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CRITICAL AND TIMELY ISSUES FOR GEORGIA'S ENERGY SECURITY

USAID ENERGY PROGRAM

30 October 2020

This publication was produced for review by the United States Agency for International Development. It was prepared by Deloitte Consulting LLP. The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

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DATA

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ACRONYMS

BCM	Billion Cubic Meters
CBM	Coal-Bed Methane
TSO	Transmission System Operator
NGO	Non-Governmental Organization
REST	Renewable Energy Summit in Tbilisi
ESCO	Electricity Market Operator
EIB	European Investment Bank
SOCAR	State Oil Company of Azerbaijan Republic
LEPL	Legal Entity of the Public Law
CMM	Coal Mine Methane
CNG	Compressed Natural Gas
DSO	Distribution System Operator
EnCT	Energy Community Treaty
EU	European Union
G4G	Governing for Growth in Georgia (USAID Project)
GNERC	Georgian National Energy and Water Supply Regulatory Commission
GoG	Government of Georgia
GOGC	Georgian Oil and Gas Corporation
GSE	Georgian State Electrosystem
HPP	Hydro Power Plant
IFI	International Financial Institution
LNG	Liquefied Natural Gas
MoU	Memorandum of Understanding
MW	Megawatt
PPA	Power Purchase Agreement
PSH	Pumped-Storage Hydroelectricity
PV	Photovoltaic
R&D	Research & Development
SCP	Southern Caucasus Pipeline
SGC	Southern Gas Corridor
SOE	State Owned Enterprise
TPP	Thermal Power Plant
TYNDP	Ten Year Network Development Plan
UGS	Underground Gas Storage
USAID	United States Agency for International Development
VRE	Variable Renewable Energy

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INTRODUCTION

This report was written under contract for USAID after a request for an update of the prior year's report. The Critical and Timely Issues for Georgia's Energy Security report serves both USAID and the Government of Georgia (GoG) by drawing attention to the most pressing challenges and concerns for Georgian energy security. A brief analysis accompanies each entry to give a general overview, highlight potential ongoing factors, and pose essential questions going forward.

The objective of USAID Energy Program is to support Georgia's efforts to facilitate increased investment in power generation capacity as a means to increase national energy security and facilitate economic growth. The Program will have a significant impact on energy market reform efforts of the GoG to comply with the country's obligations under the Energy Community Treaty (EnCT). The investment objective will be achieved through the provision of technical assistance to a variety of stakeholders in the energy sector.

The ultimate goal of this Program is to enhance Georgia's energy security through improved legal and regulatory framework and increased investments in the energy sector. The ultimate expected outcome of this Program is an energy legal and regulatory framework that complies with European requirements and encourages competitive energy trade and private sector investments.

The contract has Task 5 energy security that calls for consultation and advice to GoG. This report is meant to provide a synthesis and analysis of energy security issues at a mid-term point in delivering the USAID Energy Program. The intended audience is the GoG, electricity and gas Transmission System Operators (TSOs), the Regulator, Non-Governmental Organizations (NGO's) and other key stakeholders in the energy sector.

Based on performed analysis of electricity and natural gas sectors, the team has identified energy security issues for both sectors and additionally explored cross-cutting topics. The approach was to identify all possible matters that can influence the energy security of Georgia. As with the prior iterations of this report, we recognize that improving energy security on the national level requires complex and holistic approach including also oil, coal, biomass and other energy sources. However, this report series is focused specifically on electricity and natural gas security issues for Georgia. This decision is based in part on the overwhelming influence on energy security these two sectors exert vis-à-vis these other sources. As such, the other sources of energy are only linked to the above-mentioned sectors (for example, fuel switching option during gas supply disruption).

This report here is an updated 2020 version of last year's report of the same name. The idea behind an annual update stemmed from the decision that keeping a list of the critical issues and their stage of analysis and understanding could serve the GoG well in understanding the current dynamics of its energy security situation. As such, there will be some items that remain from prior versions of this document that are preserved here due to steadfast importance.

The list shown here also reflects items discussed in prior iterations of this Critical and Timely Issues series, often with advancements in Program findings that have taken place in the past year since the previous version of this report. Additionally, its conclusions also draw from the 2019 Renewable Energy Summit in Tbilisi (REST) Conference, The 2020 Energy Security Conference Series that featured three events, including the Scenario Planning Workshop on COVID-19 and its impact on Energy Security. There is prevailing opinion that sustainable operation of Enguri Hydro Power Plant (HPP) has the highest priority for the electricity sector. For the gas sector, the major energy security issue is monopolistic market structure and high dependence on single (practically) external supplier. Additionally, the planned Samgori South Dome underground gas storage is foreseen as an important energy facility towards achieving a secure supply of gas. That said, the major issue that has been added to this list, and warrants the greatest attention and urgency going forward, is the cross-cutting issue of cybersecurity for energy security. By far, the greatest change to this year's edition of this report can be found in the Cross-cutting Section at large (C.), with cybersecurity leading the way. It is worth noting that only brief attention is paid here to complex and severe geopolitical threats and challenges facing Georgia's energy security predicament. For a more in-depth analysis of the most important of these factors and their impact Georgia's energy security by use of a scholarly framework, please refer to the Energy Security: Geopolitical Analysis report as well as the Executive Briefer – Geopolitical Dimensions.

Indeed, other energy security issues provided below have important role in improving overall energy security of the country.

List of Identified Energy Security Issues:

ELECTRICITY SECTOR ENERGY SECURITY ISSUES

	Electricity Sector Security Issues	Description
1	Enguri/Abkhazia – what options does Georgia have to ensure long-term operation of the HPP?	Enguri HPP has lacked proper maintenance for years. Maintenance of main structures and facilities may require significant funding as well as shut down of the power plant for several months. Technical problems such as damaged pressure tunnel, filling reservoir with silt, deterioration of derivation tunnel, etc. has not been addressed properly for years. On the other hand, consumption in Abkhazia is increasing rapidly. There is urgent need for sustainable solution of energy allocation between Abkhazia and rest of Georgia, but currently Georgia lacks the capacity or bargaining leverage to effectively resolve the issue. Perhaps building production capability through other HPP projects might alleviate the pain of a potential Enguri shutdown. For more information, please refer to Executive Briefer – Enguri and Abkhazia.
2	Battery storage – how should innovative technologies such as battery storage, enter into the market?	Georgia's energy system is evolving, with more variable renewable energy. Better methods to manage the Variable Renewable Energy (VRE) production are needed. Should Georgia propose traditional forms of storage such as pumped hydro or start to use more flexible and modular storage such as grid-connected battery systems? How can the market decide which storage is most cost effective?
3	Is Pumped-Storage Hydroelectricity (PSH) affordable? To what extent it can improve energy security?	Pumped storage facilities existing in many countries across the globe. The prices vary widely based on the site specifications - size of reservoir dams, geological conditions, length of tunnel(s), re-settlements, etc. The risks are large for such construction projects and should be properly examined. If a pumped storage facility was purchased, would it improve security of supply and if so, in which ways?
4	How does Georgia attract new technologies into the market? Software, hardware, smart metering, various solar technologies?	Smart technologies are developing rapidly. The opportunities to improve efficiency, reliability and stability through new technologies is increasing. The introduction of these technologies could be incentivized by the GoG and Georgian National Energy and Water Supply Regulatory Commission (GNERC) through network investment programs and electricity market rules. Another approach is to let power sector entities to decide themselves if the new technologies provide a better position to increase profits. The third approach would see the GoG seeking donor assistance to develop pilot programs to highlight the benefits of new technologies in the Georgia electricity sector.
5	What relay and automatic control equipment would improve energy security for Georgia?	USAID, other donors and International Financial Institutions (IFIs) have supported the development of new system controls on the Georgian power sector. There are additional software, hardware, metering, relays, controls and communications equipment that will improve the operation of the power system. Which are the most critical and which provide the highest payback should be examined.
6	How much wind power is too much? How can it be increased?	The GoG wants to increase the amount of wind power on the power sector having signed Memorandum of Understanding (MoUs) covering over 1300 Megawatt (MW) of new wind power projects. There are several integration issues and the mitigation of those factors will be required so that the projects under MoU can be developed. The ongoing development of grid infrastructure to allow for greater VRE integration, whether through battery storage or interconnections, should continue to be explored and a Georgian State Electrosystem (GSE) priority.
7	Should Georgia promote off-shore wind power projects?	Off-shore wind projects are very common in Europe, such as in Spain, England and Denmark, given that winds are strong and quite steady on the sea. Georgia could allow developers to build wind turbines on the Black Sea. Given the importance of tourism to Georgia's economy, will building wind turbines on the water negatively impact tourism along the Black Sea? Many experts are doubtful of off-shore potential in Georgia. Many cite that it appears that the greater wind potential for Georgia is primarily onshore, while the greater energetic potential on the Black Sea is in the Western region. This is in addition to concerns on integrating VRE into the grid. As such, any efforts to promote wind power generation should instead prioritize onshore facilities.

	Electricity Sector Security Issues	Description
8	Is Interconnection “capacity” something that can be counted on, or just viewed as energy for Georgia?	If long-term firm power purchase agreements are signed by Georgia energy suppliers or large consumers, the system planners may perceive that new generation may not be needed in Georgia and heavy reliance would be on the neighboring power markets to deliver the capacity to Georgia, even during emergencies in the their power systems. System planners should examine what risks Georgia would assume if the country depended on the delivery of capacity from neighboring countries. Additionally, this would weaken Georgia’s relative energy security, growing its dependence on foreign partners to meet domestic needs rather than reducing it.
9	Russia and Iran are discussing stronger energy ties – how will this impact energy infrastructure in Georgia?	The interconnection of the Russia and Iranian power systems will require large, back-to-back transmission facilities. The intention was for these facilities to be built by Georgian and Armenian transmission companies. There was a high risk that the facilities would not be needed or proper compensation made by foreign power traders to cover the cost of building the lines and therefore the electricity customers of Georgia and Armenia would be expected to pay through network tariffs those costs, just as the Georgian electricity customers have paid for the new Turkish interconnection. The risky scenario some predicted has transpired- where Georgia went ahead with its section of the North-South connection, with electric transmission connections developed at great cost but without its foreign counterparts to connect with. Therefore, Georgia has outlaid much needed financial capital for other energy sector development needs on an effort that to this point has produced nothing of consequence for its energy security benefit. For more information, please see Executive Briefer – Gas Pipelines and Cross-border Interconnections
10	Can Georgia move transition to a competitive capacity market and not impact energy security?	In the regulated electricity market, the GoG, GSE, GNERC and Electricity Market Operator (ESCO) have overseen building of new generation and securing power purchases from neighboring power systems to ensure reliable power system. In a completely competitive generation market, the need for new capacity and signing of cross power trades should be done based on the price signals in the market. Thus far, these trade negotiations and price signals have been secretive rather than publicly disclosed, which limits private sector actor’s ability to forecast accurately. A need remains for many proposed and planned production plants, whether HPP or other, for PPA’s to guarantee profitability. Additionally, proper attention has thus far been paid to proper market monitoring to ensure competitive electricity markets, both in the Day-ahead and balancing markets, will be very important. More attention and effort is needed here over the next months in the immediate sense to make sure GNERC is ready on day one.
11	What is the right amount of reserve capacity for Georgia?	Georgia will increase its energy production from hydro and other renewable energy plants. The amount of capacity required should be based on one or more indicators, such as percent of total peak demand, loss of load probability, reliability criteria, and so forth. An examination is required of the future power system generation makeup and a determination of the level of reliability that Georgians can and/or are willing to pay.
12	How does Georgia moving towards a summer-peaking electricity sector impact its approach to energy security?	During last decade, electricity demand growth rate was higher during summertime (mainly July- August) compared to winter months. There is high expectation that this trend will continue. Georgia certainly is becoming summer peaking country. This fits the domestic production schedule as compared to winter when HPP production is lower. Still though, it is possible imports might be necessary or increased generation. This could accelerate solar power development in Georgia to better match peak seasonality.
13	How can Georgia operate its electricity sector without the connection to Russia?	There is always a risk that the Russian interconnection may be disconnected, on a temporary or permanent basis. Could the Georgian power system operate without power flowing from Russia? The Russian power system is a source of ancillary services that would need to be replaced within the Georgian power system. Additionally, as energy demand continues to soar in Georgia and domestic production lags further and further behind, dependency may grow along with it.
14	How does distributed generation, such as solar home systems, impact energy security?	Distributed generation could be defined as any generating facility connected to the distribution networks. The growth of distributed generation (net metering at homes and commercial entities, small wind farms, small solar Photovoltaic (PV) systems, etc.) is slowly growing and could become

	Electricity Sector Security Issues	Description
		a significant source of new generating resources in the future. How will the increased distributed generation reduce the requirement for new large generation plants and new transmission lines? Additionally, an ongoing concern is the as mentioned integration capacity issues.
15	Can demand-side management be used as a resource for improving energy security – targeted energy efficiency programs, demand resources, load shifting, etc.	In the US and Europe, demand resources are used for covering spinning reserve requirements. In New England (US), energy efficiency programs are used in place of building new generating capacity. These approaches should be examined to determine how they can be used in Georgia. That said, it will be difficult for these kinds of demand side management tools to be effective due to a number of factors. First, Georgia still is at roughly half the average consumption levels worldwide, meaning that just by nature of improving quality of life and the domestic economy consumption should accelerate quite rapidly. Secondly, as the price point remains so low for consumers any action that does not alter it significantly will continue to exacerbate inefficiency.
16	Is transmission congestion a problem for Georgia today or in the future?	Georgia's transmission system is quite large compared to its system peak. There is one area where congestion exists. Is this a significant problem that will grow and will hamper market operations, or it is a small issue that perhaps will go away once more generation is built in the eastern side of Georgia?
17	What are the adopted (officially approved) power system reliability and security criteria (relevant National Standards, if any)?	Each power system should be developed based on adopted criteria. As part of Georgia's acquis into the European Energy Community, it agreed to follow previous regulations governing security of supply and reliability draft codes, which are currently being developed and assessed.
18	What are the most cost-efficient ways to satisfy expected electricity demand growth (according to recent demand projections electricity demand for Georgia will be increased by almost 80% by 2030)?	Given recent energy forecast demand developed under USAID Governing for Growth (G4G) in Georgia project grant, it is expected that electricity demand will be increasing in Georgia on average by 3.9% (GSE in its Ten-Year Network Development Plan (TYNDP) 2020-2030 evaluates 3%, 5% and 7% growth scenarios). Already the import of electricity has increased significantly in the country. In this situation, proper assessment should define strategy how to satisfy anticipated demand in most cost-efficient way. This may involve mix of policies such as promoting specific type of generating plants, demand side management, fuel switching, etc.
19	Will unambiguous policy on Power Purchase Agreements (PPA-s) in the electricity generation sector increase investments and impact energy security?	The GoG has decided to halt the signing of long-term PPAs except for strategic plants. The new Feed in Premium Tariff mechanisms for HPPs was adopted recently and the possible impact is yet ambiguous. The delay in establishing the new mechanisms leaves a lot of uncertainty for developers, especially wind and solar power plants that are typically more expensive than HPPs. The delay has also caused a continued reliance on PPA's in the short term, as the only guarantor of financial feasibility for bringing on new production facilities or powerplants.
20	Potential political risks (Russia), their impact on energy security and mitigation measures	Russia is a supplier of electricity and ancillary services. It does not hold a dominant position on the electricity market, though it does provide emergency supply of electricity during winter months and it provides frequency control for Georgia. The Georgia power planners can review the risks of Russia increasing prices, sudden disconnections, and requesting compensation for the provision of ancillary services. The threat remains of Russian predatory behavior, for which there is a clear pattern from past actions. Mitigation efforts should continue. For more information, please see Executive Briefer – Geopolitical Dimensions.
21	What are the possibilities of establishing a regional power market and optimization of peaking and seasonal regimes between the countries?	All countries in the region participate in energy trading with Georgia. Combining the markets in each country to a single electricity market may provide more efficient electricity market, but it is not clear how it will, if at all, improve energy security. The level of energy security before and after creation of a single market will be examined.

GAS SECTOR ENERGY SECURITY ISSUES

	Gas Sector Security Issues	Description
1	Gas storage: strategic reserve not only used for force-majeure situations but also in regular basis	Natural gas provides about 40% of Georgia's total primary energy needs and almost all gas is imported. Dependency on imported gas increases significantly during the winter period. As of now, Georgia is the only country in the region that does not have any gas storage but development has begun on a new facility at the Samgori South Dome gas field. This new facility, funded with assistance from German Government-Owned Development Bank (KfW) and the European Investment Bank (EIB), is an essential step in building Georgia's energy security resilience and fulfilling its obligations under EnCT.
2	Critical Infrastructure - reliability and supply chain resilience	Infrastructure reliability is one of the major energy security issues. According to GNERC's annual reports almost third of transmission pipelines are more than 40 years old. The data is not available for distribution companies, however in the capital Tbilisi there are large share of old pipelines as well. This factor influences efficient management of system on two levels: relatively high costs for losses and maintenance and supply disruptions on local grids. Additionally, the reliability and security of infrastructure has been a concern. For more information, please refer to Executive Briefer – Critical Infrastructure Resiliency.
3	Diversification of imported fuels: will State Oil Company of Azerbaijan Republic (SOCAR) be the only natural Gas supplier to Georgia and what is the potential risk for disruption? Threat of over reliance on Azerbaijan for natural gas.	SOCAR's monopoly has increased during last years. While Georgia may have increased its resiliency against Russian predatory behavior when it comes to gas, relying on a sole source of supply is still hugely problematic. Concern is well justified especially considering how importing from a foreign State-Owned Enterprise (SOE) is viewed by the Hirschman Index. The risk of disruption is probably still lesser, given the relative trade symmetry in the Georgia-Azerbaijan relationship versus the Georgia-Russia relationship, but still risky. Georgia does run a high risk because of its single source of supply for natural gas, especially with SOCAR (the main import partner) being a SOE. This is because the symmetrical nature of the Georgia-Azerbaijan trade relationship and Georgia's role as a primary transit organ of the South Caucasus Pipeline (SCP) and Southern Gas Corridor (SGC). For more information, please refer to Executive Briefer – Diversification of Energy Supplies.
4	Pressure delivery problems and ways to resolve them	This has to be addressed on both levels: Transmission and distribution levels. Due to changes in urbanization (high rising building instead of single-family dwellings) of certain districts, gas network systems in some distribution areas need reconfiguration. There are low pressure issues, that effects customer service quality. Even if security of supply is improved on national level there is need of improving supply continuity in certain local districts.
5	Support mechanisms for reducing distribution network losses (still high, especially in Tbilisi and Sakorggas Distribution System Operators (DSOs))	Despite improvements during last years, distribution network losses are still very high in Georgia compared to eastern European countries. For example, in 2018 distribution network losses in Tbilisi was 8.3% while typically DSOs are observing 1-3% total losses in European Union (EU) countries.
6	Is there a potential to switch from gas consumption to alternative fuel during a potential supply interruption	This option can be utilized by old Thermal Power Plants (TPPs) located in Gardabani. Also, it is important to explore what alternative measure can be in place for household heating? Additionally, electric cars may substitute part of cars running on Compressed Natural Gas (CNG). Moreover, as demand continues to soar, and SOCAR and SCP lag behind export capacity, there is a growing concern that a vulnerability dependence on Russian gas imports and Gazprom will reemerge.
7	Policy & Legislation Initiatives to decrease monopolistic actions of suppliers and liberalization of local markets	Even in case of monopolistic markets there is an opportunity to decrease monopolistic influence on the market. Regulations related to "gas release" program or introduction of gas trading environment can support competition at wholesale level. Additionally, further implementation of EC acquis and pursuant regulations should aid this effort. One major step in this direction was the adoption of the new law on Energy and Water Supply.
8	Strategy for Research & Development (R&D) of local fossil fuel resources and implementation of energy technologies	R&D programs of local fossil fuels can facilitate the use of local resources and contribute to the growing energy demand. Energy technologies associated to gas infrastructure or for local sources exploration will contribute to energy security. For instance, utilizing Coal Mine Methane (CMM) and Coal-Bed Methane (CBM) potential.

	Gas Sector Security Issues	Description
9	Promote local gas producers	Local gas producers can support diversification of sources which is related to energy security. Off-shore gas potential has to be identified and exploration promoted.
10	Liquefied Natural Gas (LNG)	LNG could contribute to diversification of sources including security of supply. Of course, it would have to be able to compete at a price point with other suppliers or fill a critical need. Still, the massive capital investment and technical difficulty of an LNG port makes this development unlikely. Instead, a recent proposal by Georgian Oil and Gas Corporation (GOGC) envisions fulfilling growing gas demand, and avoiding the accompanying Russian dependence, by executing swaps with the further down-market SCP partners. Further exploration of this could provide a much-needed boon for enhancing the supply of natural gas and enhancing energy security. For more information, please Executive Briefer – Natural Gas Demand and Supply Gap.
11	Demand growth for Natural Gas and ending of Supplemental provision of SCP	In 2026, the Supplemental gas from the SCP, which composes a substantial percentage of the natural gas imports of Georgia, will be abandoned. This will occur just as demand continues to rise, raising concern about an automatic and uncontrollable reemergence of dependence on Russia and Gazprom. This must be dealt with by either enhancing infrastructure or building multilateral ties such as LNG.
12	Promotion of natural gas transit routes through Georgia (The impact of Trans-Caspian Gas Pipeline, White Stream project)	Georgia has a strategic geographic location, and this can be used to promote the gas transit routes through its territory. Trans-Caspian Gas Pipeline will not only support the domestic gas supply but will also contribute to energy security as an additional route of supply. Still, significant doubt remains about the feasibility and financials of a Trans-Caspian pipeline. While Turkmenistan states they would be ready to supply roughly 40 BCM annually, SCP infrastructure could not accommodate that capacity regardless. Instead, an Intra-Caspian pipeline, from unexploited Turkmenistan fields to Azerbaijani existing infrastructure is much more realistic. For more information, please see Executive Briefer – Natural Gas Demand and Supply Gap. Another resource can be Executive Briefer – Gas Pipelines and Cross-border Interconnections.

CROSS-CUTTING ENERGY SECURITY ISSUES

	Cross-Cutting Energy Security Issues	Description
1	Cybersecurity	When it comes to recent trends in global energy security, cybersecurity has drawn much attention due to large scale disruptions that the energy system attacks can cause. Disruptions to energy supply delivery can have devastating cascading effects across the entire energy infrastructure value chain. Sophisticated and coordinated cyber-attacks can pose significant physical, socioeconomic and financial damages and the governments are often unprepared to address these emerging threats to their national energy systems. Georgia has taken steps to increase their cybersecurity related activities and focus, especially within the energy sector, but there is certainly still more that needs to be done. Example of progress to this point include the establishment of the Legal Entity of the Public Law (LEPL) Digital Governance Agency and Cyber Security Bureau. That said, more attention is needed to ensure that any steps forward in other sectors are shared for energy security purposes. Such efforts are expected to be the focus of increased donor activities in the near future. For more information, please refer to Executive Briefer – Cybersecurity.
2	Gas emergency action plan: Gas fired power generation vs protected gas customers (households and small business)	Currently "social gas" sector is defined as a household and TPP gas customers in Georgia. In case of supply disruption, the gas emergency action plan should be in place identifying protected customers. Emergency action plan inter alia shall define who are the protected customers (typically in EU they are small non-household and household customers), and what is the priority groups in the event of demand curtailment.
3	Effect of Gas supply disruption on electricity system (gas fired power generation)	As TPP output is significantly important for Georgia during winter months, it has to be evaluated what is the impact on electricity system stability, what are the risks of disruption, tools to mitigate those risks and alternative ways to address the issue.

Cross-Cutting Energy Security Issues		Description
4	COVID-19 Pandemic	The COVID-19 global pandemic is producing significant challenges for countries around the world, with particularly difficult shocks felt in global energy markets and the sector as a whole. While the immediate focus on COVID-19's primary effects tends to revolve around public health and general economic vitality realms, there are certainly second order effects that affect energy security. These include impacts to critical workforce protection, business and service continuity needs, customer support mechanisms, and future policy, regulatory, and system mitigation measures. Additionally, COVID-19 is an example of a Black Swan event, an unpredictable event or disruption that exceeds normal expectations and has the potential to inflict severe consequences. For more information, please refer to materials from Executive Briefer – Black Swan, COVID-19.
5	Role of the gas storage in increasing security of electricity supply	The planned Underground Gas Storage (UGS) in Georgia will improve gas security of supply. It has to be identified who are the priority customer groups that have access to the stored gas in case of supply disruption and emergency. From the supply-side, gas-fired power plants are the most suited for providing a back-up for VRE generation as they are able to start-up and ramp-up rapidly. It should also play a critical role in the case of any sort of crisis, a previous critical weak point in the Georgian energy market.
6	How much gas generating capacity is needed for VRE integration?	One of the solutions to address intermittency of the solar and wind power is to have flexible gas fired power plants to provide reserve capacity and support further integration of VRE to the grid. How much will be needed is based upon a combination of factors, such as further GSE infrastructure efforts, realized gains in VRE generation and production, and other integration strategies such as battery use and offloading.
7	How can Hydrogen Production help Georgia in improving Energy Security?	Exploring hydrogen is becoming more and more important energy policy direction in EU and other regions. Producing Green Hydrogen is promising for Georgia as well, as it will greatly help utilization and integration of rich domestic variable renewable energy potential. In addition, due to asymmetric seasonal generation and consumption pattern in Georgia, excess hydro power generation could be used for production of hydrogen. Furthermore, hydrogen can be mixed up with natural gas in local and transit gas pipelines, reducing natural gas import dependency for Georgia and increasing revenues from exporting it.
8	Carbon Markets and Energy Security, Risks and Opportunities	While the future of carbon markets is not an immediate concern for Georgia, they may be on the horizon given Georgia's commitment and momentum to join the Energy Community. Of course, several factors would need to come into play for Carbon Markets to arise in the broader Energy Community as a whole or in Georgia alone. That said, Georgia may be well positioned to succeed in a larger European carbon market system, given its ample carbon free generation capacity (namely hydro). For more information, please refer to Executive Briefer – Carbon Markets, Risks and Opportunities
9	Climate Change	The risks of climate change (and challenges they pose) to energy security have gained prominence in recent years, attracting more attention and study. Renowned energy security expert Dr. Robert Ichord labeled climate change as one of the critical factors a study must assess with regards to its energy security paradigm. Climate change's impact on energy security can be broken down into direct effects it might have on generation, transmission, demand, and more, and from mitigation measures taken to counteract it. These might be movement away from carbon-emitting based generation resources, policy or legislative steps, and more. For additionally information, please refer to Executive Briefer – Climate Change and Energy Security.
10	EU Third Energy Package	With Georgia en route to adopting the EU Third Energy Package, Georgia is in the process of implementing significant change across its energy sector. Several of these changes can and likely will have an impact to energy security, especially implementing EU Directives and Regulations related to security of electricity supply and security of natural gas supply. This process and its success should provide benefits for Georgia's relative energy security. For more information, please see Executive Briefer – EU Third Energy Package.

	Cross-Cutting Energy Security Issues	Description
11	Role of Government for Energy Security	<p>First and foremost, Georgia should prioritize establishing a National Energy Security Strategy, produced as a result of careful energy policy and foreign policy planning and analysis. This is a must-do first step that governments should take with regard to establishing a foundation for energy security. Other actions Georgia can take would be to further embrace the implementation of energy efficiency policies and support mechanisms for bringing online additional generation. Greater transparency and information in the sector could also be a boon. For more information, please see Executive Briefer – Role of Government in Energy Security.</p>
12	Role of Donors and International Institutions	<p>The donor community has been instrumental in assisting Georgia’s energy security improvement efforts, one such example being the South Dome Samgori Gas Storage Facility (with funding assistance from KfW + EIB). USAID Energy Program is just one more example of how multifaceted assistance can propel progress on a variety of factors that impact energy security. For more information, please see Executive Briefer – Role of Donors and International Institutions.</p>

ANNEXES

A. EXECUTIVE BRIEFER – ENGURI AND ABKHAZIA

Executive Briefer – Enguri and Abkhazia

Where Georgia stands today. Prospects and Opportunities for Tomorrow.



Historical Context of Enguri HPP

THREAT LEVEL

The Enguri hydropower plant generates about a third of all electricity in Georgia but it lies in a precarious position. While the dam itself is firmly in Georgian territory, it has its production facility in Abkhazia. For over 20 years, Georgia has provided all power to the breakaway region at no charge in exchange for recognition of Georgia's ownership of Enguri. The arrangement since 1996 was that Abkhazia recognized Georgian ownership of Enguri HPP but Georgia had to provide 40% of the power generated by Enguri HPP to Abkhazia. This has continued even as Russia has installed 5000 troops in the region plus family. The facility is also aging and in need of repairs.

Today, the consequences of this deal have been compounded by Georgia's substantial reforms and Abkhazia's lack of them. Abkhazia does not make collections, rendering energy essentially free in the region, greatly increasing both demand and inefficiency. Meanwhile, Georgia has introduced metering and many other aspects of a developing energy market.

Two-Pronged Issue

1 Energy Security Dilemma

- The challenge Enguri and the larger relationship with Abkhazia poses to Georgia's energy security touches both generation and consumption.
- At this time, Abkhazia (~200k population) consumes equivalent to Tbilisi Metro area (1.3 M). The breakaway region has remained at Soviet levels of consumption because they continue to receive energy for free from Georgia. This trend is unsustainable.



2 Geopolitical Factors

- Since the 1996 Agreement, Georgia has been funneling significant energy resources to its breakaway region.
- Georgia has continued to do this despite the Russian occupation, declaration of independence, stationing of Russian troops, and more – without an apparent alternative.
- It is unclear what actions might be undertaken by Russia or Abkhazia if Georgia forced a renegotiation or ceased to provide free energy.



Executive Briefer – Enguri and Abkhazia

Where Georgia stands today. Prospects and Opportunities for Tomorrow.



Ongoing Challenges Regarding Enguri and Georgia's Paths Forward

Associated Malign Russian Influence

- Russia has consistently challenged the Euro-Atlantic community integration efforts by Georgia and other former Soviet republics.
- Russia's behavior is characterized by acting as a regional influencer in its immediate "sphere of influence"
- Russia's support for and occupation of Abkhazia and South Ossetia are major elements of this strategy. Given its military presence in Abkhazia and its ability to limit future energy transfers, Russia could provoke hostilities that Georgia needs to avoid.

Surging Abkhaz Demand

- Given that Georgia cannot simply stop supplying electricity to Abkhazia due to the geography and geopolitical considerations, surging inefficient consumption in Abkhazia poses its own challenges.
- Georgia currently lags significantly behind worldwide consumption averages– a figure that is poised to rise given advancements in quality of life.
- Should Georgia **continue to divert much of Enguri's vital domestic energy supply**, it will severely impact its ability to meet its energy security and independence objectives.

Enguri HPP Rehabilitation Needs

- Enguri is in need of urgent repairs, some of which have already begun and are underway.
- More substantial repairs are necessary, which are expected to force Enguri's closure for an extended period of time in the coming years.
- This closure will cut off significant volumes of Georgia's energy supply. The ramifications will depend on the extent of the closure.
- Finding a more suitable resolution to the Enguri situation is a necessary next step for Georgian energy policy

Priorities and Possibilities for Georgia

- First and foremost, Georgia should prioritize maintaining a pragmatic relationship that ensures peaceful and continuous operation of Enguri HPP – destabilizing actions should be avoided wherever possible.
- Second, Georgia should in the near term seek rehabilitation solutions that ensure the long term viability of Enguri HPP.

- While the costs of the repairs will be significant, both in direct spend and replacement energy purchases, the alternative is further infrastructure degradation that would undermine energy security.
- It is possible that with repairs and reductions in flows of energy to Abkhazia, the breakaway region might induced to consider efficiency efforts measures.

B. EXECUTIVE BRIEFER – GAS PIPELINES AND CROSS-BORDER INTERCONNECTIONS

Executive Briefer– Gas Pipelines and Cross-border Interconnections

Where Georgia stands today. Prospects and Opportunities for Tomorrow.



Georgia's Keys to Success in the Neighborhood

HYDROCARBON EXPORT PARTNERSHIP WITH AZERBAIJAN

1 — The regional partnership between Georgia and Azerbaijan has been the defining success of Georgia's energy and foreign policy in the past two decades, cementing Georgia's role as a transit hub.

2 — Additionally, Georgia's mutually beneficial, strategic and pragmatic relationship with Azerbaijan provides the highest assurance of security of supply.

CONTINUE EXPANDING REGIONAL INTERCONNECTIONS

1 — Georgia has made significant progress in recent years on this front with a new 500 KV interconnection with Azerbaijan and DC Converter with Turkey.

2 — These projects will help Georgia create a more symbiotic energy relationship with its neighbors and demonstrate its commitment to cooperation.

BECOME ENERGY COOPERATION LEADER

1 — Starting with its time of Chairmanship of the Energy Charter in 2015, Georgia has led the way towards regional electricity cooperation in the region.

2 — Crafting and leading a coalition that cooperates on energy issues could be a meaningful policy leadership role for Georgia.

Ten Year Plan for Regional Transfer Capacities in 2030



Source: 10 Year Network Development Plan of Georgia for 2020-2030, GSE

Executive Briefer– Gas Pipelines and Cross-border Interconnections

Where Georgia stands today. Prospects and Opportunities for Tomorrow.



Main Transit Arteries

South Caucasus Pipeline (SCP)

The SCP is a strategic natural gas export route from Azerbaijan's Caspian Shah Deniz gas field through Georgia to Turkey and onward to the European markets.

Baku-Tbilisi-Ceyhan (BTC)

The primary sister oil pipeline of SCP, the B-T-C serves the same function and objective. Along with the smaller Baku-Tbilisi-Supsa pipeline, it completes Georgia's hydrocarbon sourcing transit infrastructure.

Regional Interconnections

Georgia has the following high voltage interconnection:

- Georgia-Russia (500 KV)
- Georgia-Azerbaijan (500 KV)
- Georgia- Armenia (220 KV)
- Georgia-Turkey (400 KV)

Regional Context of the Southern Caucasus Energy Infrastructure

After the fall of the Soviet Union, and the regional hostilities that followed, the power systems of the Southern Caucasus underwent significant degradation. Since then, Georgia and Azerbaijan in particular have strengthened their cooperation and began jointly exporting Caspian Sea oil and gas to Western markets. Despite these efforts, the potential for interconnections remains largely underutilized.

Continuing to build on the progress of regional cooperation is a key element of Georgia's energy policy and energy security strategy.

Importance of Pipelines and Interconnections to Energy Security



The most important aspect of energy security remains diversification of supply sources above all else, and the number of different means a state has to import energy supplies is typically covered by pipelines, interconnections, and then open market purchases.

For Georgia, which lacks domestic production capacity for essential elements of its energy mix beyond hydro power, this is all the more true. To increase its energy security, Georgia has strengthened cooperation with Azerbaijan to jointly export Caspian oil and gas via Georgian pipelines to Western markets.

THREAT LEVEL



Relevant Regional Pipelines



Source: Diplomat Magazine, Iran's Other side: the South Caucasus, 2014

C. EXECUTIVE BRIEFER – GEOPOLITICAL DIMENSIONS

Executive Briefer – Natural Gas Demand and Supply Gap

Where Georgia stands today. Prospects and Opportunities for Tomorrow.



Developments to watch for

Trans-Caspian Pipeline
Prospective pipeline across the Caspian seabed, connecting Central Asian resources to the Caucasus export network.

LNG Capacity Building
As the market for LNG grows and prices drop, the opportunities for "swaps" to benefit Georgia will grow. A "swap" is a contractual arrangement to purchase a commodity (in this case LNG) from a provider in a separate location for the same commodity at an agreed price.

Greater Renewables Integration
Over the next decade, Georgia aims to significantly increase its renewables penetration, increasing its energy security. One challenge is integrating the intermittent variable energy (VRE) into the grid. By 2030, Georgia will be able to integrate 1,852 MW of VRE into its grid.

Georgia's Looming Supply Gap and Available Options

INTERNAL ACTIONS
Domestic actions Georgia can take to mitigate external factors

- IMPROVE END-USE ENERGY EFFICIENCY:**
With both **rising demand and declining supply levels**, Georgia should prioritize greater energy efficiency to limit negative impact on energy security
- STIMULATE VARIABLE RENEWABLES GROWTH:**
Prioritize development and deployment of renewable energy generation

EXTERNAL ACTIONS
Steps that will limit vulnerabilities and enhance independence

EXPLORE REGIONAL "SWAP" POTENTIAL:
One way that Georgia can seek to **maximize its potential import capacity** is by executing "swaps" with regional partners. The most advantageous scenario would be executing a "swap" of LNG from **European regasification terminals eastward to Georgia**, by utilization of Georgian off-take from the SCP pipeline.

MINIMIZE RUSSIAN MARKET SHARE:
If Georgia finds potential **"swap" partners unwilling or unable**, and cannot negotiate an extension of supplemental off-take gas, Russia will almost certainly regain a market presence. Georgia should work concertedly to make sure it **secures the entirety of its non-Russian import capacity** to limit the size of Russia's supplier role, and therefore the **severity of any coercive energy diplomacy**.

Executive Briefer – Geopolitical Dimensions

Where Georgia stands today. Prospects and Opportunities for Tomorrow.



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Trans-Caspian Pipeline
Potential pipeline across Caspian seabed, connecting Central Asian resources to Caucasus export network.

LNG Capacity Building
As the market for LNG grows worldwide and prices drop, the opportunities for "swaps" that could benefit Georgia should grow.

Greater Variable Renewable Energy (VRE) Integration
Over the next decade, Georgia aims to significantly increase its VRE penetration, increasing relative energy security.

Growing Cyber Threats
Cyberattacks are on the rise worldwide, particularly on energy systems. See our other Executive Briefer on Cybersecurity for more information.

REGIONAL CHALLENGES

MALIGN RUSSIAN INFLUENCE	REGIONAL HOSTILITIES	ONGOING OCCUPATIONS
<ul style="list-style-type: none"> Russia has consistently challenged the Euro-Atlantic community integration efforts by Georgia and other former Soviet republics. This effort has manifested itself in both geopolitical "stick" coercive actions and "carrot" incentive actions, as well as outright military confrontations Russia's behavior is best described as trying to act as a regional leader in its "sphere of influence" 	<ul style="list-style-type: none"> Simmering hostilities and conflicts between Georgia's neighbors threaten to undermine regional progress Tensions between Azerbaijan and Armenia, Turkey and Armenia, and Georgia and Russia all are poised to upset the trading equilibrium of the moment Balancing these state to state relationships is essential to maintaining Georgia's successful trajectory 	<ul style="list-style-type: none"> Russia's ongoing occupation of both Abkhazia and South Ossetia undermine Georgia's territorial integrity and greater sovereignty Georgia's inability to exert control over the entirety of territory has led to significant energy security consequences related to Enguri HPP Finding a more suitable resolution to the Enguri situation is a necessary next step for Georgian energy policy



“Georgia's destiny is not its alone to write.”
-Paul Stronski, Carnegie Endowment Scholar

D. EXECUTIVE BRIEFER – CRITICAL INFRASTRUCTURE RESILIENCY

Executive Briefer – Critical Infrastructure Resiliency

Where Georgia stands today. Prospects and Opportunities for Tomorrow.



So WHAT?

Critical Vulnerability if Energy Infrastructure is Compromised

Any threat to energy sector infrastructure could have significant upstream or downstream effects on the general and essential functioning of a country. Due to longer useful life of energy infrastructure assets, the legacy systems are particularly vulnerable due to their age and significant maintenance costs but advanced energy technologies, including smart grids, expose more vulnerabilities due to their integrated systems, interdependencies and automation.

Technological Developments Amplify Threats

As novel technology is installed, such as advanced sensors and the Internet of Things, the increase in efficiency comes with greater sophistication to access and disrupt critical systems.

Managing Potential Threats

Attacks on energy infrastructure, whether from cyber actors, terrorists, or conventional means by nation-states, pose a threat to virtually all nations. Understanding the context of the threat and taking efforts to mitigate it is essential.

Achieving Resiliency

THREAT LEVEL

1. Robustness – the ability to absorb shocks and continue operations

- This factor incorporates designing systems to be able to absorb a predictable eventuality, and putting in place structural replacements that allow for continuation.
- Additionally, preparing for extreme events that may never occur – including pandemics.

2. Resourcefulness – the ability to skillfully manage a crisis as it unfolds

- How critical actors take measures to fix or mitigate effects of a disturbance or attack.
- Given that disturbances are likely, the ability to respond to disruptions is as important as protections themselves. This is more about proper personnel preparedness than technology.

3. Rapid Recovery – the ability to get services back as quickly as possible

- Critical infrastructure is most important for its enabling abilities, therefore, resuming services is the immediate benchmark.
- A combination of contingency plans, training, preparedness, and effective response teams are the best insurance policy.

4. Adaptability – the ability to incorporate lessons learned from past events to improve resilience

- Agencies, companies, and government must all collectively learn from prior disruptions, eliminate vulnerabilities where possible and incorporate contingency plans.

“Infrastructure resilience is the ability to reduce the magnitude and/or duration of disruptive events.”

– U.S. National Infrastructure Advisory Council

Executive Briefer – Critical Infrastructure Resiliency

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Major Challenges

1. Increased Cyber Risk

Cyberattacks are on the rise worldwide, particularly on energy systems. See our other Executive Briefer on Cybersecurity for more information.

2. Extreme Events

While countries cannot expect to predict extreme events occurring, they still must properly plan for them by establishing resource funding allotments and redundancies within the system.

3. Cross-Sector Risks

While the energy sector is slightly more insulated from downstream effects of failures in other systems, it does still have factors and products it relies on. These include fuel products, water, data networks, communications, and transportation to name a few.

Next Steps for Georgia

1 Robustness

- Continue **investing in increased gas storage facilities**, such as the Samgori South Dome development
- Storage facilities for various fuel types allow for continued functioning and **additional protections against disruptive shocks**

2 Resourcefulness

- Georgia should invest in crisis management capacity building for its energy institutions personnel
- This is not a significant monetary investment – but rather time and focused effort to understand respective institutional roles in case of an event or attack

3 Rapid Recovery

- While protection infrastructure is key, accepting the risk and having immediate after-action plans is irreplaceable
- Georgia should formalize contingency plans in the case of the disruptions deemed most likely to occur

4 Adaptability

- Create or install an intra-agency body or groups within each entity specifically responsible for consistent improvement to existing resiliency systems
- There are potential lessons to be learned from the current novel coronavirus pandemic about strategies for maintaining uninterrupted operations, including periodic situational awareness assessments at each energy entity



Source: NIAC 2010 Report

E. EXECUTIVE BRIEFER – DIVERSIFICATION OF ENERGY SUPPLIES

Executive Briefer – Diversification of Energy Supplies

Where Georgia stands today. Prospects and Opportunities for Tomorrow.



Global Energy Expert Bob Ichord's Energy Security Framework

1. External Energy Dependence

Energy is vital to national defense and basic functioning. Vulnerability arises when states over rely on external sources.

2. Import Diversification

Countries seek to minimize this external vulnerability by diversifying their import sources. See to the right.

3. Import Reliability, Price Stability and Vulnerability to Disruptions

Of course, it is necessary to assess how reliable those import sources are as well. Do they deliver consistently at fair prices?

4. Governance, Transparency, and Accountability

While less important, these factors can impact the overall functioning of energy markets, and therefore energy security.

5. Prices, System Costs and Sector Commercial Viability

How efficient does the energy market function? If there is an overreliance on subsidies it could undermine investment.

6. Resiliency, Emissions and Environmental Sustainability

Is the energy market resilient to potential effects to climate change? Examples could be drought, hurricanes, and sea level rise.

Importance of Diversification

- States seek to diversify their energy import sources to reduce their vulnerability to any disruptions
- That said, there are cases where diversification may require investments or incur costs that outweigh the relative gains to energy security
- To measure these costs and benefits to diversification, it's necessary to account for import reliability and vulnerability due to geopolitical actions

Georgia's Diversification Status

While rich in hydro resources, Georgia lacks significant hydrocarbons and therefore is heavily reliant on imported oil and gas.

Georgia imports gas almost exclusively from Azerbaijan, both as offtake from SCP and a separate SOCAR pipeline.

In 2018, Georgia significantly reduced its Russian share of gas imports, a marked success given past vulnerability.

Georgia net imports electricity. Due to high seasonality of hydro production, Georgia imports electricity through low production winter periods and exports in the summer.

KEY ANALYSIS

Georgia has improved its energy security despite its immense dependence on Azeri imports by transitioning away from overreliance on a less secure actor, Russia. Due to its more equal trade posture– Baku depends on Georgia for transit while Russia can much more easily weaponize such a small fraction of its energy exports.

Executive Briefer – Diversification of Energy Supplies

Where Georgia stands today. Prospects and Opportunities for Tomorrow.



Georgia's Energy Diversification Priorities: A Path Forward

INTERNAL ACTIONS

Domestic actions Georgia can take to amplify and mitigate external factors

INVEST IN GAS STORAGE:

Further gas storage developments, in addition to Samgori facility, would help with normal market functioning as well resiliency against disruptive shocks, including geopolitical waves.

STIMULATE VARIABLE RENEWABLE GROWTH:

Prioritize development and deployment of renewable energy generation

ESTABLISH VIABLE COMPETITIVE POWER MARKET:

A functioning and market sensitive power exchange is an essential element of energy security– and enhance relative gains on diversification.

IMPROVE END-USE ENERGY EFFICIENCY:

With rising demand and import levels, Georgia should prioritize greater efficiency to limit negative impact on energy security

EXTERNAL ACTIONS

Steps that will limit vulnerabilities and enhance independence

CONTINUE EU ACQUIS:

Greater integration into the Energy Community will benefit Georgia's energy market both through direct improvements and institutional legitimacy

PRIORITIZE REGIONAL COOPERATION:

Georgia has found success as the transit hub for energy supplies crossing the Caucasus– leaning into this role, from East to West and North to South, should result in benefits.

PREPARE FOR INCREASED SHAH DENIZ II GAS OFFTAKE:

The potential of significantly greater levels of gas transiting through Georgia, and a corresponding increase in cheap offtake, would be a significant benefit for Georgia.



F. EXECUTIVE BRIEFER – NATURAL GAS DEMAND AND SUPPLY GAP

Executive Briefer – Natural Gas Demand and Supply Gap

Where Georgia stands today. Prospects and Opportunities for Tomorrow.



The Pending Gap Between Gas Supply and Demand...

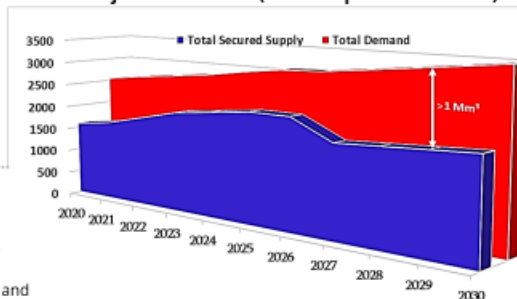
Georgia has made significant progress over the past decades in meeting its energy demand with ample supply. It has achieved this largely by regional cooperation, namely with Azerbaijan. In addition to receiving direct imports, in return for jointly exporting Caspian energy to Western markets, it has received compensatory supplemental gas.

Through these dealings, Georgia has improved its energy security despite its immense dependence on Azeri imports by transitioning away from overreliance on a less secure actor, Russia (see Executive Briefer on Diversification of Energy Supplies).

Still, due to an expiration of the supplemental gas contract with Azerbaijan, surging domestic demand, and limited additional Azeri export capacity, Georgia faces a looming supply gap of up to 1.2-1.5 bcm/year, about half of its current consumption.

THREAT LEVEL

Comparison of Total Secured Supply with Projected Demand (GOGC Expected Scenario)



Source: Georgian Oil and Gas Corporation, Supply Gap Projections

Looming Russian Vulnerability

- Without concerted action, it is almost inevitable that a dependency on Russia as a gas supplier will reemerge.
- Russia has demonstrated its dissatisfaction with a Eurocentric policy shift from Georgia and other similar formerly Soviet republics.
- This effort has manifested itself in both geopolitical "stick" coercive actions and "carrot" incentive actions, which has included pricing for essential natural gas imports.
- This has already happened once for Georgia, as it learned the hard way how easily Russia was able to manipulate energy export prices.
- Mitigating Russia's ability to pursue coercive energy policies, by limiting vulnerability, is essential.

Executive Briefer – Natural Gas Demand and Supply Gap

Where Georgia stands today. Prospects and Opportunities for Tomorrow.



Developments to watch for

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Prospective pipeline across the Caspian seabed, connecting Central Asian resources to the Caucasus export network.

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As the market for LNG grows and prices drop, the opportunities for "swaps" to benefit Georgia will grow. A "swap" is a contractual arrangement to purchase a commodity (in this case LNG) from a provider in a separate location for the same commodity at an agreed price.

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Over the next decade, Georgia aims to significantly increase its renewables penetration, increasing its energy security. One challenge is integrating the intermittent variable energy (VRE) into the grid. By 2030, Georgia will be able to integrate 1,852 MW of VRE into its grid.

Georgia's Looming Supply Gap and Available Options

INTERNAL ACTIONS
Domestic actions Georgia can take to mitigate external factors

- IMPROVE END-USE ENERGY EFFICIENCY:**
With both rising demand and declining supply levels, Georgia should prioritize greater energy efficiency to limit negative impact on energy security
- STIMULATE VARIABLE RENEWABLES GROWTH:**
Prioritize development and deployment of renewable energy generation

EXTERNAL ACTIONS
Steps that will limit vulnerabilities and enhance independence

- EXPLORE REGIONAL "SWAP" POTENTIAL:**
One way that Georgia can seek to maximize its potential import capacity is by executing "swaps" with regional partners. The most advantageous scenario would be executing a "swap" of LNG from European regasification terminals eastward to Georgia, by utilization of Georgian off-take from the SCP pipeline.
- MINIMIZE RUSSIAN MARKET SHARE:**
If Georgia finds potential "swap" partners unwilling or unable, and cannot negotiate an extension of supplemental off-take gas, Russia will almost certainly regain a market presence. Georgia should work concertedly to make sure it secures the entirety of its non-Russian import capacity to limit the size of Russia's supplier role, and therefore the severity of any coercive energy diplomacy.

G. EXECUTIVE BRIEFER – CYBERSECURITY

Executive Briefer – Cybersecurity

Where Georgia stands today. Prospects and Opportunities for Tomorrow.



CONTEXT AND RELEVANCE

When it comes to recent trends in global energy security, cybersecurity has drawn much attention due to large scale disruptions that the energy system attacks can cause. Disruptions to energy supply delivery can have devastating cascading effects across the entire energy infrastructure value chain. Sophisticated and coordinated cyber attacks can pose significant physical, socioeconomic and financial damages and the governments are often unprepared to address these emerging threats to their national energy systems.

Mitigating cyber threats has become a top priority for countries around the world.

REGIONAL HISTORY

Cybersecurity is a major Energy Security concern in the region. In 2008, after a Turkish section of the BTC oil pipeline ruptured, western media reported that a cyber unit within the Russian Special Services was responsible.

The attack consisted of gaining control of separate industrial systems and increasing pressure within the pipe section while disabling alarms. This was the first instance of a cyber related energy security threat, but far from the last. Russia also famously perpetrated an attack on Ukraine's energy networks in 2015. These actions cemented the importance of cyber concerns to energy security.

PRESENT OUTLOOK



Global Outlook

Cyber attacks have been steadily increasing over the past decade. As such, updating outdated control systems (SCADA in particular) has become an essential component of energy security. These efforts are only more important as smart metering and the "internet of things" create the potential for cascading affects of any cyber attack.



Where Georgia Stands

Georgia has embraced the challenges that come with cybersecurity. It earned a ranking of 18th best globally in the latest Cybersecurity Index from the United Nation's International Telecommunications Union (ITU). **Still, due to geopolitics, Georgia has been repeatedly targeted, as it media and communications sectors were in Nov. 2019.**

THREAT LEVEL

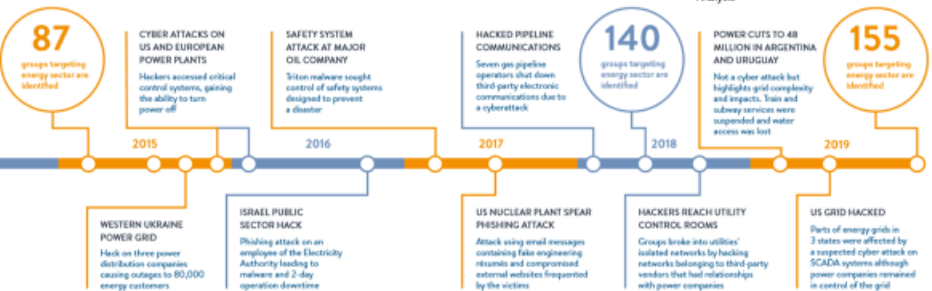


So What?

Georgia's resiliency to Cyber vulnerabilities, especially in its grid, must be highly proficient given the likelihood of this lever being pulled in any future hostilities. Additionally, disruptions to Georgia's normal energy transit operations also threaten to undermine the reliability of its exports.

Cyber Incidents on the Rise

Source: Worldenergy.org, Marsh and McLennan Analysis



Executive Briefer – Cybersecurity

Where Georgia stands today. Prospects and Opportunities for Tomorrow.



TERMS TO KNOW

- Anti-virus**
Software designed to prevent infection
- Botnet**
Network of compromised computers
- Brandjacking**
Cybercrime impersonating well known organizations
- Denial of Service (DoS or DDoS) Attack**
Cyberattack to prevent access to a resource/ Distributed DoS if from a varied network
- Drive-by-Download/ Phishing**
Cyberattack using email or files to gain access to a system without consent.
- Ransomware**
Handicaps system functionality for ransom

1 CHALLENGES

State Sponsored Threat	<ul style="list-style-type: none"> Georgia faces threats from malicious and advanced cyber actors and independents These attacks could target transit systems or critical infrastructure
Legacy Infrastructure	<ul style="list-style-type: none"> Key cyber challenge for energy security comes from long-lasting energy infrastructure that was developed before the advent of cyber threats
Internet of Things	<ul style="list-style-type: none"> As grids implement new technologies to increase efficiency, these systems are more vulnerable to cyber attack due to automation, interdependencies, and missing manual protections

2 SUCCESSES

<ul style="list-style-type: none"> Georgia has addressed the growing cyber threat following the 2008 Russia-Georgia war Established Cyber Security Bureau to coordinate all threat mitigation and response activities 	Development of Cyber Security Bureau
<ul style="list-style-type: none"> Georgia launched CyberLab, an online resource of IT professionals to hone their cyber related skills 	Capacity Building
<ul style="list-style-type: none"> Through its accession to the EU Third Energy Package, Georgia has coopted strong legal frameworks surrounding cyber intrusions 	Legal Frameworks

3 BIG TAKEAWAYS

<p>UNDERSTAND THE THREAT</p> <p>Both state sponsored actors and well-financed independent groups have the sophistication and motivation to access Georgian energy networks.</p>	<p>BE PREPARED WITH EDR</p> <p>Endpoint Detection and Response systems should be mandated at all state energy actors, allowing for quick Responses to inevitable intrusions.</p>	<p>ENSURE RESILIENCE</p> <p>Maximizing the system's ability to absorb sudden shocks and allow for continued normal operations is essential to both national and energy security.</p>
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H. EXECUTIVE BRIEFER – BLACK SWAN, COVID-19

What is a "Black Swan" Event?

A Black Swan is an unpredictable event or disruption that exceeds normal expectations and has the potential to inflict severe consequences. Black Swan events are extremely rare but have the ability to impose severe damage on entire economies or societies.

When news reports first began emerging about a novel coronavirus in Wuhan, China, few people could have predicted it would force over one-third of the world's population into a lockdown.

While the world jointly manages the initial disruptions and health system consequences of COVID-19, the biggest challenge may come from trying to restart economies and restore freedom of movement safely and effectively in the months to come.

The following are some of the potential impacts and dilemmas.

Black Swan Example: COVID-19 and Global Energy Sector Impact

THREAT LEVEL



New Workforce Normal

Given that the energy sector serves an enabling and strategic function in national economies, ensuring that the highly skilled and first-responder workforce (in key energy installations such as nuclear power plants or control rooms) is protected during such emergencies is essential. Regulators may further enable and mandate relevant workforce protections, security measures and system resilience. Additionally, remote telework is a "new normal" for resilient business operations.



Decreased Demand and Reduced Revenue

The global shutdown has drastically reduced worldwide energy consumption and demand, causing significant financial strain and losses across the energy sector worldwide. The COVID-19 pandemic has also caused a disruption to the global oil markets which was exacerbated by a brief price war between OPEC and Russia. The power market performance has been pessimistic, even since an output cutting settlement was reached.



Financially-stressed Customers

Given the massive virus containment measures enacted in various parts of the world through social distancing, the resulting economic consequences have been rapid and dramatic in some instances. This process has left customers much less financially secure and likely will impact their ability to pay for non-essential goods and services. Additionally, in many areas, governments and regulators have specifically provided subsidy support, including delayed or forgiven payments for energy services, depending on the severity of economic impact.



Impacted Supply Chains

This is particularly true of the renewables sector, where a vast majority of input material, product sourcing and manufacturing occurs in China, the outbreak epicenter of COVID-19. As a result, its factories were closed early, impacting downstream energy companies and projects worldwide, causing widespread delays. Further disruptions occurred in supply chains dependent on particular shipping routes.

Georgia's Significant COVID-19 Energy Sector Challenges

Critical Workforce

- Georgia has worked diligently to restore the institutional technical knowledge and capabilities it currently has in its energy sector, but still its highly technical workforce is rather small, making the cross-training critical to retain emergency preparedness and response.
- Additionally, given the significant contribution from one particular hydro power plant, Enguri HPP, the relatively small contingent of on-site workers is disproportionately critical.

Customer Support

- While Georgia has not been affected severely by the virus itself, with a very low per-capita infection rate, the extent of the Government's response to contain it were extensive.
- As a result, Georgia, which already had a significant vulnerable population, may have to examine of potential rate shifting.

Business and Service Continuity

- For years, Georgia has successfully procured generation capacity through long-term PPAs. These contractual liabilities will likely be exacerbated by COVID-19.
- When the crisis began, Georgia had many energy infrastructure developments either planned or under construction – delays to these projects could have cascading effects with increased financial risks.

POLICY, REGULATORY AND SYSTEM MITIGATION MEASURES FOR GEORGIA

- Analyze impacts of expected revenue decreases and increased costs of liquidity.
- Adjust scheduling and dispatch to minimize in-force PPA exposure.
- ESCO fiscal viability and role transition will take place in a more complex environment and of utmost importance.
- Use tariffs and subsidies to provide extra protection for vulnerable customers.
- Adjust household tariffs for temporary relief from payments.
- Continue commitment to VRE generation development and integration capability.

“

Governments need to make sure they keep clean energy transitions top of mind as they respond to this fast-moving crisis.

Dr. Fatih Birol, IEA Executive Director

I. EXECUTIVE BRIEFER – CARBON MARKETS, RISKS AND OPPORTUNITIES

Executive Briefer – Carbon Markets, Risks and Opportunities

Where Georgia stands today. Prospects and Opportunities for Tomorrow.



Global View of Carbon Markets

MECHANISM TO TIE CARBON TO REAL COST

- 1 — The cost of carbon establishes the economic opportunity cost for markets.
- 2 — Countries will continue to rely on cheaper fossil fuels, especially where poverty and energy insecurity is rampant, unless incentive measures offsets that benefits.

VAST COST SAVINGS ON IMPLEMENTATION

- 1 — Environmental groups such as the Environmental Defense Fund argue that an international carbon market could cut the financial cost of meeting the Paris Agreement obligations by 59-79%.
- 2 — Allow the developed countries to “finance” green, sustainable development policies in countries that cannot afford them.

RISK OF CIRCUMVENTION

- 1 — A version of carbon markets exists where lax rules allow for states to continue pollution levels at minimal cost.
- 2 — The efficacy can also come under doubt if not properly enforced— a carbon market system from the Kyoto protocol actually increased emissions due to widespread corruption.



Key Components of Carbon Markets

THREAT LEVEL

- Emissions Trading Systems (ETS)**
An Emissions Trading System (EST) is the foundation of any carbon market- it sets a mandatory or voluntary limit on emissions, eg. a cap, and allows countries that underutilize their levels to sell them on an open market. This structure, sometimes referred to as a Cap and Trade system, allows the countries to share costs and responsibilities of sustainability.
- Independent Governing Authority or Regulator**
A required authority, this market oversight body is responsible for implementing and operating the market, and enacting and enforcing monitoring, reporting, and verification (MRV) requirements.
- Stabilize Carbon Pricing**
One of the essential components of any carbon market is establishing an effective and enforceable price design. By adding a price on carbon, investors and developers are guaranteed a stable and predictable valuation mechanism which is essential to effective carbon system functioning - carbon credits will become key to financing.
- Article 6 of the Paris Climate Agreement**
Article 6 allows for and prescribes an international carbon market system where all countries set their reduction targets and could sell carbon off-sets they have achieved on the open market.

Executive Briefer – Carbon Markets, Risks and Opportunities

Where Georgia stands today. Prospects and Opportunities for Tomorrow.



1 RISKS for Georgia

Price Volatility	<ul style="list-style-type: none"> • A key risk to any carbon market system. • Whether Georgia establishes its own system, or folds into a larger Energy Community one, presents risks about stability for the former and agency for the latter.
Energy Community Moves too Fast	<ul style="list-style-type: none"> • Secretariat of the Energy Community launched study of pricing design systems for EC carbon market. • While great for decarbonization, Georgia may not be able to without sacrificing security of supply.
Limiting Energy Security	<ul style="list-style-type: none"> • While the proponents of carbon markets cite benefits to energy security, the opponents claim it is a zero-sum game • The reality is mixed - it increases chances for financing but reduces means to limit vulnerability.

2 OPPORTUNITIES for Georgia

<ul style="list-style-type: none"> • With a highly green energy mix, Georgia is well positioned for any carbon market. • Georgia's immense hydro power and oncoming wind and solar would likely make it a key beneficiary of selling carbon credits. 	Prime Positioning
<ul style="list-style-type: none"> • Georgia already used a capital program at Enguri to increase efficiency which afforded it credits under Kyoto. • Similar programs, with significant planned wind and solar capacities, could benefit Georgia. 	Successful Past
<ul style="list-style-type: none"> • As wealthy developed countries look for ways to cut their counted emissions standards, Georgia could capitalize on this by securing financing for domestic sustainable and GHG-free developments. 	Financing Assistance

Overall, if Georgia were to be included in a larger (regional or international) carbon market system, it would likely be a net positive for Georgia's energy development but have mixed effects on its energy security outlook.

J. EXECUTIVE BRIEFER – CLIMATE CHANGE AND ENERGY SECURITY

Executive Briefer – Climate Change and Energy Security

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Accepted Tenets of Climate Change

- Human-related emissions of greenhouse gases (GHG) and other pollutants are the primary cause of the Earth's climatic changes and rising temperature.
- Other factors, including volcanoes, proximity to the sun, etc. also impact climate change but on much larger time scales.
- While uncertainties are plentiful about the exact nature how climate change will impact localized weather events, evidence suggests there may be either increased frequency of extreme events or increased severity, or both.

Source: European Commission, Climate Strategies and Targets, 2020.

Climate Change's Impact on Energy Security (ES)

THREAT LEVEL

Direct Effects of Climate Change on Energy Security

PHYSICAL THREATS TO SYSTEMS AND INFRASTRUCTURE

Worldwide, the onset of climate change has forced governments to consider how its various effects will impact and potentially disrupt the national energy sectors. In particular, the increased localized potential for drought, hurricanes, floods, tsunamis, ice storms and sea level rise, as well as other severe climate events, could dramatically impact a country's ability to meet its energy security goals.

CLIMATE ALTERED IMPACTS USE AND DEMAND

There is a potential for climate change to cause weather effects over time that shift states' needs and consumption patterns.

Climate Policy Mitigation Effects on Energy Security

HIGHER PENETRATION AND FAVORABILITY OF RENEWABLES

In contrast with a traditional view of energy security which prioritized maximum domestic output of all energy sources, an energy security progressive view should discount the importance of bringing on newer fossil fuel and instead shift the energy policy to incentivize GHG-free energy sources, such as renewables.

FUTURE OF CARBON MARKETS

Carbon markets are one policy response that has gained traction in many parts of the world. This would directly affect the competitiveness of certain generation technologies and likely impact a country's energy security strategy. For more information, see Executive Briefer on Carbon Markets.

"Policies and measures to mitigate emissions and adapt to changing conditions should be included in a modern concept of energy security."

*-Dr. Robert Ichord,
Global Energy Security Expert and
Atlantic Council Fellow*

Executive Briefer – Climate Change and Energy Security

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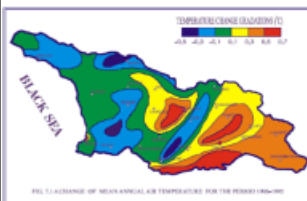
Where Climate Change Fits into Georgia's Energy Security Situation

DIRECT EFFECTS

How climate change might impact Georgia's energy ecosystem

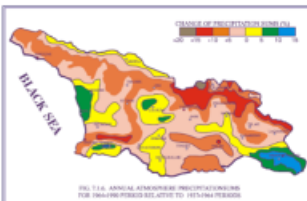
INCREASED TEMPERATURES:

First and foremost, **increased temperatures will exacerbate surging demand for energy for cooling** over the summer periods.



REDUCTION/ REDISTRIBUTION OF RIVER FLOWS:

While not confirmed, any change in river tendencies could **drastically impact Georgia's considerable hydro output.**



Images Source: WWF 2009 Report, Climate Change in Southern Caucasus, Taghievva.

MITIGATION EFFECTS

How Georgia's mitigation actions could play out specifically

CONTINUATION OF EU ACQUIS:

Greater integration into the Energy Community (EC) will benefit Georgia's energy market **both through direct improvements and institutional legitimacy**, but will relinquish control on climate policy to the EU.

REDUCED DEMAND FOR FOSSIL FUELS:

As part of a global shift away from fossil fuels, **Georgia may see decreased importance of its current transit role** of Caspian hydrocarbons in the future.

INCREASED RENEWABLES PENETRATION

With a **high level of renewables already in its energy mix** (80% hydro), and significant untapped potential, Georgia is well positioned to continue tapping climate friendly energy sources **without jeopardizing its energy security.**

IMPROVE END-USE ENERGY EFFICIENCY:

In response to climate change, Georgia will likely continue to prioritize greater efficiency. Energy conservation has a dual positive effect of impacting favorably energy security and **reducing reliance on imports.**

K. EXECUTIVE BRIEFER – EU THIRD ENERGY PACKAGE

Executive Briefer – EU Third Energy Package

Where Georgia stands today. Prospects and Opportunities for Tomorrow.



Benefits of EU Third Energy Package

ESTABLISH COMPETITIVE ENERGY MARKET

- 1 — Through effective policies and regulations, the electricity and gas markets will be more responsive to price signals and consumer behaviors.
- 2 — By being more responsive to market dynamics, **the energy sector will improve its long-term fiscal position.**

INCREASE TRANSPARENCY

- 1 — Restricting the practice of non-transparent PPAs will remove preferential treatment by GoG in selecting its business partners.
- 2 — Eliminating the economic waste that results from these unfavorable agreements, and granting the requisite authorities to regulators to evaluate market conditions will result in greater market efficiencies and consumer benefits.

INCENTIVIZE INVESTMENTS

- 1 — By developing unbundled energy services, investors' appetite will grow in response to increased market opportunities.
- 2 — Creating **innovative support schemes** and regulatory incentives for renewable energy sources will attract new investments.



Key Components of EU Third Energy Package

THREAT LEVEL

- Unbundling**
One of the most crucial elements of the Energy Community's SOP. Unbundling is the functional and accounting separation of energy supply and generation from the operation of distribution networks. This is essential to ensuring fair market competition.
- Independent Regulators**
Independent regulatory oversight is critical to ensuring competitive market performance, affordable prices, balanced stakeholder interests, and consumer protections.
- Agency for the Cooperation of Energy Regulators**
ACER helps ensure that the various national regulators cooperate and ensures smooth market functioning across the broader internal energy market.
- Cross-border Cooperation**
National transmission system operators (TSOs) are responsible for ensuring security of supply for both electricity and natural gas across their power and gas networks. At a higher level, the European Network for Transmission System Operators for Electricity (ENTSO-E) and its gas counterpart, ENTSO-G, ensure optimal cross-border flows.
- Open and Competitive Retail Markets**
The market rules outlined in the Third Package also grant specific protections to consumers, including right to choose or change a supplier, transparent price information, and effective dispute resolutions

Executive Briefer – EU Third Energy Package

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Recent Major Achievements in Georgia

- 1** Implement Draft Law on Energy and Water Supply
- 2** Began Implementing New Laws on Supporting Renewable Energy Sources
- 3** Electricity Market Design and TSO Certification Approved
- 4** Capacity Building and Training on Necessary Market Monitoring Underway

Next Steps for Meeting Energy Community Acquis...

- 1 Establish Competitive Market and GEE**
 - With the newly formed Georgian Energy Exchange in place, Georgia and its energy actors must continue the momentum as it establishes a true competitive market.
 - The basis for the new market will rely on a shift away from Power Purchase Agreements and towards a functioning day-ahead market.
- 2 Transition Toward Unbundling**
 - The major step that's needed here comes from GSE, which will require it to acquire the rest of the transmission network, either by merger or lease agreement.
 - Additionally, ESCO will need to address its shifting role and fiscal liabilities to ensure its long term viability.
- 3 Successful Market Monitoring Set-up**
 - To ensure the newly competitive electricity markets function effectively, and the intended benefits from competition are indeed realized, market monitoring will be essential.
 - Further assistance may from the donor community might be helpful on the topic when building out the necessary tools and processes.

L. EXECUTIVE BRIEFER – ROLE OF GOVERNMENT IN ENERGY SECURITY

Executive Briefer – Role of Government in Energy Security

Where Georgia stands today. Prospects and Opportunities for Tomorrow.



How Governments Can Impact Energy Security

1 Establish Energy Security Strategy

- A National Energy Security Strategy document, produced as a result of careful energy policy and foreign policy planning and analysis, is the first step governments can and should take with regard to establishing a foundation for energy security.
- Geopolitical and environmental considerations also impact energy security concerns.



2 Lead Implementation of Energy Policies

- Create an enabling environment (regulatory oversight, competitive procurement, PPPs, wholesale market liquidity) for private investors to facilitate energy project development and new generation capacity.
- Regulators play a vital role in implementing a government's energy security prerogatives through market incentives and support schemes targeting investment shortfalls.
- An integrated resource and resilience plan (IRRP) is an important policy instrument for reducing external vulnerabilities and developing domestic resources.



THREAT LEVEL



3 Embrace Transparency and Information

- One of the most overlooked aspects of energy security is how effectively a government both monitors and reports relevant sector information.
- Expert energy institutions are vital to energy sector data collection and analysis.
- Transparent and accessible market information allows for objective reviews, improves investor confidence and their ability to secure financing and ensures public trust in the market.

Energy Governance in the Region

Energy security strategy in the region varies greatly, mainly due to the differing relationships the regional governments on domestic energy supply and accessibility. **Azerbaijan, rich in hydrocarbons, is an exporter** – their government has prioritized finding markets for their plentiful oil and gas resources, realizing significant financial gains for the state. **Georgia has found success in partnering with Azerbaijan to export** those resources through its territory, rendering itself an **essential transit state**. **Armenia**, due to its lack of significant domestic energy sources and ongoing hostilities, **is an energy importer**.

While states' energy strategy is mainly driven by the security of their domestic energy sources, and the states of the South Caucasus are no exception. However, each state's government can strive to develop a strategy to improve their overall energy security outlook.



<http://www.internationalaffairs.org.au/news-68m/conflict-in-the-caucasus>

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Government of Georgia's Energy Security Impact

GEORGIA'S SUCCESSES

How Georgia has improved its energy security position

PROMOTING RENEWABLES:

Realizing its immense renewable potential, primarily in hydrological but also in wind and solar resources, GoG has prioritized investments and project developments in these key sectors.

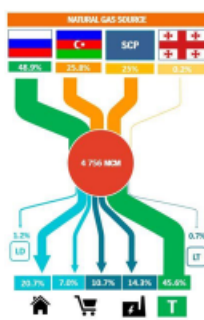
TRANSIT AGREEMENTS:

Georgia's transit agreements, such as the Baku-Tbilisi-Ceyhan oil pipeline and the South Caucasus Pipeline, have secured plentiful and cost-effective hydrocarbons.

GEOPOLITICAL POSITION:

Georgia has improved its energy security outlook over the past few years by further cementing its reduction of direct gas imports from Russia.

2019 Balance of Natural Gas



Vast majority of 48.9% from Russia is transited (T)

Source: GNERC 2019 Report on Annual Activities

NEXT STEPS

What the Government should prioritize next

ESTABLISH NATIONAL ENERGY SECURITY STRATEGY:

Currently, Georgia lacks a comprehensive energy security strategy framework around which to formulate energy sector policies– while achievements have been made on an ad hoc basis, a coherent strategy is needed to further amplify any existing gains.

INCREASE TRANSPARENCY:

Several aspects of Georgia's energy transactions remain non-transparent, especially activities surrounding PPAs and the transit fees from Russia.

ACCELERATE RENEWABLES:

With high penetration of RES already in its energy mix (80% hydro), and a significant variable renewable potential, Georgia is well positioned to continue tapping climate friendly energy sources which will boost its energy security.

CYBERSECURITY STRATEGY FOR ENERGY SECTOR:

Georgia should build upon progress and better organizing its cybersecurity efforts to benefit its overall energy security.

M. EXECUTIVE BRIEFER – ROLE OF DONORS AND INTERNATIONAL INSTITUTIONS

Executive Briefer – Role of Donors and International Institutions

Where Georgia stands today. Prospects and Opportunities for Tomorrow.



Donor Community's Impact

- 
Propelling System Improvements and Development
 The donor community often provides critical project development assistance, technical expertise and capacity building that are both essential to accelerating sector advancements. The support includes study tours, targeted training, advisory services, and leveraging communities of knowledge.
- 
Providing Critical Investment Funds
 Due to the high costs of energy infrastructure improvements, Georgia has often received investment funds for its infrastructure projects from the donor community.
- 
Enabling Energy Cooperation
 One of the commonly embraced objectives has been to promote efforts that improve successful regional and international cooperation. Georgia has been a beneficiary of its strategic geographical location.
- 
Emerging Trends in Joint Ventures and Hybrid Partnerships
 One of the trends that has grown in recent years has been a shift away from investment in the form of pure aid towards a joint venture between private actors or state entities along with a donor institution.

Key Efforts

THREAT LEVEL 

- 1. South Dome Samgori Gas Storage Facility (KfW +EIB)**
 - This storage facility for natural gas, with the majority of funding come from the German development bank and the European Investment Bank, will allow for continued functioning and additional protections against disruptive shocks.
 - Additionally, the facility should play a key role in normal market operations, helping lessen impact of high seasonality of current energy mix.
- 2. Enguri HPP Repairs (EBRD)**
 - Due to the long-standing need for reconstruction at the strategic hydro power plant, the European Bank for Reconstruction and Development has pledged a €38 million investment toward repairs which began last year.
 - The repairs will ensure the long-term viability of Georgia's most important energy production facility.
- 3. USAID Energy Program**
 - Represents just one example of how energy sector development impact can be achieved through non-infrastructure means.
 - Over the years, the U.S. Government, through USAID, has contributed significant capacity building and technical assistance resources, including analytical studies, sector assessments, trainings, and study tours that support Georgia's path to self-reliance.

"Our end goal is a Georgian society that is open, self-reliant, and integrated into the global marketplace."

- Bonnie Glick, USAID Deputy Administrator

Executive Briefer – Role of Donors and International Institutions

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Next Steps for Donor Community Engagement in Georgia

SUPPORT LAUNCHING OF COMPETITIVE MARKET

- 1 — The introduction of a competitive power market **should improve the fiscal foundation of the broader energy sector, but its successful implementation is essential.**
- 2 — International aid and investment should emphasize institutional and technical knowledge transfer to ensure a smooth transition.

REMAIN ENGAGED

- 1 — The international donor community has been instrumental in assisting Georgia achieve meaningful progress in its energy sector and energy security over the past decade.
- 2 — Now that the economic acceleration has slowed, and a global recession is expected due to COVID-19, that unwavering commitment must continue.

PRIORITIZE CAPACITY BUILDING

- 1 — Further assistance should come with an emphasis on building Georgian institutional and technical capacities with a view toward sustainability.
- 2 — Funding opportunities that extend beyond direct infrastructure improvement investments will more closely align with this long-term goal.



Ten Year Plan for Regional Transfer Capacities in 2030



Source: 10 Year Network Development: Plan of Georgia for 2020-2030. GSE

N. EXECUTIVE BRIEFER – NATURAL GAS DEMAND AND SUPPLY GAP

Executive Briefer – Natural Gas Demand and Supply Gap

Where Georgia stands today. Prospects and Opportunities for Tomorrow.



The Pending Gap Between Gas Supply and Demand...

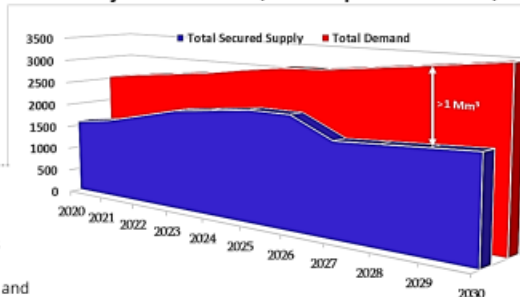
Georgia has made significant progress over the past decades in meeting its energy demand with ample supply. It has achieved this largely by regional cooperation, namely with Azerbaijan. In addition to receiving direct imports, in return for jointly exporting Caspian energy to Western markets, it has received compensatory supplemental gas.

Through these dealings, Georgia has improved its energy security despite its immense dependence on Azeri imports by transitioning away from overreliance on a less secure actor, Russia (see Executive Briefer on Diversification of Energy Supplies).

Still, due to an expiration of the supplemental gas contract with Azerbaijan, surging domestic demand, and limited additional Azeri export capacity, Georgia faces a looming supply gap of up to 1.2-1.5 bcm/year, about half of its current consumption.

THREAT LEVEL

Comparison of Total Secured Supply with Projected Demand (GOGC Expected Scenario)



Source: Georgian Oil and Gas Corporation, Supply Gap Projections

Looming Russian Vulnerability

- Without concerted action, it is almost inevitable that a dependency on Russia as a gas supplier will reemerge.
- Russia has demonstrated its dissatisfaction with a Eurocentric policy shift from Georgia and other similar formerly Soviet republics.
- This effort has manifested itself in both geopolitical "stick" coercive actions and "carrot" incentive actions, which has included pricing for essential natural gas imports.
- This has already happened once for Georgia, as it learned the hard way how easily Russia was able to manipulate energy export prices.
- Mitigating Russia's ability to pursue coercive energy policies, by limiting vulnerability, is essential.

Executive Briefer – Natural Gas Demand and Supply Gap

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Developments to watch for

Trans-Caspian Pipeline
Prospective pipeline across the Caspian seabed, connecting Central Asian resources to the Caucasus export network.

LNG Capacity Building
As the market for LNG grows and prices drop, the opportunities for "swaps" to benefit Georgia will grow. A "swap" is a contractual arrangement to purchase a commodity (in this case LNG) from a provider in a separate location for the same commodity at an agreed price.

Greater Renewables Integration
Over the next decade, Georgia aims to significantly increase its renewables penetration, increasing its energy security. One challenge is integrating the intermittent variable energy (VRE) into the grid. By 2030, Georgia will be able to integrate 1,852 MW of VRE into its grid.

Georgia's Looming Supply Gap and Available Options

INTERNAL ACTIONS
Domestic actions Georgia can take to mitigate external factors

- IMPROVE END-USE ENERGY EFFICIENCY:**
With both rising demand and declining supply levels, Georgia should prioritize greater energy efficiency to limit negative impact on energy security
- STIMULATE VARIABLE RENEWABLES GROWTH:**
Prioritize development and deployment of renewable energy generation

EXTERNAL ACTIONS
Steps that will limit vulnerabilities and enhance independence

- EXPLORE REGIONAL "SWAP" POTENTIAL:**
One way that Georgia can seek to maximize its potential import capacity is by executing "swaps" with regional partners. The most advantageous scenario would be executing a "swap" of LNG from European regasification terminals eastward to Georgia, by utilization of Georgian off-take from the SCP pipeline.
- MINIMIZE RUSSIAN MARKET SHARE:**
If Georgia finds potential "swap" partners unwilling or unable, and cannot negotiate an extension of supplemental off-take gas, Russia will almost certainly regain a market presence. Georgia should work concertedly to make sure it secures the entirety of its non-Russian import capacity to limit the size of Russia's supplier role, and therefore the severity of any coercive energy diplomacy.

O. EXECUTIVE BRIEFER – POWER MARKETS AND ENERGY SECURITY

Executive Briefer – Power Markets and Energy Security

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Main Factors Affecting Power Market Future

RENEWABLES AND DECARBONIZATION CONTINUES

—Power markets globally will continue to be seriously disrupted by both renewable energy sources and decarbonization efforts, which will continue their surge in prominence next decade.

Major trends and their development



Monitor Deloitte 2018

Power Markets' Shifting Impact on Energy Security

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1 Renewables Gain a Prominent Role in Energy Security, Raising Regulatory and Operational Stakes

- With costs continuing to decline and their market share growing rapidly, renewables are now important to both the overall power market mix as well as the energy security outlook of the countries.
- The ability of energy regulators and grid operators to respond to the inherent gaps in the security of supply through the accelerated integration of renewables will be tested in terms of price mechanisms, financing support schemes, and grid resilience.

2 Electrification Penetration

- As electrification continues, the security of supply gaps will reveal the importance of effective energy resource planning policies
- This has **fundamentally changed the way countries view energy security**, disrupting conventional wisdom that may overemphasize hydrocarbon sourcing—likely a trend that will favor Georgia over time.

3 Policy, Regulation, and Operational Improvements

- Government policy makers and energy regulators will be pressed hard to design energy market frameworks and carry out their effective oversight to integrate new services (ESCOs) and technological innovations while ensuring consumer protections and preventing market concentration.
- The surge in renewables will test the grid resiliency and require sound resource planning and system modeling to prevent cascading outages.

Executive Briefer – Power Markets and Energy Security

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TERMS TO KNOW

Dark Doldrums
Times during which there are prolonged periods of low wind or solar power generation, causing prolonged yield losses.

Duck Curve
A phenomenon common with widespread solar PV power generation, especially distributed solar PV. Describes the excess load capacity during low-demand hours of daylight before a sudden demand ramp up just as supply decreases.

LNG
Liquified Natural Gas, a method of gas production, storage and transport allowing for an international gas trade without pipeline concerns.

1 CHALLENGES

Dark Doldrums	<ul style="list-style-type: none"> • While infrequent and unlikely, prolonged generation deficiencies are unsustainable. • Conventional generation or long term storage capacity needed to cover for this.
Duck Curve Complication	<ul style="list-style-type: none"> • Having flexible capacity needed to meet significant ramping • While hydro's flexibility is a boon for meeting the Duck Curve's ramping needs, the seasonality of hydro is a challenge.
Internet of Things	<ul style="list-style-type: none"> • As grids implement new technologies, they also add vulnerabilities. See Executive Briefers on Cybersecurity and Critical Infrastructure for explanation.

2 SUCCESSES

Generation Capacity	<ul style="list-style-type: none"> • With the surge in both renewables and cheaper, cleaner natural gas, power markets have never had as much capacity. • For Georgia, the flexible nature of Hydro should be of particular importance.
LNG Market	<ul style="list-style-type: none"> • LNG has dramatically changed energy security outlooks and power markets. • LNG swaps are a special boon for states like Georgia that seek to minimize the importance of pipeline geopolitics.
Regional Cooperation	<ul style="list-style-type: none"> • Through its 2014 Accession to the Energy Community, Georgia has prepared relevant legal and regulatory frameworks to meet its regional energy market integration obligations.

Georgia made significant strides to improving its energy security in the past decade, but the successful development and establishment of its power market could determine if its similarly successful in the next decade.

P. EXECUTIVE BRIEFER – SHIFTING CONSUMPTION AND DEMAND PATTERNS

Executive Briefer – Shifting Consumption and Demand Patterns

Where Georgia stands today. Prospects and Opportunities for Tomorrow.



Georgia's Peak Demand Season is Trending Toward Summer

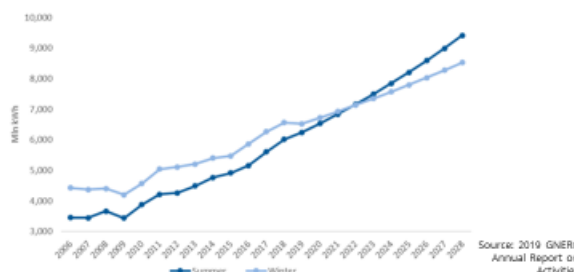
THREAT LEVEL

For years, Georgia's energy balance has been defined by two phenomena: **an early summer peak in the generation capacity**, fueled by the high seasonality of its large hydro power plants, **and a winter peak in both electricity and gas demand**, largely driven by heating needs.

This trend now appears to be changing. According to GNERC, this consumption pattern will reverse around 2023, and will be largely driven by increased demand for air conditioning and other appliances. **This dramatic change in a country's energy balance can have severe impacts on its overall energy security outlook**, and will necessitate appropriate policies and planning strategies to lessen the negative outlook.

Still, energy security is primarily affected by a country's ability to meet its own demand from indigenous sources or secure it externally at affordable prices — the change in peak periods are not a result of winter demand decreases (as that is still growing), but **rather due to a faster growth rate in summer consumption**.

Consumption During the Summer and Winter Periods



Source: 2019 GNERC Annual Report on Activities

Impact of Consumption Pattern Change on Georgia's Energy Security



Regional Outlook

In the past, Georgia has been a net exporter of electricity, largely driven by its excess hydropower during the summer season. As Georgia's summer consumption rises continues to rise in the coming years, Georgia will likely **no longer be able to export energy at the same level until new generation capacities come online**. This could be further penetration of new variable renewables. Additionally, its import share will proportionately decrease.



Meeting Demand, Security of Supply

While its importance should be understood within the larger context of energy security, **the coming change in the demand pattern should be a net positive factor for Georgia's energy security outlook**. This can be achieved by better aligning the country's consumption needs with the domestic output, therefore reducing dependency in the long run.

Executive Briefer – Shifting Consumption and Demand Patterns

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Positioning Georgia's Supply Sources to Thrive

CONTINUE GENERATION AND STORAGE INVESTMENTS

1 — While it might be tempting to examine the shifting demand trend and view it as a favorable outcome for Georgia considering its alignment with generation seasonality, **it overshadows the larger trend of immense consumption growth** over the next decade. For more information, see Executive Briefer on Energy Demand and Supply Gap.

2 — The trend also does little to resolve the **ongoing gaps in supply over the winter periods**, which will likely still demand imports or vast improvements to the domestic storage capabilities.

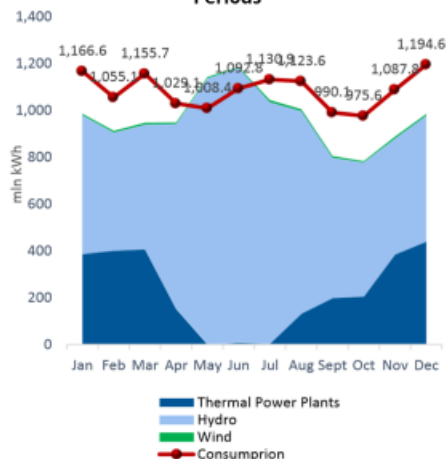
3 — Considering the coming onset of Georgia's domestic wind and solar production, with an estimated integration capacity of 1852 MW of variable renewable energy by 2030, the renewables market is expected to begin maturing quickly. Still, these new sources and particularly solar **are likely to be summer peaks as well, making storage essential too**.

PRIORITIZE ENERGY EFFICIENCY

1 — The logical next step for Georgia as it tries to meet soaring demand and consumption with limited supply **will be tackling energy efficiency**.

2 — Implementing the recent law on Energy Efficiency is on the of the significant remaining hurdles Georgia needs to clear, and **should be a great benefit to this effort to better align energy supply and demand**.

Consumption During the Summer and Winter Periods



Source: 2019 GNERC Annual Report on Activities

USAID Energy Program

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