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USAID ENERGY PROGRAM

CRITICAL AND TIMELY ISSUES FOR GEORGIA'S ENERGY SECURITY

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27 April 2018

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DATA

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ACRONYMS

CBM	Coal-Bed Methane
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
GNERC	Georgian National Energy and Water Supply Regulatory Commission
GoG	Government of Georgia
GSE	Georgian State Electrosystem
HPP	Hydro Power Plant
IFI	International Financial Institution
LNG	Liquefied Natural Gas
mln	Million
MoU	Memorandum of Understanding
MW	Megawatt
PPA	Power Purchase Agreement
PPP	Public Private Partnership
PSH	Pumped-Storage Hydroelectricity
PV	Photovoltaic
R&D	Research & Development
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
WEG	World Experience for Georgia

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1. INTRODUCTION

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 Government of Georgia (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.

Based on performed analysis of electricity and natural gas sectors, the team has identified energy security issues for both sectors and additionally explored power to gas topics. The approach was to identify all possible matters that can influence the energy security of Georgia. 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 is focused specifically on electricity and natural gas security issues for Georgia. The other sources of energy are only linked to the above-mentioned sectors (for example, fuel switching option during gas supply disruption).

A draft list of issues was presented to the several stakeholders and based on the feedback the draft list was updated. Further, the updated energy security topics were presented to World Experience for Georgia (WEG) and the team obtained their comments and suggestions. Annex 1 below provides the updated list of the energy security issues based on the feedback from above mentioned organizations. It also provides brief description of each identified energy security topic.

Based to the discussions with the identified stakeholders and the analysis, 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. The planned underground gas storage is foreseen as an important energy facility towards achieving uninterrupted gas supply, benefiting both natural gas customers and power generation units. Indeed, other energy security issues provided below have important role in improving overall energy security of the country.

The next step for the Program is to prioritize those identified issues based on predefined criteria. The priority criteria, ranking methodology and ranked energy security topics for Georgia will be presented in a follow-up report.

ANNEX. LIST OF IDENTIFIED ENERGY SECURITY ISSUES

A. ELECTRICITY SECTOR ENERGY SECURITY ISSUES

	Electricity Sector Energy Security Issues	Description
1	Enguri/Abkhazia – what options does Georgia have to ensure long-term operation of the HPP?	Enguri HPP was lacking a 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.
2	Battery storage – Armenia is requesting a pilot project from Tesla – 10-15 MW battery systems – 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 least cost?
3	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.
4	What relay and automatic control equipment would improve energy security for Georgia?	USAID, other donors and 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.
5	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 1400 MW of new wind power projects. There are several integration issues and Georgian State Electrosystem (GSE) has recommended restricting new wind power generation to 400 MW by 2030 due to several factors. The mitigation of those factors will be required so that the projects under MoU can be developed.
6	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/
7	How should the interconnection capacity at the Turkish border be allocated in the country?	The amount of capacity provided to energy traders may need to be limited, due to system conditions and due to system operation requirements.
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 Turkish power market to deliver the capacity to Georgia, even during emergencies on the Turkish power system. System planners should examine what risks Georgia would assume if the country depended on the delivery of capacity from Turkey.

9	What value, if any, does a second line from Akhaltsikhe s/s to Turkey provide? Who should pay for it? Is it the best option for a new interconnection?	The second line is to provide n-1 coverage on the interconnection. Given the low amount of energy transferred to date, is the line needed in the next 5 years? The new line would end in Tortum, which is within the congested area on the Turkish transmission system. Having the line extended to Erzurum would mean that the line would not be subject to interruption due to congestion.
10	Russia and Iran are discussing stronger energy ties – how will this impact energy customers in Georgia?	The interconnection of the Russia and Iranian power systems will require large, back-to-back transmission facilities. These facilities will be built by Georgian and Armenian transmission companies. There is 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.
11	Can Georgia move transition to a competitive capacity market and not impact energy security?	in the regulated electricity market, the GoG, GSE and GNERC 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.
12	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 to pay
13	How does Georgia having a summer-peaking electricity sector impact its approach to energy security?	During recent years, electricity demand growth rate was higher during summer time (mainly August- September) compared to winter months. There is high expectation that this trend will continue. Georgia certainly is becoming summer peaking country. This rises the following Energy Security related questions: To what extent will be growing summer peak? How it will accelerate solar power generation in Georgia? where "geographically" demand will grow? (i.e. will it require configuration of the network) etc.
14	How can Georgia operate its electricity sector without the connection to Russia?	There is a always a risk that the Russian interconnection may be disconnected, on a temporary or permanent basis. If so, how can the Georgian power system operate at standard operating levels 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.
15	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) farms, etc.) is slowing growing and could become 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?
16	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.
17	Is transmission congestion a problem for Georgia today or in the future?	Georgia' 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?
18	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. An examination of the criteria is required with the possible need for updating the criteria to international standards.
19	What are the most cost-efficient ways to satisfy expected electricity demand	Given recent energy forecast demand developed under USAID Governing for Growth (G4G) in Georgia project grant, it is expected

	growth (according to recent demand projections electricity demand for Georgia will be increased by almost 80% by 2030)?	that electricity demand will be increasing in Georgia on average by 3.9% (GSE in its Ten Year Network Development Plan (TYNDP) 2018-2018 evaluates 3%, 5% and 7% growth scenarios). However, rapid growth is expected for next 3-5 years. 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.
20	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?
21	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 replacement mechanism, Public Private Partnership (PPP), is not developed. 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.
22	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.
23	What are the possibilities of 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.

B. GAS SECTOR ENERGY SECURITY ISSUES

	Gas Sector Energy 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. Georgia is the only country in the region that does not have any gas storage.
2	Infrastructure reliability and supply chain resilience	Infrastructure reliability is one of the major energy security issues. According to GNERC's annual report by the end of 2016, 75 % of transmission pipelines are more than 20 years old and 27% are more than 40 years old. The data is not available for distribution companies, however in the capital Tbilisi there are big share of old pipelines as well. This influences efficient management of system on two levels: relatively high costs for losses and maintenance and supply disruptions on local grids.
3	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 to be 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.
4	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 2016 totally 112 mln m3 was lost in distribution network. Around 60% of this number was lost in Kaztransgas network.
5	Diversification of imported fuels: will SOCAR be the only natural Gas	SOCAR's monopoly has even increased during last year, substituting "Russian transit gas".

	supplier to Georgia and what is the potential risk for disruption	
6	Is there a potential to switch from gas consumption to alternative fuel during a potential supply interruption	This can be for Thermal Power Plants (TPPs) especially old ones. Also, it is important to explore what alternative measure can be in place for heating for households? Additionally electric cars may substitute part of Compressed Natural Gas (CNG) cars.
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.
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.
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) port	LNG port will contribute to diversification of sources including security of supply.
11	Promotion of natural gas transit routes through Georgia (The impact of Trans-Caspian Gas Pipeline, White Stream project)	Georgia has 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.

C. POWER TO GAS SECURITY ISSUES

	Power to Gas Security Issues	Description
1	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 European Union (EU) they are small non-household and household customers), and what is the priority groups in the event of demand curtailment.
2	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.
3	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.
4	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 integration to the grid

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