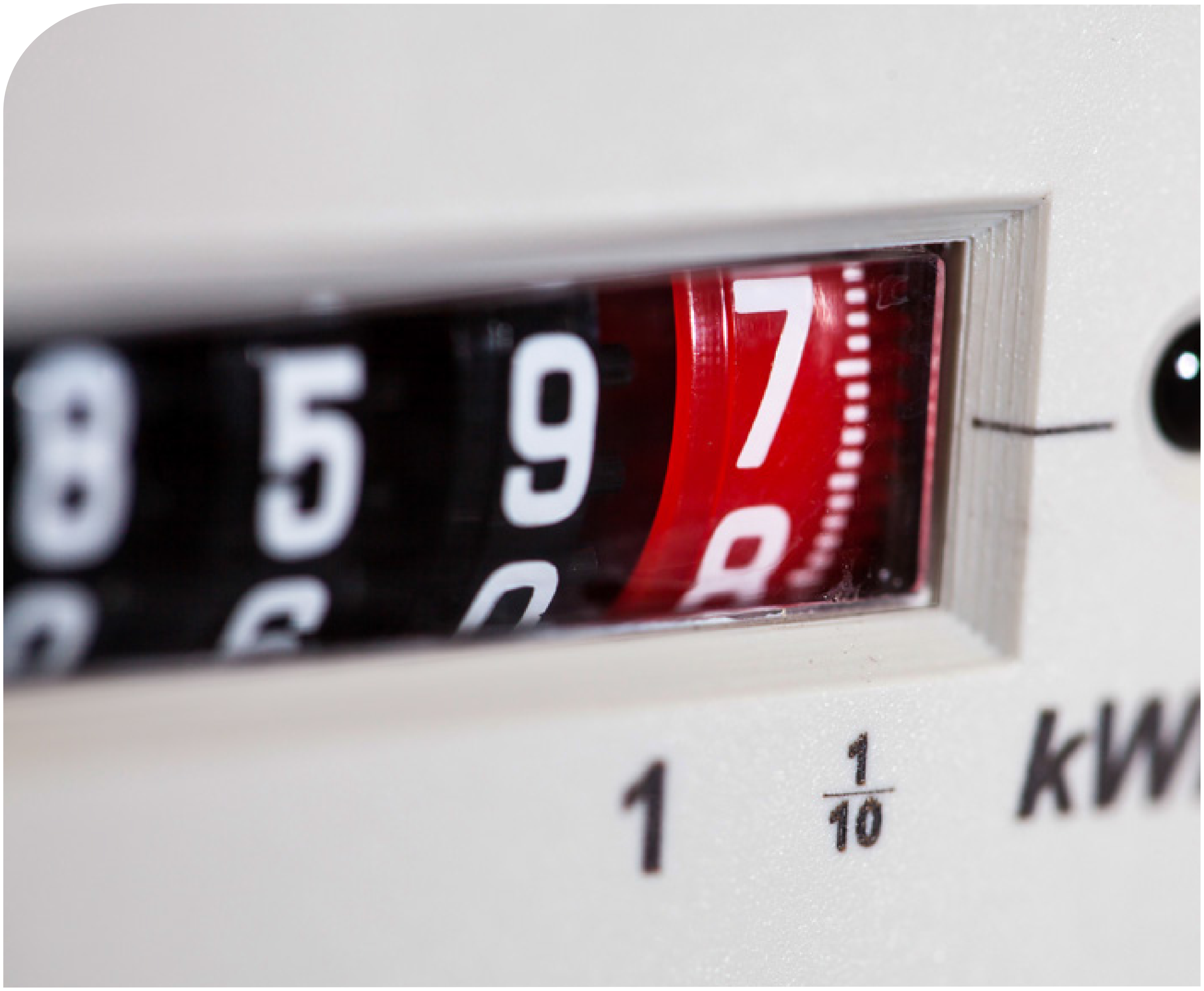
Georgia's Utilities Sector

Reforms in Progress



Georgia | Energy | Utilities

Industry Overview

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Terms and Definitions

ADB - Asian Development Bank
BWC - Batumi Water Company
CAPEX - Capital expenditures
CNL - Cost of network losses
CORR - Correction (adjustment coefficient)
CPI - Consumer Price Index (here: inflation rate in %)
ctrlOPEX - Controllable operational expenses
ENTSO-E - European Network of Transmission System Operators for Electricity
ESCO - Electricity market operator
EOI - Expression of interest
ET - EnergoTrans
EU - European Union
GC - Guaranteed capacity
GGU - Georgian Global Utility
GNERC - Georgian National Energy and Water Supply Regulatory Commission
GoG - Government of Georgia
GSE - Georgian State Electrosystem (Transmission system operator)
gW - Gigawatt
gWh - Gigawatt hour
GWP - Georgian Water and Power
HVDC - High voltage direct current
HPP - Hydro power plant
JV - Joint venture
kV - Kilovolt
kW - Kilowatt
kWh – Kilowatt hour
MDF - Municipal development fund
MENR - Ministry of environment and natural resources protection
MoA - Ministry of agriculture
MoE - Ministry of energy
MoU - Memorandum of understanding
MRDI - Ministry of regional development and infrastructure
mW - Megawatt
mWh – Megawatt hour
MWC - Mtskheta Water Company
NARUC - National Association of Regulatory Utility Commissioners
ncOPEX - Non-controllable operational expenses
NFA - National Food Agency
OPEX - Operational expenses
RAB - Regulatory asset base
RCB - Regulatory cost base
RWC - Rustavi Water Company
SRE - SakRusEnergo
SPA - State Procurement Agency
TOTEX - Total expenses
TPP - Thermal power plant
USoA - Uniform standard of accounts
UWSCG - United Water Supply Company of Georgia
WACC - Weighted average cost of capital
WSS - Water supply and sanitation

Executive Summary

Georgia took an important step toward EU integration by signing the Association Agreement in June 2014. EU integration processes require compliance with the legal standards of EU member countries. As an integral part of this process, Georgia is introducing legal reforms in the energy and water supply and sanitation (WSS) markets. The reforms are aimed at guaranteeing the financial sustainability of utility suppliers while ensuring stable electricity and WSS supplies.

The new model for setting prices for regulated utilities is a hybrid of "incentive-based" and "cost plus" models. This model aims to prevent sudden increases in utility prices and overinvestment, while allowing for a reasonable markup on the capital and operational expenses companies must incur for continued operations and innovation. Incentive-based regulation also rewards utilities for operational efficiency and penalizes poor performance.

"Incentive-based" regulation is aimed at reducing costs, while "cost plus" caps CAPEX for regulated companies for a given regulation period. Incentive-based regulation incentivizes companies to improve service quality in a cost effective way and allows them to retain savings from efficiency gains. The "cost plus" approach sets a ceiling on CAPEX, incorporating a specific return on the regulatory asset base (RAB) – assets used to conduct regulated activities. The weighted average cost of capital (WACC) for a utility is used as the allowed return on the RAB. The WACC measure is fixed by GNERC at 13.54% for the 2015-17 price control period.

The reform of electricity market price control regulation will pave the way for the WSS market, which is just embarking on reforms. The regulator plans to engage an independent utility consultant to efficiently implement reforms. Infrastructure needs to be rehabilitated to ensure continuous, high quality service supply to 100% of the population by 2020 – a goal set by the Government of Georgia (GoG). Moreover, there must be adequate revenue potential to generate much needed investor interest in the sector.

The necessary institutional framework is in place to ensure a smooth transition in the electricity and WSS markets. The experience of western countries shows the importance of an independent and transparent regulatory body. Georgian National Energy and Water Supply Regulatory Commission (GNERC), which regulates both the electricity and water markets, is financially independent from the GoG, with accountability mechanisms in place for the commission to remain impartial and efficient.

It is too early to evaluate the effects of the implemented reforms on the electricity and WSS market. International experience shows that successful reform implementation should result in increased productivity and higher service quality. The most significant indicator of effective implementation would be Georgia joining the European energy community and gaining access to the unified grid of EU countries – the European Network of Transmission System Operators for Electricity (ENTSO-E). Once connected to ENTSO-E, Georgia will be able to export electricity to Eastern European countries through energy swaps.

Power Supply Reform: Transparency, Competition, and Innovation

Georgia has made significant progress in reforming electricity generation, transmission, and distribution. The reforms have liberalized the electricity generation sector for newly built hydropower plants (HPPs): those built after August 2008 can charge market prices on generated electricity while HPPs built before August 2008 are regulated. Distribution companies have been offered a new incentive-based pricing model, which, if implemented properly, leaves room for innovation and development. The institutional reforms currently being implemented are aimed at transparent and efficient electricity sector regulation, independent of any influence from the GoG. The legal basis has been reworked for approximation to European energy market standards. Full liberalization of the electricity market and connection to the unified European grid (ENTSO-E) is expected to be finalized in 2017; time will tell just how efficiently the implementation will proceed.

Following the liberalization of generation, power supply has become one of the most attractive sectors for international and local investors. In 2014 alone, 145mW of installed capacity has been added to the grid in the form of small and medium sized hydro power plants. 23 hydropower plants with 1.5tW of installed capacity are in the pipeline and expected to become operational in the coming 7 years. According to estimates by the Ministry of Energy (MoE), Georgia only uses 1/5 of its total hydro resources and has ample potential for further development to satisfy local demand and supply cheap electricity to its trade partners, both existing and potential.

Amidst the liberalization of the supply side of the electricity market, customer protection is also being taken into account. The new methodology used to determine the end-user price of electricity sets a ceiling on how much a distribution company can earn per kWh supplied to the consumer. This keeps prices in check and is designed to leave a reasonable margin for the supplier. Customer service and satisfaction are also accounted for in the new by-laws adopted by the independent regulatory commission – Georgian National Energy and Water Supply Regulatory Commission (GNERC).

Transparent institutional and legislative framework

A solid institutional structure is of paramount importance in supporting sector reform. The Georgian electricity market has two leading regulatory bodies: the MoE is responsible for developing national policy and defining a long-term strategy for each link in the electricity value chain, while GNERC monitors the market and issues licenses for generation, transmission and dispatch, and distribution.

GNERC is an independent regulatory body, not subject to direct supervision from any other state authority, but accountable to parliament. GNERC's independence is guaranteed by a legally mandated, self-sufficient revenue stream. The commission's budget is funded predominantly from regulatory fees paid by all energy market participants (0.3% of the revenues of a given company), ensuring that the commission need not rely on state budget subsidies, which contributes to its credibility as an independent regulator. This independence is a primary requirement for synchronization with the EU energy market and is outlined in the best practices of energy market regulation. The head of the regulatory commission and 5 other commissioners are appointed by the Prime Minister of Georgia.

Table 1: Elements of regulatory discretion for the MoE and GNERC

	MoE	GNERC
Develops national policy for the sector	✔	
Develops a national strategy for emergencies and safety in the energy sector	✔	
Approves the list of system and inter-system transmission lines	✔	
Monitors the energy market		✔
Regulates tariffs		✔
Issues, modifies, and revokes licenses		✔
Mediates disputes and imposes sanctions		✔

Source: Law of Georgia on Electricity and Natural Gas, G&T Research

The legal basis for GNERC consists of the constitution and laws of Georgia, international treaties and agreements, the charter of GNERC and other legal acts, which outline its functions and authority.

The Law on Electricity and Natural Gas is the primary piece of legislation for the electricity sector. The law establishes the rules for the generation, transmission, distribution, and consumption of electricity. State policy for the sector's development must comply with this legislation. The law is one of the documents that define GNERC's functions and legal boundaries.

The Law on Independent National Regulatory Authorities sets the legal framework for the regulator's activities. According to this law, the regulatory body is created by the state, but the state has no authority over it; the regulator operates at its discretion within the scope of the authority defined by the law and GNERC's charter.

The Law of Georgia on Licenses and Permits entitles GNERC to issue licenses for generation, distribution, transmission and dispatch, as well as the electricity market operator license.

GNERC defines the mechanics of the electricity market through its by-laws. The commission adopts the country's grid code – a document outlining the technical specifications that a facility connected to a public electric network must meet and the rules that the facilities must adhere to in order to connect to a transmission or distribution network. The existence of a grid code is one of the requirements of the EU's Energy Directive. The rules for supply and consumption of electricity, determined by GNERC, are the main guidelines for business-to-customer relationships. The methodology for setting tariffs and fees, also outlined by the commission, is an internationally compliant document defining how regulatory audits are conducted and electricity prices are set in order to keep consumer prices in check while encouraging investment in electricity infrastructure by market players.

Table 2: The legal framework of the Georgian electricity market

	Primary legislation	By-laws / Policy documents
Law of Georgia on Electricity and Natural Gas	✔	
Law of Georgia on Independent National Regulatory Authorities	✔	
Law of Georgia on Licenses and Permits	✔	
State policy in Georgia's energy sector	✔	
The charter of GNERC		✔
Wholesale electricity market rules		✔
Rules of supply and consumption of electricity		✔
Methodology for setting the tariffs and fees		✔
Resolution on calculation of normative losses		✔
Resolution on setting the regulatory fees		✔
The grid code		✔

Source: Law of Georgia on Electricity and Natural Gas, G&T Research

Competitive value chain

Power Plants

HPPs account for up to 80% of electricity consumed in Georgia, followed by imports at 5-7%, and thermal power plants (TPPs) at 15-18%. TPPs are the second cheapest energy source and are most utilized September through April when HPP production is gradually reduced from its peak summer level. Imports are the most expensive source of electricity. In 2014, imports came from Russia (77%) and Azerbaijan (23%). Georgia also has the ability to import electricity from Turkey and Armenia, but it rarely does so.

Almost all generation assets in Georgia are privatized, with the exception of two state-owned large conventional (dam) hydropower plants, Enguri and Vardnili. Prior to obtaining a license for electricity generation, the developer of a new HPP signs a memorandum of understanding (MoU) with the government, conducts a feasibility study, acquires a generation license and applies for a construction permit. Construction permits must be approved by either local authorities (for HPPs under 50mW) or the ministry of economics and sustainable development of Georgia (for HPPs over 50mW).

Table 3: License and permit requirements for HPPs

	Installed capacity **(under 13mW)**	Installed capacity **(over 13mW)**
License and permit requirements	• MoU • Construction permit • Land acquisition/rent agreement • Environmental permit*	• MoU • Generation license • Construction permit • Land acquisition/rent agreement • Environmental permit

**Environmental permits are not required for HPPs with installed capacity below 2mW*
Source: GNERC, G&T Research

Domestic producers sell electricity domestically to distribution companies, direct customers, and the electricity market operator – ESCO, and/or export electricity to neighboring countries. ESCO manages electricity sales to balance market supply and demand. Furthermore, ESCO manages the electricity generated by the TPPs in winter months. ESCO is compensated for its efforts through a service fee set by GNERC, which currently stands at GEL 0.0019/kWh and is integrated into the end-user bill. HPPs with installed capacity below 13mW can sell generated electricity directly to any consumer with no consumption threshold in place. Currently, Georgian electricity is only exported to Russia, Azerbaijan, Armenia, and Turkey, with the latter making up the largest market.

All newly built HPPs are required to sell 20% of annual generation volumes during the winter months to ESCO at a pre-determined price for 10 years. The price is set in the initial MoUs signed with the government during the expression of interest (EOI) stage.

Transmission and Distribution

To accommodate the booming generation sector, the transmission infrastructure has been updated by the transmission system operator – Georgian State Electrosystem (GSE). GSE was recently granted the status of a transmission system operator (TSO) as part of the reformed legal base for the electricity market. The EU Energy Directive stresses the importance of assigning TSO status to the entity that operates transmission lines and conducts dispatch activities. Further details on GSE's regulatory scope are provided in Table 4.

GSE owns 75% of Georgia's high voltage transmission lines (1,873km in total). Additional transmission capacity will be added over the coming decade, according to the MoE's transmission network development plan, published in April 2015. Up to EUR 600mn will be invested in upgrading transmission and power grid infrastructure, adding an additional 2,400mW of cross-border transmission capacity. The National Control Center (NCC), which is located in GSE's headquarters, operates the transmission grid and ensures overall system reliability in day-to-day operations as well as in emergency situations.

Three transmission companies, including GSE, operate in Georgia and transport electricity from the generation assets to electrical substations. EnergoTrans (ET), another transmission license holder (fully owned by GSE), owns and operates a back-to-back substation crucial for exports as it converts the direct current from Georgia to make it compatible with Turkey's system. ET also owns and operates the 400kV high voltage direct current (HVDC) Akhaltsikhe-Borcka line that transports electricity efficiently at high speed to Turkey. The third transmission company is SakRusEnergo (SRE), a 50-50 JV between the Georgian and Russian governments. SRE owns and operates 220/330/500kV lines, including the major export line to Russia, the 500kV Kavkasioni line.

As the only holder of a dispatch license, GSE constantly monitors the power system to ensure stable electricity supply. Dispatchers determine the most cost-efficient generation source to meet increased demand and procure the needed electricity. GSE's dispatch fee is regulated by GNERC and is currently set at GEL 0.00102/kWh. The fee is paid by distributors, exporters, and direct customers.

Table 4: Elements of regulatory discretion for GSE and ESCO

	GSE	ESCO
Owns and operates high voltage transmission lines	✔	
Conducts auctions for transmission capacity allocation for exports to Turkey	✔	
Registers bilateral contracts	✔	
Sole dispatch licensee on the market	✔	
Ensures grid stability	✔	
Balances the market		✔
Purchases guaranteed capacity from TPPs		✔
Imports electricity for grid stability and emergency purposes		✔
Creates and manages the unified database of energy purchases and sales		✔

Source: Law of Georgia on Electricity and Natural Gas, G&T Research

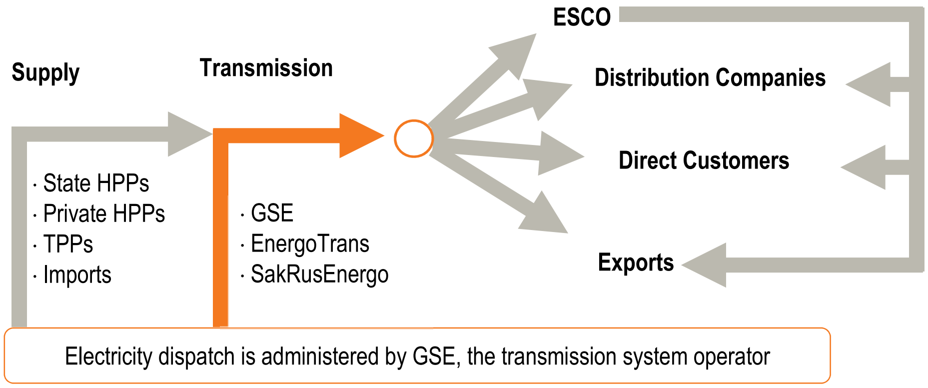
Consumers

Distribution companies link generation companies and end users and distribute over 80% of electricity consumed domestically. Three distribution companies operate in Georgia: Energo-Pro Georgia, Telasi, and Kakheti Energy Distribution, all privately owned. They are responsible for distribution, billing, metering, and servicing end customers. Distribution operations are mainly conducted via 220/380V, 6-10kV, and 35-110kV lines owned by the three companies. Any enterprise that consumes over 7gWh/year qualifies to be registered as a direct customer and buy electricity directly without the involvement of ESCO or other distribution companies. Five companies currently trade as direct customers.

Locally generated excess electricity is exported to neighboring countries. Georgia produces excess electricity in the summer and since electricity is a non-storable commodity, exports the surplus. Georgia's export capacity is limited by the maximum transmission capacity of the export lines. As a result, in line with the EU's energy directive, GNERC has established electricity market capacity rules for import/export. Export capacity is allocated via auctions conducted by the GSE, as EnergoTrans' parent company. Electricity exporters find buyers on the Turkish market and agree on a price per kWh. Exporters then submit a request for the desired export capacity and GSE allocates capacity to the exporter with the highest bid price. If multiple exporters submit identical prices, the capacity is split evenly among them. Exports to Russia, Azerbaijan, and Armenia are managed via bilateral contract negotiations. Export activities are not subject to license requirements, meaning any company can trade electricity.

There is currently no day-ahead market for short-term trades; medium- and long-term bilateral contracts account for 85% of trade. In order for an entity to qualify as a party to a bilateral contract (for the direct purchase of electricity from a generation company), it must be either a distribution license holder or a direct customer (an entity that consumes over 7gWh of electricity annually). Georgia does plan to reform this system and establish an open electricity market by 2017. Once the reforms are completed, the direct customer threshold will be lowered to 1kWh/year to allow virtually all participants to trade on the day-ahead market.

Diagram 1: Electricity value chain



Source: G&T Research

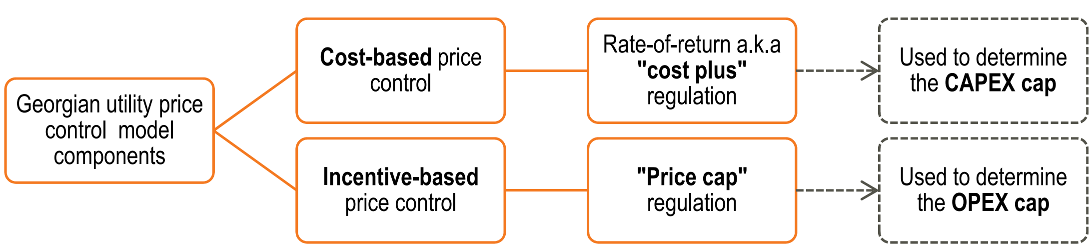
Electricity market price control reform

GNERC calculates tariffs for generation (for regulated entities), transmission, dispatch, distribution, and consumption, in accordance with price control methodology. Correct pricing is fundamental to the proper functioning of the electricity market, ensuring the security of supply, network sustainability, and competitiveness. In the absence of competition among the transmission and distribution companies, the electricity price control methodology is intended to mimic competitive market pressures in these sectors. The latest methodology for setting tariffs, adopted by GNERC in July 2014, is designed in line with GNERC's goals to:

- Keep the end-user price in check and avoid drastic hikes over a short period of time
- Incentivize investments in electricity networks with the goal of ensuring security of supply
- Keep distribution company revenues in check by capping the return on assets

The methodology uses two internationally accepted utility regulation models: cost-based (a.k.a. rate of return) and incentive-based. The regulator uses these models to estimate the capital (CAPEX) and operating (OPEX) expenses associated with supplying electricity and incentivize the companies to focus on efficiency gains.

Diagram 2: Utility price control regulation model components in Georgia



Source: GNERC, G&T Research

Encouraging adequate investment in distribution networks while keeping electricity prices in check is a crucial part of the price control policy. Since there is a positive correlation between capital investment and network efficiency, unregulated CAPEX can lead to overinvestment, which would drive the end-consumer price higher. To eliminate this temptation for the utility company, the regulator sets a ceiling on CAPEX using a cost-based approach under which the utility can recover capital and depreciation costs for the price control period, along with a predetermined return on capital.

GNERC incentivizes investment in distribution networks by incorporating the investments in the utility tariff in advance. The planned investments during a price control period *t* are integrated in the end-consumer price for price control period *t,* guaranteeing the investor an adequate return. If there is a difference between the planned and actual values in investments, the commission makes corrections to tariffs for the next price control period, taking into account the time value of money. However, utility firms are required to get advance approval from the regulator for any unplanned investment. If they do not, the regulator has the right not to account for those investments in the final electricity tariff. The regulator conducts ex-ante and ex-post analyses to assess firm investments. Sanctions can be imposed if firms do not meet post-investment efficiency or quality targets that were used to justify the investment. Details associated with determining the CAPEX cap for each utility supplier are provided in Appendix 1.

Incentive-based regulation caps OPEX and defines an efficiency benchmark. OPEX is defined as the sum of controllable and non-controllable operating expenditures. OPEX associated with the functioning of a utility supplier is audited by the regulator in the beginning of every price control period (currently 2015-17). Annually, OPEX is only adjusted for inflation and the efficiency benchmark. The efficiency benchmark to which a company is held throughout a price control period is called the X factor. GNERC set the X factor at 2% for 2015-17 (the first price control period), meaning distribution companies are expected to increase efficiency by 2% every year over the price control period. If a utility supplier has its OPEX audited in the beginning of the price control period, next year's tariff will be determined based on the audited OPEX minus 2% for efficiency and will be adjusted for inflation. Detailed steps for calculating OPEX for a utility are provided in Appendix 1.

Uniform standards for accounting and procurement will soon be synchronized with US and EU best practices. GNERC receives financial and operating data from market participants on a quarterly basis for monitoring purposes and to estimate the adequacy of the tariff in some cases. In order to streamline compliance with the reporting standards, the regulator is in the process of adopting the Uniform System of Accounts (USoA). USoA is being adopted via international consultations with organizations such as NARUC of USA (National Commission of Regulatory Utility Commissioners). USoA implementation is slated to be finalized in 2016. A law on procurement for utility companies is currently being discussed as part of EU energy market harmonization efforts. There is currently no unified procurement system and utilities make purchases through direct contracts or public tenders. The law would require companies to conduct procurement activities through the State Procurement Agency (SPA).

The latest amendment to the methodology for calculating generation tariffs for regulated HPPs and TPPs was adopted in July 2014. GNERC calculates generation tariffs for regulated generation assets and TPPs. HPPs with installed capacity under 13mW and HPPs built after August 2008 are fully deregulated and not subject to price controls. HPP deregulation is aimed at encouraging investment in the energy sector.

Table 5: Prices paid for electricity sold by generation companies

	Installed capacity **(under 13mW)**	Installed capacity **(over 13mW)**
Built before August 2008	Market price	Tariffs set by GNERC
Built after August 2008	Market price	Market price
TPPs	Tariffs set by GNERC	Tariffs set by GNERC

Source: GNERC, G&T Research

TPP-generated electricity has a two-tier tariff. The first tier is the guaranteed capacity (GC) fee, which covers the costs of maintaining a TPP in standby mode. TPP gas turbines take 0.5 to 2 hours to fire up and supply electricity to the grid and GSE requires them to remain in standby mode 180 days per year, on average. TPPs, therefore, stand ready to supply electricity to meet an anticipated shortage from HPPs. The per diem amount required to have TPPs in stand-by mode is determined by GNERC and is called the guaranteed capacity fee, which is allocated proportionally based on the daily electricity output in kWhs and integrated in the final electricity bill. The second tier of the tariff is the price of actual electricity supplied by the TPPs. Detailed steps for determining TPP tariffs are provided in Appendix 1.

Wholesale market prices are made up of deregulated, gas-fired, and imported electricity prices and are published online on a monthly basis. The monthly weighted average price is significantly lower in the summer (GEL 0.04/kWh in 2014) than in the winter (GEL 0.11/kWh in 2014). This is due to a much larger share of more expensive imported and gas-fired electricity in total consumption in the winter. The recent depreciation of the Georgian currency has put pressure on electricity prices. Currency depreciation has pushed up the prices as the electricity and gas imports are paid for in US$. In February 2015, the electricity price averaged GEL 0.153/kWh, up 36%y/y.

Generating companies can connect to a new network (transmission or distribution) free of charge. Despite the fee waiver, generation companies incur costs for using substations and transformers to connect to the grid. The generation companies have to purchase the equipment necessary for transmitting the generated capacity through the transmission and distribution lines.

GNERC sets the transmission tariff once a generator connects to the transmission network. Tariffs are set individually for each transmission license holder and the high-voltage export lines are subject to a separate tariff. The transmission tariffs are determined based on the maintenance and investment costs incurred by the company managing the lines. A detailed calculation for transmission tariffs is provided in Appendix 1.

Table 6: Transmission tariffs for license holders

	Low, medium, and high voltage lines	Transmission tariff / kWh
GSE	• 35/110/220kV • 6/10kV	• GEL 0.00758 / kWh
ET	• 400kV (export lines) • 500kV	• GEL 0.0035 / kWh • GEL 0.0027 / kWh
SRE	• 220/330/500kV	• GEL 0.0018 / kWh

Source: GNERC, G&T Research

Distribution companies are in charge of electricity distribution, metering, billing and customer service. Distribution companies own both medium and low voltage networks and the supporting substation infrastructure. The distribution tariff for getting the electricity from the high voltage transmission lines through medium and low voltage distribution networks is calculated by GNERC. The distribution network tariffs are integrated in the final electricity tariff paid by the end user.

Residential and commercial/industrial consumer tariffs are differentiated. Household tariffs vary based on the amount of electricity consumed, with a lower rate for households that consume less electricity per month (an incentive for more energy efficient and lower income consumers). Commercial/industrial tariffs are set based on the voltage used (low or medium), which is in turn determined by the type of business activity and the type of current and line connection the entity needs. The detailed calculation for the distribution and end-user tariffs can be viewed in Appendix 1.

Table 7: Consumption tariffs for end users

	Voltage line	Tariff / kWh
Telasi (commercial/industrial)	• 35/110kV • 3.3/6/10kV • 220/380V	• GEL 0.0.073 / kWh • GEL 0.126 / kWh • GEL 0.136 / kWh
Telasi 220/380V (residential, Tbilisi)	• Up to 101kWh/month • 101-301kWh/month • Over 301kWh/month	• GEL 0.112 / kWh • GEL 0.136 / kWh • GEL 0.15 / kWh
Energo-Pro Georgia (commercial/industrial)	• 35/110kV • 3.3/6/10kV • 220/380V	• GEL 0.082 / kWh • GEL 0.087 / kWh • GEL 0.135 / kWh
Energo-Pro Georgia 220/380V (residential)	• Up to 101kWh/month • 101-301kWh/month • Over 301kWh/month	• GEL 0.076 / kWh • GEL 0.11 / kWh • GEL 0.148 / kWh
Kakheti Energy Distribution (commercial/industrial)	• 35/110kV • 6/10kV • 220/380V	• GEL 0.064 / kWh • GEL 0.81 / kWh • GEL 0.117 / kWh
Kakheti Energy Distribution 220/380V (residential)	• Up to 101kWh/month • 101-301kWh/month • Over 301kWh/month	• GEL 0.11 / kWh • GEL 0.14 / kWh • GEL 0.148 / kWh

Source: GNERC, G&T Research

GNERC sets the normative loss allowance for each price control period in advance as each distribution and transmission network incurs losses. GNERC sets out the rate of network losses for each license holder and compensates based on the weighted average price of electricity for any given year. For the current price control period (2015-17), normative network losses for distribution licensees are set between 7.5% and 12.4% of the total amount of electricity supplied. A calculation of normative losses is provided in Appendix 1.

Table 8: Allowed and actual network losses

Licensee	Allowed normative loss for 2015-17	Actual loss as of 2013
JSC Telasi	• 12.4%	• 7.5%
Energo-Pro Georgia	• 7.5%	• 8.3%
Kakheti Energy Distribution	• 10.5%	• 24.6%

Source: GNERC, G&T Research

The final consumption tariffs listed above are the sum of all components – energy, network, and service charges – as outlined below.

Table 9: End-user electricity tariff components

	Energy charges	Network charges	Service Charges
Price of the generated electricity	✔		
Transmission tariff		✔	
Distribution tariff		✔	
ESCO fee			✔
GSE (dispatch) fee			✔
Guaranteed capacity fee			✔

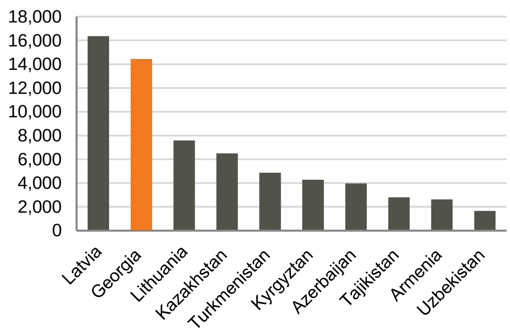
Source: G&T Research

In contrast with the consumers connected to distribution networks, direct customers are free to buy electricity directly from generation companies. They have more flexibility when it comes to the final price they pay for electricity consumption as they can negotiate directly with the generation company. However, they still have to pay the fixed fees for transmission and pass-through of electricity. Pass-through occurs when one distribution licensee cannot avoid using the distribution lines of another licensee in order to receive or supply electricity. In this case, the licensee has to pay the pass-through surcharge to the owner of the network. In Georgia the tariffs for pass-through and distribution are the same (for retail and commercial/industrial, respectively). Direct customers also pay the ESCO, GSE, and GC fees.

Water Supply and Sanitation Reform: Slowly but Surely

Georgia has one of the largest renewable water resources per capita in the former Soviet Union. Although rich in natural resources, the country faces a number of challenges in improving service and standards in the water supply and sanitation (WSS) sector. Georgia's urbanization level is estimated at 53% and most of the urban population is concentrated in the biggest cities: Tbilisi, Kutaisi, and Batumi. The uneven growth of the urban population has put pressure on the need to develop appropriate urban services, including WSS. Secondary cities are growing as well, further increasing demand for WSS services.

Figure 1: Estimated renewable water resources by country*, m³/capita



Source: AquaStat
**Data is from different years for different countries ranging from 2007-11*

A significant portion of the Georgian urban population has access to a functional WSS system. The biggest cities in Georgia – Tbilisi (1.1mn), Kutaisi (150,000), Batumi (160,000), and Rustavi (125,000) – account for more than 40% of the total population and have access to WSS services, as do other medium-sized cities with populations over 50,000, like Poti and Zugdidi. According to ADB, only 10% of surveyed households do not have water supply at home and use surface water. Half of Georgia's population lives in rural areas where WSS services are not always accessible.

The WSS sector needs investment. The Georgian government's goal is to secure 100% WSS coverage by 2020. The government plans to invest around US$ 1.6bn to deliver safe water and sanitation services; the plan is outlined in the government's strategy, titled "Georgia 2020". Up to US$ 350mn has been invested through international financial institutions. ADB is the lead donor with US$ 326mn, of which US$ 500,000 is a grant for technical assistance and the rest a sovereign loan.

A clear institutional and legislative framework needs to be in place to encourage further investment and increase confidence in the sector. The long-term sector development plan is currently being drawn up by a special commission led by the Prime Minister of Georgia. The strategy is expected to be ready by the end of 2015. Implementation of advanced WSS distribution price setting methodology is also on the agenda. GNERC has been assigned control of the WSS market, along with the electricity market. It plans to implement a similar price setting methodology, modified to account for WSS specifics. GNERC representatives have announced a plan to hire an international utility consultant for efficient implementation, which will maximize benefits for investors and consumers alike.

Institutional structure and legislative framework

The main regulatory bodies in the Georgian WSS sector are the ministry of regional development and infrastructure (MRDI), the ministry of the environment and natural resources (MENR), and GNERC. The state policy for the sector is being developed by a special commission led by the PM of Georgia. GNERC plays the same role in the WSS sector as in the electricity sector and regulates the economic and license-related aspects of WSS services. The MENR oversees the environmental safety and sustainability aspects of the water recovery and supply process. The MRDI is responsible for channelling funds and planning the development of WSS infrastructure. Most funds from IFIs are channelled through the municipal development fund (MDF), an independent body created under the MRDI. The National Food Agency (NFA), another independent body under the ministry of agriculture (MoA), is responsible for ensuring that drinking water quality standards are met.

Table 10: Elements of regulatory discretion for the MRDI, MoE, MoA, and GNERC for the WSS sector

	MRDI / MDF	MoA / NFA	MoE	GNERC
Regulatory provisions and by-laws	✔	✔	✔	✔
Environmental safety and sustainability			✔	
Recovery of surface and underground waters			✔	
WSS infrastructure planning and development	✔			
WSS services licensing and regulation				✔
WSS services economic regulation				✔
Drinking water quality control		✔		

Source: ADB, Law of Georgia on Electricity and Natural Gas, Law of Georgia on Exploitation of Natural Resources, G&T Research

The legal basis for WSS services is largely similar to that of electricity generation and supply, as the Law on Electricity and Natural Gas was amended to regulate the water sector as well. The Law on Independent National Regulatory Authorities, Law on Licenses and Permits, and by-laws on fee and tariff methodology also apply to the WSS sector.

The Law on Water and the Law on Fees for Natural Resources regulate the environmental aspects of water usage and WSS service provision. The Law on Water ensures that water resources are recovered in adherence with international standards for environmental sustainability. The Law on Fees for Natural Resources assigns specific fees for water usage, as water (both surface and underground) is state property and is leased to companies for GEL 0.0001/m^3 of water recovered.

Service quality is ensured through a by-law on the rules of supply and consumption of drinking water. The rules that are adopted by GNERC under the Law on Electricity and Natural Gas oblige WSS service providers to operate a 24-hour hotline and respond to customers in a timely manner. Absent any emergency, water contamination, or customer delinquency, WSS services should be provided continuously or the providers will face sanctions. The rules also require the provider to accept and act on applications for connecting to the drinking water supply network within 5 days of submission. The supplier is responsible for controlling and preventing illegal activities like theft and illegal network connections.

A commission headed by the PM has been established to develop a strategic development plan for the water sector in Georgia. The coordination council consists of the following major stakeholders:

- Prime Minister of Georgia
- Minister and Deputy Ministers of Regional Development and Infrastructure
- Deputy Ministers of Economy and Sustainable Development
- Minister and Deputy Ministers of Environment and Natural Resources
- Deputy Minister of Finance
- Minister of Agriculture
- United Water Supply Company of Georgia (UWSCG) representatives
- Independent engineering, hydrology, finance, and strategy development experts

Table 11: The legal framework of the Georgian WSS market

	Primary legislation	By-laws / Policy documents
Law on Electricity and Natural Gas	✔	
Law on Independent National Regulatory Authorities	✔	
Law on Licenses and Permits	✔	
Law on Water	✔	
Law on Setting Fees for the Use of Natural Resources	✔	
State policy in Georgia for drinking water supply and sanitation*	✔	
Law of Investment Support by the Government	✔	
GNERC charter		✔
Rules of supply and consumption of water		✔
Methodology for setting WSS tariffs and fees		✔
Resolution on setting regulatory fees		✔

**The document is currently being created and is to be released by the end of 2015*
Source: Law of Georgia on Electricity and Natural Gas, G&T Research

Market framework

Institutional reforms in 2009 significantly altered the WSS landscape. Until 2009, 66 companies provided WSS services to consumers across Georgia. Following a round of privatization in 2008, the assets of the companies servicing Tbilisi, Mtskheta, and Rustavi were sold to Georgian Global Utilities Limited (GGU), currently represented by Georgian Water and Power (GWP) in Tbilisi, Mtskheta Water Company (MWC) in Mtskheta, and Rustavi Water Company (RWC) in Rustavi. The other 66 companies were consolidated into three utility companies: East, West, and Adjara. In 2010, further consolidation merged East and West into one regional authority – United Water Supply Company of Georgia (UWSCG). UWSCG and Batumi Water Company (BWC) continue to serve the Autonomous Republic of Adjara.

WSS businesses are vertically integrated. They lease surface waters from the state, pump and transport water, maintain sanitation systems, and provide customer service, including metering, billing, and maintaining customer hotlines.

WSS services are provided by three utility companies:

- GGU – privately owned, services the major urban centers, including Tbilisi
- BWC – state-owned, managed by the municipal government of Adjara
- UWSCG – state-owned, covers 90% of the geographic area and 59% of the population

Table 12: Utility companies providing WSS services

Licensee	Coverage area	% of Population serviced	Ownership type	Revenue source
GGU	Tbilisi, Rustavi, Mtskheta	32%	Private	Revenues collected from the customers
BWC	Adjara region	9%	Public	Revenues collected from the customers, government subsidies
UWSCG	Georgia (except select urban centers listed above)	59%	Public	Revenues collected from the customers, government subsidies

Source: GNERC

Customers are divided into two main groups: households and commercial/industrial users. The latter group includes:

- Government organizations
- Commercial enterprises
- Industrial enterprises
- Public utilities

Bilateral contracts govern relationships between water utilities and consumers. The agreement terms must comply with the rules of supply and consumption of WSS services.

Households can legally refuse the installation of water meters, in which case they pay a set price per capita per day. Industrial/commercial customers are required to have water meters installed for proper metering and billing**.**

Market prices, tariffs, and fees

The two components of WSS service – water supply and sewage – are subject to three tariff levels. Households and commercial/industrial customers pay different rates. Furthermore, household tariffs vary based on their metered status (installed meter vs. per-capita payment), but most households pay per capita.

Table 13: WSS service tariff components

	GWP	UWSCG
Household, metered (GEL/m^3)	Water supply: 0.191 Sewage: 0.034 **Total: 0.225**	Water supply: 0.355 Sewage: 0.068 **Total: 0.423**
Household per capita (GEL/capita/month)	Water supply: 2.259 Sewage: 0.408 **Total: 2.667**	Water supply: 1.704 Sewage: 0.326 **Total: 2.03**
Commercial/industrial (GEL/m^3)	Water supply: 2.966 Sewage: 0.763 **Total: 3.729**	Water supply: 2.86 Sewage: 0.79 **Total: 3.65**

Source:GNERC

WSS service providers pay regulatory fees to GNERC and natural resource retrieval fees to the MENR. The regulatory fee for GNERC is set at 0.3% of total revenues. The fee for connecting a new customer to the water supply system is also determined by the regulator and is paid by the licensee. The fee for using natural resources amounts to GEL 0.0001/m^3 of water retrieved and is paid monthly by the licensees to the MoE.

WSS market price control

GNERC sets water utility tariffs. In contrast to the electricity market price control mechanisms, there is no elaborate methodology for setting WSS service tariffs. Up to 60% of the population is serviced by the state-owned utility UWSCG. The revenues generated by the company are not sufficient to recover costs and the government subsidizes roughly 50% of costs for state-owned entities.

Privately owned GGU is subject to tariffs based on the principle of total expenditures (TOTEX). The TOTEX principle incorporates all economically justified expenditures (at GNERC's discretion) associated with supplying WSS services and adds a fair profit margin or rate of return. Justified expenses include:

- Expenses related to ensuring water quality standards
- Operating expenses related to the provision of WSS services
- Capital expenditures
- Investments

The methodology was adopted in 2008 and has not been updated since. GNERC sets tariffs separately for each licensee. Administrative procedures associated with setting the tariff for WSS services are similar to the procedures outlined for the electricity tariff approval.

Due to a lack of unified standards of accounts (USoA) and detailed methodology based on internationally acknowledged utility price regulations (e.g. incentive-based methodology for setting electricity tariffs), the classification of expenditures to be compensated by the final tariff on WSS services is outlined in the methodology document adopted by the regulator. The profit margin is set using one of two profit margin determination methods – weighted average cost of capital (WACC) or return on costs.

Network losses should be a part of the methodological framework set by GNERC. However, as it is difficult to account for the losses due to the scarcity of meters in the household segment, there are no normative loss provisions set out for WSS services.

WSS service tariffs may be subject to adjustments/corrections (CORR) if the following occurs:

- Inflationary pressure (over/under 10%)
- Change in the fees for using natural resources
- Change in electricity tariffs
- Legislative changes

WSS tariffs are set per m^3 of water supplied to the customers. The supplier must present to the regulator a detailed account of projected revenues needed to recover costs for supplying WSS services. Based on that account, GNERC adds a fair profit margin to the total cost of delivering WSS services and sets the final tariff on consumption, which serves as the revenue cap for the WSS service provider.

Appendix 1: Electricity Market Price Control

Capital expenditures (CAPEX): In order to control costs and consequently the end-user price, GNERC caps the amount of revenue a utility company can generate by capping the capital expenditures it can incur. RAB is a key component in estimating the limit on allowable CAPEX. RAB includes the value of the existing asset base, estimated depreciation (from the year prior to the price control period), and commission-approved investments. RAB is estimated based on historical price and is accounted for at book value. If the historical value is not available, the commission can use the replacement value of the assets.

Diagram 3: Determining the CAPEX cap

Determine the cap on CAPEX for a the price control period t+1 – CAPEX caps are calculated annually factoring in the license holders' investment plans for the coming year

CAPEX cap for *t+1*: pre-tax $WACC_{(t+1)}$ x $RAB_{(t+1,\ GEL)}$ + $Depreciation_{(t+1,\ GEL)}$

Step 1: RAB for the price control period t+1 – data gathering and audit by GNERC

RAB components:

- **TA:** The value of tangible assets at the end of the test period *(t-1)* when setting the tariff for the price control period *(t+1).*
- **IA:** The value of intangible assets at the end of the test period *(t-1)* when setting the tariff for the price control period *(t+1).*
- **pD:** Projected depreciation for existing and projected tangible and intangible assets.
- **RA:** Residual assets – assets that were decommissioned during the test period *(t-1),* assets that will be decommissioned during the tariff calculation period *(t)* and price control period *(t+1)* periods, as well as the technical impairment loss for the test period *(t-1)*.
- **pINV:** Projected investments for period *t* and for the price control period *t+1* that are approved by the commission.
- **TP:** The value of third-party financed assets. Third-party funds are grants and subsidies the company may receive in addition to revenue from regulated activities. The value is determined as of the end of the test period *(t-1)* when setting the tariff for the price control period *(t+1).*
- **pTP:** Projected assets to be purchased with third-party financing.
- **pDTP:** Depreciation incurred on third-party financed assets.

Step 2: Calculate RAB by adding the components that GNERC counts as components of RAB and subtracting the ones it does not

RAB = $TA_{(t-1,\ GEL)} + IA_{(t-1,\ GEL)} - pD_{(t,\ t+1,\ GEL)} - RA_{(t-1,\ t+1,\ GEL)} + pINV_{(t,\ t+1,\ GEL)} - TP_{(t-1,\ GEL)} - pTP_{(t,\ t+1,\ GEL)} + pDTP_{(t,\ t+1,\ GEL)}$

The weighted average cost of capital (WACC) for a utility is used as the allowed return on the RAB. The WACC measure set by GNERC uses specific debt and equity weights (g=0.6; e=0.4), market rate of return (r_m), debt interest rate (r_d) and industry specific beta (β). Even though the WACC is set by GNERC, utility firms are free to choose their actual leverage ratio. WACC is fixed at 13.54% throughout the price control period of 2015-17.

Step 3: Estimation of the WACC component values – based on industry averages

WACC Components:

- r_m = market rate of return **= 14.75%**
- **DP =** debt premium **= 3.50%**
- r_{rf} = risk free market rate approximated by the yield to maturity on long-term government bonds **= 7.50%**
- **β =** industry beta **= 1.00**
- **g =** share of debt **= 60%**
- r_d = cost of debt **=** r_{rf} **+ DP**
- r_e = cost of equity **=** $r_{rf} + \beta \times (r_m - r_{rf})$
- **T =** profit tax = **15%**

Step 4: Calculate WACC to be inserted in the equation determining the CAPEX cap – the WACC figure is the mandated cap for the maximum return on assets or the ROA cap

Pre-tax WACC = $(1-g) \times r_e / (1-T) + g \times r_d$

Source: GNERC, G&T Research

GNERC sets specific annual depreciation/amortization rates and the duration of the useful life for classified assets to calculate the depreciation on assets purchased after July 2014 (Appendix 3).

Capping OPEX: GNERC classifies operational expenses into two distinct categories – the OPEX that a company has control over (see table below) – the controllable OPEX (ctrlOPEX), and the OPEX that the company has no control over – non-controllable OPEX (ncOPEX). Non-controllable OPEX (ncOPEX) is also accounted for in the determination of the final cost of electricity supply and includes:

- Taxes
- ESCO fee
- Regulation fee
- Other fees
- Other non-controllable expenses that can be justified as being outside of the utility company's control

ncOPEX is adjusted annually for inflation. ctrlOPEX and ncOPEX make up the cap for total OPEX for the price regulation period, but the efficiency rate is only integrated in the calculation of ctrlOPEX.

Diagram 4: Capping OPEX

Step 1: Cost audit for controllable OPEX at the beginning of the price control period – data gathering and audit by GNERC

OPEX components:

- Salaries and wages
- Maintenance
- Service purchases
- Administrative costs
- Security
- Insurance
- Business trips
- Service of third-party financed assets
- Interest on short-term debt
- Other

↓

Step 2: Annual adjustments are made for inflation and the efficiency factor – the initially audited costs are used for 3 to 5 years, depending on the length of the price control period

Year 1 (t+1): $ctrlOPEX_{(t-1),\ GEL}$
Year 2 (t+2): $ctrlOPEX_{(t-1),\ GEL} \times (1+CPI_t - X_t)$
Year 3 (t+3): $ctrlOPEX_{(t-1),\ GEL} \times (1+CPI_t - X_t) \times (1+CPI_{t+1} - X_{t+1})$

↓

Step 3: Add ncOPEX and adjust for inflation

Year 1 (t+1): $ncOPEX_{(t-1),\ GEL}$
Year 2 (t+2): $ncOPEX_{(t-1),\ GEL} \times (1+CPI_t)$
Year 3 (t+3): $ncOPEX_{(t-1),\ GEL} \times (1+CPI_t) \times (1+CPI_{t+1})$

↓

Step 4: Capping the cost of network losses

$CNL_{(t+1)}$ = Weighted average price of electricity per $kWh_{(t+1)}$ x Predetermined rate of allowed network loss (%) x total electricity supplied by the distribution company

Source: GNERC, G&T Research

Following the CAPEX and OPEX determination for a given price control period, the total regulatory cost base (RCB) can be determined individually for each utility. RCB represents the total cost a utility company will incur in getting the electricity from supplier to consumer. The regulatory cost base is determined on an annual basis by GNERC for each individual licensee and is calculated based on the cost plus principle, which accounts for CAPEX, OPEX, the cost of normative losses, and corrections. The factor of correction (CORR) serves as the adjustment mechanism from year to year. The correction factor is necessary to adjust for fluctuations. When setting the correction factor, GNERC takes into account the time value of money, using WACC for the test and price control periods, *t-1* and *t.*

Diagram 5: RCB calculation

Estimation of the RCB for the price control period t+1
RCB = CAPEX $_{(t+1,\ GEL)}$ + OPEX $_{(t+1,\ GEL)}$ + CORR $_{(t+1,\ GEL)}$ + CNL $_{(t+1,\ GEL)}$

Source: GNERC, G&T Research

RCB then serves as the basis for individual tariffs as mapped out below.

Diagram 6: Tariff formula for transmission

Estimation of tariff for electricity transmission for the price control period t+1
$\mathbf{T_{t+1}}$ **=** (RCB_{t+1} / Amount of electricity transmitted) x 100

Source: GNERC, G&T Research

Diagram 7: Fee for dispatching electricity

Estimation of the dispatch fee for the price control period t+1
$\mathbf{Fee_{t+1}}$ **=** (RCB_{t+1} / Amount of electricity dispatched) x 100

Source: GNERC, G&T Research

Diagram 8: Fee for ESCO's services

Estimation of the ESCO fee for the price control period t+1
$\mathbf{Fee_{t+1}}$ **=** (RCB_{t+1} / Amount of electricity supplied to the end consumer) x 100

Source: GNERC, G&T Research

Diagram 9: Tariff formula for distribution and pass-through

Estimation of the distribution/pass-through tariff for the price control period t+1
$\mathbf{T_{t+1}}$ **=** (RCB_{t+1} / Amount of electricity distributed or passed through) x 100

Source: GNERC, G&T Research

Diagram 10: Tariff formula for consumption

Estimation of the consumption tariff for the price control period t+1
$\mathbf{T_{t+1}}$ **=** weighted average cost of electricity$_t$ + $T_{t+1,\ \mathbf{distribution}}$

Source: GNERC, G&T Research

GNERC sets a two-tier tariff for guaranteed capacity. The tariff covers:

- Payment for guaranteeing capacity (a stand-by fee is paid when TPPs are idle) – the GC Fee
- Production-based payment (for actual generation) – the price for electricity generated by TPPs

The GC fee is paid proportionally by all grid users and is reflected in the end user price. Fees are calculated separately for each TPP.

Diagram 11: Formula for calculating the GC fee

Estimation of the GC fee for the price control period t+1
Per diem fee for GC = (fixedOPEX + CAPEX) / Amount of days on standby

Source: GNERC, G&T Research

Diagram 12: Formula for calculating the tariff for TPP-generated electricity

Estimation of the TPP-generated electricity tariff for the price control period t+1
T_{t+1} = [variableOPEX + difference (planned and actual exchange rate) + difference (planned and actual price of natural gas)] / amount of electricity supplied

Source: GNERC, G&T Research

Appendix 2: WSS Market Price Control

Table 14: Classification of expenditures associated with providing WSS services

	Total expenses	Profit margin
Electricity purchase	✔	
Payroll	✔	
Inventory/raw materials	✔	
Chemicals for ensuring water quality standard	✔	
Natural resources usage/regulation fee for GNERC	✔	
WSS system supervision	✔	
Costs associated with controlling environmental damage	✔	
Purchased services	✔	
Depreciation and maintenance	✔	
Business trips	✔	
Lease/interest	✔	
Administrative costs	✔	
Security costs	✔	
Staff training	✔	
Insurance	✔	
Misc (no more than 10% of OPEX)	✔	
Return on costs		✔
WACC ($g \times r_d + e \times r_e$)		✔

Source: GNERC, G&T Research

Diagram 13: WSS service tariff calculation

Estimation of the water tariff for the price control period t+1
T_{water} = Projected revenues / Amount of water supplied to the consumer (m^3)

Source: GNERC, G&T Research

Appendix 3: Classification of Amortization/Depreciation

GNERC sets specific annual depreciation/amortization rates and the duration of the useful life for classified assets to calculate the depreciation on assets purchased after July 2014.

Table 15: Fixed depreciation/amortization rates for regulated TPPs

TPPs	Annual rate of depreciation/ amortization	Useful life (in years)
Condensing power plants	4.0%	25
Thermal portion of the power plant	4.0%	25
Gas turbine	3.3%	30
Auxiliary equipment	4.0%	25
Equipment for environment protection	6.7%	15
Power plant facilities	2.2%	45

Source: GNERC

Table 16: Fixed depreciation/amortization rates for regulated HPPs

HPPs	Annual rate of depreciation/ amortization	Useful life (in years)
Accumulating structures	1.7%	60
Hydro technical facilities (Dam, head units, diversion tunnel, etc.)	2.2%	45
Other HPP equipment and devices	3.3%	30
Power aggregates	4.0%	25
Safety and measurement devices, remote control, telecommunication, telecontrol and automated devices	4.0%	25
Power plant power devices, including transformers, commute and distribution devices	2.2%	45
Other electric devices at a power plant	4.0%	25

Source: GNERC

Table 17: Fixed depreciation/amortization rates for PPE and intangibles (other than power plants and transmission network components)

PPE and Intangibles	Annual rate of depreciation/ amortization	Useful life (in years)
Transport facilities	3.3%	30
Operation facilities	1.8%	55
Administration facilities	1.5%	65
Substation building	2.2%	45
Warehouse space	5.0%	20
Furniture and mobile inventory	10.0%	10
Computers and office equipment	20.0%	5
Tools / devices	10.0%	10
Lightweight motor vehicles	12.5%	8
Heavyweight motor vehicles and specialized machinery	8.3%	12
Intangible assets	20.0%	5

Source: GNERC, G&T Research

Table 18: Fixed depreciation/amortization rates for network components

Network components	Annual rate of depreciation/ amortization	Useful life (in years)
Aerial high voltage transmission lines (500-400-330-220-110kV)	2.2%	45
Substation power equipment, including transformers, commute and distribution devices	2.5%	40
Safety and measurement devices, remote control, telecommunication, telecontrol and automated devices	4.0%	25
Other (for 500-400-330-220-110kV aerial transmission lines)	4.0%	25
Aerial transmission lines (35-10-6-3.3kV)	2.9%	35
Underground transmission lines (35-10-6-3.3kV)	2.5%	40
Medium voltage substation power devices, including transformers commute and automated devices	2.9%	35
Safety and measurement devices and protection from overstrain, remote control, telecommunication, telecontrol, and automated devices	4.0%	25
Aerial transmission lines under 1kV	2.9%	35
Underground transmission lines under 1kV	2.5%	40
Safety and measurement devices and protection from overstrain, remote control, telecommunication, telecontrol and automated devices	2.9%	35
Electricity meters	5.0%	20
Converters, direct current supplements, compensation devices	4.0%	25
Phone lines	2.9%	35

Source: GNERC, G&T Research

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