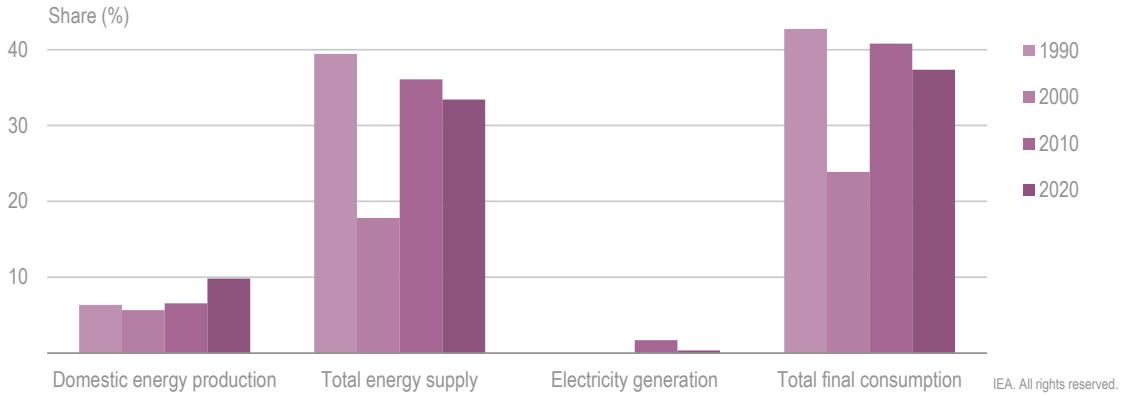
Oil supply and demand

Figure 5.6 Share of oil in Kyrgyzstan's energy system, 1990-2020



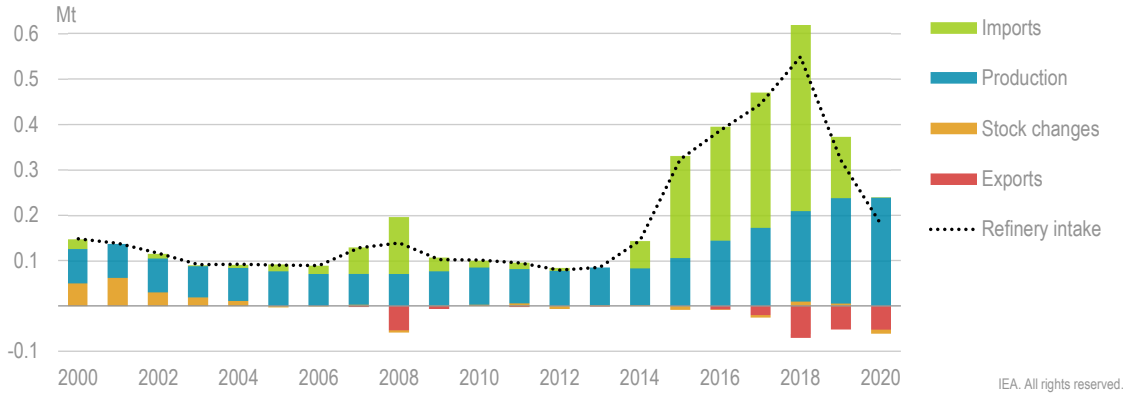
Source: IEA (2022a), World Energy Statistics and Balances (database), https://www.iea.org/data-and-statistics

With a 33% share in 2020, oil is the main energy source in Kyrgyzstan's TES. The majority of this is covered by imports, given that domestic production is limited, despite having tripled in the last decade. Oil use for generating electricity and heat is negligible and virtually all oil is consumed in by end-use sectors.

Since 2014, there has been an upward trend in oil production. In 2014 the production volume was a mere 82 kt of oil; in 2020 production reached 239 kt, that is, oil production increased by 157 kt or 191%. This became possible due to the commissioning of new wells and co-operation with foreign investment companies. As a result of joint activities of Kyrgyzneftegaz OJSC with investment companies in recent years, 410 new wells were drilled. The increase in oil production was reflected in the growth in the production of petroleum products and their sale.

In 2020, 52 kt of oil were exported. The average price of 1 tonne of oil was KGS 20 500 or about USD 265.

Figure 5.7 Kyrgyzstan's crude oil supply, 2000-2020



Source: IEA (2022a), World Energy Statistics and Balances (database), https://www.iea.org/data-and-statistics

Most demand for petroleum products is met by imports. The Kyrgyz Republic imports oil products from Russia and Kazakhstan. Most of the oil products are delivered by rail.

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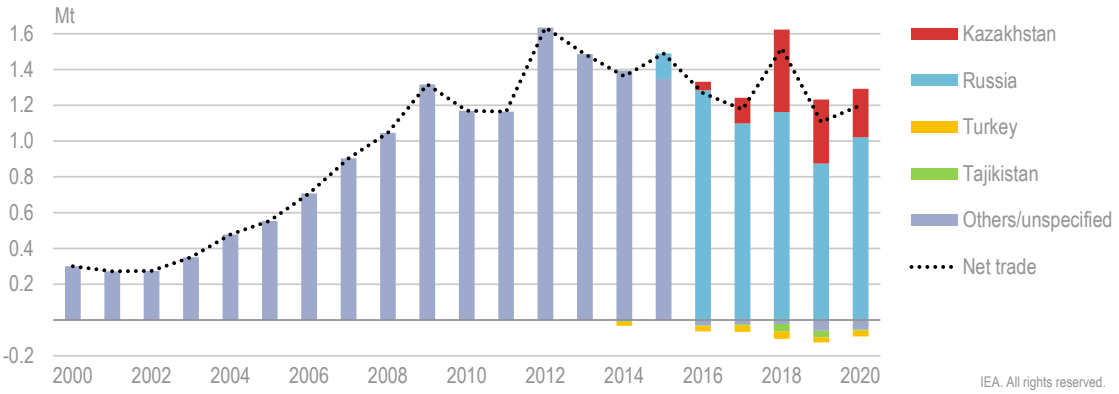
Oil products are imported by private companies. The government does not do any import planning. Import taxes are collected at the border. Fuel quality is checked by the Center for Standardization and Metrology under the Kyrgyz MoE.

Figure 5.8 Kyrgyzstan's oil product imports by country, 2000-2020

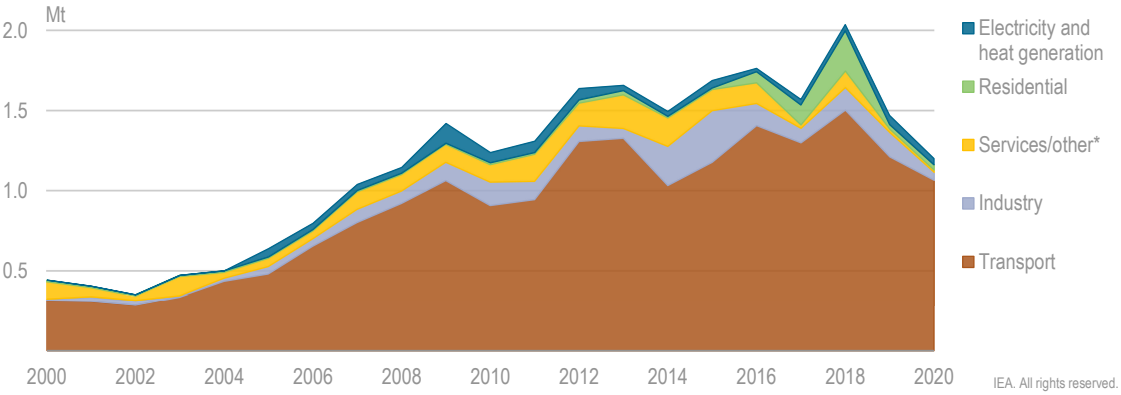


Source: IEA (2022a), World Energy Statistics and Balances (database), https://www.iea.org/data-and-statistics

According to the NSC, in 2020, the annual consumption of motor gasoline was 0.55 Mt consumption of diesel fuel was 0.52 Mt. Almost all diesel fuel and motor gasoline is used in transport. Translating these figures into commensurate volumes, the total consumption of road transport amounted to about 1.1 Mtoe, where the share of gasoline is 51.3% and diesel fuel is the remainder.

Due to the increase in prices for petroleum products over the past three years, there has been a trend towards a decrease in the consumption of motor gasoline and diesel fuel. In just between 2018 and 2020, consumption of diesel and gasoline slumped by over 30%.

Figure 5.9 Oil consumption by sector, 2000-2020



* includes commercial and public services, agriculture, forestry and unspecified consumption.
Source: IEA (2022a), World Energy Statistics and Balances (database), https://www.iea.org/data-and-statistics

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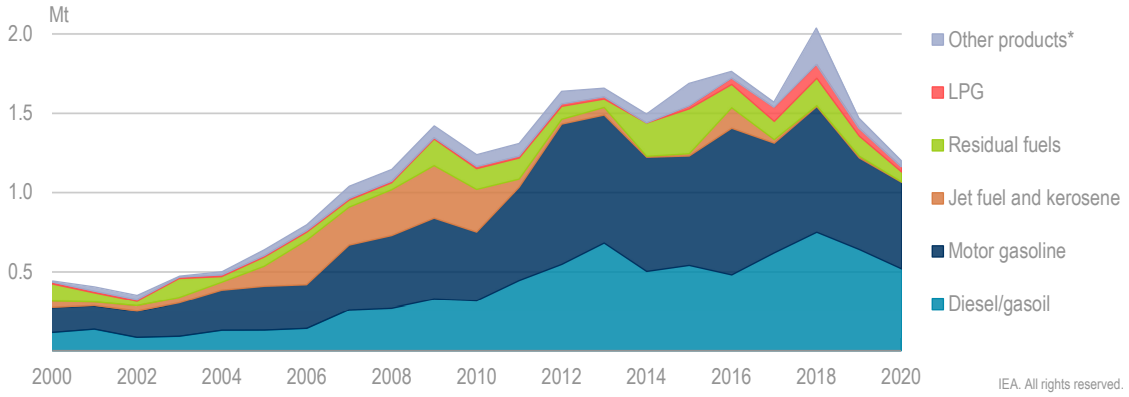
Figure 5.10 Oil consumption by product, 2000-2020



* includes lubricants and bitumen.
Source: IEA (2022a), World Energy Statistics and Balances (database), https://www.iea.org/data-and-statistics

Oil market structure

OJSC KyrgyzNefteGaz is the sole upstream oil and gas enterprise in Kyrgyzstan. It has a complete production cycle, from oil and gas exploration, well drilling, oil and gas production to sale of petroleum products. The company also refines oil through its subsidiary Closed Joint-Stock Company (CJSC) Kyrgyz Petroleum in a single refinery in Jalal-Abad.

Oil refineries

There are three key oil refineries in the Kyrgyz Republic located in the cities of Jalal-Abad, Kara-Balta and Tokmok, with several others scattered throughout the country. All of the country's refineries can be classed as mini-refineries (typically refineries that process under 1 Mt/year). These are simple refineries that often have minimal secondary units, and are not able to produce high-quality fuel products that meet European standards. There are currently nine companies operating refineries in Kyrgyzstan.

The refinery in Jalal-Abad was put into operation in 1996. Currently, it produces AI-80 gasoline, as well as diesel and fuel oil. The construction of refineries in the cities of Kara-Balta and Tokmok was financed by investors from China, and were put into operation in 2013 (Kara-Balta) and 2015 (Tokmok), refining imported crude oil. As a result, local production of gasoline, fuel oil and diesel fuel has increased in recent years. At the same time, there are risks of underutilisation of new refineries due to global crude price volatility and periodic shortages of crude due to unreliable supply, which was exacerbated by the Covid-19 pandemic.

About 10% of the country's domestic demand is met by domestic refineries.

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Table 5.2 Oil refineries in Kyrgyzstan, 2021

	Company	Capacity (kt/year)	Products	Operation status (as of June 2021)
1	China Petrol LLC Company Junda	800	Gasoline 80-92, diesel, mazut, heating oil, propane-butane gas	Idle
2	CJSC KyrgyzPetroleum Company	500	Gasoline 80-92, diesel, mazut	In operation
3	Synergy Investment Group (Kant Oil refinery)	200	Diesel, mazut, naphtha heating oil	Works periodically, if raw materials are available
4	Tokmok Oil Refinery LLC	400	Gasoline 80-92, diesel, mazut, propane- butane gas	Idle
5	Kemin Oil Refinery LLC	100	Gasoline 80, diesel, mazut	In operation
6	Jalal-Abad Oil Refinery LLC	75	Gasoline 80, diesel, mazut	Works periodically, if raw materials are available
7	Sv Rich LTD	100	Gasoline 80, diesel, tar, bitumen, mazut	Works periodically, if raw materials are available
8	Boil LLC	25	Gasoline 80-92, diesel, mazut	Works periodically, if raw materials are available
9	Safar LLC	50	Diesel, mazut	Works periodically, if raw materials are available

Note: The largest refinery, China Petrol Junda, is currently idle because of lack of Chinese specialists due to the pandemic.
Source: Kyrgyz Republic, Ministry of Energy.

Import of oil products

The most important trading partners for oil products are Russia and Kazakhstan. Over 80% of total imports of oil and oil products come from Russia.

The Kyrgyz Republic imports oil products from Russia under the agreement between the governments of Russia and the Kyrgyz Republic on co-operation in the supply of oil and petroleum products signed on 6 June 2016. Every year an indicative balance of petroleum products (the so-called allocated quota) is negotiated and signed with Russia, and private petroleum traders import oil products within the allocated quota.

All oil products are imported by rail and ground transportation.

Export of oil

In 2020, 51.5 kt of oil were exported. The average price of 1 tonne of oil was KGS 20,500 or about USD 265.

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A Kyrgyz governmental decree on 1 March 1 2021 placed a temporary ban on the export of oil and petroleum products from Kyrgyzstan to third countries.

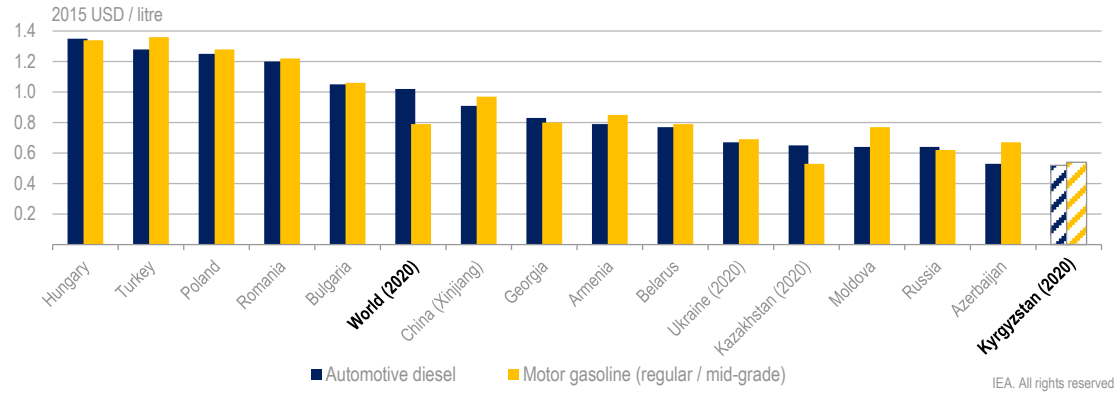
According to the current legislation, the government of the Kyrgyz Republic has the right to prohibit the export of oil and gas produced in the territory of the republic, and products of their processing for a period not exceeding six months during a calendar year.

Oil prices

Petroleum product prices are not regulated, although the Anti-monopoly Regulation Service under the Ministry of Economy and Commerce of the Kyrgyz Republic monitors fuel prices to protect against "excessive profits". Prices for petroleum products are not subsidised and include both excise and value-added tax.

Prices for petroleum products are significantly lower than the world average, even lower than in Russia, the supplier country, but higher than in Kazakhstan. The average price of RON-95 motor gasoline in 2020 in the republic amounted to USD 0.62 per 1 litre.

Figure 5.11 Transport fuel prices in selected countries, 2021



Source: IEA (2022b), World Energy Prices (database), https://www.iea.org/data-and-statistics/data-products?filter=prices

As a member of the EAEU, the Kyrgyz Republic has agreed to form a common market for oil and petroleum products, in addition to the gas and electricity markets currently being formed by the EAEU. The market for oil and petroleum products of the EAEU is expected to be launched in 2024, although member countries still have to work out many details.

Assessment

Kyrgyzstan's gas resources are marginal. Local production covers about 5% of the oil demand and about 1.3%, of the gas demand.

Most oil and gas deposits have been exploited for more than 70 years and have produced approximately 70% of their economically viable capacity. About 80% of the remaining oil reserves are difficult to extract. Their development requires additional costs and the use of special technologies.

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The level of natural gas production is declining due to the depletion of fields and wear and tear of equipment. Further growth in production is possible only through the exploration of new deposits in promising areas.

The self-sufficiency of the country in oil products and natural gas is less than 5% and is completely dependent on external supplies of oil products and natural gas.

Over 80% of total imports of oil and oil products come from Russia.

Raw materials and components for production of petroleum products are imported.

Domestic production of gasoline, fuel oil and diesel fuel has risen increased due to private investment in new oil refineries, however, domestic production continues to be dependent on imports of crude oil.

Due to reconstruction and development of the natural gas network and new investment in the system, the overall level of gasification of the country has increased from 22% in 2014 to 35% at the end of 2020.

Import of oil products is completely privatised and there is no government process for planning imports and domestic sales of oil products.

The government may introduce a temporary ban on the export of oil product but there is no clear and transparent process for determining and communicating reasons for the ban.

The quality of domestic oil products is not high. Modernisation of local refineries' equipment is required to reach Euro-4 and Euro-5 standards.

Recommendations

The government of Kyrgyzstan should:

- Consider diversification of oil and oil products supplies. Liberalisation of the oil products market resulted in oil imports coming from two countries and over 80% coming from one country.
- Improve the regulatory framework for the export of oil products by establishing a clear and known in advance set of conditions for announcing a ban on export.
- Introduce quality requirements for local oil refineries to ensure Euro-4 and Euro-5 standards.
- Consider transfer of motor transport to compressed natural gas to reduce dependence on imported oil products.
- Apply solid economic analysis to gas network extensions in remote and mountainous areas, as in Naryn and Issyk-Kul regions (where there is no gasification at all).
- Consider introduction of non-hydrocarbon gas (biogas) especially in rural areas and develop a strategic vision for biogas development.
- Introduce requirements for installation of gas-fired boilers for new construction in cities.

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- Encourage the private sector to introduce gas-fired boilers that meet high energy efficiency standards.
- Transfer existing boilers operating on electricity, fuel oil and coal to gas.
- Reform tariffs to reach the cost recovery levels to encourage improved investment into the gas infrastructure and provide incentives for energy efficiency.

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6. Energy, environment and climate change

Key data

Total GHG emissions without LULUCF* (2017): 15.87 MtCO2-eq, -44% since 1990, +24% since 2010

GHG emissions without LULUCF* by sector (2017): energy 57.5%, agriculture 32.0%, industrial processes 6.8%, waste 3.7%

Total GHG emissions with LULUCF* (2017): 5.5 MtCO2-eq, -69.6% since 1990, +154.3% since 2010

Energy-related CO_2 emissions (2020):

CO_2 emissions from fuel combustion: 8.2 $MtCO_2$ (+35.6% since 2000, -64.0% since 1990)

CO_2 emissions by fuel: coal 48.7%, oil 43.8%, natural gas 7.5%

CO_2 emissions by sector: transport 40.8%, electricity and heat generation 27.7%, residential 20.9%, industry 5.6%, services/other 5.0%

CO_2 intensity (CO_2 emissions per GDP): 0.30 $kgCO_2$/USD (2015 PPP) (world average 2019 0.26)

* Land use, land-use change and forestry. For non-Annex I countries of the Kyoto Protocol, recent GHG data availability are limited. The latest national inventory covers 1990-2017 (pending government approval).

Overview

The World Bank estimates that Kyrgyzstan is one of the world's lowest contributors to GHG emissions. Its energy and agriculture sectors, however, are the top two drivers of national emissions at 55% and 34% respectively (World Bank, 2019).

The Kyrgyz Republic ratified the UNFCCC in January 2000 and the Kyoto Protocol in January 2003. In accordance with the obligations of the parties to the Framework Convention under Articles 4 and 12, Kyrgyzstan prepared the First (2004), Second (2008) and Third (2016) National Communications on Climate Change. These documents, first of all, confirm the intentions of the country to actively participate in solving such a global environmental problem as climate change.

Preparation of the Fourth National Communication on Climate Change and the First Biennial Update Report on the United Nations Framework Convention on Climate Change will be completed in 2022.

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The Kyrgyz Republic has ratified the 2019 Paris Agreement. According to the Paris Agreement, the Kyrgyz Republic is not a donor country and has no obligation to provide financial assistance to other countries. On the contrary, as a developing, mountainous landlocked country, and as one particularly vulnerable to climate change, the Kyrgyz Republic has the opportunity to receive financial support for the implementation of national programmes to adapt to the negative effects of climate change and take the necessary measures for sustainable low-carbon development.

Actions on climate change are reflected in the main development documents – the National Development Strategy of the Kyrgyz Republic for the period 2018-2040 and the National Development Program of the Kyrgyz Republic until 2026.

The importance of climate action and the need to improve the national climate policy have received institutional confirmation in the creation of the State Committee on Ecology and Climate of the Kyrgyz Republic, which is an authorised state body for environmental safety and climate sustainability, and whose chairman is a member of the Cabinet of Ministers of the Kyrgyz Republic. In 2021 the State Committee on Ecology and Climate of the Kyrgyz Republic became the Ministry of Natural Resources, Ecology and Technical Supervision.

Greenhouse gas emissions

The Kyrgyz Republic is a country with relatively low GHG emissions. In 2017, the contribution of the republic to global GHG emissions from fossil fuel combustion was 0.032%, while the population is 0.082% of the total world population. Thus, the volume of GHG emissions per capita in the Kyrgyz Republic is less than half the global average. However, planned economic development will inevitably lead to a sharp increase in GHG emissions, which determines the need for active actions to reduce emissions.

In 2017, the total GHG emissions in the Kyrgyz Republic amounted to 15.9 million tonnes of CO_2 equivalent (Mt CO_2-eq), and removals were 10.4 Mt CO_2-eq, thus resulting in net GHG emissions of 5.5 Mt CO_2-eq. In 2017 compared with 1990, total GHG emissions decreased by 43.9%, and net emissions by 69.5%.

In 2017 compared with 1990, GHG emissions decreased by 55.5% in the energy sector and by 21.2% in the agriculture sector. However, GHG emissions increased in the sector of industrial processes and product use by 23.7%, and in the waste sector by 26.9%. Furthermore, the CO_2 absorption in the land use, land-use change and forestry sector remained almost unchanged (increased by 0.9%).

However, in the period 2007-2017, there was a tendency of growth in GHG emissions, which necessitates the strengthening of additional measures to develop a long-term national strategy for low-carbon development.

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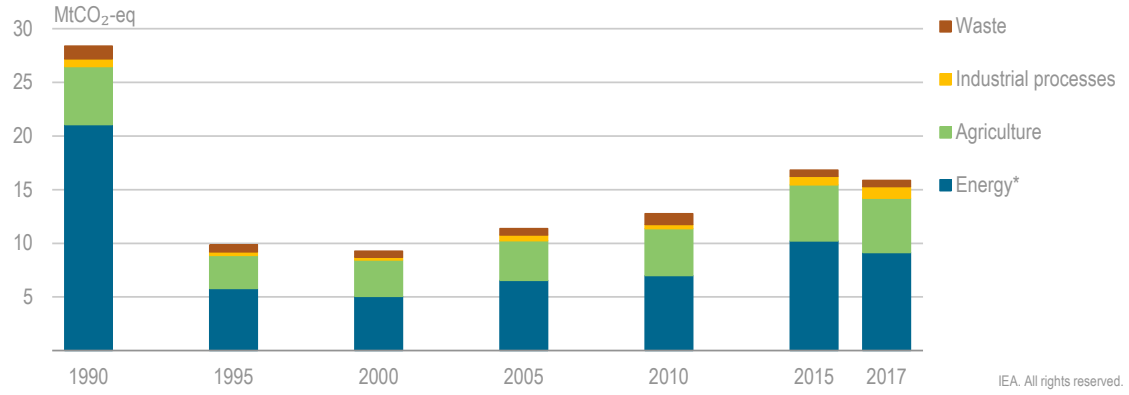
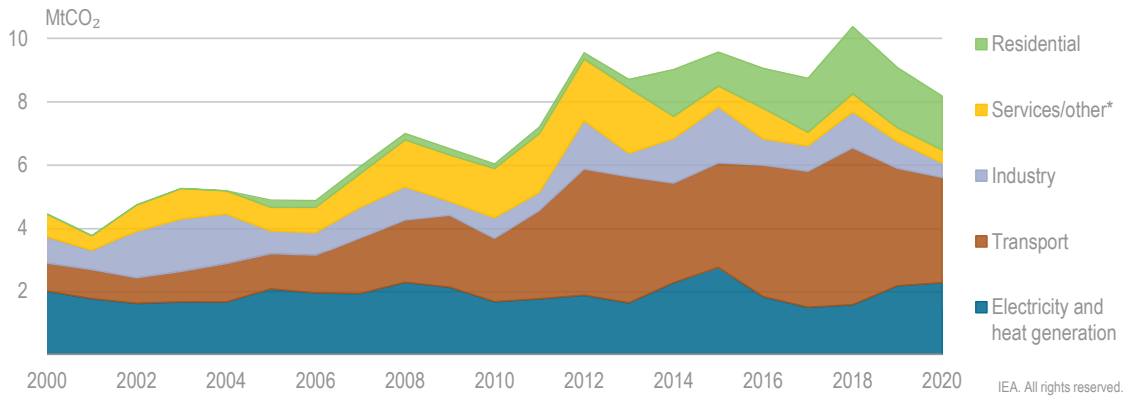
Figure 6.1 Kyrgyzstan's greenhouse gas emissions by sector, 1990-2017



Source: Third National Communication of the Kyrgyz Republic under the UNFCCC (2016).

In 2020, Kyrgyzstan's CO_2 emissions from fuel combustion were 8.2 $MtCO_2$. This was significantly lower than in 1990, mainly due to structural changes in the economy as heavy industry has declined. In the last two decades the increase in emissions was driven by the transport sector.

Figure 6.2 Kyrgyzstan's CO_2 emissions from fuel combustion by sector, 2000-2020



* includes commercial and public services, agriculture and unspecified consumption
Source: IEA (2022), Greenhouse Gas Emissions from Energy (database), https://www.iea.org/data-and-statistics

Total CO_2 annual emissions seem to be somewhat erratic, but generally on an increasing trend (Figure 6.3). Given that the transport sector is the main contributor to emissions, consumption and emission patterns are closely linked. It is notable that the growth in emissions outpaced the growth of economy (measured per capita).

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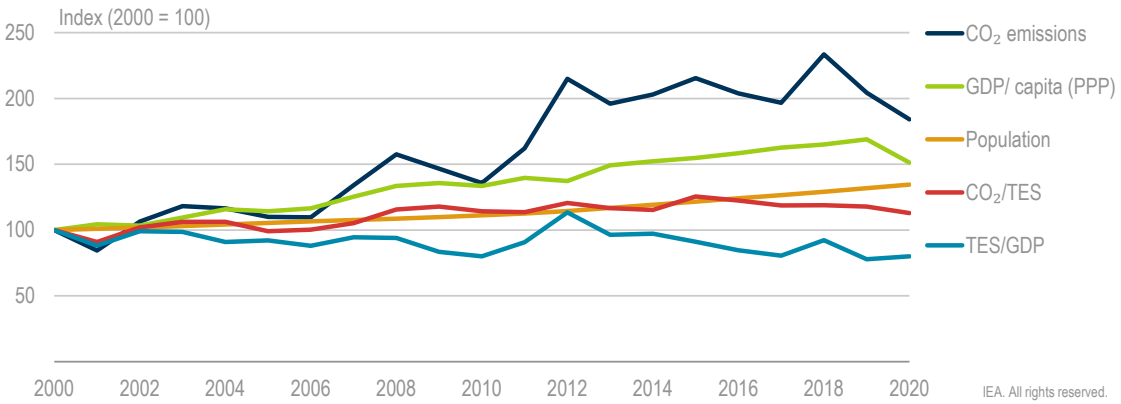
Figure 6.3 Energy-related CO_2 emissions and main drivers in Kyrgyzstan, 2000-2020



Source: IEA (2022), Greenhouse Gas Emissions from Energy (database), https://www.iea.org/data-and-statistics

Institutional framework

In 2021, the State Committee for Ecology and Climate was formed and later that year it was transformed into the Ministry of Natural Resources, Ecology and Technical Supervision.

The Ministry of Natural Resources, Ecology and Technical Supervision of the Kyrgyz Republic is an authorised state executive body responsible for development and implementation of state policy and co-ordination in the areas of environmental protection, ecology and climate.

The Climate Finance Center operates under the Ministry of Natural Resources, Ecology and Technical Supervision. The main objectives of the Climate Finance Center are to assit in attracting financial resources and investments from the UN Green Climate Fund and international organisations, as well as in promoting investments and implementing programmes and projects in the field of climate change.

In the Kyrgyz Republic, there is the Coordination Commission on Climate Change, headed by the first deputy Cabinet minister of the Kyrgyz Republic. The Coordination Commission includes all heads of key ministries and departments of the republic, and representatives of the civil, academic and business sectors.

Climate change policy

Kyrgyzstan signed the Paris Agreement in 2019, thereby joining the global community in the fight against climate change. The main tool of the Paris Agreement are the NDCs. They present a country's commitments towards reducing GHG emissions and adapting to climate change impacts. Kyrgyzstan is in the process of updating its NDCs under the lead of the Ministry of Economy.

The Kyrgyz Republic, like many other countries in the global community, by ratifying the Paris Agreement in November 2019, committed to reducing GHG emissions, a cause of climate change, by between 11.5% and 13.8%, and confirmed its intention to transform economic activities to a low-carbon model and to increase climate resilience. These

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commitments translate into the provision of NDCs, which bring together each country's efforts on reduction of national emissions and climate change adaptation. NDCs are to be updated every five years. The country developed updated national measures that contribute to achieving the Paris Agreement goals in the spring of 2021.

The NDC process is supported by the UN Development Programme as well as other development partners, and expert consultation support is provided as part of the technical assistance.

The country has developed and is implementing the following strategic documents related to the NDC: the NDS, Climate Investment Program of the Kyrgyz Republic and Program for the Development of a Green Economy in the Kyrgyz Republic for 2019-2023.

In 2021, Kyrgyzstan presented the Updated NDC (UNDC) to the reduction of GHG gas emissions. The government identified a number of targets that reflect the estimated reduction of GHG emissions as a contribution to the achievement of the goals of the Paris Agreement in 2025 and 2030 (UNDC, 2021).

Box 6.1 Overall mitigation goal of the Kyrgyz Republic

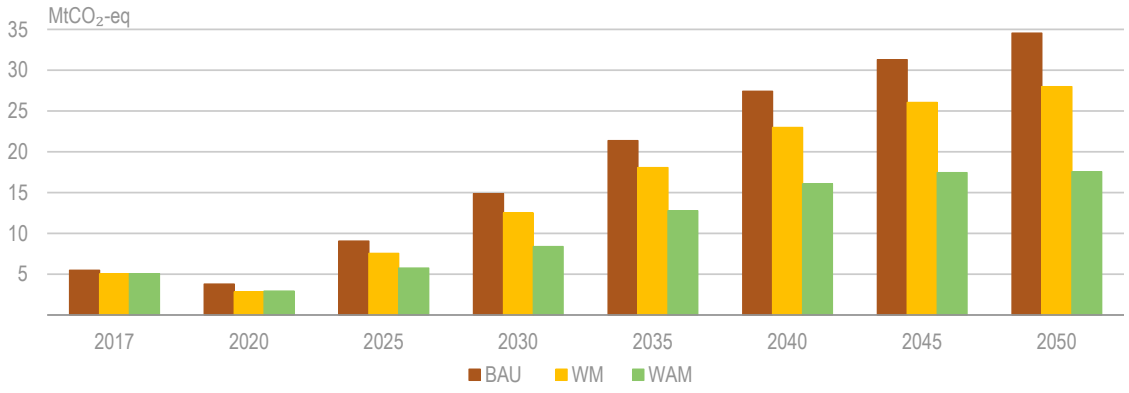
The overall mitigation goal of the Kyrgyz Republic is to unconditionally reduce GHG emissions by 16.63% by 2025 and by 15.97% by 2030, under the business-as-usual scenario. Should international support be provided, GHG emissions will be reduced by 2025 by 36.61% and by 2030 by 43.62%, under the business-as-usual scenario.

Source: UNDC (2021)

The UNDC indicates directions for a low-carbon transformation until 2030, with consideration given to national priorities and the SDGs. The Kyrgyz Republic recognises the importance of the adoption of the Low-Carbon Development Strategy and the National Adaptation Policy.

The UNDC's projection of GHG emissions by 2050 estimates that the emissions in CO_2 equivalent will increase by more than three times in the energy sector compared with 2017.

Figure 6.4 Projection of greenhouse gas emissions by 2050



Note: BAU = business as usual; WM = with measures; WAM = with additional measures.
Source: UNDC (2021)

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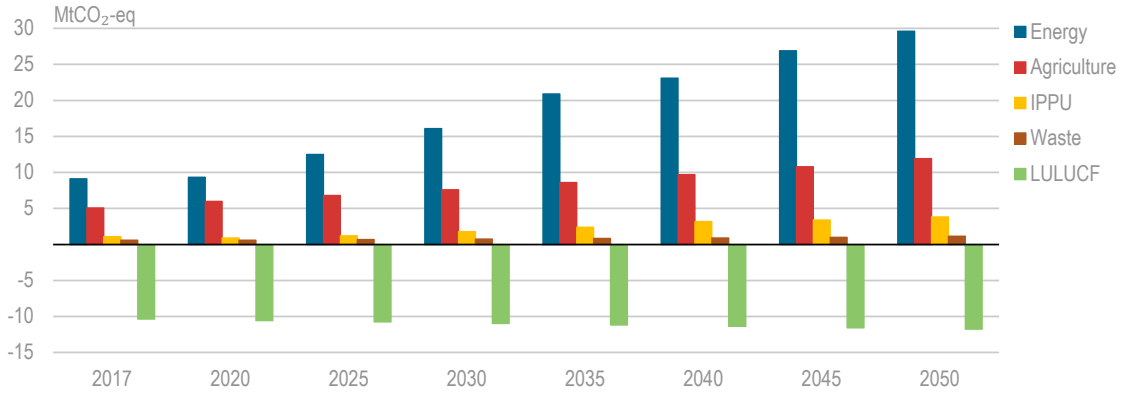
Mitigation

The UNDC estimates that around 60% of all GHG emissions in the country are concentrated in the energy sector.

The mitigation measures in the energy sector are planned to be realised through a decrease in the consumption of fossil fuels and an increase in the generation of energy based on renewable energy sources, as well as the modernisation of energy supply systems. Activities in energy efficiency will also contribute to the GHG emissions reduction and should be promoted.

Figure 6.5 GHG emissions projections by sector in the BAU scenario until 2050



Note: IPPU = Industrial processes and product use; LULUCF -= Land use, land-use change and forestry
Source: UNDC (2021)

The UNDC proposes mitigation measures for the energy sector to achieve the following goals: reduce GHG emissions, improve energy efficiency, and develop renewable energy sources.

Measures for reduction of GHG emissions proposed in the UNDC include the following:

- reducing coal consumption through gasification of households
- replacing light vehicles with internal combustion engines with electric vehicles
- reducing electricity losses during transmission
- replacing diesel/gasoline fuel engines buses with buses with gas-powered engines in Bishkek and suburbs, and in Osh city
- expansion of the trolleybus fleet by replacing buses with internal combustion engines in Bishkek
- reconstruction and improvement of the heat supply system of the city of Bishkek.

Some of the proposed measures are fully aligned with the effective National Energy Program for 2008-2010 (NEP) with its integrated plan for fuel-energy complex development to 2025, and in particular improvement of the heat supply system in Bishkek and reduction of losses.

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Measures on increased use of gas are entirely consistent with the NDS, which gives priority to the transition to the use of high-quality fuels, and in particularly prioritises continuing gasification of the country and transitioning from centralised district heating to autonomous gas-fired facilities for heating of households and administrative buildings.

And some measures are yet to be translated into programmes and strategies for integrated energy sector development, as well as action plans to upgrade the electric networks to enable expansion of the trolleybus fleet and charging of light electric vehicles that are proposed by the UNDC.

The UNDC also proposed measures for improvement of energy efficiency and established target indicators for 2025 and 2030.

Table 6.1 Mitigation measures for improvement of energy efficiency proposed by the UNDC

Mitigation measures	Target indicators, kt CO_2-eq	
	2025	2030
Scaling up the installation of energy-efficient stoves in households (WAM)	772 449	886 314
Improving energy efficiency of small boiler houses by replacing coal-fired boilers with gas-fired ones (WAM)	402 203	1 223 697
Construction of new buildings according to energy-efficient corporate social responsibility (WM)	14 552	16 866

Source: UNDC (2021)

The Kyrgyz renewable energy policy has always been focused on development of the country's hydropower potential. This state emphasis on the development of renewable energy sources has already resulted in a number of policy documents.

Some of the UNDC's proposed measures for development of renewable energy are fully consistent with the previous and effective policies and include the following:

- increasing the capacity of existing hydropower plants (HPPs) (WM)
- electricity generation at existing private small hydropower plants (WM)
- construction of new hydropower plants (WAM).

At the same time the UNDC explicitly demonstrated the expected GHG emissions reductions resulting from implementation of measures in other (non-hydro) renewable energy projects.

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Table 6.2 Non-hydro based mitigation measures of the UNDC

The GHG emissions reductions from the non-hydro renewable energy development measures calculated by the UNDC:

Mitigation measures	Target indicators, kt CO_2-eq	
	2025	2030
Expanding the use of biogas plants (20 plants) (WAM)	187 666	1 311 980
Expansion of the application of solar heat collectors (WAM)	Not estimated	78 400
Development of geothermal energy (heat pumps) (WAM)	Not estimated	38 590
Solar power development (WAM)	Not estimated	13 000
Wind energy development (WAM)	Not estimated	3 594

Source: UNDC (2021)

These measures are fully in line with the NDS, which sets a target of no less than 10% of environment-friendly energy sources (small hydroelectric power plants, solar and wind power plants, solar collectors, heat pumps, the use of biogas, etc.) in the country's total energy balance.

Climate change adaptation

Climate change and its adverse impacts on ecosystems pose severe threats to Kyrgyzstan's economy, including the energy sector.

The Priority Directions for Adaptation to Climate Change in the Kyrgyz Republic until 2017 were prepared and approved by the government of the Kyrgyz Republic on 2 October 2013, No 549. The document defined the key vulnerable sectors and the action areas for the country as a whole.

The Third National Communication on Climate Change did not address vulnerability and adaptation in the energy sector, even though it recognised that a change in surface run-off significantly impacted hydro-based power generation in Kyrgyzstan. The Third National Communication assumed that energy sector vulnerability could be reduced mainly due to the diversification of energy sources, i.e. the mitigation measures.

The UNDC in 2021 contains a list of adaptation measures covering all the most vulnerable sectors: water resources, agriculture, energy, emergencies, public health, forestry and biodiversity.

The key climatic impacts for Kyrgyzstan are:

- changes in the gross hydropower potential of rivers
- increase in the critical load on the energy infrastructure with temperature drops
- increased vulnerability of energy facilities and infrastructure from hydrological emergencies.

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Table 6.3 Adaptation measures for energy sector in the UNDC, 2021

Goals	Measures	Expected results
Increasing adaptive capacity	Conducting scientific research on the impact of climate change on the energy security of the country. A scientifically based policy for climate-sustainable development of the energy sector was formulated. Developing a policy for the development of the energy sector, taking into account climate change issues, gender aspects and interests of vulnerable groups. Raising awareness and knowledge of energy sector employees and the public on climate change issues.	A scientifically based policy for climate-sustainable development of the energy sector was formulated.
Strengthening climate resilience/	Increase the resilience of the energy infrastructure against overloads during critical drops in temperature. Reduced losses in the energy sector from the impact of climate change. Ensuring the safety of energy infrastructure from climatic emergencies. Diversification of electricity sources due to the impact of climate change on the country's hydropower.	Reduced losses in the energy sector from the impact of climate change.
Reducing vulnerability to negative impacts of climate change impacts	Development of mechanisms to strengthen accounting and control over the rational use of energy resources.	Increased efficiency in the use of energy resources.

Source: UNDC, 2021

Mitigation and adaptation actions are often complementary. Mitigation measures can increase adaptive capacity, and adaptation measures can reduce GHG emissions. Mitigation can be beneficial for climate change adaptation to some extent through the use of ecological transport and highly efficient heating and cooling systems, and action on the development of renewable energy sources.

At the same time, adaptation to climate change is also beneficial for mitigation. The most significant contribution to mitigation is made through developing a policy for the development of the energy sector taking into account climate change issues, gender aspects and interests of vulnerable groups.

Other adaptation measures with co-benefits to GHG emissions reduction identified by the UNDC include the following:

- Increase the resilience of the energy infrastructure against overloads during critical drops in temperature.
- Ensure the safety of energy infrastructure from climatic emergency.
- Diversify electricity sources due to the impact of climate change on the country's hydropower.
- Develop mechanisms to strengthen accounting and control over the rational use of energy resources.

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Assessment

Kyrgyzstan has demonstrated its commitment to fulfilling its obligations under the Paris Agreement by ratifying the treaty in November 2019. The acknowledgement of climate action as an important policy issue is also reflected in the evolution of the State Committee on Ecology and Climate of the Kyrgyz Republic into the Ministry of Natural Resources, Ecology and Technical Supervision.

In April 2021, the Kyrgyz government approved a UNDC until 2030, setting the overall mitigation goal of the Kyrgyz Republic to unconditionally reduce GHG emissions by 16.63% by 2025 and by 15.97% by 2030, under the BAU scenario. Should international support be provided, GHG emissions will be reduced by 2025 by 36.61% and by 2030 by 43.62%, under the BAU scenario.

Around 60% of all GHG emissions in Kyrgyzstan are created by the energy sector. A decrease in the consumption of fossil fuels and increase in renewable energy is planned, as well as the modernisation of energy supply systems. The promotion of activities to increase energy efficiency will also contribute to GHG emissions reduction.

The UNDC represents the long-term vision and plans of the Kyrgyz Republic. It will help consolidate fragmented climate change policies and serve as a guide for their implementation. It indicates directions for a low-carbon transformation until 2030, with consideration given to national priorities and the SDGs.

in the period 2007-2017, there was a tendency of growth in GHG emissions, which necessitates the strengthening of additional measures to develop a long-term national strategy for low-carbon development.

The Kyrgyz Republic recognises the importance of the adoption of the Low-Carbon Development Strategy and the National Adaptation Policy.

Even though most of the mitigation measures proposed by the UNDC are aligned with the effective national development strategies and government policies, there is still a need to more explicitly address climate change issues in the long-term strategies for integrated energy sector development. The key climatic impacts, and changes in the gross hydropower potential of rivers, should be carefully assessed as part of the sector planning to address the growing demand. In addition, the proposed non-hydro renewable energy developments should be carefully assessed and align with the transmission and distribution plans.

Kyrgyzstan plans to lay a foundation for the National System of Monitoring, Reporting and Verification by 2025 to assess the effectiveness of the implementation of mitigation and adaptation actions.

The UNDC is one of the key tools for mainstreaming the long-term agenda and actions that need to be taken to ensure long-term sustainability.

This document will serve as a starting point for starting a substantive dialogue with development partners and climate organisations to attract the resources the country needs.

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Recommendations

The government of Kyrgyzstan should:

- Make efforts to better align the country's strategic climate change documents with the energy strategy and the national development strategies.
- Ensure the co-ordination and integration of climate change measures into national policies and strategies for different sectors, including energy.
- Continue dialogue with development partners and climate organisations to attract the resources the country needs for implementation of the mitigation and adaptation measures.
- Develop relevant secondary legislation to enable implementation of the mitigation and adaptation measures set forth by the UNDC.
- Ensure that new energy sector projects are designed and implemented according to the highest environmental and social performance standards.
- Improve climate-related data collection and encourage the relevant changes in the official national statistics system.
- Continue efforts to develop National System of Monitoring, Reporting and Verification.
- Develop a long-term national strategy for low-carbon development.

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For further reading:

UNDP (United National Developmnet Programme) (2021) Kyrgyz Republic's climate plan invites international cooperation | Climate Promise (undp.org), https://climatepromise.undp.org/news-and-stories/kyrgyz-republics-climate-plan-invites-international-cooperation

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7. Energy efficiency

Key data

(2020)

Total final consumption (TFC): 3.2 Mtoe (oil 37.2%, electricity 32.7%, coal 15.4%, district heat 9.4%, natural gas 5.2%), +40.9% since 2010

Consumption by sector: residential 46.6%, transport 33.7%, services/other 10.6%, industry 9.1%

Energy consumption (TFC) per capita: 0.49 toe (world average 2019: 1.30 toe), +16.8% since 2010

Energy intensity (TFC/GDP): 118 toe/USD million PPP (world average 2019: 78 toe/USD million PPP), +2.6% since 2010

Energy consumption and sector trends

Kyrgyzstan's final consumption of energy (TFC) amounted to 3.2 Mtoe in 2020, having grown almost 50% over the last decade (+41% since 2010). Consumption has grown rapidly both in the residential (+173% since 2010) and transport (+61%) sectors.

The residential subsector is the largest single energy consumer in the country, accounting for 47% of TFC, whereby the buildings sector as a whole represents over half of Kyrgyzstan's final electricity consumption. Transport accounted for 34% of TFC and industry for 9% in 2020, with the remaining TFC tied to agriculture, services and other non-specified activities, including Kyrgyzstan's shadow economy (Energy Charter, 2018; World Bank, 2019a).

Energy demand in industry has shrunk by a over a third since 2010. Transport sector demand increased over five-fold between 2000 and 2018, but consumption remains very sensitive to fuel prices, explaining the stark decrease in 2019 and 2020. It should be noted that detailed sectoral analysis is not feasible due to limitations in demand data accuracy and coverage. The energy statistics management and use are discussed in the Chapter 'General energy policy'.

Opportunities for efficiency improvements in Kyrgyzstan are evident across all sectors, with total demand-side savings potentials estimated at 25% for electricity and 15% for heat; savings potential is particularly evident in the buildings sector, as discussed in more detail below. It is worth noting that residential electricity consumption almost tripled (+169%) between 2010 and 2020, increasing the potential and need for efficiency gains (IEA, 2020).

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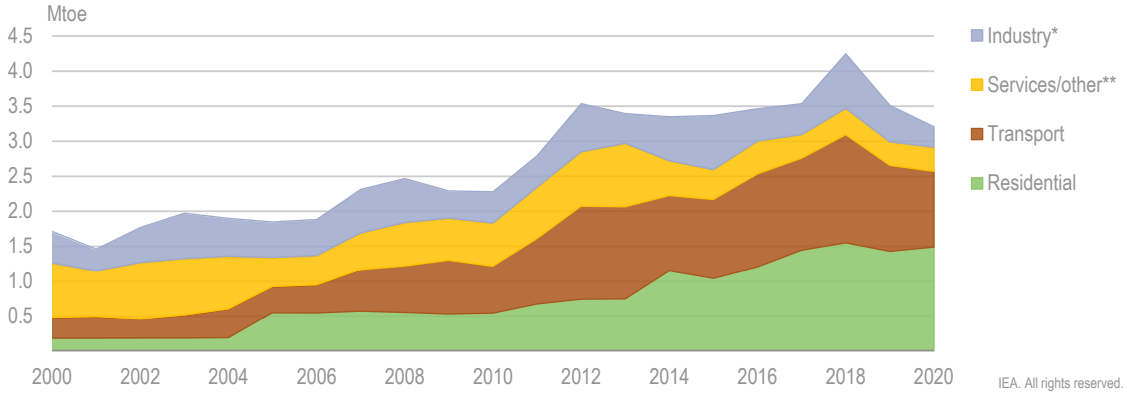
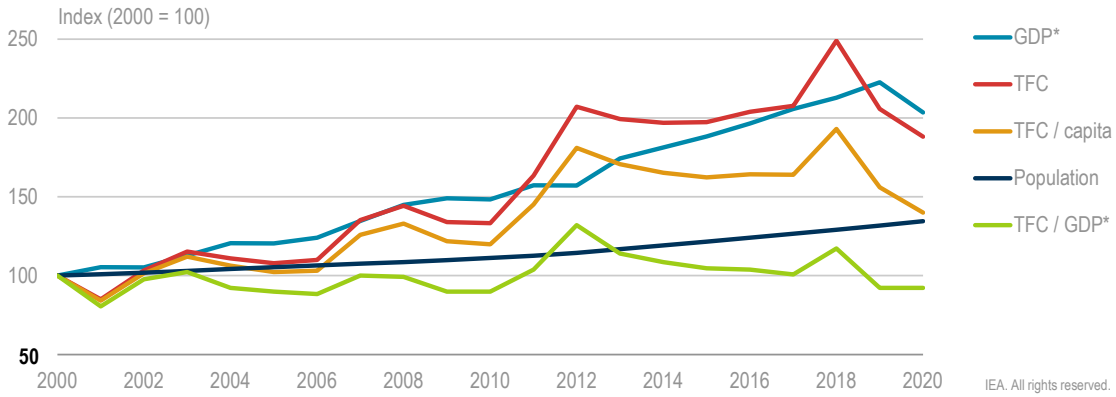
Figure 7.1 Total final consumption by sector, 2000-2020



Note: For the purposes of the study, officially reported road fuel consumption in residential sector was reallocated to transport sector.
* includes non-energy consumption.
** includes commercial and public services, agriculture and forestry as well as unspecified energy consumption
Source: IEA (2022), World Energy Statistics and Balances (database), https://www.iea.org/data-and-statistics

Kyrgyzstan's energy intensity (measured by TFC/GDP) has fluctuated, but has remained essentially flat over recent decades (-8% in 2000-2020) (Figure 7.2). This is due to a strong correlation between GDP and energy consumption.

Figure 7.2 Drivers for energy consumption and energy intensity, 2000-2020



* expressed in constant 2015 USD billion and purchasing power parity (PPP).
Source: IEA (2022), World Energy Statistics and Balances (database), https://www.iea.org/data-and-statistics

Policies and measures

While energy efficiency is a stated policy priority for the Kyrgyz government and forms part of wider strategic efforts to improve energy security, Kyrgyzstan has only a limited set of policies and measures in place to improve demand-side energy efficiency. Existing policies and measures are also short term in nature rather than tied to long-term energy savings objectives or targets, and cover mainly the buildings sector, with few measures in place to improve energy efficiency in industry and transport (Energy Charter, 2018).

To date, efforts to develop policies and measures for energy efficiency have constituted a relatively small part of the country's energy strategy, which is mainly targeted at improving ailing energy system infrastructures to ensure more consistent power supply and to reduce transmission and distribution losses.

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High levels of poverty, notably among Kyrgyzstan's predominantly rural population, are also an important factor influencing the development of demand-side energy efficiency policies and measures. Despite previous reform efforts, government subsidies notably for electricity – the predominant fuel in Kazakhstan, provided by the country's extensive yet intermittent hydro resources – remain high, particularly in the buildings sector. These create disincentives for investments in energy efficiency.

Legislative framework

Energy efficiency legislation has been in place in Kyrgyzstan since at least 1996, with the adoption of the Energy Law, which stipulated that energy efficiency should be considered during the development of other national energy-related programmes, as cited below (Energy Charter, 2018).

Subsequently, in 1998, the Law on Energy Savings was passed. This law remains the main legislative instrument on energy efficiency in Kyrgyzstan, providing a basic regulatory framework covering both energy supply and distribution as well as the demand side and assigning competence for efficiency legislation to government institutions. The law notably includes a provision for mandatory energy audits for organisations, although there are no specifics on types of organisations, frequency, etc.

The 1998 law also provides for the creation of a dedicated Energy Saving Fund to support the purchase of energy-efficient equipment and a range of other energy efficiency related investments. Contributions to the fund are to be made through the proceeds of energy savings, contributions from energy companies and the sale of shares of energy companies, among other means.

The Energy Saving Fund is not yet operational, however. Other key elements of the 1998 law are also not yet or not fully implemented, such as the designation of the main governmental authority responsible for energy efficiency, or secondary legislation specifying government competencies to enforce MEPS or other specific efficiency measures. Market actors, such as utilities, have also not been assigned any specific obligations or requirements on energy efficiency since the adoption of the law (Energy Charter, 2018).

For the buildings sector, a separate Law on Energy Efficiency in Buildings that mirrors the provisions of the European Union's Energy Performance of Buildings Directive (EPBD) was passed in 2012. Its provisions include MEPS for new buildings and retrofits, the issuance and display of energy performance certificates (EPCs), expert accreditation, and inspection regimes for heating and hot water systems. While some secondary legislation, including building codes, have been approved, there is little evidence to suggest these are being implemented and enforced.

In addition to specific energy efficiency legislation, overarching programmes and strategies that contain some mention of or focus on energy efficiency have also been adopted by the Kyrgyz government. The NEP was adopted in 2008. It features a Fuel and Energy Complex Development Strategy until 2025, which includes objectives to achieve a rational and efficient use of energy resources while also improving the efficiency of electricity and heat transmission and distribution.

Further, a National Sustainable Development Strategy for 2013-2017 was adopted in 2013. The strategy stipulated that energy-efficient technologies are to be used in new

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buildings, and that the government plans to deploy a large-scale building retrofit programme along with the introduction of building efficiency passports. To date, however, such a programme has not yet been deployed.

The National Development Strategy of the Kyrgyz Republic for 2018-2040, (Development Strategy) was approved on October 31, 2018. Under the Development Strategy, energy efficiency technologies must be applied in all new construction and the government plans to implement large-scale programmes on energy-efficient reconstruction of old residential and non-residential buildings and introduce energy efficiency passports for all buildings.

Institutional framework

Until February 2021, the State Committee on Industry, Energy and Subsoil Use (State Committee) served as the authorised state body to develop energy policy. At the end of 2020, the government initiated administrative reforms that resulted in reestablishing the Ministry of Energy.

The Ministry of Energy is the main government body with competence over energy efficiency policies. It is tasked with developing a coherent policy framework, creating incentive schemes for energy efficiency, energy conservation and use of RE and raising awareness among consumers.

The The Technical Safety Service within the Ministry of Energy, is responsible for supervising and regulating compliance with safety requirements, land legislation requirements, and technical requirements in the energy sector, whereby the State Agency for Architecture, Construction, Housing and Communal Services under the Cabinet of Ministers has overarching responsibility for implementation of the 2012 Law on Energy Efficiency of Buildings. The Center for Standardization and Metrology under the Ministry of Economy (Kyrgyzstandard), meanwhile, is responsible for the adoption of standards for energy-using devices.

Energy tariff setting and other wider energy sector regulatory matters fall under the responsibility of the Department for Regulation of the Fuel and Energy Complex under the Ministry of Energy.

Buildings

The buildings sector in Kyrgyzstan holds significant energy efficiency potential. Most residential and non-residential (primarily public) buildings were constructed during the Soviet era, with less than 25% of buildings constructed after 2004. Official data on Kyrgyzstan's buildings stock, notably floor space and energy performance, are limited. However, the technical energy savings potential of the country's residential buildings, including the installation of efficient appliances, has been estimated at nearly 90% of the sector's annual consumption. For public buildings, this potential is estimated at more than 50% (Energy Charter, 2018; World Bank, 2019a).

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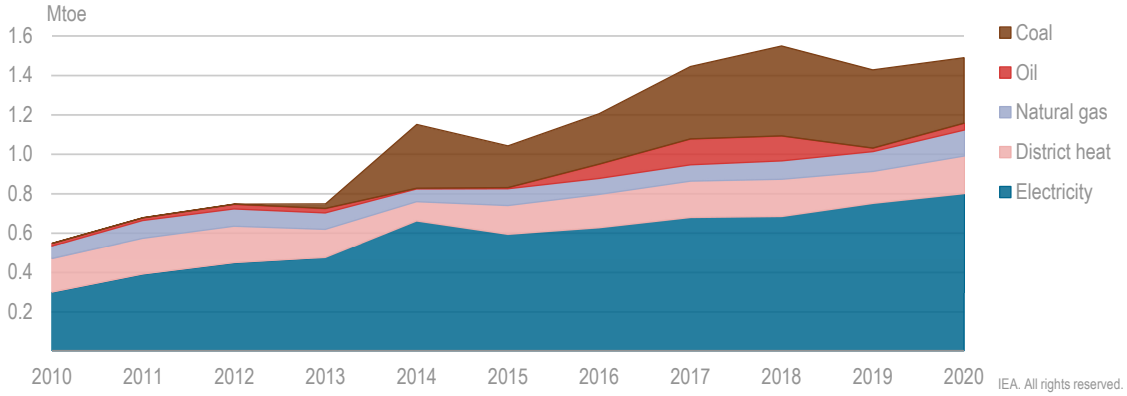
Figure 7.3 Total final consumption in residential sector by source, 2010-2020



Source: IEA (2022), World Energy Statistics and Balances (database), https://www.iea.org/data-and-statistics

As noted previously, a basic legislative framework for building efficiency exists in Kyrgyzstan; however, implementation issues remain, and there are currently few if any co-ordinated efforts to improve the energy performance of the buildings sector, particular in terms of the existing stock. MEPS for new buildings, meanwhile, are often ignored or not enforced during the construction phase, and EPCs are not being effectively deployed in the market (Energy Charter, 2018).

Programmatic technology initiatives such as switching to more efficient lighting, improving building insulation and transitioning to more efficient space heating could offer significant efficiency gains, and could support wider efforts to improve overall energy system efficiency. Indeed, for Kyrgyz policy makers, heating is an important topic. Only 17% of Kyrgyz households, mainly in urban centres such as Bishkek, have access to district heating systems during Kyrgyzstan's long and cold winters. In most other residential buildings, coal is the most prevalent source of heating, followed by wood and dung, not only creating concerns in terms of sustainable energy sources but also generating significant health risks through poor indoor air quality (World Bank, 2020).

Heating is also important for Kyrgyzstan's approximately 10 000 public buildings. Built during the Soviet era, they consume 10% of the country's primary energy, with nearly 90% of this consumption used for heating. More than half of all public buildings also rely on electricity for heating, with frequent power outages causing thermal discomfort notably in years when hydroelectric output is low. While their generally poor condition creates challenges in terms of programmatic retrofits, a USD 1 billion long-term investment programme in Kyrgyzstan's public buildings would be more cost-effective than building new power generation capacity (World Bank, 2019a).

Unsustainably low tariffs for electricity and district heating are an important barrier preventing improvements to heating inefficiencies in Kyrgyzstan. Residential electricity tariffs remain low despite previous reform attempts, covering only 60% of the cost of producing, transmitting and distributing electricity to households. Heat tariffs, meanwhile, cover at most 50% of the costs of supplying district heating to buildings in cities. These low tariffs create important disincentives to investments in energy-efficient technologies in households and to needed infrastructure upgrades to ageing and ailing district heating infrastructures (Energy Charter, 2018).

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The government of Kyrgyzstan is aware of the issue but tariff reforms are limping. In March 2020 a MTTP for electricity and heating and hot water tariffs until 2022 was approved by the government. Under the new MTTP tariffs for main groups of consumers remained at the level of 2015 and no increases to reach the cost recovery level were planned until 2022.

A new MTTP for 2021-2025 was officially approved on September 30, 2021, however, the electricity residential tariffs remained at the level of 2015 (0.77 KGS).

Moreover, the current Medium Term Tariff Policy envisages no change to the residential up to 700 kWh' pricing block before 2023, except for the residents of high mountain and remote areas for the period 1 October to 1 May. These customers have the same tariff regardless of consumption.

On December 6, 2021 by virtue of decree of the President starting January 1, 2022 electricity tariff for low-income families with children under 16 years receiving the state allowance was decreased from 0.77 KGS to 0.50 KGS for consumption under 700 kWh per month.

Appliances and energy-using equipment

While official data on electricity consumption from appliances and energy-using are not available, some data have been compiled by the Kyrgyz NSC on ownership levels of certain types of products. These data indicate a considerable increase in ownership levels between 2008 and 2015 of refrigerators and washing machines, which saw 30% growth, while mobile phone ownership grew by 50%. Similar information on lighting, electric water boilers and air conditioners is not available.

MEPS for appliances and energy-using equipment, including lighting products, are being developed in Kyrgyzstan as part of the country's membership in the EAEU. Currently, however, these standards are not in place, nor are any measures in place to require public authorities to procure efficient products, such as light-emitting diode (LED) lighting, for example. This represents a missed opportunity in terms of achieving an estimated 750 GWh of potential, and economically viable, electricity savings from these devices by 2030. Savings potentials are particularly salient with respect to lighting products and appliances due to the significant energy performance improvements combined with cost decreases of these devices in recent years (Energy Charter, 2018).

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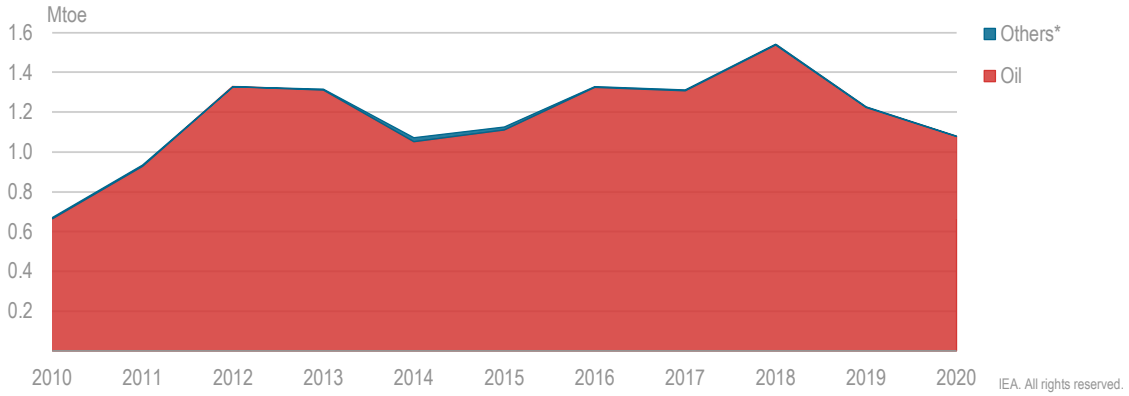
Transport

Figure 7.4 Total final consumption in transport sector by source, 2010-2020

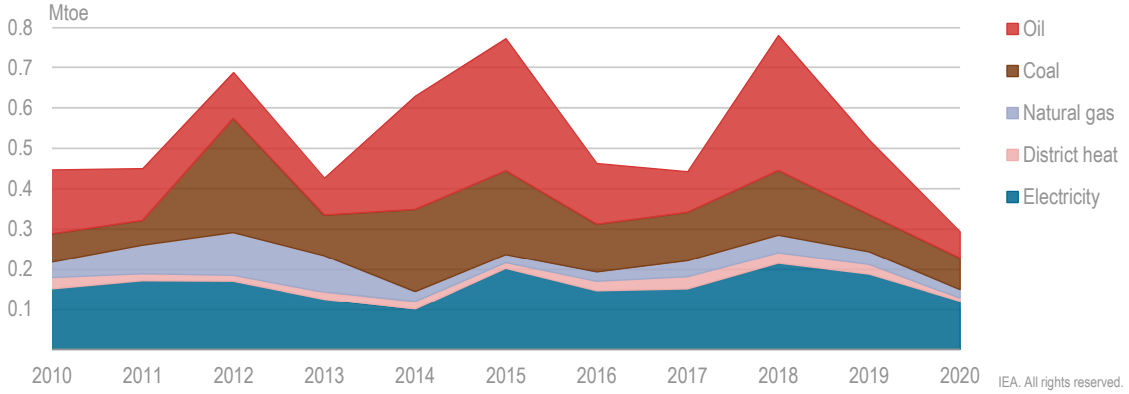


* includes electricity and natural gas
Source: IEA (2022), World Energy Statistics and Balances (database), https://www.iea.org/data-and-statistics

Kyrgyzstan's transport sector accounts for one-third of the country's TFC, with increasing levels of vehicle ownership particularly in the last decade. The sector's annual energy savings potential is estimated at above 40%. Except for higher duties on the imports of older vehicles, there are currently no policies in place to increase the energy efficiency of the Kyrgyz transport sector, such as import bans on inefficient vehicles, fuel economy standards or public transport-related strategies (Energy Charter, 2018).

Industry

Figure 7.5 Total final consumption in industrial sector by source, 2010-2020



Source: IEA (2022), World Energy Statistics and Balances (database), https://www.iea.org/data-and-statistics

At 9% of TFC, Kyrgyzstan's industrial sector represents the smallest share of the country's sectoral energy demand in comparison with buildings and transport. The annual energy efficiency potential of Kyrgyzstan's industry sector is estimated at just over 11% of annual energy consumption.

While standards are in place for some industrial energy-consuming equipment, such as pumps and motors, these apply only to new equipment. There are no measures in place to replace existing inefficient equipment, and there are no policies to incentivise the adoption of energy management systems within industry.

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Despite mention of energy audits in the 1998 Energy Savings Law, no specific audit provisions, e.g. regular mandatory audits, central reporting and implementation of audit findings, exist for Kyrgyz industries. However, unlike in the buildings sector, tariffs for industrial energy consumers increased by nearly 70% in 2015, and further increased in 2021 with the adoption of the new MTTP. Although no information is available in terms of any efficiency gains that can be correlated to this tariff increase (Energy Charter, 2018).

Financing and cross-cutting measures

To achieve higher levels of energy performance, Kyrgyzstan requires investments in more efficient technologies, notably in its building sector. An Energy Savings Fund, as outlined in Kyrgyz legislation, could play an important role in this regard, along with funding from multilateral institutions. However, available evidence suggests that the financing of energy efficiency improvements in Kyrgyzstan is currently not a priority, and important barriers remain to the deployment of a major retrofit programme for public buildings (World Bank, 2019a).

There are no active measures in Kyrgyzstan to promote a market for energy efficiency services, e.g. energy service companies (ESCOs), which could play in important role in improving energy efficiency in Kyrgyzstan, in both the buildings and industry sectors. Energy suppliers are currently not required or incentivised to invest in energy efficiency, and requirements to increase the procurement of energy-efficient technologies or services by public authorities are either limited or poorly enforced (Energy Charter, 2018).

Assessment

Residential buildings and the transport sector represent the largest portion of TFC in Kyrgyzstan, with available evidence pointing to strong demand growth in recent years. Current policy efforts to improve energy efficiency in these sectors are limited.

Energy use in industry remains moderate in comparison, although data availability is limited and, combined with services and non-specified activities, actual TFC may be higher.

Official data across all sectors are limited and may be inaccurate, complicating efforts to assess the impact of policies, set long-term targets and track progress over time.

Overarching energy efficiency legislation has been in place in Kyrgyzstan for more than two decades. However, sector coverage is limited, and there are significant gaps in terms of secondary legislation, implementation and enforcement.

MEPS are in place for new construction in the buildings sector, although there are issues in terms of implementation. No significant legislation or programmes are in place to improve the energy efficiency of existing buildings.

MEPS are being developed for appliance and energy-using products as part of Kyrgyzstan's EAEU membership.

Policies are currently lacking in the transport sector, with no measures such as fuel economy standards or efficiency-based import restrictions in place.

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In industry, some standards are in place for pumps and motors; however, information on a more comprehensive policy framework for industrial energy efficiency is not available.

Except for industry, where electricity tariffs were increased significantly in 2016 and in 2021, tariffs for electricity remain well below costs of power generation. This limits investments in new generation capacity and creates disincentives for investments in end-use energy efficiency improvements.

Tariffs are particularly low in the buildings sector, both for electricity and for district heat, limiting available funds to upgrade and scale up district heating infrastructure as an alternative to electricity as the main fuel for heating residential and public buildings in municipalities.

The buildings sector is characterised predominantly by Soviet-era structures and represents the largest potential for energy efficiency gains in Kyrgyzstan. Current policies and programmes are insufficient to unlock this potential, however.

Appliances and energy-using devices, including lighting, represent a significant part of the overall building efficiency potential. However, these technologies are largely unregulated in Kyrgyzstan, and there are currently no significant policy efforts or programmes in place to improve end-use energy efficiency in this area.

The transport sector has seen significant demand growth in the last decades but is largely unregulated in Kyrgyzstan, representing a clear policy gap as well as a potential area for energy efficiency improvements.

In industry, basic standards for equipment combined with significant electricity tariff increases suggest that the government of Kyrgyzstan has made some effort to address the energy performance of industry. A more comprehensive policy framework and improved data collection are needed, notably to track the impact of tariff increases, to unlock the sector's efficiency potential.

In addition to the need for tariff reform, there are gaps in terms of more comprehensive efforts to increase financing and investment for energy efficiency improvements across the economy. The completion of an Energy Savings Fund, as well as reforms to energy supplier obligations and public procurement, are needed.

The market for energy efficiency services and ESCOs remains largely underdeveloped in Kyrgyzstan.

Recommendations

The government of Kyrgyzstan should:

- Develop long-term energy savings targets as part of a national energy efficiency action plan covering all key sectors of the economy and with a particular focus on heating in public and residential buildings, which constitute the largest share of growing energy demand.

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- Implement existing provisions of the Law on Energy Savings while completing the policy framework on buildings and energy-using equipment and adding clear and specific provisions for industry, such as energy audits, and the transport sector, such as bans on imports of inefficient passenger vehicles.
- Improve institutional arrangements and governance to ensure that energy efficiency policies and measures are fully developed and implemented, potentially through the creation of a dedicated agency or other authority for energy efficiency.
- Implement the Energy Savings Fund and stimulate the development of a market for energy efficiency services and ESCOs together with international partners and as part of efforts to improve economy-wide growth, notably for small and medium-sized enterprises.

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8. Renewable energy

Key data

(2020)

Hydroelectricity generation: 14.0 TWh (90.7% of the total electricity generation)

World average renewable energy shares (2019): 13.8% of TES and 26.0% of electricity generation

No official data available on other consumption of renewable energy (solar, wind, biomass, geothermal).

Overview

Kyrgyzstan has considerable untapped renewable energy potential. Currently over 90% of the electricity supply comes from hydropower generation, and the Kyrgyz government usually emphasises that only over 10% of hydropower potential has been developed.

Opportunities to develop decentralised renewable energy technologies are especially promising, primarily small hydropower plants on rivers in the mountains.

Other viable options for renewable energy development in Kyrgyzstan include generating heat from solar energy and biogas, and electricity from wind and solar resources; no projects so far exploit these technologies.

Renewable energy potential has not yet been fully studied. Currently, the MoE with support from the United States Agency for International Development (USAID) Power Central Asia Activity has begun work on identifying renewable energy zones (solar, wind energy) to determine potential resources in the territory of the country.

Although over 90% of the electricity in Kyrgyzstan is produced by large hydropower plants, and hydropower generation could be classified as “green”, the Kyrgyz legislation distinguishes between “traditional energy” and “renewable sources of energy”.

The Law on Renewable Energy (the RE Law) defines “traditional energy” as energy received from non-renewable resources or generated by a hydropower plant with installed capacity of 30 MW and above.

The RE Law further defines renewable sources of energy to include solar, wind, hydropower, and non-fossil and non-carbon energy sources (biomass energy), as well as secondary forms of energy (cooling towers, transformer substations, other industrial facilities and installations that release secondary energy during their operations).

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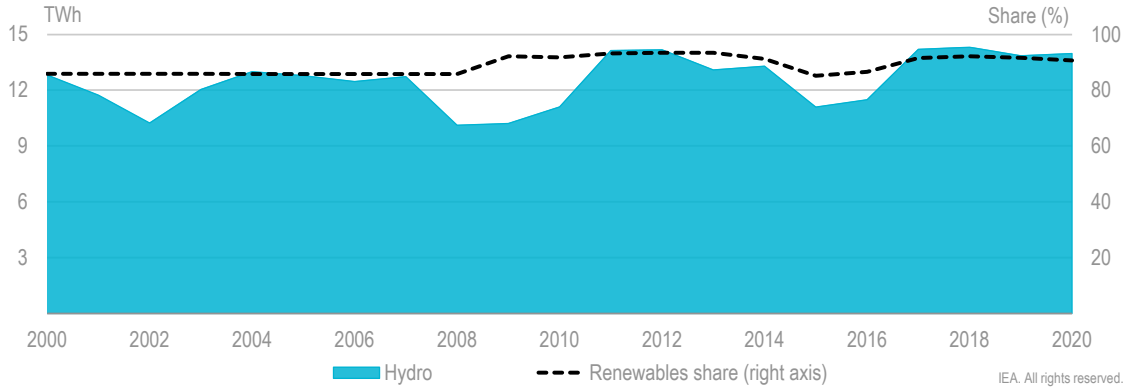
Figure 8.1 Renewable energy in Kyrgyzstan's electricity generation, 2000-2020



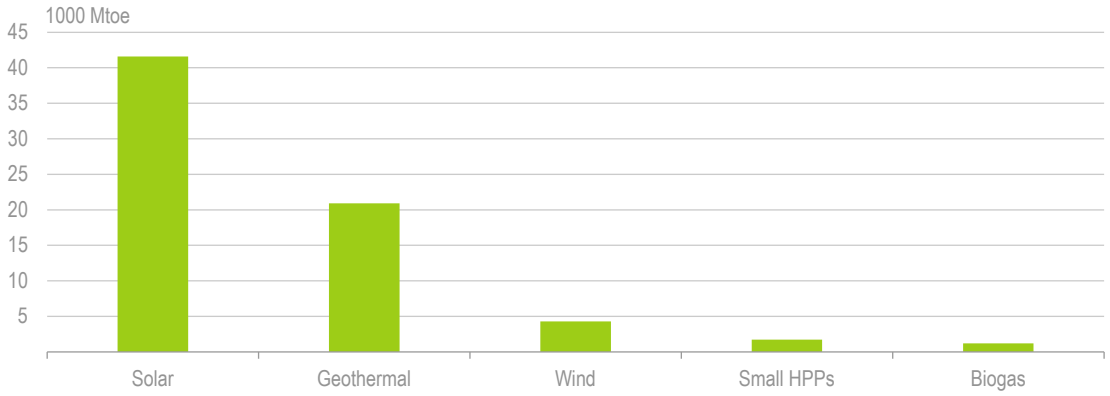
Source: IEA (2022), World Energy Statistics and Balances (database), https://www.iea.org/data-and-statistics

Based on this legal distinction, only generation by small hydropower plants below 30 MW should be included in the share of renewable energy. Estimates of the share of small hydropower vary from 1% to 1.38% (UNDP, 2018).

In 2018 the share of RES in Kyrgyzstan's energy mix was about 1% (not including large HPPs), but the potential of RES in Kyrgyzstan is estimated at 840.2 Mtoe per year. The main types of renewable energy sources are solar energy, small rivers and water currents, wind energy, geothermal energy, and biomass:

- hydropower – 5 billion to 8 billion kWh per year
- wind – 44.6 million kWh
- solar – 490 million kWh (USAID, 2018).

Figure 8.2 Average annual renewable energy potential



Source: KSTU (2020a).

According to estimates made by the KSTU, the available renewable energy resources (excluding hydropower) can theoretically cover 50.7% of the required energy in Kyrgyzstan. At the same time, technical capabilities today amount to 20%, economically justified 5.6%, and practical use is now at the level of about 1%.

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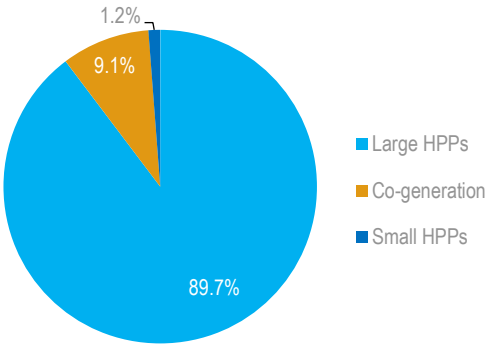
Supply and demand

Small hydropower

In terms of the potential of hydro resources (142 billion kWh), Kyrgyzstan ranks third among the Commonwealth of Independent States (CIS) countries after Russia and Tajikistan.

To date, only 15% of the potential of the country's hydropower capacity of large rivers has been used, and only 3% of small rivers.

Figure 8.3 Electricity generation by source, 2020



Source: KSTU (2020b).

The Renewable Energy Department of KSTU estimates the potential of small rivers and streams at 1.6 million kilowatts (kW) of power, and the generation can be about 5 billion kWh to 8 billion kWh per year. Territorially all surveyed small rivers are grouped in the river basins adjacent to the rivers of Chu, Talas, Naryn, Sary-Jaz, Karadarya, Syrdarya and the Lake Issyk-Kul.

Eighteen small HPPs (SHPPs), including nine private ones, which currently operate produce 53.84 MW with an annual output of about 245.88 million kWh.

Table 8.1 Small hydroelectric power plants in operation

	Name of the SHPP	Capacity (MW)	Output (GWh)
	JSC Chakan GES, including	**38.5**	**160.5**
1	Lebedinovkaya SHPP	7.6	32.5
2	Alamedin SHPP -1	2.2	11.0
3	Alamedin SHPP -2	2.5	12.3
4	Alamedin SHPP -3	2.1	12.8
5	Alamedin SHPP -4	2.1	12.5
6	Alamedin SHPP -5	6.4	17.3
7	Alamedin SHPP -6	6.4	17.2
8	Small Alamedin HPP	0.4	1.7

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	Name of the SHPP	Capacity (MW)	Output (GWh)
9	Bystrovskaya SHPP	8.7	43.2
10	Kalininskaya SHPP	1.4	6.22
11	Issyk-Atinskaya SHPP	1.6	11.20
12	Naiman SHPP	0.6	2.9
13	Ak-Suyu SHPP	0.5	2.57
14	Tegermentinskie GES	3.0	12
15	Kyrgyz-Ata SHPP	0.26	1.46
16	Shakhimardan SHPP	1.0	3.3
17	Konurolon SHPP	3.6	25.9
18	Kok Say SHPP	3.4	18.8
	Total	**53.84**	**245.88**

Note: This table was developed by the authors based on dispersed data available at the Kyrgyz Electricity Settlement Center and the Department for Regulation of the Fuel and Energy Complex of the Ministry of Energy of the Kyrgyz Republic.

There is not an established process for collection of data on total output of the small hydropower plants operating in Kyrgyzstan. Only output of the largest cascade of the small hydropower plants, Chakan GES, is included in the national statistical reports.

Solar energy

In the Kyrgyz Republic, in the residential areas at altitudes up to 2 000 metres above sea level, direct solar radiation to the surface under average cloudiness at noon ranges from 0.3 kW/m^2 to 0.4 kW/m^2 in winter to 0.6 kW/m^2 in summer (per day from 2.19 kWh to 2.72 kWh in winter and 6.53 kWh to 6.75 kWh in summer).

The average annual duration of sunshine is 2 500 hours to 2 600 hours. One square metre of solar thermal collector can provide 500 watt-hours (Wh) to 600 Wh in summer and 300 Wh to 400 Wh in winter and can generate 1 028 kWh to 1 278 kWh (3 700 megajoules [MJ] to 4 600 MJ) of energy per year.

For example, in Bishkek in December there are the fewest hours of sunshine (approximately 70-90 hours). The peak occurs from May to August, with about 130-155 hours of sunshine per month

Currently there are no industrial photovoltaic (PV) plants connected to the central power grid.

There is a local small producer. The Kyrgyz-German company NEW-TEK LLC is already operating in Kyrgyzstan for the production of solar modules on the territory of the free economic zone in Bishkek. The NEW-TEK LLC plant produces mono- and poly-crystalline solar modules with high efficiency; for example, the efficiency of a monocrystalline panel is at least 16.5%. The total production capacity of the plant is about 50 MW per year, which is about 200 000 modules. The products of this company are mainly export-oriented. In

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Kyrgyzstan, solar PV power stations are implemented mainly for individual use. These are mainly private houses (autonomous consumers), small farms, country houses, cafes, restaurants, etc.

With support from the ADB, a pilot project was implemented to install 90 off-grid power supply kits, each rated at 300 watts. These autonomous power supply kits were donated for installation in order to determine the viability and necessity of such kits for households. Of the 90 solar panel kits, the following number have been already installed:

In the Jalal-Abad region:

- 36 sets in the village of Kyzyl-Beyit (Aksy district)
- 14 sets Kurpsai
- 2 sets installed in the Chychkan gorge

In the Naryn region:

- 16 sets in the village of Kyzart (Jumgal district)
- 15 sets installed in the village of Ken-Suu (Jumgal district)

In the Chui region:

- 4 sets installed in the Suusamyr valley;
- 3 sets installed in the village of Kok-Oyrok (Keminsky district).

According to the MoE, a number of renewable energy projects are in the development stage. Thus, in the rural district of Toru-Aigyr of the Issyk-Kul region, the construction of a solar power plant has reached the stage of preparing design and estimate documentation and connecting to electric networks.

Renewable heat

In September 2017 a 0.5 MW solar district heating plant (364 Chinese-made flat plate collectors) in the capital, Bishkek, was inaugurated. The operator of the solar field is Bishkekteploenergo, the largest thermal energy provider in the city. The national Environmental Protection Fund supported the project financially by offering a grant of KGS 10.6 million – 72% of the total investment costs of KGS 14.8 million (around USD 212 000).

According to Bishkekteploenergo, the solar plant feeds into the return line of the existing district heating network, which supplies a day care, a school, residential housing units and four student buildings. The solar heat system was designed and installed by Bishkekteploenergo.

In total, Bishkek now has 484 solar panels installed of total capacity of 0.686 MW (including 364 solar panels mentioned above with total capacity of 0.518 MW and 120 panels installed in Orto-Sai suburb with total capacity of 0.168 MW). Both solar plants pre-heat water for the Bishkekteploenergo‘s boilers.

Today there is a relatively large interest in the application of solar thermal systems in Kyrgyzstan. There are already operating industrial thermal solar installations implemented

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for thermal energy supply. In general, solar hot water supply systems with a total area of 30 000 m^2 were installed in the country. These were mainly sports camps, service stations, dairy farms, boarding houses, rest houses, etc.

Currently, there are some small workshops and firms engaged in the implementation of solar water heating installations of various types, mainly oriented for autonomous consumers.

Wind

The wind potential of the Kyrgyz Republic is about 49.2 toe to 105 toe, based on assessment of the wind energy potential based on generalised statistical data of weather stations and the method of calculating the reserves of wind resources from known average annual wind speeds.

In Kyrgyzstan's predominantly mountainous terrain, winds of constant direction and strength sufficient for power generation can be found only in remote and sparsely populated areas.

Analysis of instrumental observations at meteorological stations reveals that the actual average annual wind speed is much lower than 5 metres per second (m/s) (only at one weather station does it exceed 5 m/s, and that is for two months per year only).

As construction of wind power plants is considered feasible from an average annual wind speed of 8 m/s, those areas with average speed of 5 m/s or less are not suitable for wind turbine installation. The potential for wind energy is therefore very low in populated residential areas, and the areas where wind energy could be economically viable are far from consumer centres and difficult to access.

Analysis of the average monthly and annual wind speeds (m/s) for some regions of Kyrgyzstan for the period of 1936-1980 showed that Balykchy and north Tyua-Ashu have sufficient wind potential, where the long-term average annual speed slightly exceeds 4.0 m/s.

In the residential areas, the average monthly wind speeds are no more than 2 m/s to 2.5 m/s. At the same time, in winter, the frequency of winds with a speed of 0 m/s to 1 m/s is 50% or more. Steady winds with a speed of 4 m/s and more are observed on watersheds, far from most population centres.

According to estimates, out of 2 billion kWh per year of the gross energy potential of wind flows in Kyrgyzstan, no more than 140 million kWh are technically justified; no more than 4 million kWh can be considered economically justified for development. This is due to the specific conditions for the distribution of the wind diagram in the high mountainous conditions of Kyrgyzstan.

Despite the existing wind potential in Kyrgyzstan, there are no wind generators and wind power stations and installations connected to the grid. According to the MoE, construction of the first wind station has begun in the city of Balykchy.

It should be noted that there are sporadic pilots of low-power wind turbines for autonomous consumption. In particular, wind turbines manufactured by Vetroen (Russia) with a rated power of 5 kW to 6 kW.

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Geothermal

Kyrgyzstan has more than 30 geothermal sources, but only some of them are used, and then only in sanatoriums and resorts (e.g. Issyk-Ata and Teplye Klyuchi) due to their low capacity. One method of using low-capacity geothermal energy involves collecting scattered low-temperature (5°C to 10°C) natural heat or industrial waste heat through heat pumps for heat supply. However, heat pumps are not widely used in Kyrgyzstan for several reasons, such as low electricity tariffs, lack of consumer knowledge on modern residential heat supply technologies, and a lack of specialised installation companies.

Prospects for the economic use of geothermal energy are determined by the depth of geothermal occurrence at 100°C. The average value of geothermal heat flux is 55 MW/m^2 with a range of 13 MW/m^2 to 134 MW/m^2. The average value of the gradient at a depth of about 1 km is 25°C/km, and the range of their variation is 7°C/km to 40°C/km. In general, there is an increase in geothermal gradients from south to north and from west to east. The Talas-Chatkal-Kurama and East Kyrgyz anomalous zones have high geothermal gradients of 30°C/km to 40°C/km and more.

The smallest depths of occurrence of the 100°C isotherm (2.5 km) were identified in the North-Chuyskaya and Bar-Barskaunskaya areas of the East Kyrgyz zone. In the Talas-Chatkal-Kurama zone, the depth of the 100°C isotherm is estimated at 3 km or more.

The technical possibilities of using the potential of geothermal energy are limited within the development of 170 gigajoules (GJ) per year, or 27% of explored sources. Only 22 GJ per year are economically feasible for development, the main reason for which is the extremely low thermal potential of known geothermal energy sources.

Low-potential sources of geothermal energy can be used for hot water supply and heating purposes. For example, a source in the Ak-Suu gorge can be used for the heating needs of the city of Kara-Kol, as it is located at a short distance of 10 km. The spring has a stable year-round temperature of 55°C with a flow rate of 83 m^3 per hour. Competing methods of heating the city require large capital investments to meet the domestic needs of the city. Deposits in Ysyk-Ata and Dzhergalan are also promising for similar use.

A practical application of a low-grade energy source is applied at the American University of Central Asia, where the entire building is heated and cooled using the energy of the thermal mass of the earth.

Biomass

The total potential of biomass in the energy sector is relatively high. The main obstacle to the widespread biomass use in energy production is lack of a system of collection, transportation and storage of the necessary raw materials (agricultural waste) from a large number of small farms. The constraint for wider use of biogas plants in the communal sector is a general underdevelopment of the solid waste processing segment.

The main barriers to using biomass are its high cost and low conversion efficiency compared with fossil fuels, underdeveloped supply logistics, and risks associated with intensification of agriculture. Biomass capacity includes agriculture (livestock and plants), the food industry and solid domestic waste. Forestry waste, wastewater treatment systems, wood processing and the paper industry are not included because quantities are negligible.

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The economic and productive capacity of biomass from livestock, plant material and the food industry relies heavily on the productivity of processing equipment and quantities provided by farms.

Local sources of biomass include biomass from agricultural livestock and straw, the potential use of which is estimated at 9 732 terajoules (TJ). However, the level of their use is at an extremely low level due to the consumption of dry manure (dung) for heating residential premises. But heating is inefficient, as primitive kitchen stoves are used, which leads to significant internal and external pollution.

Forest biomass has limited potential due to the fact that only 4.32% of the territory of Kyrgyzstan is covered by forest. Forest biomass for energy use is not suitable in terms of seasonality, geographical dispersion, most of the biomass is located in sparsely populated areas.

The table below demonstrates calculations of the technically available ready-to-use energy potential of biomass in Kyrgyzstan areas with poor transport infrastructure.

Table 8.2 Technically available ready-to-use energy potential of biomass

	Forest biomass and forest processing	Agriculture biomass	Total
Energy potential (TJ)	2 292	9 732	12 024
Energy potential (toe)	54 689	232 212	286 901

Source: Second National Communication of the Kyrgyz Republic to the UN Framework Convention on Climate Change (2008).

In Kyrgyzstan, the potential for the introduction of biogas technologies significantly exceeds the current level of use of these technologies.

Currently, more than 70 different types of biogas plants have been built and are being operated for small peasant farms, in private houses in rural areas and other small facilities in almost all regions of the republic.

Policy

In recent years, the Kyrgyz Republic has been paying special attention to the development of renewable energy. This state emphasis on the development of renewable energy sources has already resulted in a number of policy and legislative and regulatory acts in the field of renewable energy.

A number of programmes for development of small hydropower were developed between 1999 and 2015. The NEP and the Strategy for Fuel and Energy Sector Development until 2025 called for active development of SHPPs and wide use of solar energy for hot water and heating systems. However, no specific quantified targets were established (NEP, 2008).

The government plans to have no less than 10% of environment-friendly energy sources (small hydroelectric power plants, solar and wind power plants, solar collectors, heat pumps, the use of biogas, etc.) in the country's total energy balance (NDS., 2018).

The GEC states that introduction of low-carbon renewable energy sources and improving energy efficiency are absolute priorities.

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The document also outlines the tasks of developing small hydropower, stimulating the development of solar and wind energy, determining the resources of renewable energy sources (SHPPs, solar systems, wind and biogas plants) for each district of the Kyrgyz Republic and developing legislative initiatives to stimulate the development of distributed energy production, as well as power exchange to reduce network losses and network load (GEC, 2018).

The GEC also provides for the development of a vision, strategy and plan for the development of the energy sector until 2040, taking into account the country's obligations under the SDGs to increase the share of renewable energy sources to 10% of total electricity generation.

However, currently there is no comprehensive strategy for renewables development based on solid economic and technical analysis of how to achieve the stated 10% target.

In April 2021 the MoE with the support of the International Renewable Energy Agency (IRENA) and UNDP in the Kyrgyz Republic started discussions on the Renewables Readiness Assessment (RRA) to identify and explore resource potential (solar PV and wind) as well as conduct capacity building on renewable energy target setting as foundations to strengthen investment. These activities will provide important insights on the suitability of conditions in Kyrgyzstan for the deployment of renewable energy, along with the overarching objective of supporting its NDC process.

In 2021, Kyrgyzstan presented the UNDC to the reduction of GHG emissions. The UNDC identifies a number of targets that reflect the estimated amount of reduced GHG emissions as a contribution to the achievement of the goals of the Paris Agreement in 2025 and 2030 (UNDC, 2021). In particular, in addition to traditionally proposed new hydropower plants (both large and small) the following measures are proposed for the development of renewable energy:

- expanding the use of biogas plants
- increasing the capacity of existing HPPs and existing private small hydropower plants
- expansion of the application of solar heat collectors
- development of geothermal energy (heat pumps)
- solar power development
- wind energy development

In April 2022 the press service of the Cabinet of Ministers reported that several documents on solar development were signed:

- The Cabinet of Ministers signed an agreement on the construction of a 1 000 MW solar power plant in the Issyk-Kul region with Chinese investors (the Chinese energy consortium as part of CPID and CR20G).
- The Cabinet of Ministers signed an MoU on the construction of a solar power plant and a 260 MW hydroelectric power station with Spanish energy company EcoEner.
- The Ministry of Energy signed an MoU with Masdar (United Arab Emirates) on construction of a solar power plant with a capacity of 500 MW.

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Legal framework

Back in 2008, the government adopted the Law on Renewable Energy to legitimise an incentive framework for renewable energy development.

Box 8.1 Incentives for the development of renewable energy based on the Law on Renewable Energy

The Law on Renewable Energy establishes an incentive framework for the development of renewable energy:

Incentives for design, construction and operation of installations using renewable energy sources, such as:

- exemption from customs duties on import and export of equipment, installations and spare parts
- relief from licensing of generation
- guaranteed project payback period (no more than eight years)
- right to sell the output to consumers under commercial agreements or use the generated electricity for own needs
- guaranteed purchase of the renewables output by the largest distribution company in the region where the installation is located – if this output has not been consumed by the renewable energy owner or supplied under commercial agreement
- during the project payback period, a preferential feed-in tariff
- after the project payback period, a tariff set by the Kyrgyz government for each renewable energy project individually based on a calculation of justified generation costs plus fair profit
- tariffs subject to indexation on an annual basis.

Least-cost connection point for the renewables installation to the grid.

Obligation on the renewable energy owner to bear all costs related to construction of transmission lines to the grid interconnection point.

Guaranteed non-discriminatory access of renewable energy output to the grid and obligation on the national transmission and distribution companies to ensure unobstructed transit of renewable power to consumers.

Compensation of additional cost of the distribution companies for purchase of renewable energy output by including this cost in the distribution company's tariff.

The MoE has prepared a draft of a new law on renewable energy (the draft RE law) and in early 2022 posted it for public discussion. The MoE recognises that the need for a new draft RE law is driven by a number of problems, including the power deficit, lack of mechanisms for reimbursement of costs of energy companies for purchase of renewable energy at a higher price, some issues of environmental protection and others.

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One of the new proposals by the MoE is establishment a Single Buyer – a legal entity that will be determined by the MoE and that will purchase all and any renewable electricity provided that electricity meets the established standards and requirements. The costs of the Single Buyer for the purchase of renewable energy are proposed to be compensated by tariffs for end consumers.

The status of the Single Buyer and procedure for determining by the ministry, as well as procurement methods, are not clearly specified.

The draft law is still being discussed and it is yet unclear what new provisions would be approved by the parliament. But the government initiative to improve the legal framework for renewables development is commendable and demonstrates the government commitment to establish a sustainable basis for renewable energy operation in the Kyrgyz Republic.

Regulatory framework

The regulatory framework is not yet fully developed and includes only several regulations that aim to establish conditions and procedures for implementation of renewables projects.

For example, the Regulation on Generation and Supply of Electricity by Renewable Energy Facilities intends to describe the full cycle to prepare and implement a renewable energy project. However, several stages, including land-use rights and grid connection, are not sufficiently developed.

The regulation requires all physical and legal entities involved in activities in the renewable energy subsector to be recorded in the register of renewable energy subjects maintained by the MoE. Upon the registration, the ministry issues a renewable energy registration certificate.

According to the MoE, as of December 2021 registration certificates were issued for 71 renewable energy subjects, including one 300 MW solar power plant and one 10 MW wind tower.

The renewable energy register keeps track of intentions and plans for implementation of renewables projects but does not include a monitoring system to follow up on the implementation status and record the commissioning.

In 2021 the government also approved regulations aimed at streamlining procedures for providing land plots for the construction of power plants using RES, including use and disposal of the state forest fund. In addition, “Regulation on procedure for issuing documents for the design, construction and commissioning completed construction facilities” was approved by the decree of the government of the Kyrgyz Republic dated 6 August 2021. This regulation aims at facilitating the process for accepting renewable energy facilities for operation.

The Department for Regulation of the Fuel and Energy Complex of the MoE of the Kyrgyz Republic is responsible for setting tariffs for electric, thermal energy and natural gas and for licensing of energy sector activities (exceptions are the generation of electricity from RES and entities that generate electricity for their own use from any sources of energy with capacities below 1 000 kW). However, renewable energy plants must still obtain a licence for the sale of their output.

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The draft RE law proposes to fully de-license new renewable energy projects.

In October 2021 the Cabinet of Ministers of the Kyrgyz Republic approved VAT exemptions for a number goods and equipment for construction of renewable energy facilities.

The resolution dated 4 October 2021, No. 196, "On Approval of the List of Specialised Goods and Equipment Intended for the Construction of Power Plants Based on the Use of Renewable Energy Sources Subject to VAT Exemption When Imported into the Territory of the Kyrgyz Republic" was adopted.

System integration of renewable energy

The Law on Renewable Energy guarantees non-discriminatory access of renewable energy output to the grid and obligates the national transmission and distribution companies to ensure unobstructed transit of renewable power to consumers. However, the effective regulatory framework provides for no procedural details and just states that distribution companies must issue a set of technical requirements for grid connection of the renewable energy facility.

There are no established rules and procedures for grid connection of new generation, including variable renewable energy integration. New renewables projects can often face delays and excessive costs to connect to the grid. To address these issues, the grid connection regulations should at least establish clear rules governing grid connection procedures and costs to allow renewable energy operators to connect on a non-discriminatory basis, as well as ensure timely connection for new renewable energy facilities.

Currently the MoE and JSC National Grid are working on developing rules for grid integration with support from USAID Power Central Asia Activity.

Prices and tariffs

The Law on Renewable Energy obligates distribution companies to purchase electricity generated by renewable energy plants. However, in reality there is neither incentive nor an enforcement mechanism to implement this legal provision. The preferential tariff for renewable energy is high compared with the purchase price for electricity generated by the national generation company, which is approved by the Energy Regulator. There is no mechanism to compensate additional costs incurred by a distribution company to purchase renewables output.

The draft RE law proposes to establish a Single Buyer; however, its status and procurement methods are not clearly defined in the draft law.

Pursuant to the Law on Renewable Energy, the Energy Regulator developed and approved methodology for calculation of tariffs for electricity supplied by stations generating electricity using renewable energy sources (the Renewable Energy Tariff Methodology). This methodology applies to newly commissioned projects. It was revised and simplified several times and currently it is linked to end-user tariffs only.

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Box 8.2 Formula for renewable energy feed-in tariff

After the revisions to the Renewable Energy Tariff Methodology, the effective renewable energy feed-in tariffs formula is as follows:

$$T = Tm \times K,$$

Where:

T is the calculated tariff, in KGS/kWh

Tm is the maximum end-user tariff currently in effect (currently tariffs for industrial customers)

K is a coefficient (currently the coefficient is 1.3 for all renewable energy projects).

Source: Energy Regulator (2020)

This Renewable Energy Tariff Methodology may be amended pursuant to adoption the new draft RE law.

Assessment

The Kyrgyz Republic has a fairly large renewable energy potential, including the energy of the sun, small watercourses, biofuels, geothermal and wind energy. However, despite the huge potential, the practical use of RES is currently insignificant, and in the country's energy balance it is no more than 1%.

To establish a framework for development of renewable energy the Kyrgyz Republic adopted the Law on Renewable Energy in 2008. This law defined renewables as ecologically clean energy generated from renewable sources of energy and renewable fuel, including solar, wind, hydropower, non-fossil and non-carbon energy sources (biomass energy), as well as secondary forms of energy.

Even though the legal definition includes various sources of renewable energy, government policies in the area of renewable energy focused on development of small hydropower plants until 2018.

The NDS sets a target of the share of environment-friendly energy sources to be at least 10% of the country's total energy balance and expands the range of RES to contribute to the target (small hydroelectric power plants, solar and wind power plants, solar collectors, heat pumps, the use of biogas, etc.).

However, currently there is no economic and technical analysis of how to achieve the stated 10%. Neither is there a clear implementation plan supported by technical studies to identify any risks to reliability of the national power system. The work started by the MoE with the support of USAID Power Central Asia Activity would significantly contribute to a clear vision on how the available renewables potential could be exploited in the most economic and efficient way.

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There is not yet an established process for collection of data on total output of the SHPPs operating in Kyrgyzstan. Only output of the largest cascade of them, Chakan GES, is included in the national statistical reports. The MoE recently started registering intentions of new developers to implement renewable energy projects, but a monitoring system for implementation is still missing.

A number of solar and wind projects are being planned for implementation, but the country lacks rules for integration of new variable capacity additions to the national power system. Transparent rules and procedures for integration of new renewable energy facilities could help avoid any unintended consequences that have the potential to worsen overall reliability of supply.

Electricity tariffs do not yet reach cost recovery level and planned tariff reform is restrained. The preferential tariff for renewable energy is high compared with the purchase price for electricity approved by the Energy Regulator for the distribution companies. There is no mechanism to compensate additional costs incurred by a distribution company to purchase renewable energy output. The draft renewable energy law proposes establishing a Single Buyer; however, its status and procurement methods are not clearly defined in the draft law.

Recommendations

The government of Kyrgyzstan should:

- Develop a comprehensive policy for renewable energy development. The new renewable energy policy should be an integrated part of the overall strategy to develop the power system and improve operations of the electricity sector.
- Develop an Atlas of Renewable Energy Sources (resource map) for Kyrgyzstan, which is necessary for state bodies to understand the full potential of the country's resources, and for private sector enterprises to identify specific objects for the development of renewable energy sources. The atlas would be useful for investors, state and local governments, planning institutes, organisations designing power generating stations and power supply systems of territories, companies engaged in the sale and installation of PV stations, water heating installations and their users, scientific organisations, and universities.
- Conduct technical studies for renewable energy integration into the national grid to identify any risks to reliability of the national power system and propose mitigation measures to be included in the action plan for implementation of the new renewable energy policy.
- Continue the gradual increase of electricity tariffs. Sound tariff policy and cost recovery are prerequisites for attracting investors to build new renewable energy projects.
- Continue developing a sound legal and regulatory framework, including but not limited to adoption of the update renewable energy law and regulations on the renewable energy grid integration.

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9. Energy research, development and demonstration

Key data

Global Innovation Index ranking: 98 out of 132 (2021)

Research and development expenditure: USD (2015) 7.6 million, or 0.1% of GDP (2018)

Overview

Technology research and development (R&D) is almost non-existent in Kyrgyzstan: the main reasons for this are a lack of funding (state funding of research institutes under the National Academy of Science is insufficient) and the country's small market.

The main areas of energy research conducted in Kyrgyzstan are electric power and thermal power. The scientific focus is mainly on ways to reduce losses, improve reliability of electrical networks and ensure stable operation of the power system, especially in emergency situations. Quite a lot of attention is paid to research aimed at ensuring stability and reliability of the electric networks.

Complex research is being conducted on improving the efficiency of heat production at the co-generation plants in Bishkek and Osh, as well as increasing efficiency of local coal combustion in the co-generation plants' boilers.

Some energy efficiency and energy saving research is under way. Renewable energy resources are also being studied.

In addition, with assistance, knowledge transfer and some limited technology deployment, a handful of local small non-governmental organisations implemented several pilot projects in renewable energy development. Replication of such projects is minimal or absent.

Nevertheless, Kyrgyzstan has significant potential to increase its R&D activities, including in the energy field, with the support of long-term planning. Overall spending on R&D is low, and the country does not yet have a specific strategy or action plan for energy R&D.

Legal and institutional framework

The Law on Science and State Scientific and Technical Policy Framework (the Law on Science), among other things, defines the main goals, directions and principles of the state

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scientific and technical policy, the role of the state in the development of science and technology, and forms and methods of state regulation.

Box 9.1 Goals of the Law on Science

The Law on Science and State Scientific and Technical Policy Framework defines the following goals of the state scientific and technical policy:

- Increase the effectiveness and efficiency of science in solving socio-economic, cultural and other challenges.
- Develop scientific and scientific-technical potential and optimise functioning of scientific and scientific-technical organisations.
- Create necessary conditions for the development and functioning of scientific and scientific-technical organisations.
- Ensure stability of social guarantees for scientific and scientific-technical workers.
- Promote the role of science and technology, encourage freedom of scientific creativity and revitalise scientific and scientific-technical activities.

The government approves priority areas for the development of science, engineering, technology and innovation. The Law on Science requires the government to, among others:

- Create a modern science infrastructure.
- Finance scientific research, scientific and technical programmes.
- Ensure concentration of resources in priority areas of development of science, technology and innovation.
- Organise statistical and information support in the scientific and technical field.

The Law on Science establishes an advisory body to be formed by the government - the Council on Science, Innovations and New Technologies under the prime minister of the Kyrgyz Republic – to develop proposals to the government on topical issues of state policy in the field of scientific and technological development.

Currently the chairman of the Cabinet of Ministers heads the council. The Minister of Education and Science and the Minister of Economy and Commerce are members of the council. Currently there are over 25 members, mainly representations of universities and institutes. The energy sector is represented by the Scientific Research Institute of Energy and Economy under the MoE.

The Law on the High-Technology Park establishes the legal framework for functioning of the high-tech park and state support for the development of the software industry. It defines the basic principles of the high-tech park legal regime, including the basic principles of taxation of the residents. The high-tech park by virtue of this law is limited to software development and supply, export of information technologies and software, and creation of interactive service centres and their functioning.

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Institutional framework

The **Ministry of Science and Education** is the main state body involved in the development of policy in the field of scientific research, education and transfer of new technologies.

The **National Academy of Sciences of the Kyrgyz Republic** (NAS) is the main scientific institution that carries out both fundamental and advanced scientific research.

In December 1993, the Academy of Sciences of the Kyrgyz Republic, formerly established under the Soviet Academy of Sciences, became the NAS by government decree.

The aims of the NAS are to carry out research in natural, technical and social sciences, to train scientific staff in all fields of science, to advise the government in matters of scientific policy, and to disseminate knowledge.

The NAS defines themes of research in the national academies, co-ordinates fundamental research financed by the state, participates in international organisations, and organises symposia and conferences to discuss scientific problems and co-ordinate research.

Decree No. 37 of the NAS Presidium dated 27 May 2009 set the following priority scientific areas of the NAS in the energy sector:

- effective use of water and hydropower resources, water and energy safety improvement
- strategy of interstate water consumption and economic mechanisms for transborder water resources management
- renewable energy sources.

Energy-related research is implemented by several institutions under the NAS.

The Institute of Water and Hydropower Issues was established in 1992 and is engaged in basic and applied research in the area of rational use of water and energy resources. The institute has seven laboratories:

1. laboratory of water and water-energy resources
2. laboratory of hydropower
3. laboratory of economy, water ecology and water use
4. laboratory of rational use of underground waters
5. laboratory of alpine lakes
6. laboratory of mountain ecosystems
7. laboratory of information support.

Energy issues researched by the Institute of Water and Hydropower include:

- Development of electronic maps on various topics: average year-round temperature, evaporation, vapourability, humidification, unit area discharge, glaciers and negative water processes.
- Forecast assessment of water resources development in current climate tendencies.

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Institute of Automation and Information Technologies under the NAS studies:

- Automatic and synergetic management of technological processes.
- Instrument engineering.
- Machinery, devices and systems for transformation of renewable energy.

The most recent energy-related R&D of the Institute of Automation was development of remote automatic devices for meter reading and data processing. State funding for this development reportedly did not exceed KGS 2.5 million (about USD 36 000 at the 2017 exchange rate).

The Institute of Natural Resources under the NAS has the following research areas:

- elaboration and establishing of technologies of renewable energy sources as well as creation of power installation complexes based on unconventional and renewable energy sources, including those for mountainous settlements
- elaboration and introduction of progressive technologies and technical means for processing natural and mineral resources
- development of modernised heating devices for effective burning of solid fuel.

One major energy-related development is obtaining a new type of compositional fuel-agglomerate small-density bio-lignite fuel and studying ways of its effective combustion. Reportedly funding was provided by a Korean company, but the amount is unknown.

The Scientific Research Institute of Energy and Economy under the MoE of the Kyrgyz Republic is a state scientific institution for research design and development in the areas of energy and economy.

Among multiple tasks the energy-related research areas include the following:

- scientific research in support of energy sector development
- analysis and forecast of energy resources demand by branch of economy
- development and implementation of energy efficiency technologies and programmes.

The most recent research included analysis of the useful quality of local coals and development of rational ways to use local coals under new and existing technologies.

Universities and higher education institutions provide education and training of personnel in universities and special institutions of higher and post-secondary education. Technical universities also take an active part in conducting research work in the energy and other industries. No information on energy-related research at universities was obtained during preparation of this overview.

KSTU in 2021 introduced new curriculum on renewable energy assessment and development. The curriculum was developed with support from with the USAID Power the Future Activity and was based on best international practices in renewables development and modern technology standards, The syllabus was completed and the new course started in 2021.

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Funding

According to **the NAS**, financing of science in Kyrgyzstan is 0.07% of GDP (2021).

In 2021, the budget for funding scientific research (through the NAS and the Ministry of Education and Science) was KGS 552.8 million (about USD 6.5 million). The budget for research work in the universities does not exceed 7-10% of their budgets. The share of funding scientific research at the expense of the business sector is not tracked by statistics, but it can be assumed that it is negligible.

The Law on Science establishes the following sources of funding for scientific and scientific-technical activities:

- the republican budget (up to 1% of annual expenditures)
- National Science Foundation
- off-budget funds
- voluntary funds of individuals and legal entities
- loans and grants
- funds of scientific and scientific-technical organisations from research, publishing and consulting
- foreign and domestic investments.

State funds could be used for financing fundamental research, projects in priority areas of development of science and technology, and applied scientific developments of national importance.

State financing from the National Science Foundation is based on the results of the selection of projects on a competitive basis. No information is available on competitive funding but it could be assumed that remains negligible.

The National Science Foundation primarily finances fundamental and applied scientific research, scientific and technical programmes and targeted scientific research in priority areas of science.

The National Science Foundation finances:

- Fundamental and applied scientific research, scientific and technical programmes and targeted scientific research in priority areas of science.
- Grants for scientific research of scientific and scientific and technical workers, scientific teams, and organisations.
- Support for the development of intersectoral R&D activities.
- Implementation of training programmes for scientific personnel in promising and new areas of science and technology, including training of personnel abroad.
- Publication, acquisition and provision of scientific and scientific-technical information (journals, electronic materials, etc.).
- Organisation and participation in scientific forums (congresses, conferences, symposia and others).

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According to the NSC, around 112 organisations, including state-funded scientific institutions, universities and institutions of higher education and a few companies, report to the NSC the volume of their R&D works under Form 1 – Science. Most of these organisations are engaged in agriculture and healthcare.

The NSC data collection system does not allow to distinguish R&D activities among the works implemented and reported under Form 1 – Science, and volume of state funding of the R&D could not be assessed. No data are publicly available on budgets of individual institutions under the NAS.

According to the NSC, 97% of scientific and technical works between 2015 and 2020 were implemented with own resources.

Table 9.1 Volume of scientific and technical works (in current prices)

	2015	2016	2017	2018	2019
			Total cost of works (million KGS)		
All scientific and technical works, including:	473.9	500.3	531.6	510.4	527.9
research work, including	426.8	454.7	479.6	465.1	483.2
basic research, among them	208.4	230.9	210.8	200.9	248.1
engineering development works, among them	31.7	33.5	30.7	32.7	39.1
design and technological works	25.1	23.8	22.1	16.9	21.6
development of pre-production models	1.0	1.9	0.1	4.0	9.7
project design for construction	2.6	0.1	0.8	0.1	0.0
scientific and technical services	15.4	12.1	19.8	12.5	5.6
			Among those implemented with own resources		
All scientific and technical works, including:	460.6	489.3	513.1	495.0	513.1
research work, including	415.4	444.1	469.1	451.8	471.5
basic research, among them	208.4	230.9	210.8	200.9	248.1
engineering development works, among them	29.8	32.2	29.4	30.8	36.4
design and technological works	25.0	23.5	21.3	16.1	20.0
development of pre-production models	4.0	9.7	7.4	14.6	16.4
project design for construction	0.9	0.0	0.7	0.1	0.0
scientific and technical services	15.4	12.0	13.1	12.4	5.2

Source: NSC (2020).

Among these 112 organisations only four institutions (listed above) implement basic and applied research in the energy sector; however, they are now more engaged in policy-related studies and/or feasibility studies.

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The Law on Science provides for a contractual framework for funding for applied innovative research on new equipment and technologies. However, private-sector funding has been negligible or absent.

Some of the funding for projects at energy-related institutes comes from donor-funded projects. Kyrgyz institutions are often engaged by international companies as subcontracts for donor-funded projects. Donor-funded project-based contracts are short-term and not sustainable. Such contracts are not related to any RDI and are mainly designed to review the state of the energy industry, and include technical and economic analysis for various scenarios of energy sector development.

Assessment

According to various policy documents, the government has considered energy to be a key sector for the country's economic and social development. This prioritisation still needs to be translated into programmes and instruments supporting research, development and innovation (RDI) in the country where energy should be included in priority research subjects.

There is so far no specific strategy to guide RDI pertaining to the energy sector.

Kyrgyzstan is spending a relatively small amount on scientific research and is spreading its limited funding across a number of institutions and subjects.

Financing of science in Kyrgyzstan is 0.07% of GDP and this is the lowest-spending even compared with former CIS countries, such as Lithuania at 0.9%, Ukraine at 0.5% and Armenia at 0.2%.

There are no official statistics on the amounts spent on research pertaining to energy. Funding for most research bodies in Kyrgyzstan, including the organisations focusing on energy, is intended to pay salaries and basic administrative costs.

Given the lack of state funding, the main institutions involved in energy-related research are primarily self-financed, with most funding coming from policy-related studies and/or feasibility studies. Most of these are donor-funded project-based contracts with international organisations.

Private-sector participation in energy research is negligible and almost absent.

Interviews conducted noted a general lack of interface among universities, research institutes and industry, as well as a lack of government support mechanisms for innovation in industry.

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Recommendations

The government of Kyrgyzstan should:

- Formulate an energy RDI strategy, including the setting of clear priorities within thematic areas and applied research, to ensure that priorities are linked with those of the NDS.
- Building on such a strategy, introduce an energy-specific research support scheme with a dedicated budget per specific research area.
- Strengthen the links and co-operation among policy makers, scientific research institutions and industry, e.g. through establishing working groups and conducting regular roundtables to address the concrete challenges in the energy sector requiring scientific research and innovation.
- Improve and expand international collaboration to exchange best practices in energy RDI policy making with other relevant countries and foster knowledge-sharing related to sustainable technologies, especially energy efficiency and renewable energy.
- Continue development of new curricula based on best international practices in energy development and modern technology standards and provide incentives for young professionals and researchers to pursue careers in energy RDI, including in collaboration with international partners.

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ANNEX A: Energy balances

Kyrgyzstan

Energy balances and key statistical data

Unit: Mtoe

SUPPLY		1990	2000	2010	2017	2018	2019	2020
TOTAL PRODUCTION		**2.50**	**1.37**	**1.27**	**2.09**	**2.32**	**2.39**	**2.45**
Coal		1.41	0.16	0.21	0.68	0.87	0.94	0.99
Peat		-	-	-	-	-	-	-
Oil		0.16	0.08	0.08	0.17	0.20	0.23	0.24
Natural gas		0.07	0.03	0.02	0.02	0.02	0.02	0.02
Biofuels and waste[1]		0.01	0.00	0.00	0.00	0.00	0.00	0.00
Nuclear		-	-	-	-	-	-	-
Hydro		0.86	1.10	0.96	1.22	1.23	1.19	1.20
Wind		-	-	-	-	-	-	-
Geothermal		-	-	-	-	-	-	-
Solar/other		-	-	-	-	-	-	-
TOTAL NET IMPORTS		**4.98**	**0.90**	**1.51**	**1.86**	**2.19**	**1.55**	**1.52**
Coal	Exports	0.91	0.01	0.00	0.19	0.30	0.41	0.40
	Imports	2.03	0.32	0.50	0.45	0.41	0.50	0.46
	Net imports	1.12	0.31	0.49	0.27	0.11	0.09	0.06
Oil	Exports	0.16	0.00	0.10	0.10	0.21	0.19	0.16
	Imports	3.04	0.33	1.31	1.58	2.10	1.41	1.35
	Int'l marine and aviation bunkers	-0.09	-0.04	-0.28	-0.02	-0.01	-0.01	-0.00
	Net imports	2.79	0.29	0.93	1.47	1.89	1.21	1.19
Natural gas	Exports	-	-	-	-	-	-	-
	Imports	1.45	0.55	0.23	0.23	0.26	0.25	0.27
	Net imports	1.45	0.55	0.23	0.23	0.26	0.25	0.27
Electricity	Exports	0.47	0.27	0.16	0.10	0.06	0.02	0.03
	Imports	0.09	0.03	0.01	-	-	0.02	0.03
	Net imports	-0.38	-0.24	-0.15	-0.10	-0.06	-0.00	0.00
TOTAL STOCK CHANGES		**-**	**0.05**	**-0.02**	**-0.11**	**0.04**	**0.08**	**-0.19**
TOTAL SUPPLY (TES)[2]		**7.49**	**2.32**	**2.75**	**3.84**	**4.56**	**4.02**	**3.78**
Coal		2.53	0.47	0.70	0.87	1.04	1.06	1.03
Peat		-	-	-	-	-	-	-
Oil		2.95	0.41	0.99	1.60	2.07	1.50	1.26
Natural gas		1.52	0.57	0.25	0.25	0.28	0.27	0.28
Biofuels and waste[1]		0.01	0.00	0.00	0.00	0.00	0.00	0.00
Nuclear		-	-	-	-	-	-	-
Hydro		0.86	1.10	0.96	1.22	1.23	1.19	1.20
Wind		-	-	-	-	-	-	-
Geothermal		-	-	-	-	-	-	-
Solar/other		-	-	-	-	-	-	-
Electricity trade[3]		-0.38	-0.24	-0.15	-0.10	-0.06	-0.00	0.00
Shares in TES (%)								
Coal		*33.8*	*20.2*	*25.5*	*22.7*	*22.8*	*26.3*	*27.1*
Peat		-	-	-	-	-	-	-
Oil		*39.4*	*17.8*	*36.1*	*41.6*	*45.4*	*37.3*	*33.4*
Natural gas		*20.3*	*24.7*	*9.0*	*6.6*	*6.1*	*6.7*	*7.5*
Biofuels and waste[1]		*0.1*	*0.2*	*0.1*	*0.0*	*0.0*	*0.0*	*0.0*
Nuclear		-	-	-	-	-	-	-
Hydro		*11.5*	*47.6*	*34.7*	*31.8*	*27.0*	*29.6*	*31.8*
Wind		-	-	-	-	-	-	-
Geothermal		-	-	-	-	-	-	-
Solar/other		-	-	-	-	-	-	-
Electricity trade[3]		*-5.1*	*-10.5*	*-5.3*	*-2.7*	*-1.4*	*-0.0*	*0.1*

0 is negligible, - is nil, .. is not available. Please note: rounding may cause totals to differ from the sum of the elements.

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Unit: Mtoe

DEMAND							
FINAL CONSUMPTION	**1990**	**2000**	**2010**	**2017**	**2018**	**2019**	**2020**
TFC	**6.91**	**1.70**	**2.27**	**3.54**	**4.25**	**3.51**	**3.21**
Coal	2.08	0.20	0.37	0.56	0.71	0.57	0.49
Peat	-	-	-	-	-	-	-
Oil	2.95	0.41	0.93	1.57	2.04	1.45	1.20
Natural gas	0.61	0.16	0.12	0.16	0.17	0.15	0.17
Biofuels and waste[1]	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Geothermal	-	-	-	-	-	-	-
Solar/other	-	-	-	-	-	-	-
Electricity	0.85	0.69	0.61	0.95	1.02	1.06	1.05
Heat	0.41	0.24	0.24	0.31	0.30	0.27	0.30
Shares in TFC (%)							
Coal	*30.1*	*11.9*	*16.4*	*15.8*	*16.8*	*16.3*	*15.3*
Peat	-	-	-	-	-	-	-
Oil	*42.7*	*23.9*	*40.8*	*44.3*	*48.0*	*41.2*	*37.3*
Natural gas	*8.8*	*9.6*	*5.3*	*4.4*	*4.0*	*4.3*	*5.2*
Biofuels and waste[1]	*0.1*	*0.2*	*0.2*	*0.0*	*0.0*	*0.1*	*0.0*
Geothermal	-	-	-	-	-	-	-
Solar/other	-	-	-	-	-	-	-
Electricity	*12.4*	*40.5*	*26.8*	*26.7*	*24.0*	*30.3*	*32.7*
Heat	*5.9*	*13.9*	*10.5*	*8.7*	*7.2*	*7.8*	*9.4*
TOTAL INDUSTRY[4]	**2.52**	**0.45**	**0.45**	**0.44**	**0.78**	**0.52**	**0.29**
Coal	2.08	0.20	0.07	0.12	0.16	0.09	0.08
Peat	-	-	-	-	-	-	-
Oil	-	0.01	0.16	0.10	0.34	0.19	0.07
Natural gas	-	-	0.04	0.04	0.04	0.03	0.02
Biofuels and waste[1]	-	-	-	-	-	-	-
Geothermal	-	-	-	-	-	-	-
Solar/other	-	-	-	-	-	-	-
Electricity	0.44	0.24	0.15	0.15	0.22	0.19	0.12
Heat	-	-	0.03	0.03	0.03	0.02	0.01
Shares in total industry (%)							
Coal	*82.6*	*45.1*	*15.7*	*27.1*	*20.5*	*17.6*	*26.7*
Peat	-	-	-	-	-	-	-
Oil	-	*1.6*	*35.5*	*22.8*	*43.0*	*35.6*	*22.5*
Natural gas	-	-	*8.5*	*8.9*	*5.6*	*6.0*	*7.1*
Biofuels and waste[1]	-	-	-	-	-	-	-
Geothermal	-	-	-	-	-	-	-
Solar/other	-	-	-	-	-	-	-
Electricity	*17.4*	*53.3*	*34.0*	*34.3*	*27.7*	*36.2*	*41.5*
Heat	-	-	*6.3*	*6.8*	*3.2*	*4.7*	*2.2*
TRANSPORT	**2.02**	**0.30**	**0.67**	**1.31**	**1.54**	**1.23**	**1.08**
OTHER[5]	**2.36**	**0.96**	**1.16**	**1.78**	**1.92**	**1.76**	**1.83**
Coal	-	-	0.30	0.44	0.55	0.48	0.41
Peat	-	-	-	-	-	-	-
Oil	0.94	0.11	0.10	0.15	0.16	0.04	0.05
Natural gas	0.61	0.16	0.08	0.12	0.12	0.12	0.15
Biofuels and waste[1]	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Geothermal	-	-	-	-	-	-	-
Solar/other	-	-	-	-	-	-	-
Electricity	0.40	0.44	0.46	0.79	0.80	0.87	0.93
Heat	0.41	0.24	0.21	0.28	0.28	0.25	0.30
Shares in other (%)							
Coal	-	-	*26.2*	*24.7*	*28.7*	*27.2*	*22.6*
Peat	-	-	-	-	-	-	-
Oil	*39.9*	*12.0*	*9.1*	*8.5*	*8.5*	*2.0*	*2.6*
Natural gas	*25.6*	*17.0*	*6.6*	*6.6*	*6.5*	*6.9*	*8.0*
Biofuels and waste[1]	*0.2*	*0.4*	*0.3*	*0.1*	*0.1*	*0.1*	*0.1*
Geothermal	-	-	-	-	-	-	-
Solar/other	-	-	-	-	-	-	-
Electricity	*17.1*	*45.9*	*39.5*	*44.5*	*41.6*	*49.5*	*50.6*
Heat	*17.2*	*24.7*	*18.3*	*15.7*	*14.5*	*14.2*	*16.1*

0 is negligible, - is nil, .. is not available. Please note: rounding may cause totals to differ from the sum of the elements.

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Unit: Mtoe

DEMAND							
ENERGY TRANSFORMATION AND LOSSES	**1990**	**2000**	**2010**	**2017**	**2018**	**2019**	**2020**
ELECTRICITY GENERATION[6]							
Input (Mtoe)	1.82	1.54	1.11	1.43	1.45	1.45	1.48
Output (Mtoe)	1.35	1.28	1.04	1.33	1.34	1.30	1.32
Output (TWh)	15.73	14.93	12.10	15.51	15.53	15.12	15.40
Output Shares (%)							
Coal	*13.1*	*4.3*	*5.0*	*7.5*	*7.0*	*7.5*	*8.4*
Peat	-	-	-	-	-	-	-
Oil	-	-	*1.7*	*0.2*	*0.2*	*0.2*	*0.3*
Natural gas	*23.5*	*9.8*	*1.5*	*0.8*	*0.5*	*0.6*	*0.5*
Biofuels and waste[1]	-	-	-	-	-	-	-
Nuclear	-	-	-	-	-	-	-
Hydro	*63.5*	*85.9*	*91.8*	*91.6*	*92.2*	*91.7*	*90.7*
Wind	-	-	-	-	-	-	-
Geothermal	-	-	-	-	-	-	-
Solar/other	-	-	-	-	-	-	-
TOTAL LOSSES	**0.58**	**0.61**	**0.47**	**0.43**	**0.46**	**0.51**	**0.52**
of which:							
Electricity and heat generation[7]	0.46	0.26	0.07	0.09	0.11	0.15	0.15
Other transformation	-	0.01	0.01	0.00	-0.00	0.00	0.03
Own use and transmission/distribution losses	0.12	0.35	0.39	0.34	0.35	0.35	0.34
Statistical differences	**-**	**-0.00**	**-0.01**	**0.13**	**0.15**	**-0.01**	**-0.05**
INDICATORS	**1990**	**2000**	**2010**	**2017**	**2018**	**2019**	**2020**
GDP (billion 2015 USD)	5.15	3.55	5.26	7.30	7.55	7.90	7.22
Population (millions)	4.39	4.90	5.45	6.20	6.32	6.46	6.59
TES/GDP (toe/1000 USD)[8]	1.45	0.65	0.52	0.53	0.60	0.51	0.52
Energy production/TES	0.33	0.59	0.46	0.54	0.51	0.59	0.65
Per capita TES (toe/capita)	1.70	0.47	0.51	0.62	0.72	0.62	0.57
Oil supply/GDP (toe/1000 USD)[8]	0.57	0.12	0.19	0.22	0.27	0.19	0.17
TFC/GDP (toe/1000 USD)[8]	1.34	0.48	0.43	0.49	0.56	0.44	0.44
Per capita TFC (toe/capita)	1.57	0.35	0.42	0.57	0.67	0.54	0.49
CO_2 emissions from fuel combustion ($MtCO_2$)[9]	22.8	4.5	6.0	8.8	10.4	9.1	8.2
CO_2 emissions from bunkers ($MtCO_2$)[9]	0.3	0.1	0.8	0.1	0.0	0.0	0.0
GROWTH RATES (% per year)	**90-00**	**00-10**	**10-17**	**17-18**	**18-19**	**19-20**	**00-20**
TES	-11.1	1.7	4.9	18.5	-11.7	-6.0	2.5
Coal	-15.5	4.1	3.2	18.9	2.0	-3.2	4.0
Peat	-	-	-	-	-	-	-
Oil	-17.9	9.2	7.0	29.4	-27.6	-15.7	5.7
Natural gas	-9.3	-8.1	0.4	10.1	-3.1	4.9	-3.5
Biofuels and waste[1]	-3.3	0.4	-12.7	44.5	-12.8	-23.7	-4.7
Nuclear	-	-	-	-	-	-	-
Hydro	2.5	-1.4	3.6	0.8	-3.2	0.9	0.4
Wind	-	-	-	-	-	-	-
Geothermal	-	-	-	-	-	-	-
Solar/other	-	-	-	-	-	-	-
TFC	-13.1	2.9	6.5	19.9	-17.4	-8.5	3.2
Electricity consumption	-2.1	-1.3	6.5	7.8	4.1	-1.4	2.1
Energy production	-5.8	-0.8	7.4	10.9	2.8	2.4	2.9
Net oil imports	-20.4	12.6	6.7	28.8	-35.8	-2.3	7.4
GDP	-3.7	4.0	4.8	3.5	4.6	-8.6	3.6
TES/GDP	-7.7	-2.2	0.1	14.6	-15.6	2.9	-1.1
TFC/GDP	-9.7	-1.1	1.7	15.9	-21.1	0.1	-0.4

0 is negligible, - is nil, .. is not available. Please note: rounding may cause totals to differ from the sum of the elements.

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Notes

1. Data on consumption of (solid) biofuels is not systematically collected in Kyrgyzstan.
2. Excludes international marine bunkers and international aviation bunkers.
3. Total supply of electricity represents net trade. A negative number in the share of TES indicates that exports are greater than imports.
4. Industry includes non-energy use.
5. Other includes residential, commercial and public services, agriculture/forestry, fishing and other non-specified.
6. Inputs to electricity generation include inputs to electricity, CHP and heat plants. Output refers only to electricity generation.
7. Losses arising in the production of electricity and heat at main activity producer utilities and autoproducers. For non-fossil-fuel electricity generation, theoretical losses are shown based on plant efficiencies of 100% for hydro, wind and solar photovoltaic.
8. Toe per thousand US dollars at 2015 prices and exchange rates.
9. Toe per thousand USD at 2015 prices and exchange rates.
10. "CO_2 emissions from fuel combustion" have been estimated using the IPCC Tier I Sectoral Approach methodology from the 2006 IPCC Guidelines. Emissions from international marine and aviation bunkers are not included in national totals.

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ANNEX B: Acronyms, abbreviations and units of measure

AC	alternating current
ADB	Asian Development Bank
BAU	business as usual
CAPS	Central Asian Power System
CASA-1000	Central Asia-South Asia power project
CDM	Clean Development Mechanism
CJSC	closed joint-stock company
CPID	China Power International Development Limited
CR20G	China Railway 20 Bureau Group Corporation
DC	direct current
DSO	distribution system operator
EAEU	Eurasian Economic Union
EE	energy efficiency
EPBD	Energy Performance of Buildings Directive
EPC	energy performance certificate
ESCO	energy service company
GDP	gross domestic product
GHG	greenhouse gas
HPP	hydroelectric power plant
IAEA	International Atomic Energy Agency
IEA	International Energy Agency
IRENA	International Renewable Energy Agency
IPPU	Industrial processes and product use
JODI	Joint Organisations Data Initiative
JSC	joint stock company
KGS	Kyrgyzstani som
KSTU	Kyrgyz State Technical University
LED	light-emitting diode
LULUCF	Land use, land-use change and forestry
MEI	Ministry of Energy and Industry
MEPS	minimum energy performance standards
MoE	Ministry of Energy
MoU	memorandum of understanding
MTTP	Mid-Term Tariff Policy

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NDC	Nationally Determined Contribution
NDP	National Development Program
NDS	National Development Strategy
NEHC	National Energy Holding Company
NEP	National Energy Program
NSC	National Statistical Committee
OJSC	open joint-stock company
PPP	purchasing power parity
PV	photovoltaic
R&D	research and development
RDI	research, development and innovation
RES	renewable energy sources
RRA	Renewables Readiness Assessment
SDG	Sustainable Development Goal
SHPP	small hydroelectric power plants
SMR	small modular reactor
TES	total energy supply
TFC	total final consumption
TSO	transmission system operator
UNDC	Updated Nationally Determined Contribution
UNECE	United Nations Economic Commission for Europe
UNFCCC	United Nations Framework Convention on Climate Change
UNSD	United Nations Statistics Division
USAID	US Agency for International Development
VAT	value-added tax
WAM	with additional measures
WM	with measures

Measurements

bcm	billion cubic metres
Bt	billion tonnes
Gcal	gigacalories
GJ	gigajoules
GW	gigawatts
GWh	gigawatt-hours
km^2	square kilometre
kt	kilotonnes
kt CO_2-eq	thousand tonnes of CO_2 equivalent

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kV	kilovolt
kW	kilowatts
kWh	kilowatt-hours
m/s	metres per second
mcm	million cubic metres
MJ	megajoules
Mt	million tonnes
Mtoe	million tonnes of oil equivalent
MVA	megavolt amperes
MW	megawatts
TJ	terajoules
TWh	terawatt-hours
Wh	watt-hours

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Kyrgyzstan 2022

Energy Sector Review

This International Energy Agency (IEA) desk study of the energy policies of Kyrgyzstan was conducted under the auspices of the EU4Energy programme, which is being implemented by the IEA, the Energy Community Secretariat and the Energy Charter Secretariat.

Kyrgyzstan's plentiful water resources make hydropower the country's most important energy source. In addition, Kyrgyzstan has significant coal deposits, but oil and natural gas resources are marginal, making the country dependent on imports of natural gas, oil and oil products.

The Kyrgyz government's long-term Sustainable Development Strategy sets out priorities for the evolution of the country's energy sector through 2040. Key government goals include reducing the country's dependence on hydrocarbon energy sources through further large-scale development of hydropower resources, while also increasing the share of other renewables such as solar, wind and biogas to 10% of the country's total energy mix.

This report assesses Kyrgyzstan's energy sector and the related challenges facing the country, proposing policy recommendations to enhance energy policy making, improve energy data collection and strengthen power system security.

International Energy Agency

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