BANK OF GEORGIA
RESEARCH

Georgia's Hydropower Potential

Giving water the green light

Georgia | Energy | Electricity
Industry Overview
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Ekaterina Gazadze
Head of Research | egazadze@bog.ge | +995 32 444 444 ext. 3760

George Shengelia
Associate Director | gshengelia@bog.ge | +995 32 444 444 ext. 3751

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Terms and Definitions

CAGR – Compound Annual Growth Rate
EBRD – European Bank for Reconstruction and Development
EC – European Commission
EMRA – Energy Market Regulatory Authority (Turkey)
EIB – European Investment Bank
ESCO – Electricity System Commercial Operator (Georgia)
EU – European Union
EUAS – Electricity Generation Company (Turkey)
GNEWSRC – Georgian National Energy and Water Supply Regulatory Commission
GoG – Government of Georgia
GSE – Georgian State Electrosystem
HPP – Hydropower Plant
IEA – International Energy Agency
IPS – Interregional Power System (Russia)
MENR – Ministry of Energy and Natural Resources of Georgia
MEX – Moscow Energy Exchange
MOE – Ministry of Environment of Georgia
MoU – Memorandum of Understanding
NPP – Nuclear Power Plant
OECD – Organization for Economic Co-operation and Development
TEIAS – Turkish Electricity Transmission Corporation
TETAS – Turkish Electricity Trading and Contracting Company
TPP – Thermal Power Plant
UFG – Unified Federal Grid (Russia)
UPS – Unified Power System
USAID – United States Agency for International Development
WB – World Bank

Direct Consumer – a consumer that uses more than 7 GW of energy and has the right to purchase electricity directly from generators and ESCO, as well as to import electricity. There are 8 large direct consumers in Georgia. The term is comparable to "eligible consumers" in other countries.

Retail market – consumers that use less than 7 GW of energy, including households, small companies, government institutions, etc.

Regulated power plants (regulated mainly for tariff purposes) – there are 16 regulated generators in Georgia, either in public or private ownership with over 13 GW of installed capacity. All thermal plants are regulated.

Deregulated power plants (deregulated mainly for tariff purposes) – includes all other plants, all of which were built after 2008.

1 KW = 1,000 Watt
1 MW = 1,000 KW
1 GW = 1,000,000 KW
1 TW = 1,000,000,000 KW

Executive Summary

Georgia's electricity sector has travelled a long and winding road from constant blackouts and cold winters a decade ago to an electricity surplus today. While the developed world was making advances in renewable energy, Georgia struggled for its existence. Since then reforms have been implemented and the sector has transformed noticeably. Although challenges remain, Georgia is committed to further reform – it takes darkness to notice the light.

The sector seems to have troughed in 1996, with only several hours a day of available electricity for the population and the lowest annual per-capita consumption in the last 20 years at 1,120 KWh. This was the logical consequence of Georgia's uneasy early years of independence. As of 2011, per-capita electricity generation reached a much healthier 2,079 KWh. Collection rates improved dramatically at all levels, as did overall system efficiency.

In 2006-2010 investments into fixed generation and distribution assets amounted to 7.8% of the country's annual average GDP. Electricity supplies grew 44% over 2003-2011 while exports surged 301%. Georgia became a net exporter of electricity in 2007.

Untapped potential for renewable energy. If harnessed, Georgia could produce 32 TWh of hydropower annually, 4x more than currently. The extra capacities would allow for 6.3 TWh of exports by 2020. The country would also become self-sufficient in energy, have the flexibility to replace more costly imports (currently required to meet peak demand) with hydro power, and substitute a hefty share of more expensive domestic thermal electricity.

Georgia boasts an electricity production potential of 32 TWh annually, or 4x larger than its current production.

Georgia boasts the region's cheapest energy supplies. The generation tariff for hydroelectricity in Georgia is the lowest in the region at around US$ 0.02/KWh. This compares favourably with the tariff for Azeri thermal power plants (US$ 0.03/KWh), despite their subsidized gas prices. Turkish and Armenian generating costs are even higher. Although the construction of new capacities is likely to raise costs across all countries, we believe Georgia will remain very competitive, with only select Azeri producers able to operate below Georgian costs if the country continues to subsidize gas prices.

Georgian hydropower is the cheapest in the region and is set to maintain its cost advantage in the foreseeable future.

Strong export capacity. Georgia is poised to grow export capacities 1.7x by 2015 and 6.7x by 2020. Turkey's high electricity prices and its proximity to Georgia, as well as Georgia's low production costs for hydropower, set the stage for future growth in exports. Turkish electricity demand grows on average 7% annually, and we see the country posting a deficit of 118 TWh by 2020. This fits well with the projected increase in Georgia's generating capacities, with 6.3 TWh of excess power available for export by that time. In 2011, the average wholesale electricity tariff in Turkey (US$ 0.08/KWh) was well above the cost of production of newly built hydropower generators in Georgia (around US$ 0.06/kWh). The potential for increased electricity exports to Russian regions neighbouring Georgia and the EU also look promising.

Georgia's export capacities are projected to grow 1.7x by 2015 and 6.7x by 2020.

Attractive regulatory regime mitigates greenfield risks. Newly built hydro stations will remain the property of investors through a Build-Operate-Own system. Moreover, HPPs with an installed capacity of less than 13 MW will have the right to operate or export without a license, sell generated power directly to consumers, and set tariffs at their discretion. Currently, 55% of Georgia's electricity generating capacity is privately owned; the remaining 45% is represented by two stations that are partially or fully located in the occupied region of Abkhazia, meaning they cannot be privatized.

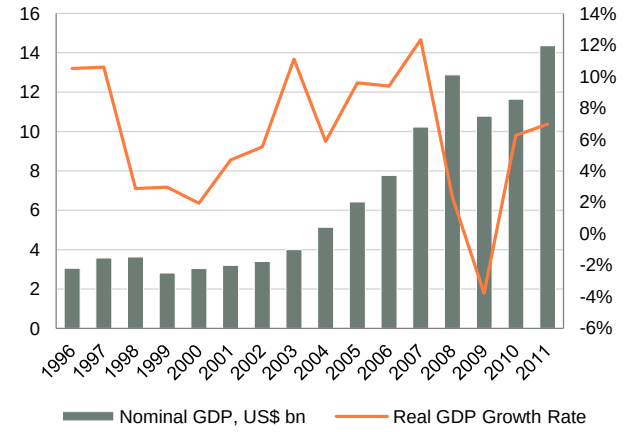
The regulatory environment is investor-friendly: HPPs operate and export without licenses, and tariffs for new plants are at their discretion.

Georgia on my mind...

Georgia is located east of the Black Sea, bordering Turkey and Armenia to the south, Azerbaijan to the southeast, and Russia to the north. It has a population of approximately 4.5mn. Mikheil Saakashvili was elected president in 2004 following the Rose Revolution at the end of 2003 and in 2008 was re-elected for a five-year term. Georgia's next parliamentary elections are scheduled for autumn 2012, with presidential elections to be held in 2013.

Average 6% annual GDP growth. The post-crisis Georgian economy returned to positive growth by the end of 2009 and performed relatively well compared to select non-resource-based peers. In spite of the 2008 war with Russia and the global financial and economic crisis, the scale of the economy's contraction in 2009 was much smaller than in other regional countries.

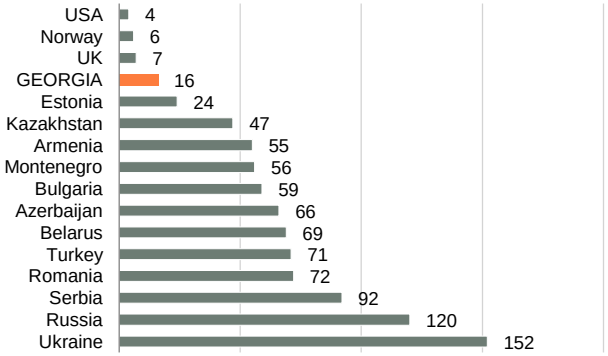
Figure 1: Georgia's GDP growth rate and nominal GDP



Source: International Monetary Fund

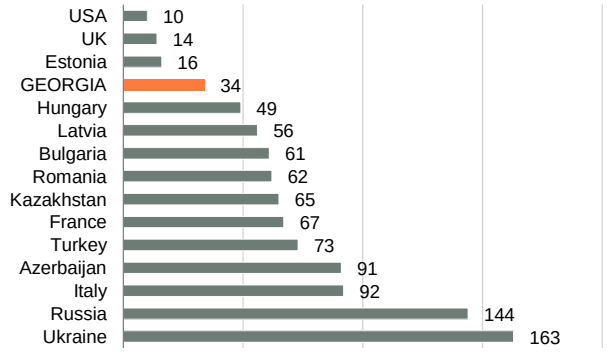
Business environment is more investor-oriented. The Georgian investment environment improved considerably in recent years with fewer taxes and simplified procedures for opening a business. Georgia has also made great strides in eradicating red tape across all levels of government.

Figure 2: World Bank's Ease of Doing Business Survey, 2011



Source: World Bank, 2011 (Rank out of 183 counties)

Figure 3: Economic Freedom Index, 2012



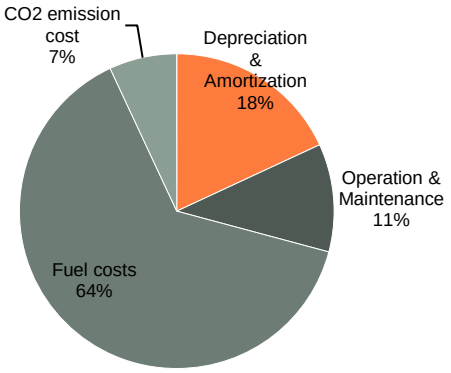
Source: The Heritage Foundation, 2012 (Rank out of 179 countries)

Giving water the green light

We believe hydropower will gain momentum in the future on the back of its cost advantages and global efforts to reduce CO2 emissions. Rising prices for coal and other fossil fuels will likely trickle down into the final prices of producers using these inputs, mainly thermal power plants. Emission-reduction plans will also transfer higher environmental costs onto thermal power plants, in our view. This, in turn, should have long-term benefits for hydro energy.

Fuel costs account for 64% of total electricity production costs for gas-fired thermal power plants, based on our calculations.

Figure 4: Breakdown of TPPs' production costs



Source: USAID, Bank of Georgia Research Estimates

Hydropower is one of the cheapest energy sources in the region and enjoys an operating cost advantage over thermal power. Although hydropower plants are front-heavy in terms of investment, they usually do not require the scale of research and development as other renewable energy sources do.

Construction costs for HPPs vary depending on type, size, technology, and geographical location. According to the IEA, average OECD numbers suggest small HPPs are usually more expensive to build than larger HPPs.

Table 1: HPP construction cost per MW in OECD countries

Size	Installed Capacity	Type	Construction cost per MW, US$ mn
Small	< 10 MW	Run-of-river	2 - 4
Medium	10 - 100 MW	Run-of-river	2 - 3
Medium	100 - 300 MW	Dam and reservoir	2 - 3
Large	> 300 MW	Dam and reservoir	< 2

Source: IEA

However, according to a USAID study, small HPPs (<10 MW) provide the cheapest energy in the region, with construction costs of just US$ 1.4-1.65mn/MW and production costs as low as US$ 0.04-0.05/KWh (please see our financial analysis for hypothetical HPP in the appendix).

Table 2: Generation, construction and production costs in Black Sea region

Type	Construction cost per MW, US$ mn	Production cost per KWh, US$
Nuclear	2.75	0.075 - 0.081
Thermal (Coal-fired)	1.7-2.3	0.093 - 0.096
Thermal (Gas-fired)	0.6-1.25	0.081 - 0.120
Hydro	1.2-2.2	0.044 - 0.0745
Solar	5-6	0.385 - 0.244
Wind	2-2.4	0.102 - 0.118

Source: USAID

The investment attractiveness of small hydro can be further enhanced by grouping projects together to achieve economies of scale, which supports the findings of the USAID study. The initial attractiveness of small HPPs is countered by size constraints and start-up costs. Small HPPs are also most sensitive to production instability due to the seasonal nature of water supplies. Nevertheless, they do have a long production life of 35-50 years. Many of the above mentioned disadvantages can be mitigated through adequately planned funding structures, government incentives, and electricity sale opportunities that make small HPPs competitive and attractive. Grouping allows collective small hydro projects to be more efficiently funded and allows for collective procurement.

Table 3: HPP construction and production costs in Black sea region

Type	Installed Capacity	Construction cost per MW, US$ mn	Production cost per KWh, US$
Dam and reservoir	500 MW	2.2	0.0745
Penstock	150 MW	2	0.0692
Run-of-river	150 MW	1.2	0.0476

Source: USAID

Hydropower is one of the most efficient energy sources. At 85-90%, hydropower's efficiency is high, well ahead of fossil fuel (up to 60% efficiency) and wind and solar (20-40%). Moreover, according to the MOE, 1 TWh of electricity exported from Georgia can reduce a recipient country's CO2 emissions by 326-1,380 kt (depending on the fuel type and plant efficiency and assuming the energy replaces a comparable amount of fossil-fuel energy).

Table 4: CO2 emission factor in TPPs

		CO2 emission factor, thousand tonnes CO2/TWh	
Fossil Fuel	Plant efficiency %	Low	High
Coal	30	1047	1380
	45	698	920
Oil	30	853	907
	50	512	544
Natural Gas	30	652	700
	60	326	350

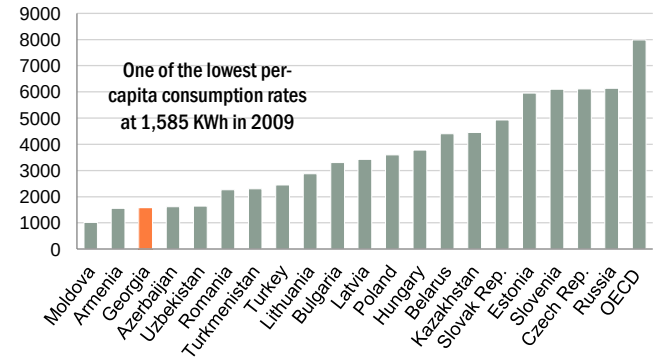
Source: MOE

Although Georgian exports to the EU will not be significant in the near term, the viability of this market should be examined soon. We believe that Europe will require more hydropower to satisfy its goal of significantly cutting the use of coal-fired thermal power plants and gradually reducing CO2 emissions to 85-90% by 2050. Although 2050 may seem distant, it is only one investment cycle away, according to the European Wind Association – the lifetime of a fossil fuel plant ranges from 35-45 years for coal-fired plants and 30-35 years for gas-fired thermal plants.

Georgia's export capacity

We expect per-capita use of electricity to continue rising, in-line with the growth of the Georgian economy to around 3,067 KWh by 2020. Georgian electricity consumption has been on the rise in the last few years, reaching 2,079 KWh per capita in 2011, or 1.14 KWh per GDP in US$ unit terms.

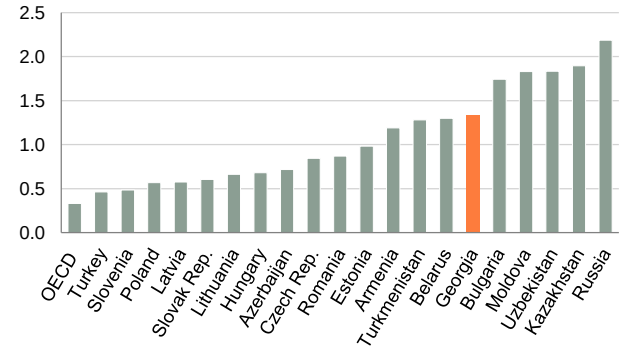
Figure 6: Electricity consumption per capita, 2009



Source: World Bank

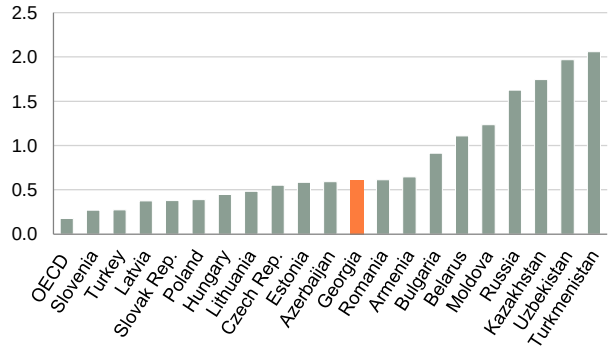
In the long-run, the country's consumption pattern will depend greatly on the economy's growth rate and the presence of energy-intensive industries.

Figure 7: Electricity Consumption/GDP (constant US$), 2009



Source: World Bank

Figure 8: Energy use (oil equivalent)/GDP (constant US$), 2009



Source: World Bank

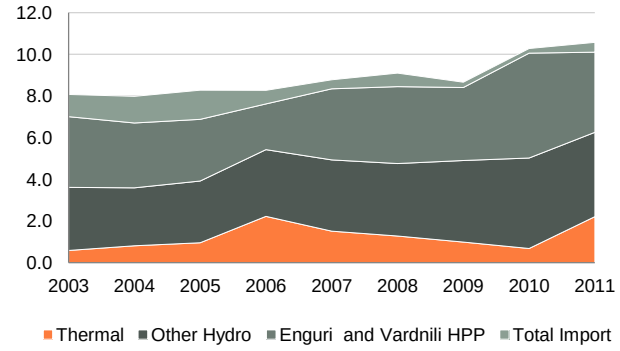
Electricity use per unit of GDP is higher in Georgia (1.33) than in most peer countries; we believe this is the result of electricity holding the largest share of Georgia's energy use. We see this ratio decreasing in the future as the use of other forms of energy by industry accelerates.

Energy intensity is likely to remain below developed-country levels since the main driver of GDP growth is expected to be the services sector rather than energy-intensive industries.

Since 2003, electricity generation has outstripped demand with a 44% growth rate (5% CAGR), reaching 10.1 TWh as of 2011. This growth was driven by rehabilitated power plants, improved efficiency, increased total generation capacity, and reduced technical losses, which fell from 14% of the total electricity supply in 2003 to 1.8% in 2011.

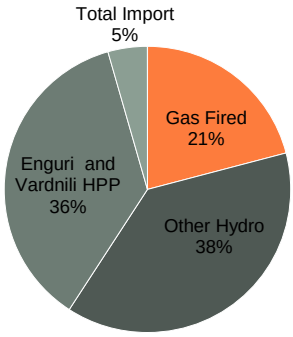
Demand grew 38%, or at a 4% CAGR, during the same period and broadly tracked Georgia's economic growth, except in 2006 when the country's largest power plant Enguri was under repair.

Figure 9: Georgia's electricity supply structure 2003-2011, TWh



Source: ESCO, MENR

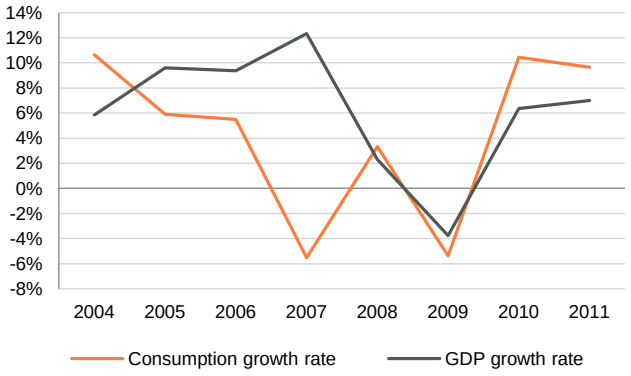
Figure 10: Georgia's current electricity supply structure, 2011



Source: ESCO

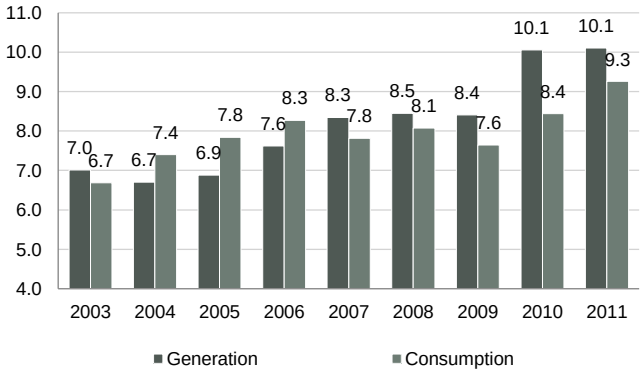
The composition of the industry is likely to change in the future, in our view, with hydropower reaching a projected 86% of supply (currently 74%) as of 2015 and 93% as of 2020, with the balance bridged by thermal power (7%, down from 21% as of 2011).

Figure 11: Electricity consumption/GDP growth rate, 2004-2011



Source: ESCO, MENT

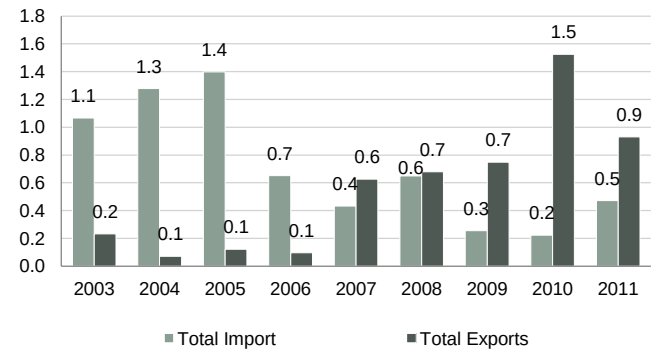
Figure 12: Electricity generation/consumption, 2003-2011, TWh



Source: ESCO

Despite the benefits that come from a large share of renewable energy capacities, Georgia is marked by a seasonal supply of power – a surplus in the summer and deficit in the winter as many rivers suffer from insufficient water flow. The gap is bridged by thermal power and imports. On an annual basis, we expect the country to remain a net exporter. Georgia aims to export 12% of its generated electricity by 2015 and 31% by 2020. Since 2003, Georgia boosted power exports 301% to 931 GWh as of 2011. Over the last 5 years, electricity imports have remained relatively stable. Georgia imports an average 406 GWh annually to cover domestic demand and we expect imports to be fully replaced by domestic sources from 2016.

Figure 13: Electricity import/export, 2003-2011, TWh

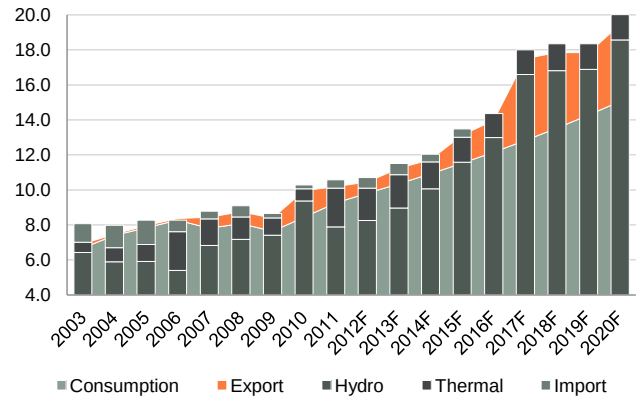


Source: ESCO

Extra generation capacities will remain even if Georgian consumption grows at a high rate in-line with GDP. We believe Georgia will increase its export potential 1.7x by 2015 and 6.7x by 2020, according to our baseline scenario. Assumptions on growth in generation are based on already-signed MOUs for new HPPs.

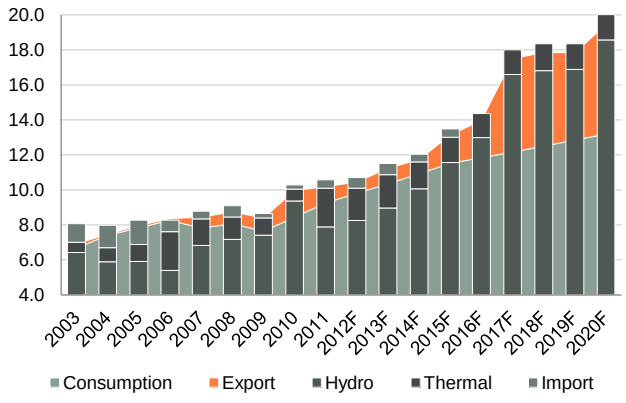
In our high-end scenario we assume the consumption growth rate will match forecasted average annual GDP growth of 5.6%. As a result, the country will have 1.6 TWh of capacities available for export by 2015 and 4.4 TWh by 2020.

Figure 14: Georgia's electricity balance and export potential (high consumption), TWh



Source: Bank of Georgia Research Estimates

Figure 15: Georgia's electricity balance and export potential (base demand), TWh



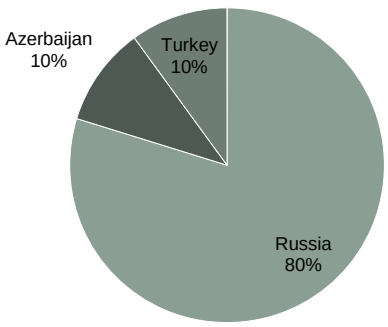
Source: Bank of Georgia Research Estimates

In our base case scenario, we estimate that electricity consumption will also track GDP growth rate until 2015 at an average of 5.6% but halve to 2.75% from 2016. This will create available export capacity of 1.6 TWh by 2015 and 6.3 TWh by 2020.

Traditionally, consumption growth tracks GDP growth in rapidly growing economies. In our example, we used Turkey's consumption trend, which has broadly tracked GDP over the last several years. Georgia has shown a similar trend in the recent past. The estimates include technical losses and internal use at HPPs.

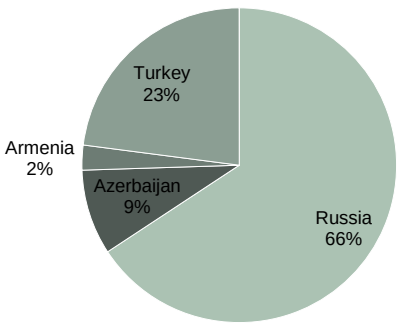
In 2011, 63% of Georgia's surplus electricity was exported to Russia, which also accounted for the largest share of imports (80%). Turkey's share of total exports was relatively low due to transmission line constraints, which are expected to be resolved after a new line becomes operational in 2012-2013.

Figure 16: Electricity export structure, 2007-2011



Source: ESCO, MENT

Figure 17: Electricity import structure, 2007-2011

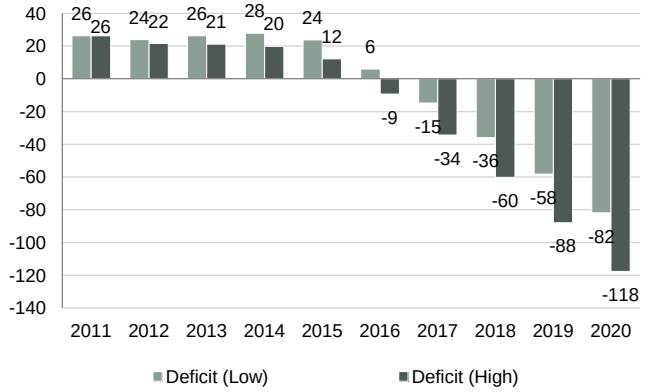


Source: ESCO

Excess capacity target: Turkey

Turkey is likely to continue running an electricity deficit. Based on TEIAS forecasts, Turkey will have an electricity deficit of 82-118 TWh by 2020. The shortfall is expected to be met by domestic generation and imports from neighboring countries.

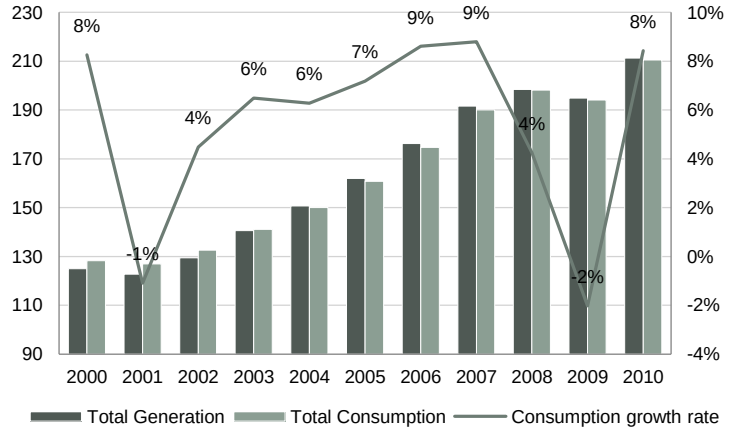
Figure 18: Projections of electricity deficit in Turkey, 2011-2020



Source: TEIAS, Bank of Georgia Research Estimates

Turkish electricity consumption grew noticeably over the last 10 years (2000-2010 CAGR of 5.1%), in-line with increasing urbanization and industrialization. In 2010, consumption reached 210TWh, an 8% y/y increase.

Figure 19: Electricity consumption/generation in Turkey, 2000-2011, TWh

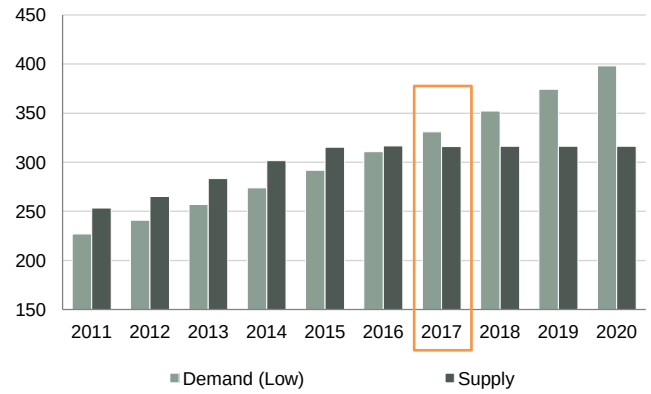


Source: TEIAS

Turkey's 10-Year Electrical Energy Generation Capacity Projection (2011-2020) prepared by TEIAS outlines two scenarios for future electricity consumption. The low demand case projects 6.6% average annual electricity consumption growth to 398 TWh by 2020, while the high demand case sees 7.5% annual average growth to 434 TWh by 2020.

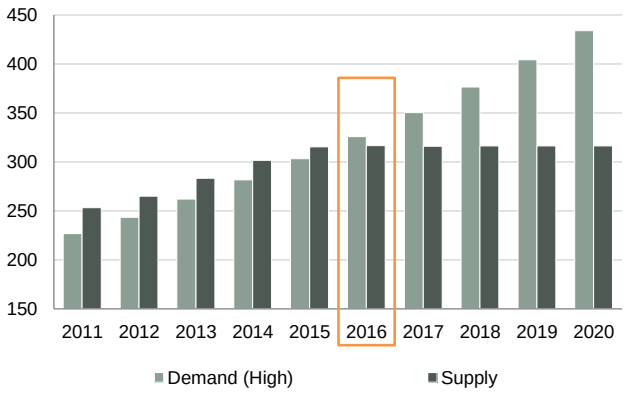
Under the high demand scenario, Turkey will become a net importer of electricity by 2016 with an estimated deficit of 9 TWh. Under the low demand scenario, a deficit of around 15 TWh will emerge by 2017.

Figure 20: Electricity supply/demand projections in Turkey (low demand case), 2010, TWh



Source: TEIAS

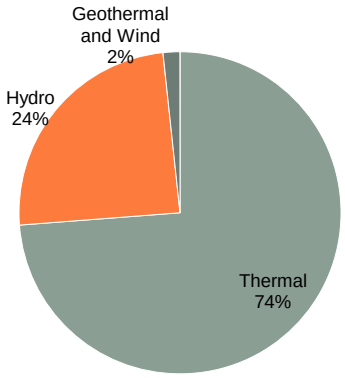
Figure 21: Electricity supply/demand projections in Turkey (high demand case), 2010, TWh



Source: TEIAS

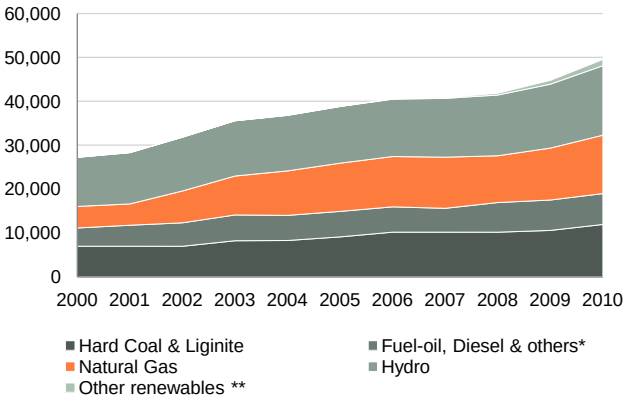
Over the last 10 years, Turkish generation capacity increased at a 6.2% CAGR along with growing demand. Total installed capacity reached around 49,524 MW as of 2010, supported by the addition of gas-fired TPPs and HPPs.

Figure 22: Electricity generation by sources in Turkey, 2010



Source: TEIAS

Figure 23: Installed capacity growth in Turkey



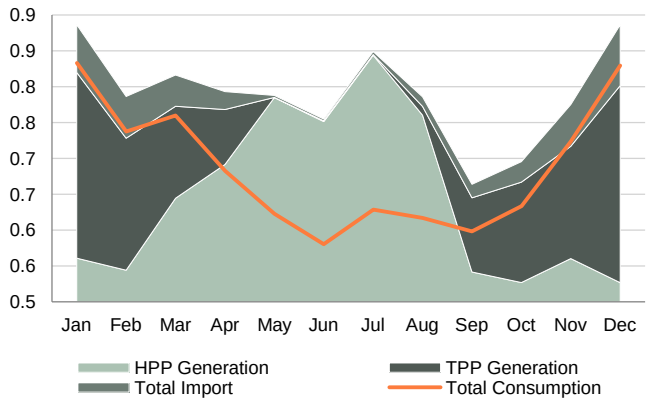
*Others: LPG, Naphtha, wastes, Multi fuel fired resources
**Other Renewable: Geothermal and Wind resources

Source: TEIAS

The Turkish government has announced plans to construct a 5 GW nuclear power plant, projected to meet 5% of the country's electricity use and have an expected cost/KWh of US$ 0.1235.

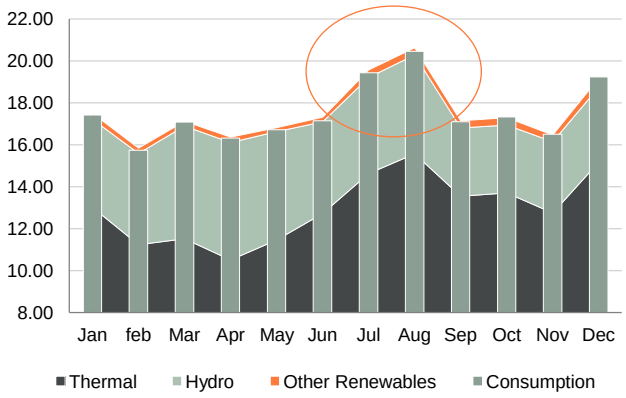
We believe the Turkish market can absorb Georgia's extra electricity production, especially in the summer. Due to high demand for air conditioning, Turkey's summer peak demand outstrips winter peak demand, pushing electricity prices to as high as US$ 0.09/KWh in the summer. Turkey's consumption pattern moves inversely to the pattern of Georgian hydro generation in the summer – Georgian consumption falls in the summer, while Turkish demand peaks.

Figure 24: Monthly average electricity generation/consumption in Georgia, 2007-2011, TWh



Source: ESCO

Figure 25: Monthly electricity generation/consumption in Turkey, 2011, TWh

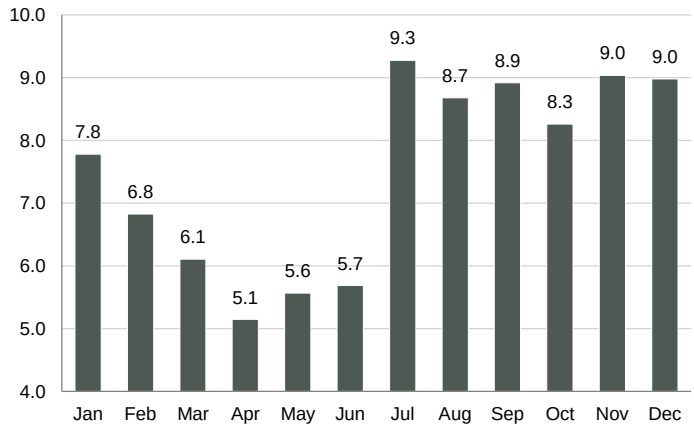


Source: TEIAS

We expect tariffs will remain high in Turkey on the back of rising fossil fuel prices. This is significant given that fuel accounts for around 64% of a TPP's total production costs, according to our calculations.

Turkish electricity tariffs are only regulated for the state-owned wholesaler TETAS (US$ 0.10/kWh). Monthly average wholesale tariffs for 2011 are shown below (day-ahead market prices are used for reference).

Figure 26: Monthly average wholesale tariff in Turkey, 2011 (US$ ¢ / KWh)



Source: TEIAS

Even if the new NPP is built, Georgian hydropower will remain one of the cheapest alternatives for Turkey to fill its electricity deficit. The current generation cost in Georgia is around US$ 0.02; the cost/KWh for newly built HPPs will be around US$ 0.06, while the average tariff in Turkey is around US$ 0.09.

Table 5: Generation costs in the region

Country	Source	Current generation tariff, US$	Cost of new generation, US$
Georgia	Hydro	0.02	0.06 (average)
Azerbaijan	Natural gas	0.03	0.032 - 0.098 *
Armenia	Nuclear	0.03	0.06 - 0.133 **
Turkey	Natural gas	0.09	> 0.09
	Nuclear	n/a	0.12

* Depends on gas price ** Depends on capital and financing costs

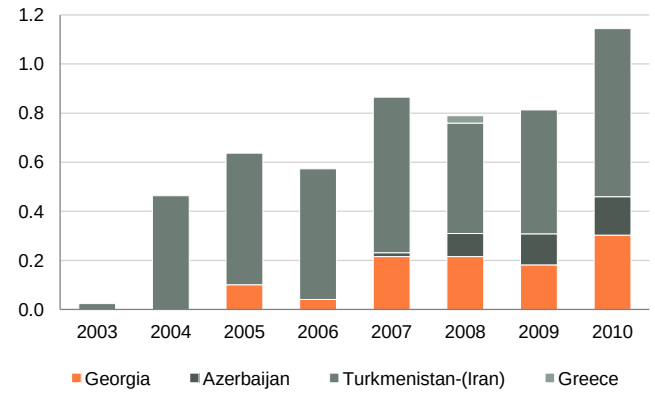
Source: WB, Bank of Georgia Research Estimations

Georgia is poised to gain a greater share of Turkish imports in the coming years as other trading partners are unlikely to meet Turkish demand. In 2010, Turkey imported 1.1 TWh and exported 1.9 TWh of electricity. Turkmenistan and associated transit capacities from Iran accounted for 60% of Turkish imports, Georgia for 26%, and Azerbaijan for 14%.

In 2009, Turkmenistan generated 15.98 TWh of electricity (gas-fired TPPs accounted for 99% and hydro for 1%) and consumed 12.18 TWh. The surplus was exported to Turkey, Afghanistan, and Iran.

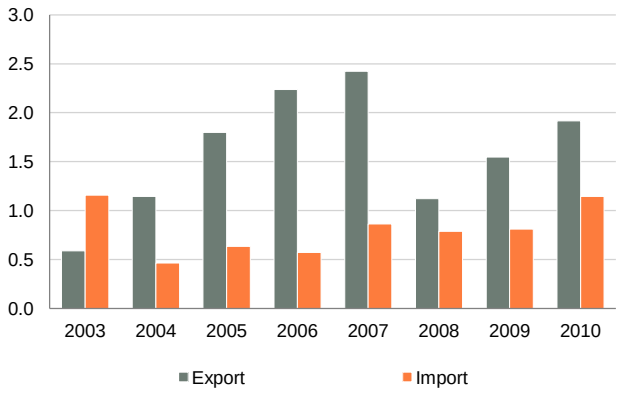
According to the Ministry of Energy of Turkmenistan, the country plans to boost electricity generation to 27.4 TWh by 2020, just barely ahead of projected consumption of 26.4 TWh. The country's gross surplus of around 1 TWh will lag far behind Turkey's projected deficit of 82-118 TWh, meaning Turkey will need to seek imports elsewhere.

Figure 27: Turkey's electricity import by countries, 2003-2010, TWh



Source: TEIAS

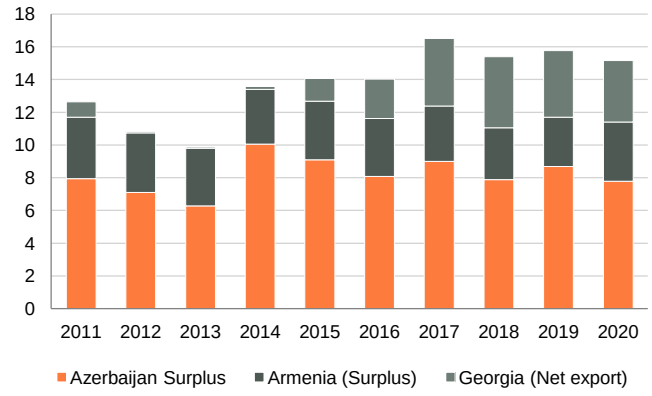
Figure 28: Turkey's electricity import/export, 2003-2010, TWh



Source: TEIAS

Georgian hydropower remains very attractive on a cost basis compared with other regional countries that have electricity surpluses and the capacity to export to Turkey. According to the WB, the regional electricity surplus will reach 15 TWh by 2020, roughly 13-18% of Turkey's projected deficit. In Azerbaijan, electricity generation growth will come from newly constructed TPPs, while Armenia plans to build a large 1,200 MW nuclear power plant to replace its aging one, slated to be decommissioned in 2017. Electricity produced at nuclear and thermal plants is more expensive than hydro.

Figure 29: Projections of electricity surplus in South Caucasus, 2011-2020



Source: World Bank, Bank of Georgia Estimates

The absence of electricity trading regulations is the major risk related to Georgian electricity exports to Turkey. Both regulations and tariff methodology governing access to the new 500/400kV high-voltage line (BSTN project) still need to be defined. The cross-border electricity trading agreement with Turkey has

already been ratified by Georgia and it is currently pending ratification by the Turkish parliament. Even after Turkey ratifies the agreement, both countries would need time to improve system compatibility.

Trading with Turkey may allow Georgia to gain access to European markets. Once the trading mechanism with Turkey is set up, Georgia may use the transmission route and trading agreement as a basis to export part of its excess power to Europe. Turkey joined the European Network of Transmission System Operators for Electricity (formerly the UCTE) and harmonized its legislation with EU directives to allow cross-border trading in 2011.

Other potential markets

Russia

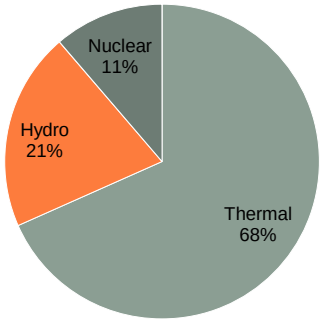
Russia's South IPS, the region closest to Georgia, is a potential market. The South IPS is facing a substantial electricity deficit: electricity use in the region grew 4% y/y to 86 TWh in 2011, leaving a 7 TWh shortfall.

Continued liberalization and increasing gas prices will put pressure on electricity tariffs in Russia. The Russian government plans to gradually hike regulated domestic gas prices to export netback parity levels. In 2011, the gas price grew 15% to around US$ 96/tcm. In 2011, the average wholesale tariff in South IPS stood at US$ 0.0353/KWh.

As part of the restructuring of the country's electricity market, formerly state-owned vertically integrated monopolies have been unwound and partly privatized. However, network companies, the system operator, and nuclear and hydropower plants are still state-owned, and the government has retained stakes in several territorial and wholesale GenCos through the state-controlled utility company.

In addition, in the coming years Russia will need to invest into the electricity sector to rehabilitate aging thermal power plants.

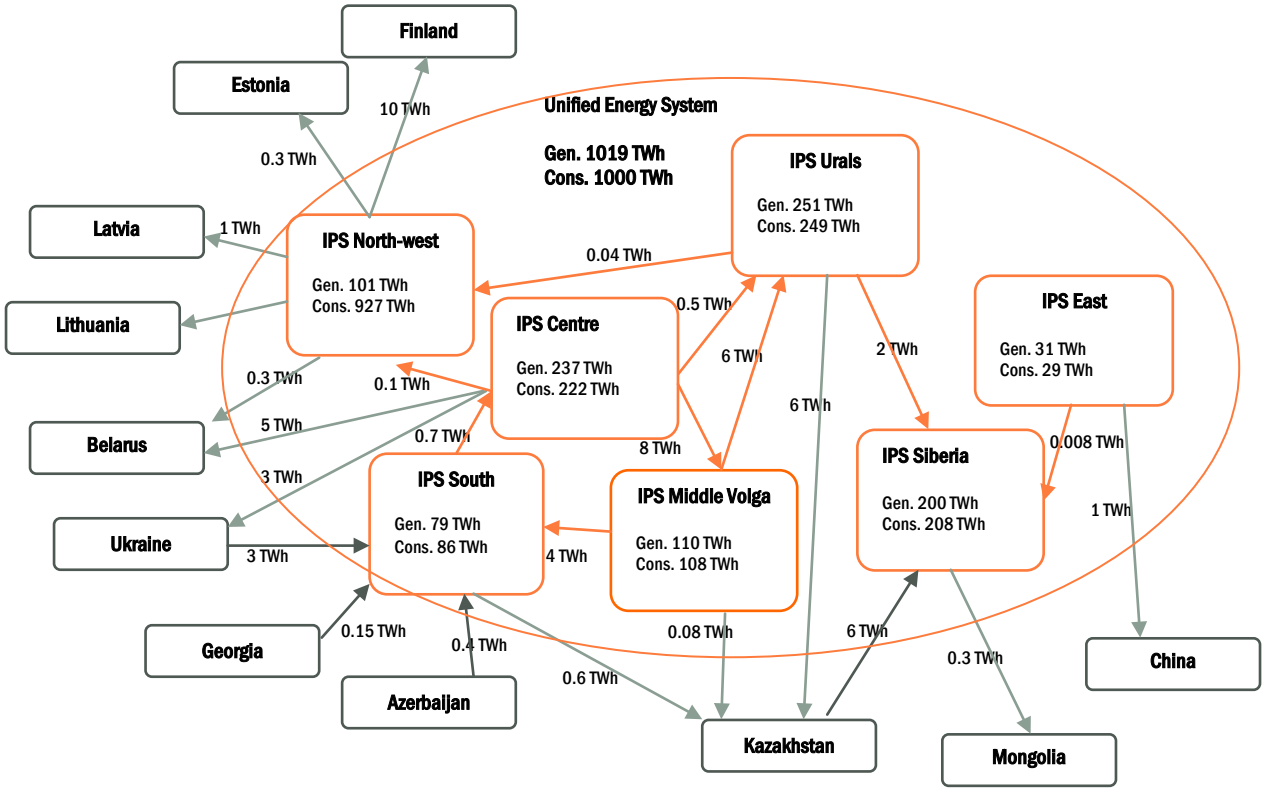
Figure 30: Installed capacity breakdown by sources in Russia, 2011, TWh



Source: Unified Federal Grid

Around 70% of electricity trades occur at unregulated prices. Russia has 6 independently balanced IPSs: North-West, Centre, Middle Volga, Urals, South, and Siberia. IPSs operate in parallel, making electricity transfers over 6 time zones possible. The seventh, the Far East IPS, operates separately.

Diagram 1: Russian electricity market balance, 2011

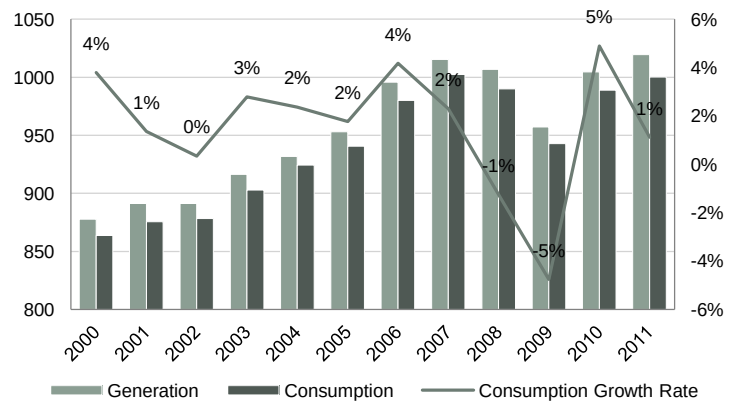


Source: System Operator of UES, Bank of Georgia Research

Russia has two tariff zones: the Europe-Urals zone (with three hubs: Centre, Urals, and South) and the Siberian zone (including western and eastern Siberia). There is also an isolated area, as well as non-tariff zones (a regulated market). The two tariff zones have different geographical characteristics and different fuel mixes. The European zone has a high share of thermal power plants while the Siberian zone is dominated by hydroelectric generation. Prices are therefore higher in the European zone than in Siberia, where South IPS, bordering Georgia is included.

In 2000-2011, Russia's electricity consumption and generation increased 16% to 1,000 TWh and 1,019 TWh, respectively. Russia as a whole is a net electricity exporter; however, certain IPSs, especially the South IPS bordering Georgia, run a deficit.

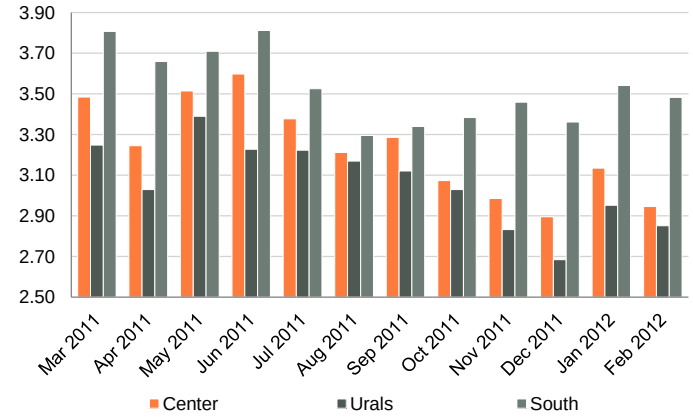
Figure 31: Electricity generation/consumption in Russia, 2011, US ¢/KWh



Source: Unified Federal Grid

The gap is bridged with electricity purchased from other IPSs and with imports from neighbouring countries.

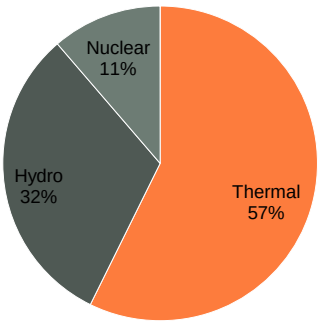
Figure 32: Day ahead monthly average electricity tariffs in Russia's European zone, 2011, US ¢/KWh



Source: Moscow Energy Exchange

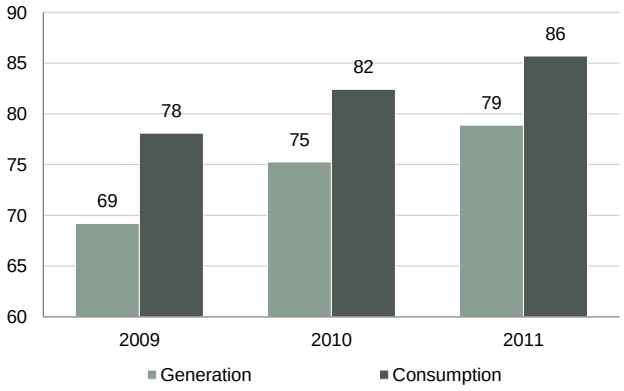
Trading with IPS South may be possible in the future as a way of smoothing peak load demand, but sustained exports may be difficult as new HPPs' electricity will be relatively expensive initially (new generation cost of US$ 0.06/KWh vs. Russia's gas-subsidized generation costs of US$ 0.035/KWh). However, with further market liberalization and rehabilitation of capacities, prices are likely to increase in Russia.

Figure 34: Installed capacity breakdown by sources in South IPS, 2011



Source: Unified Federal Grid

Figure 35: Electricity generation/consumption in South IPS, 2009-2011, TWh



Source: Unified Federal Grid

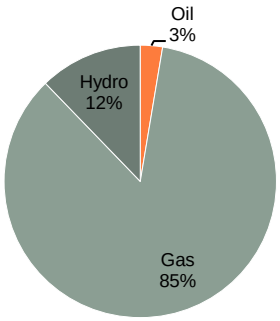
In 2011, the South IPS had a 7 TWh deficit, covered mostly by purchases from the Middle Volga IPS and imports from Ukraine (the average Ukrainian wholesale tariff stands at US$ 0.05/KWh vs. US$ 0.02/KWh in Georgia).

Azerbaijan

Despite its self-sufficiency in gas, the major disadvantage of Azerbaijan's dependence on thermal power is a high cost of electricity generation. The Azeri government plans to continue expanding domestic generation capacities, mainly with new thermal plants. The availability of cheaper domestic gas and uncertainty over the elimination of electricity subsidies limit the potential for exports to Azerbaijan.

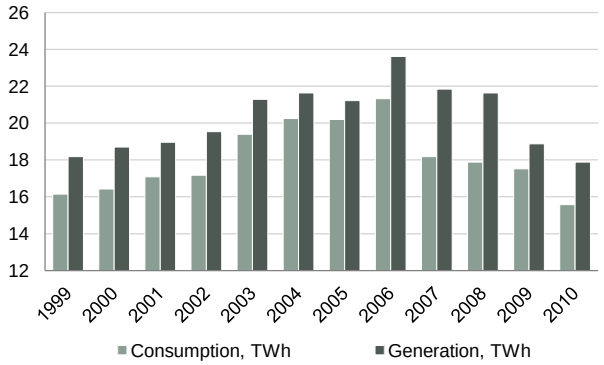
In 2010, Azerbaijan reported electricity consumption of 15.58 TWh and generation of 17.89 TWh. Over the last 10 years, electricity generation significantly outstripped consumption. The excess export capacity is projected to increase around 3x to 7.8 TWh by 2020.

Figure 36: Electricity generation breakdown by sources in Azerbaijan, 2009



Source: International Energy Agency

Figure 37: Electricity consumption/generation in Azerbaijan, 1999-2010, TWh



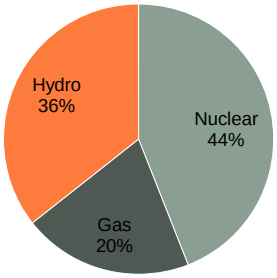
Source: World Bank Data

Armenia

At this stage, export opportunities to Armenia do not appear promising, especially if HPPs continue to be built and/or a new NPP is built. The Armenian government emphasizes self-sufficiency and is actively promoting the development of small- and medium-sized HPPs. The government plans to substitute the aging Metsamor NPP (installed capacity of 750 MW) with a new NPP with installed capacity of up to 1,200 MW. The Metsamor plant needs to be closed by 2017, but the odds of a delay are high, in our view.

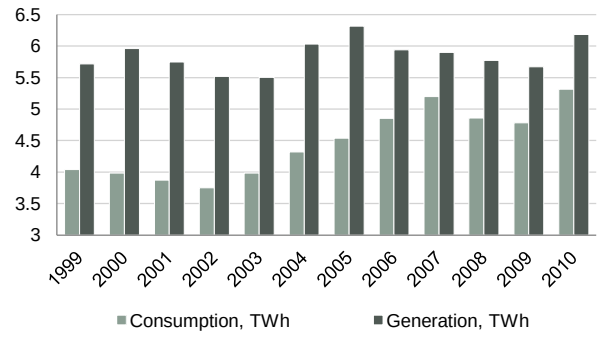
Armenia reported electricity consumption and generation of 5.3 TWh and 6.2 TWh, respectively, in 2010. Over the last 10 years, Armenia had an annual average gross electricity generation surplus of around 0.9 TWh. The export capacity is projected to increase 4x to 3.6 TWh by 2020.

Figure 38: Electricity generation breakdown by sources in Armenia, 2009



Source: International Energy Agency

Figure 39: Electricity consumption/generation in Armenia 1999-2010, TWh



Source: World Bank Data

Electricity sector in more detail

Georgia has succeeded in significantly liberalizing the electricity market and implementing legislative revisions. This has allowed the private sector to largely take over operations via privatizations. Four key state institutions operate in the Georgian electricity sector:

Ministry of Energy and Natural Resources (MENR) – Policymaker. The abovementioned reforms in the electricity sector have limited the MENR's mandate to:

- Development and implementation of energy policy
- Environmental safety
- Creation of a competitive environment through efficient market regulation
- Approval of annual energy balances
- Participation in approval of strategic projects

Georgian National Energy and Water Supply Regulatory Commission (GNEWSRC) – Regulatory body. The GNEWSRC is an independent body whose main functions include:

- Licensing in the energy sector
- Setting and regulating tariffs, including for generation, transmission, dispatch, and distribution.
- Monitoring of the quality of services provided by license holders
- Dispute resolution (GNEWSRC is also authorised to impose sanctions for regulatory breaches).

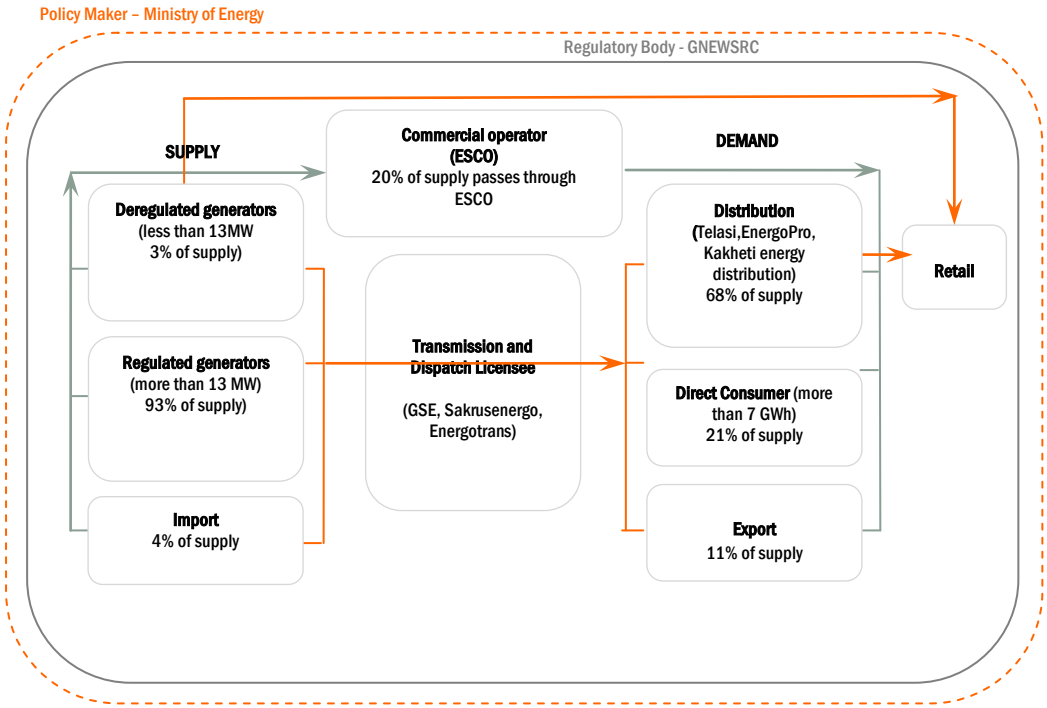
Electricity System Commercial Operator (ESCO) – Commercial operator. According to Electricity Market Rules, licensed suppliers of electricity and any direct (eligible) consumers of electric power (currently some of the largest wholesale consumers) may enter into short- or long-term direct contracts for the sale and purchase of electricity. ESCO, as a balancing market (thus taking away surplus and filling the deficit at any particular moment) is eligible to trade non-contracted electricity and guaranteed capacity based on market-defined pricing mechanisms. It supplies dispatch licensees with information required to carry out supply and plan consumption.

ESCO is responsible for:

- Balancing the market and ensuring grid stability
- Conducting export/import operations to meet systemic needs and for emergency purposes
- Creating and managing a unified database on the wholesale purchase and sale of energy (including the creation and management of a unified reporting registry)

Georgian State Electrosystem (GSE) – Transmission system owner and operator (dispatch licensee). GSE is the only dispatch licensee. Its main function is technical control and supervision over the entire power system to ensure an uninterrupted and reliable power supply. It only has the right to purchase electricity to cover transmission losses. GSE also owns and operates part of the high-voltage transmission grid and interconnection lines with neighbouring countries.

Diagram 2: Electricity Market Structure



Source: Bank of Georgia Research

Electricity trading in Georgia occurs either by direct contracts between parties or through ESCO, subject to registration and scheduling with the dispatch licensee. Generation companies can sell electricity directly to ESCO, consumers, distribution companies, or export markets in accordance with market rules.

Direct consumers, distribution companies, and exporters are also required to purchase guaranteed capacity as defined by market rules. Guaranteed capacity supports power system operations to maintain uninterrupted and reliable electricity supplies. Fixed daily tariffs are paid for the guaranteed capacities to generation companies.

Policy and regulation

The Law on Electricity and Natural Gas from 1997 and the Electricity Market Rules are the primary legislation governing Georgia's energy sector.

HPPs with an installed capacity of less than 13MW have the right to operate without a license and sell generated power directly to consumers. Tariffs are also at their discretion.

Tariffs are fully deregulated for HPPs built after August 1, 2008 and regulated by the GNEWSRC for those built before August 1, 2008. In the winter, however, all HPPs are required to sell power locally to bridge the domestic supply gap. ESCO guarantees the purchase of this electricity at market prices.

According to electricity regulation rules, tariffs are calculated based on cost plus methodology, provided they:

- Cover expenses (including technical losses) and provide a reasonable return on investment to incentivize further investment into the sector
- Account for energy capacity and other transmission and distribution losses
- Reflect the cost of supplies to each group of customers

The long-term goals of the electricity sector are outlined in the energy policy of Georgia of 2006. The policy is aimed at promoting energy security, foreign investment, liberalization, and bilateral and regional

cooperation. It also focuses on refurbishment and rehabilitation of existing facilities, construction of new facilities, improved metering, etc.

Georgian regulation of the hydropower sector offers potential investors ownership advantages: newly built HPPs will remain the exclusive property of prospective investors (under a Build-Operate-Own scheme) in contrast to the BOT (Build-Operate-Transfer) system used in countries like New Zealand, Canada, and Australia.

Under the terms of the 2006 energy policy, the terms of investments into large HPPs are negotiated directly with the GoG.

Other regulatory issues and taxation

Newly constructed small hydro plants with installed capacity of less than 13 MW will not require an operating license, only a construction permit and an environmental permit. For plants exceeding 13 MW, the investors should obtain the following:

- MOU signed by the Ministry of Energy of Georgia
- Environmental permit (part of/a condition of the construction permit)
- Land rental agreement with the regional authorities
- Water usage rights from the MOE
- Construction rights from the MENR

The terms of investment in large HPPs are subject to approval by the GoG.

The GoG offers a number of tax benefits:

- No payroll tax or social insurance tax
- No capital gains tax
- No wealth tax, inheritance tax or stamp duty
- Foreign-sourced income for individuals is fully tax-exempt

Table 6: Taxes in Georgia

	2011	2012F	2013F	2014F
VAT	18%	18%	18%	18%
Income Tax	20%	20%	18%	15%
Social Tax	nil	nil	nil	nil
Corporate Profit Tax	15%	15%	15%	15%
Dividend & Interest Income Tax	5%	5%	3%	nil
Property tax	up to 1%	up to 1%	up to 1%	up to 1%

Source: Bank of Georgia Research; Georgia's pocket tax book

Investment support

To support investment into the sector, the government has established several vehicles, including JSC Partnership Fund and the Georgian Energy Development Fund, Georgian Green Energy Development Company.

Georgian Energy Development Fund: With an expected lifetime of 10 years, the fund will support energy projects in Georgia and the CEE region through early project development investment and through an offering of the government`s shares in GEDF to potential investors.

JSC Partnership Fund is a 100% state-owned private equity fund established in 2011. The fund focuses on four main sectors: energy, agriculture, manufacturing, and real estate. However, the current portfolio consists of transport, oil & gas, and energy assets.

The fund has two main products: Insurance (guaranteeing off-take agreement liabilities) and investment in the form of equity, senior and subordinated debt.

Georgian Green Energy Development Company was established to facilitate investments in Georgia's energy sector. Established by the Georgian government, GGEDC is a 100% subsidiary of Georgian Oil and Gas Corporation.

KFW EUR 5.1mn Renewable Energy Fund is a revolving fund whose aim is to promote investment in renewable energy infrastructure by enabling Georgian commercial banks to extend loans to companies to invest in renewable energy projects, particularly hydro. Additional EUR 25mn was recently allocated to the fund.

Currently, the largest investors in Georgia's electricity sector are: Energo-Pro, INTER RAO and Georgian Industrial Group.

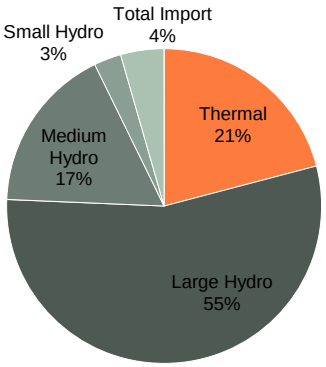
Generation

Georgia's electricity generation sector is dominated by hydropower, since the country has no domestic oil and gas deposits and few coal resources. Hydropower has a long history in Georgia. Georgia's first hydro dam opened in 1898 and the country has since built and operated over 50 plants, including the world's tallest concrete arch dam, the 272m tall Enguri. In 2011, large HPPs accounted for 55% of total electricity generation (the two largest generators, Enguri HPP and Vardnili Cascade, accounted for nearly 36% alone). Thermal power accounted for 21% of the country's total generation in 2011, of which 99.9% came from gas-fired assets.

Run-of-river operations generally offer greater economies and a smaller impact on the environment. Georgia's hydro sector is dominated by run-of-river plants, with the notable exception of Enguri HPP, the country's single-largest electricity producer. Marked by a more predictable construction timeline and shorter dam/reservoir construction periods, simpler technologies, and fewer operating risks, run-of-river operations generally offer greater economies and a smaller impact on the environment. This effect is even greater for smaller HPPs.

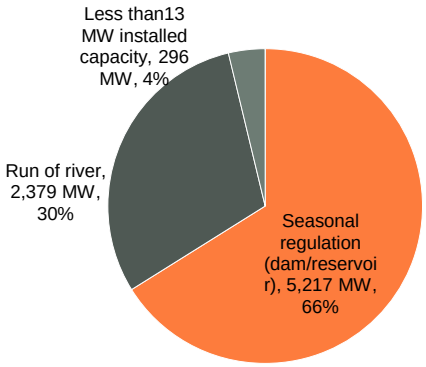
We classify generation assets by the size of their production capacities: large (over 100MW installed capacity), medium (13-100MW) and small (below 13MW). Georgia's electricity market regulation only classifies generation assets as regulated (over 13MW) or unregulated (below 13 MW). Georgia currently has 18 large and medium HPPs, 40 small HPPs, and 4 TPPs.

Figure 40: Hydropower generation structure by size of HPPs, 2011



Source: ESCO, Bank of Georgia Research

Figure 41: Hydropower plants by types, 2011



Source: MENR

Over 2003-2010, Georgia privatized most of its installed generation capacity – 55% of production capacities are owned by 6 private investors. Although 45% of the total capacity is nominally owned by the government, it is largely provided by the Enguri and Vardnili stations, which are partially or fully located in the occupied territory of Abkhazia. All of Georgia's thermal power capacities are privately owned.

Table 7: HPP ownership

Ownership, HPPs	Name	Installed capacity, MW	Annual output kW/h mn	Commissioning date
Energo-Pro Georgia	Atsi HPP	16	85	1941
	Chitakhevi HPP	21	110	1949-1950
	Dzevrula HPP	80	117	1956
	Gumati HPP Cascade (I, II)	67	376	1956-1958
	Lajanuri HPP	113	438	1960
	Ortachala HPP	18	80	1954
	Rioni HPP	48	325	1933
	Satskhenisi HPP	14	50	1952
	Zahesi HPP	37	260	1927-43
	Shaori HPP	38	114	1955
Eastern Energy Corp.	Khadori HPP	24	100	2004
Georgian Industrial Group	Small HPPs (<13 MW)	32	170	1976-1987
G.M.Georgian Manganese	Vartsikhe HPP Cascade (I,-IV)	256	1000	1976-1987
Georgian Water & Power	Zhinvali HPP	134	350	1985
Inter RAO UES	Khrami HPP Cascade (I, II)	223	368	1947-1963
State owned	Enguri HPP	1300	3800	1978
	Vardnili HPP	220	663	1971
Others, privately owned	Small HPPs (<13 MW)	54	250	
Total		**2,694**	**8,656**	

Source: MENR , ESCO

Georgia has total installed electricity production capacity of 3,400 MW, including 2,700 MW of hydro capacities and 700 MW of thermal, the latter of which are reserve capacities only to meet peak load demand.

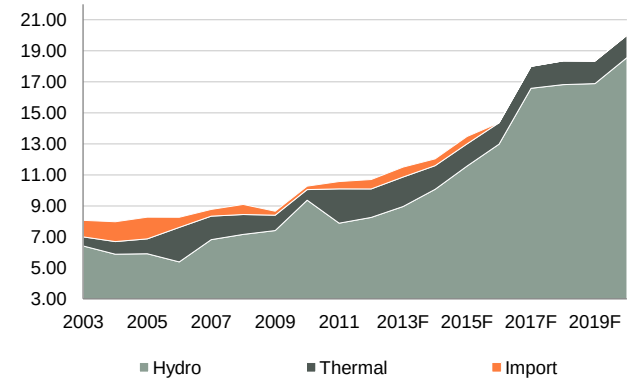
Table 8: TPP ownership

Ownership, TPPs	Name	Installed capacity, MW	Annual output kW/h mn	Commissioning date
Energo-Pro Georgia	G Power TPP	110	900	2006
Georgian Industrial Group	Tbilsresi TPP (Unit I,II)	260	1,800	1963-1972
Georgian Industrial Group	Tkibuli TPP	13.4	96	2011
Inter RAO UES	Mtkvari TPP	300	2,200	1990
Total		**683**	**4,996**	

Source: MENR, ESCO

The share of gas-fired thermal assets of the total will gradually decrease, in our view, to just 7% by 2020 as rising gas prices make thermal power uncompetitive versus cheaper hydro resources. In addition, dam projects under development will partially substitute the need for base load capacity.

Figure 42: Electricity supply structure forecasts

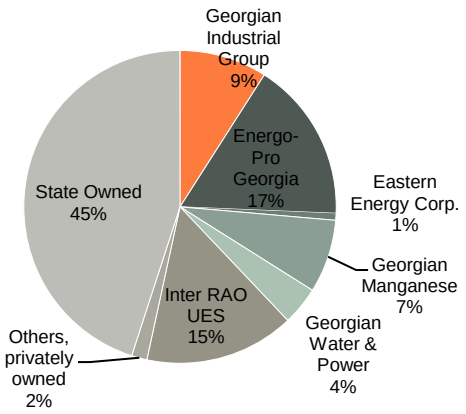


Source: ESCO, Bank of Georgia Research Estimates

On the back of US$ 4.4bn in investments (already-signed MOUs), the Ministry of Energy sees total installed capacity reaching around 4,100 MW by 2015 (700 MW in new generation capacities) and 6,000 MW by 2020 (an additional 1,900 MW). Currently, the GoG is seeking investments for 41 greenfield projects (each below 100 MW capacity) with total projected capacity of around 450 MW.

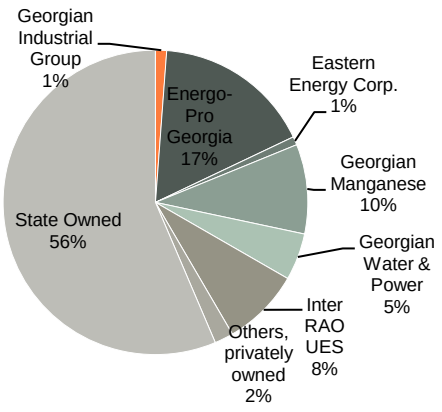
The largest private investor in the electricity generation sector is Energo-Pro Georgia, which owns up to 17% of total installed capacity, followed by Inter RAO UES and Georgian Industrial Group with 15% and 9%, respectively. Georgian Manganese (which is also the largest electricity consumer) accounts for 7%.

Figure 43: Ownership structure of total generation assets, 2011



Source: GNEWRC

Figure 44: Ownership structure of hydro generation assets, 2011



Source: GNEWRC

Georgian Industrial Group

Georgian Industrial Group (GIG) is the country's largest diversified industrial group with investments in coal mining, electricity generation, machinery production, real estate, liquefied petroleum gas stations, and other segments.

GIG owns 6 small HPPs with 32 MW of total installed capacity. The company also owns the 260 MW gas-fired Tbilsresi TPP and the 13 MW coal-fired Tkibuli TPP. Over the mid-term, the company plans to expand its portfolio of generation assets by constructing/upgrading thermal and hydro plants.

Energo-Pro Georgia and Inter RAO UES are described in more detail under the distribution section of this report.

Enguri HPP and Vardnili Cascade

The Enguri HPP and Vardnili Cascade are the largest electricity generations assets in the country, accounting for 36% of 2011 production and 45% of installed capacity. The Enguri complex actually encompasses two separate entities: the Enguri HPP (installed capacity of 1,300 MW: 5 units each of 260 MW capacity) and the Vardnili Cascade (Vardnili 1 – 220 MW; Vardnili 2, 3, 4 – 40 MW each, which are not currently operational).

The Enguri HPP generation assets are located on the Abkhaz side of the administrative border (currently occupied), while its arch dam is on Georgian-controlled territory. The Vardnili Cascade is located fully in occupied Abkhazia. Both the Enguri HPP and Vardnili Cascade remain in the ownership of the Georgian government. The government of Georgia operates the assets. Part of the generated electricity is consumed by Abkhazia and part is consumed domestically.

One stage of rehabilitation has been completed at the Enguri HPP and the second stage was launched in 2010. In 2008, three units, the tunnel, and the dam were rehabilitated. Currently, the rehabilitation of the remaining two units is in progress. The EBRD and European Investment Bank (EIB) provided around EUR 40mn in debt financing and the European Commission provided a EUR 5mn grant. The plant is scheduled to be at designed capacity by 2014.

G-Power

Energo-Pro acquired the G-Power TPP in 2011 from Energy Invest. The plant has two 55 MW gas turbines, with the potential to increase generation capacity by 40 MW.

Mtkvari TPP

Inter RAO UES acquired the Mtkvari TPP from AES Corporation in October 2003 after the latter decided to exit Georgia. The plant has two units, each with an installed capacity of 300 MW. The second unit has not been operational since an explosion in 2002.

Tbilsresi TPP

Tbilsresi TPP was privatized in February 2010 and is 100%-owned by a subsidiary of Georgian Industrial Group. The plant has two units, each with installed capacity of 130 MW. GIG also owns the newly built coal-fired 13 MW Tkibuli TPP.

Currently there are 44 MoUs signed between private developers and the GoG for the construction of new HPPs, with total installed capacity of 2,600 MW. Up to 10 HPPs with projected installed capacity of around 340 MW are already under construction. Feasibility studies and permitting are largely completed on another 15 projects, and construction of these projects is expected to start in the coming months.

Table 9: Pipeline of hydropower plants

	Company	Name of the project	Capacity, MW	Annual generation, GWh	Construction Commencement Date	Construction Completion Date	Investment, US$ mn
Norway	Clean Energy	Adjaristskali HPP I	26	128	Oct 2012	Apr 2015	58
		Adjaristskali HPP II	14	66	Oct 2012	Apr 2015	30
		Adjaristskali HPP III	6	32	Oct 2012	Apr 2015	13
		Chorokhi HPP	36	182	Oct 2012	Apr 2015	80
		Koromkheti HPP	21	113	Oct 2012	Apr 2015	46
		Vaio HPP	40	196	Oct 2012	Apr 2015	89
		Zomleti HPP	31	147	Oct 2012	Apr 2015	69
Turkey	Adjar Energy	Khelachauri HPP	36	154	Jan 2012	Dec 2016	69
		Kirnati HPP	35	173	Jan 2012	Dec 2016	57
	ATAÇ	Lekarde HPP	20	107	May 2013	Jan 2016	32
		Magna HPP	21	106	May 2013	Jan 2016	33
	EMCT	Gubazeuli HPP VI	3	20	Dec 2011	Dec 2013	5
	Georgian Urban Energy	Paravani HPP	78	425	Jul 2009	Jul 2013	125
	KGM	Bakhvi I HPP	15	85	Jun 2013	Aug 2017	42
		Bakhvi HPP II	20	110	Dec 2011	Nov 2013	35
		Bakhvi HPP III	6	35	Oct 2011	Aug 2012	10
		Bakhvi HPP V	2	10	Jan 2012	Jul 2013	3
	Kolin Construction	Tsageri HPP	110	570	Jul 2012	Feb 2017	200
	Optimum Energy	Abuli HPP	20	129	Apr 2012	May 2014	39
		Akhalkalaki HPP	15	85	Apr 2012	Mar 2014	29
		Arakali HPP	11	63	Apr 2012	May 2014	22
Georgia	Alliance Energy	Nabeglavi HPP	2	13	Dec 2011	May 2013	3
	Caucasus Energy and Inf.	Mtkvari HPP	43	200	Dec 2009	Sep 2015	65
	Energo Aragvi	Aragvi HPP	8	50	Feb 2012	Feb 2015	8
	Energy	Larsi HPP	20	98	Jul 1905	Oct 2013	20
	Georgian Investment Group	Khobi HPP I	47	247	Nov 2014	Nov 2017	81
		Khobi HPP II	40	221	Dec 2011	Apr 2015	65
	GGEDC	Shilda HPP	5	28	Oct 2011	Oct 2013	6
	Namakhvani	Namakhvani HPP	450	1677	2012	-	800
	Feri	Khadori 2	5	35	2012	2014	4
	Machakhela HPP LLC	Machakhela HPP I	28	120	2013	2016	35
		Machakhela HPP II	27	130	2013	2016	30
	Georgian Railway Construction Ltd.	Nenskra HPP	210	1200	Apr 2012	Nov 2017	630
	Hydro Development Comp.	Kintrishi HPP	5	30	Mar 2012	Jul 2014	8
	Rusmetal	Lukhuni HPP I	11	66	May 2015	Dec 2019	16
		Lukhuni HPP II	12	74	Aug 2010	Dec 2014	12
		Lukhuni HPP III	8	46	May 2020	Dec 2024	18
Czech Rep.	Energo-Pro Georgia	Alpana HPP	44	236	Apr 2014	Apr 2018	117
		Sadmeli HPP	125	620	Nov 2011	Mar 2016	250
	Zoti Hydro	Kvirila HPP	5	22	Dec 2010	Dec 2015	11
		Zoti HPP	36	144	Dec 2010	Dec 2015	75
Georgia-USA	Darial-Energy	Dariali HPP	109	521	Nov 2011	May 2014	135
Czech Rep.	Wind Energy Invest	Paravani WPP	50	170	May 2013	Nov 2014	101
India	Trans Electrica Ltd.	Khudoni HPP	702	1500	Apr 2012	Nov 2017	776
	Total		**2,557**	**10,385**			**4,351**

Generation Tariffs

Hydropower Plants (HPPs)

HPPs are regulated by a single constituent tariff, which nonetheless differentiates between HPPs built before August 1, 2008, those that became operational after 1 August 2008, and those with less than 13 MW of installed capacity.

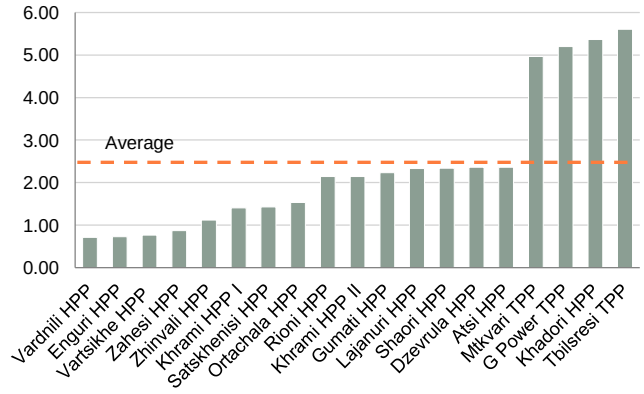
Tariffs for HPPs built after August 1, 2008 and for existing HPPs of less than 13 MW capacity are fully deregulated. Tariffs for HPPs built before August 1, 2008 with more than 13 MW installed capacity are regulated by GNEWSRC.

Thermal Power Plants (TPPs)

A two-tier tariff is applied for relatively high-cost electricity producers, including gas-fired TPPs. The tariff consists of a guaranteed capacity payment, based on the company's fixed costs, and a production-based payment, which covers generation costs.

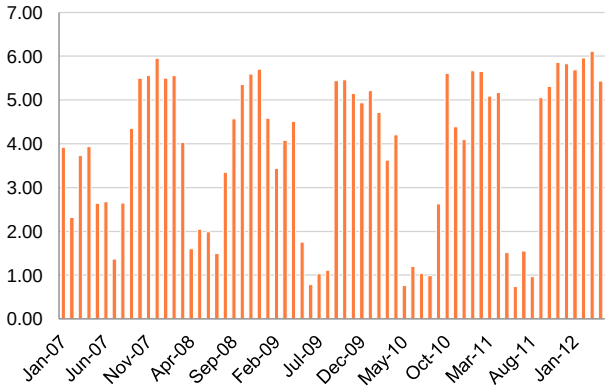
The average generation tariff in Georgia is GEL 0.0392/KWh, or approximately US$ 0.024/KWh, though it varies by generation asset. For example, the Enguri HPP has a tariff of US$ 0.0072/KWh, while G-Power has a tariff of US$ 0.056/KWh net of VAT.

Figure 45: Generation Tariffs, US$ ¢/KWh, 2011



Source: ESCO, Bank of Georgia Research Estimates

Figure 46: Monthly Weighted Average Tariff of the Balancing Electricity Sold by ESCO, 2007-2012



Source: ESCO, Bank of Georgia Research Estimates

The tariffs at which ESCO sells electricity to balance the market can be used for reference to wholesale market prices. The monthly weighted average electricity price is relatively low in the summer, around GEL 0.02 (US$ 0.01), compared to around GEL 0.09 (US$ 0.06) in the winter.

The variation is the result of the seasonality of hydro generation assets. HPPs get sufficient volumes of river water during the summer and are able to cover the country's needs, whereas hydro power is unable to satisfy Georgia's electricity needs in the winter. The shortfall is covered by relatively expensive thermal power and imports.

Maps of power plants of Georgia

Source: USAID, Bank of Georgia Research

Transmission

The backbone of the transmission network is a 500 kV line, connecting Georgia to Russia and Azerbaijan, and running through Tbilisi and northwest Georgia where the largest power plants (Enguri and Vardnili HPPs) are located. The Georgian grid is inter-connected with Russia through 500 kV and 220 kV lines (through Abkhazia), with Azerbaijan at 500/330 kV lines, and with Armenia and Turkey at 220 kV lines. There are also isolated 110 kV connections with Armenia and Russia.

The transmission network was one of the Georgian electricity system's major weaknesses. Mismanagement in the 1990s hit the system with high technical losses, electricity theft, and a lack of investment. Since 2003, investments have significantly improved stability. At the moment, Georgia's transmission network operates 500, 330, 220, 110, and 35 kV lines, with a total of 11,297 km of lines.

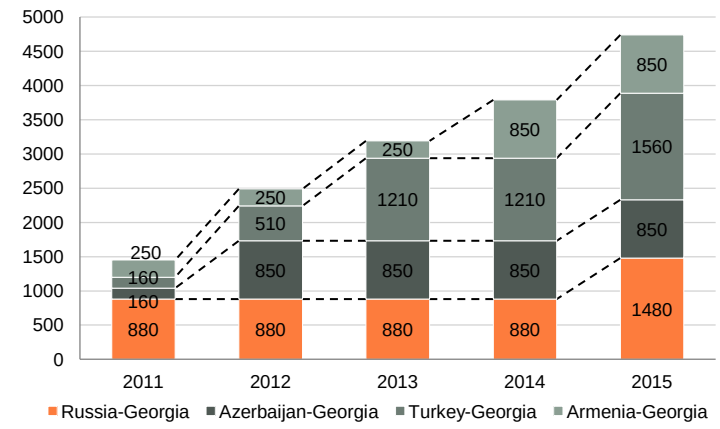
Total transmission capacity to Turkey will jump more than 7.6x to 1,210 MW when new 400 kV and 154 kV lines are commissioned in 2013. Currently, the country's export capacity to Turkey is limited to 160 MW by a 220 kV line, which will be used only in emergency situations once the new lines come on stream. The new line is being constructed within the framework of the Black Sea Transmission Network (BSTN).

Transmission capacity to Azerbaijan will rise more than 5.3x to 850 MW after the rehabilitation/construction of 500 kV and 330 kV lines, slated to be completed in 2012.

GSE also plans to increase export capacity to Armenia almost 3.4x to 850 MW once the construction of a new 500 kV line is completed in 2014.

Georgia's transmission capacity to Russia will rise 1.68x to 1,480 MW by 2015. Georgia plans to construct a new 500 kV line connecting Russia with Georgia. The current transmission capacity is 880 MW.

Figure 47: Cross border transmission line development, cumulative, MW



Source: GSE

Table 10: GSE existing and planned transmission lines

Country	Voltage, kV	Export Capacity, MW				
		2011	2012	2013	2014	2015
Russia-Georgia	500	600	600	600	600	600
	500 (Planned)	-	-	-	-	600
	220	160	160	160	160	160
	110	60	60	60	60	60
	110	60	60	60	60	60
	Total	**880**	**880**	**880**	**880**	**1480**
Azerbaijan-Georgia	500 (Planned)	-	600	600	600	600
	330	160	250	250	250	250
	Total	**160**	**850**	**850**	**850**	**850**
Turkey-Georgia	400 (Planned)	-	350	700	700	700
	400 (Planned)	-	-	-	-	350
	220	160	160	160	160	160
	154 (Planned)	-	-	350	350	350
	Total	**160**	**510**	**1210**	**1210**	**1560**
Armenia-Georgia	500 (Planned)	-	-	-	600	600
	220	160	160	160	160	160
	110 (will not be used)	50	50	50	50	50
	110	40	40	40	40	40
	Total	**250**	**250**	**250**	**850**	**850**
Total		**1450**	**2490**	**3190**	**3790**	**4740**

Source: GSE

Georgia's transmission system is controlled by three companies: Georgian State Electrosystem (GSE), EnergoTrans (100% owned by GSE), and SakRusEnergo (50/50 Georgian/Russian ownership).

Georgian State Electrosystem

100% state-owned GSE operates 220/110/35 kV overhead lines and 91 substations with total installed capacity of 8,400 MW, including three 500 kV substations. The operator is also responsible for electricity dispatch.

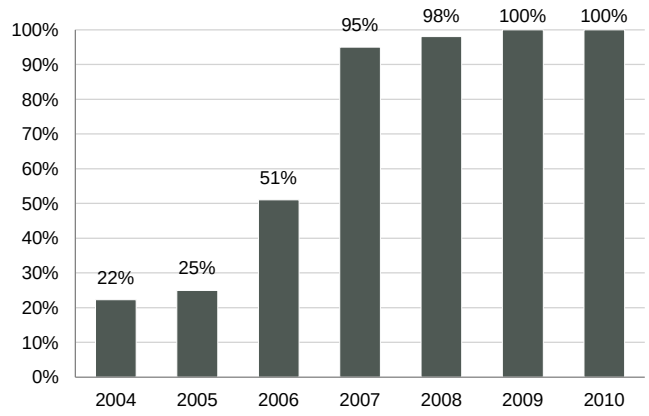
Table 11: GSE lines by transmission capacities

GSE Transmission Capacity				
Lines		Substations		
Voltage	**Length (km)**	**Voltage**	**No.**	**Capacity**
220 kV	1583.3	500 kV	3	3439.3
110 kV	893.2	220 kV	17	4371.4
35 kV	461.8	110 kV	24	410.6
		35 kV	47	178.9

Source: GSE

The transmission tariff collection rate increased to 100% in 2009 from as low as 22% in 2004. Moreover, the implementation of a number of rehabilitation projects increased network reliability, cut technical losses, and helped ensure uninterrupted power transmission.

Figure 48: Ownership structure of total generation assets, 2011



Source: GNEWRC

From 2004 to 2010, GSE invested over GEL 200mn (US$ 123mn) and completed the following projects:

Table 12: GSE planned investment projects

Type of project	Voltage	Location	Purpose
Rehabilitation	500/330/220 kV substations	Gardabani	Rehabilitation of substations to improve interconnection with neighboring countries.
Rehabilitation	220 kV Senaki 1,2 OHL and substations	Menji-Tskaltubo	Transmission line for electricity from planned Namakhvani HPP into Turkey and increase of capacity transmission to the Poti Industrial Zone
Construction	20/110 kV double-circuit OHL	Menji-Khorga-Poti	Transmission line will supply electricity to Poti Free Industrial Zone, which is aimed at supporting the development of the transportation sector and creating a regional logistics center in Poti.
Construction	double chained 110 kV line	Trialeti-Tseva	The construction was implemented within the framework of the construction of a railway line connecting Georgia to Turkey. The line will provide electricity to the railway.

Source: GSE

Aside from the transmission business, GSE also holds a dispatch license.

SakRusEnergo

Established in 1996, SakRusEnergo is a Russian-Georgian state conglomerate (50-50%) that owns and operates 500/330/220 kV high-voltage lines. Since 1996, it has completed several rehabilitation projects on its 500 kV line, improving network stability.

Energotrans

In 2009, Energotrans (100% owned by the GSE) broke ground on the most important project in the sector in recent years, the Black Sea Transmission Network (BSTN), which will see the construction of a new 500 kV overhead line connecting Gardabani-Akhaltsikhe-Zestaponi, a 400 kV line from Akhaltsikhe to the Turkish border, and a 500/400/220 kV substation with an HVDC back-to-back station in Akhaltsikhe.

Table 13: Lines/Stations to be constructed

Voltage	Connection/Location
500 kV OHL	Gardabani-Akhaltsikhe-Zestaponi (for domestic use and access to further lines to Turkey)
400 kV OHL	Akhaltsikhe to Turkish border
500/400/220 kV substation	Gardabani/Akhaltsikhe/Zestaponi/Marneuli (for above line)
HVDC back to back station	Akhaltsikhe (for above line)

Source: GSE

The cost of the project is estimated at EUR 300mn. It will be financed by the European Commission (EC), the Neighbourhood Investment Facility (NIF), Kreditanstalt fuer Wiederaufbau (KfW), the EBRD, the European Investment Bank (EIB), and the GoG, and is scheduled for spring 2013 completion.

The 500/400 kV overhead lines are scheduled to be completed in July 2012 with 500/400/220 kV substations (with an HVDC back-to-back station) scheduled to be completed in spring 2013. The first 350 MW unit of the back-to-back station is expected to be operational by summer 2012.

The goals of the BSTN project are to improve the stability of the Georgian electricity system, ensure uninterrupted power supplies to southern Georgia, and enable power producers to increase export capacities to Turkey and Eastern Europe.

Transmission Tariffs

Transmission tariffs are set by the GNEWRC and are based on the volume of electricity transferred (postage-mark principle), regardless of distance. Unlike certain other countries, there is no charge for generation capacity and consumer tariffs reflect transmission costs.

Table 14: Transmission tariffs by type of lines

Voltage	Tetri/KWh	US$ cent/KWh
35-110-220 kV (GSE)	0.5	0.31
6-10 kV (GSE)	1.11	0.68
500kV (Sakrusenergo)	0.18	0.11
Dispatch (GSE)	0.15	0.09
Total transmission tariff for 35-110-220 kV	**0.83**	**0.51**
Total transmission tariff for 6-10kV	**1.44**	**0.88**

Source: GNEWRC

The 500 kV line forms the backbone of Georgia's transmission system. Depending on consumers' needs, electricity can be delivered by 35-110-220 kV (US$ 0.0051/KWh aggregate tariff) or 6-10 kV (US$ 0.0088/KWh aggregate tariff) lines.

The aggregate transmission tariffs consist of 500 kV line, dispatch, and either 35-110-220 kV or 6-10 kV line tariffs as electricity flows through different voltage lines.

Map of transmission network of Georgia

Source: USAID, Bank of Georgia Research

Distribution

Distribution companies account for up to 80% of total electricity consumption. The two main consumption groups in Georgia are direct consumers (large industrial enterprises) and three distribution companies, Energo-Pro Georgia, Telasi, and Kakheti Energy Distribution (the first two also own some generating assets).

Energo-Pro Georgia

Having entered the market in 2007, Energo-Pro Georgia is now the largest player in the electricity industry. Its parent company, Czech-based Energo-Pro, also owns generation assets in Turkey, Armenia, Bulgaria, and the Czech Republic, but the majority of its assets are in Georgia.

Energo-Pro Georgia boasts a 61% market share (excluding the occupied regions of Abkhazia and South Ossetia) and covers all of Georgia except the capital Tbilisi and the eastern Kakheti region. Energo-Pro Georgia owns the country's largest distribution company, which distributes electricity to up to 70% of Georgia's territory and serves approximately 862,000 customers, including 820,000 households and 42,000 commercial and state organizations.

It also owns and operates 15 small- and medium-sized HPPs with total installed capacity of around 470 MW, as well as the 110 MW gas-fired G-Power (100% ownership).

Energo-Pro Georgia is also actively involved in electricity trade with neighbouring countries. The company is building a new 154 kV high-voltage transmission line connecting Georgia to Turkey. The project cost is around US$ 123mn. It is also planning to construct three HPPs in the coming years – the 71 MW Alpana HPP, the 97 MW Sadmeli HPP, and the 41 MW Zoti HPP.

Table 15: Energo-Pro Georgia's hydro generation assets (>13MW)

Name	Installed Capacity, MW	Annual output GWh	Commissioned
Atsi HPP	16	85	1941
Chitakhevi HPP	21	110	1949-1950
Dzevrula HPP	80	117	1956
Gumati HPP Cascade (I, II)	67	376	1956-1958
Lajanuri HPP	113	438	1960
Ortachala HPP	18	80	1954
Rioni HPP	48	325	1933
Satskhenisi HPP	14	50	1952
Zahesi HPP	37	260	1927-43
Shaori HPP	38	114	1955
Total	**452**	**1,995**	

Source: Energo-Pro Georgia

Telasi - INTER RAO UES

Russia's INTER RAO UES is the second largest private investor in the sector. The company owns 75% of the distribution company Telasi (24.5% is owned by the GoG and the rest by minority shareholders, mostly former employees). The company mainly provides electricity to Tbilisi and the surrounding region. It has approximately 492,000 customers and a 35% market share in distribution as of 2011 (excluding Abkhazia and South Ossetia).

In 1998, previous owner AES Corporation acquired a controlling stake from the state. With the electricity system near collapse as a result of neglect and corruption, AES-Telasi faced significant challenges during its time in Georgia. Due to financial difficulties, AES Corporation sold its stake in 2002 to INTER RAO UES.

INTER RAO UES also owns one of Georgia's largest hydropower plants, the Khrami HPP Cascade (I, II) with 223 MW of total installed capacity, as well as the country's largest gas-fired Mtkvari TPP, with 300 MW of total installed capacity.

INTER RAO UES has also expressed an interest to build one or more hydro projects with up to 100 MW of installed capacity.

Table 16: INTER RAO UES's generation assets

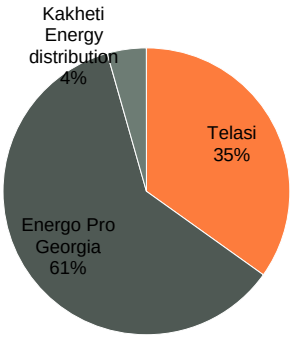
Name	Installed Capacity, MW	Annual output GWh	Commissioned
Mtkvari TPP	300	2,200	1990
Khrami HPP Cascade (I, II)	223	368	1947-1963
Total	**553**	**2,568**	

Source: INTER RAO UES

Kakheti Energy Distribution Company

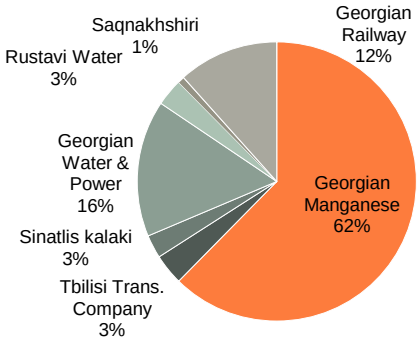
Acquired by Lithuania's Ahema Group in 2008, the Kakheti Energy Distribution Company delivers electricity to eastern Georgia, especially the Kakheti region. As of 2011, the company had a market share of just 4% (excluding Abkhazia). The company is contracted to invest up to GEL 15mn to finance individual re-metering and grid rehabilitation projects, but it is currently on hold.

Figure 49: Market share of distribution companies, 2011 (excl. Abkhazia)



Source: ESCO

Figure 50: Direct consumers' consumption breakdown, 2011

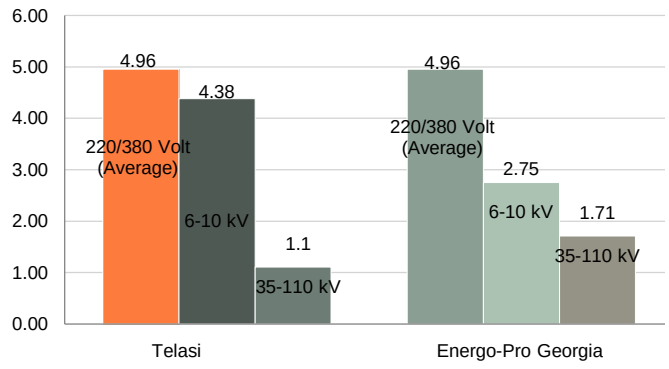


Source: ESCO

Distribution Tariffs

Distribution operations are conducted mainly via 220/380 V, 6-10 kV, and 35-110 kV lines. All electricity distribution tariffs are also set by the GNEWRC and vary by voltage lines due to the size of technical losses and distribution costs.

Figure 51: Distribution tariffs, 2012, US$ ¢



Source: ESCO

Consumption

Georgia's wholesale consumer market consists mainly of 7 large industrial enterprises that qualify as direct consumers (annual consumption above 7 GWh).

Table 17: Direct Consumers, 2011, GWh

	Annual consumption
Georgian Manganese	1,122
Georgian Water & Power	284
Georgian Railway	210
Tbilisi Trans. Company (Tbilisi Metro)	64
Rustavi Water	57
Sinatlis Kalaki (Tbilisi Light)	49
Saqnakhshiri	14

Source: ESCO

As per Georgia's long-term state policy, direct consumers can buy electricity directly from suppliers. Currently, the legislation sets the annual electricity consumption threshold for direct consumers at 7 GWh. By 2017, the cap is expected to be gradually cut to as low as 1 KWh as part of the push to liberalize the market.

The retail segment (households, small businesses, government institutions, etc.) holds a 76% share of consumption, including 35% in Tbilisi alone.

Table 18: Annual direct consumption threshold

Period	Annual consumption
2006-2009	≥ 30 GWh
2010-2012	≥ 7 GWh
2013-2015	≥ 3 GWh
2016-2017	1 GWh
2017	1 KWh

Source: Georgian Energy Policy

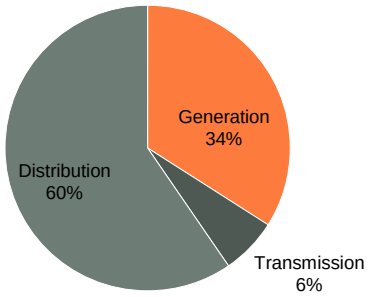
Final retail and wholesale tariffs

The regulator sets the final retail tariff, which consists of generation, transmission, dispatch, and distribution tariffs.

Based on our estimates, distribution accounted for around 60% of the final consumer tariff, followed by generation (34%), and transmission and dispatch (6%). The distribution portion of the final tariff is higher than in other countries. In Russia, for example, distribution accounts for 40% of the final consumer tariff, while generation accounts for 60%.

In Georgia, the high proportion of distribution is related to the fact that the GNEWSRC allows distribution companies to recover previously incurred capex costs (mainly network upgrade and individual re-metering projects). Historically, Georgian distribution companies suffered from very high technical and commercial losses and an inefficient system. For example, in 2005 Telasi reported losses of around 35%. By 2011, the number decreased sharply to 15%.

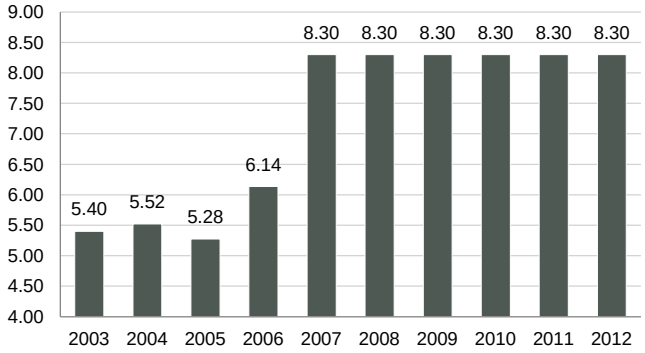
Figure 52: Contribution of each segment of the sector into the final retail tariff



Source: Bank of Georgia Research Estimates

The recalculation of tariffs can take place as changes in inputs, macroeconomic parameters, companies' cost structures, and the scale of investments dictate. The average retail tariff increased 45% from 2003 to 2007, but has remained stable over the last 6 years at around US$ 0.0773/KWh.

Figure 53: Average retail tariffs, US$ ¢/KWh, 2003-2012



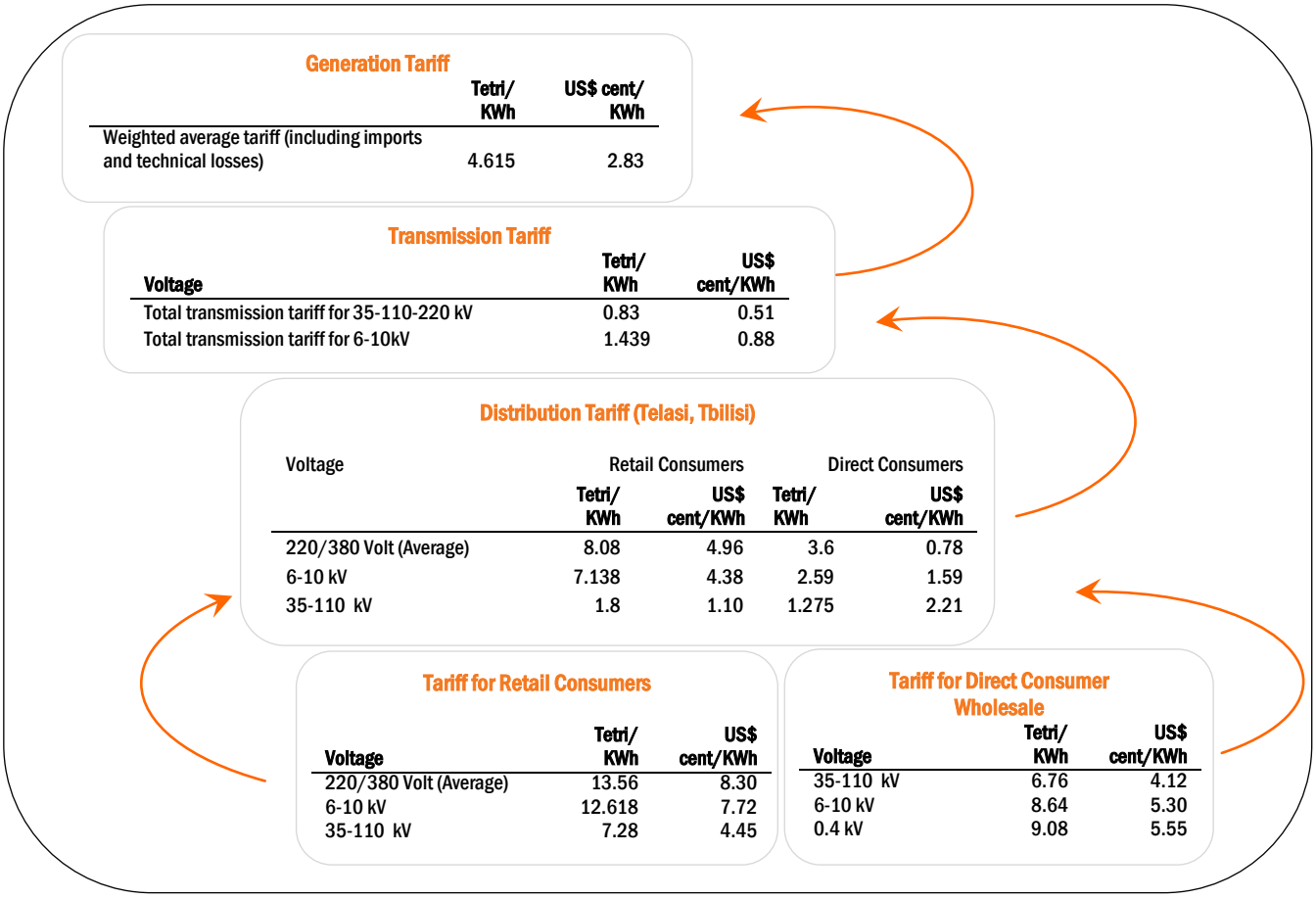
Source: MENR

Flow of Funds

The flow of funds within the system suggests that current tariffs offer all market participants a sufficient operating profit margin. However, due to lack of disclosure, it is difficult to estimate financial indicators.

We expect the tariff structure to shift over time with final tariffs remaining relatively stable. The shift will be driven by the introduction of new generating capacities following the commissioning of new power plants starting 2015. New producers' marginal costs are likely to be higher vs. fully depreciated existing hydro plants.

Diagram 4: Flow of Funds



In our view, the shift in the tariff structure should eventually affect the margins currently enjoyed by distribution companies; we view any transfer of this increase onto final retail consumers as unlikely and believe that the overall impact for distribution will be marginal as network capex requirements will be largely completed by that time.

Potential hikes in generation tariffs integrate well with the construction timeline for new HPPs as they require an average 3-5 years to complete. Moreover, Georgian generators should benefit more from export opportunities at that time as the Turkish market enters a growth phase. However, we do not expect the existing tariff structure to change until 2015.

Electricity sector SWOT

Strengths

- Liberalized market
- Government support for hydropower and willingness to implement further changes
- Investor-friendly legal and tax framework
- Fully deregulated tariffs for newly built HPPs
- High competitiveness within the region
- Low cost of generating hydropower
- High collection rates
- Electricity consumption growth
- Export potential

Weakness

- Market is still evolving and requires further harmonization with EU guidelines and other trade partners to spur international trade
- Transmission network issues need to be addressed in terms of access, congestion, and tariffs
- Individual metering uncompleted in rural areas
- Room for improved efficiency in the system

Opportunities

- Only 20% of Georgia's hydro resources utilized
- Small to medium greenfield hydro opportunities through the Build-Own-Operate (BOO) system
- Potential for exports to other markets, including Turkey in the near-term, Russia and the EU in the mid- to long-term
- Opportunities for regional cooperation between Georgia, Azerbaijan, and Armenia in mutual trade transit

Threats

- Unfavourable changes in political and economic environments of all potential trade partners
- Decrease in electricity demand in Turkey, as a result of slowdown of economic growth
- Decrease of electricity prices in Turkey
- Delays in development of generation and transmission capacities

Appendices

Financial Analysis – Hypothetical HPP Model

Assumptions

Debt Financing	70%	Corporate tax	15%
Equity Financing	30%	Property tax	1.0%
Equity Amount	600,000	Tariff growth rate	3.0%
Debt Amount	1,400,000	Carbon credit allowance coefficient (gr. per kWh)	0.3999
Debt Interest rate	11%	Carbon credit Price, US$	12
Debt Maturity, yrs	10	Export	80%
Cost of Equity	17%	Domestic Sales	20%
WACC	11.65%	Tariff Export, US$	0.09
Installed Capacity MW	1.00	Tariff Domestic, US$	0.04
Capacity Load	60%	Average Tariff, US$	0.08
Output KWh	5,256,000	Cost per MW, US$	2,000,000
Technical losses and own consumption	3%	SG&A cost, % of revenue	2%
O&M cost, % of revenue from electricity	3.0%	Transmission and system services, US$	0.015

Source: Bank of Georgia Research

Income statement, US$

Period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Revenue	**0**	**0**	**433,088**	**446,081**	**459,463**	**473,247**	**487,444**	**502,068**	**517,130**	**532,644**	**548,623**	**559,915**	**571,442**	**583,210**	**595,224**
Chg,y/y				*3%*	*3%*	*3%*	*3%*	*3%*	*3%*	*3%*	*3%*	*2%*	*2%*	*2%*	*2%*
COGS	0	0	-89,716	-89,403	-89,101	-88,810	-88,532	-88,265	-88,010	-87,769	-87,540	-88,002	-88,437	-88,013	-87,595
Gross profit	**0**	**0**	**343,372**	**356,678**	**370,362**	**384,437**	**398,913**	**413,803**	**429,120**	**444,875**	**461,083**	**471,913**	**483,005**	**495,197**	**507,628**
Gross margin			*79%*	*80%*	*81%*	*81%*	*82%*	*82%*	*83%*	*84%*	*84%*	*84%*	*85%*	*85%*	*85%*
SG&A	-8,319	-8,489	-8,662	-8,922	-9,189	-9,465	-9,749	-10,041	-10,343	-10,653	-10,972	-11,198	-11,429	-11,664	-11,904
EBITDA	**-8,319**	**-8,489**	**334,711**	**347,756**	**361,173**	**374,972**	**389,164**	**403,762**	**418,777**	**434,222**	**450,111**	**460,715**	**471,577**	**483,533**	**495,724**
EBITDA margin			*77%*	*78%*	*79%*	*79%*	*80%*	*80%*	*81%*	*82%*	*82%*	*82%*	*83%*	*83%*	*83%*
D&A	0	-36,000	-68,000	-68,000	-68,000	-68,000	-68,000	-68,000	-68,000	-68,000	-68,000	-68,000	-74,656	-74,656	-74,656
EBIT	**-8,319**	**-44,489**	**266,711**	**279,756**	**293,173**	**306,972**	**321,164**	**335,762**	**350,777**	**366,222**	**382,111**	**392,715**	**396,921**	**408,877**	**421,068**
EBIT margin			*62%*	*63%*	*64%*	*65%*	*66%*	*67%*	*68%*	*69%*	*70%*	*70%*	*69%*	*70%*	*71%*
Financial expenses	-132,000	-132,000	-216,722	-216,722	-216,722	-216,722	-216,722	-216,722	-216,722	-216,722	-216,722	-	-	-	-
PBT	**-140,319**	**-176,489**	**49,989**	**63,034**	**76,451**	**90,250**	**104,442**	**119,040**	**134,055**	**149,500**	**165,389**	**392,715**	**396,921**	**408,877**	**421,068**
Income tax expense	0	0	-7,498	-9,455	-11,468	-13,537	-15,666	-17,856	-20,108	-22,425	-24,808	-58,907	-59,538	-61,332	-63,160
Net profit	**-140,319**	**-176,489**	**42,490**	**53,579**	**64,983**	**76,712**	**88,776**	**101,184**	**113,947**	**127,075**	**140,580**	**333,808**	**337,383**	**347,546**	**357,908**

Source: Bank of Georgia Research

Financial Analysis – Hypothetical HPP Model

Project valuation

Project IRR	**19%**														
Project NPV	**$752,792**														
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
EBIT	-8,319	-44,489	266,711	279,756	293,173	306,972	321,164	335,762	350,777	366,222	382,111	392,715	396,921	408,877	421,068
-Tax expense	0	0	-7,498	-9,455	-11,468	-13,537	-15,666	-17,856	-20,108	-22,425	-24,808	-58,907	-59,538	-61,332	-63,160
-Tax shield on interests	0	0	-32,508	-32,508	-32,508	-32,508	-32,508	-32,508	-32,508	-32,508	-32,508	-	-	-	-
+D&A	0	36,000	68,000	68,000	68,000	68,000	68,000	68,000	68,000	68,000	68,000	68,000	74,656	74,656	74,656
-Capex	-900,000	-800,000	-	-	-	-	-	-	-	-	-	-166,400	-	-	-
-Increase in working capital	0	0	-9,388	-16,568	-1,065	-1,095	-1,126	-1,158	-1,190	-1,224	-1,259	-805	-825	-924	-941
FCFF	-908,319	-808,489	285,316	289,224	316,132	327,831	339,864	352,240	364,970	378,065	391,535	234,602	411,214	421,277	431,622
Terminal Value	3,478,020														

Source: Bank of Georgia Research

IRR sensitivity analysis

Tariff, US$ \ Cost per MW, US$	1,550,000	1,700,000	1,850,000	2,000,000	2,150,000	2,300,000	2,450,000
0.05	15%	13%	12%	11%	10%	9%	8%
0.06	18%	16%	15%	14%	13%	12%	11%
0.07	21%	19%	18%	16%	15%	14%	13%
0.08	23%	21%	20%	19%	17%	16%	15%
0.09	26%	24%	22%	21%	20%	18%	17%
0.10	28%	26%	24%	23%	22%	20%	19%
0.11	30%	28%	26%	25%	23%	22%	21%

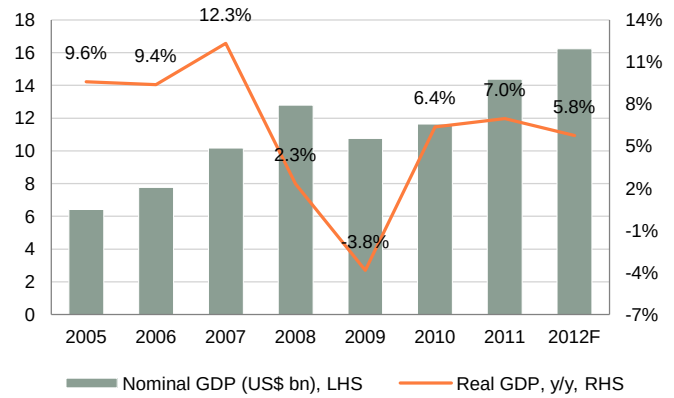
NPV sensitivity analysis

Tariff, US$ \ Cost per MW, US$	1,550,000	1,700,000	1,850,000	2,000,000	2,150,000	2,300,000	2,450,000
0.05	$187,876	$77,176	-$33,524	-$144,224	-$254,924	-$365,624	-$476,324
0.06	$486,881	$376,182	$265,482	$154,782	$44,082	-$66,618	-$177,318
0.07	$785,887	$675,187	$564,487	$453,787	$343,087	$232,387	$121,687
0.08	$1,084,892	$974,192	$863,492	$752,792	$642,092	$531,392	$420,692
0.09	$1,383,898	$1,273,198	$1,162,498	$1,051,798	$941,098	$830,398	$719,698
0.10	$1,682,903	$1,572,203	$1,461,503	$1,350,803	$1,240,103	$1,129,403	$1,018,703
0.11	$1,981,909	$1,871,209	$1,760,509	$1,649,809	$1,539,109	$1,428,409	$1,317,709

Source: Bank of Georgia Research

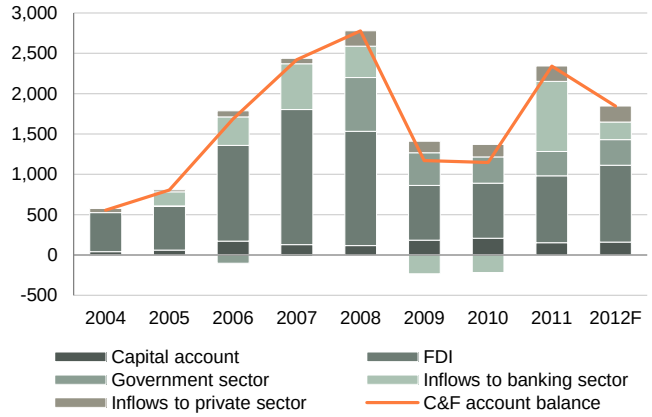
Georgian macro snapshot

GDP growth



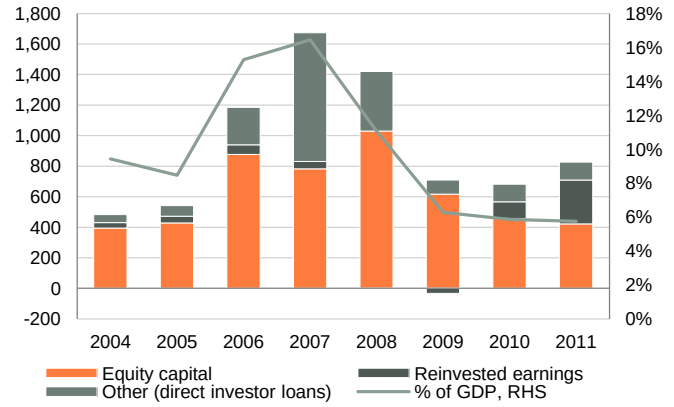
Source: Geostat, Bank of Georgia Research

Structure of capital and financial account balance, US$mn



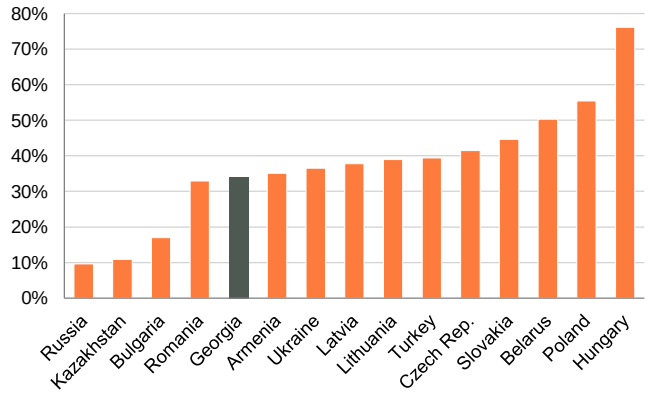
Source: National Bank of Georgia, Bank of Georgia Research

Foreign Direct Investment



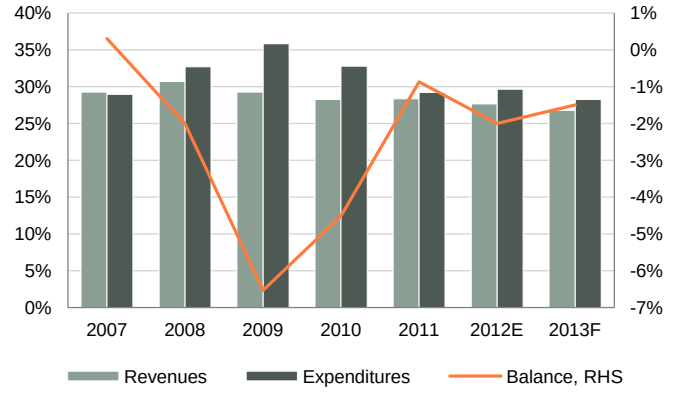
Source: National Bank of Georgia

Total government debt, % GDP



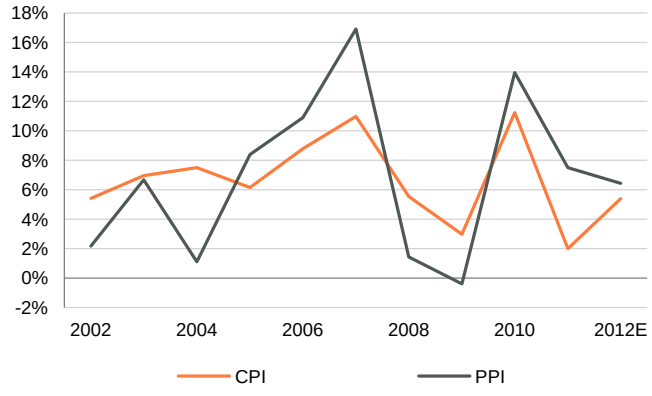
Source: Bloomberg

General budget execution, % of GDP



Source: Geostat, Bank of Georgia Estimates

CPI and PPI, eop, Chg y/y



Source: Geostat, Bank of Georgia Estimates

Contacts

Head of Research
Ekaterina Gazadze | egazadze@bog.ge

Associate Director
George Shengelia | gshengelia@bog.ge

Associate
Giorgi Iremashvili | giremashvili@bog.ge

Analyst
Sopho Khelashvili | skhelashvili@bog.ge

Bank of Georgia Research

29a Gagarin Str.
Tbilisi 0160, Georgia
Tel: +995 32 2444 444
Email: Research@bog.ge

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