International Energy Agency

EU4Energy

Georgia 2020

Energy Policy 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.

Georgia is one of the focus countries of the EU4Energy programme, which is implemented by the IEA and the European Union, 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 is designed to support the goals and aspirations of the eleven Focus Countries to implement sustainable energy policies and foster co-operative energy sector development at the regional level. As part of this programme, an in-depth review of each Focus Country is being conducted during 2019-21 to update, enrich and extend analysis of the IEA's 2015 Energy Policies Beyond IEA Countries: Eastern Europe, Caucasus and Central Asia. Georgia is the first country to have hosted the in-depth peer review team during this cycle.

Since the 2015 review, Georgia has made solid progress in both improving the security of its energy supply and transitioning to a more sustainable energy system. The energy sector has been instrumental in establishing the overall liberal economic policy that has earned Georgia a reputation for being a "star reformer". Since Georgia's accession to the Energy Community in 2017, its government has undertaken ambitious reforms to implement the EU acquis[1] for electricity and gas markets, security of supply, renewable energy, energy efficiency and statistics.

It is my hope that this second in-depth review will guide Georgia in its energy sector reforms and help it achieve its energy policy goals of providing affordable, secure and clean energy to its population while strengthening its position both internationally and as a key energy transit country in the Caucasus region.

Dr. Fatih Birol
Executive Director
International Energy Agency

[1] *Acquis communautaire* (in French): The body of Community legislation by which all EU member states are bound. Countries joining the EU must have implemented the existing acquis communautaire by the time of accession

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1. Executive summary

Progress to date

Georgia has made solid progress in the past decade, both in improving the security of its energy supply and in transitioning to a cleaner, more sustainable energy system. The energy sector has been instrumental in establishing Georgia's overall economic policy focused on creating a liberalised economic environment through minimal state interference, deregulation, privatisation, reduced and simplified licensing and taxation, and free trade. All this has earned Georgia the reputation of being a "star reformer" and raised its governance and investment-climate ratings internationally.

The country's electricity sector has evolved from being based on a single-buyer model in the late 1990s – characterised by frequent blackouts, inefficiency and non-payments – to an increasingly competitive model that incorporates private assets and enables greater system stability. Ongoing reforms aim to unbundle the electricity sector and enhance competition and security of supply in accordance with the EU energy acquis. Significant private investments have been obtained for the construction of new hydropower plants (HPPs), stimulated by Georgian power purchase agreements (PPAs) and attractive Turkish market prices for Georgian electricity exports. The recent construction of combined-cycle gas turbine (CCGT) plants has made gas use more efficient and helped to compensate for the seasonality of hydro-based generation. Considerable investments in cross-border infrastructure have boosted regional trade, optimising the use of regional resources and improving security of supply. Furthermore, the introduction of incentive regulations has reduced network losses.

Regarding fossil fuels, low entrance barriers have made Georgia's oil product market quite competitive, and supply diversification is robust. Domestic crude oil and gas production have been declining, but the government is taking measures to keep the investment climate attractive to encourage further hydrocarbon exploration and production. Similar to the electricity sector, investments in oil and gas transportation infrastructure have strengthened Georgia's standing as a transit country and a regional energy platform.

The Georgian government has also made efforts to develop national strategies, policies and measures to combat climate change, adapt the national economy to climate variations, and protect the environment. Thanks to the large share of hydropower in the country's energy mix, Georgia's CO_2 intensity (fuel combustion emissions per unit of gross domestic product [GDP]) is below the world average. As a member of the European Energy Community (EnC), Georgia is working to align its legislation with the EU energy acquis, particularly to promote energy efficiency (EE) and renewable energy (RE). Laws, draft laws, action plans and some regulatory documents have been developed with donor support but some of them had not been approved as of late 2019. However, the regulator,

municipalities and some businesses have implemented several praiseworthy initiatives without waiting for formal adoption of the EE and RE legal and regulatory frameworks. One example is the successful launch of a net-metering programme that has spurred small business and household investments in distributed rooftop photovoltaic (PV) systems. Another commendable trend is the growing use of electric vehicles, supported by national and municipal measures as well as by municipal initiatives to improve public transportation.

Challenges ahead

Although Georgia is still confronted with many challenges in its transition to a more secure, sustainable and affordable energy future, the government recognises most of them and is considering various measures to address them.

Strategic policy making

The Main Directions of State Policy in the Energy Sector, approved in 2015, outline general energy policy directions but provide neither the rationale for these strategic priorities nor guidance on strategy development. Although the more detailed Energy Strategy of Georgia 2020-2030 was approved by ministerial order in October 2019, the absence of a comprehensive energy strategy has affected all aspects of the energy sector and hampered its development. Ad-hoc policy decisions have not been based on sound information or analysis, undermining the energy sector's investment climate.

The 2019 strategy is a commendable effort to make investors and stakeholders aware of the government's intentions and signal its commitment to energy sector reforms, as well as guide development of a market model and secondary legislation to improve market attractiveness for long-term investment. The strategy can, however, be improved: the government should complement the existing document with a long-term action plan that encompasses a wider vision and strategic milestones based on modelling.

Solid analysis of various scenarios based on reliable data is the foundation of sound policy making. The coverage, quality and availability of energy statistics in Georgia have increased notably since the last IEA review in 2015, and the government is encouraged to continue trying to maximise the use of energy data for policy development and tracking progress. Energy efficiency indicators would be particularly useful for demand-side management and long-term energy policy planning, but the existing activity data for developing the indicators are scattered. Consolidating the data as much as possible would allow for the identification of key gaps and creation of a single dataset.

Relevant government institutions are working together to ensure that the energy strategy is consistent with the country's climate change and sustainable development strategies, as well as with its economic, environmental and social policies. However, more could be done to enhance the links between the energy and the research, development and demonstration (RD&D) policies. The Georgian government should therefore continue (and strengthen) its work on RD&D support, including fundamental research on energy technologies and market deployment of innovative solutions. The current Innovation Strategy should be updated with a limited set of priorities organised within thematic areas, and energy-related RD&D should be consistent with the priorities of the national Energy Strategy.

Institutional reforms

A complete system of data collection, processing, modelling, alternative scenario development, policy analysis and decision-making needs to be developed to enable the government to make sound policy decisions. The National Statistics Office of Georgia (Geostat) is doing commendable improvements in collecting energy supply and demand data, including the development of energy efficiency indicators. These efforts should be continued. In addition, the government should consider creating an analytical entity to bring together qualified national experts and specialists to kick-start the process of sound modelling and analysis to inform policy making.

It is also important to have a strong executive body responsible for developing and implementing the energy sector strategy. Georgia had a separate Ministry of Energy until recently, but it was merged into the Ministry of Economy and Sustainable Development (MoESD) in November 2017. Although this new ministry is better positioned to co-ordinate energy, environmental and climate-change policies with more demand-side attention, abolishing the Ministry of Energy has weakened policy making in the energy sphere and may have delayed the reform Georgia committed to as an EnC member. It is important that the MoESD place the energy sector among its highest priorities, and ensure that the department dealing with the energy sector is sufficiently staffed and has the institutional and human-resource capacities to make strategic decisions on the future of the energy market, and to develop and implement energy policies.

The national energy regulator's independence and authority are integral to the successful implementation of energy sector reforms. The Georgian National Energy and Water Supply Regulatory Commission (GNERC) is considered to be competent and independent, and it operates professionally and transparently. It is important that GNERC maintain the authority necessary to make key electricity and gas sector decisions to enable competition as well as improve service quality and consumer protection while ensuring security of supply.

Energy security

Georgia's steadily growing electricity demand is currently being met by domestic hydropower generation (abundant in summer but reduced in winter), supplemented by imports and thermal generation. However, the supply-demand gap is growing: Georgia has been a net electricity importer for the last several years, and in 2019 imports were needed to meet domestic demand even in the summer. Implicit gas subsidies for thermal generation create downwards pressure on end-user tariffs, which does not encourage energy-saving. Plus, the emergence of a new consumer group – cryptocurrency miners attracted by relatively low electricity prices – has made it even more challenging to meet the country's demand during supply-constrained periods.

On the supply side, Georgia has a large portfolio of power plants at various stages of development with identified developers and investors. New HPPs and RE projects are on hold in anticipation of a new market model and support scheme, and the completion of existing HPP projects (about 150) is also being hampered by various barriers, including local opposition and a dim market outlook. The government needs to develop and communicate a sound, clear and comprehensive strategy for the electricity sector, and adopt a new electricity market model as soon as possible. A thorough inventory, as well as monitoring and oversight of existing projects, is also recommended.

In the gas sector, the current market structure and legal framework contradict the principles of the EU energy acquis and provide neither proper regulation nor true competition, which raises energy security concerns. Non-transparent governmental agreements with the two suppliers – Azerbaijan's SOCAR and the Russian Federation's (hererinfater "Russia") Gazprom Export – and the absence of a competition mechanism have left the market segmented and largely monopolistic, which gives these companies considerable market leverage. The regulation allowing distribution companies to supply gas to non-residential consumers at non-regulated prices puts the consumer at the mercy of powerful monopolistic suppliers.

Furthermore, the government's undisclosed long-term agreement with SOCAR undermines prospects of unbundling and market competition. The government is therefore encouraged to renegotiate the agreement in view of the expected gas sector reforms to make the sector more transparent. The lack of supply diversity, SOCAR's dominance of the gas supply chain, and the absence of competition could be a threat to energy security and affordability, as well as to Georgia's economic competitiveness. The government would benefit significantly from putting strong checks and balances in place to manage the risks of the current situation. As the planned gas storage facility would reinforce energy security, its construction should be accelerated.

In the oil sector, an impending task for the government is to fulfil the requirements of the EU acquis for oil, i.e. the obligation to maintain minimum stocks of crude and/or petroleum products. The implementation deadline of 1 January 2023 may be challenging to meet, as Georgia's draft Law on Emergency Stocks, prepared in 2017, is still being discussed with sector stakeholders. The new draft law should address several issues, including available facilities and compliance costs, and especially the impact of the obligations on small importers and their effect on pricing.

The suspension of coal production at the Mindeli and Dzidziguri coal mines following a lethal accident is necessary until security issues have been resolved. Plans to build a 300-megawatt (MW) power plant together with a coal mine are driven by the attractiveness of greater energy security and economic development, but the downside risks – both environmental and economic – are considerable. The government must therefore ensure that investment is adequate for the mine to meet world-class standards for productivity and safety, and for power plant efficiency and pollution control, if the project goes ahead. If these conditions cannot be guaranteed, it would be better to cancel the project to avoid environmental and safety problems.

Energy transition: Alignment with the EU acquis

According to the Protocol on the Accession of Georgia to the Energy Community Treaty, Georgia has committed to implement several EU directives and regulations on electricity and gas markets, security of supply, renewable energy, energy efficiency and statistics. The government of Georgia, supported by donors and international financial institutions, has developed several draft laws to comply with these obligations and has made progress in developing the necessary secondary legislation.

These are very commendable developments, and they demonstrate the government's commitment to align its energy sector with EU regulations. The draft laws are mostly framework laws, and the key regulatory and organisational/technical decisions, including those on a new electricity market model, support scheme(s) for renewables and the future of Georgia's gas market, will be addressed in secondary legislation. The government is

therefore urged to continue its high-standard work with all stakeholders to make these decisions as soon as possible, in full compliance with the EU energy acquis, to provide certainty and visibility to investors and market participants.

Energy, climate change and the environment

The government of Georgia recognises that climate change severely threatens Georgia's (and the world's) sustainable development, and that it may adversely affect various sectors of the economy, including the energy sector. Because climate change is modifying the hydrology of Georgian rivers and altering water availability for hydropower generation, the Georgian Energy Strategy rightly targets electricity generation diversification (by developing other renewable sources such as wind and solar) as well as increased trade with neighbouring countries to optimise the region's use of natural resources. More efforts could be made to: i) assess all possible impacts of climate change (i.e. of rising sea levels, weather extremes, changing hydrology, etc.) on the country's energy infrastructure, including hydropower plants and electricity and gas transmission and distribution systems; and ii) develop adaptation strategies to minimise possible negative effects.

The key climate change mitigation measures the Georgian government envisages are increased energy efficiency, renewable energy deployment and sustainable forest management. The establishment of a legal and regulatory framework to transpose the existing EU acquis on EE and RE is ongoing, as is forest reform, but this process should be accelerated.

Because establishing energy efficiency policy is challenging due to its cross-cutting nature and the large number of participants involved, the government could consider creating a separate body with the mission of improving energy efficiency across all sectors of the economy. Such a targeted, dedicated institution with clear competences and responsibilities could facilitate and streamline the implementation of Georgia's EE objectives.

To support RE development, Georgia aims to introduce market-based schemes compatible with the EU acquis to ensure the smooth integration of RE generators into the future power market. But even during the transition period, before the electricity market is fully functional, competitive and transparent mechanisms – such as auctions for procuring RE capacity – could be put in place. Another short-term action to consider is streamlining the permitting and licensing procedures for hydropower and other RE projects, for example by establishing a one-stop shop.

Concerning opposition to new HPPs, adequate measures should be taken to ensure that they comply with the highest technical, environmental and social quality standards. Adoption of the Environmental Assessment Code is a positive development, but implementation of the Code should be properly enforced. The legal and regulatory framework for social, environmental and economic impacts of energy projects should also be further developed, particularly to address the resettlement of local populations and measures to ensure higher-quality environmental and social impact assessments. Adhering to stringent safety standards for power plant construction could reduce local opposition to new projects, as could public awareness-raising on various issues related to hydropower, including the need to meet growing energy demand in a climate-friendly way.

In the area of air quality, the government plans to take appropriate measures, such as introducing best available technologies (BATs); amending the national legislation to

transpose EU standards; and establishing a framework for regulating air emissions from various sectors. Adequate attention and resources should be allocated to implementing these plans, and the government should also enhance efforts to continue improving the quality and reliability of data on air quality.

An issue that requires urgent attention at the highest policy level is the long-standing unsustainable use of biomass. Although access to gas is becoming increasingly widespread in rural areas, people continue to use wood for heating because it is more affordable. Illegal biomass use has consequently devastated Georgia's forests, especially around towns and villages and in the vicinity of forest roads. The disappearance of biomass resources results in biodiversity loss, landslides and land erosion, flash floods and greater energy poverty.

The government should therefore reinforce efforts to ensure that the current unsustainable use of biomass be replaced by more sustainable alternative solutions. First, the ongoing forestry reform should be accelerated to implement robust forest resource management as soon as possible. Second, the use of waste and residue resources should be supported, for example by developing logistical solutions and targeted state support mechanisms within defined areas for small businesses. Third, more efficient stoves should be introduced along with other energy efficiency measures to reduce consumption.

Consumer protection and service quality

One of the objectives of the national energy policy is to improve service quality and the protection of consumer interests. To this end, Georgia's energy regulator (GNERC) is to be applauded for having introduced successful incentive regulation approaches to reduce network losses, thereby improving electricity and gas supply quality. GNERC continuously monitors the supply reliability through relevant indicators. GNERC has also established various praiseworthy mechanisms for customer protection.

To provide affordable energy to households, the government's policy is to take advantage of the relatively inexpensive natural gas Georgia has access to as a transit country, and to supply this "social" gas to the residential sector and thermal power plants (TPPs) at considerably less than the market price. Although the government does not cover the gap between the market price and subsidised tariffs directly from the state budget, these implicit subsidies are a significant loss of potential budget revenues. According to the price-gap approach, gas subsidies amounted to 1.1% of GDP for the residential sector and 0.5% for electricity in 2017 – equal to 6.7% of budget spending that year. These price subsidies are the primary barrier to the effective development of electricity and gas markets as well as energy efficiency and renewable energy.

Although politically challenging, the benefits of phasing out subsidies and redirecting scarce budget resources towards energy efficiency improvements would be manifold: higher macroeconomic stability; greater energy security; increased economic effectiveness; a cleaner environment, and more equitable social assistance. What is more, energy price subsidies are regressive: wealthier people living in larger apartments and owning more appliances benefit more from the subsidies than less affluent citizens do. There is no economic rationale for retaining subsidies if they are not serving their main purpose – protection of the poor. Targeted social assistance measures should therefore accompany a careful, gradual approach to phase out the subsidies.

The current gas policy also leaves non-residential consumers unprotected from market monopoly. The absence of competition and/or price regulation in the commercial segment of the gas market means there is no downward pressure on the gas prices industries and commercial enterprises must pay. This may be reducing the competitiveness of the Georgian economy, which could lead to lower wages and/or growing unemployment and result in social unrest. The gradual phase-out of subsidies and cross-subsidies in the gas and electricity sectors – as greater competition is introduced and/or regulations are strengthened – is therefore a much healthier way to protect a vulnerable population while boosting economic development. The phasing out of subsidies should be accompanied by targeted financial support to protect the most risk-exposed customers.

Key recommendations

The government of Georgia should:

- Strengthen the country's long-term energy strategy by:
  - 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.
  - Ensuring clear links among the country's: a) energy strategy; b) strategic climate change documents under the United Nations Framework Convention on Climate Change (UNFCCC); c) sustainable development strategies; d) economic, environmental and social policies; and e) national RD&D strategy.
  - Introducing a robust action plan and monitoring mechanisms to track progress and adjust implementation schemes if needed.
  - Addressing all types of energy, including fossil fuels and renewable energy (i.e. biomass/biofuels) in policy coverage.
- Continue to improve the collection of national energy statistics to inform policy decisions (via e.g. energy efficiency indicator development).
- Raise its analytical capacity by: a) assembling qualified national experts and specialists for energy market and policy analysis to develop functional policies and industry regulations; and b) strengthening co-operation with academia so that energy sector development is based on solid scientific evidence.
- Continue to work closely with parliament and other stakeholders to swiftly adopt primary legislation on new electricity and gas markets, to promote energy efficiency and renewable energy, and to give clear signals to all market participants and guide their investment decisions.
- Develop effective secondary legislation that enables efficient market functioning, and gradually phase out the state's selective interference in the energy sector so that wholesale energy trade and investment decisions can be made according to market principles.

- Gradually phase out implicit subsidies and cross-subsidies in the electricity and gas sectors to enable much-needed investments in infrastructure, encourage energy efficiency and renewable energy development, and ensure savings and a more equitable distribution of public wealth. In parallel, targeted financial support should be refined to protect the most vulnerable customers.
- Introduce stronger checks and balances in the gas sector to address the lack of competition and encourage more transparency.

2. General energy policy

Key data

(2018)

TPES: 4.8 Mtoe (natural gas 41.7%, oil 26.4%, hydro 17.7%, coal 6.3%, bioenergy and waste 5.6%, geothermal 0.4%, wind 0.2%, solar 0.1%), +60.5% since 2008

TPES per capita: 1.3 toe/cap (world average 2017: 1.9 toe/cap)

TPES per unit of GDP: 119 toe/2015 USD million PPP (world average 2017: 123 toe/USD million PPP)

Energy production: 1.3 Mtoe (hydro 68.4%, bioenergy and waste 21.8%, coal 4.5%, oil 2.4%, geothermal 1.4%, natural gas 0.7%, wind 0.6%, solar 0.2%), +16.2% since 2008

Country overview

Located in the Southern Caucasus at the crossroads of Western Asia and Eastern Europe, Georgia is bounded on the west by the Black Sea, on the north by Russia, on the south by Turkey and Armenia, and on the southeast by Azerbaijan (Figure 2.1). Situated on the shortest route between Europe and Asia, its transport system is a key link in the historic Silk Road trade network. The capital and largest city is Tbilisi, and the country covers 69 700 square kilometres (km^2) with a population of 3.72 million and gross domestic product (GDP) per capita of USD 4 068 in 2018 (World Bank, 2019). Georgia is a unitary, semi-presidential republic,[2] with the government elected through a system of representative democracy.

Georgia's overall economic policy has been focused on creating a liberalised economic environment through minimal state interference, deregulation, privatisation, reduced and simplified licensing and taxation, and free trade. This has earned it the reputation of being a "star reformer" and has raised its governance and investment-climate ratings internationally. Georgia's economy has grown strongly over the last decade, at an average annual growth rate (AAGR) of 4.5% despite numerous external shocks, and the medium-term growth outlook is positive (World Bank, 2019).

[2] A semi-presidential republic is ruled by an elected president, a prime minister and a cabinet. The president is usually elected and serves for a fixed term specified by the constitution.

Figure 2.1 Map of Georgia

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

In its pursuit of westward-leaning political, economic and foreign policies, Georgia has been a signatory to the Energy Charter Treaty since 1995 and a member of the World Trade Organization since 2000. It signed an Association Agreement, including assent to the Deep and Comprehensive Free Trade Area (DCFTA), in June 2014 with the European Union, and the agreement was ratified by the European Parliament in December 2014. In October 2016, Georgia's Ministry of Energy signed an Accession Protocol to the Energy Community Treaty, which was ratified by the parliament in April 2017.

Georgia's well-developed energy sector has been largely unbundled since the late 1990s. With hydropower and fuelwood as its primary domestic energy sources, the government is focused on securing private investment to construct new hydropower stations and diversify fossil fuel supply sources and routes.

Energy supply and demand

Georgia's primary energy supply is dominated by imports (Figure 2.2). Domestic energy production consists mainly of hydropower and bioenergy, with small amounts of coal (up to 2018[3]), and oil and gas production. Virtually all the natural gas and almost 90% of the coal consumed domestically in 2018 were imported, and although two small refineries recently commenced operations, Georgia currently relies almost fully on oil product imports as well. Natural gas and oil products together formed over two-thirds of the total primary energy supply (TPES) in 2018.[4]

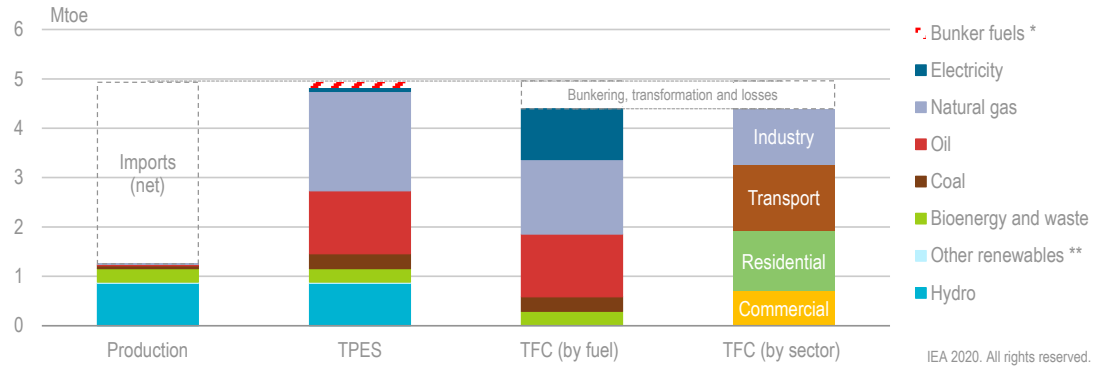
[3] Georgian coal mines were closed in 2018 due to safety concerns after ten people lost their lives within a seven-month period.

[4] TPES is made up of production + imports – exports – international marine and aviation bunkers ± stock changes. This equals the total supply of energy consumed domestically, either in transformation (e.g. power generation and refining) or in final use.

Transport was the largest energy-consuming sector in 2018, responsible for 31% of total final consumption (TFC),[5] followed by the residential and industry sectors, both with shares of more than 25%. The public and commercial sectors accounted for the remainder.

Oil and natural gas are the main energy sources in final consumption. While oil products are used mostly in the transport sector, natural gas consumption is more diverse, as it is used for electricity generation (17% of total generation in 2018), in industry and in the residential sector. Furthermore, natural gas accounts for the largest share of energy consumed in the residential sector.

Figure 2.2 Energy production, supply and consumption by fuel and sector, 2018



Georgia is a net energy importer, with natural gas and oil dominating the energy supply.

* Includes international aviation and marine bunker fuel. Not included in TPES.

** Includes wind, geothermal and solar thermal.

Note: Mtoe = million tonnes of oil equivalent.

Source: IEA (2020), *World Energy Balances 2020* (database), www.iea.org/statistics.

Energy production and self-sufficiency

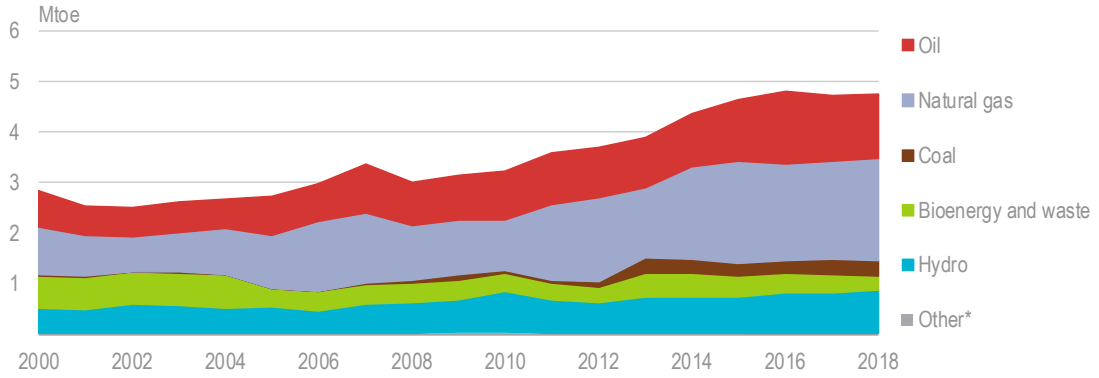
Although TPES declined rapidly after the collapse of the Soviet Union, it increased 68% during 2000-18 to reach 4.8 Mtoe (Figure 2.3).

Natural gas and oil (mostly refined oil products) have made up the majority of TPES growth. Their combined share expanded 16% between 2000 and 2018, to account for 68% of overall TPES in 2018. Supplies of both energy sources consist mostly of imports.

Compared with the world average, Georgia uses notably less coal (6% of TPES vs. 27% in 2017) (Figure 2.4). Also, the share of fossil fuels in TPES is slightly below the world average (75% vs. 81%).

[5] TFC reflects final energy consumed by end users in the form of electricity, heat and fuels (such as natural gas and oil products), and does not include the transformation sector (e.g. power generation and refining).

Figure 2.3 Total primary energy supply by source, 2000-18



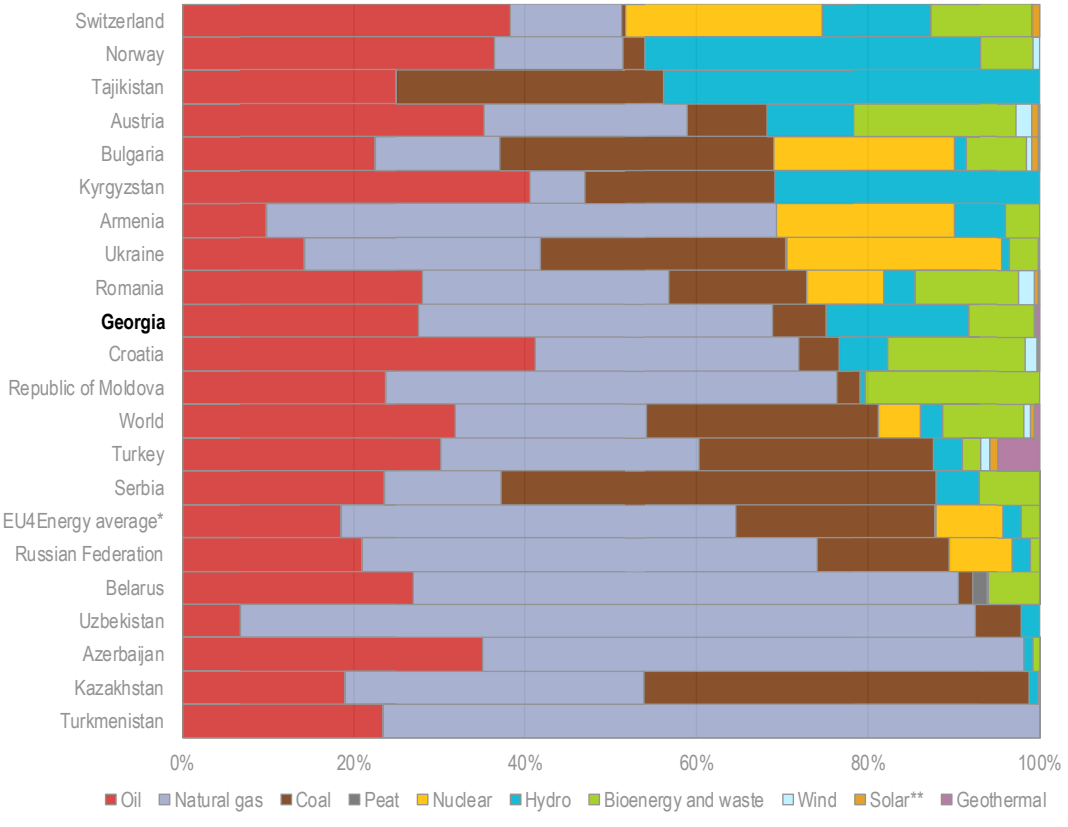
Georgia's TPES increased at an AAGR of 2.9% from 2000 to 2018.

* Includes wind, geothermal and solar; not visible at this scale.

Note: Electricity trade is not included in the graph.

Source: IEA (2020), *World Energy Balances 2020* (database), www.iea.org/statistics.

Figure 2.4 Breakdown of total primary energy supply in selected countries, 2017



Fossil fuels make up 75% of Georgia's TPES.

* Covers Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Tajikistan, Turkmenistan, Ukraine and Uzbekistan.

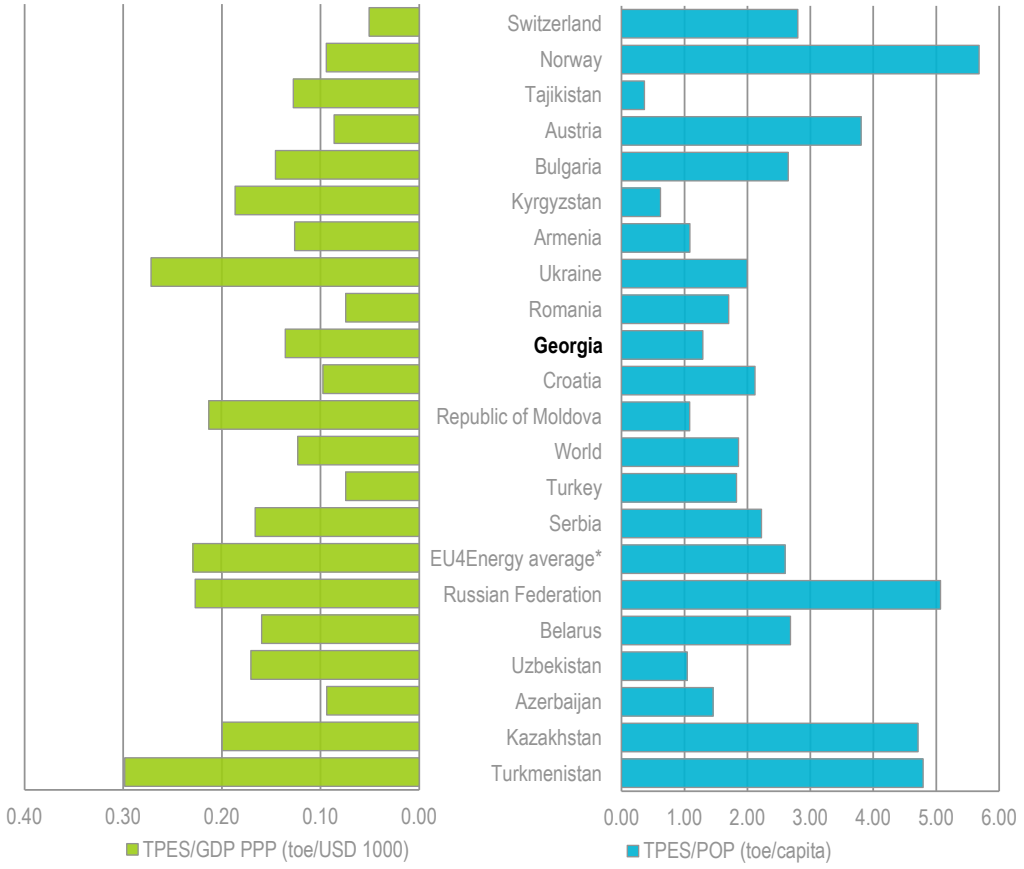
** Includes solar PV, solar thermal, wave and ocean power, and other power generation (e.g. from fuel cells).

Note: Electricity trade not included; countries sorted by the fossil fuel share in the TPES.

Source: IEA (2019), *World Energy Balances 2019*, www.iea.org/statistics.

Georgia also consumes less energy per capita than most other EU4Energy countries and falls below the world average (Figure 2.5). In terms of TPES per unit of GDP at purchasing power parity (PPP), Georgia is slightly above the world average but below that of EU4Energy countries.

Figure 2.5 TPES per GDP PPP and per capita in selected countries, 2017



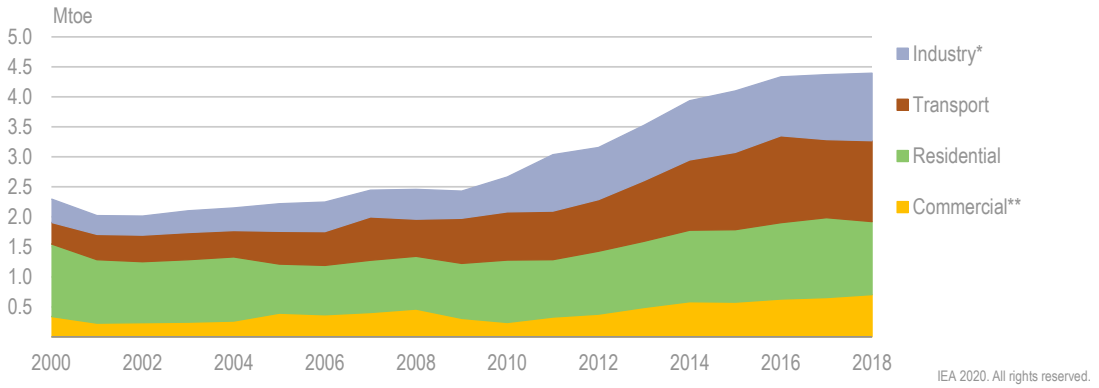
Notes: toe = tonne of oil equivalent. POP = population.

Source: IEA (2019), *World Energy Balances 2019*, www.iea.org/statistics.

Energy consumption

Georgia's TFC was at its lowest in the early 2000s and has increased ever since except for a slight drop in 2009 following the global economic downturn and the military conflict with Russia in 2008 (Figure 2.6). In 2018, its TFC was 4.4 Mtoe (+90% since 2000). The residential sector has traditionally been the largest consumer of energy (since 1995), but in recent years growth in transport sector consumption (+276% since 2000) has challenged this order. With a share of over 30%, transport was the largest energy consumer in 2018, followed by the residential sector (28%). Since 2000, industry sector consumption has expanded almost 190%, forming a 26% share of TFC in 2017. Commercial sector energy consumption has also increased by over 100% since 2000, and its share in TFC was 16% in 2018.

Figure 2.6 Total final consumption by sector, 2000-2018



Georgia's TFC almost doubled (+91%) from 2000 to 2018, mostly as a result of growth in the transport and industry sectors.

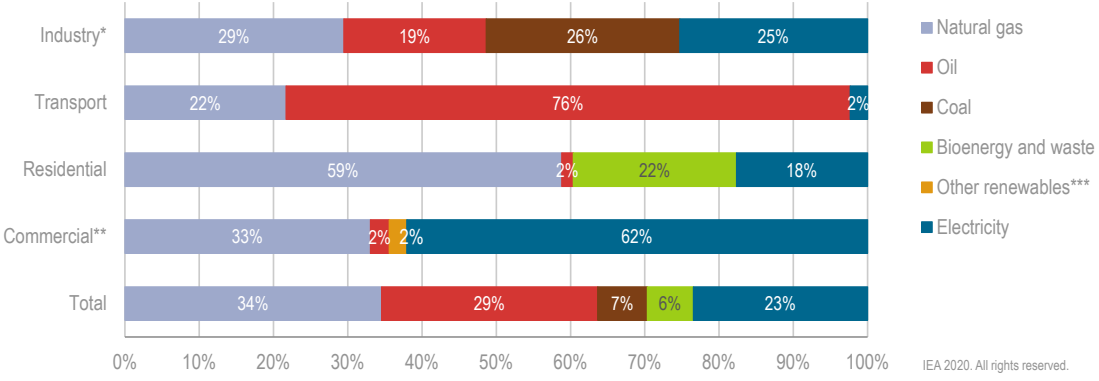
* Includes non-energy consumption.

** Includes commercial and public services, agriculture and forestry.

Source: IEA (2020), *World Energy Balances 2020* (database), www.iea.org/statistics.

Natural gas is the largest energy source in Georgia's energy consumption, accounting for 34% of TFC in 2018, with the majority consumed in the residential sector (Figure 2.7). Oil is the second-largest source at 29% of TFC, followed by electricity (23%). Remaining consumption (13%) consists of bioenergy, coal, solar thermal and geothermal. Industry energy sources are diverse, whereas electricity accounts for a considerable share in the commercial sector. Despite oil products being the dominant energy source in the transport sector, the expanding natural gas share (16%) is noteworthy. Georgia does not currently use district heating.

Figure 2.7 Total final consumption by source and sector, 2018



Natural gas and oil dominate except in the commercial sector, which uses mainly electricity.

* Includes non-energy consumption.

** Includes commercial and public services, agriculture and forestry.

*** Includes geothermal and solar thermal.

Note: For ease of readability, shares of less than 1% are not shown.

Source: IEA (2020), *World Energy Balances 2020* (database), www.iea.org/statistics.

Energy sector governance

Executive

The Ministry of Economy and Sustainable Development (MoESD) is responsible for state policy in the energy sector as well as policies related to the sustainable development of the country's economy. It can adopt secondary legislation related to the energy sector (through ministerial orders). The MoESD took over the responsibilities of the former Ministry of Energy in 2017.

The Ministry of Environmental Protection and Agriculture develops and implements state policy pertaining to climate change, the environment and agriculture. It is responsible for environmental impact assessments (including for energy sector projects) as well as for state governance and control over the use of natural resources (except for minerals, oil and gas).

The Ministry of Finance (MoF) sets fiscal policy and oversees government spending. For example, it raised concerns about the possible financial implications of memorandums of understanding (MoUs) and power purchase agreements (PPAs) signed with hydropower developers.

The Ministry of Infrastructure and Regional Development is overseeing several building renovation projects that have an energy-efficiency component and are funded by different donors through the Municipal Development Fund.

The Georgian Energy Development Fund is a state-owned joint-stock company created in 2010 and reporting to the MoESD. Its mission is to develop Georgia's renewable energy potential by identifying promising renewable energy projects and supporting their development through pre-feasibility and preliminary environmental impact assessments, and by finding investors.

The National Forestry Agency, reporting to the Ministry of Environmental Protection and Agriculture, is responsible for sustainably managing the Georgian Forest Fund, which involves overseeing multipurpose forest management planning; forest maintenance, restoration and reforestation; and forest inventories.

The Public-Private Partnership Agency is a new body created following adoption of the Law on Public-Private Partnerships in May 2018. The agency's mandate is to lead the development and implementation of public-private co-operation projects.

Legislative

The Parliament of Georgia adopts primary legislation according to the procedure laid out in the Constitution. New laws or amendments to existing legislation can be initiated by the government, ministries, parliamentary committees, individual members of parliament or groups of members, and by citizens when an initiative has at least 30 000 supporters. By default, laws are adopted in three hearings by the parliament and enter into force the 15th day after official publication.

The parliamentary **Committee on Sectoral Economy and Economic Policy** oversees energy sector developments through regular or topical hearings with the participation of the MoESD and other stakeholders. The parliamentary **Environmental Committee** is

concerned with the environmental impact of energy projects as well as forestry reform, which may influence the use of biomass as a fuel.

The parliament's oversight of energy sector reforms has traditionally been limited and mostly concerned with the impact of policies and legislation on energy tariffs. In 2019, when several energy-related draft laws were submitted to the parliament, both committees requested that the government develop a long-term energy sector strategy.

Secondary legislation (regulations, decrees, orders, etc.) is initiated and passed by the Georgian National Energy and Water Supply Regulatory Commission (GNERC) and the relevant executive bodies (ministries).

Regulatory

GNERC, established in 1997, is the regulatory body for the energy sector. Its responsibilities are to:

- develop and/or approve key electricity and natural gas sector regulations such as the rules of energy supply and consumption, the grid code, the standard conditions presented by the market operator and dispatch and transmission licensees, tariff methodologies, licensing rules and conditions, etc.
- issue licences and regulate the activities of the electricity and natural gas sector licensees; monitor the energy markets.
- set and regulate tariffs for electricity transmission, dispatch, distribution, transit, import and export, and market operator services, as well as for natural gas transportation, distribution, transit, supply and consumption. It also sets caps on wholesale prices for existing plants based on their costs, except for deregulated plants with a capacity below 40 megawatts (MW).
- resolve disputes among regulated market participants or between consumers and service providers. Cases are resolved in open hearings, but if parties disagree with the GNERC decision, they are authorised to take the case to court.
- organise and co-ordinate energy sector certification processes.
- ensure a legal basis for stable supplies of electricity and natural gas as well as water, etc.

Changes to the Electricity and Natural Gas Law in 2007 moved some of the regulator's key functions (i.e. approval of the electricity market rules and the ten-year network development plans [TYNDPs] of transmission operators) to the ministry responsible for energy (currently the MoESD), which substantially weakened GNERC's position of independent regulator. According to the MoESD, a currently implemented reform aims at making GNERC responsible for approving market rules.

The State Agency for Oil and Gas is a regulatory body established in 1999 under the Oil and Gas Law as an independent body to oversee and regulate oil and gas exploration and production. Since 2013, the State Agency for Oil and Gas has been a legal entity under public law within the MoESD and is responsible for regulating oil and gas operations, oil refining, gas processing and/or transportation activities in Georgia according to Oil and Gas Law Amendment No. 467 of 25 March 2013.

Energy Statistics

The National Statistics Office of Georgia (Geostat) is responsible for official energy statistics and leads the national energy statistics consulting group that serves as a platform for dialogue and information-sharing among national data providers and users (see Section Energy Statistics).

Key policy directions

Strategic policy making

Until late 2019, the government's energy policy was laid out in the very short Main Directions of State Policy in the Energy Sector of Georgia, adopted in 2015 (Box 2.1). The document does not explain how Georgia's strategic priorities were developed.

Draft strategies developed for the power and natural gas subsectors for 2017-26 were posted for public discussion in 2016 and offer an overview of the subsectors at that time, but they have still not been finalised. The most advanced long-term planning documents for these subsectors are the TYNDPs prepared by the electricity and gas network operators, based on analysis of past trends and modelling different demand-supply scenarios.

Documents prepared by the Georgian government under the United Nations Framework Convention on Climate Change (UNFCCC) (i.e. its Intended Nationally Determined Contribution, the Third National Communication, biannual updates, etc.) include lists of national policies and measures related to energy efficiency and renewable energy. The government developed and approved a National Energy Efficiency Action Plan (NEEAP) on 23 December 2019 and a National Renewable Energy Action Plan (NREAP) on 3 October 2019. Other documents with a strategic dimension and links to the energy sector include the National Environmental Action Programme (NEAP) 2017-2021, the draft Low Emission Development Strategy (LEDS) and the draft State Strategy for the Development of Solid Biofuels.

Several projects have been financed by donors and implemented by international consultants for capacity-building on energy and power sector planning. International donors and international financial institutions (IFIs) have also sponsored assessments of energy sector investment priorities, the most recent being an undisclosed study by McKinsey, commissioned by the MoESD. As these documents have not been released to the public, it is difficult to judge whether they have affected Georgian policy making in the energy sector.

In 2019, the parliament requested that the MoESD provide a general strategy document demonstrating the state's vision for energy sector development. In response, the MoESD, together with experts from the energy sector's public entities, developed an updated draft Energy Strategy in October 2019.[6] Although it refers to existing action plans such as the TYNDPs as well as plans to expand gas infrastructure in rural areas, it does not include strategic targets based on solid analysis of supply-demand trends and various scenarios for the energy sector overall.

[6] This draft strategy, approved by the MoESD, was made available for comment in November 2019 – after completion of the in-depth review (IDR) mission.

Box 2.1 Main Directions of State Policy in the Energy Sector

The main policy targets are:

i. Diversification of supply sources and optimal utilisation of local resources and reserves to meet all local electricity demand.

ii. Utilisation of Georgia's renewable energy resources, including hydropower, wind, solar, biomass and geothermal.

iii. Gradual harmonisation with the EU energy acquis.

iv. Energy market development, and improvement of energy trading mechanisms.

v. Reinforcement of Georgia's role as a transit country and as a regional platform for the generation and trade of clean energy.

vi. Development and implementation of an integrated approach to energy efficiency.

vii. Consideration of environmental components in the implementation of energy projects.

viii. Improvements in service quality and the protection of consumer interests.

Source: Ministry of Energy (2015), Main Directions of State Policy in the Energy Sector of Georgia.

Energy reforms: Alignment with the EU acquis

According to the Protocol on the Accession of Georgia to the Energy Community Treaty signed 14 October 2016, Georgia has committed to implement several EU directives and regulations related to electricity, natural gas, energy efficiency, renewable energy and energy statistics (Table 2.1).

Table 2.1 Energy directives and regulations to be transposed by Georgia

Directive	Focus area	Due date*
DIRECTIVE 2009/72/EC	Electricity market	31.12.2018
DIRECTIVE 2009/73 /EC	Natural gas market	31.12. 2020
REGULATION 714/2009	Cross-border trade in electricity	31.12.2018
REGULATION 715/2009	Access to natural gas networks	31.12. 2020
DIRECTIVE 2005/89/EC	Security of electricity supply	31.12.2019
DIRECTIVE 2009/28/EC	Renewable energy	31.12.2018
DIRECTIVE 2012/27/EU	Energy efficiency	31.12.2018
DIRECTIVE 2010/31/EU	Energy efficiency of buildings	31.12.2019
DIRECTIVE 2008/92/EC	Transparency of gas and electricity supply	31.12.2017
REGULATION 1099/2008	Energy statistics	31.12.2017

* Due dates can be reviewed and can include a 12-month grace period. A further extension for implementing directives can also be permitted if the Georgian government requires more time.

Sources: Adapted from TBC Capital (2019), "Energy sector overview: Charging forward" and Tsurtsumia, T. (2017), "Georgia's European energy commitments".

Georgia's legal and regulatory framework for the electricity and gas sectors was amended in 2018 to introduce some approximation with the EU energy acquis. Amendments to the Law on Electricity and Natural Gas have obligated large electricity consumers to become direct customers at the wholesale level and have allowed wholesale trade (see Chapter 6 on electricity). In 2018, GNERC approved amendments to the 2014 Electricity Network Code to make the operation of transmission networks more transparent, and adopted the Natural Gas Network Rules that define the procedures, conditions and principles for managing the gas transportation and distribution system. GNERC also introduced new Service Quality Rules to improve electricity, natural gas and water suppliers' commercial service quality.

To further comply with Energy Community (EnC) membership obligations, the Government of Georgia has developed and approved several laws, draft laws and strategic documents. These include: a new Law on Energy and Water Supply published 27 December 2019; a draft Law on Energy Efficiency; a draft Law on Energy Performance of Buildings; a Law on Energy Labelling published 26 December 2019; and a Law on Promoting the Production and Use of Energy from Renewable Sources published 27 December 2019, as well as NEEAP and NREAP.

The draft laws were developed with the EnC's help, and all of them had been submitted to the parliament and were awaiting public discussion and adoption as of December 2019. In parallel with developing this draft primary legislation, the MoESD and the regulator, supported by donors and IFIs, have begun preparing secondary legislation so that it can be passed soon after adoption of the primary legislation.

In addition, the Electricity Market Intermediary Concept Design was approved in December 2018 by an order of the Minister of Economy and Sustainable Development. This document is to serve as a basis for further development of the final electricity market design.

The framework for energy sector projects (and other public services and infrastructure) was reformed with adoption of the Law on Public-Private Partnerships in May 2018 (Box 2.2). The law provides some flexibility and exemptions for the energy sector, which is considered strategic. Projects in the energy sector can be negotiated directly with a single private partner, without a public tendering and evaluation procedure. However, if an energy project with a capacity greater than 100 MW is initiated by a private partner, it should include a feasibility study prepared by an independent party. Power generation projects could benefit from long-term guaranteed PPAs.

Box 2.2 Public-private partnerships

Georgia's Law on Public-Private Partnerships was adopted in May 2018 and enacted in August 2018. It provides a legal framework for co-operation between public and private partners when developing public infrastructure or providing municipal services.

The law defines the criteria for public-private projects, which should involve the provision of public (municipal) services by a private partner or the operation and/or creation and maintenance of public infrastructure. Public-private partnership contracts are signed for at least five years, are worth at least USD 2 million, and are fully or partially financed by private partners.

The law allows both concessional and non-concessional partnerships. In the first case, the private partner gets revenues from the end consumers of the services being provided. In the second, the private partner is compensated by the public partner. The law and its bylaws provide rules for project identification, initiation and preparation; procedures for selecting private partners; the stages of project implementation and monitoring; and guidelines for post-implementation relations.

Source: *Georgia Today* (2018), "Public-private partnerships: An effective legal tool for attracting FDI".

Energy statistics

Official energy statistics are the responsibility of the National Statistics Office of Georgia (Geostat), and statistics data are open and in the public domain.[7] Geostat also leads the informal national energy statistics consulting group that serves as a platform for dialogue and information-sharing among national data providers and users.

Since 2014, Geostat has been responsible for compiling the official *Energy Balance of Georgia*. To achieve this, it was necessary to introduce new data collection to obtain information on the final consumption of energy resources, and at the same time Geostat adopted international standards and a methodology[8] for collecting and compiling energy data (solid biomass data are considered representative). Energy consumption data do not include end-use data from Abkhazia and South Ossetia, however.

In 2016, when Georgia became an EnC member, additional indicators for energy statistics were required in accordance with European Parliament and Council regulations. To fulfil these reporting obligations, Geostat submits annual energy questionnaire responses to the IEA and Eurostat (for coal, electricity, renewables, oil and gas).[9] Since 2018, Geostat has also been publishing monthly oil and gas data, as well as data on electricity and gas prices.

Furthermore, Geostat conducted a household survey in 2017 to collect information on end uses of energy (e.g. for space heating and cooking), thus establishing a basis upon which the government may formulate energy efficiency indicators.[10] The survey is to be conducted every five years, and with IEA support, Geostat has also begun compiling datasets for the industry and residential sectors. The next household energy consumption survey is planned for 2022.

The MoESD is among the main users of the energy data. The energy module of the national greenhouse gas (GHG) inventory, prepared by the Ministry of Environmental Protection and Agriculture, is based mostly on the official energy balance. Although the available energy data could improve energy planning, including through long-term energy modelling, this potential is currently being realised only to a limited extent.

Energy efficiency is high on the government's agenda, with several draft laws awaiting adoption, and there is consensus on the need for relevant information and analysis.

[7] https://www.geostat.ge/en
[8] https://unstats.un.org/unsd/energystats/methodology/ires/
[9] https://www.iea.org/statistics/resources/questionnaires/
[10] https://webstore.iea.org/energy-efficiency-indicators-fundamentals-on-statistics; https://webstore.iea.org/energy-efficiency-indicators-essentials-for-policy-making

Geostat has therefore also included energy efficiency data production in its medium-term strategy,[11] and the Government of Georgia plans to establish an energy efficiency unit within the MoESD.

Assessment

Strategic policy making

Georgia has made significant progress in pursuing its key energy policy directions approved in 2015, and has begun to develop a more strategic vision for various subsectors, including electricity, renewable energy and energy efficiency. However, its 2015 Main Directions of State Policy outlines only general energy policy directions without providing the rationale for strategic priorities or guidance on strategy development. The more detailed Energy Strategy of Georgia 2020-2030 was approved by ministerial decree in October 2019. As an official government vision for the sector was absent until late 2019, the TYNDPs developed by the electricity and gas transmission system operators served as unofficial subsector strategies, supplemented by five-year investment plans for transmission and distribution networks.

It is encouraging that the MoESD has developed an updated draft strategy for the energy sector. It is very important to ensure that the new strategy is updated and provides a long-term comprehensive vision for development of the entire energy sector based on analyses of various scenarios.

Several documents prepared by the Georgian government for UNFCCC reporting list national policies and measures related to energy efficiency and renewable energy. In addition, national action plans for energy efficiency and renewable energy have been developed and adopted to comply with Georgia's obligations as an EnC country. It is important to guarantee consistency among them while ensuring they are based on sound analysis of reliable data and solid forecasts.

The recently adopted new Energy and Water law is intended to improve Georgia's capacity to achieve higher levels of energy security, attract substantial investments and improve the regional standing. To further improve the energy sector investment climate, the country's new energy policy and strategy should be developed: a) in line with its general economic development strategy; b) transparently, in co-operation with sector stakeholders; and c) based on sound analytical evidence and planning methods. A clear, strategic long-term policy vision would:

- make investors and stakeholders aware of the government's intentions
- reduce ad-hoc policy decisions without a sound analytical and informational basis
- signal a strong commitment to energy sector reforms
- guide the development of a market model and secondary legislation
- improve market attractiveness for long-term investments in the energy sector.

[11] https://www.geostat.ge/en/modules/categories/630/strategy-for-the-development-of-statistics

Improving energy data use

Reliable data is the basis for sound policy making. The 2015 IEA review highlighted the need to "maximise the use of energy data for energy policy setting and tracking progress, and continue improvements to the collection, compilation and use of energy data and encourage development of energy efficiency indicators as a tool for demand-side management and long-term energy policy planning" (IEA, 2015). The coverage, quality and availability of energy statistics in Georgia have since improved notably.

There is consensus on the need for relevant information and analysis on energy efficiency. Developing indicators to assess the current situation in all sectors (industry, services and transport) and later monitor the impact of policy measures remains a priority.

Geostat has included energy efficiency data production in its medium-term strategy, and at the same time the Government of Georgia plans to establish an energy efficiency unit within the MoESD. Clarifying the future roles of both institutions to avoid duplications or gaps would therefore help optimise the use of human resources.

Because the residential sector is responsible for almost 30% of TFC, the results of the first household energy consumption survey conducted in 2017 have been highly important, being used and quoted by both public and private sector entities. The results of the next survey, planned for 2022, will be crucial for monitoring development and assessing the quality of between-survey expert estimates. Resources to carry out the tasks should be secured as soon as possible, and interim data be estimated and modelled by experts.

Activity data required to develop energy efficiency indicators (e.g. on the vehicle fleet and housing stock) are currently scattered. Consolidating these data as much as possible would permit the identification of key gaps and the creation of a single dataset for the use of national institutes.

Draft legislation on oil stockholding obligations entails a detailed monitoring system.[12] To avoid duplicating any data collection and to ensure compliance with international methodology, the relevant stakeholders should work together closely to design it.

Institutional reforms

To enable the government to make sound policy decisions, the entire chain of data collection, processing, modelling, alternative scenario development, policy analysis and decision-making needs to be developed in Georgia. To kick-start this process, the creation of an analytical entity to assemble qualified national experts and specialists to develop functional plans and policies and to recommend industry regulations should be explored.

It is also important to have a strong executive body responsible for developing and implementing the energy sector strategy. Georgia had a separate Ministry of Energy until recently, but it was merged into the MoESD in November 2017, with energy sector governance subordinated to one of its deputy ministers. On the positive side, this strong new ministry could be better positioned to co-ordinate energy, environmental and climate change policies with more attention to the demand side (the former Ministry of Energy focused primarily on supply, particularly on developing the country's large hydro potential).

[12] The draft legislation transposes Directive 2009/119/EC to the national context.

Nevertheless, abolishment of the Ministry of Energy and the transference of its functions and staff seems to have weakened policy making and energy diplomacy capacity in the energy sphere. This may be one of the reasons for delays in the energy reform Georgia committed to under EnC membership. It is important to ensure that the MoESD places the energy sector among its highest priorities, and that the department dealing with the energy sector is sufficiently staffed and has strong institutional and human resource capacities to make strategic decisions on the future energy market as well as develop and implement energy policies.

Another key priority is the independence and authority of the national energy regulator. GNERC operates professionally, and its competence and independence appear to be in line with European standards. Sector stakeholders report that the regulator is transparent and co-operates with them to develop effective regulatory solutions. It is important to guarantee GNERC's continued authority to make key electricity and gas sector decisions, to enable competition as well as improve service quality and consumer protection while ensuring security of supply.

Supply-demand balance and regional trade

Diversification of supply sources and the optimal use of local resources to meet electricity demand, as well as the utilisation of renewable energy sources (RESs), are among Georgia's key policy objectives (see Box 2.1), and it has made significant progress in these areas. Not only has it attracted private investments in new hydropower plants (HPPs) (driven by PPAs and attractive Turkish market prices), it has also begun developing other RESs (e.g. a wind plant has been built and several more are planned). It has also successfully initiated a net-metering programme and is building modern combined-cycle gas turbine (CCGT) plants to improve the efficiency of gas use and address the seasonality of hydro-based generation. In addition, substantial investments have been made in cross-border infrastructure to strengthen Georgia's role as a transit country and regional platform for clean energy.

Significant challenges remain, however, as the electricity supply-demand gap is growing. Georgia has been a net importer of electricity for several years already, and in 2019, imports were needed to meet domestic demand even in the summer (i.e. the period when water is more readily available for hydropower generation). New HPP/RES projects are on hold in the expectation of a new market model and support scheme, and there is also strong opposition by non-governmental organisations (NGOs) and residents to some new HPPs. Undoubtedly, a sound, clear and comprehensive government strategy for the electricity sector must be developed and communicated, and the new electricity market model must be adopted as soon as possible.

Energy reforms: Alignment with the EU acquis

According to the Protocol on the Accession of Georgia to the Energy Community Treaty, Georgia has committed to implement several EU directives and regulations on electricity and gas markets, security of supply, renewable energy, energy efficiency and statistics. The Government of Georgia has developed several draft laws to comply with these obligations and, along with this draft primary legislation, has also made progress in developing secondary legislation with the support of various donors and IFIs.

These very commendable developments demonstrate the government's commitment to align Georgia's energy sector with EU regulations. The draft laws that have been

developed are framework laws, and the key regulatory, organisational and technical decisions, including those on the new electricity market model, support scheme(s) for renewables and the future of Georgia's gas market, will be covered in secondary legislation. The government is therefore urged to continue working with all stakeholders to make these decisions as soon as possible, in full compliance with the EU energy acquis, to provide certainty and visibility to investors and market participants.

Consumer protection and service quality

One of the objectives of the national energy policy is to improve service quality and the protection of consumer interests. To this end, Georgia can be applauded for having introduced successful incentive regulations to reduce network losses, thus improving electricity and gas supply quality. The regulator (GNERC) has also established various praiseworthy mechanisms for customer protection.

To provide affordable energy to households, the government's policy is to take advantage of the relatively inexpensive natural gas Georgia has access to as a transit country, and to supply this "social" gas to the residential sector and thermal power plants (TPPs) at considerably less than the market price. Although the government does not cover the gap between the market price and subsidised tariffs directly from the state budget, these implicit subsidies are a significant loss of potential budget revenues. According to the price-gap approach, gas subsidies for the residential sector amounted to 4.6% of total budget spending in 2017 and 2.1% for the electricity sector (see Chapter 3 on natural gas). These price subsidies are the primary barrier to the effective development of electricity and gas markets.

Although politically challenging, the benefits of completely phasing out subsidies and redirecting budget resources towards energy efficiency improvements would be manifold: higher macroeconomic stability; greater energy security; increased economic effectiveness; a cleaner environment; and more equitable social assistance. What is more, energy price subsidies are regressive: wealthier people tend to consume more because they live in larger apartments and own more appliances, and thus benefit to a greater extent from subsidies. There is therefore no economic rationale to retain subsidies, as they are not serving their main purpose – protection of the poor. Targeted social assistance measures should accompany a careful, gradual approach to phase out the subsidies.

The current gas policy also leaves non-residential consumers unprotected from market monopoly. The absence of competition and/or price regulation in the commercial segment of the gas market means there is no downward pressure on the prices industries and commercial enterprises must pay for gas. This may be reducing the competitiveness of the Georgian economy, which could lead to lower wages and/or growing unemployment and result in social unrest. The gradual phase-out of subsidies and cross-subsidies in the gas and electricity sectors – as greater competition is introduced and/or regulations are strengthened – is therefore a much healthier way to protect a vulnerable population while boosting economic development. The phasing out of subsidies should be accompanied by targeted financial support to protect the most risk-exposed customers.

Recommendations

The Government of Georgia should:

- Strengthen the country's long-term energy strategy by:
  - 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.
  - Ensuring clear links among the country's: a) energy strategy; b) strategic climate change documents under the UNFCCC; c) sustainable development strategies; d) economic, environmental and social policies; and e) national research, development and demonstration (RD&D) strategy.
  - Developing the strategy in close consultation with all stakeholders, based on solid analysis of supply-demand trends and alternative scenario modelling that applies reliable data and sound assumptions.
  - Introducing a robust action plan and monitoring mechanisms to track progress and adjust implementation schemes if needed.
  - Addressing all types of energy, including fossil fuels and renewable energy (i.e. biomass/biofuels) in policy coverage.
- Raise its analytical capacity by: a) assembling qualified national experts and specialists for energy market and policy analysis to develop functional policies and industry regulations; and b) strengthening co-operation with academia so that energy sector development is based on solid scientific evidence.
- Continue to work closely with parliament and other stakeholders to swiftly adopt primary legislation on a new energy market, as well as on energy efficiency, to give clear signals to all market participants and guide their investment decisions.
- Develop effective secondary legislation that enables efficient market functioning, and gradually phase out the state's selective interference in the energy sector so that energy trade and investment decisions can be taken according to market principles.
- Gradually phase out implicit subsidies and cross-subsidies in the electricity and gas sectors to enable much-needed investments in infrastructure, encourage energy efficiency and renewable energy development, and ensure savings and a more equitable distribution of public wealth. In parallel, targeted financial support should be refined to protect the most vulnerable customers.
- Introduce stronger checks and balances in the gas sector to address the lack of competition and encourage more transparency.
- Further develop national energy statistics to inform policy decisions by:
  - Continuing to liaise with Geostat to ensure correct and accurate data are available for energy planning and adequate resources are allocated for data production (e.g. for energy efficiency indicator development in the service and transport sectors).

- Actively engaging in dialogue via the national energy statistics consulting group to communicate key data needs to data providers.
- Optimising human resource capacity by clarifying the roles of entities collecting, analysing and monitoring energy data (especially on energy efficiency between surveys and on oil stockholding obligations).

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3. Natural gas

Key data

(2018)

Domestic production: negligible (0.01 bcm, 0.4% of domestic gas supply)

Net imports: 2.40 bcm, +85% since 2008

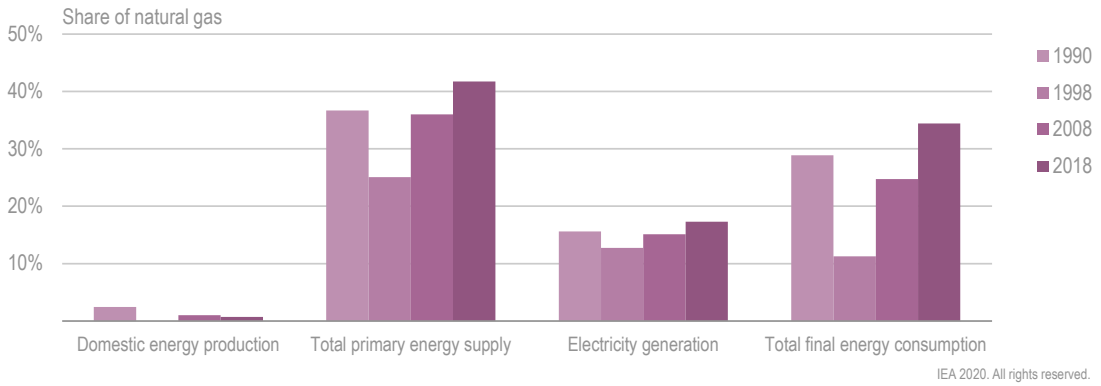
Share of natural gas: 0.7% of domestic energy production, 41.7% of TPES, 17.3% of electricity generation, 34.4% of TFC

Gas consumption by sector: 2.41 bcm (residential 35.3%, power and heat generation 20.3%, industry 16.5%, transport 14.5%, commercial 8.8%, energy sector own use 4.6%)

Overview

Natural gas is Georgia's main energy source. In 2018, the country's natural gas supply totalled 2.41 billion cubic metres (bcm), making up over 40% of total primary energy supply (TPES). The share of natural gas in total final consumption (TFC) has increased notably in the last two decades, reaching 34% in 2018 (Figure 3.1). Consumption has increased primarily in the residential sector, but more gas is also consumed for road transport.

Figure 3.1 Share of natural gas in Georgia's energy system, 1990-2018



Natural gas is Georgia's main energy source, accounting for over 40% of TPES in 2018.

Source: IEA (2020), *World Energy Balances 2020* (database), www.iea.org/statistics.

With negligible domestic gas production (see details in Chapter 5), Georgia depends almost fully on imports. Gas is imported mainly from Azerbaijan, but some is also received from the Russian Federation (Russia).

The seasonality of gas consumption poses a challenge, as it is difficult to meet demand in the winter when it is used for both heating and thermal electricity generation. To improve natural gas security, Georgia has plans to construct a natural gas storage facility (see Storage below).

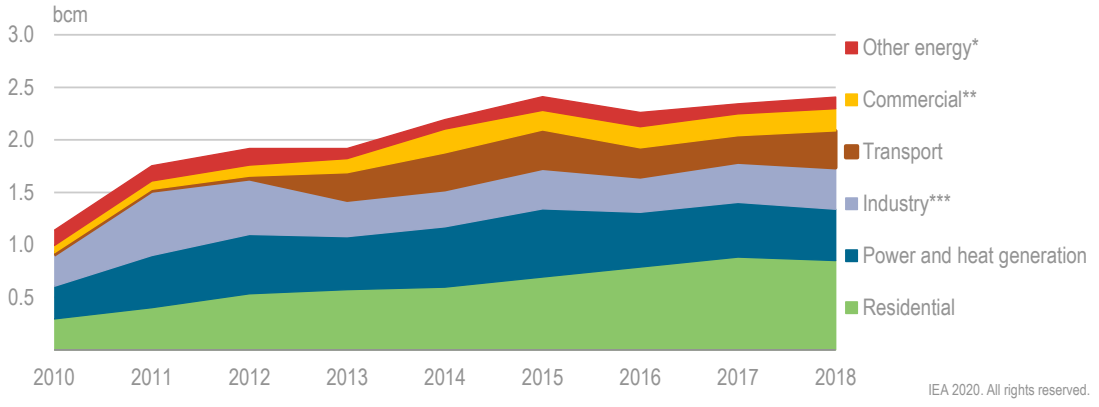
Supply and demand

Consumption of natural gas

Georgia's gas consumption has almost doubled in the past decade (from 1.32 bcm in 2008 to 2.41 bcm in 2018) (Figure 3.2). In 2018, the residential sector accounted for 35% of natural gas consumption, with electricity generation following at 20%. The remainder was used in industry (16%), transport (15%) and the commercial sector (9%). A small amount was also consumed by the energy industry and lost in the pipeline system (5%).

The residential sector is the main driver of consumption growth, with its gas use almost tripling in the past decade (+263% during 2008-18) owing to economic growth, greater gas availability[13] and ongoing gas network expansions in rural areas. According to the recent household energy consumption survey, natural gas is consumed primarily by urban households (80% of residential consumption), which use it mainly for heating and cooking.[14] Lower gas consumption by rural households is related more to gas price than to availability, as gas network expansion to rural areas has been continuous in recent years (see Infrastructure below).

Figure 3.2 Natural gas consumption by sector, 2010-18



Georgia's largest natural gas consumer is the residential sector.

* Includes the energy sector's own consumption and losses in oil and gas production.

** Includes commercial and public services, agriculture and forestry.

*** Includes non-energy consumption.

Source: IEA (2020), *World Energy Balances 2020* (database), www.iea.org/statistics.

[13] The South Caucasus Pipeline (SCP) started operations in 2007.

[14] https://www.geostat.ge/en/single-archive/3320

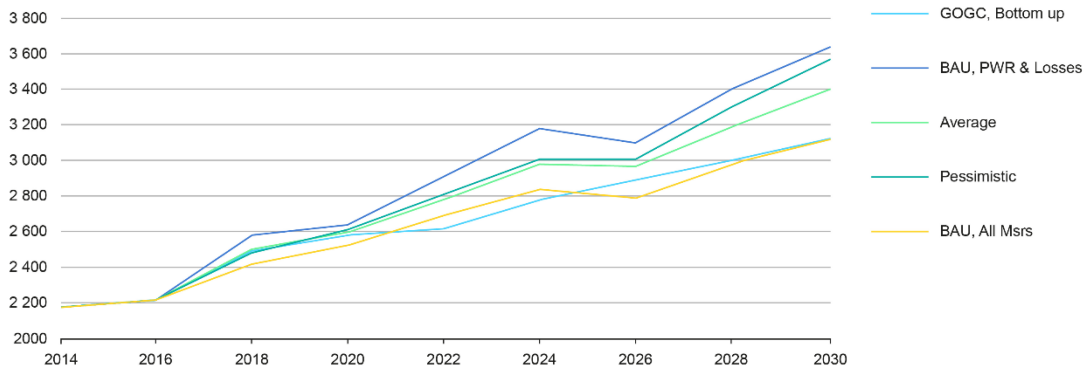
Electricity generation is the second-largest consumer of natural gas in Georgia. District heating production from natural gas stopped in the early 1990s following the disconnection of gas supplies from Russia. Natural gas-fired power plants are used mostly in the winter to compensate for the seasonal reduction in hydropower output, which means that natural gas consumption in the power sector fluctuates from year to year according to hydrological variations.

Industry consumption has remained relatively stable in recent years. The main industry subsectors consuming natural gas are petrochemicals (for fertiliser production), food, non-metallic minerals, construction, and the iron and steel industry.

In recent years, natural gas consumption in the transport sector has increased, accounting for 14.8% of the sector's total consumption in 2018.

Growth in gas consumption is projected to continue through 2030 in all scenarios modelled by the former Ministry of Energy under the US Agency for International Development (USAID) Enhancing Capacity for Low Emission Development Strategies (EC-LEDS) Clean Energy for Georgia Programme (Figure 3.3).

Figure 3.3 Natural gas consumption projections to 2030



Natural gas consumption is projected to increase significantly through 2030 in all scenarios.

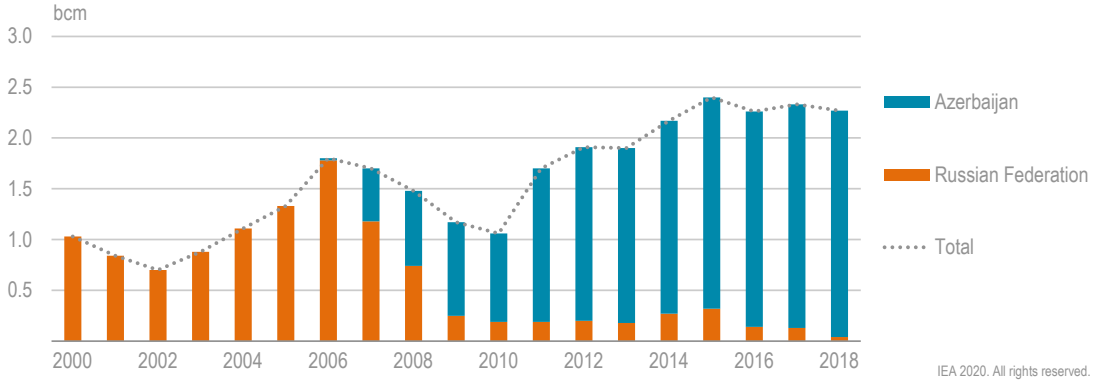
Source: MoESD (2019a), "Response to the IEA Energy Policy Questionnaire".

Trade

In 2018, Georgia's total gas imports were around 2.3 bcm (Figure 3.4). In line with rising consumption, the volume of gas imports increased almost 90% over 2008-18.

Russia was the sole provider of natural gas to Georgia until 2005, but since 2009 most imports have come from Azerbaijan, mainly as direct imports but also as transit fee payments from the South Caucasus Pipeline (SCP). A portion of this gas comes from Russia.

Figure 3.4 Georgia's natural gas imports by entry point, 2000-18



The majority of Georgia's natural gas imports currently originate from Azerbaijan.

Sources: Adapted from GNERC annual reports and data provided by GOGC.

Gas imports are based on several agreements and long-term contracts:

1) A memorandum on the supply of natural gas concluded between the Government of Georgia and the State Oil Company of Azerbaijan Republic (SOCAR) to meet household and power generator demand. In addition, natural gas is imported at a higher undisclosed price to meet industrial and commercial demand. The terms and conditions of imports from Azerbaijan are detailed in a gas supply agreement (for December 2011 to December 2030) and a gas purchase agreement (for July 2012 to July 2030) (undisclosed).

2) A host government agreement with the Shah Deniz International Consortium to import gas via the SCP (BP, 2002). The terms and conditions are detailed in: a) a contract for the sale and purchase of optional gas (for October 2008 to October 2068) that gives Georgia the right to purchase up to 5% of the transit gas from Azerbaijan's Shah Deniz field, with the volume of optional gas increasing after completion of Phase II of the Shah Deniz development; and b) a contract for the sale and purchase of additional gas (for January 2006 to January 2026) that has granted Georgia an additional 500 million cubic metres (mcm) of gas annually since 2019. (Note: optional and additional gas contract prices are significantly below market prices for the region.)

3) A gas purchase agreement with Russia's Gazprom Export (for 13 March 2019 to 31 December 2020).

Until the third quarter of 2017, the North-South Gas Pipeline system owner, Georgian Oil and Gas Corporation (GOGC), received an annual in-kind fee for natural gas transit services from Russia to Armenia under a contract with Gazprom Export. Small volumes of Russian gas were also imported periodically by various commercial companies. A new two-year agreement came into effect in 2017, under which transit services were partially reimbursed in kind (roughly 50%) and partially paid in cash in the first year, and fully in cash in the second year. In March 2019, the initial agreement was extended and amended following direct negotiations between the Minister of Economy and Sustainable Development and Gazprom Export officials. The new agreement allows some businesses in Georgia to purchase gas directly from Gazprom Export, but the contract has been declared a commercial secret and is not publicly available. Neither the transit fee nor the gas purchase price, nor any other possible conditions, have been disclosed.

Gas supply security

The GOGC's analysis of potential risks and threats to Georgia's natural gas sector demonstrates that infrastructure failures and the lack of a strategic fuel reserve could lead to critical natural gas supply situations. In addition, the seasonality of gas consumption is making it increasingly difficult to balance demand and supply, especially in winter. During peak load and/or reduced or interrupted supply periods, there could be severe gas shortages.

In the case of an unplanned interruption from any major source, the country is not able to compensate for shortages (GOGC, 2018). Several interruptions have, in fact, been reported in recent years, during which gas supplies have been suspended for up to three weeks or reduced by at least 30% of the planned total.

In addition, natural disasters or corrosive damage caused by pipeline aging have resulted in main gas pipeline accidents. There have also been several unplanned gas supply cuts due to sabotage and technological problems, or to prevent technical failures (GOGC, 2018).

The draft Law on Energy and Water Supply includes provisions for gas supply security in line with the EU acquis, but the details are expected to be adopted in secondary legislation.

Box 3.1 Challenges for the natural gas sector

The Energy Strategy of Georgia 2020-2030, adopted in October 2019, identifies the following key gas sector challenges and contains policies and measures to address each of them:

- critical natural gas supply import dependency
- possible natural gas supply shortages
- lack of strategic fuel reserves
- obsolete and decrepit transport infrastructure components
- gas supply issues in the country's temporarily occupied territories
- process deficiencies in establishing a competitive market and developing regulatory legislation.

Source: MoESD (2019b), The Energy Strategy of Georgia 2020-2030.

Gas sector structure

There are two levels of gas trade in Georgia: at the wholesale level, natural gas is traded through bilateral agreements only. Wholesale suppliers import natural gas (or purchase small quantities of natural gas produced in Georgia) and resell it to retailers or other suppliers. Most of the gas is imported from Azerbaijan (Figure 3.5).

At the second level, retailers supply natural gas directly to end users. Companies can be active at both market levels, however. In 2018, there were 33 suppliers, 2 of which were active in the wholesale market only, 25 in the retail market only, and 6 in both. Companies affiliated with SOCAR dominate both wholesale and retail activity.

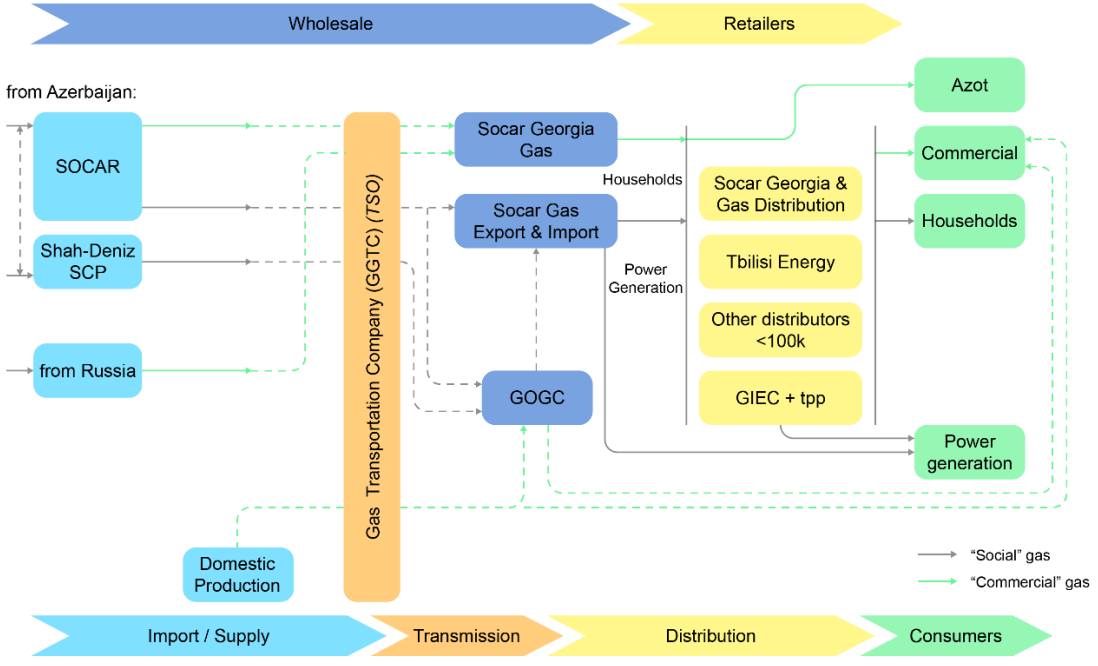
By law, natural gas distribution and supply are treated as two different activities, but distribution licensees are not prohibited from carrying out supply activities.

Natural gas supplies to non-household customers have been deregulated and opened to competition, at least formally. Although many different suppliers are theoretically allowed to operate in one distribution area, in practice customers have not been switching suppliers so far. In effect, non-household customers are purchasing natural gas in a market in which there is neither competition nor tariff regulation (see Gas Prices below).

The main gas pipelines (except SCP) and related equipment and infrastructure are the property of the GOGC, which is responsible for constructing new gas pipelines and overhauling the existing network. The gas transportation system is operated and maintained by the Georgian Gas Transportation Company (GGTC) under a lease agreement with the GOGC. GGTC, a state-owned company, is the gas transportation licensee.

According to legislation in force since October 2019, it is the GOGC's responsibility to prepare gas transportation system development plans, although this contradicts the Energy Community's requirement for such plans to be prepared by a transmission system operator (TSO). According to the new Law on Energy and Water Supply, a natural gas transportation network development plan shall be prepared by a TSO and presented to GNERC no later than 1 October 2020 (GOGC, 2018).

Figure 3.5 Georgia's natural gas market structure



Sources: Adapted from MoESD (2019a), "Response to the IEA Energy Policy Questionnaire" and GOGC (2018), Ten-Year Development Plan for Georgian Gas Transmission Network 2019-2028.

Compliance with the EU acquis

To comply with the Energy Community Treaty requirements for the gas sector, Georgia must take the following mandatory actions:

- Identify/establish a TSO, distribution system operators (DSOs), a natural gas storage operator and a market operator, based on the principles of Directive No. 2009/73/EC on the Internal Market in Natural Gas and on European Regulation No. 715/2009 on Access to Natural Gas Transmission Networks. Although the current licensee of transportation operations (the GGTC) most closely fits the definition of independent system operator, it is not fully independent.
- Define/establish a public supplier and a last-resort supplier to ensure guaranteed supply to vulnerable customers (Directive No. 2009/73/EC).
- Develop gas market rules in line with the requirements of the European Union's third energy package.
- Amend the legal and regulatory framework for the new market model to require the functional and/or legal separation of network operations (transportation and distribution) from supply activities, as well as the separation of property/infrastructure.
- Define the rights and responsibilities of market participants.
- Adopt provisions to protect consumers' rights (i.e. reliability of supply, high technical quality of natural gas, choice of supplier).

The Energy and Water Supply Law, adopted by parliament on 20 December 2019, envisages the gradual transition to a competitive market in line with the EU acquis, but it does not provide details on the future market model. The key elements are expected to be defined in secondary legislation once the law has been adopted.

The launch of a new market structure and completion of a natural gas trading platform are expected by around 2023. At the same time, Georgia plans to maintain an affordable price for the social segment of the market, which will be one of the obligations of the public supplier and will be made possible with Shah Deniz gas. Consequently, the supply of what is known as "social gas" will not be based on free-market principles, according to the government's plans.

Infrastructure

Georgia's natural gas transmission system is made up of several parts (Figure 3.6):

- The **main gas pipeline system**, owned by the GOGC, consists of: a) the North-South Gas Pipeline that transports gas from the Russian-Georgian border in the north to the Georgian-Armenian border in the south; and b) the East-West Gas Pipeline (with several terminals) to transport gas from the Georgian-Azeri border in the east towards the west. In the centre of Georgia, it splits into several branches going towards Sukhumi, Ajara and Poti.
- The **South Caucasus Pipeline (SCP),** also known as the Baku-Tbilisi-Erzerum Gas Pipeline, transits gas produced in the Shah Deniz field from Azerbaijan to Turkey. The pipeline is 692 km long, including 249-km Georgian section. The design throughput of the pipeline is 20 bcm per year.

Table 3.1 provides design capacity and actual load data for all Georgia's main gas pipelines.

Table 3.1 Capacity and load of gas pipelines (bcm/y), 2016

Pipeline/direction	Design capacity	Actual throughput	Actual load	Peak-load coefficient*
North-South main pipeline**	16 10	8.0 4.0	≈2.05 ≈1.87	2.3 2.1
Georgian main gas pipeline system	0.25/0.45/1.5/4.0	≈3.5-3.8	≈2.3	2.2
Azerbaijan border - Saguramo	4.0	≈2.5	≈1.5	1.7
SMC interconnector	4.0	≈1.6	≈0.8	1.9
Center-West direction	1.5-4.0	≈1.2	≈0.62	1.7
West Georgia direction	4.0	-	≈0.41	1.5
Bakuriani direction	0.25/0.45/1.5	-	0.04	2.1
South direction	1.5/0.5	≈0.1-0.5	≈0.056	1.8
Kakheti direction	1.5/0.5	≈0.1-0.5	≈0.072	2.5
Qobuleti direction	1.5	≈0.3-0.5	≈0.073	2.8
Kazbegi direction	4.0	≈2	≈0.02	1.5

* virtual annual peak load relative to actual load.

** data for 1 200-millimetre (mm) section on upper line; 1 000-mm data on lower line.

Source: GOGC (2018), Ten-Year Development Plan for Georgian Gas Transmission Network 2019-2028.

For commercial metering of incoming gas from the North-South transit as well as for gas received from SOCAR, Georgia depends on metering stations outside its territory (the metering station close to the Russian border at Gveleti is currently not operational). It can also control incoming volumes by adjusting the balance of outflows from the system. The GOGC's ten-year transport infrastructure development plan for 2019-28 includes short-, medium- and long-term investment projects, with investment costs to 2027 totalling USD 713 million.

At the beginning of 2019, 84% of the country had access to natural gas and the government envisages gas access for all remaining settlements in its three-year plan, with GEL 200 million (Georgian lari) allocated for this purpose from the state budget. The GGTC is expected to build the necessary infrastructure that will then be leased to licensed distribution companies for operation. It is considered more appropriate in some mountainous regions (Upper-Svaneti, Pshav-Khevsureti, Tusheti, etc.) to develop decentralised autonomous systems based on liquefied natural gas (LNG), compressed natural gas (CNG) or liquefied petroleum gas (LPG) along with local renewable energy resources (GOGC, 2018).

Figure 3.6 Georgia's natural gas pipeline network

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

Source: GOGC (2018), Ten-Year Development Plan for Georgian Gas Transmission Network 2019-2028.

Storage

The GOGC is planning to convert the depleted Samgori South Dome oilfield near Tbilisi into an underground gas storage (UGS) facility. A pre-feasibility study for the project was completed in April 2016, a EUR-150 million loan from KfW was announced in August 2018, and feasibility studies were ongoing in 2019. A tender has been announced to select design, procurement and construction contractors, but the tendering process had not yet been completed as of October 2019. The project is reportedly to be completed by 2023 if the feasibility studies do not reveal any critical issues.

This project is planned to store gas from the Shah Deniz gas pipeline as well as provide commercial storage for other suppliers. It will be designed to store up to 500 mcm of gas (210-280 mcm of active gas) (Table 3.2).

Table 3.2 Main design parameters of the underground gas storage facility

1	Total volume of gas	500 mcm
2	Volume of active gas	210-280 mcm
3	Buffer gas volume	220-290 mcm
4	Filling speed	1.7-2.5 mcm/day
5	Withdrawal speed	≥2-6 mcm/day
	Average speed (in normal winter period)	2 mcm/day
	Speed in strategic operation mode (30 critical days)	3.5 mcm/day
	Speed during times of system stress (7 days)	5 mcm/day
	Speed during times of system stress (1 day)	6 mcm/day

Source: MoESD (2019a), "Response to the IEA Energy Policy Questionnaire".

Gas prices

As explained in the Trade section above, gas purchased by Georgia from the Shah Deniz Consortium at a preferential price serves as social gas for the population and thermal power plants (TPPs). The regulatory commission (GNERC) sets end-user gas tariffs for household customers.

For non-household customers, the price of natural gas is not regulated, as per a ministerial order adopted in 2007. Instead, supply prices are determined based on customer-supplier agreements. Given the monopolistic power of suppliers affiliated with SOCAR (see Gas Sector Structure above) and the absence of tariff regulation, prices for non-household customers are set in a non-transparent manner, without regulatory control or competitive pressure.

For non-household customers connected to the distribution network, the price of natural gas is determined through public offers, which means suppliers are obligated to sell natural gas at the preliminary offered price only. Because this obligation is not imposed on suppliers selling gas to commercial customers connected to the transportation network, the average price of natural gas for commercial customers connected to the distribution network is lower than for those connected to the transportation network (Table 3.3).

Table 3.3 Natural gas price summary (GEL/m³), 2019

Commercial customers (distribution network)*	0.57
Commercial customers (transport network)*	0.69
Social gas* commodity only	0.25-0.30
Household customers (including all taxes and levies)	0.46-0.57

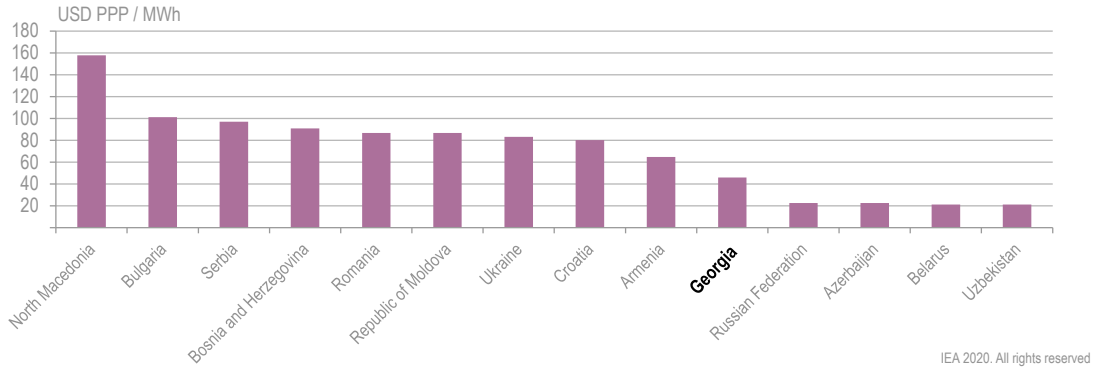
* exclusive of delivery costs and value-added tax (VAT) (18%).

Sources: MoESD (2019a), "Response to the IEA Energy Policy Questionnaire"; adapted from Geostat.

Comparison using available end-use price data for residential sector shows that the price (adjusted for PPP) in Georgia is lower than in some other countries heavily dependent on imports such as the Republic of North Macedonia, Bulgaria and the Republic of Moldova

(Figure 3.7). Also worth noting is that price in Georgia is over double the one of Belarus where most gas is imported.

Figure 3.7 Residential sector natural gas prices for selected countries, 2017



Georgia's residential sector gas prices are lower than for many other countries heavily dependent on imports.

Notes: PPP = purchasing power parity. MWh = megawatt hour.
Source: IEA (2019), *Energy Prices and Taxes 2019*, www.iea.org/statistics.

Available information on prices for natural gas used in the transport sector is limited, but among a set of countries with non-negligible share of natural gas consumption in transport, the price in Georgia (adjusted for PPP) seems high (Figure 3.8).

Figure 3.8 Transport sector natural gas prices for selected countries, 2017

Transport sector natural gas prices are high in Georgia.

Source: IEA (2019), *Energy Prices and Taxes 2019*, www.iea.org/statistics.

Assessment

Natural gas is Georgia's primary energy source, and 99.5% of gas demand is met with imports. Most imports come from Azerbaijan, and smaller amounts come from Russia and some other limited sources of supply. Imports and a large part of gas distribution and retail supply activities are carried out by companies affiliated with SOCAR.

Georgia's current gas market structure and legal framework contradict the EU energy acquis and do not allow for proper regulation or true competition, which also raises energy security concerns. Non-transparent governmental agreements with the two suppliers – Azerbaijan's SOCAR and Russia's Gazprom Export – and the absence of a competition mechanism have left the market segmented and largely monopolistic, making it vulnerable to unfair leverage. The regulation allowing distribution companies to supply gas to non-residential consumers at non-regulated prices puts the consumer at the mercy of powerful monopolistic suppliers. Furthermore, the government's undisclosed long-term agreement with SOCAR undermines prospects of unbundling and market competition. The government is therefore encouraged to renegotiate the agreement in view of the expected reforms.

The lack of supply diversity, SOCAR's dominance of the gas supply chain, and the lack of competition could severely threaten Georgia's energy security and affordability, as well as its economic competitiveness. The government would benefit significantly from putting strong checks and balances in place to manage the risks of the current situation.

In this context, promising developments could result from implementation of the EU energy acquis. The Georgian government is introducing a new energy law that is expected to establish the legal separation of gas distribution and supply companies, and by 2023 the regulator is expected to have established an entry-exit system for setting tariffs to transparently use the gas network. Irrespective of transmission access and pricing methodology, it will be essential that the asset base of each network be comprehensive so that tariff-setting can be more transparent and reflect all costs involved in moving gas into and out of the network.

Monitoring and adjusting the market

Georgian lawmakers and the government are encouraged to adopt primary and secondary legislation to enable implementation of the EU energy acquis in the gas sector as soon as possible. Next, the results of the energy market model under development should be monitored constantly. The strategic vision recommended in Chapter 2 should be used to set clear expectations on the level of market competition and to outline how the government will proceed if results are unsatisfactory.

Although the legal separation of gas distribution and supply is welcome, this approach alone may not be sufficient to create a competitive environment if supplier monopoly persists. A key problem is the limited availability of competitively priced gas supplies. The government could consider measures to diversify supply sources and create competition, such as instituting a transparent common market platform (e.g. through mandatory gas release and resale).

Because the mandatory trading of imported natural gas on exchange (i.e. pooling) could enhance market transparency and encourage competition, the government could consider establishing a binding obligation for natural gas importers to sell their imported commodities fully or partially on exchange. Anonymous exchange trading would fracture the current monopolies of incumbent importers, distributors and suppliers, and would attract market newcomers for both wholesale and retail trading. This would contribute significantly to market liquidity and competitivity. Transitioning partially or gradually to full exchange trading – e.g. via an obligation to sell imported gas to a single buyer – could be considered an interim measure until the market can function competitively without additional regulatory interference.

Subsidies and tariffs

According to the price-gap approach, gas subsidies for the residential sector amounted to 4.6% of total budget spending in 2017, and to 2.1% for the electricity sector.[15] Thus, implicit gas price subsidies were equivalent to 43% of total government expenditures on education and more than 5.7 times its expenditures on research and development.[16] These price subsidies are therefore a major barrier to effective electricity and gas market development, a primary cause of wasteful gas consumption and, consequently, a key factor driving excessive gas demand and the current account imbalances that put downward pressure on the exchange rate. These subsidies also inhibit the development of Georgia's renewable energy sources: despite a drastic decline in the levelised cost of electricity (LCOE) from solar and wind resources in recent years, their significant potential remains untapped due to the difficulty of competing with power produced from subsidised natural gas.

It is clearly essential to phase out subsidies and reconsider how to distribute the benefits of social gas. The government currently sets the price of gas based on the cost of the discounted volumes it obtains for transiting gas from the Shah Deniz field. The discounted gas price is then used by the regulator (GNERC) to calculate the full residential tariff, including distribution and transmission charges. Currently, only residential consumers unconditionally receive the discounted gas price, and the volume supplied to each household is not capped. Plus, the government prices this social gas differently for customers in Tbilisi than for those in the regions, and offers another price again to subsidise thermal power generation. Not only does this distort the market considerably, it contradicts EU market principles and international best practices.

The current system of residential tariff-setting also carries the risk of regressive subsidies, as residential users with higher incomes and consumption stand to benefit more than vulnerable consumers. However, if residential social gas tariffs were to increase steadily for consumption above a certain threshold, benefits would be limited to only the essential portion of residential gas demand. Having a stepped tariff system would thereby also encourage energy efficiency and responsible consumption.

Furthermore, phasing out cross-subsidisation of residential consumption by other users would benefit other consumer categories. For instance, lower tariffs for commercial users – particularly small and medium-sized enterprises and micro businesses – could be especially beneficial, allowing ventures to take greater advantage of business opportunities, create jobs and boost household earnings.

If the government considers releasing gas sales to third parties, it could opt to monetise the full value of transit gas and use the proceeds to compensate suppliers that provide residential users with gas at a social rate. This would give Georgian gas consumers stronger price signals (i.e. make them aware of the real cost of energy) and offer transparency on the value of the transit agreement without affecting the fair distribution of social benefits.

[15] The price-gap methodology is the one most commonly applied to quantify energy consumption subsidies. The price gap is defined as the difference between the price of natural gas sold to commercial users (reference price for full cost of supply) and the "social" price offered to other end users. To calculate the total value of the subsidy, the price gap is multiplied by total units of gas consumed: *subsidy = (reference price – end-user price) × units consumed.* See https://www.iea.org/topics/energy-subsidies for more information on energy subsidies.

[16] Data on government expenditures on education and R&D in 2017 come from the World Bank Development Indicators database.

Reinforcing security of supply

The Government of Georgia should step up efforts to establish a comprehensive emergency action plan to better manage disruptions caused by network constraints and supply failures. The plan should transparently set a merit order for disconnecting from and reconnecting to the network, and to achieve the desired level of reliability, the government and the regulator should introduce economic incentives and penalties that reflect potential disconnection impacts for different categories of users. The emergency action plan should be owned as much as possible by the transmission and distribution network operators, as they are best placed to manage the risks of supply outages.

Although the government and the GOGC recognise the importance of gas storage to maintain the supply-demand balance given that gas consumption is highly seasonal, progress on developing a storage facility appears slow compared with initial plans.

As mentioned above, Georgia depends largely on metering stations outside its territory, which means it risks limited access to metering points as well as intended or unintended metering errors. As good industrial practice, it is recommended that the government restore the metering station at Gveleti and consider establishing proper control metering at the border with Azerbaijan as well.

Strengthening price regulation

As mentioned in Chapter 2, GNERC has made commendable efforts to introduce incentive regulations that stipulate efficiency, but it could also consider further price regulation improvements. The current regulatory periods for distribution and transmission appear shorter than those set in Europe, which could unduly raise network operation costs. Lengthening the regulatory period could allow for better co-ordination of investment planning with network development to maximise investments and achieve greater operational efficiency. Also, as key components of the gas tariff methodology are changeable (e.g. interest rates, inflation, exchange rates), a system to handle these uncertainties should be introduced to track key drivers of tariffs and to set thresholds to reopen tariffs calculations and revenues agreed upon.

In accordance with the “Investment Appraisal Rule” approved by GNERC at the end of the 2019, gas network extension projects will be assessed using a methodology similar to the European Network of Transmission System Operators for Gas (ENTSO-G) cost-benefit analysis (CBA) methodology. However, this is not necessarily the case for network extensions to bring gas to remote villages: such projects are financed through the budget based on socio-political considerations rather than on CBAs. The government’s policy to extend gas access to remote areas, including mountainous villages, may therefore need to be revised, as it has a high probability of becoming uneconomic. Moreover, it does not seem to address the issue of deforestation for winter heating, as consumers are continuing to use wood even once they have access to gas for heating. The sustainable use of biomass allied with energy efficiency measures, including efficient combined heat and power plants, could be a viable alternative.

GNERC plans to introduce economic tests to evaluate new investment requests, which is a praiseworthy initiative, but the methodology should ensure that the regulator allows network extensions only when the level of demand justifies the cost of the extension. In addition, net present value (NPV) tests should be set such that a sizeable portion of the costs can be recovered through revenue gained from the new users benefiting from the

investment. This approach would make gas distribution and transmission costs more affordable, and allow more resources to be directed towards maintenance and improvement of the current network.

Recommendations

The Government of Georgia should:

- Introduce stronger checks and balances to manage the lack of competition in the gas sector, including by:
  - Improving transparency in contractual arrangements across the whole value chain (from imports to distribution/supply) until a competitive gas market has been established.
  - Properly metering natural gas at the country's entry and exit points.
  - Establishing a single-buyer mechanism (as a transitional measure) to strengthen bargaining power.
- Consider options to introduce competition, such as mandatory gas release to other suppliers.
- Spread the benefits of the social gas across user categories and eliminate cross-subsidisation.
- Step up efforts to establish a comprehensive emergency action plan.
- Work with the regulator to introduce a transparent, cost-reflective methodology for calculating gas transit tariffs for the North-South transit pipeline and to ensure non-discriminatory access to the network.
- Apply sound economic analysis to network extension projects designed to provide further gas access in remote areas and consider alternative sustainable options.
- Expedite construction of the gas storage facility and assure its proper operation to guarantee security of supply during seasonal demand fluctuations.

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Further reading

Galt &Taggart (2019), "Georgian Oil and Gas Corporation: New highs from 2020", 16 August 2019, Galt &Taggart Research, Tbilisi.

GOGC (2016), *Investor presentation*, GOGC, Tbilisi.

4. Oil

Key data

(2018)

Crude oil production: 0.03 Mt (0.6 kb/d), -43.0% since 2008

Oil product net imports: 1.35 Mt (27.0 kb/d) (imports 1.45 Mt, exports 0.10 Mt)

Share of oil: 2.4% of domestic energy production, 26.4% of TPES, 28.9% of TFC

Consumption by sector*: 1.34 Mt (transport 82.5%, industry 15.0%, residential 1.3%, commercial 1.0%, energy industry own use 0.1%)

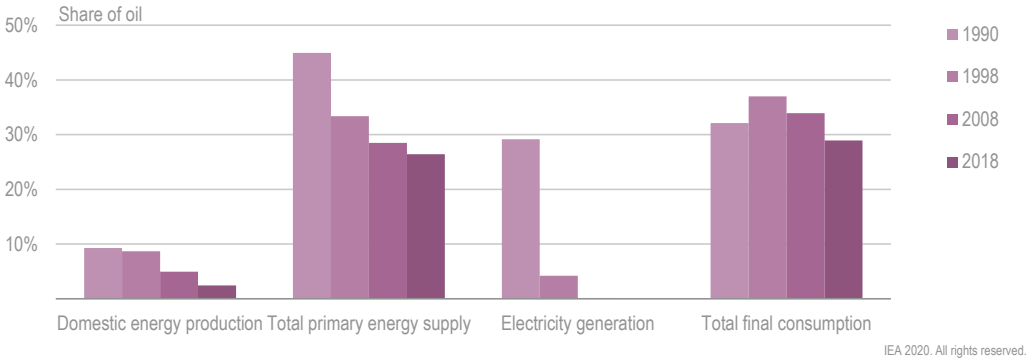
*Domestic consumption excludes international marine bunkers.

Overview

At 26% in 2018, Georgia's share of oil in total primary energy supply (TPES) has remained stable since 2008 (Figure 4.1). Because the country's oil refining sector is in its infancy and refined product imports therefore make up the majority of supply**,** oil product import dependency has hovered around almost 99% for the past decade. Net oil product imports were 1.4 million tonnes (Mt) in 2017, +65% since 2008. In 2018, 1.3 Mt of oil products were consumed, corresponding to 29% of total final consumption (TFC). Oil product consumption has risen almost 50% since 2008, driven mostly by the transport sector but also by increasing industrial use for construction and mining.

Georgia produces small quantities of crude oil (upstream activities are described in Chapter 5) and had two working refineries as of 2019, with a total capacity of 210 kilotonnes per year (kt/yr). Small quantities of oil products are also exported.

Figure 4.1 Share of oil in Georgia's energy system, 1990-2018



Georgia's oil supply consists mainly of oil product imports to satisfy rising transport and industry consumption.

Source: IEA (2020), *World Energy Balances 2020* (database), www.iea.org/statistics.

To comply with its commitments as a member of the Energy Community, Georgia is developing a legal framework for a compulsory oil stockholding system.

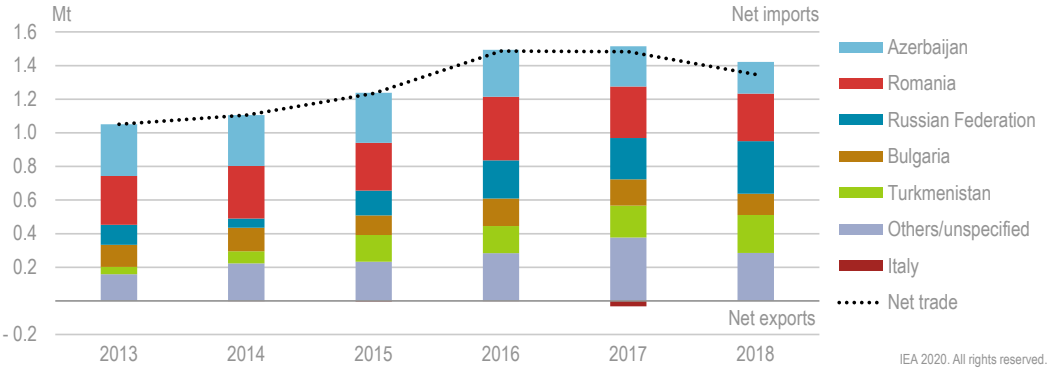
Supply and demand

Oil product trade

Georgia relies mostly on imports for refined oil products. Its nameplate refining capacity (210 kt/yr) is equivalent to 20% of average oil product supplies for 2008-18, but since oil product consumption has increased in recent years (+29% since 2013), domestic refining even at full nameplate capacity would satisfy only a fraction of demand.

During 2013-18, Georgia's net oil product imports increased to 1.45 Mt (+28% since 2013) (Figure 4.2). Import sources are diverse (Azerbaijan and Russia, as well as Bulgaria, Romania, Greece, Italy, Turkmenistan and other countries), providing substantial flexibility for dealing with a potential supply disruption. By product type, diesel/gasoil accounts for the largest share (39% in 2018), followed by motor gasoline (38%). Fuel oil imports make up 6% of the total.

Figure 4.2 Georgia's oil product imports by country, 2013-18



Georgia imports oil products from a variety of countries.

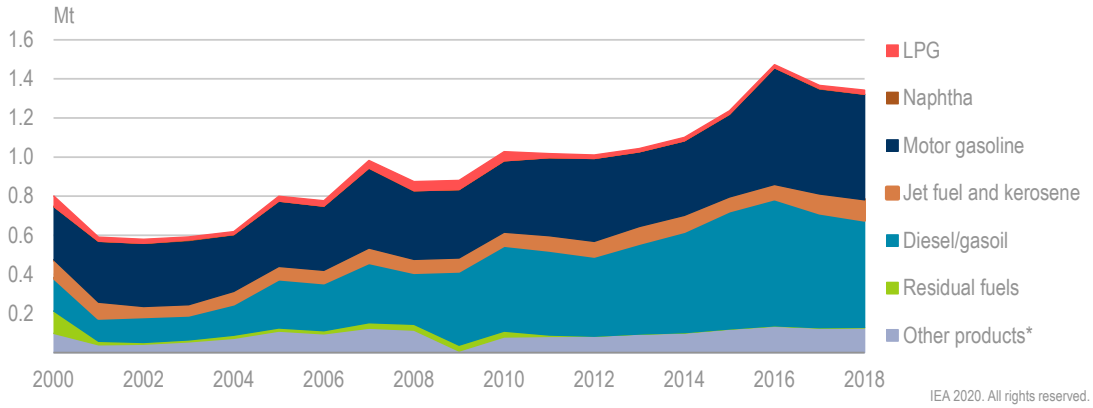
Note: Breakdowns of oil product imports by origin prior to 2013 are not available.

Source: IEA (2020), *World Energy Balances 2020* (database), www.iea.org/statistics.

Oil demand

Oil consumption in Georgia increased nearly 50% between 2008 and 2018, mostly in the transport sector but also in industry (Figure 4.3). Consumption dropped briefly in the wake of the 2008 financial crisis but then continued to rise after the economy recovered. Recent fluctuations (a notable increase in 2016 and a decrease in 2017) are linked to fuel price changes: the price of compressed natural gas (CNG) increased in 2016, shifting consumption towards oil products, whereas in 2017 both diesel and gasoline prices rose, reducing their consumption.

Figure 4.3 Georgia's oil consumption by product, 2000-18



Georgia's oil consumption is dominated by diesel and motor gasoline in the transport sector.

* Crude oil, naphtha, lubricants, bitumen, paraffin waxes and petroleum coke

Notes: LPG = liquefied petroleum gas. Total consumption includes refinery fuels and aviation bunkers but excludes backflows from the petrochemical sector and international marine bunkers.

Source: IEA (2020), *World Energy Balances 2020* (database), www.iea.org/statistics.

Diesel/gasoil is Georgia's most-consumed oil product, accounting for 41% of all oil products used in 2018. In the transport sector, however, motor gasoline was the main oil product (almost 50%) and diesel accounted for 40%, as some of the overall diesel/gasoil share was used in the industry sector.

The transport sector (mostly road transport) remains Georgia's largest oil-consuming sector by far, responsible for 83% of total oil consumption in 2018. Industry consumption has remained stable in recent years at around 14% of the total, and the commercial and residential sectors claimed the remainder. No oil is consumed for electricity generation.

Transport infrastructure

Georgia is an oil transit country. Crude oil transportation infrastructure consists of the Baku-Tbilisi-Ceyhan (BTC) pipeline and the Western Route Export Pipeline (WREP). Most of the crude oil transited through the pipelines is produced in Azerbaijan, with relatively small amounts coming from Kazakhstan and Turkmenistan. Crude oil and petroleum products from Azerbaijan, Kazakhstan and Turkmenistan are also transited by rail to Georgian seaports (Batumi, Poti and Kulevi oil terminals).

The BTC pipeline has been transporting oil extracted from the Azeri-Chirag-Gunashli field in the Caspian Sea to Turkey's Ceyhan port (on the Mediterranean Sea) since 2005. The pipeline is 1 768 kilometres (km) long (229 km in Georgia) and has eight pumping stations, two of which are in Georgia. The pipeline's maximum annual capacity is 38 Mt.

The WREP, also known as the Baku-Supsa Pipeline, is 830 km long and transports crude oil from the Azeri-Chirag-Gunashli field via the Sangachal terminal in Azerbaijan to western Georgia's Supsa terminal (Figure 4.4). It has been in operation since 1999 and can transport up to 7 Mt per year. The Supsa terminal, with a capacity of 160 000 tonnes (t), was constructed as part of the WREP project. More than 40% of Georgia's existing transit potential is still not being used according to the Ministry of Economy and Sustainable Development (MoESD).

Figure 4.4 Georgia's oil transportation infrastructure

Source: Adapted from MoESD (2019a), "Response to the IEA Energy Policy Questionnaire".

Oil market structure

Institutional framework

The **Ministry of Economy and Sustainable Development (MoESD)** determines Georgia's main policy directions for oil production, processing and transportation.

The **State Agency of Oil and Gas** under the MoESD is responsible for state regulation of the sector. It issues licences, supervises and controls the fulfilment of licensing conditions, and determines tariffs for transporting domestically produced crude oil through Georgia by pipeline.

The **Georgian Oil and Gas Corporation (GOGC)** is the country's national oil company that initiates production sharing agreements with investors that are signed by the State Agency of Oil and Gas on behalf of the Government of Georgia. GOGC contributes to cross-border oil transportation system operations within Georgia and also conducts activities in other parts of the energy sector.

State involvement in the petroleum products market is limited, with the government supervising only competition and product-quality requirements. While the Competition Agency monitors the market to ensure fair competition, quality standards for petroleum products on the Georgian market are determined by legislation.

Refining

The country currently has two licensed oil refineries: Globe Ltd, with a nameplate refining capacity of 80 000 t of crude oil per year, and the ZD Oil Company (130 000 t/yr). Their production has been limited due to the availability of more competitively priced imported oil products, so total output has reached only 20 000 t/yr so far (see Supply and Demand above).

About 23.4 kt of crude oil were processed in Georgia in 2017, mainly to produce diesel fuel and heavy oil (Table 4.1). An accredited laboratory of the Oil and Gas Agency controls the quality of refined products (MoESD, 2019b).

Table 4.1 Oil products produced by Georgian refineries, 2017

Final product	Tonnes
Naphtha	3 425
Gasoline	2 198
Diesel fuel	9 987
Heavy oil	8 752

Source: MoESD (2019b) The Energy Strategy of Georgia 2020-2030.

Distribution

Five major companies – Wissol Petroleum JSC Georgia, Gulf (San Petroleum Ltd Georgia), Rompetrol Ltd Georgia, SOCAR Georgia Petroleum, and Lukoil Ltd Georgia – operate in the petroleum product wholesale and retail market. Together, they supply roughly 70-75% of the market, and they have gasoline stations in Tbilisi and throughout the territory controlled by the Government of Georgia.

As the import of transport fuel into Georgia is not subject to licensing, there are no significant legislative restrictions on entry into the oil products market.

Emergency response policy

As a member of the Energy Community, Georgia must fulfil the requirements of Council Directive No. 2009/119/EC on minimum stocks of crude oil and/or petroleum products. The implementation deadline for Georgia to meet the Directive is 1 January 2023.

The Directive requires that member states establish emergency oil stocks amounting to either 90 days of total net oil imports or 61 days of domestic consumption of the main oil products, whichever amount is higher, and to put in place procedural measures to be taken in an emergency. As almost all oil products consumed in Georgia are imported, the relevant stockholding requirement under the Directive is 90 days of net imports. This equates to Georgia needing to hold emergency oil stocks of approximately 366 kt of crude oil equivalent.[17]

The former Ministry of Energy, supported by the Energy Community, prepared a draft Oil Stockholding Law in December 2017 intended to transpose the Directive into national legislation. This draft law establishes an emergency oil stockholding requirement on oil importers and producers, and it appoints the State Agency of Oil and Gas as the central stockholding entity (CSE).

If the 2017 draft law is adopted, all compulsory stockholders will be required as of 1 January 2023 to hold emergency stocks equal to 25% of their crude oil or petroleum product imports during the previous calendar year. To build up the required stocks by the beginning of 2023, the draft law suggests a 5-year transition period during which 18 days of oil and/or petroleum product stocks would be added annually.

Economic operators (importers and oil storage tank owners) have raised several issues with regards to meeting the proposed emergency stockholding requirement, including the lack of oil storage facilities, the impact of the obligation on small importers and the effect it will have on retail prices.

Because of institutional changes in late 2017/early 2018, finalisation and adoption of the draft law was postponed. The procedure recommenced in the fall of 2019, however, and the MoESD plans to organise new consultations with stakeholders to discuss all their questions and find solutions. It is expected that the draft Oil Stockholding Law will subsequently be updated and prepared for adoption.

The Energy Strategy of Georgia 2020-2030, adopted on 7 October 2019, emphasises that keeping the required minimum reserves of crude oil and/or petroleum products in accordance with the European directive requirements is one of the country's priorities.

Oil prices and taxes

Almost all petroleum products consumed in Georgia are imported, at a cost in line with international (Platts) prices. A value-added tax (VAT) (18%) and excise duties are imposed on oil products, varying by product type as per Georgia's tax code. The excise duty is lowest for diesel (GEL 400/t), followed by kerosene and jet fuel (GEL 440/t) and gasoline (GEL 500/t). Lubricants are taxed at GEL 800/t.

[17] IEA Secretariat's estimate based on total oil net imports of 1.35 Mt/y.

Assessment

The Georgian oil sector is quite small, with 13 companies owning licenses for upstream activities. Although two small refineries are currently operating in Georgia, the economic rationale for domestic refining remains unclear, as these refineries are unable to run at full capacity throughout the year. Higher fuel-quality specifications have also made it difficult for these refineries to operate, as it is unlikely that they have invested in the complex secondary units needed to meet these new standards.

Five major companies operate as both wholesale and retail operators in Georgia's downstream market, and the presence of multiple companies in both the wholesale and retail spheres suggests that the licensing regime does promote competition.

Georgia relies almost fully on imports to satisfy its fuel needs, with Russian, Azerbaijani, Turkmen and European refineries supplying roughly 80% of total imports. While Georgia has officially transitioned to Euro 5-specification motor fuels, some Euro 3 and 4 fuel is still being imported. SOCAR Georgia has noted the importation of lower-specification nano diesel from Azerbaijan's refining sector, but it is unclear where this fuel goes, so increased market monitoring and greater import transparency are advisable.

An impending task for the Georgian government is to fulfil the requirements of the EU acquis for oil, i.e. the obligation to maintain emergency stocks of crude and/or petroleum products. The implementation deadline of 1 January 2023 may be challenging to meet, as Georgia's draft Law on Emergency Stocks, prepared in 2017, is still being discussed with sector stakeholders. The new draft law should address several issues, including available facilities and compliance costs, and especially the impact of the obligation on small importers and its effect on pricing.

The various emergency response systems of International Energy Agency (IEA) member countries reflect differences in oil market structure, geography and national emergency response policy. Establishing oil stockpiles is undeniably time-consuming and requires domestic market changes and significant financial resources, especially if it is necessary to build up domestic storage capacity and acquire large volumes of crude oil or petroleum products. However, holding emergency oil stocks is very economically beneficial because it is a crucial tool for mitigating the economic damage caused by an oil supply disruption. Preventing the harmful price spikes associated with disruptions to oil supplies avoids the payment of substantial import costs and gross domestic product (GDP) losses (IEA, 2018).

There are different ways to set up and finance a stockholding system, depending on whether compulsory stocks are held as government/agency stocks or under an obligation on industry (Box 4.1). Financing must cover two principal sets of costs: expenses involved in setting up emergency stocks, and those of administering and maintaining the stocks.

Some options for regional co-operation, such as cross-border stockholding arrangements and joint stockpiling models, are flexible and pragmatic near-term alternatives.

Box 4.1 Stockholding in IEA countries

The various stockholding regimes of IEA member countries reflect differences in oil market structure, geography and national emergency response policy. Three general approaches exist to ensure that overall stock levels meet minimum requirements: government stocks; agency stocks; and industry stocks. Some countries use only one category of these, whereas most countries use a combination.

Government-owned stocks are typically financed through the central government budget and are held exclusively for emergency purposes. **Agency stocks** are also considered public stocks when a stockholding arrangement involves establishing a separate agency to maintain all or part of the stock obligation. The agency can be administered by the government or led and/or owned by industry. Public stocks offer the advantage of providing a clear indication of oil available solely for emergency purposes.

Industry stocks include both stocks held to comply with national stockholding rules and for commercial purposes.[18] For emergency stockholding, a government generally requires certain companies (e.g. importers, refiners, product suppliers and wholesalers) to hold a minimum amount of stocks. The required amount is set in proportion to the company's oil import share or its share of sales in the domestic market. One general attraction of a mixed system, in which both public and industry stocks are held, is that it can improve overall visibility of emergency stocks while maintaining an operational link with oil companies. In some cases, however, it can be problematic to distinguish between companies' operational and obligatory stocks, and thus difficult to monitor the stockholding obligation and the availability of these stocks in a crisis. By contrast, it is easier to monitor stocks that are completely segregated from operational stocks.

Another approach is to hold emergency stocks in tanks within commercial tank farms, where the location and volume of emergency stocks can be identified at any moment and made available during a crisis. This approach may offer the dual benefits of making the stocks visible and easy to check, and also readily available to be injected into the operational system quickly in times of emergency.

Source: IEA (2019), Energy Security in ASEAN+6 and IEA (2018), *Costs and Benefits of Emergency Stockholdin*g, IEA, Paris.

In addition to establishing emergency oil stockholding, Georgia must also put emergency response procedures in place in case of a supply disruption. To test and strengthen these procedures, Georgia should run an emergency response exercise every two years.

Improving the quality and timeliness of monthly oil data is also a critical aspect of oil supply security and is essential for building up and monitoring the maintenance of emergency oil stocks. Georgia should therefore ensure that adequate attention and resources are given to monthly oil data collection. More complete annual oil data, including stock changes, are also needed to construct a complete description of the country's energy situation, so sharing timely data on oil product imports and stock levels with the National Statistics Office of Georgia (Geostat, responsible for the national energy balance) is important.

[18] IEA emergency stockholding methodology. EU Council Directive No. 2009/119/EC does not count commercial stocks as contributing towards meeting the 90-day net import stockholding requirement.

Recommendations

The Government of Georgia should:

- Set up and/or strengthen monitoring processes to ensure that oil product imports meet the legal specifications (Euro 5) and should increase transparency on the fuel specifications of imports.
- Finalise stakeholder consultations on the draft Law on Emergency Stocks, addressing concerns about the costs of the obligation by exploring burden-sharing based on each operator's market share, full or partial exemptions for smaller operators, and the possibility of fulfilling the obligation by using existing stocking facilities located outside Georgia.
- Send the draft Law on Emergency Stocks to parliament along with all the information and support necessary to pass the draft law in a timely fashion.
- Run emergency response exercises every two years to test system responsiveness in case of a supply disruption.
- Ensure that any data collected is passed on to Geostat in a timely fashion.

References

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Further reading

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GOGC (Georgian Oil and Gas Corporation) (2016), Investor presentation, GOGC, Tbilisi.

5. Hydrocarbon exploration and production

Key data

(2018)

Crude oil production: 0.030 Mt (0.6 kb/d), 2.5% of domestic oil supply, -43.0% since 2008

Natural gas production: 0.01 bcm, 0.4% of domestic gas supply, -22% since 2008

Coal production: 0.138 Mt, 38.0% of domestic coal supply

Overview

Georgia produces small amounts of oil and natural gas, with production volumes declining over the past decade. Several companies operate in the upstream sector, in both exploration and production.

Domestic coal production satisfied about 38% of Georgia's coal demand in 2018, but production was suspended in that year following several fatal mining accidents. The future of the coal mining industry is therefore uncertain.

Oil and gas

Georgia's confirmed hydrocarbon reserves are estimated at 3.2 million tonnes (Mt) of oil and 3.7 billion cubic metres (bcm) of natural gas (Table 5.1).

Table 5.1 Estimated oil and natural gas reserves

	Reserves, January 2019			Production 2018
	Confirmed	Estimated	Possible	
Oil (Mt)	3.2	7.8	41	0.03
Gas (mcm)	3 742.6	4 874.8	6 153.9	10.2

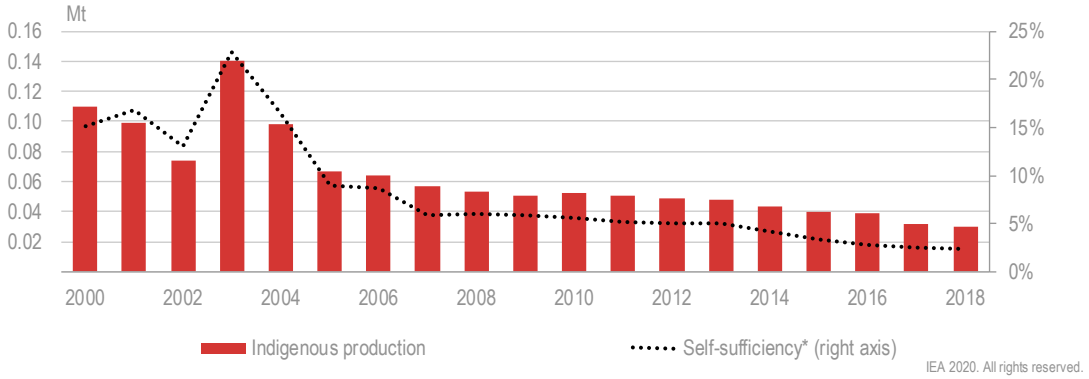
Note: mcm = million cubic metres.

Sources: For reserves: based on data provided by the State Agency for Oil and Gas (SAOG); for production: Geostat (2019), *Energy Balance of Georgia 2018*.

In 2017, 0.032 Mt of crude oil was produced in Georgia (Figure 5.1). A share of production is exported and the rest processed in domestic refining facilities. Outside of the early

1990s, crude oil production in Georgia peaked in 2003 and has declined since (-77% between 2003 and 2017).

Figure 5.1 Crude oil production in Georgia, 2000-18



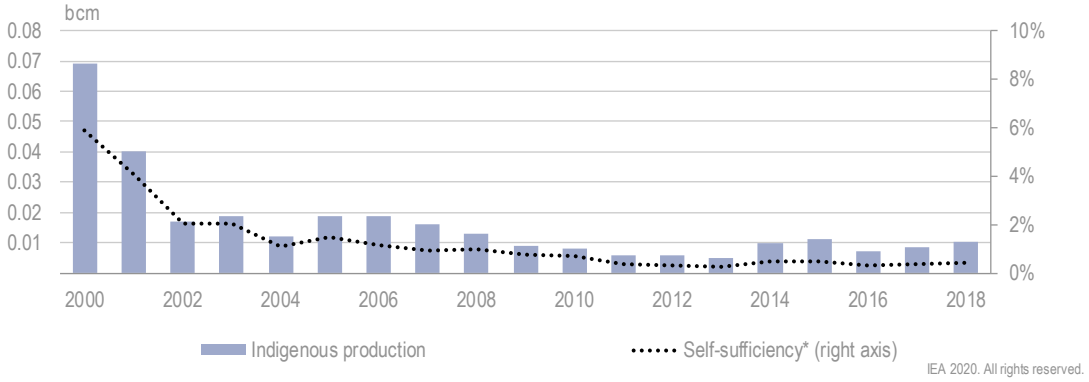
Georgia's crude oil production has been declining since the early 2000s.

* Indicates the share of domestic production in domestic supply.

Source: IEA (2020), *World Energy Balances 2020* (database), www.iea.org/statistics.

As for natural gas, Georgia produced 10 mcm in 2018 (Figure 5.2). Production peaked in 2000 at almost 70 mcm but thereafter declined rapidly (-85% during 2000-18) to the current level.

Figure 5.2 Natural gas production in Georgia, 2000-18



Georgia's natural gas production has been in steady decline since 2000.

* Indicates the share of domestic production in domestic supply.

Source: IEA (2020), *World Energy Balances 2020* (database), www.iea.org/statistics.

Oil and gas exploration and production in Georgia are governed by the Law on Oil and Gas. The key regulatory document is the Order on Approval of the National Rules Regulating the Production of Oil and Gas Operations issued by SAOG.

Georgia's territory is divided into licence blocks (Figure 5.3), and investor companies, selected through international tenders, sign production sharing agreements (PSAs) with

the government. In 2019, seven investor companies were conducting exploration activities in Georgia and six were producing oil and gas.

The Georgian Oil and Gas Corporation (GOGC), Georgia's national oil company, is responsible for:

- participating in negotiations and initiating PSAs between the state and investors.
- acting as a commercial and operating partner in PSAs on behalf of the Georgian government.
- administering the state's share of oil and gas produced and creating joint co-ordination committees with the investor to manage PSAs.
- implementing other sectoral functions assigned by the state, including holding the licence for oil production and producing oil in the licensed area, and maintaining wells located in non-licensed areas (GOGC, 2019).

The GOGC also represents the Georgian state as the owner of sectoral property (wells, special equipment, railway dead-ends, oil-accumulation systems, warehouses, etc.) and has the right to transfer property ownership to respective licence-holder investors.

In addition to its functions as Georgia's national oil company, the GOGC is involved in some economic activities. For example, it has an enterprise for treating and storing crude oil until it is sold (50 000-tonne capacity) and is also a gas supplier and electricity generation licensee, owning and operating a new combined-cycle gas turbine (CCGT) power plant.

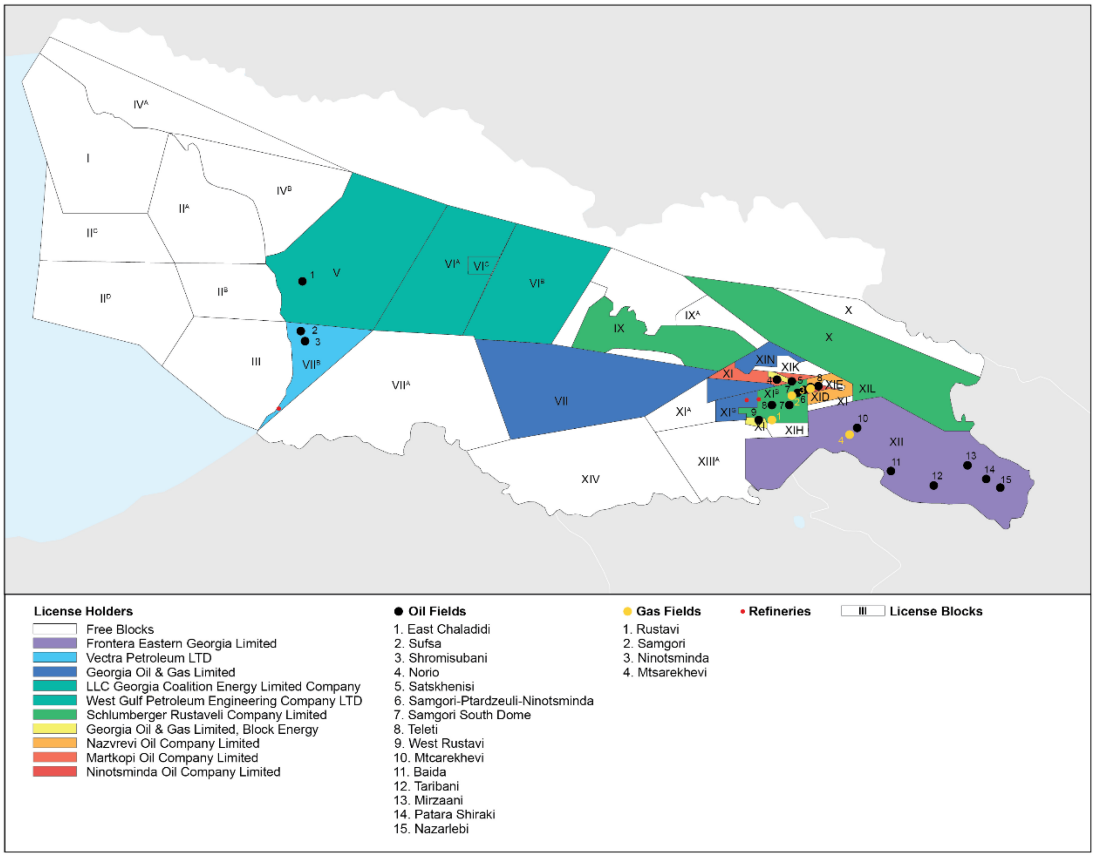
The State Agency for Oil and Gas (SAOG) within the MoESD solely supervises and controls the compliance of activities in the field of oil and gas with the legislation of Georgia, except for the supervision and control exercised by the tax and law enforcement authorities within their powers. The Agency is responsible for regulating oil and gas operations, oil refining, gas processing and/or transportation activities in Georgia according to the Law on Oil and Gas.

Its functions include:

- defining licence areas for oil and gas operations and deciding on the form of offering (tender or auction) and form of contract
- conducting tenders, selecting winners, and negotiating and concluding contracts with potential investors to carry out oil and gas operations
- issuing licences for oil and gas operations, oil refining, gas treatment and transportation, and approving all necessary authority, allotment permits and certificates
- supervising contract licensee compliance in the use of oil and gas resources
- establishing and managing the central database for all information on oil and gas resources and operations in Georgia, as well as on oil refining, gas processing and transportation
- issuing the normative acts supporting oil and gas operations, oil refining, gas processing and transportation
- supporting the licensees in meeting their contractual obligations

- supervising oil refining and gas processing to ensure environmental safety and oil and gas product quality, and contributing to the development, modification and approval of standards for raw materials and oil and gas products
- transferring all contractual operational and commercial duties (except for the regulatory functions) to the national oil company
- establishing tariffs for transporting raw materials and oil and gas products.

Figure 5.3 Georgia's oil and gas licence blocks



Source: Adapted from MoESD (2019a), "Response to the IEA Energy Policy Questionnaire".

The Energy Strategy of Georgia 2020-2030 highlights several priorities for the oil and gas sector:

- **Effectively use existing resources and the discovery of new deposits** to enlarge the share of local resources in the country's energy balance and ensure energy security. Accordingly, special emphasis is put on using discovered resources at current deposits through the wider use of modern methods and technologies, and on the discovery of new deposits through exploration, deep-hole drilling and qualified production.
- **Effectively use local intellectual resources and accumulated experience**, to which end the state intends to facilitate the proper involvement of local professional resources in resolving key operational issues, which in turn will create a significant number of new jobs. In resolving strategic objectives, it will consider the country's vital interests (key issues in

developing licensing blocks are currently settled by foreign specialists whose main concern is to make the most of profits in the short term rather than properly addressing local specifics and the interests of the country).

- **Ensure the state's influence as guaranteed under the law** by revising currently complex and unbalanced procedures in the course of decision-making by contractors on technical matters. As a result, the state (i.e. the SAOG and the GOGC) will be able to actively engage in (and block, if necessary) the practical implementation of contractor decisions that are not properly substantiated (MoESD, 2019b).

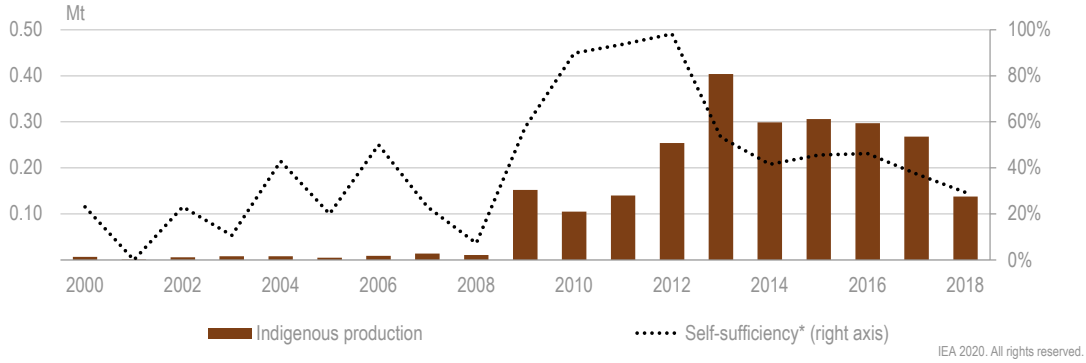
Coal

Georgian coal reserves are estimated at 300 Mt to 500 Mt according to the Georgian Industrial Group (GIG), whereas the German Federal Institute for Geosciences and Natural Resources (BGR) indicates 200 Mt of reserves and 700 Mt of resources, all of them hard coal. The reserves are located mainly in the three regions of Tkibuli-Shaori, Tkvarcheli and Akhaltsikhe.

In 2018, 0.138 Mt of coal was produced in Georgia (Figure 5.4). Domestic coal satisfies only a non-negligible share of domestic consumption, although in recent years both production and consumption have decreased rapidly.

Coal consumption fluctuated considerably between 2008 and 2018. In 2008, 0.07 Million tonnes of oil equivalent (Mtoe) of coal were consumed, whereas 2018 consumption was 0.30 Mtoe. Demand peaked in 2013 at 0.32 Mtoe, with the cement and steel industries accounting for the largest shares.

Figure 5.4 Coal production in Georgia, 2000-18



Georgian coal production re-started in 2009 following privatisation of the mines.

* Indicates the share of domestic production in domestic supply.

Source: IEA (2020), *World Energy Balances 2020* (database), www.iea.org/statistics.

Coal mining was well developed in Georgia during the Soviet period, but production decreased after 1991 and began to rise again only in 2009 when the mines were privatised by GIG. Saknakhshiri ("Georgian Coal"), owned by GIG, is the only coal mining company in Georgia. Its operations include coal mining, coal handling and the preparation of run-of-mine (ROM) coal as well as electricity generation (the company has a 13-mwgawatt [MW] coal-fired power plant).

The two operational underground coal mines, Mindeli and Dzidziguri, are both part of the Tkibuli-Shaori coal basin located in the mountainous area of Imereti close to the border at Racha (western Georgia). Saknakhshiri mines hard coal, a medium-volatile bituminous coal with a considerable amount of methane, and total coal under the mining licence amounts to 331 Mt.

Surface mining of coal happens only in Tkvarcheli (on territory not controlled by the Government of Georgia). There are six abandoned underground mines: two in Tkibuli and four in Akhaltsikhe.

Once extracted, almost all ROM coal is processed at the enrichment plant adjacent to the mine shafts. Average plant capacity is 150 tonnes per hour, so it can process nearly 0.6 Mt of ROM coal annually. After enrichment, three types of clean coal are obtained, of which 70-75% is ROM coal.

Coal production has been suspended since 2018 because of accidents in which several miners were killed or injured. According to preliminary reports, a methane explosion in one of the Tkibuli Mindel shaft's tunnels allegedly caused deformation of the walls. Rehabilitation and further development of the local coal industry will depend on the demand for coal for power generation (Box 5.1).

There are no incentive programmes for coal.

Georgia does not produce coalbed methane (CBM) from virgin coal seams because of the high cost.

Box 5.1 Georgia's plans for a coal-fired power plant

A thermal power plant with an installed capacity of 300 MW that would combust coal from mines owned by GIG is planned for construction at Gardabani. In 2017, CPower, a member of GIG, signed an MoU with the government and a PPA with Georgia's Electricity System Commercial Operator (ESCO). CPower also signed a contract in November 2017 to build and supply equipment for this plant with the Chinese company Dongfang Electric Corporation. Construction was to start in 2018 with the thermal power plant coming online in the last quarter of 2020, but after the July 2018 accident in the Mindeli Mine operated by Sakhnakhshiri Co., which is owned by GIG, GIG announced its intention to transfer ownership of Sakhnakhshiri Co. to the state. It was still unclear in November 2019 how this development will impact construction of the planned plant.

Source: Miljević, Mumović and Kopač (2019), Analysis of Direct and Selected Indirect Subsidies to Coal Electricity Production in the Energy Community Contracting Parties.

Assessment

Georgia's hydrocarbon production is quite small. Nevertheless, there seems to be a good working relationship between investors and the SAOG, with PSAs working well.

Local opposition has reportedly been a barrier to investment in some locations, with communities protesting potential seismic exploration because they have insufficient knowledge about the environmental impact of the work to be carried out. Meanwhile, excessive bureaucracy in other government ministries (e.g. relating to tax audits and

construction permits) has impeded efficient operations and potentially harmed what appears to be a positive investment climate overall. These types of issues could curb further investment by private companies all across the value chain, particularly for the construction of new oil stockholding facilities.

Prospects for Georgian refining are unclear (see Chapter 4 on oil), and it is difficult to expand the upstream sector with little to no market for Georgian crude production. Furthermore, volumes remain too low to be exported in an economically efficient fashion even though the crude is of high quality.

Suspending coal production at the Mindeli and Dzidziguri mines following the lethal accidents is necessary until the security issues have been resolved. Harsh geological conditions, along with insufficient investment in the mines over many decades, has made production dangerous.

Building a 300-MW power plant (and a coal mine with enough capacity to feed it) makes sense in terms of energy security and economic development. It would meet around 20% of Georgia's electricity demand, and such a plant would be a welcome source of diversification in a system currently over-dependent on hydro generation. However, without proper planning and adequate investment, the project could be a major failure (because of mining accidents, a lack of coal, excessive pollution, etc.). The government must therefore ensure that investment is adequate for the mine to meet world-class productivity and safety standards if the project proceeds, and for the power plant to conform with high efficiency and pollution controls. If these conditions cannot be guaranteed, it would be better to cancel the project to avoid environmental problems and mining accidents. In taking this decision, the government must remember that the plant would bind the country to coal for approximately 40 years.

Recommendations

The Government of Georgia should:

- Remove barriers to investment – particularly administrative burdens – to encourage further investment in exploration and production activities. It should specifically:
  - strengthen the role of the SAOG to implement the one-stop-shop principle stipulated under the Law on Oil and Gas.
  - ensure that the ministries' lines of communication are open and easily accessible.
- Establish a stakeholder consultation process to examine social and environmental concerns surrounding new upstream or refining projects.
- Address the social and environmental impacts of coal mine closures in accordance with best practices applied successfully in other countries (addressing social impacts should involve the retraining of coal miners).
- Assess the pros and cons of building a coal-fired power plant, making certain that it would meet the highest environmental and safety standards. If this is not feasible, make it clear that coal-fired generation will not be part of Georgia's energy mix and prioritise the development of other power sources instead.

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6. Electricity

Key data

(2018)

Total electricity generation: 12.1 TWh, +43.7% since 2008

Electricity generation mix: hydro 81.9%, natural gas 17.3%, wind 0.7%, coal 0.1%

Electricity net imports: 0.92 TWh (imports 1.52 TWh, exports 0.60 TWh)

Installed capacity: 4.06 GW

Electricity consumption: 12.0 TWh (commercial 32.3%, industry 27.6%, residential 20.8%, transport 3.1%, energy sector 0.3%, other sectors* 16.0%), +70.3% since 2008

* electricity supplied to Abkhazia.

Overview

Georgia's electricity system is interconnected with those of Azerbaijan, the Russian Federation (Russia), Turkey and Armenia. Cross-border trade allows Georgia to balance supply and demand despite the seasonal fluctuations of its hydropower-dominated electricity generation fleet. Due to rising domestic consumption – a trend expected to continue – it has been a net importer of electricity in recent years.

In the past decade, Georgia's electricity sector has been transformed from a vertically integrated single-buyer structure into an unbundled system with significant private sector participation in generation and distribution. It is continuing to evolve profoundly because Georgia is obligated as a member of the Energy Community (EnC) to harmonise its legislation with EU power sector standards by 2025. The country is therefore developing a new market model with more competitive and transparent rules for power trading.

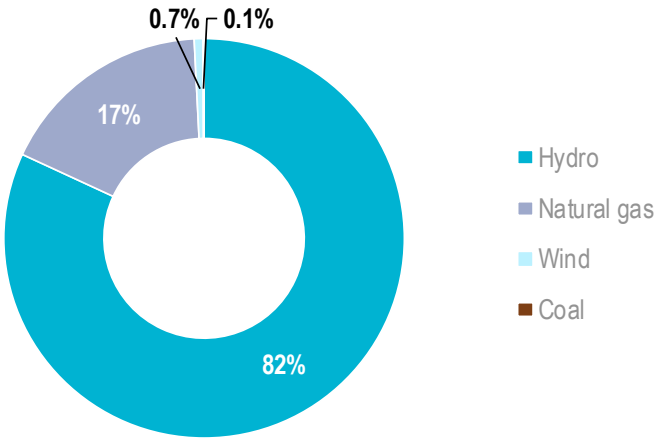
Supply and demand

Supply and demand have opposing seasonality patterns: maximum generation is in May-June, while maximum demand occurs during the winter, when hydro-based generation is at its lowest. This demand pattern has, however, been changing in recent years: with the increasing use of air conditioning, summer demand has risen, using hydropower output internally and leaving less electricity available for export.

Generation

Georgia's electricity is generated mainly by hydropower plants (HPPs) (the average share has been over 80% since 2000), with the remainder supplied by thermal power plants (TPPs) fired primarily by natural gas (Figure 6.1). Small amounts of wind-based electricity are generated by the 20 megawatts (MW) of installed wind capacity.

Figure 6.1 Georgian electricity generation by source, 2018

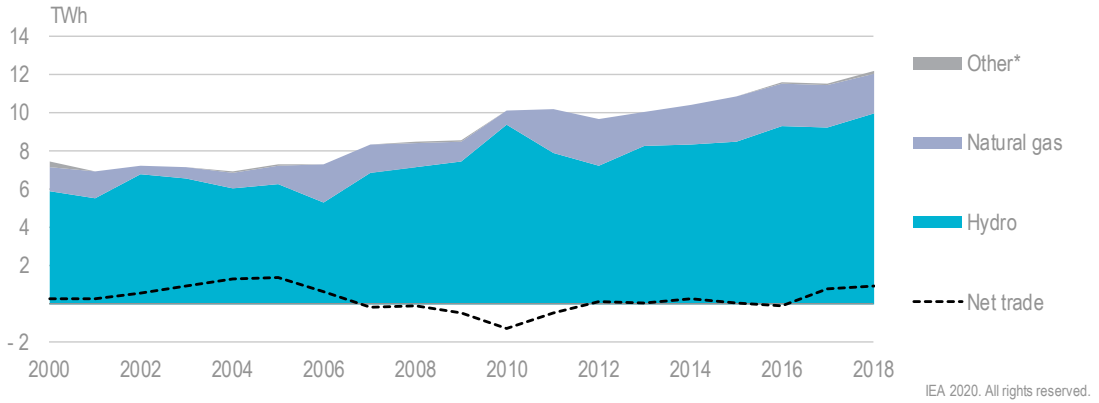


Most electricity in Georgia is generated by hydropower plants.

Source: IEA (2020), *World Energy Balances 2020* (database), www.iea.org/statistics.

Due to rising domestic consumption, Georgia recently became a net importer of electricity (in 2017-18) (Figure 6.2). In 2018, it generated 12.1 terawatt hours (TWh) and net imports totalled 0.9 TWh.

Figure 6.2 Georgian electricity generation by source, 2000-18



Georgia has had to increase its electricity imports since 2016 to meet rising consumption.

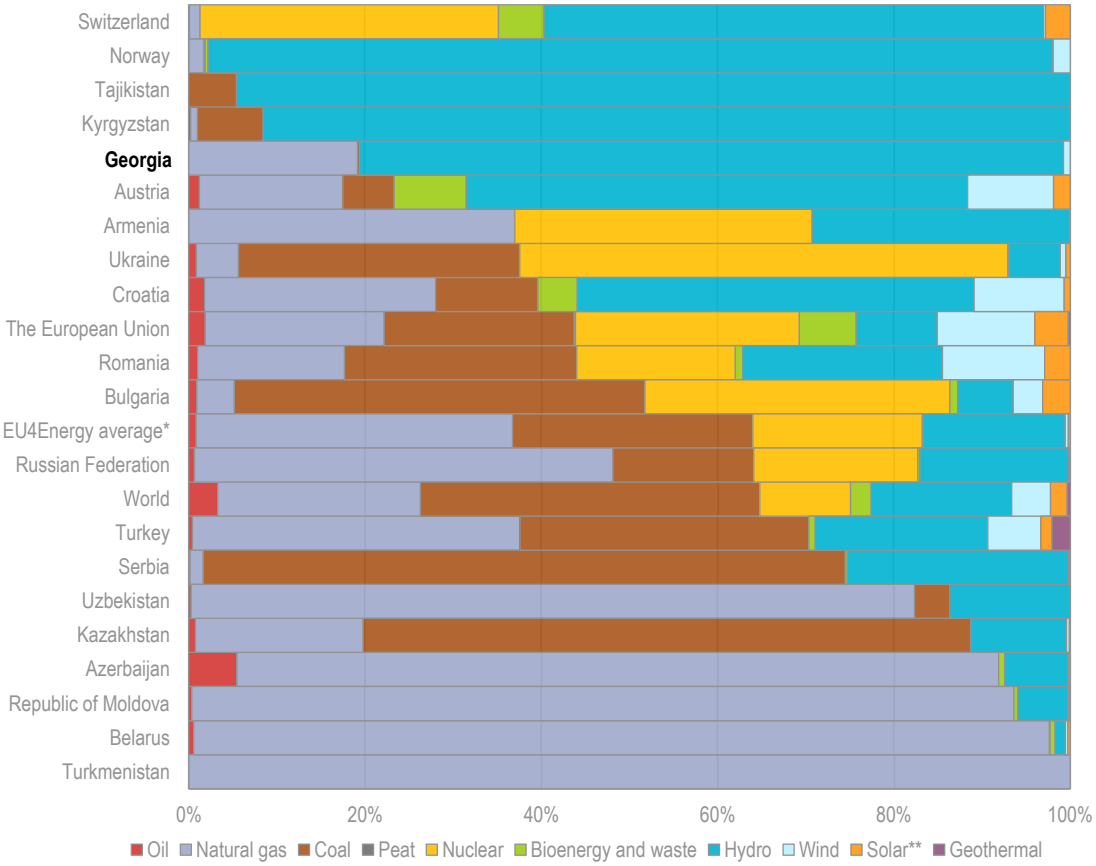
* Includes coal, oil and wind; not visible at this scale.

Source: IEA (2020), *World Energy Balances 2020* (database), www.iea.org/statistics.

As mentioned above, hydro is Georgia's foremost power generation source, accounting for 82% of total electricity generated in 2018. Natural gas made up virtually all the rest, at a share of 18%. Some electricity has been generated by coal-fired thermal plants and the Kartli wind farm in recent years, but even combined, their share of total generation remains around 1% only. Electricity has not been generated from oil since 2011.

Owing to the large amount of hydro in Georgia's electricity mix, the share of fossil fuels is below 20% (Figure 6.3). This is well below the world average of almost two-thirds of global electricity generation.

Figure 6.3 Electricity generation by source in selected countries, 2017



Less than 20% of Georgia's electricity generation is from fossil fuels.

* Covers Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Tajikistan, Turkmenistan, Ukraine and Uzbekistan.

** Includes solar photovoltaic (PV), solar thermal, wave and ocean power, and other power generation (e.g. from fuel cells).

Note: countries sorted by fossil fuels' share in electricity generation.

Source: IEA (2019a), *World Energy Balances 2019*, www.iea.org/statistics.

Georgia's installed generation capacity stood at 4.11 gigawatts (GW) in 2019, with HPPs accounting for the largest share, followed by combustible fuels (Table 6.1). Most thermal capacity relies on natural gas, and the most recent capacity addition was the 2016 commissioning of the 231-MW Gardabani gas-fired plant (also the first power plant in

Georgia to be able to operate in combined-cycle mode). There are currently no plants used for district heating.

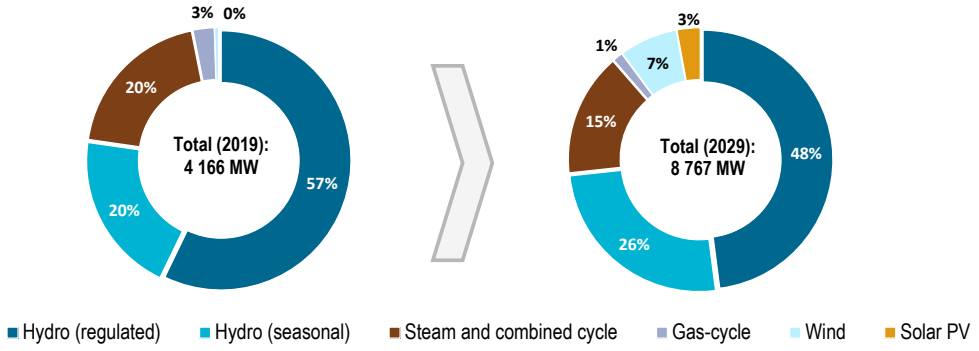
Table 6.1 Georgia's installed electricity generating capacity (GW), 2015-19

Energy source	2015	2016	2017	2018	2019
Hydro	2.8	2.8	3.16	3.11	3.22
With reservoirs	*1.99*	*1.99*	*2.23*	*2.22*	*2.38*
Run-of-river	*0.81*	*0.81*	*0.93*	*0.9*	*0.84*
Wind	-	-	0.02	0.02	0.02
Combustible fuels	0.73	0.93	0.93	0.93	0.93
Gas-cycle	*0.11*	*0.11*	*0.11*	*0.11*	*0.11*
Steam and combined-cycle	*0.62*	*0.82*	*0.82*	*0.82*	*0.82*
Total capacity	**3.53**	**3.73**	**4.11**	**4.06**	**4.17**

Source: Georgian State Electrosystem (GSE) annual reports 2015-19.

The GSE projects that total installed capacity will more than double to 8 767 MW by 2029 (Figure 6.4). However, recent trends in commissioning new capacity suggest that this projection is too optimistic and is unlikely to be realised.

Figure 6.4 Georgia's projected electricity generating capacity



Considering Georgia's recent progress in commissioning new plants, the GSE projection that total installed capacity will more than double by 2029 is unlikely to be realised.

Source: GSE (2019), Ten-Year Network Development Plan of Georgia 2019-2029.

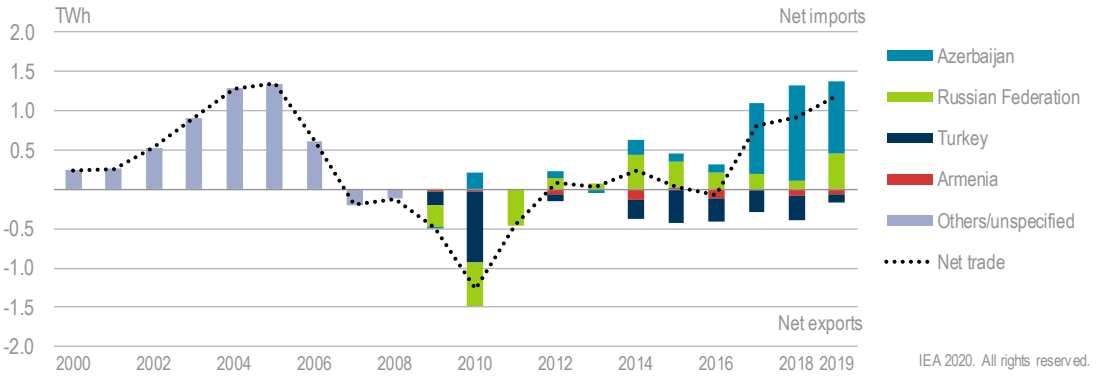
Imports and exports

Georgia is well interconnected and trades electricity with Azerbaijan, Russia, Turkey and Armenia. Cross-border trade allows Georgia to balance supply and demand despite the seasonality of its HPP-dominated electricity generation fleet. Electricity is exported in surplus months (usually April-August) and imported during periods of deficit (Figure 6.5). In 2018, Georgia imported 1.5 TWh and exported 0.6 TWh, resulting in net imports of 0.9 TWh. Most imports come from Azerbaijan and most exports go to Turkey.[19] Through

[19] Latest monthly electricity production and trade data available from ESCO (Electricity Market Operator of Georgia), https://esco.ge/en/energobalansi/by-year-1/elektroenergiis-balansi-2019.

its interconnections, Georgia can also serve as a transit country for power flowing north to south. The volume of electricity transiting through Georgia is a function of electricity prices in different markets, with electricity transit prices established through agreements between the GSE and neighbouring transmission system operators (TSOs).

Figure 6.5 Georgia's electricity trade by country, 2000-19



Georgia has become a net importer of electricity, mainly from Azerbaijan, in recent years.

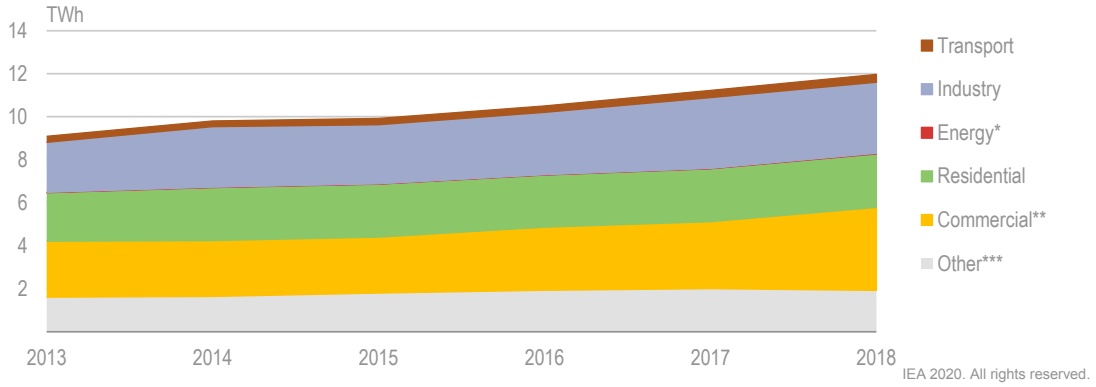
Sources: IEA (2019a), *World Energy Balances 2019*, www.iea.org/statistics; ESCO (2019), "Electricity balance 2019", https://esco.ge/en/energobalansi/by-year-1/elektroenergiis-balansi-2019.

Electricity consumption

According to available data, electricity consumption has increased nearly 80% since 2000. However, caution must be taken in analysing long-term final consumption trends because only recently have the quality and availability of energy statistics improved significantly. As it is possible to compare sectoral shares and trends in electricity consumption since 2013 only, it is certain that total consumption in 2018 (12 TWh) was over 30% higher than in 2013 (Figure 6.6).

The industry and commercial sectors are the largest energy consumers at almost 30% of total electricity consumption each, and within industry the iron and steel subsector consumes the most by far. The residential sector is in third place with a share just above 20%. Transport has remained stable at around 3%, solely for rail transport, and the energy sector consumes only a very small amount of electricity (<1%) to support its activities. Around 18% of the total electricity supply is consumed in Abkhazia, for which a breakdown is not available.

Figure 6.6 Georgia's electricity consumption by sector, 2013-18



Georgia's electricity consumption has increased steadily, mainly in the commercial sector.

* Includes coal mines and unspecified energy sectors, not visible at this scale.

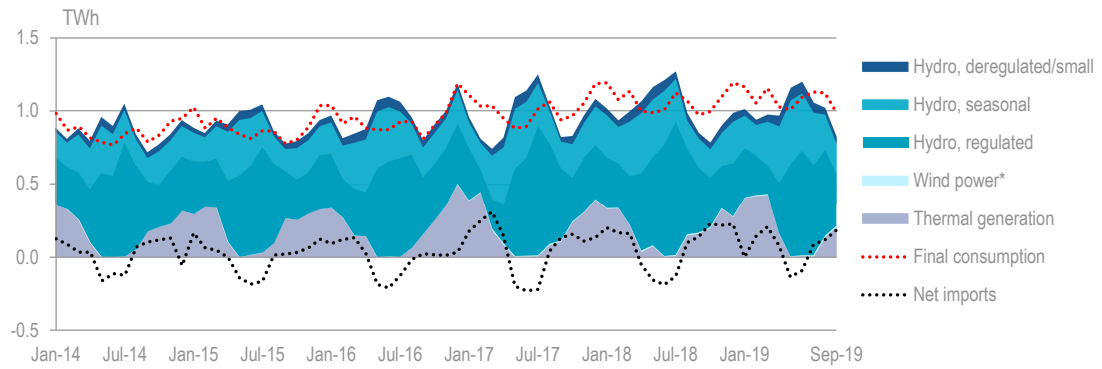
** Includes commercial and public services, agriculture and forestry.

*** Electricity supplied from Enguri HPP to Abkhazia. Breakdown for this consumption is not available.

Source: IEA (2020), *World Energy Balances 2020* (database), www.iea.org/statistics.

Georgia's annual electricity consumption pattern follows several peaks and valleys: the main peak is in the winter (around 1 100 gigawatt hours [GWh] per month) with local peaks around March and August (Figure 6.7). Consumption is generally lower in the spring and then again in September (around 900 GWh/month), and the summer peak is gradually increasing. Production variations are more irregular, reflecting hydrological conditions.

Figure 6.7 Georgia's monthly electricity generation, consumption and trade, January 2014-September 2019



Thermal power generation, mainly from natural gas, covers variations in seasonal consumption and hydropower production.

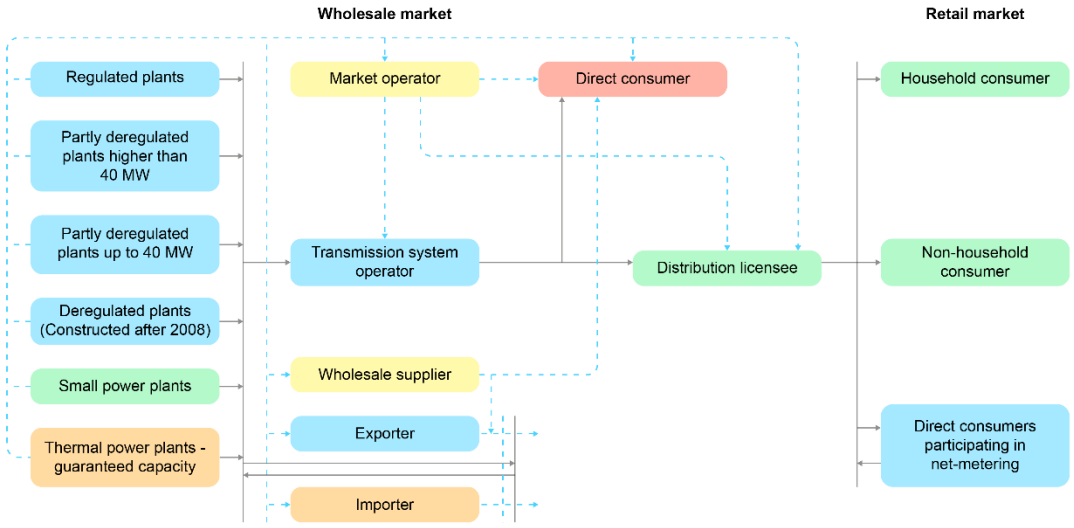
* Not visible at this scale.

Source: ESCO (2019), "Electricity balance 2019", https://esco.ge/en/energobalansi/by-year-1/elektroenergiis-balansi-2019.

Sector structure

Figure 6.8 illustrates the structure of Georgia's electricity sector as of October 2019, but it will be modified after implementation of the new Energy and Water Law (as discussed in the Market Reforms section below).

Figure 6.8 Georgia's electricity market as of October 2019



Georgia's electricity market, currently based on bilateral contracts and the trading of "balancing" electricity, is set to be further liberalised and deregulated in line with the EU acquis.

Source: GNERC (2019), Report on Activities of 2018.

The **Georgian National Energy and Water Regulatory Commission (GNERC)** is the independent market regulator, financed through the regulation fees paid by licensees, importers, suppliers and the Electricity Service Commercial Operator (ESCO).

Generation

Electricity generators are classified for regulatory purposes as:

- **Regulated power plants** for which GNERC sets fixed tariffs.
- **Partly deregulated power plants with a capacity higher than 40 MW**, for which the regulator sets marginal tariffs (upper margin).
- **Partly deregulated power plants with a capacity lower than 40 MW,** for which the regulator does not set tariffs, but they are subject to the licensing rules and conditions.
- **Deregulated power plants constructed after 1 August 2008** that act on the market without any tariffs set by the regulator.
- **Guaranteed capacity sources,** for which the regulator sets guaranteed capacity fees and marginal tariffs (upper margin).

Power plants with an installed capacity above 15 MW must obtain an electricity generation licence, whereas those below 15 MW (**small power plants**)[20] do not require one.

In 2018, 91 generators were registered: 5 thermal, 2 regulated, 9 partly deregulated, 14 deregulated (hydro) and 61 small (deregulated) power plants. The three largest electricity generators account for over half of the market share, which means that the generation market is highly concentrated: 33.43% Enguri HPP LLC; 9.76% Gardabani Thermal Power Plant LLC; and 9.96% Vartsikhe HPP LLC (GNERC, 2019).

The state-owned Enguri/Vardnili cascade supplies more than 50% of its electricity output to the breakaway region of Abkhazia free of charge. Although the Enguri dam is located on territory controlled by the Georgian government, the powerhouse is in the breakaway region.

Electricity **importers and exporters** do not require a licence, as their activities are deregulated.

Wholesale trade

The wholesale market consists of a direct (bilateral) contract segment and "balancing" electricity. In 2018, direct contracts accounted for 80.3% of total wholesale electricity delivered, and balancing electricity for 19.7% (GNERC, 2019).

The **Electricity System Commercial Operator (ESCO)** has the role of wholesale market operator: it is responsible for trading both balancing and guaranteed-capacity electricity. It registers participants for wholesale trade and receives, analyses and reports wholesale electricity trade data.

Eligible (direct) consumers (those connected to transmission lines with a capacity of 35 kilowatts [kW] or more) can purchase electricity directly in the wholesale market. In 2019, entities whose average monthly consumption for their own needs was 5 million kilowatt hours (kWh) or more were obligated to register as direct consumers, whereas registration was voluntary for those with lower consumption.[21]

In the bilateral-contracts market, the sellers are generators and importers, and the buyers are: i) retail suppliers (distribution licensees); ii) eligible direct customers; iii) exporters; iv) traders who purchase electricity from generators and importers and supply it directly to customers and exporters; v) the dispatch licensee (the GSE) covering transmission losses; or vi) generators (for self-consumption). To participate in wholesale market trading, an entity must register with ESCO as a qualified enterprise. In October 2019, 15 direct consumers and more than 10 traders were registered (Galt &Taggart, 2019a).

Balancing market

Georgia does not have a balancing and ancillary services market according to the definition of the European Network of Transmission System Operators for Electricity (ENTSO-E). Instead, balancing electricity is traded through the market operator (ESCO), which fills any sale and purchase volumes of electricity (capacity) that are not traded through bilateral contracts.

[20] The ceiling was 13 MW until late 2019.
[21] In 2018, the threshold was 15 million kWh.

As the market operator, ESCO compares the contracted and actual volumes of electricity traded each month and defines the volume and price of balancing electricity according to the electricity (capacity) market rules. It organises monthly settlements with eligible enterprises that purchase or sell electricity through it. The price of balancing electricity is set monthly, based on the weighted average price of electricity purchased from different generators and importers. To have the volumes of electricity necessary to balance the market, ESCO purchases it from HPPs throughout the year and supplements it with imports and thermal generation when hydro generation is insufficient.

Guaranteed capacity (reserve) market

There is no free market for trading firm capacity, but TPPs receive revenues in the form of guaranteed capacity (reserve) payments.

The Government of Georgia defines guaranteed capacity sources according to amount of guaranteed capacity and periods of availability. In 2018, five thermal units operated by four companies were defined as guaranteed capacity sources and used to ensure secure functioning of the system. Regulatory amendments adopted in 2018 made it possible (at least in theory) for other plants to become guaranteed capacity sources if they comply with specific technical requirements. Every year the regulator GNERC sets a guaranteed capacity fee and marginal tariffs (upper margin) for each guaranteed capacity source. In 2019, the guaranteed capacity fee varied from GEL 20/day to GEL 385/day for different thermal units (GNERC, 2019).

Transmission and dispatch

TSOs own and operate the electricity transmission grid and support cross-border electricity trading. There are three TSOs in Georgia: the state-owned GSE; Energotrans (a subsidiary of GSE); and Sakrusenergo (owned 50% by the Ministry of Economy and Sustainable Development [MoESD] and 50% by Russia's Inter RAO). Negotiations on shifting transmission operation responsibilities to one TSO are ongoing, and various legal approaches are being tested to clearly define the TSO's control areas as per the EU energy acquis.

GSE is the largest TSO, as it owns and operates 3 350 km of transmission lines and 93 substations. It also acts as the dispatch operator, managing the entire transmission network through the National Dispatch Centre, and oversees the cross-border transmission lines interconnecting Georgia's system with those of Russia, Turkey, Armenia and Azerbaijan.

Distribution and supply

At the retail level, there are three categories of customers: i) households; ii) non-household customers; and iii) retailers possessing renewable energy (RE) micro power plants with a capacity of up to 100 kW.

Electricity distribution and supply are not yet separate. The two distribution system operators (DSOs) – Telasi and Energo-Pro Georgia (EPG) – deliver electricity to final consumers through distribution networks and deal with billing and collection. Telasi is a subsidiary of the Russian energy conglomerate Inter RAO (75%) and the Georgian state-owned Partnership Fund (25%). It supplies electricity to 0.57 million consumers in the Tbilisi municipality, with total electricity consumption of about 3 TWh per year. EPG

Georgia, which is part of the Czech Energo-Pro Group, covers the rest of Georgia (excluding the breakaway regions), i.e. 1.2 million consumers that use 5.9 TWh annually. In addition to distribution, Telasi and EPG have generation assets: Telasi produced 0.5 TWh of electricity in 2018 and EPG 1.8 TWh (TBC Capital, 2019).

By law, small power plants can sell electricity directly to end users, including retail customers, but their participation in the retail market is insignificant and in practice consumers do not switch to other suppliers. The monopoly positions of distribution companies in their distribution zones creates a barrier to direct bilateral trade in the retail market. GNERC assesses Georgia's electricity retail market as being "highly concentrated", with EPG accounting for 66.5% of the market share (GNERC, 2019).

Market reforms

Georgia's electricity market is undergoing profound transformation. As a member of the Energy Community (EnC), Georgia is obligated to harmonise its legislation with EU power sector standards by 2025. It is therefore developing a new market model with more competitive and transparent rules for power trading, and several draft laws and strategic documents have been developed in compliance with EnC membership obligations (see Chapter 2, General Energy Policy).

Amendments to primary legislation and several regulatory documents adopted in 2017 and 2018 have already changed certain electricity market rules:

- Large customers have been required to register as eligible consumers and participate in the wholesale market since May 2018.
- Power plants with installed capacity of less than 40 MW were deregulated in 2018; prior to this (since 2008), only power plants with a capacity of 13 MW or less were deregulated.
- Small-capacity power plants (up to 15 MW) can sell electricity to ESCO from September to May at a wholesale price equivalent to the upper limit set for HPPs by GNERC.
- The regulatory period has been extended to three years for generation (regulated plants), dispatch, transmission, and distribution companies. Regulated tariffs will be based on a company's three-year development plans.
- Distribution companies can benefit from grace periods to create digital maps of distribution grids and integrate supervisory control and data acquisition (SCADA) elements in their accounting process.

The Electricity Market Concept design was approved by the MoESD on 24 December 2018. It defines in general terms the roles and responsibilities of key market participants in accordance with EU Directive No. 72/2009/EC. It is an intermediary document that will serve as a basis for the detailed design of the electricity market concept design.

Building upon the Electricity Market Concept, the government prepared a Law on Energy and Water Supply and approved it in late 2019. This law defines a new legal framework for electricity generation, transmission, distribution, dispatch, supply and trade, and provides guidelines for the transition period, based on several principles (Galt &Taggart, 2019a; TBC Capital, 2019):

- The unbundling of supply and distribution activities from production and trading activities by the end of 2020: transmission and distribution will remain regulated activities while trade

and supply become fully deregulated. Transmission and distribution licensees that currently have both functions will have to be reorganised.

- The defining of new and existing participants in the wholesale and retail markets, such as a supplier of last resort (nominated by the government), a universal service provider (under a public service obligation), traders and eligible consumers.
- The abolishment of cross-subsidies among vertically integrated companies.
- A transition to market-based end-user prices through deregulation, unbundling and supplier switching. However, prices for electricity generated by some plants will continue to be set by GNERC.
- The enhancement of power trading activities and diversification of power trading options through the creation of a day-ahead market, a day-in market, and a market for balancing electricity and ancillary services.

In addition to the regulation of the security of supply and support to competitive energy markets development, according to the new law on Energy and Water Supply it was decided that the responsibility for adopting the market rules is transferred to GNERC, while the Ministry adopts the security of supply rules.

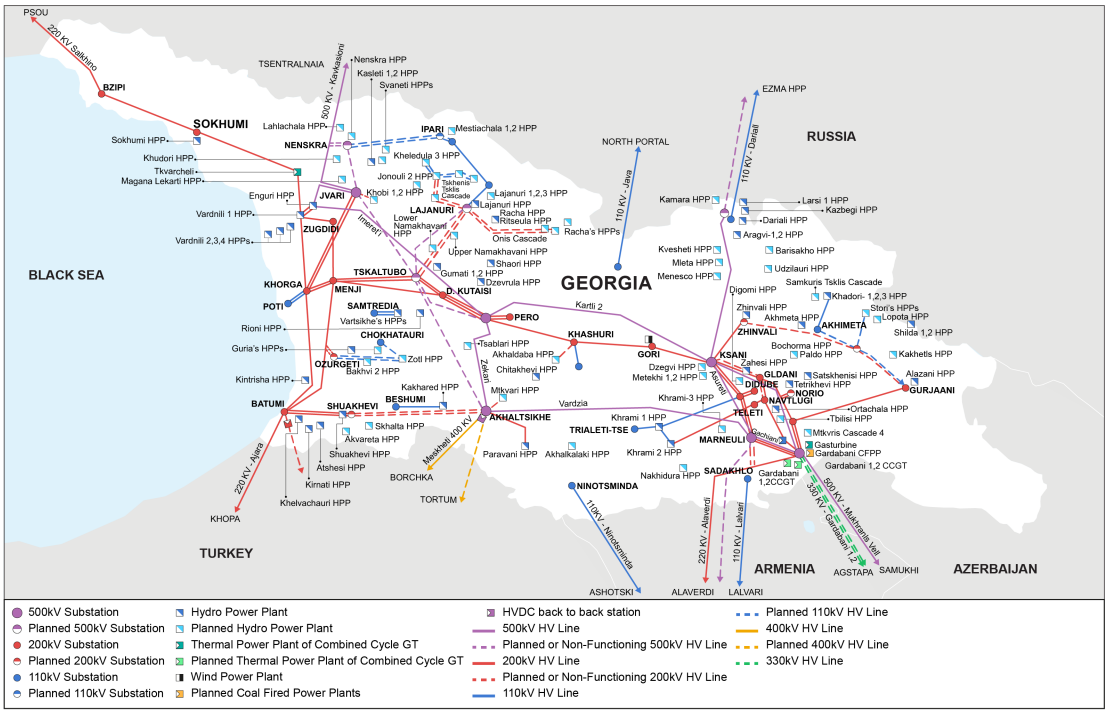
However, the law does not provide details on the structure and functioning of the future market. For example, it does not specify trading principles or a mechanism to integrate existing long-term power purchase agreements (PPAs) into the market. Many political and organisational/technical decisions related to the future market are expected to be made by the MoESD and GNERC in secondary legislation two to five months after adoption of the law.

Infrastructure and cross-border trade

Transmission system

Georgia's transmission network was designed for parallel operation with the North Caucasus and Armenia/Azerbaijan power systems: electricity generated by HPPs in western Georgia was transmitted to Russia, while the TPPs located in eastern Georgia received fuel from Azerbaijan. As a result of this legacy, today most electricity is generated by HPPs in the west, while the main consumption centres are in the eastern part of the country (Figure 6.9). Power in the system therefore flows primarily west to east, especially during the spring and summer when there is no thermal generation.

Figure 6.9 Georgia's electricity transmission system



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: GSE (2019), Ten-Year Network Development Plan of Georgia 2019-2029.

According to the GSE, substantial investments in the transmission and distribution networks are required to upgrade the reliability of the system and continue ensuring security of supply in the context of growing demand. It is frequently challenging for the western part of the system to transfer the full load flow, and cross-border lines are not backed up, which risks creating an emergency in the case of an outage. Furthermore, several 220-kilovolt (kV) dead-end lines threaten system stability. Peak loading of substations has increased significantly in recent years, especially in Tbilisi and the Batumi nodes, and the N-1 criteria are not being met in several substations (GSE, 2019).

The GSE also reports that the Georgian power system has a shortage of operating reserves, which results in poor power quality in isolated regimes. In addition, when any large power unit fails, the emergency control system initiates load-shedding. Therefore, the Ten-Year Network Development Plan (TYNDP) envisages increasing operating reserves by constructing regulated hydropower plants with water storage, as well as TPPs, and rehabilitating existing generation facilities. The GSE is also upgrading the Central SCADA/EMS System Software and Server Upgrade Project to ensure that hardware and software respond to modern system requirements. The new system will be compatible with ENTSO-E standard. The GSE is also implementing a network backbone upgrade project that aims at creating a unified data transport network that would replace the existing system. Box 6.1 lists other development objectives for the next ten years.

Box 6.1 Network development objectives

According to the GSE's TYNDP, Georgia's transmission network will be developed to meet the following targets:

- transmission of existing generation
- fulfilment of single contingency (N-1) criterion (improvement of reliability)
- integration of new HPPs into the network
- increased network potential for power transit
- establishment of reliable power supply centres to support development of production/tourism centres
- increased responsiveness to (naturally) increasing demand in the power system
- replacement of old thermal units with flexible, cost-effective combined-cycle TPPs
- provision of adequate operating reserves
- improved power quality.

Source: GSE (2019), Ten-Year Network Development Plan of Georgia 2019-2029.

Cross-border connections

Georgia's electricity network is connected to networks in Russia, Azerbaijan, Armenia and Turkey. Cross-border links allow for bidirectional power exchange with these countries, as well as transit from Russia and Azerbaijan to Turkey.

Cross-border trade allows Georgia to counterbalance the seasonality of its electricity generation fleet dominated by HPPs. The existing transmission network has adequate capacity to meet current needs, but further growth in cross-border power flows is limited by the national power system's operating modes (see Box 6.2) as well as by the physical capacities of cross-border lines. As trade and transit volumes increase and new generation capacity comes online, network reinforcement and expansion will be required. The TYNDP details an investment of EUR 750 million during 2019-29 for network projects, both cross-border and local.

The TYNDP estimates that Georgia will play an important role in the regional integration of Caucasus and Black Sea countries' power systems, to be carried out by 2029. The GSE expects that cross-border links between Georgia and its neighbours will expand significantly during 2023-29, allowing 1 400 MW of power to be exchanged with Turkey, 1 600 MW with Russia and 700 MW with Armenia. Power exchanges of 700 MW to 1 000 MW are already possible between Georgia and Azerbaijan (GSE, 2019). Table 6.3 enumerates existing and planned cross-border lines.

The results of different scenarios modelled by the GSE demonstrate that the construction of new cross-border lines with neighbouring states is necessary to optimise the operation of Georgia's power system (GSE, 2019).

Table 6.2 Georgia's current and projected transmission connections with neighbouring systems

Bordering country	Cross-border line	Voltage (kV)	Exchange	Capacity (MW)	Operation date
Armenia	Alaverdi	220	Export/Import	150 / 100	Operational
	Marneuli	400	Export/Import	700	2025
Azerbaijan	Mukhranis Veli	500	Export/Import	700	Operational
	Gardabani	330	Export/Import	670	2022
Russian	Kavkasioni	500	Export/Import	610	Operational
	Ksani-Stepantsminda-Mozdok	500	Export/Import	1000	2023
	Salkhino	220	Export/Import	50 / 150	Operational
Turkey	Meskheti	400	Export	1050	Operational
	Akhaltsikhe-Tortumi	400	Import	350	2022
	Batumi-Muratli	154	Export/Import	350	2025
	Adjara	220	Export/Import	150	Operational

Source: GSE (2019), Ten-Year Network Development Plan of Georgia 2019-2029.

Box 6.2 Regional power systems

The power systems of South Caucasus countries are connected to three large synchronous areas that have differing technical characteristics and standards:

Turkey is synchronised with ENTSO-E: two 400-kV lines to Bulgaria and one 400-kV line to Greece.

Georgia and Azerbaijan are connected to the Interregional Power System/Unified Power System (IPS/UPS) area with Russia.

Armenia is in synchronous operation with Iran (two 220-kV lines and plans for a 400-kV link) and Turkmenistan.

Synchronous operation is therefore complex and challenging. It currently requires either costly back-to-back direct current (DC) connections (Georgia-Turkey) or connecting in island mode (Georgia-Armenia). Georgia's connection with Armenia will be strengthened through back-to-back DC.

Security of supply

Rapidly rising electricity demand means that new generation capacity will be needed in upcoming years, so numerous power plants are in planning, supported by government policy. Although 150 projects (installed capacity of 5.4 GW) are currently at various stages of development with identified investors, full implementation of all planned projects is unlikely. The construction of HPPs has slowed for various reasons, including delays in introducing a new market model; higher investment risks for generation companies since PPAs were abolished; problems with construction permits; and strong local opposition. Even partial implementation of the 150 projects would make Georgia a net exporter of electricity as of 2021, but without the addition of new capacity it may need to import

electricity, even in the summer. In 2019, for the first time in Georgia's history, electricity imports exceeded exports during the summer.

Enguri HPP's high market share (33%) is a concern for security of supply. The plant is not expected to be decommissioned, but ongoing repairs and problems with the breakaway region of Abkhazia are creating tensions.

The government's National Disaster Risk Reduction Strategy of Georgia 2017-2020 aims to establish a unified disaster risk reduction (DRR) system, improve national and local disaster preparedness and response capabilities, and increase response efficiency to potential threats. It includes a section on possible accidents at the country's large hydropower plants (Enguri, Lajanuri, Shaori and Zhinvali) as well as at the Poti watershed structure.

New challenges for Georgia's electricity system stem from the significant load increases of cryptocurrency mining. The cryptocurrency economy is estimated to account for up to 15% of Georgia's total power load, although the exact consumption by all miners, large and small, is difficult to assess (Longurashvili, 2018; World Bank, 2018).

The increasing use of decentralised small-scale generation systems, electric vehicles and other new technologies makes it more difficult to forecast supply and demand and respond quickly to rapidly changing loads. To address these challenges, the TYNDP proposes:

- constructing HPPs with reservoirs
- enhancing energy efficiency
- establishing power storage stations and batteries
- constructing thermal plants and inter-system power transmission infrastructure
- perfecting control and operation systems
- introducing smart grids
- installing transmission lines with dynamic transfer capacity
- optimally integrating wind and solar power stations (possibly with storage batteries)
- acquiring advanced static VAR compensator ("SVC PLUS") and flexible alternating current transmission system (FACTS) equipment
- utilising up-to-date planning and modelling devices (GSE, 2019).

A pumped-storage power plant on the Enguri river is also in planning. Three companies were launched in June 2018 – the Enguri Pumped-Storage Power Plant limited liability company (LLC) (established by the Georgian Oil and Gas Corporation [GOGC]); the joint-stock company (JSC) Georgian Energy Development Fund; and the Enguri HPP LLC – and pre-feasibility assessments are ongoing (GOGC, 2019).

The Law on Energy and Water Supply introduces measures aligned with the EU acquis to ensure the security of the electricity supply for all consumers and to protect vulnerable consumers from supply interruptions.

System integration of renewable energy

Interest in variable renewable energy (VRE) sources such as solar and wind is growing. Because of their variable nature, however, integrating them into the system creates additional challenges.

Georgia's electricity TSO (GSE), with the support of the European consultant's consortium DIgSILENT-DMCC-R2B, has studied the possibilities of integrating VRE sources into the Georgian power system. Their research results indicate that the system can integrate 333 MW of wind and 130 MW of solar generating capacity by 2020-21 (after the introduction of balancing mechanisms), and it will be possible to integrate approximately 665 MW of wind and 260 MW of solar by 2025 if certain assumptions, restrictions and requirements are met. By 2030, it should be possible to integrate 1 332 MW of wind energy and 520 MW of solar (100% of Georgia's RE potential) (GSE, 2019).

With the financial support of donors, the GSE has commissioned a study on possible energy storage solutions in Georgia's power system (including batteries and hydro-accumulating stations); it is expected to be completed in 2020. This research also aims to evaluate opportunities for the maximum possible integration of wind and solar power plants.

The GSE is reportedly already taking some measures to facilitate VRE integration, including planning RE integration hubs and demand-side management (although consumers are not yet being compensated for demand-side flexibility).

The connection of RE plants to the transmission grid is regulated by Chapter 2 of the Grid Code approved by GNERC in April 2010. Grid connection difficulties are reported to be one of the barriers to RE development (see Chapter 9 on renewable energy). For example, a new 100-MW HPP operated for two years at half-capacity because the GSE was unable to connect it with adequate capacity. This was caused by public opposition to the construction of power lines.

Prices and tariffs

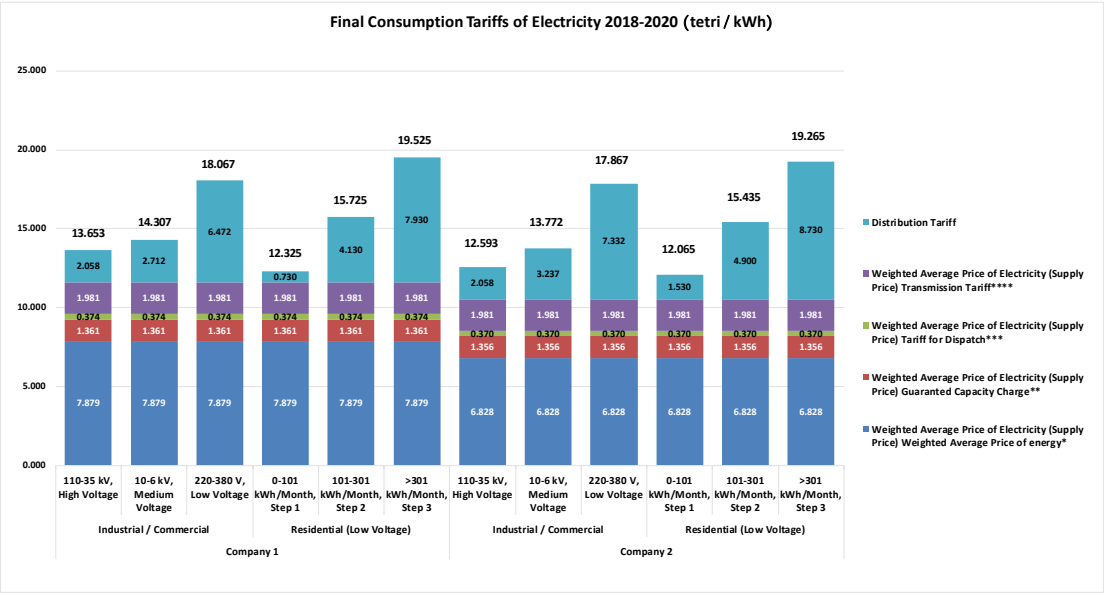
Regulated and deregulated prices for electricity generators co-exist in Georgia, with regulated prices for plants constructed in the past and already amortised exerting downward pressure on final end-user tariffs. For example, the tariff for the Enguri plant was set at EUR 0.44/kWh from January 2020, and deregulated power plants, i.e. plants built after 1 August 2008 or with an installed capacity of less than 40 MW, can benefit from free trade and sell electricity at the market-based price.

GNERC establishes fixed electricity purchase prices for HPPs with reservoirs (regulated power plants). For partially regulated power plants and TPPs, GNERC establishes an upper price cap on electricity sold. As discussed in Chapter 3 on gas, electricity production costs for TPPs are indirectly subsidised because they receive natural gas at below the market price. Electricity generation tariffs for regulated HPPs range from GEL 0.018/kW to GEL 0.041/kW, whereas for TPPs they range from GEL 0.08/kW to GEL 0.115/kW. In addition to the price for electricity generated, TPPs receive guaranteed capacity compensation to cover fixed costs, as discussed in Sector Structure above.

The export of electricity is deregulated (the price is set by market participants), whereas the electricity import price is set according to the marginal tariff formula established by GNERC.

GNERC also regulates retail electricity tariffs for households and commercial consumers supplied by distribution companies (Figure 6.10). The price depends on consumption volume, ranging from GEL 0.14/kWh to GEL 0.23/kWh for households, and from GEL 0.15/kWh to GEL 0.21/kWh for commercial users (GNERC, 2019).

Figure 6.10 Georgia's final-consumption electricity tariffs, 2018-20



Source: GNERC (2019), Report on Activities of 2018.

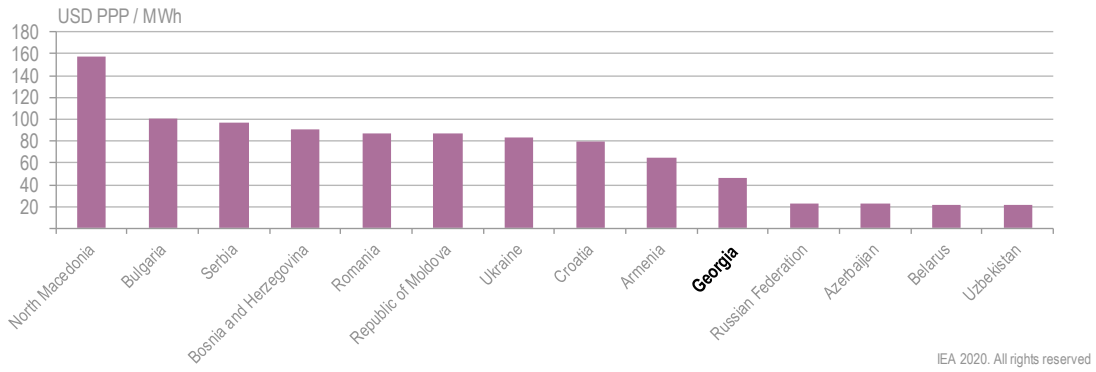
TSOs receive a fixed price set by GNERC for transferred electricity, based on investments in infrastructure and operating costs. GNERC accepts transmission losses of 2%, and those above 2% are excluded from the tariff calculation, which encourages loss reduction. The total transmission tariff in 2018 was GEL 0.0198/kWh, 38% higher than in 2017.

GNERC sets tariffs for all regulated companies (except TPPs) for a period of three years (the regulatory period for TPPs is only one year because of fluctuating fuel costs). In 2017, GNERC set the tariffs for generation, dispatch, transmission and distribution licensees for the 2018-20 regulatory period, while for guaranteed power sources (TPPs) tariffs were set for 2018 only (GNERC, 2019).

New generation capacities, as well as much-needed investments in transmission and distribution networks, are raising final electricity prices. The regulatory impact assessment for the Energy and Water Supply Law demonstrates that electricity prices will rise in all scenarios in the upcoming years, but the growth rate will be lower if the electricity market reform is implemented.

An international price comparison, especially with neighbouring countries (Figure 6.11), reveals the potential for Georgia to strengthen its role as a regional electricity trading hub, as consumer prices south of Georgia (in Turkey, Armenia and Azerbaijan) are higher than in the north (Russia).

Figure 6.11 Figure 6.11 Residential electricity prices for selected countries, 2017



Georgia's residential electricity prices are lower than those of neighbouring countries.

Note: PPP = purchasing power parity.
Source: IEA (2019b), *Energy Prices and Taxes 2019*, www.iea.org/statistics.

Assessment

Government policy

The government's electricity sector policy in the past decade has aimed to improve energy security to meet domestic demand and export excess electricity to neighbouring markets. It has tried to achieve this by: i) attracting private investment for the construction of new HPPs of all sizes; ii) building TPPs that use natural gas, which Georgia receives as a transit fee; iii) rehabilitating and strengthening the domestic transmission and distribution system; and iv) increasing cross-border capacity with neighbouring countries.

An important aspect of the policy is the desire to create an attractive environment for investment in HPPs through deregulated prices for new plants, the option to export electricity without any licence during the summer months, low taxes, minimal licensing/permitting bureaucracy, no water fees, etc. Several privately financed HPPs have been constructed thanks to this policy, but new projects have been suspended since guaranteed PPAs were abolished in 2016 and many of the existing 150 projects have also stalled.

As discussed above, the Government of Georgia should adopt an integrated energy strategy based on its vision of electricity sector development, with specific expansion targets for each technology established according to the electricity demand forecast and taking demographic and economic development into account. Such a strategy should present a general vision for future developments as well as a roadmap for short- and medium-term implementation of concrete actions and the setting of targets.

Supply-demand balance

A key characteristic of Georgia's electricity sector is the seasonality of consumption and generation. Until recently, hydropower production had been adequate during the summer months (April to July) to cover demand, whereas production during the winter (including from TPPs) has fallen short. Georgia has therefore been exporting excess electricity during the summer and importing the shortfall in the winter months. However, with demand

increasing rapidly and hydrological conditions becoming more unfavourable, import dependence has grown in the past several years and Georgia had to import electricity even during the summer in 2019, which is alarming.

Another concern is the suboptimal use of the Enguri HPP, situated partly in the territory of Abkhazia. The Enguri HPP covers expanding Abkhazian consumption free of charge, but as it is the country's only noteworthy power storage plant, it should be operated in accordance with grid stabilisation and peaking-operation requirements, which seems not to be the case. At optimal usage, the Enguri HPP could improve electricity supply security considerably on both sides of the administrative border with Abkhazia.

Significant consumption by bitcoin miners has also been observed in recent years. This volatile demand is responsible for 10-15% of total consumption at certain periods, depending on the bitcoin price. Cryptocurrency mining thus creates additional challenges for the power sector, the first being related to the price these miners pay for electricity. Because of Georgia's long-term wholesale contracts at relatively affordable prices, its marginal costs of electricity supply have been quite low. However, as demand has increased and Georgia has become a net importer of electricity, its marginal costs are rising. It is not certain that the electricity prices cryptocurrency miners are paying cover (or will cover) these marginal costs. An additional problem is that in mountainous areas, electricity is provided free of charge not only to needy people who cannot afford it, but also to those who rent rooms and use them for cryptocurrency mining.

Cryptocurrency mining also poses challenges for electricity sector investment planning, as the energy demand of cryptocurrency miners is volatile at present and quite uncertain in the medium and long term. This activity could move to other countries and the cryptocurrency market could change dramatically in the future, which makes it very difficult to plan electricity sector infrastructure (Longurashvili, 2018; World Bank, 2018).

On the demand side, volume-based tariffs for electricity in the residential sector, with tariff levels dependent on consumption volumes, are a positive measure and can encourage energy-saving. At the same time, however, the use of subsidised gas for TPPs diminishes the incentive to use electricity efficiently. Phasing out subsidies is therefore recommended to allow the market to optimise supply and demand patterns (see Chapter 2).

New generation

Georgia has a large portfolio of power plants at various stages of development with identified developers and investors. However, the government does not prioritise projects based on cost-benefit analyses, or on each project's value to the electricity system and its social and environmental impacts. The tightening of government policy on PPA guarantees in 2016 means the inception of new projects is riskier, at least until a new electricity market model is functional and a new RE support scheme is in place. Completion of the existing 150 projects (many initiated by brokers aiming to resell them) is also hindered by local opposition and dim market prospects. A thorough inventory, as well as monitoring and oversight of the current owners' investment obligations, is needed.

Georgia still has vast untapped hydropower potential. To develop it, the government should strive to establish favourable investment conditions and streamline licensing procedures for construction, including rationalising the newly established Public-Private Partnership Center's operations.

Thanks to the net metering programme, micropower plants are now being constructed in Georgia. Their total installed capacity exceeded 1.2 MW in October 2019 (see Chapter 9).

The social impacts of new HPPs can be a major barrier to HPP development. Opposition – due partly to a lack of communication and partly to insufficient confidence in HPPs following several failed plants (because of flaws in environmental and geological studies as well as in the design and implementation of projects) – can delay projects by many years. The regulatory framework should therefore ensure that the social impacts of new HPPs be considered at the beginning of planning, especially since the most delicate issue is resident resettlement. If locals will be affected by the construction of new impoundments, their interests and necessities should be properly acknowledged and, as far as possible, resettlement should be avoided or limited. When resettlements must be carried out, it is important to fully respect residents' rights, improve or at least restore their former living standards and earning capacity, encourage their participation in planning the resettlement and, if possible, give them the opportunity to share some of the project's benefits.

Transmission, distribution and system operations

Grid modernisation is essential to an economy's competitiveness, and strengthening Georgia's power transmission network is necessary to further reinforce supply reliability by reducing power outages and raising transmission line efficiency.

Twinning programmes that offer training in modern technical standards could provide opportunities for young professionals in the energy sector.[22]

TPPs will remain important for ensuring grid stability, especially as greater integration of VRE sources (e.g. wind, solar PV) will more strongly affect the distribution network. Georgia's continuing integration into the regional electricity market will also provide more flexibility to the Georgian electricity system, and storage and demand-response solutions could offer relief for the grid during peak periods.

TPPs receive guaranteed capacity (reserve) payments according to their guaranteed capacity and periods of availability. All TPPs are designated as guaranteed capacity providers almost automatically, without independent monitoring and evaluation of the actual need for this capacity. As all fixed costs of TPPs are covered irrespective of their actual level of generation, there is little incentive for operators to run these plants. It is therefore advisable to review this arrangement while developing an ancillary services market as part of the ongoing reform, as the capacity payments do not seem to be in line with EU rules. In the European market model, the wholesale price should stimulate capacity availability; it can be further supported by a forward market to hedge price risks. Capacity payments are allowed in the European Union only for strategic reserves, for which the rules are very strict.

The Enguri HPP is not currently used for grid stabilisation or peaking operations, as per its design. Nevertheless, HPPs are very suitable for grid stabilisation and should be operated accordingly. The best way to achieve this is by introducing an hourly electricity market and an additional market for ancillary services.

There is an initiative to construct a pumped-storage HPP, and some HPPs with reservoirs are also in development. However, there appears to be no strategy to increase storage capacity across the country on a large scale. Without a long-term strategy to develop storage capacity, and with opposition from NGOs, the general tendency is to favour run-

[22] https://ec.europa.eu/neighbourhood-enlargement/tenders/twinning_en.

of-river projects. There is also no mechanism for unified spatial planning, wherein energy generation and storage interests would be balanced and optimised with those of irrigation and potable water in consideration of the country's present needs and the current (and expected) effects of climate change. Georgia should encourage hydropower storage development by prioritising the establishment of suitable locations and favourable investment conditions. Having stored energy improves supply security, allows for the alleviation of seasonal supply shortages during the winter, and is particularly useful for grid stabilisation.

Additionally, microgrid pilot projects should be incentivised in rural areas. These projects could combine several RE sources (i.e. PV, efficient biomass-based district heating, and biogas production from agricultural residues and biowaste), and could have a positive effect on the local economy (i.e. by revealing untapped tourism potential, reducing illegal deforestation, stimulating start-ups, etc.).

Electricity market reforms

Georgia has developed several draft laws and strategic documents in compliance with its EnC membership obligations. The Electricity Market Concept, approved in December 2018 and defining in general terms the roles and responsibilities of the main market participants, is an intermediary document intended to serve as the basis for the electricity market's final design. The Energy and Water Supply Law, c, is also a framework document, so key decisions taken by the government and the regulator on the new market model will be reflected in secondary legislation. These decisions should be made as soon as possible, however, to provide the stability and visibility investors require.

Recommendations

The Government of Georgia should:

- Work with the regulator and other stakeholders to accelerate the adoption of electricity market rules to offer more transparency to market participants and investors on market design, and to provide the stability and visibility necessary to attract investment.
- Constantly monitor the results of implementing the energy market model under development and modify the approach in a transparent way as needed.
- Introduce an ancillary services market as soon as possible to create economic incentives for the system operator to enlarge the use of hydropower for grid stabilisation. Also, normalise payments for reserve capacity and provide it on an equitable basis to reservoir HPPs as well.
- Ensure that the regulator has the independence and authority to regulate the market effectively and encourage stronger competition.
- Raise public awareness of the need for – and benefits of – ongoing market reforms.
- Continue using all possible flexibility mechanisms, including dispatchable generation, interconnections, demand-side management, storage and innovative technologies, to facilitate grid integration of VRE sources.
- Intensify the rollout of smart meters and smart technologies, and use them to their full potential.

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7. Energy, environment and climate change

Key data

(2017)

Total GHG emissions excluding LULUCF* (2015):** 17.6 $MtCO_2$-eq.

Total GHG emissions including LULUCF* (2015):** 13.7 $MtCO_2$-eq.

Energy-related CO_2 emissions (2017):

CO_2 emissions from fuel combustion: 8.7 $MtCO_2$ (+114.5% since 2005, -74.0% since 1990)

CO_2 emissions by fuel: natural gas 45.1%, oil 40.7%, coal 14.2%

CO_2 emissions by sector: transport 42.1%, residential 20.4%, industry 19.4%, power and heat generation 12.5%, commercial 5.6%, other energy 0.02%

CO_2 intensity (CO_2 emissions per GDP): 0.25 $kgCO_2$/2010 USD PPP (world average 0.29)

* Land-use, land-use change and forestry.

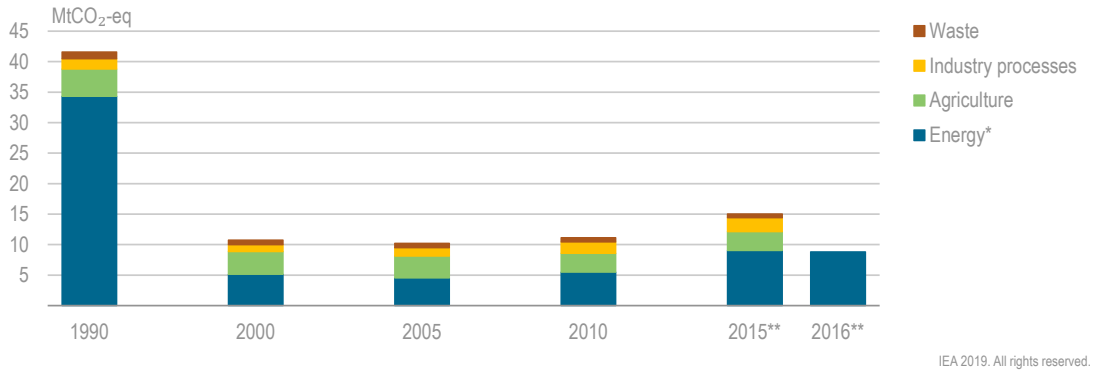
** For non-Annex I countries of the Kyoto Protocol, recent data availability is limited (https://di.unfccc.int/detailed_data_by_party). The latest national inventory covers 1990-2015 (MEPA, 2019a).

Overview

Georgia is a non-Annex I Party to the United Nations Framework Convention on Climate Change (UNFCCC), with reporting to the UNFCCC implemented through national communications and biennial update reports. The country has ratified both the Kyoto Protocol and the Paris Agreement. It has committed to a voluntary, non-conditional obligation to reduce its greenhouse gas (GHG) emissions 15% by 2030, and this target can be increased to 25% subject to a global agreement, access to affordable financial resources and technology transfer.

In 2015 (most recent year for which data are available), energy-related emissions accounted for 62% of Georgia's total GHG emissions (not including effects from land use) (Figure 7.1). This increase from the early 2000s – when it was around only 50% – can be attributed mainly to higher energy consumption in the transport sector.

Figure 7.1 Georgia's greenhouse gas emissions by sector, 1990-2015



Georgia's GHG emissions fell sharply in the 1990s but have been rising steadily since 2000. Energy-related emissions account for over 60% of the total.

$MtCO_2$-eq = million tonnes of carbon dioxide equivalent.

* Includes fuel combustion (for power and heat generation, and for industry, transport, residential and commercial energy consumption), fugitive emissions from fuels and energy industry own consumption.

** For non-Annex I countries party to the Kyoto Protocol, the latest year for data availability varies.

Source: MEPA (2019b), Georgia's Second Biennial Update Report.

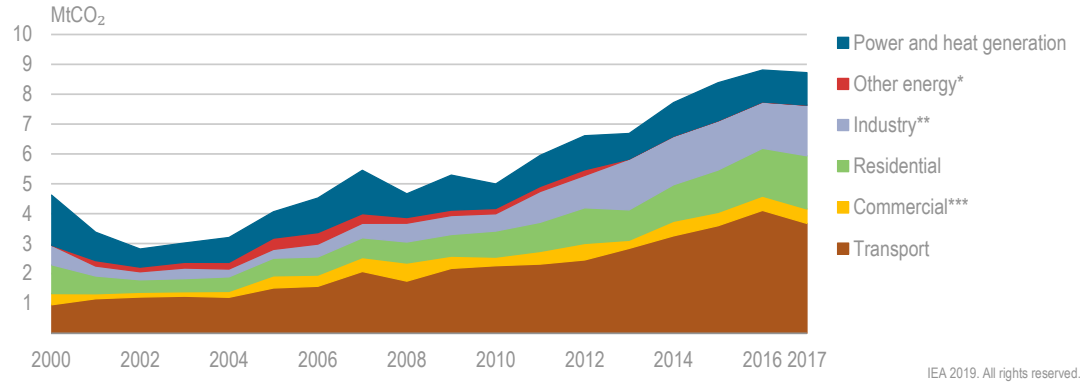
CO_2 emissions from fuel combustion and carbon intensity

In 2017, Georgia's CO_2 emissions from fuel combustion were 8.7 million tonnes of carbon dioxide ($MtCO_2$) (+60% from 2007) (Figure 7.2). The transport sector accounted for 42% of these emissions, followed by the residential sector (20%) and industry (19%). Owing to the large share of hydro in electricity generation (80%), the power generation sector[23] accounts for only 12% of energy-related emissions. The remainder is attributed to the commercial sector (6%).

The high portion of hydro in the power mix also means that reallocating emissions from electricity production to the respective sectors (i.e. as indirect emissions) does not notably impact sectoral emission shares. Fluctuations in power sector emissions result from variations in hydrological conditions affecting hydropower plant (HPP) output. Compensation for these variations comes primarily from natural gas-fired power plants.

[23] In IEA statistics it is reported as "Power and Heat", but there is no district heating in Georgia.

Figure 7.2 Georgia's energy-related CO_2 emissions by sector, 2000-17



Georgia's energy-related CO_2 emissions have increased mainly because of higher energy consumption in the transport sector.

* Includes emissions from coal mines and oil and gas extraction.

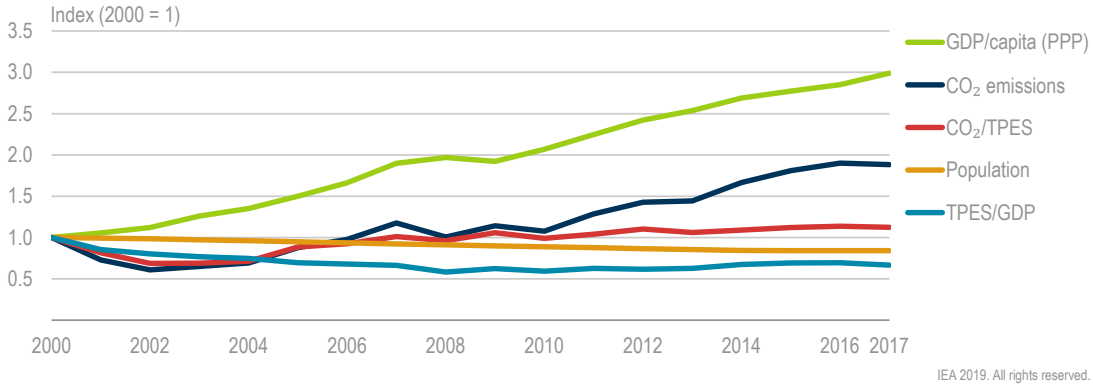
** Includes CO_2 emissions from combustion at construction and manufacturing industries.

*** Includes commercial and public services, agriculture/forestry and fishing.

Source: IEA (2019), *CO_2 Emissions from Fuel Combustion* (database), www.iea.org/statistics.

A country's CO_2 emissions are determined by population changes and economic development, measured as gross domestic product (GDP) per capita. Emissions are also affected by the energy intensity of the economy and the carbon intensity of the energy supply. In Georgia, the effects of economic growth are partially offset by slow population decline and the energy intensity of the economy (Figure 7.3). From 2000 to 2017, however, GDP at purchasing power parity (PPP) increased by 152%. This notable economic growth resulted in rapid growth in the number of private cars, leading to increased transport sector emissions. Other reasons for rising total CO_2 emissions (+88% since 2000) are higher production in the manufacturing industry, greater access to gas in the residential sector, and increased electricity generation by thermal power plants to meet growing demand.

Figure 7.3 Georgia's energy-related CO_2 emissions and main emissions drivers, 2000-17



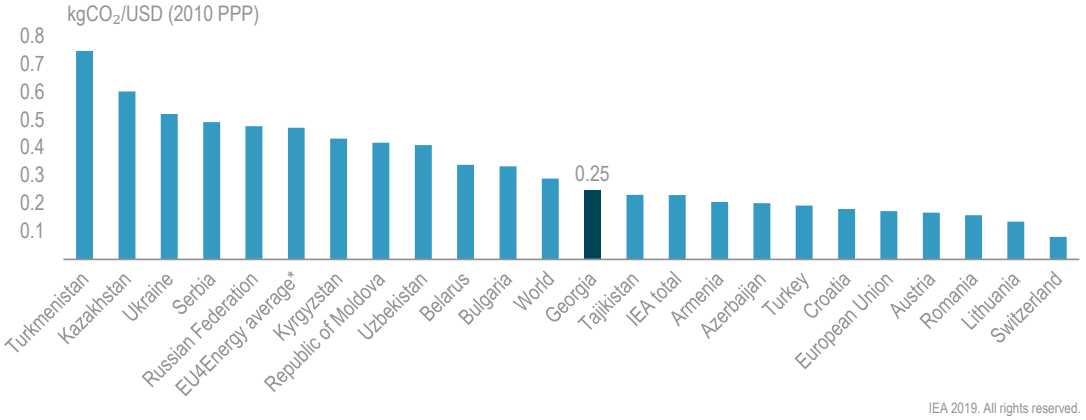
Georgia's GDP per capita (at PPP) has grown by over 150% since 2000, a key factor in the increase in energy-related CO2 emissions.

Notes: TPES = total primary energy supply. GDP/capita (PPP) is constant GDP in USD 2010 prices at PPP.

Source: IEA (2019), *CO_2 Emissions from Fuel Combustion* (database), www.iea.org/statistics.

Georgia's CO_2 intensity, 0.25 kilogrammes of carbon dioxide ($kgCO_2$)/USD (2010 PPP), is below the world average (Figure 7.4). For economies that use high shares of coal for power and heat generation and in industry, CO_2 intensity is notably higher.

Figure 7.4 CO_2 intensity in Georgia and selected countries, 2017



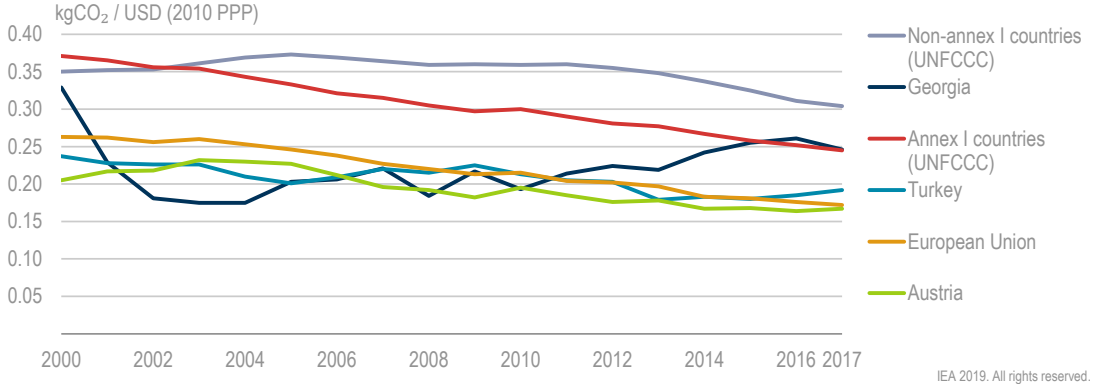
Georgia's CO_2 intensity is below the world average.

* Covers Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Tajikistan, Turkmenistan, Ukraine and Uzbekistan.

Source: IEA (2019), *CO_2 Emissions from Fuel Combustion* (database), www.iea.org/statistics.

Georgia's CO_2 intensity has been increasing since 2010 but showed a drop in 2017 owing to lower energy consumption in road transport, the sector responsible for the largest portion of energy-related CO_2 emissions (Figure 7.5).

Figure 7.5 CO_2 intensity in Georgia and selected countries, 2000-17



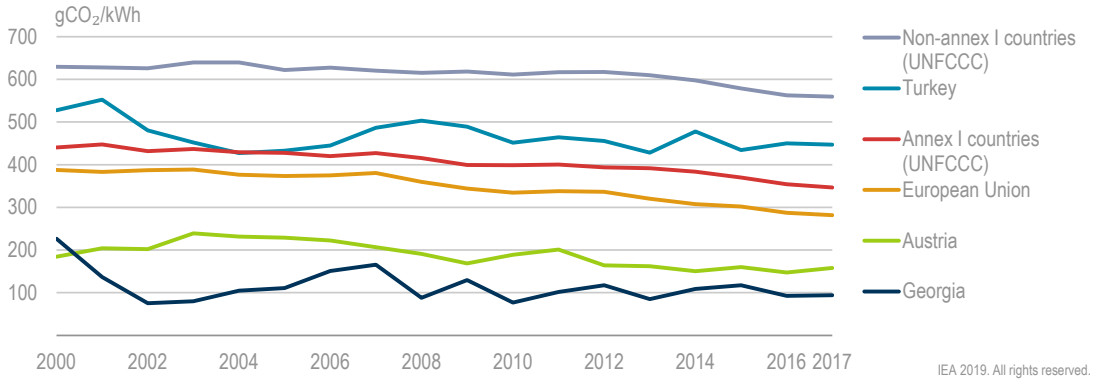
Georgia's CO_2 intensity is on an upward trajectory, contrary to the average trend of non-Annex I countries. The increase is linked primarily with the country's economic growth.

Source: IEA (2019), *CO_2 Emissions from Fuel Combustion* (database), www.iea.org/statistics.

In 2017, Georgia's power generation sector emitted an average of 94 grammes of CO_2 (gCO_2) per kilowatt hour (kWh) of energy produced (Figure 7.6). The low carbon intensity of Georgia's

electricity generation is attributed to the high portion of hydro resources used, with volatility linked to seasonal and other hydrological variations. For countries relying mostly on fossil fuels for power and heat generation, carbon intensity can be significantly higher.

Figure 7.6 CO_2 intensity of power and heat generation in selected countries, 2000-17



The CO_2 intensity of power generation in Georgia is low and has been relatively stable because of the country's heavy reliance on hydroelectricity, which is the main reason for its low carbon intensity overall.

Source: IEA (2019), *CO_2 Emissions from Fuel Combustion* (database), www.iea.org/statistics.

It is expected that Georgia's GHG emissions will increase as a result of population expansion and economic development (GoG, 2018). Georgia has, however, committed to aid international emissions-reduction efforts.

Institutional framework

The **Government of Georgia** is the body responsible to the UNFCCC.

The **Ministry of Environmental Protection and Agriculture** (MEPA) defines and implements Georgia's climate change policy at the national level. It issues environmental permits for energy sector projects; takes inventories and monitors climate change processes; co-ordinates preventative measures for global climate change manifestations; develops adaptation measures; and defines and implements air quality policy. MEPA's Department of Environment and Climate Change is responsible for co-ordinating national Climate Communications, and its Environmental Supervision Department enforces air-quality standards and norms through its central and regional offices.

The **National Environmental Agency (NEA**), subordinate to MEPA, deals with preparations for natural, hydrometeorological and geological disasters; prepares hydrometeorological forecasts for rivers and other bodies of water; produces and disseminates information on the state of the environment; and manages the state's unified information funds on mineral and land resources, among other responsibilities.

The **Ministry of Economy and Sustainable Development (MoESD)** develops and implements energy efficiency measures in the energy, industry, construction and transport sectors; develops and implements policies to support renewable energy; and elaborates

the Green Growth Strategy, among other responsibilities. MoESD's Energy Policy Department is responsible for renewable energy and energy efficiency measures. MoESD also develops technical regulations for the transport sector and implements the overall transport policy.

The **Ministry of Internally Displaced Persons from the Occupied Territories, Labour, Health and Social Affairs** defines the maximum allowable concentrations of polluting substances.

The **National Statistics Office of Georgia** provides statistical data on economic activities for the compilation of emissions inventories.

The **municipalities** of Georgia are also key stakeholders in both the mitigation of and adaptation to climate change. They are responsible for urban planning; developing and maintaining local road infrastructure; and local traffic management, including parking.

Georgian institutions responsible for climate change policy benefit from technical and financial support from donors and international financial institution (IFIs) to prepare national communications and biennial updates for the UNFCCC because internal capacity is lacking.

There are plans to establish a **Climate Change Committee**, which would help the public, private and non-governmental sectors as well as academia integrate climate change issues into their policies and strategic plans. It would also support co-ordination and co-operation with donors and financial institutions, improve legislation, increase public awareness on climate change issues, and encourage the development and implementation of clean technologies (MEPA, 2019b).

Climate change policy

Georgia joined the UNFCCC in 1994, and its parliament ratified the Kyoto Protocol 28 May 1999. In 2010, Georgia joined the Copenhagen accord, and on 25 September 2015 it submitted its Intended Nationally Determined Contribution (INDC) to the UNFCCC secretariat (see Mitigation below). The Georgian government approved the Paris Agreement on 21 February 2017 and the Parliament ratified it on 7 June 2017.

Georgia has also participated in Clean Development Mechanism (CDM) projects, as defined by the Kyoto Protocol. For its seven registered CDM projects, the projected emissions reduction is 1.84 $MtCO_2$-eq per year.

The documents prepared by the Georgian government for UNFCCC reporting (its INDC, the *Third National Communication*, biennial updates, etc.) list national policies and measures to mitigate climate change, primarily by supporting energy efficiency and renewable energy.

The European Union-Georgia Association Agreement, which entered into force in 2016, emphasises the necessity for collaboration in climate change mitigation and adaptation, emissions trading, the integration of climate change into industrial policy, and clean technology development.

Preparation of the Low Emission Development Strategy (LEDS) for Georgia began in 2013 and the draft version was ready in 2017. Its objectives are to: (a) ensure an integrated, complex approach for long-term sustainable development; (b) take national development goals and circumstances into consideration; (c) facilitate transformational development; (d) ensure the accomplishment of international climate change obligations; and (e) obtain funding from public and private sources (MEPA, 2019b). The draft LEDS had not yet been officially approved as of November 2019.

In addition, the Energy Community issued a recommendation in 2018 that Contracting Parties prepare integrated National Energy and Climate Plans (NECPs) according to the EU Governance regulation. Such NECP is currently under development in Georgia.

The Socio-Economic Development Strategy of Georgia (Georgia 2020) recognises the importance of addressing climate change effects at the national level. Similarly, some sectoral strategies (e.g. the Agricultural Strategy for 2015-2020 and the draft Energy Strategy) integrate climate change-related elements and aim to introduce climate-smart practices.

Mitigation

In its INDC, Georgia voluntarily accepted the obligation to reduce its GHG emissions by 15% compared with the business-as-usual (BAU) level by 2030. This emissions-reduction target may be increased to 25%, subject to a global agreement that would enable technical co-operation, access to affordable financial resources and technology transfer. A reduction of 25% below the BAU level would ensure that Georgia's GHG emissions remain 40% below the 1990 level by 2030 (Figure 7.7).

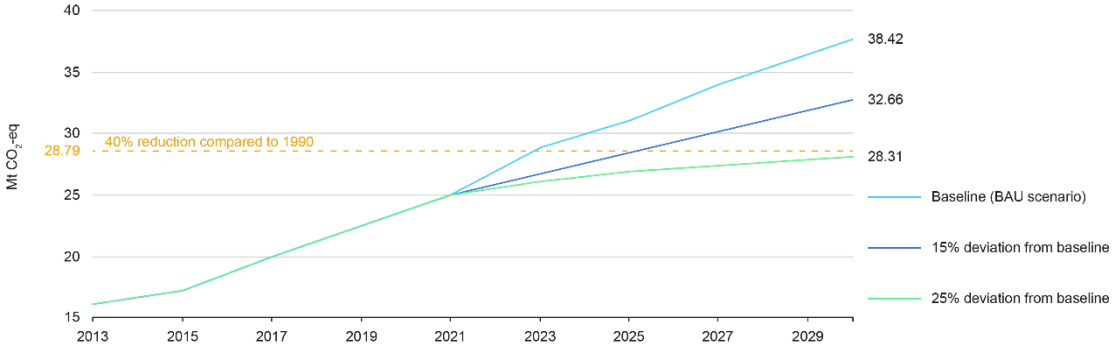
Following ratification of the Paris Agreement in 2017, the country announced it would present a more ambitious Nationally Determined Contribution (NDC) by 2020. For this purpose, MEPA, with the technical assistance of German development agency GIZ, is developing the Climate Action Plan 2021-2030, expected to be ready by 2020. Preliminary estimates indicate that Georgia may adopt an unconditional target to keep GHG emissions at 60% of the 1990 level by 2030; however, to conform with global 2-degree (2°C) and 1.5°C scenarios, this figure could be reduced by 10-18% (with financial and technological support). As the NDC is still under development, these preliminary estimates may change; therefore, they should not be considered as official numbers.

In 2017, Georgia began to develop national indicators and targets for Sustainable Development Goals, which are closely related to the reduction of GHG emissions.

In addition to national strategies, the country has important strategic initiatives at the local level – for example, the Sustainable Energy Action Plans (SEAPs) elaborated by municipalities within the framework of the Covenant of Mayors.[24] Twenty-three Georgian towns/municipalities had joined the Covenant of Mayors by 2018, undertaking a voluntary commitment to reduce GHG emissions 20% by 2020 and 30% by 2030. Ten towns and one municipality have already submitted SEAPs that envisage emissions reductions, mainly in the transport, public and residential sectors.

[24] The Covenant of Mayors is an EU initiative: https://www.covenantofmayors.eu/en/.

Figure 7.7 Georgia's GHG emissions by 2030 under various scenarios



Source: Government of Georgia (2015), "Georgia's Intended Nationally Determined Contribution submission to the UNFCCC".

As a member of the European Energy Community, Georgia has made commitments to promote energy efficiency and renewable energy sources, the key elements of its climate change mitigation policy. The government has developed a National Energy Efficiency Action Plan (NEEAP) and a National Renewable Action Plan (NREAP), which had been approved in 2019. Georgia's *Second Biennial Update Report* submitted to the UNFCCC in 2019 includes a detailed list of existing and planned mitigation measures. It also lists various technical assistance projects implemented with the support of various donors and IFIs.

Georgia is engaged in preparing and implementing Nationally Appropriate Mitigation Action (NAMA) projects. The NAMA initiatives are:

- Adaptive Sustainable Forest Management in the Borjomi-Bakuriani Forest District (this project has been implemented).
- The efficient use of biomass for equitable, climate-friendly and sustainable rural development (this project is being implemented on a small scale due to a lack of financial support).
- Energy Efficient Refurbishment in the Georgian Public Building Sector (this project is seeking support for implementation) (UNFCCC, 2019).

Adaptation

The INDC report and other documents submitted to the UNFCCC emphasise that climate change and its adverse impacts on ecosystems pose severe threats to Georgia's economy, including the energy sector. The hydrology of Georgia's rivers is particularly affected by climate change, which impacts water availability for drinking, irrigation and energy production.

The *Third National Communication of Georgia to the UNFCCC* highlights an obvious impact of global warming: the degradation of glaciers in the Caucasus mountains. Although the melting and retreating of glaciers is currently increasing the runoff of rivers fed by them, runoff will decrease in the long term as glaciers shrink and ice supplies dwindle. The *Third National Communication* quotes studies that project glacial runoff 40% below the 2010

level by 2100 due to climate change under BAU conditions. This would mean 13% less annual runoff from the Enguri river.

A possible reduction in hydropower generation was also highlighted in a US Agency for International Development (USAID)-funded study in 2016 that projects higher energy demand for cooling in the summer and lower demand for heating in the winter as a result of climate change (NALAG, 2016). It recommends measures for adapting the energy sector to overcome potential socio-economic risks related to climate change (Box 7.1).

Box 7.1 Reducing the socio-economic impacts of climate change on the energy sector

The Georgian Road Map on Climate Change Adaptation was prepared in 2016 as part of the USAID-funded initiative Institutionalization of Climate Change Adaptation and Mitigation in Georgian Regions (ICCAMGR), implemented by the National Association of Local Authorities of Georgia (NALAG).

The roadmap recommends measures to be implemented at the national level:

- Enhance risk management and long-term strategic planning for the energy sector.
- Analyse how natural disasters may impact the safety of critical energy infrastructure.
- Develop emergency action plans in the event critical infrastructure is affected by natural disasters.
- Study renewable energy resource potential, taking climate change into consideration.
- Encourage the deployment of energy-efficient buildings and technologies in the medium to long term, based on best practices and energy-efficiency construction regulations.
- Regularly survey the impacts of climate change on the energy sector.
- Consider climate change impacts when constructing critical energy infrastructure and preparing environmental impact assessments (EIAs).

Municipal actions should reinforce those at the national level:

- Analyse the structure and dynamics of energy consumption.
- Promote energy efficiency, especially in the residential sector, to improve living standards and reduce the sector's sensitivity to climate change.
- Promote the use of renewable energy technologies for cooling in the residential sector.

Source: NALAG (2016), The Georgian Road Map on Climate Change Adaptation.

Rising sea levels, weather extremes and other climate change-related issues can also affect the country's infrastructure, including for energy (e.g. electricity and gas transmission and distribution networks). Therefore, the government plans to start preparing a National Adaptation Plan in late 2020-early 2021 to improve the country's preparedness and adaptive capacity by developing climate-resilient practices that reduce vulnerability. According to its INDC, Georgia is taking measures to "integrate climate risk and resilience into core development planning and implementation" (GoG, 2015).

Energy and the environment

The third National Environmental Action Plan 2017-2021 (NEAP) was approved by government decree on 22 May 2018. It focuses on various environmental issues such as biodiversity, air quality, and water, soil and forest management. At the same time, it acknowledges the importance of climate change and highlights the links between environmental and climate change policies – particularly for air pollution, as most measures that aim to reduce it are also expected to curtail GHG emissions. Similarly, Georgia's Law on Environmental Protection (1996) and its Law on Ambient Air Protection (1999) acknowledge the significance of GHG emissions and the need to mitigate them.

Energy sector projects and environmental and social issues

All energy sector projects (for generation, transmission, distribution, storage, etc.), except those to build small HPPs (less than 5-MW capacity), are obligated to prepare an EIA and obtain an Environmental Decision (permit) from MEPA (Box 7.2). For HPPs of more than 2 MW but less than 5 MW, a special screening procedure must be conducted and MEPA decides whether an EIA is required. This procedure is governed by the Environmental Assessment Code adopted in June 2017 and enacted in January 2018.

The Environmental Assessment Code requires that social impact assessments (which cover impacts on local communities, their property, socio-economic status, cultural heritage, etc.) be assessed and that mitigation strategies be provided. However, the social component of Georgian EIAs is usually weak compared with the environmental element, and less detailed and systematised than the social components of assessments funded by IFIs. This is mainly a matter of practice rather than of legislation.

Although Georgia's legal system generally provides protection for people affected by economic or physical displacement, implementation procedures are not as detailed as in EU or IFI regulations. Notably, there is no requirement to prepare Resettlement Action Plans and no detailed procedures to implement them.

As a result, approaches to resettlement vary significantly from one project to another. Issues have been reported for projects implemented without IFI involvement and that therefore do not have to comply with IFI standards and procedures pertaining to social and environmental impacts (Green Alternative, 2012).

Non-governmental organisations (NGOs) and local residents are increasingly opposed to new HPPs. NGOs claim that environmental and social impact assessments are not being done properly and that the projects do not meet high enough quality standards. They allege that geological risks especially are not properly assessed, as some HPP projects have resulted in tunnel collapses and mud slides (also see Chapter 6 on electricity).

Box 7.2 Environmental permits

The Environmental Assessment Code was adopted In June 2017, establishing new rules for assessing possible environmental impacts of planned projects and for issuing environmental permits. It entered into force in January 2018 and mandates that project developers conduct EIAs to prevent or minimise adverse environmental impacts. The competent authority

(MEPA) is obligated to ensure public participation in decision-making before issuing an Environmental Decision (a permit to proceed with the project).

According to the Code, an Environmental Decision is issued after several stages:

1. MEPA makes the information on the project publicly available.

2. The public is given the opportunity to submit comments to MEPA (written during the first stage and through public hearings in the second and third stages).

3. MEPA is obligated to consider all public opinions expressed and take them into account during the decision-making process "if there are appropriate grounds".

4. MEPA's decision and its underlying reasoning are made available to the public.

However, some problems in the code's implementation have been reported, such as EIA reports being incomplete/missing information. Another issue is that the code allows for changes to be made to the Environmental Decision through administrative procedures, without public participation.

The code also provides for possible EIA exemption "to carry out an activity to ensure state security or take measures due to the urgent necessity caused by force majeure". While Georgian law clearly defines force majeure circumstances, activities that aim to "ensure state security" are not legally defined.

Sources: Green Alternative (2018a), "A year after the enactment of the Environmental Assessment Code: The shortcomings identified" and (2018b), "Public participation in the decision-making on energy projects".

Air quality

The transport and energy sectors are Georgia's main emitters of air pollutants (carbon monoxide [CO] and nitrogen oxides [NO_x]). According to the NEAP, the main reasons for transport sector air pollution are the age and technical condition of the car fleet, the growing number of vehicles and traffic intensity, the type and quality of fuel used, and insufficient public transport. In the energy sector, CO emissions result mainly from household firewood and natural gas consumption, and NO_x emissions are largely related to natural gas consumption. In addition, the energy and transport sectors are responsible for volatile organic compound (VOC) emissions.

Data on ambient air quality are obtained from eight automatic and one manual monitoring stations; there is also one background monitoring station in the countryside at Abastumani. These stations do not provide a comprehensive description of air quality across the entire country, and data on some air pollutants is not collected, so information is based on qualitative assessments (GoG, 2018).

The Law on Ambient Air Protection (1999) with the corresponding bylaws and technical regulations create the legal framework for ambient air protection. Although several legal amendments were adopted in 2016 to reduce transport emissions (see Chapter 8 on energy efficiency), the legislative framework does not fully reflect EU requirements such as best available technologies (BATs) and emission limit values (ELVs).

The Georgian government recognises that the current regulatory framework is not effective in regulating emissions from transport and other economic sectors. The national limit values for most common pollutants – such as sulphur dioxide (SO_2), nitrogen dioxide (NO_2), NO_X, lead, benzene, CO, arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons (PAHs) – are not in line with EU standards. Limit values for particulate matter 10 (PM10) and PM2.5 are not defined in the regulations even though they are among the most significant air pollutants.

Furthermore, technical inspection of light-duty vehicles (80% of the fleet) was not obligatory between 2004 and 2018, so a significant number may have been in poor technical condition, which also can contribute to air pollution.

Mandatory technical inspections were introduced in phases starting 1 January 2018:

- buses and trucks as of 3 January 2018
- vehicles of the government and legal entities as of 1 July 2018
- vehicles with gasoline engines of more than 3 000 cm^3 as of 1 October 2018
- all other vehicles as of 1 January 2019.

The inspection's environmental requirements are not stringent enough, however, so many vehicles may be passed while in poor technical condition.

Concerning fuel quality, gasoline in Georgia has had to comply with the Euro 5 standard since 1 January 2017, and the standard for diesel, which has been Euro 4, is expected to become Euro 5 in 2020.

Several studies draw attention to the negative impact of air pollution on the Georgian economy. According to the 2017 World Health Organization (WHO) report *Monitoring Health for the SDGs*, Georgia holds third place in Europe for mortality rate attributed to indoor and outdoor air pollution. The World Bank's 2015 environmental analysis for Georgia estimates that the annual cost of health impacts associated with PM is up to 4.3% of GDP. According to Georgia's 2018 state audit report, GEL 120 million were spent from the state budget in 2016 to treat diseases related to air pollution (Kochladze, 2018). According to the MOESD, the main contributor to the high mortality rate is indoor air pollution that is directly linked to the unsustainable consumption of firewood by households.

To address these challenges, under the NEAP 2017-2021 the government aims to:

- Reduce air emissions by regulating air pollutants from various economic sectors.
- Develop an air quality monitoring and assessment system.
- Improve the state system for emissions inventories and establish an emissions projection system (GoG, 2018).

In addition to national legislation, Georgia is party to international treaties related to air quality, including the Convention on Long-Range Transboundary Air Pollution (CLRTAP) and the Protocol on Long-term Financing of the Co-operative Programme for Monitoring and Evaluation of the Long-Range Transmission of Air Pollutants in Europe (unofficially

the European Monitoring and Evaluation Programme [EMEP]). It also plans to become a party to other key protocols: the Gothenburg Protocol, the Protocol on Persistent Organic Pollutants (POPs) and the Protocol on Heavy Metals.

Assessment

Georgia has made impressive efforts to develop national strategies, policies and measures to combat climate change, to adapt the national economy to the changing climate, and to protect the environment. However, significant barriers still impede the effective implementation of its ambitious strategies (Box 7.3). The key obstacles are inadequate institutional capacity, a lack of awareness, and insufficient co-ordination at all levels.

As a European Energy Community member, Georgia is making considerable efforts to align its legislation with the EU energy acquis, particularly to promote energy efficiency and renewable energy. Laws, draft laws, action plans and some regulatory documents have been developed with donor support but some of them had not been approved as of late 2019, so adoption and implementation of the full legal and regulatory package should be accelerated.

Several projects related to climate change are being implemented with the support of donors and IFIs. Better co-ordination among Georgia's public agencies, in communication with donor organisations and IFIs, would reduce the overlap and duplication of donor-funded activities, which would lead to a more efficient use of funds and more effective results.

Box 7.3 Georgia's key challenges for climate change mitigation

During preparation of *Georgia's Second Biennial Update Report* (BUR), consultations were held with the general public, private stakeholders, NGOs and independent experts. They revealed numerous barriers to the effective implementation of climate change mitigation measures.

- Despite some progress since the submission of Georgia's first BUR, there is still room to improve co-ordination on climate change issues among public entities as well as among the general public, private stakeholders and NGOs.
- Continuity and experience-sharing among projects is limited.
- In public entities, there is a lack of staff assigned specifically to integrate climate change issues into sectoral policies and strategic plans.
- The legislative and institutional framework on climate change issues is fragmented.
- Domestic financial resources for climate change measures are lacking.
- There is a lack of co-ordinated co-operation among public agencies, in communication with donor organisations and IFIs, on climate change-related fundraising.
- Researchers and academic institutions are not involved enough in climate change issues.
- Public entities show a low level of awareness on climate change issues.

- Public awareness is limited, resulting in low public demand for climate change mitigation actions.
- Educational courses and programmes on climate change are lacking.
- The level and pace of developing and implementing climate-friendly and sustainable technologies is low.
- The investment environment is unattractive because of trade, customs, financial and legislative barriers and a lack of consulting expertise and services.

Source: MEPA (2019b), Georgia's Second Biennial Update Report.

The Government of Georgia recognises that climate change severely threatens Georgia's sustainable development and may adversely affect various sectors of the economy, including the energy sector. Because climate change is modifying the hydrology of Georgia's rivers and altering the amount of water available for hydropower generation, the Energy Strategy rightly targets electricity generation diversification (by developing other renewable sources such as wind and solar) as well as increased trade with neighbouring countries to optimise natural-resource use in the region. More efforts could be made to: i) assess all possible impacts of climate change (resulting from rising sea levels, weather extremes, changing hydrology, etc.) on the country's energy infrastructure, including HPPs and electricity and gas transmission and distribution systems; and ii) develop adaptation strategies to minimise possible negative impacts.

To address increasing opposition to new HPPs, adequate measures should be taken to ensure that plants comply with the highest technical, environmental and social quality standards. Adoption of the Environmental Assessment Code is a positive development, and its implementation should be properly enforced using international best-practice Social Impact Assessment (SIA) standards. The legal and regulatory framework for the social and economic impacts of energy projects should be developed further, particularly for the resettlement of local populations. The regulatory framework should ensure that all possible social impacts of new HPPs be assessed at an early stage of planning, and that the interests and necessities of residents affected by energy sector projects be considered. Resettlement should be avoided or at least limited, but when it is deemed necessary it is important to fully respect residents' rights, improve or at least restore their former living standards and earning capacity, promote the participation of affected residents in resettlement planning and, if possible, give them the opportunity to share some of the project's benefits.

Imposing stringent safety standards for power plant construction can also reduce local opposition to new projects. Flaws in environmental and geological studies and in project design and implementation have caused several projects to fail, which has eroded the local population's trust in hydropower technologies. Stricter technical, environmental and social impact standards for new projects (and their proper enforcement) would reduce the ratio of failed projects and improve public perception of the whole sector.

Meanwhile, it is also essential to educate the public on hydropower-related issues (including the need to meet growing energy demand in a climate-friendly way) as part of the overall communication strategy related to renewable energy and energy efficiency. Residents have a right to information, and their concerns should be addressed in the planning process. The government agency responsible for licensing, in collaboration with

the project developer, should establish a coherent communication strategy that covers all planning phases of new HPP projects (see also Chapter 6 on electricity).

In the area of air quality, the government plans to take appropriate measures, such as introducing best available technologies (BATs); amending national legislation to transpose EU standards; and establishing a framework for regulating air emissions from various sectors. Adequate attention and resources should be allocated to implementing these plans, and the government should also enhance efforts to continue improving the quality and reliability of data on air quality. The current lack of statistical data on pollution sources is a key barrier to designing adequate policies and measures to address pollution. The enhancement of technical, financial and human resource capacities within the state agencies involved in data collection and processing is essential for sounder policy making in the area of air quality (and would also benefit policy making related to climate change).

Recommendations

The Government of Georgia should:

- Ensure clear links among the country's: a) energy strategy; b) strategic climate change documents for the UNFCCC; c) sustainable development strategies; and d) economic, environmental and social policies.
- Step up efforts to improve climate forecasting, assess the impact of climate change on the energy sector (both supply and demand) and develop relevant adaptation measures.
- Establish and provide adequate resources to the High-Level Climate Change Committee to ensure the co-ordination and integration of climate change measures into national policies and strategies for different sectors, including energy.
- Ensure that energy sector projects are designed and implemented according to the highest Environmental and Social Performance standards.
- Consider reinforcing safety standards for power plant construction and improve institutional/technical capacities to effectively enforce these standards.
- Continue working with parliament to accelerate adoption of the draft laws on Energy Efficiency; Energy Efficiency in Buildings; and intensify efforts to develop effective secondary legislation.

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8. Energy efficiency

Key data
(2018)

TFC: 4.39 Mtoe (natural gas 34.4%, oil 28.9%, electricity 23.4%, coal 6.7%, bioenergy and waste 6.2%, other renewables 0.4%), + 79% since 2008

Consumption by sector: transport 30.7%, residential 27.7%, industry 25.6%, commercial 12.3%, other* 3.8%

TFC per capita: 1.2 toe (world average 2017: 1.3 toe), +84% since 2008, +67% since 2010

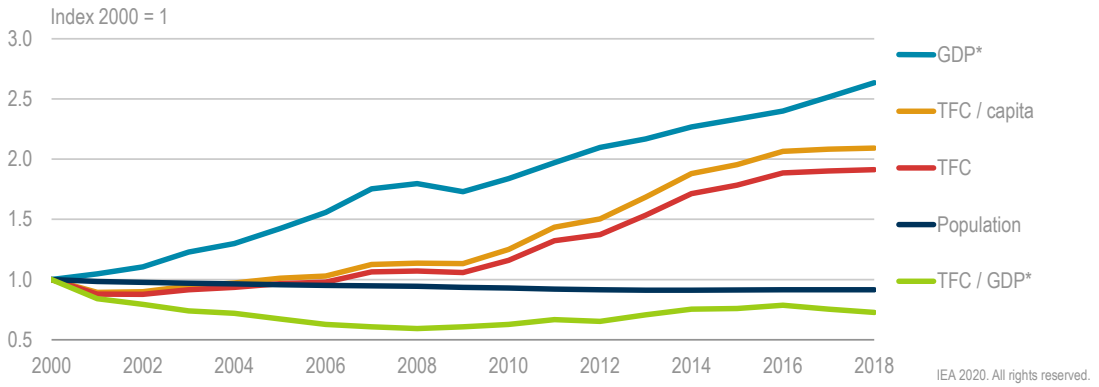
Energy intensity (TFC/GDP): 109 toe/2015 USD million PPP (world average 2017: 86 toe/USD million PPP), +22% since 2008, +16% since 2010

* electricity supplied to Abkhazia

Overview

Georgia's total final energy consumption (TFC) has generally increased in the last two decades, along with gross domestic production (GDP), as its economy was not severely affected by the financial crisis of 2008. Figure 8.1 shows that Georgia's GDP barely decreased after the crisis and then quickly regained its pre-crisis level. TFC levelled off for the duration of this recovery but has risen ever since and was almost double in 2018. The economic growth trend correlates strongly with Georgia's increased energy demand, showing no distinct signs of decoupling. Although energy demand is usually driven by population growth and economic development, in Georgia these two parameters appear to be on opposite trajectories: Georgia's population decreased 16% during 2000-18, but per-capita energy consumption more than doubled (+126%).

Figure 8.1 Georgia's energy supply and drivers, 2000-18



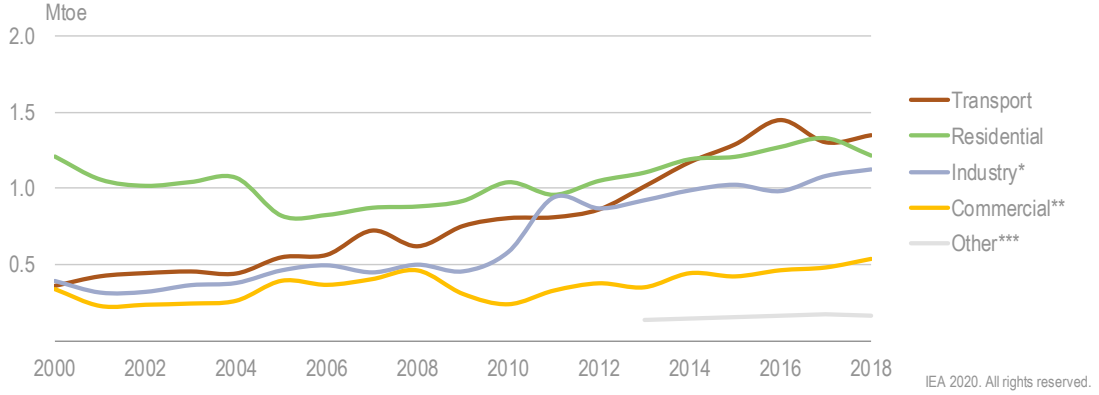
Georgia's economic growth and energy demand show no strong signs of decoupling.

* Expressed in constant 2015 USD billion at purchasing power parity (PPP).

Source: IEA (2020), *World Energy Balances 2020* (database), www.iea.org/statistics.

Analysis of TFC at the sectoral level reveals the main drivers of rising consumption (Figure 8.2). For instance, the global economic crisis clearly affected Georgia's commercial sector more than the other sectors, as its energy consumption recovered to the pre-crisis level only several years afterwards. While energy consumption in all sectors has generally expanded, in transport it has shown the strongest increase, even surpassing the residential sector as the country's largest energy consumer for several years. The sharp recent decrease has resulted from changes in consumer prices, which have consequently affected fuel consumption patterns.

Figure 8.2 Georgia's final energy consumption by sector, 2000-18



While energy consumption in all sectors of Georgia's economy has generally increased in the last ten years, growth has been strongest in transport.

* Includes non-energy use.

** Includes commercial and public services, agriculture, forestry, fishing and non-specified consumption.

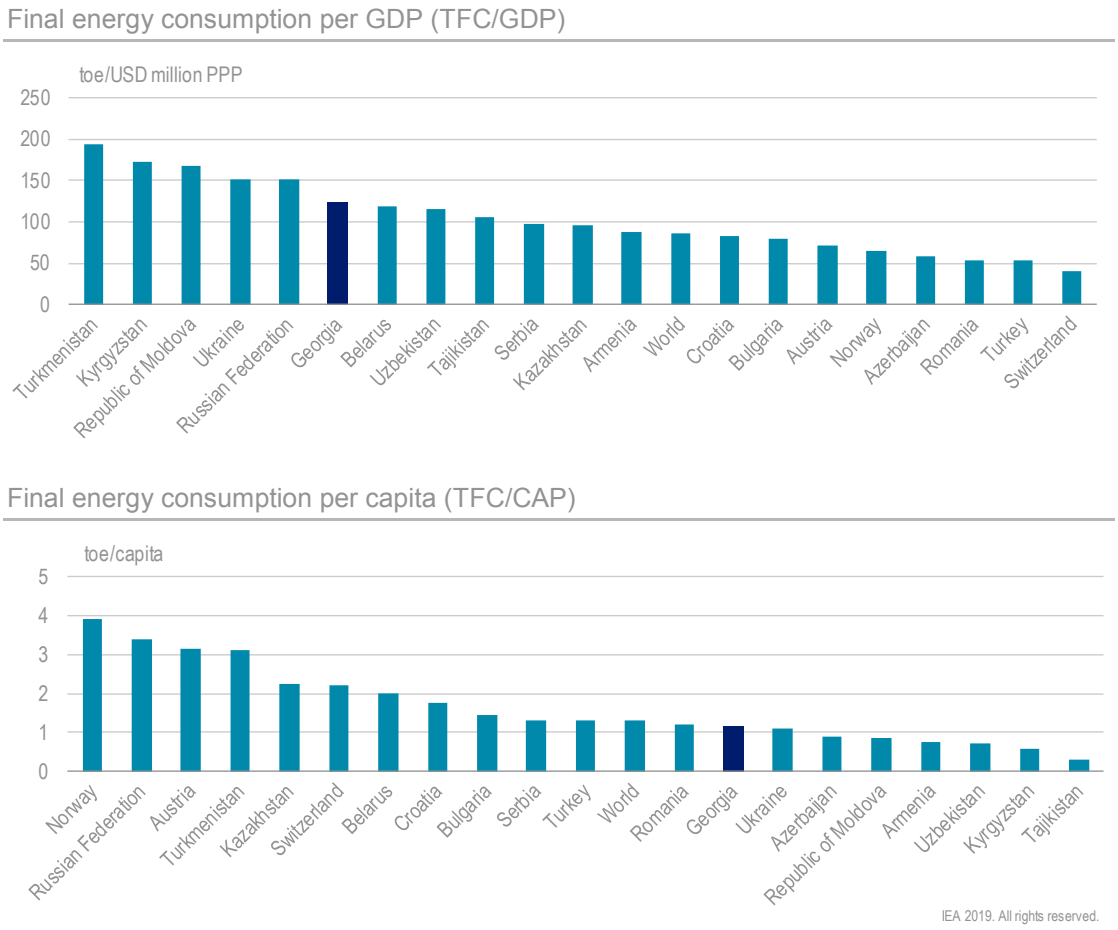
*** Represents electricity supplied by Enguri HPP to Abkhazia. Breakdown for this consumption is not available.

Notes: Mtoe = million tonnes of oil equivalent. National energy data collection in Georgia became the responsibility of the National Statistical Office (Geostat) in 2013, which explains gaps in final consumption data between 2012 and 2013.

Source: IEA (2020), *World Energy Balances 2020* (database), www.iea.org/statistics.

Energy intensity can be measured as TFC per capita, but also as TFC per GDP. In 2018, Georgia's energy intensity per unit of GDP at PPP was 109 tonnes of oil equivalent (toe) per million USD – 30% above the world average – whereas its per-capita TFC was 1.2 toe, which is slightly below the 2017 world average of 1.3 toe (Figure 8.3[25]).

Figure 8.3 Energy intensity in Georgia and selected countries, 2017



Although Georgia's TFC/GDP energy intensity is above the world average, when measured as TFC per capita it falls below.

Notes: CAP = capita. TFC does not include the energy transformation sector. For comparison, GDP data are in 2010 USD billion at PPP.

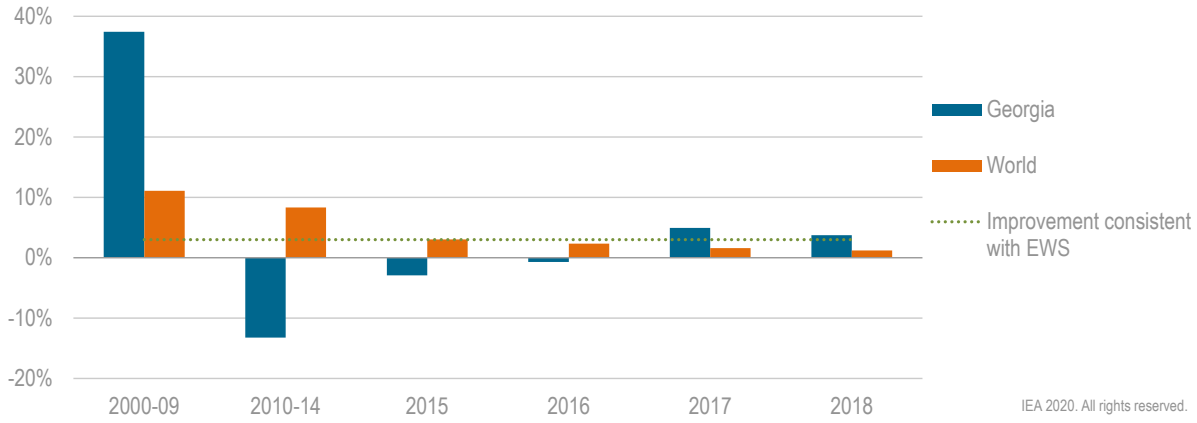
Source: IEA (2019a), *World Energy Balances 2019*, www.iea.org/statistics.

Georgia's primary energy intensity improved more than 3% year-on-year (y-o-y) in 2017 and 2018, which is consistent with the International Energy Agency (IEA) Efficient World Scenario (EWS) (Figure 8.4). The EWS shows a world with 20% more people, 60% more building space and double the GDP, but only marginally higher energy demand. The EWS fully meets the energy efficiency target of United Nations (UN) Sustainable Development

[25] Although the latest data available for Georgia is for 2018, comparisons can be made for 2017 only as not all other countries' 2018 data are yet available.

Goal 7 thanks to cost-effective measures based on energy savings and using technologies that are readily available today (IEA, 2018).

Figure 8.4 Georgia and world primary energy intensity improvements, 2000-18



Georgia's primary energy intensity has improved more than 3% y-o-y in recent years.

Notes: Primary energy intensity is total primary energy supply per gross domestic product (constant GDP in USD 2010 prices and purchasing power parity). Energy intensity is said to "improve" when less energy is needed for a given activity.

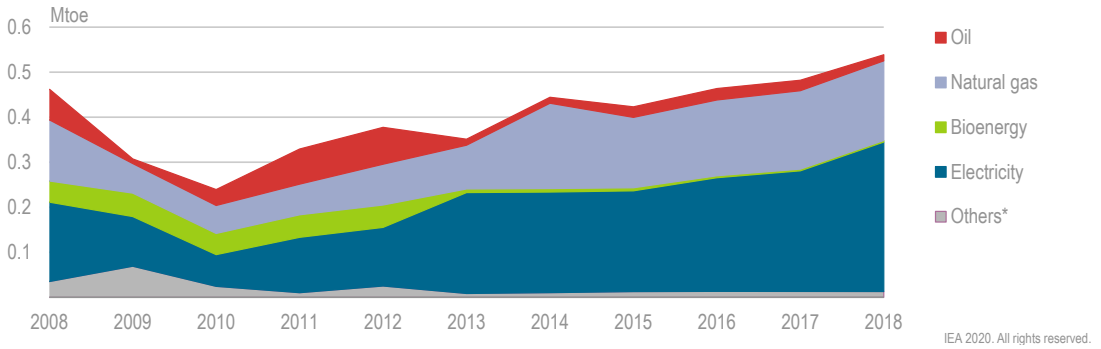
Sources: IEA (2020), *World Energy Balances 2020* (database), www.iea.org/statistics; IEA (2019b), *Energy Efficiency 2019*.

Trends by sector

Commercial and public services

Georgia's services sector has developed quickly in recent years. Tourism in particular has expanded notably, from 6% of GDP in 2011 to 18% of GDP in 2018 (WEG, 2019). Unlike the economy as a whole, the services sector was strongly affected by the 2008 economic crisis, indicated by a sharp decrease in energy consumption. Consumption began to increase again in 2010 but did not reach the pre-crisis level until 2016. In 2018, the services sector consumed 0.54 Mtoe, a 17% increase from 2008 (Figure 8.5). The majority (95%) was consumed for public and commercial services, which use mostly electricity (62% share of the energy consumed) but also some natural gas (33%). Agriculture and forestry account for around 5% of total commercial energy demand, mostly consisting of diesel oil (40%), electricity and natural gas (32% each).

Figure 8.5 TFC in Georgia's commercial and public services sector by source, 2008-18



Energy consumption in the commercial sector is dominated by electricity.

* Includes coal, solar thermal, geothermal and district heat for historical time series.

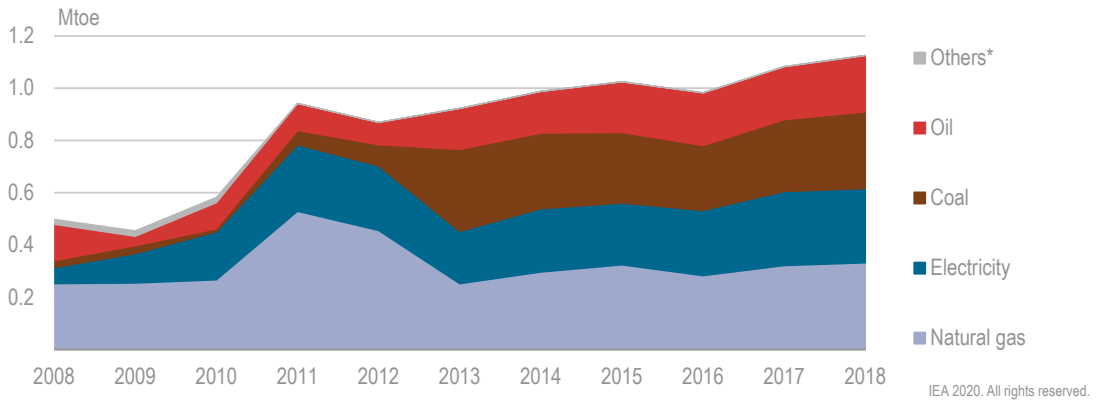
Note: Includes commercial and public services, agriculture, forestry and fishing.

Source: IEA (2020), *World Energy Balances 2020* (database), www.iea.org/statistics.

Industry

In 2018, industry consumed 1.1 Mtoe, or 26% of TFC (Figure 8.6). Industry sector consumption has expanded moderately in recent years, showing growth of 22% since 2013.[26] The main fuels are natural gas (29% share), coal (26%), electricity (25%) and oil (19%).

Figure 8.6 TFC Georgia's industry sector by source, 2008-18



Georgia's industry sector energy consumption has risen 22% since 2013 and its energy sources are diverse.

* Includes bioenergy and district heat for historical time series; not visible at this scale.

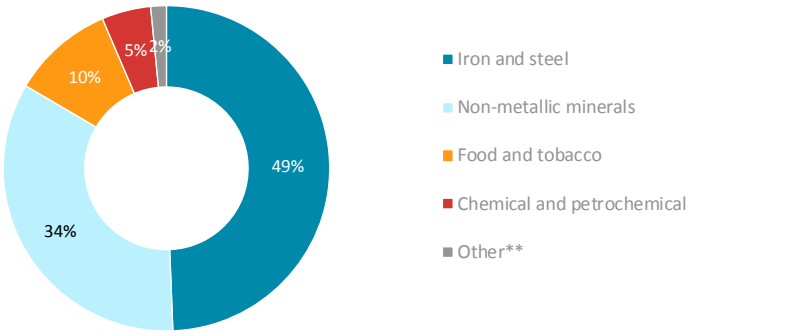
Note: Includes non-energy consumption.

Source: IEA (2020), *World Energy Balances 2020* (database), www.iea.org/statistics.

[26] National energy data collection in Georgia became the responsibility of Geostat in 2013, so there are gaps in final consumption data between 2012 and 2013.

The iron and steel subsector is the main industrial energy consumer, at 39% of total industry consumption, most of it met by coke-oven coke and electricity (Figure 8.7). The other large energy users are non-metallic minerals, food and construction.

Figure 8.7 Energy consumption in manufacturing industry* subsectors, 2018



Georgia's iron and steel and non-metallic mineral subsectors account for over 80% two-thirds of manufacturing industry consumption.

* Manufacturing industry excludes mining, quarrying and construction.

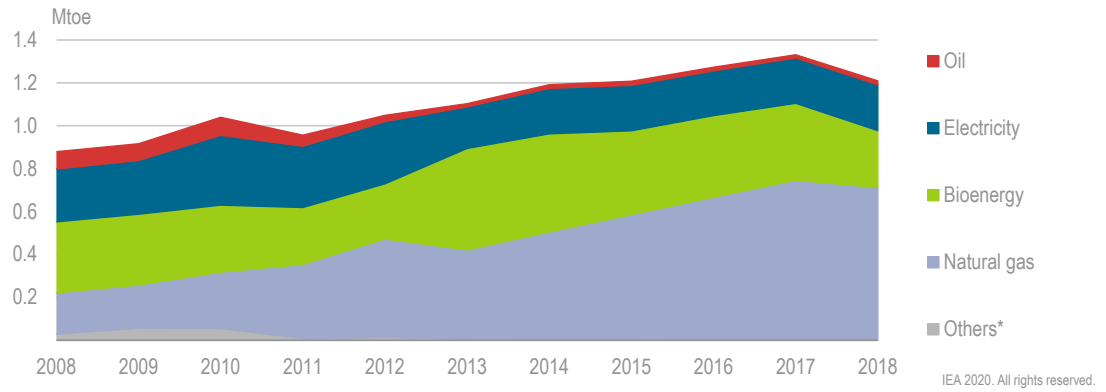
** Includes chemicals and petrochemicals; paper, pulp and printing; textiles and leather; machinery; wood and wood products; transport equipment; and unspecified industrial consumption.

Source: IEA (2020), *World Energy Balances 2020* (database), www.iea.org/statistics.

Residential

In 2018, the residential sector was responsible for nearly one-third of TFC (28%). Energy consumption has increased steadily, mostly due to higher natural gas use for heating and cooking (Figure 8.8). In recent years, the natural gas network has been extended to more homes, explaining some of the increase, although many low-income households in rural areas continue to use unsustainable wood for heating.

Figure 8.8 TFC in Georgia's residential sector by source, 2008-18



Natural gas accounts for nearly 60% of residential sector energy consumption.

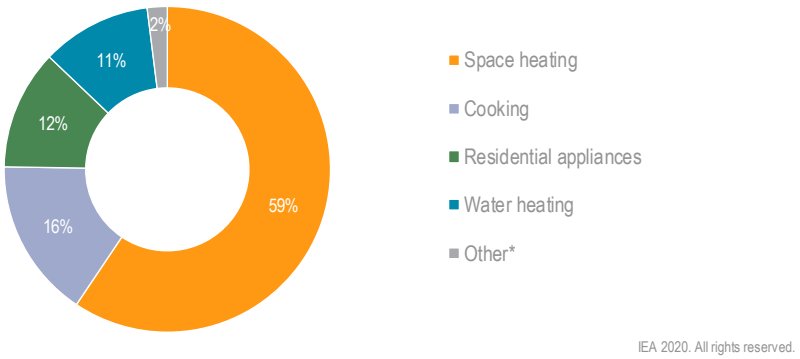
* Includes coal, solar thermal, geothermal and district heat; not visible at this scale.

Source: IEA (2020), *World Energy Balances 2020* (database), www.iea.org/statistics.

In 2018, the share of natural gas consumption in the residential sector was 59%, followed by bioenergy (22%) and electricity (18%). Consumption patterns are different for the main energy sources, as the use of natural gas has increased with expansion of the gas network, potentially reducing the share of biomass. Meanwhile, electricity consumption has remained essentially stable.

Detailed data for energy end-uses has become available since 2015 (Fig. 8.9). Majority of residential energy consumption goes towards heating the space and water.

Figure 8.9 Figure 8.9 Breakdown of TFC in the residential sector, 2017



Heating needs for space and water account for 70% of residential sector energy consumption.

* Includes space cooling.

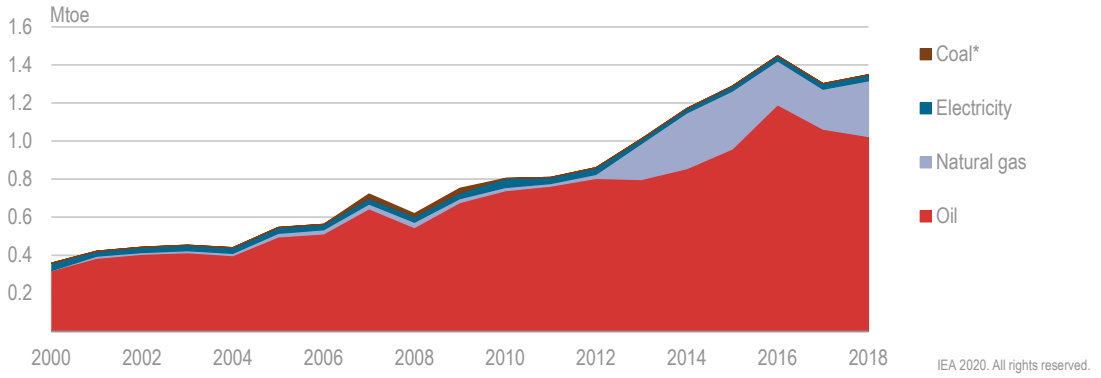
Source: IEA (2019c), *Energy Efficiency Indicators Highlights 2019*, www.iea.org/statistics.

Transport

The transport sector accounts for most of the rise in Georgia's overall energy consumption. In 2018, it was the largest-consuming sector at 1.35 Mtoe, a 120% increase from 2008 (Figure 8.9). Around 75% of the transport energy consumed comes almost equally from gasoline and diesel, while 22% is from natural gas and around 2% is from electricity (for rail transport only).

Because transport consumption has been expanding rapidly and virtually all fuels (gasoline, diesel, natural gas) are imported, developments in the sector significantly affect the entire economy. The recent dip in transport energy consumption is linked to end-use price volatility, as the sector's high share of natural gas consumption – notable even on a global scale – makes its energy use very price-dependent.

Figure 8.10 TFC in Georgia's transport sector by source, 2000-18



Georgia's transport sector, dominated by oil, has driven the country's increase in overall energy consumption.

* Not visible at this scale.

Note: Transport sector demand excludes international aviation and navigation.

Source: IEA (2020), *World Energy Balances 2020* (database), www.iea.org/statistics.

Policies and measures

Since Georgia's accession to the Energy Community Treaty, the country has begun to actively create a legal and regulatory framework on energy efficiency to comply with the EU acquis. The Ministry of Economy and Sustainable Development (MoESD) is responsible for energy efficiency policy development, and three draft laws and several secondary legal acts have been developed with the technical assistance of various international organisations:

1. The draft Law on Energy Efficiency, prepared according to EU Energy Efficiency Directive No. 2012/27/EU, which aims to:

- Establish a common framework to promote and implement energy efficiency within the country.
- Improve energy savings, increase energy supply security, enhance energy independence, and remove barriers to energy efficiency development.
- Establish a process to develop a national energy efficiency target through an energy efficiency action plan, which would also outline measures to meet the target.
- Provide a procedure to adopt the energy efficiency action plan.
- Institute an energy efficiency obligation scheme and/or alternative policy measures to achieve energy savings.
- Ensure co-ordination among parties to control, monitor and supervise implementation of the country's energy efficiency policy.

2. The draft Law on Energy Efficiency of Buildings, prepared according to EU Energy Performance of Buildings Directive No. 2010/31/EU. Several secondary acts have already been drafted but not finalised to implement this law, which will:

- Set buildings sector regulations to ensure the improved energy efficiency of existing and new buildings.
- Introduce minimum energy performance standards (MEPS) and the obligation to adopt a methodology for calculating the energy performance of buildings.
- Include provisions to establish energy performance certification and the inspection of heating and cooling equipment.
- Introduce sanctions for breaching the provisions of this law.

3. The Law on Energy Labelling, prepared according to EU Energy Labelling Directive No. 2010/30/EU, will regulate the energy labelling of various household appliances. This law was enacted on 26 December 2020.

At the end of 2019, the draft law on Energy Efficiency was submitted to the Parliament, where a relevant committee was meant to discuss it together with the draft law on Energy Efficiency in Buildings submitted to the Parliament back in 2018. In addition, the draft law on Eco-Design is being prepared by the MoESD according to the relevant EU directive and regulations.

To effectively implement and enforce energy efficiency policy, the MoESD is considering establishing a special department responsible for implementing the legal framework in collaboration with other relevant entities.

National Energy Efficiency Action Plan

A National Energy Efficiency Action Plan (NEEAP) has been developed in compliance with the EU Energy Efficiency Directive. It was initiated in 2015 (based on 2014 data), and after intensive discussions and numerous amendments it was approved in late 2019

According to the draft Energy Efficiency Law, the NEEAP will establish national energy efficiency targets for the country as of 2020 and beyond, and it will create a basis upon which to implement measures to reach the targets.

The NEEAP describes energy savings potential using business-as-usual (BAU) development as a reference scenario. It targets a 9% reduction in total primary energy supply (TPES) (equivalent to around 5 436 gigawatt hours [GWh]) and a 4% reduction in TFC (2 568 GWh) by 2020, and a 13% reduction in TPES and a 9% reduction in TFC by 2025, a 14% reduction in TPES and a 14% reduction in TFC by 2030 compared with the BAU level. However, these targets were developed using MARKAL model assumptions based on 2014 data, so need to be updated. As it is now well into 2020, the government plans to focus on developing a new Action Plan with the targets until 2030.

Monitoring, reporting and verification

The energy intensity of Georgia's economy began to improve (i.e. decrease) since 2016 (see Figure 8.1 and Figure 8.4), but it is difficult to judge whether this is owing to energy efficiency improvements or to other factors such as structural changes in the economy or mild weather.

As there is currently no measuring/monitoring, reporting and verification (MRV) mechanism in place, it is difficult to track the effects of energy efficiency measures and progress in reducing TPES and TFC. Energy efficiency actions were implemented in several sectors even before the government has officially adopted the NEEAP, but until an MRV system is in place, progress in achieving targets will have to be estimated for drafting of the next round action plan.

Box 8.1 Energy efficiency in Georgia's Energy Strategy 2020-2030

The Energy Strategy 2020-2030, adopted in October 2019, has only a short section dedicated to energy efficiency. Its measures and initiatives aim to:

Identify projects, technical assistance and grant-allocation schemes.

Adopt energy efficiency regulations for buildings, including rules for certifying their energy efficiency parameters, and improve professional qualifications in the construction sector.

- Deepen knowledge among business sector representatives, adopt rules for energy audits and energy management systems and raise the qualifications of energy auditors and service providers.
- Improve the level of knowledge and experience in energy efficiency among entrepreneurs working in industry and trade, as well as among final consumers of energy in government organisations.
- Introduce energy-efficient practices in public procurement.
- Improve efficiency in the transmission, transformation and distribution sectors, which includes reducing electricity and/or natural gas losses in networks and increasing the efficiency of gas-fired thermal power plants by switching to combined-cycle technology.
- Raise the efficiency of end-use equipment, including by introducing efficient lighting and wood stoves, and improve the efficiency of cars, pumps, engines and boilers.
- Introduce financial and tax incentives to promote energy efficiency.
- Implement qualification, accreditation and certification schemes in industry, buildings and other relevant sectors.

Source: MoESD (2019a), The Energy Strategy of Georgia 2020-2030.

Industry

As an Energy Community member, Georgia is obligated to implement the Energy Efficiency Directive, which means it must introduce energy efficiency obligation schemes (or alternative policies) for industry, as well as energy audits, energy management systems, and qualification, accreditation and certification schemes.

The draft Energy Efficiency Law introduces the obligation for large industrial companies to either conduct mandatory energy audits every four years or establish an energy management system (ISO 50001), and it also includes provisions for MEPS for industrial equipment. Energy audits are currently voluntary, there are no obligatory energy efficiency standards, no national certification programmes for energy auditors and no national accreditation. Only two entities maintain ISO 50001 (energy management systems) standards: Batumi Port since 2016 and Natakhtari beer factory since 2014.

Georgia does not have special legislation or support for energy service companies (ESCOs) and there is no established market for ESCO activities. However, the government plans to develop a legal basis to stimulate the energy service market, targeting three pillars: potential clients (local companies that consume energy); service providers (engineers, auditors, ESCOs, etc.); and financiers (local institutions that offer financing for energy efficiency investments). Actions are planned to raise the institutional and technical capacities of the stakeholders in these three groups.

Buildings

Most of Georgia's buildings were built according to Soviet-era norms and have very low thermal efficiency. The draft laws on Energy Efficiency and on Energy Performance of Buildings therefore contain several measures to address this problem. For example, the legislation requires that the public sector act as a model for energy efficiency deployment and ensure that 1% of state-owned public buildings be renovated annually according to the criteria set by the legislation.

At the time of writing, however, these draft laws had not yet been approved and the government did not have an official mandate or budget for energy efficiency improvements in buildings. Moreover, public procurement regulations obligate public entities to choose the most affordable procurement options, which in most cases are not the most energy-efficient ones. Energy efficiency improvements therefore rely largely on private sector initiatives, and developers have created a new niche enterprise to supply insulated, energy-efficient residential buildings of higher quality at a higher price. With adoption of the Energy Performance of Buildings Law, there will be mandatory minimum energy efficiency requirements; the methodology for calculating them has been developed and is pending approval.

Several energy-efficiency initiatives have been implemented in Georgia, usually supported by donors and international financial institution (IFIs) and mainly targeting public buildings such as schools and kindergartens. The latter have been financed largely by donors through the Municipal Development Fund under the Ministry for Infrastructure and Regional Development, and have been overseen partly by the EU Covenant of Mayors initiative, through which several signatory municipalities have pledged to reduce greenhouse gas (GHG) emissions according to Sustainable Energy Action Plans (SEAPs) prepared at the local level. Furthermore, energy performance certificates (EPCs) have been issued for several administrative buildings, kindergartens and schools on a voluntary basis.

Transport

Instruments to raise the efficiency of Georgia's transport sector include taxation, fuel economy standards, and the promotion of electric vehicles (EVs). The government is also actively promoting other transportation options, such as improved public transport, walking and cycling.

The taxation system in force stimulates the import of newer and less-polluting cars (Georgia does not have a car manufacturing industry, so all cars are imported). Customs taxes paid on all imports include an excise tax, an import tax and small charges for registering the car. The largest share of this customs tax is the excise tax, which is calculated by multiplying the excise rate (which depends on the age of a car) by the volume of the engine in cubic centimetres. On 1 January 2017, the excise rate increased by approximately 25% for almost all vehicles, but it doubled for 10-year-old cars and almost tripled for cars older than 14 years. The excise rate for hybrid cars less than six years old is 60% lower than for non-hybrid cars, and the excise rate for electric cars is zero. There is also no import tax on electric cars.

In addition, the government increased the excise tax on gasoline, diesel, compressed natural gas (CNG) and lubricants for cars as of 1 January 2017. In addition to these government interventions, the significant recent depreciation of Georgia's currency has driven retail fuel prices even higher, making car owners more concerned about the cost of fuel.

The relatively high price of petroleum products explains the conversion of a growing share of the transport fleet to significantly less-expensive CNG. For example, a considerable portion of Tbilisi's public transport has been converted to gas to reduce operating costs and increase environmental security. The use of hybrid cars is also increasing gradually, and the Energy Strategy 2020-2030 proposes further activities to transition public transport and private car fleets to environmentally friendly fuels (compressed, liquefied or petroleum gas and electricity) in the capital and throughout the country (MoESD, 2019a).

The fuel quality standard for gasoline in Georgia has been Euro 5 since 2017, and the government is planning to upgrade it to Euro 6. Euro 3 is the standard for diesel, but it is gradually improving, with the mandatory standard rising to Euro 4 (50 milligrammes [mg] of sulphur per kilogramme [kg] of diesel fuel) in January 2019 and to Euro 5 in January 2020. However, as mentioned in Chapter 7, Georgian authorities lack the capacity to systematically check the quality of fuel sold in Georgia.

The compulsory technical inspection of vehicles has also been introduced gradually, becoming obligatory for certain types in 2018 and for others in 2019. This measure is expected to reduce the number of inefficient cars on the roads, although some environmental non-governmental organisations (NGOs) claim the requirements are not stringent enough (see Chapter 7).

Georgia's National Road Safety Strategy, along with its corresponding action plan, was adopted in 2017. It comprises several measures, including lower speed limits on motorways and the installation of average-speed-control sections on roads, expected to reduce fuel consumption as well as increase safety. Secondary legislation is being developed to implement this strategy.

With respect to urban transport, policies and measures are determined at the municipal level: for example, Tbilisi and Batumi are in the process of modernising their bus parks and creating bus lanes. Box 8.2 outlines some other municipal initiatives.

Box 8.2 Municipal initiatives in Georgia

Not only has the municipality of Tbilisi designed a Sustainable Urban Transport Strategy for 2015-30, it also passed a Green City Action Plan (GCAP) in 2017, supported by the European Bank for Reconstruction and Development (EBRD). The EBRD's Urban

Enhancement Transport Programme is working with Tbilisi city hall to introduce a bus restructuring plan, adding 700 new electric buses to the public bus fleet during 2018-22 (100 in 2018 alone). Additional investments for the Tbilisi metro station are also planned for the acquisition of new trains and cars, and construction of a bike lane network is underway, with approximately 10 km already completed.

Batumi completed development of its GCAP in November 2019, and it is awaiting city council approval. Because transport modifications are central in making Batumi a greener city, it plans to introduce clean CNG-powered buses, promote electric transport, extend bicycle lanes and better organise traffic.

Source: MoESD (2019b), "Response to the IEA Energy Policy Questionnaire".

Electric vehicles

EVs are supported in Georgia at both the state and municipal levels. They are exempt from import tax, and in 2017-18, EV charging was free (and the government is considering extending this policy). The Tbilisi city council is considering introducing free parking for EVs, and taxi drivers who own EVs are encouraged to apply to have chargers installed in their neighbourhood at no cost. According to press reports, 60 EV chargers were to be installed in Tbilisi at 30 different locations by the end of 2019. The company installing the chargers is required to provide free service for one year, after which time it may impose a tariff for charging. In addition, an EV factory at Kutaisi is planned, with the capacity to manufacture 40 000 EVs per year.

According to optimistic Georgian State Electrosystem (GSE) projections, up to 5% of Georgia's cars could be replaced by EVs in five years and up to 20% in ten, raising peak electricity consumption 250 megawatts (MW) by the end of 2022 (GSE, 2019). Even assuming a less-bold trajectory, EVs will certainly be a major factor in energy consumption growth, particularly for peak load.

Assessment

Overall energy efficiency policy

Georgia's primary energy intensity improved more than 3% y-o-y in 2017 and 2018, which is consistent with the IEA's EWS. This is very positive, although the exact reasons for Georgia's lower energy intensity are difficult to assess because it has only just begun to develop its monitoring and evaluation system. To sustain this encouraging trend, the Georgian government should accelerate progress in establishing a legal and political framework to comply with its Energy Community Treaty obligations and to transpose the EU acquis for energy efficiency into its domestic law.

Several primary laws have been drafted and submitted to parliament, but there have been substantial delays in adopting the draft legislation. Although the 2 year NEEAP has been recently adopted, the delays in adopting primary legislation have become a serious obstacle to further action as they have been blocking the adoption of crucial secondary legislation and curtailing stakeholder activity. This is evident in the buildings sector, for

which a code on minimum energy efficiency requirements for buildings has been drafted but cannot be formally enforced because the primary legislation is lacking.

While the government is optimistic about making timely progress, the new requirement to prepare an integrated National Energy and Climate Plan (NECP) according to the EU Governance Regulation has made it necessary for Georgia to hasten progress on its long-term energy efficiency strategy.

Another challenge in formulating energy efficiency policy is the cross-cutting nature of the issue and the multiplicity of participants involved. For instance, while the main responsibility for energy efficiency lies with the MoESD, achieving gains also depends on Georgia's climate policy and its commitments under the Paris Agreement.

As efficiency measures need to be implemented in a variety of sectors, they typically also involve participants outside of the central government, e.g. municipalities carrying out public building refurbishments or social organisations running local awareness campaigns. The range of measures and participants is thus vast, with responsibilities intertwined and in constant need of co-ordination. Added to this, the government's competencies are somewhat unclear due to incorporation of the Ministry of Energy into the MoESD, plus a lack of awareness on the topic of energy efficiency persists not only among the general public and industry, but within the government itself.

Although an inter-ministerial steering platform on energy efficiency was established in 2018, it is not functional because the legislative framework is not yet in place. Many countries have created a separate agency responsible for energy efficiency, and in Georgia this idea was on the policy agenda several years ago, but it was not realised. The government should reconsider creating a separate body with the mission of improving energy efficiency across all sectors of the economy. Such a targeted, dedicated institution with clear competences and responsibilities could facilitate and streamline the implementation of Georgia's energy efficiency objectives.

Georgia drafted the Law on Energy Efficiency and the NEEAP to include energy saving targets to fully meet its commitments under the EU Association Agreement. However, the usefulness of aggregated targets may be limited without an appropriate MRV mechanism. For this mechanism to work, disaggregated data on TFC and the corresponding economic activities would be needed to calculate energy intensity by sector and subsector. At this level of disaggregation, the intensity metric provides important insights that can help analysts understand efficiency performance, evaluate energy reduction potential by sector and subsector, compare Georgia with other countries and track progress over time.

Missing data can be most effectively collected through the distribution companies handling the metering and billing of end-user consumption. The efficiency of these metering and billing systems and the proper identification of consumers' business activities are essential.

Geostat has started compiling energy efficiency indicators but enlarged input data are needed on all consuming sectors to properly monitor the outcomes of energy efficiency measures. Consolidating existing data is necessary for this purpose (e.g. centralising building stock data currently held at the municipal level). Some data on end uses of energy can be obtained only through surveys (e.g. services sector end-use energy consumption), but as surveys are resource-intensive and time-consuming, the relevant entities should define the most pertinent policies to monitor and then liaise with Geostat to develop a concerted workplan to obtain the required input.

Buildings

Despite the lack of a legal framework and delays in adopting MEPS, energy efficiency in Georgia's buildings sector has been gaining momentum. As a result, several pilot projects have been implemented at the local level, and EPCs have been issued for several public buildings on a voluntary basis.

However, there is no financing support scheme in place at the national level to assist building owners with energy-efficient refurbishments, even though the lack of access to capital is known to be a central barrier to renovations. Low public awareness of the importance of energy efficiency is another challenge, and with the Law on the Energy Performance of Buildings still at the drafting stage, there is currently no legal basis for the introduction of a mandatory system to issue EPCs for buildings.

At the same time, the unsatisfactory state of Georgia's building stock calls for urgent action. Most buildings date back to the Soviet era, and it is estimated that more than 10% of them have exceeded their lifetime.[27] One especially prevalent problem is underheating, and in many cases poor-quality building envelopes are a source of major energy losses. Addressing building envelope quality must therefore be given priority so that other refurbishments can more effectively reduce energy consumption.

Finally, while data collection has improved considerably in recent years, wide-scale refurbishment measures are hampered by the lack of a systematic building inventory that specifies typical categories of buildings and their energy consumption, which could inform decision-making in the sector.

Industry

Energy could be saved in the industry sector through heat recovery and co-generation; process optimisation and automation; improved energy management systems and procedures; advanced metering; and technology upgrades.

Georgia has already drafted the bulk of legislation aimed at improving energy efficiency in industry to meet its EU Association Agreement commitments. Among other measures, the draft legislation rightly includes provisions on energy management protocols and MEPS for industrial equipment. Georgia should also require or incentivise large industrial energy users to conform to ISO 50001 management protocol, implement actions to deliver cost-effective energy savings, and periodically report on their efforts.

There are currently no MEPS for industrial-scale electric motors or for heating, ventilation and air conditioning (HVAC) or other categories of industrial equipment, but the government plans to introduce them. A robust compliance system should also be established to monitor and enforce MEPS requirements. Furthermore, periodic updates of MEPS to conform with appropriate global thresholds, as well as penalties for noncompliance, are crucial to make industrial energy efficiency standards effective.

Small and medium-sized enterprises (SMEs) are critical for economic development and job creation in Georgia. The SME sector can therefore play an important role in developing a market for energy efficiency services: supported by targeted policies and measures, SMEs could act as energy auditors, efficient-material retailers, HVAC and energy service

[27] See ECS (2017), *Energy Governance in Georgia: Report on Compliance with the Energy Community Acquis*, p. 41.

providers, etc. The industry sector would also benefit from measures to help SMEs reduce their own energy consumption, such as support for energy audits, access to information on proven energy efficiency practices relevant to SME operations, and access to affordable financing.

Transport

Implementing national-level energy efficiency policies for Georgia's transport sector is complicated because transport policy is often enacted at the regional or municipal level. However, certain national policy levers, in conjunction with municipal-level policies, have been having a strong impact in a relatively short period of time.

Government measures on vehicle and fuel taxation (it raised excise taxes in 2017 on fuel as well as older cars) have reduced oil product demand and improved the quality of the vehicle fleet. Mandatory vehicle inspection as of 2018-19 is also a positive development that should be enforced properly.

Furthermore, the government has encouraged the shift to a more environmentally friendly vehicle fleet by reducing excise taxes 60% for hybrids less than six years old and by lifting the import tax on EVs. Hybrid and electric cars sales increased from 1.6% of total car sales in 2015 to 41.1% in 2018 as a result, with this trend set to continue.

The makeup of Georgia's light-duty vehicle fleet is clearly evolving and will continue to do so, particularly as the inspection programme begins to take the oldest and most inefficient cars off the road. These programmes should be continued to promote greater fuel economy and further reduce emissions.

In addition, a national government-led scrappage programme could encourage further consumer uptake of EVs and hybrids, further accelerating the shift away from gasoline, diesel and CNG cars.

At present, Georgia's cities are taking the lead in transforming the urban landscape by investing in infrastructure and prompting more people to use alternative modes of transport. However, investment is required to raise transport energy efficiency across the entire country, not just in the largest cities. Further municipal-level strategies are needed across Georgia, capitalising on lessons learned from previous projects. For example, Tbilisi's bike lane network could be used as a model for other major cities and towns.

The development of energy efficiency indicators for the transport sector is essential to support any relevant energy efficiency developments. The MoESD, in co-operation with Geostat, is well placed to identify what data are available, where the gaps are and what resources are needed to collect the missing information. To maximise synergies, primary data collection and the compiling of energy efficiency indicators should be aligned with the indicators already compiled for other sectors (residential and industry).

Recommendations

The Government of Georgia should:

- ☐ Accelerate the process of adopting, implementing and enforcing the primary and secondary legislation on energy efficiency.

- Consider creating a separate agency mandated to improve energy efficiency across all economic sectors. In the meantime, it should enable effective functioning of the steering platform on energy efficiency to facilitate co-operation among the various ministries and other stakeholders, and to consolidate the responsibilities of implementing energy efficiency measures.
- Initiate measures to raise public and government awareness on energy efficiency.
- Ensure Geostat has adequate resources to collect and analyse energy data, as data collection during the design, implementation and evaluation phases is an essential part of any energy efficiency programme.
- Monitor, enforce, evaluate and periodically update energy efficiency policies and measures in all sectors, based on disaggregated energy efficiency indicators.
- Liaise with Geostat to:
  - Guarantee that missing key data are collected through distribution companies in order of priority (e.g. energy consumption in the services sector, most importantly hotels).
  - Maximise the use of available data to support energy efficiency analysis (e.g. activity data for the transport sector or on the housing stock).
  - Optimise human resource capacity (e.g. by deciding who should analyse the results and be able to see which data are missing).

In the industry sector:

- Ensure the measures envisaged in the draft Energy Efficiency Law are swiftly adopted and implemented, and especially:
  - Require and enforce energy management protocols for large industrial energy users to conform to ISO 50001 standards, implement actions to deliver cost-effective energy savings, and periodically report on efforts.
  - Require data-driven MEPS for industrial equipment.
  - Adopt MEPS for industrial-scale electric motors as well as HVAC and other categories of industrial equipment. Periodically update MEPS to conform with appropriate global thresholds and penalties for noncompliance.
- Promote energy efficiency for SMEs and support SME participation in the energy efficiency services market.

In the buildings sector:

- Develop an integrated inventory of the national building stock that specifies typical categories of buildings and their energy performance, providing an empirical basis for future decision-making.

- Initiate further pilot projects on energy efficiency in buildings, with an emphasis on the residential sector. This should be carried out in close co-operation with donors and the Covenant of Mayor municipalities, be accompanied by measures to raise public awareness on energy efficiency in buildings, and specifically target building envelope improvements.
- In close co-operation with donors, continue to develop a strategy to stimulate private investment in energy efficiency measures in the buildings sector, including assessing different models of financial support schemes to assist homeowners and businesses with energy-efficient refurbishments, developing solutions for standard building types.
- Set data-driven MEPS for key building components (such as windows and roofs) and high-energy-use systems (such as ventilation and heating).
- Adopt and enforce building energy codes and EPCs.

In the transport sector:

- Support the creation and continuation of municipal-level strategies for major cities and towns for energy efficiency in transport.
- Create a strategic roadmap to increase energy efficiency in transport, focusing on key national high-traffic corridors.
- In co-operation with municipalities, stimulate investment in public transport with a country-wide bus and micro-bus replacement strategy.
- Sponsor countrywide communication campaigns promoting greater use of alternative transport modes (public transport, bicycles, scooters) from a public health perspective.
- Encourage owners of private highways to send passenger and freight data to Geostat.
- Continue existing taxation policies to incentivise further expansion of the hybrid and electric light-duty vehicle fleet.
- Initiate a scrappage programme to stimulate the continued uptake of hybrid and electric vehicles.

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9. Renewable energy

Key data

(2018)

Renewable energy[28]: 1.2 Mtoe (23.9% of TPES) and 10.0 TWh (82.6% of electricity generation)

World renewable energy shares (2017): 13.6% of TPES and 24.5% of electricity generation

Hydro: 0.9 Mtoe (17.7% of TPES) and 9.9 TWh (81.9% of electricity generation)

Bioenergy: 0.3 Mtoe (5.6% of TPES) (no electricity generation)

Geothermal: 0.02 Mtoe (0.4% of TPES) (no electricity generation)

Wind: 0.007 Mtoe (0.2% of TPES) and 0.08 TWh (0.7% of electricity generation)

Solar thermal: 0.003 Mtoe (0.1% of TPES) (no electricity generation)

Overview

Although Georgia's untapped renewable energy source (RES) potential has not been systematically measured, it is vast. Its approximately 300 rivers could produce a significant amount of hydropower, with potential hydro generation capacity estimated at 15 000 megawatts (MW), corresponding to average annual production of 50 terawatt hours (TWh). Wind potential is estimated at 1 500 MW of capacity for 4 TWh of average annual electricity generation. In most regions of the country, annual sunshine duration ranges from 250 to 280 days (1 900 to 2 200 hours), indicating considerable solar photovoltaic (PV) and solar thermal potential.

Georgia's main RES is currently hydroelectricity, accounting for 74% of the renewable energy share in total primary energy supply (TPES) in 2018. The rest was made up mainly by solid biomass from domestic forestry (23%), along with small amounts of geothermal, wind and solar energy (2.4% combined share).

The share of RESs in TPES has decreased notably since 1997, dropping from 41% in 1998 to 24% in 2018 mostly as a result of higher oil product consumption in the transport sector. The share of RESs in electricity generation remained stable during the same period, however, at above 80%. New hydro capacity has been added, a 20.7-MW wind farm has been commissioned, and over 1.2 MW of small-scale distributed solar PV capacity has been installed thanks to the net metering programme. As for biomass, it is used for heating only, not for electricity generation (MoESD, 2019a).

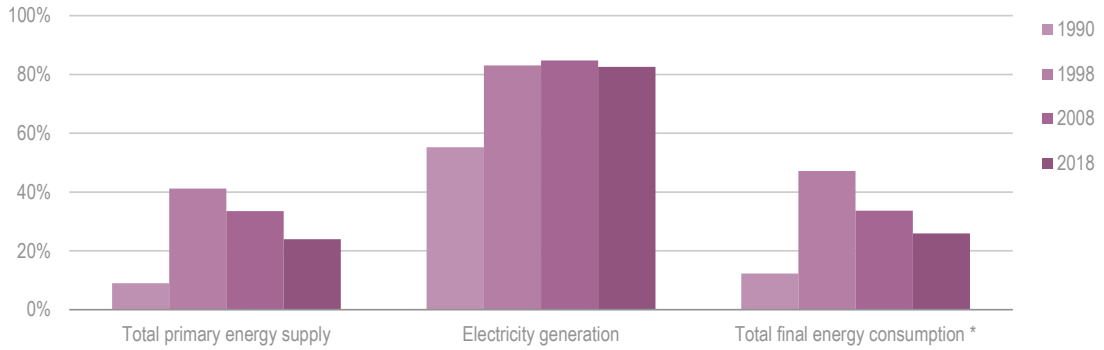
[28] This chapter covers both traditional hydropower and other less-established renewable energy technologies.

More than 100 hydropower projects are under development and over 40 are in the construction phase. Progress is slow, however, and construction is not keeping up with increasing demand.

Renewable energy supply and consumption

In the last two decades, RES shares in TPES and total final consumption (TFC) have decreased (Figure 9.1). As mentioned above, these drops are related to economic growth and the notable increase in fossil fuel consumption, mainly in road transport.

Figure 9.1 Share of renewable energy in Georgia's energy system, 1990-2018



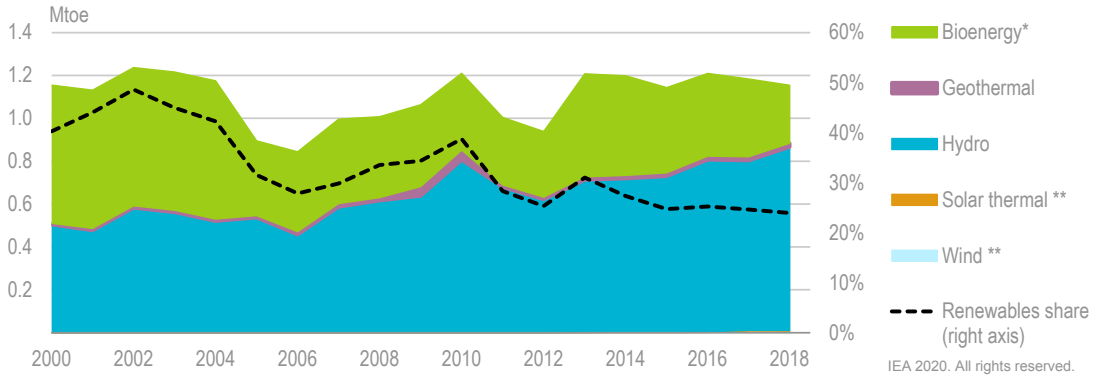
The share of renewables in Georgia's TFC has decreased in the past two decades.

* Includes direct use in TFC and indirect use through electricity and heat consumption.
Source: IEA (2020), *World Energy Balances 2020* (database), www.iea.org/statistics.

Renewable energy in total primary energy supply

The renewable energy contribution to TPES fell from 41% to 24% between 2008 and 2018 (Figure 9.2). Hydropower was the dominant source, accounting for 74% of renewables in TPES in 2018, and the remainder was mainly fuelwood used for domestic heating (all fuelwood used in the country is counted as renewable energy even though not all of it meets the EU Renewable Energy Directive's sustainability criteria for biomass). Geothermal, wind and solar thermal contributed only minor shares, as generation from the 1.2 MW of small-scale solar PV installations that had been added by October 2019 (thanks to the net-metering support scheme) was not yet reflected in the 2018 statistics.

Figure 9.2 Renewable energy in Georgia's TPES, 2000-18



Bioenergy and hydro are currently Georgia's main renewable energy sources.

* Includes solid primary biofuels.

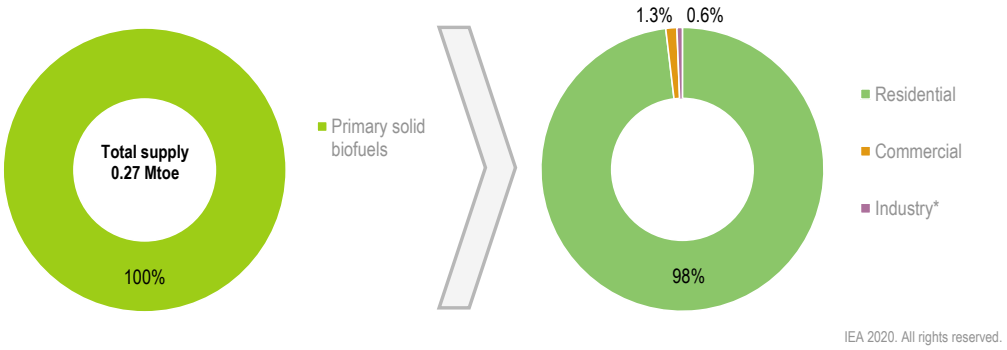
** Not visible at this scale.

Note: Mtoe = million tonnes of oil equivalent.

Source: IEA (2020), *World Energy Balances 2020* (database), www.iea.org/statistics.

Georgia's bioenergy supply totalled 0.27 Mtoe in 2018 and consisted completely of primary solid biofuels (Figure 9.3). The country's current consumption of wood biomass exceeds the authorised levels of consumption established by the forestry agency by about three times (see Bioenergy below).

Figure 9.3 Georgia's bioenergy supply by source and use by sector, 2018



Georgia's bioenergy supply consists of domestic solid biofuels mainly used in the residential sector.

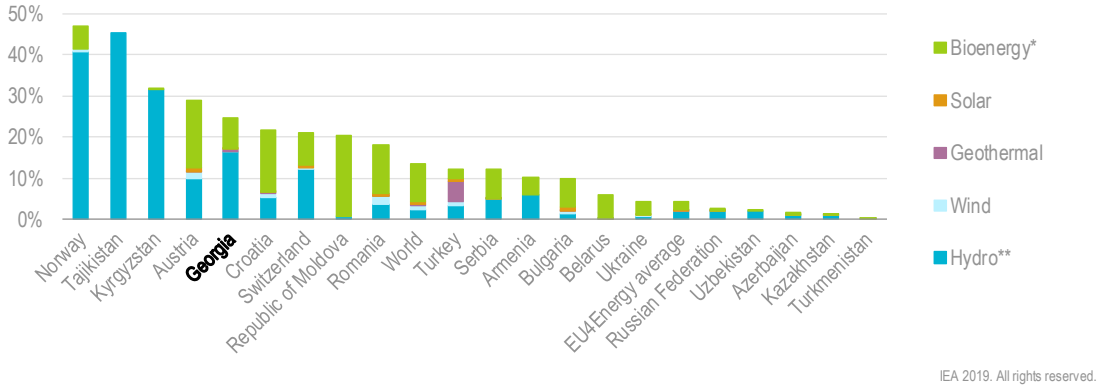
* Not visible at this scale.

Source: IEA (2020), *World Energy Balances 2020* (database), www.iea.org/statistics.

Virtually all of Georgia's bioenergy supply is consumed in the residential sector, with the commercial and industry sectors using small amounts of solid biofuels (1.9% combined share of consumption).

Georgia's share of TPES from RESs ranked above the world average in 2017 (Figure 9.4). The major contributors to the renewables share are hydroelectricity and bioenergy.

Figure 9.4 Renewable energy shares in TPES of selected countries, 2017



Georgia's share of renewables in the TPES (almost 30%) is two times higher than the world average.

* Includes solid biofuels, renewable waste, liquid biofuels and biogases.

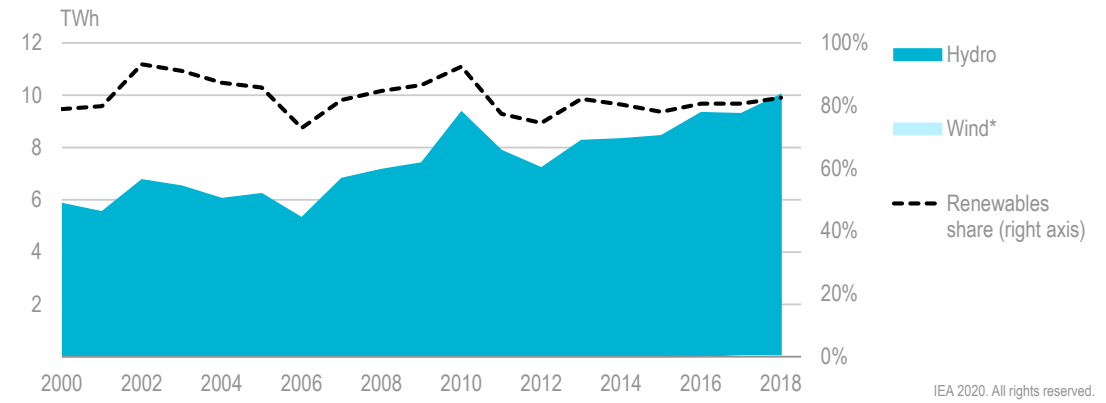
** Includes hydropower (excluding pumped storage) and tidal, wave and ocean energy.

Source: IEA (2019), *World Energy Balances 2019*, www.iea.org/statistics.

Renewable electricity generation

Georgia's renewable electricity generation is virtually all hydroelectricity (Figure 9.5). Hydropower capacity has increased 15% since 2015, and most of the new capacity is regulated.[29]

Figure 9.5 Renewable energy in Georgia's electricity generation, 2000-18



Hydropower currently accounts for nearly all of Georgia's renewable electricity generation.

* Not visible at this scale.

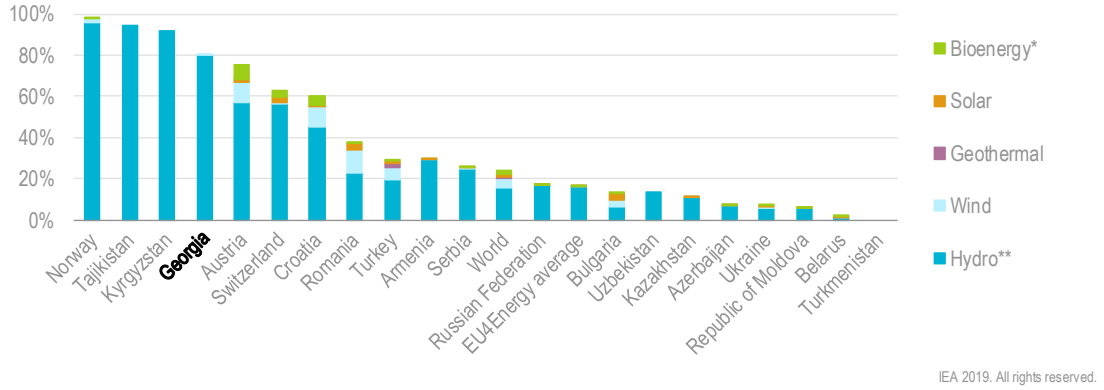
Source: IEA (2020), *World Energy Balances 2020* (database), www.iea.org/statistics.

Georgia's share of renewables in electricity generation in 2017 (82%) was significantly above the world average (24%) (Figure 9.6). In 2018, seven regulated hydropower plants

[29] Georgian State Electrosystem (GSE) annual reports 2015-19.

(HPPs) with 1 993 MW of installed capacity, 17 seasonal ones (1 039 MW) and 60 small-capacity ones (195 MW), as well as one single wind power plant (20.7 MW) were operating in Georgia, for a total installed renewable capacity of 3 248 MW. Renewable energy thus accounted for 78% of the country's total installed capacity and for 83% (10.04 TWh) of its electricity generation. In addition, two seasonal HPPs (Mestiachala 1 and 2) and four small HPPs (Orozmani, Skurdidi, Aragvi 2 and Avani) became operational in early 2019.

Figure 9.6 Renewable energy in electricity generation in selected countries, 2017



Georgia's renewable share in electricity generation (almost 80%) is notably higher than the world average of just above 20%.

* Includes solid biofuels, renewable waste, liquid biofuels and biogases.

** Includes hydro power (excluding pumped storage) and tidal, wave and ocean energy.

Source: IEA (2019), *World Energy Balances 2019*, www.iea.org/statistics.

Institutional framework

The Ministry of Economy and Sustainable Development (MoESD) is responsible for renewable energy policy. However, biomass production and use fall under the Ministry of Environmental Protection and Agriculture (MEPA) and its Forestry Agency.

The Georgian Energy Development Fund (GEDF) is a state-owned joint-stock company subordinate to the MoESD. It was created in 2010 to seek out prospective renewable energy projects and promote their development. The GEDF is engaged in:

- preliminary research
- preliminary feasibility assessments
- preliminary environmental impact assessments
- finding investors and attracting their interest to existing projects.

Investors can sign memorandums or agreements with the GEDF (and eventually a third party) that define the mutual responsibilities of the GEDF and the investor. Depending on the investor's needs, the GEDF can provide various services to facilitate project preparation and implementation.

The Public-Private Partnership Agency is a new body created following adoption of the Public-Private Partnership Law in May 2018. The agency's mandate is to lead the development and implementation of public and private co-operation projects.

Policies and measures

Historically, Georgia has prioritised the development of its hydropower resources through large, medium and small HPPs. In more recent years, however, other RESs – wind, solar and biomass – have also been gaining attention at the policy level.

In 2008, Georgia adopted a State Renewable Energy Programme to attract investment for new plants under the build-own-operate principle based on memorandums of understanding (MoUs) with the government and power purchase agreements (PPAs) with the Electricity System Commercial Operator (ESCO). The aim of the policy was to create a framework encouraging investors to build new plants on a commercial basis to serve the expanding export market (mainly Turkey) during the summer months, and to supply the internal Georgian market during the winter. The policy was not limited to hydropower, but in practice the investments were – until recently – confined to hydro plants, the most mature technology.

The practice of signing government-backed PPAs for HPPs was restricted in 2017 (see details below), and the framework for energy sector projects (HPPs as well as other renewable energy plants) was reformed with adoption of the Law on Public Private Partnerships in May 2018 (Georgia Today, 2018) (see Chapter 2).

Georgia is also in the process of approving new energy legislation to align its regulations with the EU energy acquis (including the Third Energy Package) under the terms of the Energy Community Treaty. In late 2019, the parliament approved several energy laws, including the Law on Energy and Water Supply and the Law on Promoting the Production and Use of Energy from Renewable Sources. The MoESD is studying several possible support mechanisms for RESs and it plans to introduce one or several tailored pilot schemes during the transition period, with the intention of progressing to market-based schemes once a functional electricity marked has been established.

Georgia's electricity transmission system operator (GSE) has estimated that the country's power system can integrate 333 MW of wind and 130 MW of solar capacity in 2020-21 without any negative effects (Table 9.1). These capacities can be increased to 1 332 MW (wind) and 520 MW (solar) if certain assumptions, restrictions and requirements are met. The system integration of variable renewable energy (VRE) sources is discussed in Chapter 6 on electricity.

Table 9.1 Projected system integration of variable renewable energy sources (MW)

	2020-21	2025	2030
Wind	333	665	1 332
Solar	130	260	520

Source: GSE (2019), Ten-Year Network Development Plan of Georgia 2019-2029.

NREAP and the Renewable Energy Law

A National Renewable Energy Action Plan (NREAP) was developed in compliance with Renewable Energy Directive No. 2009/29/EC to define renewable energy targets and government actions for achieving them up to 2020. As the document was only approved in late 2019, it has missed the 2020 targets. The government aims to set the 2030 targets in the new NECP, which is currently being developed for the period of 2021-2030.

Law of Georgia On Promoting the Production and Use of Energy from Renewable Sources was also developed, submitted to the parliament and approved in three hearings by December 2019. It is a framework law focusing mainly on Georgia's compliance with meeting the Energy Community Treaty requirements, reporting to the Energy Community Secretariat (ECS) and co-ordinating support policies (e.g. for statistical transfer, certificates of origin, etc.) with other Energy Community members. The law and its annexes also contain detailed provisions on setting renewable energy targets, developing the Ten-Year Renewable Energy Action Plans and monitoring progress on attaining targets.

The Law of Georgia On Promoting the Production and Use of Energy from Renewable Sources has an ambitious goal of 35% renewable energy in TFC, not taking into account the sustainability of fuelwood consumption. All wood biomass consumption in Georgia is considered as renewable energy, even though it may not meet the sustainability criteria. It is expected that the adoption of a new Renewable Energy Directive by the Energy Community will tighten these criteria and the actual target for Georgia will be reduced.

Although the does not indicate which incentive schemes Georgia intends to introduce to meet its renewable energy targets, it does specify the incentive mechanisms widely used in international practice (feed-in premiums, green certificates, price-difference agreements and special green tariffs). The government plans to conduct studies to determine which support schemes are most appropriate for different technologies and generation capacities, taking financial impacts on the state budget and on market participants into account (MoESD, 2019b).

Hydro

Investors have traditionally signed MoUs with the Government of Georgia to obtain the right to develop hydro sites. Government Decree No. 214 of 21 August 2013 (GoG, 2013) and Ministry of Energy Order No. 40 of 10 April 2014 defined two ways to develop an HPP project: i) through the tendering of preselected sites by the former Ministry of Energy and ii) through unsolicited applications to develop sites not included on the official government list. In both cases, the key condition of the MoUs was to sell a certain share of annual generation to ESCO during the winter period in the first ten years after commissioning of the plant.[30] The power sales schedule and other details would be included in the PPA signed between ESCO and the developer after signing of the MoU.

Following Georgia's agreement with the International Monetary Fund (IMF), which was concerned about the contingent liabilities of PPAs, ESCO suspended signing new government-backed PPAs in 2017. New PPAs can now be signed only after a fiscal impact assessment has been conducted, and for a period of up to eight months per year for ten years at the maximum offtake price of USD 0.06 per kilowatt hour (kWh). Investors can

[30] The decree was amended several times, changing the obligatory offtake period from three winter months to eight winter months, etc.

still sign MoUs to build HPPs or other RES plants, but they cannot request guaranteed offtake by ESCO and must intend to sell the power on the market. HPP development activities have slackened since the introduction of these new rules.

Small HPPs – i.e. with a capacity below 15 MW (as of late 2019) – do not need a generation licence and have a special offtake regime. They can sell power to any consumer, including retail customers. If they do not find customers, ESCO must buy their electricity during the eight winter months (September through April) at the highest market tariff.

Many MoUs to develop small and medium-sized HPPs have been signed since adoption of the renewable energy policy in 2008, but most of them have not reached financial closure and implementation. According to ESCO, over 90 MoUs and 48 PPAs had been signed as of September 2019. Several of these MoUs were signed before 2008, and they continue to be legally valid even if there has not been any progress in project development.

In addition to regulatory challenges, many HPP projects face opposition from local populations partly supported by environmental non-governmental organisations (NGOs) (see Chapter 7).

Contrary to many other countries with hydro resources, Georgia does not require HPP developers and investors to obtain water-use permits, and the fee for using water is very low. The issue of managing water resources – and permits for water use – affects not only the power sector but also agriculture, fishing, tourism and transport. There is currently no integrated water resource management system in place, and each ministry develops its own water-use policy for the sector under its responsibility without long-term planning or close co-ordination with other sectoral ministries. An HPP plant developer does not necessarily have access to information about other present or future possible uses of the water in question, unless the issue emerges in public hearings during environmental impact assessment approvals (see Chapter 7). In cases of conflict between users of the same river, and in the absence of a permit guaranteeing an investor's water rights, Georgia's legislation is not very clear on how to prioritise or allocate water for the different usages to resolve the dispute.

The MoESD suggests establishing a national commission on water to regulate water issues at the national level. To comply with EU requirements, Georgia has committed to develop river basin management plans for all rivers by 2022, and the MoESD is developing a new institutional setup for co-ordinated river basin management. Related to these initiatives are river basin studies carried out by the GEDF, which is attempting to formulate co-ordinated plans to develop the hydro resources of all river basins, as well as transport infrastructure (roads) and the transmission network.

Wind

Several promising sites for wind farms have been identified in areas adjacent to Poti, Kutaisi, Rustavi, Tbilisi, the Rikoti Pass (Mount Sabueti) and the Chorokhi River. The country's total annual wind energy potential is estimated at 4 TWh, with installed capacity of 1 500 MW (MoESD, 2019b).

A 20.7-MW wind power plant at Kartli was commissioned in 2016. The total cost of the facility was USD 29.7 million, with USD 22 million covered by a loan from the European Bank for Reconstruction and Development (EBRD) and the rest funded by the GEDF and the Georgian Oil and Gas Corporation (GOGC), the plant's stakeholders. In September

2019, the GOGC and GEDF announced a public auction to sell their 100% stake in this plant, and it has been sold for USD 14.4 million.

As of September 2019, the Government of Georgia had signed MoUs with various investors for the construction of 18 wind power plants worth USD 1 560 million, according to the MoESD. The total installed capacity of all the projects would be 1 200 MW and expected generation is around 4.6 billion kWh.

Solar PV

In 2015, the Georgian National Energy and Water Supply Regulatory Commission (GNERC) passed a regulation introducing net metering for small-scale power plants (with installed capacity of less than 100 kW) owned by retail consumers. Such plants are treated as micro-electricity plants and benefit from a supportive framework:

- GNERC's authorisation is not required.
- Self-consumption is exempt from taxes.
- Electricity generated above the self-consumption level can be injected into the grid and then resupplied upon request for self-consumption; otherwise, excess electricity can be sold to distribution companies at the weighted average purchase price.

GNERC reports that 67 solar PV installations were registered at the end of 2018, with a total installed capacity of 0.7 MW (GNERC, 2019). By October 2019, the total capacity had reportedly reached 1.2 MW.

The Ministry of Infrastructure has also initiated and financed a GEL 2-million project to install autonomous micro-PV plants in mountainous, hard-to-reach, sparsely populated villages (MoESD, 2019b). Although the use of solar collectors to supply hot water is considered promising in most regions, only a small amount of the country's solar thermal potential is presently being exploited (ibid.).

For larger-scale solar PV, the GEDF, supported by the EBRD, is planning to conduct a pilot tender for a 30-MW solar PV plant near Tbilisi. The Energy Strategy 2020-2030 also mentions plans to conduct feasibility studies for two pilot solar power projects: a 5-MW plant on the Gareji plateau and a 50-MW plant at Gardabani.

Bioenergy

The share of biomass in TPES is around 8%, but at the same time it is the second-largest domestic energy source in Georgia's energy balance, accounting for approximately 30% of domestic energy production in 2017. Biomass is the main fuel used for heating in rural Georgia: according to expert estimates and surveys, about 90% of the rural population uses wood for heating (Margvelashvili, 2018).

Forested land in Georgia amounts to roughly 3.1 million hectares and it is fully owned by the state. Biomass production and use are therefore governed by legislation related to forestry and agriculture, and the responsible executive bodies are MEPA and its Forestry Agency. Forestry reform is ongoing: the Concept of the Forestry reform, approved by the parliament on the first reading in October 2019, aims to introduce more sustainable and effective forest management, informed by best international practices. The Forestry Agency will be in charge of management, and firewood will be made available to consumers at forest limits.

Georgia currently has a “social cuts” mechanism whereby the population is allowed to cut trees within a certain volume quota allocated by the Forestry Agency. Implementing this policy is challenging, however, because of safety concerns and the agency’s inability to strictly monitor illegal cutting. Annual fuel wood consumption is around 2.1 million cubic metres (m^3), even though the quota allocated by the Forestry Agency is only 0.6-0.8 million m^3 and the optimal amount to be used is estimated at 200 000 m^3 (MoESD, 2019b). Plus, a considerable amount of residual biomass (up to 35%) remains in the forest after trees have been cut, but it could be used to produce biomass fuels (briquettes, wood chips and wood pellets).

The use of untapped waste and residue biomass resources could be scaled up sustainably, but Georgia does not have an enabling environment for the collection or sale of forestry and agricultural residue. Waste management legislation focuses mainly on hazardous waste and does not obligate people or companies to collect and dispose of biodegradable waste. In addition, the tax code considers the waste delivered to a producer as the producer’s revenue, which reduces the economic attractiveness of waste utilisation, including for electricity or heat production. (The use of wood briquettes made from agriculture residues is a trend that is gaining popularity, however, with schools in various regions of Georgia using them in the winter of 2018-19.)

In addition to the problem of deforestation, the use of wood for heating in inefficient stoves results in poor energy efficiency and poses a health hazard. Georgia’s indoor air quality is among the worst in the world (also see Chapter 7).

To address the unsustainable use of biomass, the government’s policy has been to extend natural gas access to rural areas to replace fuel wood consumption. However, in many cases, extending gas access has resulted in stranded investments because low-income households cannot afford natural gas (even at the subsidised rate) and continue to use wood instead. The Energy Strategy 2020-2030 envisages continuation of the gas-access policy, but also the promotion of energy-efficient equipment (wood stoves, water heaters, etc.) in wood-consuming areas (MoESD, 2019b).

Geothermal energy

Georgia has over 250 natural and artificially drilled geothermal sources grouped into 44 geothermal fields, more than 80% of which are in western Georgia. Geothermal water, used mainly for primitive household or agricultural (greenhouse) purposes, varies in temperature from 30ºC to 110ºC. The share of geothermal energy in the country's energy balance is very small.

The Energy Strategy 2020-2030 anticipates geothermal sector development, for instance through state and/or grant funding to use geothermal energy for heating and to supply hot water in municipal buildings (kindergartens, schools) within the Covenant of Mayors framework (MoESD, 2019b).

Assessment

Georgia has vast renewable energy resources, but there has been no comprehensive assessment of their economic potential. Although hydropower sites have been

inventoried,[31] there seems to be no systematic resource assessment indicating optimal locations for the construction of HPPs or other RES plants. Such an assessment should be done using a comprehensive methodology that analyses production potential, cost of deployment for individual renewable technologies by region, the existing and planned grid, estimated environmental and social impacts, and resource-sharing across sectors. In assessing hydropower potential, alternative water uses – for irrigation, drinking, tourism, etc. – should be considered, as well as projections of climate change effects. Site selections should be made public and be prioritised to give clear signals to investors.

Georgia's net metering programme for small-scale RES installations (less than 100 kW) is off to a good start. The incentives have begun to attract small business and household investments in rooftop PV, and total capacity had reportedly reached 1.2 MW by September 2019. These distributed generation sources have numerous benefits, including network loss reductions (because the energy is generated close to where it is consumed) and improved energy security (because many small generation sources are less likely to fail simultaneously, compared with one large generation source with a complex delivery system). However, seizing these opportunities may require that changes be made to connection codes, regulations and market rules. It is important that the government keep this in mind as Georgia's power market reform advances.

Regarding medium- and large-scale projects, the PPAs introduced in 2008 offered predictable conditions and a protective framework for investors. They successfully attracted hydropower investment even though the allocation of PPAs and price determination were not transparent. Because of the high fiscal liability created by them, however, they have been abolished. No new RES support schemes had been introduced as of late 2019 to replace PPAs for medium- and large-scale projects, although the MoESD is studying several mechanisms.

Box 9.1 Barriers to RES development in Georgia

In 2019, the US Agency for International Development (USAID) assessed barriers to RES development in Georgia, and the developers and investors surveyed reported the following problems:

- Complex administrative procedures, and a lack of clarity and certainty about some processes.
- Lack of guaranteed offtake at an attractive price or alternate support. The cap of USD 0.06/kWh in the new PPAs for HPPs is considered unattractive by investors.
- Uncertainties about the structure and functioning of the new electricity market, which is a risk.
- Grid connection delays and refusals for small projects; inappropriate connection points for larger ones.
- Opposition of the local population.
- Lack of hydrology data and resource assessments for other RESs.

Source: Data provided at meeting with donors and IFIs, 2 October 2019, Tbilisi.

[31] http://energy.gov.ge/investor.php?id_pages=19&lang=eng

The Energy and Water Supply Law and the Law of Georgia on Promoting the Production and Use of Energy from Renewable Sources were approved by the Georgian government in late 2019 after the review mission took place. The next step would be to put in place the relevant secondary legislation; until then, framework conditions and legal certainty for investors will remain insufficient and investment in RESs will therefore likely continue to stall.

To comply with the EU acquis, Georgia should introduce market-based support schemes for RESs to ensure the smooth integration of renewable-energy generators into the future power market. Even during the transition period – i.e. before the electricity market is fully functional – competitive and transparent mechanisms for RESs can be put in place. Auctions could be a good option, and to limit the risk of collusion, annually adjusted price caps could be introduced.

Although the government adopted a new Energy Strategy in October 2019, the country still lacks a comprehensive document or work process to develop a strategic vision, specific targets, and clear and transparent prioritisation of development projects, especially for RESs. This adds to uncertainty about the future of RESs in Georgia.

The development of targeted strategies needs to be underpinned by good data. The Georgian government should therefore produce and publish comprehensive data on renewables following international standards (e.g. the UN International Recommendations for Energy Statistics), including:

- Resource data for different RESs (e.g. solar and wind atlas).
- Deployment data for individual renewable technologies under specific policy mechanisms.
- Deployment cost data (e.g. in terms of levelised cost of energy).

The whole process – from site selection through gathering basic data for project evaluation and planning, to negotiating terms and conditions with the government – is a complicated and lengthy process. There is a lack of co-ordination within and among the different government agencies, and there is no single point of contact or one-stop shop. The licensing process should therefore be streamlined and co-ordination among government agencies improved through establishment of a one-stop shop. The newly established Public-Private Partnership Agency could assume this role.

The lack of water-use permits and only symbolic water-use fees have created a legal and contractual gap that hinders the resolution of conflicts over water use, both upstream and downstream. Water rights have not yet been a serious issue as most HPPs are run-of-river installations and their sites neither have use of the river upstream nor affect downstream irrigation. However, as more HPPs are added (some with storage capacity), issues and conflicts over water use may well emerge. Also, as Georgia is required to align its regulations with the EU Water Framework Directive, which has some rather strict provisions, the government and policy makers are encouraged to continue working towards integrated river basin management.

Growing opposition to new HPPs by NGOs and local populations stems from the environmental and social impacts of these plants as well as some implementation flaws. In some cases, opposition is caused by a lack of understanding, whereas in others the assessments of environmental and/or social impacts do not correspond to international standards of quality. Clear government commitment to the development of certain

hydropower projects, coherent communication with local communities, and better-quality impact assessments could help facilitate the development of new projects.

An issue that requires urgent attention at the highest policy level is the unsustainable use of biomass. Illegal biomass use has devastated Georgia's forests, especially around towns and villages and in the vicinity of forest roads. The disappearance of biomass resources results in biodiversity loss, landslides and land erosion, flash floods and greater energy poverty.

The government should therefore enhance efforts to ensure the replacement of unsustainable biomass use by more viable alternative solutions, keeping in mind that the transition to more modern fuels can be financially challenging for households. First, the ongoing forestry reform should be accelerated to implement robust forest resource management. Second, the use of waste and residue resources should be supported, for example by developing logistical solutions and targeted support mechanisms for small businesses. Third, more efficient stoves should be introduced along with other energy efficiency measures to reduce consumption.

As climate change is making it more challenging to generate renewable energy from water and biomass, its impact on hydropower production should be assessed and Georgia's reliance on hydropower could be reduced through the development of other RESs. Hydropower development should be incorporated into the wider context of water resource management and climate change adaptation.

Recommendations

The Government of Georgia should:

- Ensure that the NREAP and the overall national Energy Strategy have a strategic vision for RES development, including production targets for hydropower and other RES technologies, and that a transparent methodology is used to prioritise RES projects on the basis of this strategic vision.
- Establish a monitoring and reporting system to produce and publish comprehensive data on renewable resources, the deployment of RES technologies under specific policy mechanisms and the cost of deployment.
- Create competitive and transparent mechanisms, such as auctions, to attract investment for RES projects, and consider setting price caps as part of an auction mechanism.
- Clarify and streamline the authorisation and licensing process for new RES plants, for example by establishing a single point of contact.
- Define a transparent communication strategy for contentious RES projects and support project developers with awareness-raising campaigns and stakeholder involvement.
- Develop and apply a methodology for comprehensive resource assessment and identification of RES potential to select the best locations for RES plants, taking environmental and social impacts into account.
- Enhance efforts to stop the unsustainable use of forest wood. As part of this effort:

- Develop and approve state programmes to support efficient residential stoves, solar water heaters, the utilisation of forestry and agriculture residues, and other RES solutions for thermal energy generation in remote rural areas.
- Enhance co-ordination among relevant sectoral government institutions and local authorities.
- Assess biomass potential and technological solutions for its sustainable use.

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10. Energy research, development and demonstration (RD&D)

Key data

(2017)

RD&D share of gross domestic expenditures: 0.29% of GDP

RD&D per capita: USD 0.24 (2005 PPP), world average USD 2.19 (2005 PPP) (2016)

Government energy RD&D spending: GEL 1.39 million (USD 479 335) (2012-16)[32]

Overview

Implementation of Georgia's energy policy and its Nationally Determined Contribution (NDC) under the United Nations Framework Convention on Climate Change (UNFCCC) will require the deployment of new energy technologies and a commitment to continual improvements. While Georgia's research, development and demonstration (RD&D) system has historically not been a major source of new and improved energy technologies, there is an opportunity for it to make up a greater portion of the technology value chain.

Georgian RD&D in general is linked to its Socio-Economic Development Strategy to 2020, but as the country's science system has over 80 non-prioritised research directions, there are no special energy-related RD&D provisions in the Development Strategy or in any strategic document related to science and innovation. However, recent reforms have increased support for RD&D in general, the key institutions providing funding being the Shota Rustaveli National Science Foundation (SRNSF), which supports projects at the initial stages of development, and Georgia's Innovation and Technology Agency (GITA), which finances globally scalable start-up projects

Legal and institutional basis

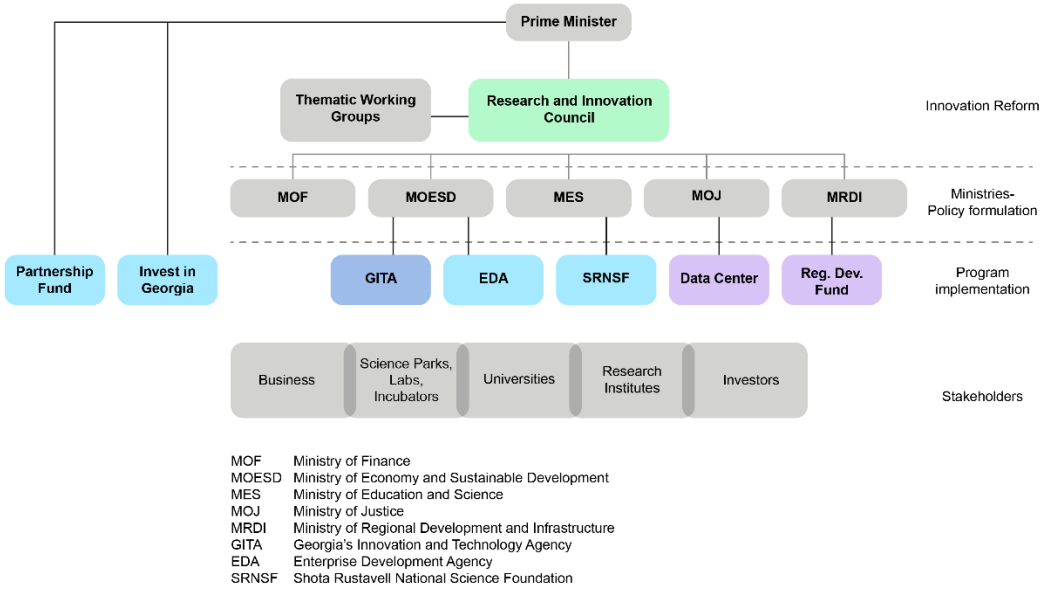
Management of the Georgian science, technology and innovation (STI) system is regulated by several laws:

[32] These numbers, gathered manually by World Experience for Georgia through comprehensive consultations with key stakeholders, represent financing allocated to energy-related projects through the Rustaveli Foundation and GITA. They do not necessarily reflect all public financing of energy RD&D because there is no single source of reliable data. They are not directly comparable with official data on **total** RD&D spending, which include expenditures not only for the costs of specific RD&D projects but also for the salaries of permanent staff of universities and research centres (including administrative staff), some other fixed costs, etc.

- the Law on Science, Technology and Their Development (1994)
- the Law on Grants (1996)
- the Law on Higher Education (2004)
- the Law on Education Quality Improvement (2010)
- the Law on Innovations (2016).

No specific institution has been designed to support energy RD&D, so energy-related research and innovation (R&I) projects are implemented within the general RD&D framework (Figure 10.1). The highest policy making level for the RD&D sector is composed of the Research and Innovation Council (RIC), the Office of the Prime Minister and the Parliamentary Committee on Education, Science and Culture.

Figure 10.1 Georgia's research, development and innovation system



Source: GITA and MES, *Innovation Ecosystem in Georgia*, quoted in MoESD (Ministry of Economy and Sustainable Development) (2019a), "Response to the IEA Energy Policy Questionnaire".

The Research and Innovation Council (RIC) was created in 2015 to serve as the top-level co-ordination body for RD&D. Until recently, however, it has been focusing on practical issues ad hoc rather than on developing a strategic vision for RD&D.

The Ministry of Education, Science, Culture and Sport (MES) is the main executive body responsible for establishing an educational and scientific environment and for supporting RD&D in the country.

The Shota Rustaveli National Science Foundation (SRNSF) was established in June 2010 to ensure the responsible use of funding dedicated to the sciences. All SRNSF programmes are implemented through calls for project proposals on a competitive basis. The SRNSF funds projects in ten categories, with energy RD&D falling under the engineering and high-technology-materials category. Within this category, no further prioritisation is done and each project seeking SRNSF financing is ranked/evaluated based on its quality and development potential. The SRNSF also supports the integration of Georgian researchers into international scientific networks and joint projects.

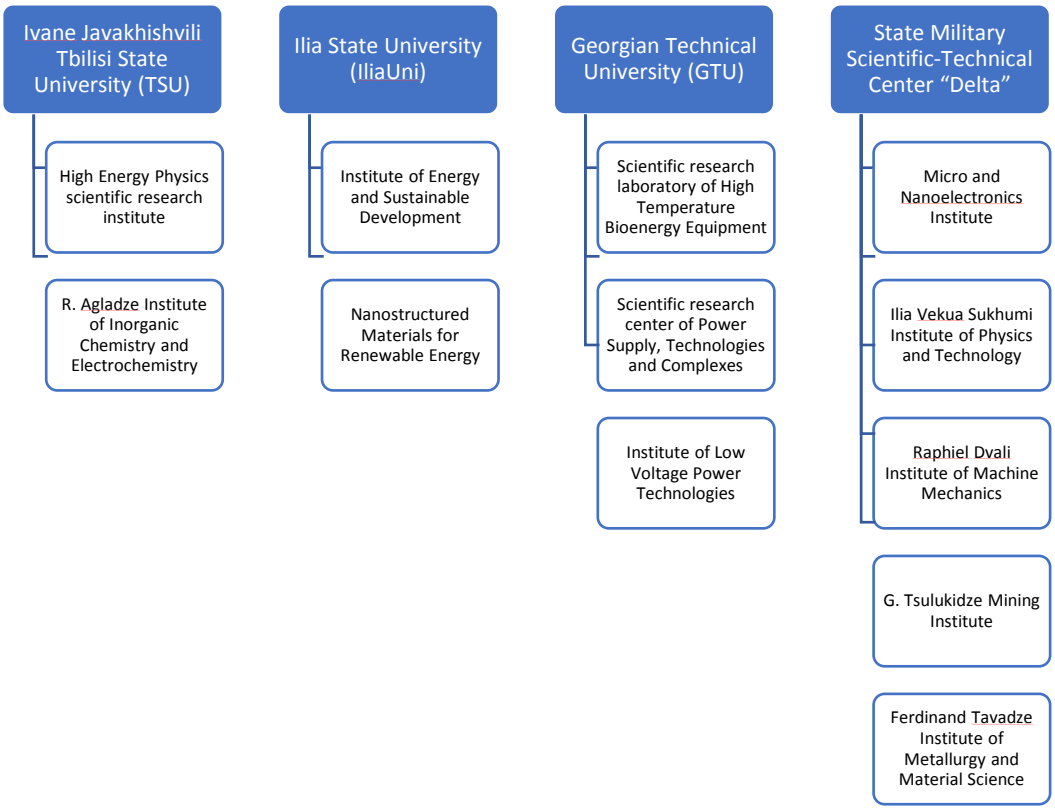
Georgia's Innovation and Technology Agency (GITA) is the main co-ordinator and mediator for establishing a national innovation system. GITA's objectives include creating a system and co-ordinating its development; stimulating innovation in modern technologies and R&D; facilitating commercialisation and the use of R&D; supporting innovative start-ups; and facilitating co-operation among scientists and businesses. GITA evaluates innovative projects based on their local or international market potential.

GITA is providing the pre-seed and seed stage financing for start-ups, covering the risks and enhancing their skills for further investment opportunities. Innovation Financing component supports the provision of the Grants, selection of eligible entrepreneurs for providing of Matching Grants (100 000 GEL) and Innovative Matching Grants (650 000 GEL). The Start-up Grant programs is designed to support early stage innovation as well as stimulate the evolution of an entrepreneurial mind-set among the Georgian community by providing incentives for enterprises to innovate and transfer technologies into the market.

GITA offers three types (prototype, travel, events) of Mini Grants for start-ups (from 5000 GEL to 15 000 GEL).

Research institutions working on energy RD&D include Ivane Javakhishvili Tbilisi State University (TSU), Ilia State University (IliaUni), the Georgian Technical University (GTU) and the State Military Scientific-Technical Center "Delta" (Figure 10.2).

Figure 10.2 Key Georgian research institutions working on energy RD&D, 2017



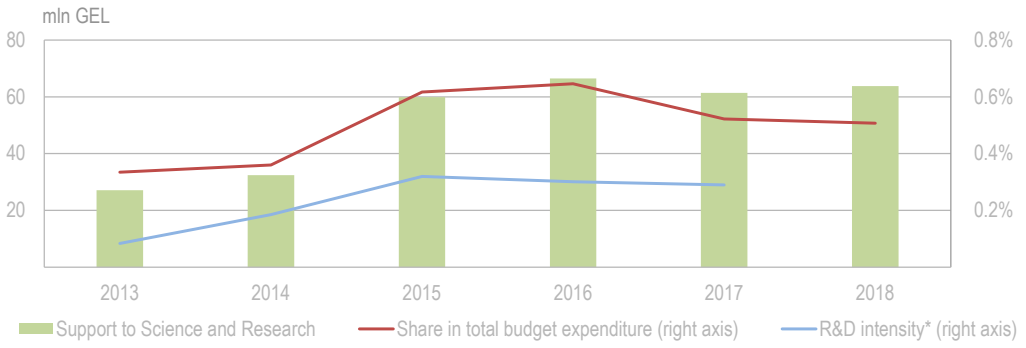
Source: Margvelashvili and Shatirishvili (2017), "Energy research, development, demonstration & deployment in Georgia".

Co-operation among business sector representatives (large industries as well as small and medium-sized enterprises) and research universities, their scientific-research institutes and independent research centres is still limited. One of GITA's objectives is to enlarge such co-operation.

Funding

Government spending on all RD&D increased significantly between 2013 and 2016, rising from 0.33% to 0.65% of total expenditures (Figure 10.3). Georgia's RD&D intensity – the ratio of government RD&D spending to gross domestic product (GDP) – increased from 0.08% in 2013 to 0.32% in 2015, but it is still behind the RD&D intensity of EU countries (2.03% on average). Furthermore, both the country's financing of RD&D and its RD&D intensity fell after 2016.

Figure 10.3 Georgia's government spending on RD&D



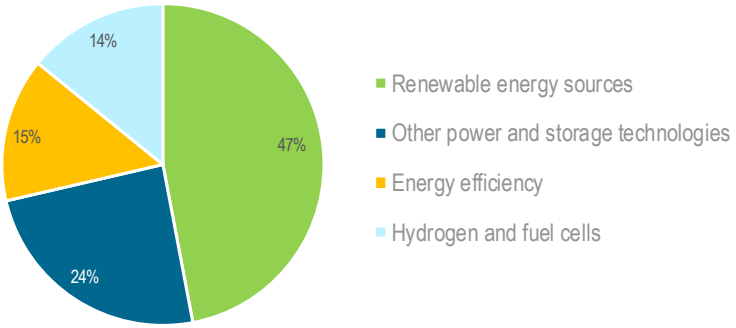
* Based on World Bank data.

Source: Adapted from MoESD (2019a), "Response to the IEA Energy Policy Questionnaire".

During 2012-16, Georgia spent GEL 1.39 million on energy-related research, development and innovation.[33] Almost 50% of the funding was used for RD&D of renewable energy sources (Figure 10.4).

[33] See Footnote 32.

Figure 10.4 Breakdown of Georgia's energy-related RD&D expenditures, 2012-16



Note: These numbers, gathered manually by World Experience for Georgia through comprehensive consultations with key stakeholders, represent financing allocated to energy-related projects through the SRNSF and GITA. They do not necessarily reflect all public financing of energy RD&D because there is no single source of reliable data.
Source: Based on data provided by World Experience for Georgia (WEG).

Public funding for RD&D in Georgia comes from several sources, and priority-setting and decision making on funding is decentralised. Project-based funding comes from the SRNSF, GITA and Enterprise Georgia, and funding for research institutes comes from MES and the Ministry of Economy and Sustainable Development (MoESD).

MES allocates funding to the universities, which then decide how to redistribute the money to the research units/institutes. The SRNSF also provides resources for maintaining and upgrading research facilities and infrastructure. In practice, there is no baseline funding for research in Georgia since MES and MoESD allocations are mostly used to cover researchers' salaries (even though salaries in research and science are well below the country's average wage, especially for beginner researchers).

Furthermore, the outcomes of government expenditures on RD&D are not monitored or evaluated on either the aggregated or disaggregated level. Each entity providing funding for RD&D develops its own monitoring system focused on the projects it supports (some entities have not yet established such systems but are in the process of developing them).

It is difficult to evaluate private sector spending on energy RD&D because reliable data and statistics are lacking. Experts estimate that funding from local industry is quite small, and while there is some international funding, it is attracted in an ad-hoc manner. The data are too scattered to present a complete picture of total funding for energy RD&D.

Some public funding is channelled to innovative ideas through special programmes:

- The Matching Grants (MGs) Program (100 000 GEL) is a part of the Georgian National Innovation Ecosystem (GENIE) Project, implemented by the Georgian Innovation and Technology Agency (GITA). The main objective of the Project is to increase innovative activities of firms and individuals in Georgia and their participation in the digital economy.

- Innovation Matching Grants Program (650 000 GEL) a new mechanism for financing innovative projects. In 2019 through the World Bank support program was announced

new Innovation Matching Grants Program. This Grant is a dollar to dollar co-investment in private equity financing (at least 51% privately owned) that further facilitates access to finance in the formation of globally scalable start-ups and aims to stimulate innovation and creation of innovative enterprises in the Georgian economy. The program will promote product, technological or business process innovation by Georgian MSMEs with a preference to innovation that introduces innovation on a global scale with a clear Georgian nexus and operations headquartered in Georgia.

- Produce in Georgia is a government programme to develop entrepreneurship by establishing new enterprises and advancing existing ones. Although the programme does not focus directly on R&I support, it provides access to financing for enterprises based (and producing) in Georgia. The programme is suitable for Georgian businesses developing or commercialising innovative energy technologies.

International collaboration

Georgia's MES signed an association agreement with the European Union's R&I framework programme Horizon 2020 (now Horizon Europe) in April 2016. Becoming an Associated Country means Georgian research organisations can participate in Horizon Europe's calls for projects with the same rights as organisations from EU member states. However, due to Georgia's lack of experience, the high level of competition, a lack of qualified research institutions and other country-specific reasons, the participation rate of Georgian organisations is quite low. As a Near Neighbour Country (NNC), Georgia is also eligible to participate in the European Cooperation in Science and Technology (COST) programme.

The SRNSF co-operates with Elsevier, which provides access to the electronic journals and data of 21 independent public research institutes and research universities, and the SRNSF pays Georgia's annual membership fees for the European Organization for Nuclear Research (CERN) and the Dubna Joint Institute for Nuclear Research. Georgia is also eligible to apply for the North Atlantic Treaty Organization (NATO) Science for Peace and Security programme.

Assessment

Implementation of Georgia's energy policy and its NDC under the UNFCCC will require the deployment of new energy technologies and a commitment to continual improvements. While Georgia's RD&D system has historically not been a major source of new and improved energy technologies, there is an opportunity for it to make up a greater portion of the technology value chain. Alternatively, the country could strategically choose to import and licence the necessary equipment from other countries and their companies.

If the Georgian government chooses to continue supporting energy technology innovation, it is important that it determine the primary objective of public support: to support economic competitiveness and exports; to improve skills and knowledge in the labour force; to correct the undersupply of private RD&D due to free-rider problems; or to direct the trajectory of technological change towards societal missions in the absence of private sector incentives.

In general, successful innovation systems perform four key functions (Box 10.1) that can all be supported by targeted policies. Georgia's energy RD&D policy focuses mainly on "resource push" (i.e. funding to universities and start-ups) and "knowledge management" (connecting with international research communities). The country could therefore benefit from a more comprehensive approach to support energy technology innovation by developing the "market pull" and "socio-political support" functions.

Box 10.1 A comprehensive approach to energy technology innovation, based on the four core functions

Resource push

- Technological innovation requires a sustained flow of RD&D funding. Given the high risks of early-stage technology development, governments must strategically invest resources based on national priorities and financing gaps. Tracking public and corporate funding for RD&D activities can help identify funding priorities.
- Successful RD&D projects are driven by a skilled workforce (e.g. researchers, engineers). A variety of indicators may inform policy making, such as the number and quality of research and academic institutions as well as of graduates and RD&D support staff, and the number of expert researchers.
- To guide research in technological innovation, decision makers must identify gaps and priorities, and possibly develop a national energy RD&D strategy or roadmaps for individual technology areas.

Knowledge management

- New products and processes usually combine novel and existing ideas generated by researchers and codified by knowledge-management institutions to make them accessible and attributable. This process may be tracked through publication and patenting statistics.
- An innovation's effectiveness depends on strong networks for knowledge exchange among research teams, academics, industry participants, policy makers and international partners. A high level of co-ordination and collaboration encourages knowledge spill-overs from a range of relevant fields.
- Market pull
- To help new products enter the market, policy makers need to align incentives throughout the innovation value chain and provide market signals indicating that the new technology can be profitable if successful, thereby fostering a stimulating innovation environment. Policy instruments may include tax, public procurement or financial incentives that complement capital grants (i.e. resource push) to enable demonstration projects.
- Among the most powerful tools policy makers can use to stimulate innovation are performance-based market instruments that enhance the attributes of the new technology (e.g. carbon pricing, public procurement rules or standards). These mechanisms are often introduced or strengthened according to a clear timetable, providing innovators with realistic lead times.

Socio-political support

- In many cases, successful innovation depends on citizen support, or at least no effective opposition. Just as the enthusiasm or approval of consumers can boost the uptake of end-use technologies, the actions of vocal opponents can derail a new technology at the final stage of market introduction. Using inclusive processes (i.e. that seek feedback from citizens and advocacy groups) to ensure robust governance and promote transparency can help identify concerns at an early stage and make it more likely that later phases will proceed smoothly.

- Policy makers need to make themselves aware of industry stakeholders' views (e.g. by consulting industry associations) to help ensure that private sector efforts can be aligned with national policy goals. Technologies that have strong political advocates will be more likely to succeed in the later stages of the innovation process, all other factors being equal.

- Multilateral co-operation through international forums is an increasingly important part of strategies to accelerate energy innovation, as high-level international political commitments provide legitimacy to national efforts (as illustrated by Mission Innovation).

Source: IEA (2019), Clean energy transitions: Accelerating innovation beyond 2020.

The doubling of Georgian RD&D (from 0.32% of GDP in 2013 to 0.62% of GDP in 2015) and the Georgian Innovation Strategy 2020 (introduced in 2016) have positively affected the country's innovation climate. The country's overall performance and ranking in the Global Innovation Index (GII) rose from 59 in 2018 to 48 in 2019, a commendable development, particularly in comparison with other countries in the region as well as with other Energy Community members.

The Georgian RD&D system would be more effective if the current Innovation Strategy were updated with a limited set of priorities within thematic areas. The currently long list of RD&D directions means no prioritisation at all in practice, which can be counterproductive.

Priorities for energy-related RD&D should be co-ordinated with the country's energy and climate strategies. It is particularly important to develop a technology strategy to achieve the energy and climate objectives of Georgia's NDC and other strategic documents. To this end, it must be determined which technologies are needed to meet these commitments, which parts of the technology value chain could be developed and produced in Georgia, and which parts it would be best to import. The government will also need to decide whether imported parts will have to be adapted to local conditions.

Recommendations developed by the Horizon 2020 Policy Support Facility (PSF) (Box 10.2) provide a good basis for reforming the Georgian RD&D system in general. One of its suggestions is to revise the role of the National Research Council (NRC), which currently does not fully address the country's need for stronger co-ordination and improved R&I governance. If the NRC's role and functions were strengthened, it could lead development of the energy technology strategy discussed above. More generally, Georgia needs a truly functional body responsible for defining clear RD&D priorities as well as updating the national innovation strategy, collecting data and publishing a yearly report on RD&D activities, including on the use of public funds.

There is also a lack of connection between industry and local academic and research institutions. Most research-oriented projects are funded by international donors and involve international consultants, while SRNSF funding is allocated to academic

disciplines rather than being used to solve the energy industry's cross-cutting intersectoral problems. This leaves the local academic institutions without close working relations with the industry sector, which affects the quality of both research and education. A good academia-industry working relationship therefore needs to be established to raise Georgia's RD&D capacity.

The competitiveness of enterprises – and therefore of the country they are based in – relies heavily on RD&D. In addition to steps already taken (incubators and start-up programmes), the Georgian government should strengthen the link between publicly funded and privately funded RD&D through regular roundtables, business programmes and specific incubators. This would also forge a connection between researchers and the business community.

Georgia would also benefit from enhanced international collaboration in the energy innovation field. A good example of international collaboration is the twinning project implemented by an Austrian-French-Greek consortium to help Georgia's energy regulator improve energy supply quality and roll out smart meters. The government could also encourage energy companies active in Georgia to get involved in international pilot projects (e.g. smart grid test beds or pilot projects for smart consumer equipment) with the involvement of the regulator to test new rules.

Box 10.2 Horizon 2020 Policy Support Facility recommendations for Georgia

In 2017-18, the Horizon 2020 PSF implemented the Specific Support to Georgia project, carried out by a panel of independent European R&I policy experts to provide advice and recommendations to the Georgian government on R&I reforms.

The panel highlighted several problems in the area of R&I, including fragmentation, excessive red tape, a lack of funding, a feeble equipment base and weak research-business links.

PSF expert policy recommendations focus on strengthening four central issues (the 4Cs):

Co-ordination

- Improve political governance of the R&I system; revise RIC's role.
- Create co-ordination mechanisms for scientific priority-setting and implement focused reforms.
- Stabilise financing for public R&I performers; set up funding mechanisms based on evaluation, and increasingly reward performance to encourage scientists and innovators to take risks and develop marketable ideas.
- Remove unnecessary legal and administrative burdens.

Concentration

- Embed R&I policy in the country's overall economic (regional) policy.
- Consolidate the fragmented research system and finalise reform of the Georgian National Academy of Sciences (GNAS).

- Concentrate R&I resources – i.e. research teams and infrastructure, as well as priorities.

Collaboration

- Create communication and co-ordination platforms to engage all relevant stakeholders.
- Set up a portfolio of financial instruments to promote R&I collaboration.
- Provide a better physical research infrastructure.

Coherence

- Guarantee the coherence of governance (authority) structures by defining roles at the strategic, operational and performance levels.
- Introduce a coherent baseline funding mechanism, making it available to all public university research labs, institutes and centres.
- Promote consistency in R&I support measures by avoiding fragmentation and duplication, ensuring complementarity, and co-ordinating support and funding measures among key participants.
- Forge stronger links between economic and strategic R&I priorities.

Source: EC (2018), *Specific Support to Georgia: Improving the Effectiveness of Georgia's Research and Innovation System through Prioritisation, Selectivity of Funding and Science-Business Links.*

Recommendations

The Government of Georgia should:

- ☐ Continue to foster a positive, innovation-friendly entrepreneurial environment and implement the Horizon 2020 PSF recommendations to improve Georgia's overall R&I system.
- ☐ Define specific energy R&I priorities and funding mechanisms:
  - > Develop a technology strategy to meet the country's energy and climate objectives, including NDC commitments.
  - > Update the current Innovation Strategy, setting clear priorities within thematic areas; ensure that energy RD&D priorities are linked with those of the national energy and climate policies.
  - > Integrate priority-setting, co-ordination of public and private researchers, and monitoring and evaluation into the funding process.
- ☐ Strengthen the connections among industry, academia and policy making, and between publicly funded and privately funded RD&D:
  - > Create working groups, regular roundtables, business programmes or specific incubators.

- Support energy education programmes in national universities.
- Develop a process and special funding schemes to address industry problems through co-operation with local research and educational institutions.
- Recommend that the SRNSF direct funding to solve the energy industry's cross-sectoral interdisciplinary problems, such as the development of methodologies for resource assessment, demand and generation forecasting, climate research and efficiency improvements.

☐ Improve and expand international collaboration:

- Encourage the involvement of Georgian institutions in Horizon Europe projects by strengthening the National Contact Points system and addressing other barriers Georgian entities faced in participating in Horizon 2020.
- Encourage energy companies active in Georgia to get involved in international pilot projects.
- Support young professionals and researchers pursuing additional education or gaining experience through internships abroad.
- Invest in more twinning programmes with other countries.
- Exchange best practices in energy R&I policy making with other relevant countries.

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Review criteria

The Shared Goals, which were adopted by the IEA Ministers at their 4 June 1993 meeting in Paris, provide the evaluation criteria for the in-depth reviews (IDRs) conducted by the IEA. The Shared Goals are presented in Annex C.

Review team and preparation of the report

The IEA in-depth review team visited Tbilisi 1-4 October 2019. The team met with government officials, energy suppliers, interest groups and various other organisations.

This report was drafted on the basis of these meetings, the team's preliminary assessment of the country's energy policy, the government's response to the IEA energy policy questionnaire and other information. The members of the team were:

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- Barbara POSCH, Councillor, Federal Ministry for Sustainability and Tourism, Directorate General for Energy and Mining, AUSTRIA

EU4Energy countries

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- Sardorjon JURAEV, Head of the Industrial Statistics Department, State Statistics Committee, UZBEKISTAN
- Farukh KHASANOV, Leading Specialist, Directorate for Development of Generation from RES, Ministry of Energy, UZBEKISTAN
- Bahodir TURAEV, Deputy Head of the Department of Strategy Development for Structural Transformation, Ministry of Economy and Industry, UZBEKISTAN
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IEA for EU4Energy programme

- Anna PETRUS, Programme Co-ordinator
- Talya VATMAN, Policy Programme Manager
- Markus FAGER-PINTILÄ, Statistics Programme Manager
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- Murman MARGVELASHVILI, Country Expert for Georgia
- Borys DODONOV, Country Expert for Ukraine
- Tolib SULTANOV, Country Expert for Uzbekistan
- Jacinta BYRNE-DEQUEANT, Administrative Co-ordinator

The review was co-ordinated by Anna Petrus with the assistance of Elena Merle-Beral who supported the review process as a consultant. Elena Merle-Beral drafted most of the report, relying on input from all team members. Markus Fager-Pintilä prepared the graphs and drafted the sections related to statistics.

This review was possible thanks to the co-operation and assistance of many people. The team expresses its gratitude to David Tvalabeishvili, Deputy Minister of Economy and Sustainable Development of Georgia, and his staff (particularly Margalita Arabidze, Deputy Head of the Energy Policy Department) for co-ordinating the response to the IEA energy policy questionnaire and for supporting the team visit. The team also expresses its sincere thanks to Murman Margvelashvili, Country Expert for Georgia for the IEA for EU4Energy programme, for his immense personal dedication to make this review possible, and for his ability to respond to the team's many requests in a very quick and effective manner. The review team is also grateful to Natalia Shatirishvili and Giorgi Mukhigulishvili, Lead Reserchers at World Experience for Georgia (WEG), for their contribution. Special thanks also go to Thea Khitarishvili, former Senior Programme Manager of the IEA for EU4Energy programme, for her inspiration, guidance and support.

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Organisations interviewed

Biodiesel Georgia
Blake Energy
CEEf Ge - Energy Efficiency Centre of Georgia (NGO)

CENN - Caucasus Environmental NGO Network

EBRD - European Bank for Reconstruction and Development

Energo-Pro

Engurhesi LLC

ESCO - Electricity System Commercial Operator (balancing market operator),

EU4Energy programme - Energy Community Secretariat

EU delegation

GNERC - Georgian National Energy and Water Supply Regulatory Commission

GSE - Georgian State Electrosystem

GEDF – Georgian Energy Development Fund

Georgian Large Dam Association

Georgian Technical University

GEOSTAT - National Statistics Office of Georgia

GIEC - Georgian International Energy Corporation

GITA – Georgia's Innovation and Technology Agency

GREDA - Georgian Renewable Energy Association

Green Alternative

Greens Movement

GRPC - Georgian Renewable Power Company

GOGC - Georgian Oil and Gas Corporation

Hydrolea LLC

International Centre for Environmental Research

KGenergy

MEPA – Ministry of Environmental Protection and Agriculture

MoF - Ministry of Finance

MoESD – Ministry of Economy and Sustainable Development

Namakhvani

Oil and Gas Agency

Public-Private Partnership Agency

SDAP

SRNSF- Shota Rustaveli National Science Foundation

Telasi

USAID - US Agency for International Development

World Bank

World Experience for Georgia (WEG)

ANNEX B: Energy balances and key statistical data

Georgia

Energy balances and key statistical data

Unit: Mtoe

SUPPLY	1990	2000	2010	2015	2016	2017	2018
TOTAL PRODUCTION	**2.02**	**1.32**	**1.31**	**1.32**	**1.38**	**1.33**	**1.25**
Coal	0.66	0.00	0.04	0.12	0.12	0.11	0.06
Peat	-	-	-	-	-	-	-
Oil	0.19	0.11	0.05	0.04	0.04	0.03	0.03
Natural gas	0.05	0.06	0.01	0.01	0.01	0.01	0.01
Biofuels and waste[1]	0.47	0.65	0.36	0.40	0.39	0.36	0.27
Nuclear	-	-	-	-	-	-	-
Hydro	0.65	0.50	0.81	0.73	0.80	0.79	0.86
Wind	-	-	-	-	0.00	0.01	0.01
Geothermal	-	0.01	0.05	0.02	0.02	0.02	0.02
Solar/other[2]	-	-	-	0.00	0.00	0.00	0.00
TOTAL NET IMPORTS[3]	**10.37**	**1.54**	**1.81**	**3.33**	**3.42**	**3.46**	**3.62**
Coal Exports	0.23	0.00	-	0.00	0.00	0.01	0.00
Imports	0.48	0.01	0.00	0.15	0.17	0.19	0.27
Net imports	0.25	0.01	0.00	0.15	0.16	0.18	0.27
Oil Exports	0.98	0.08	0.06	0.26	0.14	0.26	0.11
Imports	6.51	0.71	1.00	1.50	1.58	1.62	1.48
Int'l marine and aviation bunkers	-0.20	-0.02	-0.04	-0.07	-0.07	-0.10	-0.11
Net imports	5.32	0.62	0.90	1.17	1.37	1.26	1.27
Natural Gas Exports	-	-	-	0.08	-	-	-
Imports	4.50	0.90	1.01	2.09	1.89	1.95	2.00
Net imports	4.50	0.90	1.01	2.01	1.89	1.95	2.00
Electricity Exports	0.11	0.02	0.13	0.06	0.12	0.08	0.05
Imports	0.39	0.04	0.02	0.06	0.11	0.15	0.13
Net imports	0.28	0.02	-0.11	0.00	-0.01	0.07	0.08
TOTAL STOCK CHANGES	**0.03**	**0.00**	**0.00**	**-0.02**	**-0.00**	**0.02**	**-0.05**
TOTAL SUPPLY (TPES)[4]	**12.42**	**2.87**	**3.12**	**4.63**	**4.79**	**4.81**	**4.82**
Coal	0.89	0.01	0.05	0.27	0.26	0.29	0.30
Peat	-	-	-	-	-	-	-
Oil	5.58	0.73	0.96	1.20	1.44	1.30	1.27
Natural gas	4.55	0.95	1.02	2.02	1.89	1.96	2.01
Biofuels and waste[1]	0.46	0.65	0.36	0.40	0.39	0.36	0.27
Nuclear	-	-	-	-	-	-	-
Hydro	0.65	0.50	0.81	0.73	0.80	0.79	0.86
Wind	-	-	-	-	0.00	0.01	0.01
Geothermal	-	0.01	0.05	0.02	0.02	0.02	0.02
Solar/other[2]	-	-	-	0.00	0.00	0.00	0.00
Electricity trade[5]	0.28	0.02	-0.11	0.00	-0.01	0.07	0.08
Shares in TPES (%)							
Coal	*7.2*	*0.5*	*1.6*	*5.9*	*5.5*	*6.1*	*6.3*
Peat	-	-	-	-	-	-	-
Oil	*45.0*	*25.3*	*30.6*	*25.8*	*30.0*	*27.1*	*26.4*
Natural gas	*36.7*	*33.2*	*32.5*	*43.5*	*39.5*	*40.8*	*41.7*
Biofuels and waste[1]	*3.7*	*22.5*	*11.5*	*8.6*	*8.1*	*7.6*	*5.6*
Nuclear	-	-	-	-	-	-	-
Hydro	*5.2*	*17.6*	*25.8*	*15.7*	*16.7*	*16.5*	*17.7*
Wind	-	-	-	-	*0.0*	*0.2*	*0.2*
Geothermal	-	*0.2*	*1.5*	*0.3*	*0.4*	*0.4*	*0.4*
Solar/other[2]	-	-	-	*0.1*	*0.1*	*0.1*	*0.1*
Electricity trade[5]	*2.2*	*0.7*	*-3.5*	*0.1*	*-0.1*	*1.5*	*1.6*

0 is negligible, - is nil, .. is not available. Please note: rounding may cause totals to differ from the sum of the elements.

Unit: Mtoe

DEMAND							
FINAL CONSUMPTION	**1990**	**2000**	**2010**	**2015**	**2016**	**2017**	**2018**
TFC	**8.98**	**2.30**	**2.66**	**4.10**	**4.33**	**4.37**	**4.39**
Coal	0.65	0.01	0.02	0.27	0.25	0.28	0.29
Peat	-	-	-	-	-	-	-
Oil	2.88	0.63	0.96	1.20	1.44	1.30	1.27
Natural gas	2.59	0.46	0.61	1.36	1.34	1.44	1.51
Biofuels and waste[1]	0.46	0.65	0.36	0.40	0.39	0.36	0.27
Geothermal	-	0.01	0.05	0.01	0.02	0.02	0.02
Solar/other[2]	-	-	-	0.00	0.00	0.00	0.00
Electricity	1.16	0.54	0.63	0.85	0.90	0.96	1.03
Heat	1.23	-	0.04	-	-	-	-
Shares in TFC (%)							
Coal	*7.2*	*0.3*	*0.9*	*6.6*	*5.8*	*6.3*	*6.7*
Peat	*-*	*-*	*-*	*-*	*-*	*-*	*-*
Oil	*32.1*	*27.6*	*36.0*	*29.2*	*33.1*	*29.8*	*28.9*
Natural gas	*28.9*	*20.2*	*22.8*	*33.3*	*30.9*	*33.0*	*34.4*
Biofuels and waste[1]	*5.1*	*28.1*	*13.5*	*9.7*	*8.9*	*8.3*	*6.2*
Geothermal	*-*	*0.3*	*1.7*	*0.3*	*0.4*	*0.4*	*0.4*
Solar/other[2]	*-*	*-*	*-*	*0.1*	*0.1*	*0.1*	*0.1*
Electricity	*13.0*	*23.5*	*23.5*	*20.8*	*20.8*	*22.1*	*23.4*
Heat	*13.7*	*-*	*1.6*	*-*	*-*	*-*	*-*
TOTAL INDUSTRY[6]	**4.31**	**0.39**	**0.58**	**1.02**	**0.98**	**1.08**	**1.13**
Coal	0.58	-	0.01	0.27	0.25	0.27	0.29
Peat	-	-	-	-	-	-	-
Oil	0.98	0.08	0.10	0.19	0.20	0.20	0.22
Natural gas	1.31	0.20	0.27	0.32	0.28	0.32	0.33
Biofuels and waste[1]	-	0.04	-	0.00	0.00	0.00	0.00
Geothermal	-	-	-	-	-	-	-
Solar/other[2]	-	-	-	-	-	-	-
Electricity	0.65	0.08	0.18	0.24	0.25	0.28	0.28
Heat	0.79	-	0.02	-	-	-	-
Shares in total industry (%)							
Coal	*13.5*	*-*	*2.0*	*26.3*	*25.3*	*25.4*	*26.0*
Peat	*-*	*-*	*-*	*-*	*-*	*-*	*-*
Oil	*22.7*	*20.6*	*17.1*	*18.9*	*20.5*	*18.7*	*19.1*
Natural gas	*30.5*	*50.5*	*45.8*	*31.6*	*28.7*	*29.7*	*29.4*
Biofuels and waste[1]	*-*	*9.2*	*-*	*0.1*	*0.2*	*0.1*	*0.2*
Geothermal	*-*	*-*	*-*	*-*	*-*	*-*	*-*
Solar/other[2]	*-*	*-*	*-*	*-*	*-*	*-*	*-*
Electricity	*15.1*	*19.7*	*31.6*	*23.1*	*25.4*	*26.2*	*25.2*
Heat	*18.2*	*-*	*3.5*	*-*	*-*	*-*	*-*
TRANSPORT[4]	**1.34**	**0.36**	**0.80**	**1.29**	**1.45**	**1.30**	**1.35**
OTHER[7]	**3.32**	**1.55**	**1.28**	**1.79**	**1.90**	**1.99**	**1.92**
Coal	0.05	0.01	0.01	0.00	0.00	0.00	0.00
Peat	-	-	-	-	-	-	-
Oil	0.70	0.23	0.12	0.04	0.04	0.04	0.03
Natural gas	1.25	0.27	0.32	0.74	0.83	0.91	0.89
Biofuels and waste[1]	0.46	0.61	0.36	0.40	0.38	0.36	0.27
Geothermal	-	0.01	0.05	0.01	0.02	0.02	0.02
Solar/other[2]	-	-	-	0.00	0.00	0.00	0.00
Electricity	0.42	0.42	0.40	0.59	0.63	0.65	0.71
Heat	0.44	-	0.02	-	-	-	-
Shares in other (%)							
Coal	*1.6*	*0.5*	*1.0*	*0.1*	*0.1*	*0.1*	*0.0*
Peat	*-*	*-*	*-*	*-*	*-*	*-*	*-*
Oil	*21.2*	*15.1*	*9.4*	*2.4*	*2.3*	*1.9*	*1.7*
Natural gas	*37.5*	*17.2*	*25.4*	*41.2*	*43.5*	*46.0*	*46.3*
Biofuels and waste[1]	*13.8*	*39.4*	*28.1*	*22.3*	*20.2*	*18.2*	*14.0*
Geothermal	*-*	*0.4*	*3.6*	*0.8*	*0.8*	*0.8*	*0.8*
Solar/other[2]	*-*	*-*	*-*	*0.1*	*0.2*	*0.2*	*0.2*
Electricity	*12.6*	*27.4*	*31.0*	*33.0*	*32.9*	*32.8*	*37.0*
Heat	*13.4*	*-*	*1.7*	*-*	*-*	*-*	*-*

Unit: Mtoe

DEMAND							
ENERGY TRANSFORMATION AND LOSSES	**1990**	**2000**	**2010**	**2015**	**2016**	**2017**	**2018**
ELECTRICITY GENERATION[8]							
Input (Mtoe)	4.84	1.16	1.09	1.27	1.25	1.25	1.28
Output (Mtoe)	1.18	0.64	0.87	0.93	1.00	0.99	1.04
Output (TWh)	13.72	7.42	10.12	10.83	11.57	11.53	12.15
Output Shares (%)							
Coal	-	-	-	-	*0.1*	*0.2*	*0.1*
Peat	-	-	-	-	-	-	-
Oil	*29.2*	*3.7*	*0.3*	-	-	-	-
Natural gas	*15.6*	*17.4*	*7.2*	*22.0*	*19.2*	*19.2*	*17.3*
Biofuels and waste[1]	-	-	-	-	-	-	-
Nuclear	-	-	-	-	-	-	-
Hydro	*55.2*	*78.9*	*92.5*	*78.0*	*80.6*	*79.9*	*81.9*
Wind	-	-	-	-	*0.1*	*0.8*	*0.7*
Geothermal	-	-	-	-	-	-	-
Solar/other[2]	-	-	-	-	-	-	-
TOTAL LOSSES	**4.57**	**0.64**	**0.49**	**0.54**	**0.41**	**0.36**	**0.43**
of which:							
Electricity and heat generation[9]	3.66	0.52	0.22	0.34	0.25	0.26	0.24
Other transformation	0.20	0.00	-	0.00	-0.05	-0.08	0.00
Own use and transmission/distribution losses	0.70	0.12	0.27	0.19	0.20	0.18	0.19
Statistical differences	**1.13**	**0.07**	**0.03**	**0.00**	**-0.05**	**-0.08**	**-0.00**
INDICATORS	**1990**	**2000**	**2010**	**2015**	**2016**	**2017**	**2018**
GDP (billion 2015 USD)	15.99	6.00	11.03	13.99	14.39	15.09	15.80
Population (millions)	4.80	4.08	3.79	3.73	3.73	3.73	3.73
TPES/GDP (toe/1000 USD)[10]	0.78	0.48	0.28	0.33	0.33	0.32	0.31
Energy production/TPES	0.16	0.46	0.42	0.28	0.29	0.28	0.26
Per capita TPES (toe/capita)	2.59	0.70	0.82	1.24	1.29	1.29	1.29
Oil supply/GDP (toe/1000 USD)[10]	0.35	0.12	0.09	0.09	0.10	0.09	0.08
TFC/GDP (toe/1000 USD)[10]	0.56	0.38	0.24	0.29	0.30	0.29	0.28
Per capita TFC (toe/capita)	1.87	0.56	0.70	1.10	1.16	1.17	1.18
CO_2 emissions from fuel combustion ($MtCO_2$)[11]	-	-	-	-	-	-	-
CO_2 emissions from bunkers ($MtCO_2$)[11]	-	-	-	-	-	-	-
GROWTH RATES (% per year)	**90-00**	**00-10**	**10-15**	**15-16**	**16-17**	**17-18**	**00-18**
TPES	-13.6	0.8	8.2	3.5	0.3	0.3	2.9
Coal	-34.3	13.8	40.9	-3.7	11.4	3.8	18.9
Peat	-	-	-	-	-	-	-
Oil	-18.4	2.8	4.6	20.1	-9.3	-2.3	3.2
Natural gas	-14.5	0.6	14.7	-6.2	3.6	2.7	4.2
Biofuels and waste[1]	3.5	-5.7	2.1	-3.0	-6.0	-25.5	-4.7
Nuclear	-	-	-	-	-	-	-
Hydro	-2.5	4.8	-2.0	10.4	-1.3	8.0	3.0
Wind	-	-	-	-	875.5	-4.0	-
Geothermal	-	22.6	-18.9	7.6	2.0	1.5	6.3
Solar/other[2]	-	-	-	29.3	0.2	0.3	-
TFC	-12.7	1.5	9.0	5.7	0.8	0.6	3.7
Electricity consumption	-7.4	1.5	6.3	5.9	6.9	6.5	3.6
Energy production	-4.1	-0.1	0.1	4.4	-3.1	-6.2	-0.3
Net oil imports	-19.4	3.8	5.4	17.2	-8.7	1.0	4.1
GDP	-9.3	6.3	4.9	2.8	4.8	4.7	5.5
TPES/GDP	-4.7	-5.1	3.2	0.6	-4.3	-4.2	-2.5
TFC/GDP	-3.8	-4.5	3.9	2.8	-3.8	-4.0	-1.8

0 is negligible, - is nil, .. is not available. Please note: rounding may cause totals to differ from the sum of the elements.

Footnotes to energy balances and key statistical data

1. *Biofuels and waste* in Georgia comprise solid biofuels. Data are often based on partial surveys and may not be comparable between countries.

2. *Other* includes solar heat.

3. In addition to coal, oil, natural gas and electricity, total net imports also include biofuels trade.

4. Excludes international marine bunkers and international aviation bunkers.

5. Total supply of electricity represents net trade. A negative number in the share of TPES indicates that exports are greater than imports.

6. *Industry* includes non-energy use.

7. *Other* includes residential, commercial and public services, agriculture/forestry, fishing and other non-specified.

8. Inputs to electricity generation include inputs to electricity, co-generation (or combined heat and power [CHP]) and heat plants. Output refers only to electricity generation.

9. Losses arising in the production of electricity and heat at main activity producer utilities and by auto-producers. For non-fossil-fuel electricity generation, theoretical losses are shown based on plant efficiencies of approximately 33% for nuclear and solar thermal, 10% for geothermal and 100% for hydro, wind and solar photovoltaic.

10. Tonnes of oil equivalent (toe) per USD 1 000 at 2015 prices and exchange rates.

11. 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.

ANNEX C: International Energy Agency Shared Goals

The member countries* of the International Energy Agency (IEA) seek to create conditions in which the energy sectors of their economies can make the fullest possible contribution to sustainable economic development and to the well-being of their people and the environment. In formulating energy policies, the establishment of free and open markets is a fundamental point of departure, though energy security and environmental protection need to be given particular emphasis by governments. IEA countries recognise the significance of increasing global interdependence in energy. They therefore seek to promote the effective operation of international energy markets and encourage dialogue with all participants. To secure their objectives, member countries therefore aim to create a policy framework consistent with the following goals:

1. Diversity, efficiency and flexibility within the energy sector are basic conditions for longer-term energy security: the fuels used within and across sectors and the sources of those fuels should be as diverse as practicable. Non-fossil fuels, particularly nuclear and hydro, make a substantial contribution to the energy supply diversity of IEA countries as a group.

2. Energy systems should have **the ability to respond promptly and flexibly to energy emergencies.** In some cases, this requires collective mechanisms and action: IEA countries co-operate through the Agency in responding jointly to oil supply emergencies.

3. The environmentally sustainable provision and use of energy are central to the achievement of these shared goals. Decision-makers should seek to minimise the adverse environmental impacts of energy activities, just as environmental decisions should take account of the energy consequences. Government interventions should respect the Polluter Pays Principle when practicable.

4. More environmentally acceptable energy sources need to be encouraged and developed. Clean and efficient fossil fuel use is essential. The development of economic non-fossil sources is also a priority. A number of IEA member countries wish to retain and improve the nuclear option for the future, at the highest available safety standards, because nuclear energy does not emit carbon dioxide. Renewable energy sources will also have an increasingly important contribution to make.

5. Improved energy efficiency can promote both environmental protection and energy security in a cost-effective manner. There are significant opportunities for greater energy efficiency at all stages of the energy cycle, from production to consumption. Strong efforts by governments and all energy users are needed to realise these opportunities.

6. Continued **research, development and market deployment of new and improved energy technologies** make a critical contribution to achieving the objectives outlined above. Energy technology policies should complement broader energy policies. International co-operation in the development and dissemination of energy technologies, including industry participation and co-operation with non-member countries, should be encouraged.

7. Undistorted energy prices enable markets to work efficiently. Energy prices should not be held artificially below the costs of supply to promote social or industrial goals. To the greatest extent necessary and practicable, the environmental costs of energy production and use should be reflected in prices.

8. Free and open trade and a secure framework for investment contribute to efficient energy markets and energy security. Distortions to energy trade and investment should be avoided.

9. Co-operation among all energy market participants helps improve information access and understanding, and encourages the development of efficient, environmentally acceptable and flexible energy systems and markets worldwide. These are needed to help promote the investment, trade and confidence necessary to achieve global energy security and environmental objectives.

(The Shared Goals were adopted by IEA Ministers at the meeting of 4 June 1993 at Paris, France.)

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

ANNEX D: Glossary and list of acronyms, abbreviations and units of measure

In this report, abbreviations and acronyms are substituted for a number of terms used within the International Energy Agency. While these terms generally have been written out on first mention, this glossary provides a quick and central reference for the abbreviations used.

Acronyms and abbreviations

AAGR	average annual growth rate
BAT	best available technology
BAU	business-as-usual
BGR	Federal Institute for Geosciences and Natural Resources (Germany)
BTC	Baku-Tbilisi-Ceyhan (pipeline)
BUR	Biennial Update Report (to the UNFCCC)
CBA	cost-benefit analysis
CBM	coalbed methane
CCGT	combined-cycle gas turbine
CCS	carbon, capture and storage
CDM	Clean Development Mechanism (under the Kyoto Protocol)
CERN	European Organization for Nuclear Research
CHP	combined production of heat and power
CLRTAP	Convention on Long-Range Transboundary Air Pollution
CNG	compressed natural gas
CO	carbon monoxide
CO_2	carbon dioxide
COST	European Cooperation in Science and Technology
CSE	central stockholding entity
DC	direct current
DCFTA	Deep and Comprehensive Free Trade Area
DISCO	distribution company
DRR	disaster risk reduction
DSO	distribution system operator
E&S	environmental and social
EBRD	European Bank for Reconstruction and Development
EC–LEDS	Enhancing Capacity for Low Emission Development Strategies
EE	energy efficiency
EIA	environmental impact assessment
EnC	Energy Community

EIA	environmental impact assessment
ELV	emission limit value
EMEP	European Monitoring and Evaluation Programme
EMS	Energy Management System
ENTSO-E	European Network of Transmission System Operators for Electricity
ENTSO-G	European Network of Transmission System Operators for Gas
EPC	energy performance certificate
EPG	Energo-Pro Georgia
ESCO	Electricity System Commercial Operator
EV	electric vehicles
FACTS	flexible alternating current transmission system
FiT	feed-in tariff
GCAP	Green City Action Plan
GDP	gross domestic product
GDP PPP	gross domestic product with purchasing power parity
GEL	Georgian Lari
Geostat	National Statistics Office of Georgia
GGTC	Georgian Gas Transportation Company
GHG	greenhouse gas
GIG	Georgian Industrial Group
GII	Global Innovation Index
GITA	Georgia's Innovation and Technology Agency
GNAS	Georgian National Academy of Sciences
GNERC	Georgian National Energy and Water Supply Regulatory Commission
GoG	Government of Georgia
GOGC	Georgian Oil and Gas Corporation
GSE	Georgian State Electricity System (transmission system operator)
HPP	hydropower plant
HVAC	heating, ventilation and air conditioning
ICCAMGR	Institutionalisation of Climate Change Adaptation and Mitigation in Georgian Regions
IDR	in-depth review
IEA	International Energy Agency
IFI	international financial institution
IMF	International Monetary Fund
INDC	Intended Nationally Determined Contribution
JSC	joint-stock company
LCOE	levelised cost of electricity
LED	light-emitting diode
LEDS	Low Emission Development Strategy
LLC	limited liability company
LNG	liquefied natural gas

LPG	liquefied petroleum gas
LULUCF	land use, land-use change, and forestry
MEPS	minimum energy performance standards
MES	Ministry of Education, Science, Culture and Sport
MoESD	Ministry of Economy and Sustainable Development
MoF	Ministry of Finance
MoU	memorandum of understanding
MSW	municipal solid waste
NAMA	Nationally Appropriate Mitigation Action
NDC	Nationally Determined Contribution
NEA	National Environmental Agency
NEAP	National Environmental Action Programme 2017-2021
NECP	National Energy and Climate Plan
NEEAP	National Energy Efficiency Action Plan
NGO	non-governmental organisation
NNC	Near Neighbour Country
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NPV	net present value
NRC	National Research Council
NREAP	National Renewable Energy Action Plan
PAH	polycyclic aromatic hydrocarbon
PLUS	Power Link Universal System
PM	particulate matter
POP	persistent organic pollutant
PPA	power purchase agreement
PPP	purchasing power parity
PSF	Policy Support Facility (Horizon 2020)
PV	photovoltaic
R&D	research and development
R&I	research and innovation
RD&D	research, development and demonstration
RE	renewable energy
RES	renewable energy source
RIC	Research and Innovation Council
ROM	run-of-mine (coal)
SAOG	State Agency for Oil and Gas
SCADA	supervisory control and data acquisition
SCP	South Caucasus Pipeline (part of the Southern Gas Corridor)
SEAP	Sustainable Energy Action Plan
SIA	Security Industry Association

SMEs	small and medium-sized enterprises
SO_2	sulphur dioxide
SOCAR	State Oil Company of Azerbaijan Republic
SRNSF	Shota Rustaveli National Science Foundation
STI	science, technology and innovation
SVC	static VAR compensator
TFC	total final consumption
TPA	third-party access
TPES	total primary energy supply
TPP	thermal power plant
TRL	technology readiness level
TSO	transmission system operator
TYNDP	Ten-Year Network Development Plan (for gas and electricity transmission systems)
UGS	underground gas storage
UNFCCC	United Nations Framework Convention on Climate Change
USAID	US Agency for International Development
USD	United States Dollar
VAT	value-added tax
VOC	volatile organic compound
VRE	variable renewable energy
WACC	weighted average cost of capital
WHO	World Health Organization
WREP	Western Route Export Pipeline

Units of measure

°C	degree Celsius
bcm	billion cubic metres
cm^3	cubic centimetre
gCO_2	gramme of carbon dioxide
GW	gigawatt
GWh	gigawatt hour
kb	thousand barrels
$kgCO_2$	kilogramme of carbon dioxide
km	kilometres
kt	kilotonne
ktoe	kilotonne of oil equivalent

kV	kilovolt
kW	kilowatt
kWh	kilowatt hour
m^3	cubic metre
mcm	million cubic metres
mm	millimetre
Mt	million tonnes
$MtCO_2$	million tonnes of carbon dioxide
$MtCO_2$-eq	million tonnes of carbon dioxide equivalent.
Mtoe	million tonnes of oil equivalent
MW	megawatt
MWh	megawatt hour
toe	tonne of oil equivalent
TWh	terawatt hour

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