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# ARMENIA GAP ANALYSIS

## WITH LIST OF MARKET CHALLENGES AND LEGAL BARRIERS

ENHANCING CAPACITY FOR LOW EMISSION DEVELOPMENT STRATEGIES  
(EC-LEDS) PROJECT

CONTRACT NUMBER AID-OAA-M-15-00005

**June 2016**

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### **DISCLAIMER**

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# ACRONYMS

AMD	Armenian Dram(s)
B2B	Back-to-Back
CCGT	Combined Cycle Gas Turbine
CJSC	Closed Joint Stock Company
DCFTA	Deep and Comprehensive Free Trade Area
DISCO	Distribution Company
DSO	Distribution System Operator
EC-LEDS	Enhancing Capacity for Low Emission Development Strategies
EE	Energy Efficiency
ENTSO-E	European Network of Transmission System Operators for Electricity
EPSO	Electro Power System Operator
EU	European Union
EUROSTAT	Statistical Office of the European Union
GEL	Georgian Lari
GNERC	Georgian National Energy and Water Supply Regulatory Commission
GO	Guarantee of Origin
GoA	Government of Armenia
GWh	Gigawatt Hour(s)
HIPP	Hydropower Investment Promotion Project
HPP	Hydropower Plant
HVEN	High-Voltage Electric Networks
IBRD	International Bank for Reconstruction and Development
IRG	IRG, an Engility Company
ISO	Independent System Operator
Kcal	Kilocalorie
KfW	KfW Development Bank
kg	Kilogram(s)

kV	Kilovolt(s)
kWh	Kilowatt Hour(s)
LCEDP	Least-Cost Energy Development Plan
m <sup>3</sup>	Cubic Meter(s)
MO	Market Operator
MoENR	Ministry of Energy and Natural Resources of Armenia
MOU	Memorandum of Understanding
MVA	Mega Volt Ampere(s)
MW	Megawatt(s)
MWh	Megawatt Hour(s)
NPP	Nuclear Power Plant
PPA	Power Purchase Agreement
PSRC	Public Services Regulatory Commission of Armenia
PV	Photovoltaic
RE	Renewable Energy
RoA	Republic of Armenia
S.M.A.R.T.	Specific, Measurable, Assignable, Realistic, and Timely
SEE	Southeast Europe
SREP	Scaling-up Renewable Energy Program
tcm	Thousand Cubic Meters
TO	Transmission Operator
TPP	Thermal Power Plant
TSO	Transmission System Operator
USAID	United States Agency for International Development
USD	United States Dollar
VAT	Value Added Tax



# 1. INTRODUCTION

This *Draft Armenia Gap Analysis with List of Market Challenges and Legal Barriers* report has been prepared under the USAID Enhancing Capacity for Low Emission Development Strategies (EC-LEDS) led by IRG, an Engility Company and a team of local and international experts. The EC-LEDS project in Armenia intends to support a national energy strategy, corresponding market reforms, and promote cross-border trade with Georgia. This includes working toward the harmonization of Armenian regulatory practices and power system standards with those of Georgia to comply with European Union (EU) directives.

The purpose of this report is to provide a gap analysis and develop a list of major market challenges and legal barriers facing the Armenian power sector. The report describes an analysis of the power system of Armenia, including generation capacities, the current market design, export and import regulations, tariffs, and future development plans. An analysis of transmission development on cross-border trade for Armenia is discussed in a separate chapter along with interconnection status and other development considerations. The report also provides an analysis of the power market of Georgia focusing on existing trade relations with neighboring countries, especially Armenia.

EU energy directives cover a wide range of electricity market features, including market design rules, regulatory authority, renewable energy (RE) issues, energy efficiency (EE) requirements, environmental issues, data development and statistical reporting, and rules for competition. The gap analysis compares the Armenian legal and regulatory framework and market design to EU internal electricity market features. Market challenges and legal barriers are discussed in detail for domestic market and cross-border trade with Georgia. The conclusions and recommendations consider strategic challenges, possible negative effect of changes on the status quo, the legal basis of power market, and barriers to change. The report concludes with several recommendations.

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## 2. EXECUTIVE SUMMARY

This report was commissioned to examine the compliance of Armenian regulations in the power sector with the EU directives and to define market challenges and legal barriers for advancing the internal power market and trade with Georgia. The current market design for Armenia was implemented more than 10 years ago and falls short of legal, regulatory, and Market Rules necessary to improve trade with Georgia.

To improve the functioning of internal energy markets and resolve structural problems, the EU sets energy market requirements for transparent market and network operations, competitive wholesale and retail markets designed for consumer benefit, increased cross-border cooperation between Transmission System Operators (TSOs), and unbundling energy suppliers from network operators. The current Energy Law in Armenia does not comply with EU requirements, and many requirements for market and network operations are not clearly covered in the law. To achieve greater competitiveness, a new Energy Law based on the principles of the EU directives is needed.

Armenia's power market is not yet competitive and has a long list of market challenges. Although some unbundling has occurred, the power market remains a monopoly under a single-buyer market structure. There is only one power distribution company (DISCO), and customers do not have a choice of a power supply company. Distribution was not unbundled into a Distribution System Operator (DSO) and suppliers and there are no clear rules guaranteeing third party access to transmission and distribution networks. There are no Market Rules for settling deviations between contracted and delivered amounts of power. Balancing is accomplished by an Independent System Operator (ISO) in cooperation with the DSO on an annual basis. There are no strict regulatory mechanisms to protect vulnerable customers; however, the Government of Armenia (GoA) uses different mechanisms to protect such customers through targeted and "means tested" social support schemes. Moreover, the GoA, Ministry of Energy and Natural Resources of Armenia (MoENR), and Regulator authorize new generating capacities that may include concessions. There is no Market Operator (MO) because the existing regulations are not systemized into the Market Rules and the Network Rules (Grid Code) are not yet developed.

Current regulations for the internal market as well as tariff rules for export/import transactions have unnecessary restrictions on sector development, which makes the market less attractive for private investments. Import/export transactions are licensed, and the Regulator sets tariffs for imported electricity, but not for exported electricity. The Regulator issues licenses within 80 working days and the importer/exporter must pay about \$10,000 United States Dollars (USD) annually and provide a bank guarantee for about \$1,000. Market Rules are defined only for export and require the exporter to sign contracts with a generation unit, the Electro Power System Operator (EPSO), TSO, and the Settlement Center. More importantly, the rule permits only Hrazdan Unit5 or the Hrazdan thermal power plant (TPP) to export power. In addition, the Regulator registers import/export contracts, which takes another 10 working days. These regulations obviously make the export/import possibilities complicated and therefore require fundamental revision.

Tariffs are regulated using rate of return methodology, which does not provide sufficient incentives for optimizing costs of regulated monopolies. Distribution tariffs are not yet determined. The absence of a proper legal framework artificially restricts consumers' rights to import electricity from neighboring countries. End-user tariffs are differentiated by voltage levels for day and nighttime tariffs, and there are no capacity charges, peak tariffs, or service fees. As a result, customers have no responsibility for defined capacity charges for large generation. The average difference between day and night tariffs is

insignificant: for high voltage customers (i.e., 35 to 110 kilovolts (kV)), it is only 12 percent and, for middle (6 to 10 kV) and low voltage (0.22 to 0.4 kV) customers, it is only 26 percent. These differences do not support load management efforts.

Future development plans for the rehabilitation of the Armenia nuclear power plant (NPP), construction of a new combined cycle gas turbine (CCGT) units and hydropower plants (HPPs), and transmission system upgrades will bring new challenges and opportunities to the Armenia power market. The gradual liberalization of the power market and development of new instruments for trade with Georgia can help to meet these challenges.

Georgia has signed the Deep and Comprehensive Free Trade Area (DCFTA) and Association Agreements with the EU and is changing its internal regulations in compliance with EU criteria - the country has developed a market opening implementation plan and created a relevant market structure.

Armenia and Georgia are developing the necessary interconnection infrastructure to support trade between countries; however they can increase the efficiency of their internal power markets through development of relevant trade and system integration mechanisms, which will reduce a number of challenges typically faced by countries with a transitional economy.

To maximize the trade benefits, Armenia needs to implement the following reforms:

- Domestic consumer protection through: 1) pricing system modifications and 2) allocating responsibilities between market participants and end-users
- Fair allocation of responsibilities between market participants
- Improved incentives for private investors
- Increased opportunities for beneficial cross-border trade

It is probably important to first consider: 1) a new system of tariff approval, 2) transition to an hourly market, 3) long- and short-term balancing operations, 4) developing transparent and nondiscriminatory electricity markets, and 5) better correspondence between real consumptions growth/cross-border trade opportunities and investments. A gradual transition to a new market is needed, and this will be reflected in the next *Armenia New Electricity Market Initial Design and Action Plan to Support the Regional Trade* report.

Given that competition in wholesale and retail supply is a dominant feature of the Energy Community Treaty and the regional power integration process, it is not surprising that Armenia's power sector falls well short of meeting those requirements. This is apparent in the gap analysis that compares Armenia's power sector legal/legislative framework and market design versus the Secretariat's evaluation criteria.

Armenia's power sector indeed faces numerous challenges--beginning with increasing demand and an inefficient market and poor tariff structure. Opportunities for trade with Georgia could provide new benefits and help address many challenges in Armenia's power sector. A coordinated approach to modifying the domestic power market and improvements in the legal/regulatory framework with Georgia could provide additional benefits to Armenia. In this regard, it is recommended to "restart the power market," by giving life to a new model, developing a transitional market design with a scenario for gradual market opening to competition, and moving from "regulation" to "deregulation" with incentive-based regulation instruments.

As basic steps, the following actions are recommended for early implementation:

- Set up distribution tariffs - a prerequisite step for opening the market even for a very small portion of customers.

- Create an MO that will be responsible for organizing proper trade mechanisms in the internal market and on a regional basis. To ensure full independence of the MO and enhance its impartiality and transparency of decision-making, the GoA could transfer its shares directly to market participants.
- Separate distribution from supply, and create differentiated regulations for those entities.
- Simplify export and import rules.
- Create Network Rules and basic Market Rules, and set up transitional phases for market reforms.

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# 3. POWER SYSTEM OF ARMENIA

## 3.1 TECHNICAL INDICATORS OF THE POWER SYSTEM

Generation produces enough electricity to meet domestic demand, which is about 6,500<sup>1</sup> gigawatt hours (GWh) annually with an average growth of 2 percent. The total operating capacity of all generation units is about 2,400 MW and, after the decommissioning of the Hrazdan TPP in 2019, it will be 2,000 MW. Domestic demand is covered by 37-percent nuclear, 31.5-percent thermal, and 31.5-percent hydro generation. Peak electricity demand is about 1,300 MW and is observed during November through February. Summer peak demand is around 900 MW. There are no seasonal deficits. Generation surplus consists of TPPs; the possible exporting capacity is Hrazdan Unit5.

The power system of Armenia includes the following power plants:<sup>2,3</sup>

- **Nuclear Power Plants**
  - **Armenian NPP:** Government owned (“HAEEK” Closed Joint Stock Company (CJSC)); operating capacity is 385 megawatts (MW) (installed capacity is 440 MW and the year of commissioning was 1980); annual generation is approximately 2,400 GWh, covering about 37 percent of domestic supply. The Armenian NPP is scheduled to be rehabilitated sometime during 2017 and 2018 for a service lifetime extension up to 10 years. The rehabilitation is expected to cost about a \$300 million.
- **Thermal Power Plants**
  - **Hrazdan TPP:** Private (“RazTES” CJSC); operating capacity is 400 MW (installed capacity is 1,110 MW and the year of commissioning was 1966 to 1974); the annual generation for the internal market is approximately 500 GWh, covering about 8 percent of domestic supply. Planning for decommission is expected in 2019 due to its low efficiency.
  - **Hrazdan Unit5:** Private (“Gazprom Armenia” CJSC); operating capacity is 440 MW (installed capacity is 467 MW and the year of commissioning was 2011); and annual generation for the internal market is approximately 500 GWh, covering about 8 percent of domestic supply. Projected annual generation of the unit is about 3,000 GWh; therefore, the internal market takes only 17 percent of it. Currently, Hrazdan Unit5 is more oriented toward exporting capacity.
  - **Yerevan CCGT:** Government owned (“Yerevan TPC” CJSC); operating capacity is 220 MW (installed capacity is 238 MW and the year of commissioning was 2010); and annual generation for the internal market is approximately 950 GWh, covering about 15 percent of domestic supply. The Yerevan CCGT is working under a “gas-electricity” exchange contract, exporting about 500 GWh annually.

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1. Data presented in the report are last year’s average.

2. [www.minenergy.am/](http://www.minenergy.am/).

3. [www.psrc.am/am/sectors/electric](http://www.psrc.am/am/sectors/electric).

- **Large Hydropower Plants**

- **Vorotan Cascade:** Private (“ContourGlobal Hydro Cascade” CJSC); operating capacity is 404 MW (installed capacity is 404 MW and the year of commissioning was 1970 to 1989); and annual generation is approximately 1,000 GWh, covering about 15 percent of domestic supply. Vorotan Cascade’s assets are old and require extensive upgrading. The short-term rehabilitation plan with an investment cost of 51 million euros (€) is now under development.
- **Sevan-Hrazdan Cascade:** Private (“International Energy Corporation” CJSC); operating capacity is 552 MW (installed capacity is 561 MW and the year of commissioning was 1940 to 1962); and annual generation is approximately 450 GWh, covering about 6 percent of domestic supply. Different upgrades were done on the Cascade’s power plants during the last 15 years. At present, the Yerevan HPP is under reconstruction with investment costs of \$40 million.

- **Renewable Energy**

- About 170 private, small HPPs (under 30 MW) are operating in the system and were generally constructed during the last 10 years. Installed capacity is about 300 MW, and annual generation is approximately 700 GWh, covering about 11 percent of domestic supply. There are several small-size wind, bio, and solar plants that have limited impact on system supply.

The transmission system of Armenia is well developed and consists of 14 substations of 220 kV and 2 substations of 110 kV (overall, 33 transformers and a capacity of about 2,500 mega volt-amperes (MVA)), which were generally rehabilitated during the last 10 years or will be rehabilitated during the next 4 years. The grid is interconnected with Georgia (110 kV and 220 kV, dedicated island operation); Iran (220 kV, synchronous operation); and Turkey (220 kV, not in operation). The interconnection capacity with Georgia is about 200 MW and, with Iran, is 300 MW. Transmission system losses are around 1.8 percent. The Transmission Operator (TO) is a government-owned company (“High-Voltage Electric Networks (HVEN)” CJSC) that holds all the transmission assets within the country, but does not operate the system.

The distribution system includes 0.4 to 110 kV lines and transformers. Access to the grid is close to 100 percent. The DSO serves about one million customers and also provides last-mile service. Household annual consumption is about 35 percent; large customers (i.e., industry, transport, water supply, and irrigation) account for about 30 percent; and the remaining 35 percent are public entities and small- to medium-size businesses. Distribution system losses are about 11 percent, metering is 100 percent, and the collection ratio is close to 100 percent. All customers of 35 to 110 kV and a large proportion of 6 to 10 kV customers are integrated into a data acquisition system; 30 percent of all customers are equipped with electronic meters. In 2014, the System Average Interruption Duration Index amounted to 8.81 hours, the System Average Interruption Frequency Index had 5.48 interruptions per customer, and the Customer Average Interruption Duration Index had 1.61 hours. The DSO is a private company (“Electric Networks of Armenia” CJSC) and holds and operates all the distribution assets within the country.

The power system is dispatched by an ISO, which is a separate, government-owned company (EPSO CJSC). A supervisory control and data acquisition system has been installed on generation units and 220 kV substations.

The Settlement Center provides metering and billing services to wholesale power market participants. The data acquisition system installed in 2001 with USAID financing provides wholesale electronic meter data collection with 30-minute intervals at the Settlement Center for billing purposes.



### 3.2 INSTITUTIONAL FRAMEWORK

Armenia's power sector is regulated by the Energy Law adopted in 2001. The Energy Law provides some basic principles for national policy, but does not specify the authorities of the GoA or the MoENR to declare the policy or the role of the MoENR in the power sector. At the same time, the Energy Law describes in detail authorities given to the Public Services Regulatory Commission of Armenia (PSRC, or Regulator), which are generally in compliance with the international best practices. The Regulator:<sup>4</sup>

- Issues licenses for wholesale power market participants, including import and export transactions.
- Sets the tariffs for generation, transmission, and distribution, including end-user tariffs and service fees for the system operator and Settlement Center. The Regulator sets the tariffs for imported electricity as well.
- Sets the Market Rules in cooperation with the MoENR.
- Sets the distribution rules, including connection rules.

The Energy Law does not comply with EU requirements. In order to improve the functioning of the internal energy market and resolve structural problems, the EU sets the basic energy market requirements that, among others, covers the following:

- Transparent Market and Network Rules
- Competitive power and retail markets for consumers' benefits
- Cross-border cooperation between TSOs
- Unbundling energy suppliers from network operators<sup>5</sup>

These requirements are not clearly covered in Armenia's Energy Law; therefore, it should be substantially revised. A new Energy Law based on the principles of the EU directives can lead the sector to a competitive power market.

### 3.3 WHOLESALE POWER MARKET REGULATIONS

The wholesale power market of Armenia has no elements of competition; it is fully regulated. Only legal entities can participate in the power sector; unbundling between generation, transmission, distribution, and other activities is required by the law.<sup>4</sup> There are no comprehensive or consistent documents on Market Rules; only generation regulations presented in several decisions adopted by the Regulators. Despite considerable effort to develop a Grid Code, it has not yet been adopted.

The wholesale power market has the following regulations and characteristics:

- Generation is fully regulated with no competition. The Regulator permits one license for construction and operation. Generators have no permit to sell electricity to customers. A generation unit may export electricity only when the internal market is saturated and the sale does not contradict the interests of internal customers. Moreover, according to the Energy Law, only the most expensive generation can be exported, which practically means that Hrazdan TPP and Hrazdan Unit<sup>5</sup> are the only generation units available for export. The amount of produced

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4. [www.arlis.am/DocumentView.aspx?DocID=91484](http://www.arlis.am/DocumentView.aspx?DocID=91484).

5. <https://ec.europa.eu/energy/en/topics/markets-and-consumers/market-legislation>.

electricity is set as a “preliminary value” in the contracts<sup>6</sup> between the DSO and generation units. Therefore generation units do not have any responsibility for the “contracted” electricity.

- Transmission is fully regulated. The Regulator permits one license to a TO for construction and management of the assets. There are no defined rules for third party nondiscriminatory access to the transmission system.
- Distribution is fully regulated. The Regulator permits one license for construction and operation. Until February 2016, distribution held exclusive rights for the supply of electricity to customers.<sup>7</sup> There are no clear regulations for unbundling distribution from supply. De facto, the DSO is the only supplier and acts as a monopoly. The DSO purchases electricity from the national generating companies at regulated prices and on the basis of direct contracts. As a consequence, the wholesale market is a monopsony, with the DSO acting as a single buyer. The Regulator has not set the distribution tariffs. This fact restricts customers from importing electricity from neighboring countries because a legal basis is lacking. All the financial flows of the power sector go through the DSO. This creates higher risks for the market participants and customers when the forecasted generation mix is not “achieved” for any reason. In a situation when the DSO is not stable financially, especially if near bankruptcy, it could lead to the collapse of the power system. Such a situation arose during a recent crisis in the power sector of Armenia. Neither electricity nor capacity is a contractual value for the customers. Even large customers do not have any responsibility for the “contracted” electricity or capacity. Thus, the system annual balance creates direct risks for the DSO, but not for a generation unit or a single customer. Those risks are covered by the end-user tariffs based on the ex-post assessments.
- The ISO acts based on the Regulators’ permit (license). The Regulator sets monthly fees for the services of the ISO. The ISO is responsible for the operation and economic dispatch of the wholesale power market. The EU, for operation of the power sector, applies three general models: ISO, TSO, and Ownership Unbundling. Armenia is closest to the ISO model. However, the TSO model, which includes ISO and TO in one entity, is more responsible, transparent, and powerful in terms of financial stability since it owns and operates all transmission assets. Therefore, the GoA can switch to the TSO model if it is not planning to privatize HVEN.
- The Settlement Center acts based on the Regulators’ permit (license) as well with regulated monthly fees. The Settlement Center is responsible for metering and billing issues on the wholesale market. The Settlement Center has no other essential activities. In EU power markets, this role is usually expanded to act as a MO with responsibility for organizing power markets.

### **3.4 EXPORT AND IMPORT REGULATIONS**

Export and import principles are set in the Energy Law, and regulations are set by secondary legislation. The following regulations concern the export and import of electricity:

- The Energy Law states that any legal entity for export/import transactions must get a license, and all contracts before becoming effective must be registered by the Regulator. At the same time, the Regulator sets the licensing and contracts registration procedures. The Energy Law also defines the responsibilities of EPSO, which is the entity responsible for coordinating

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6. [www.arlis.am/DocumentView.aspx?DocID=88646](http://www.arlis.am/DocumentView.aspx?DocID=88646).

7. [www.psrc.am/images/News/haytararutyun/2016/10.02.16/1.pdf](http://www.psrc.am/images/News/haytararutyun/2016/10.02.16/1.pdf).

import/export power flows and system dispatch. An export license is issued only when the internal market demand is fully covered and the export of electricity will not impair the interests of domestic consumers.<sup>8</sup> At the same time, the Regulator sets tariffs for imported electricity. Prices for exported electricity are not regulated.

- Licensing rules<sup>9</sup> require that the exporter/importer provide: 1) the EPSO's written approval that the import/export flows under the planned regime are reasonably possible; 2) the approved national budget fee payment (about \$10,000 annually) and a bank guarantee (about \$1,000); and 3) the applicant's contract with a foreign vendor (does not apply in cases of export contracts). The Regulator issues a license within 80 working days of submission of the application.
- Market Rules<sup>10</sup> are defined only for export. The rules require that the exporter sign contracts with a generation unit, EPSO, TSO, and Settlement Center similar to the model contracts set by the Regulator. More importantly, as previously mentioned, the rule defines that only Hrazdan Unit 5 or Hrazdan TPP can be exporting to generation units, taking into account the interests of internal customers.
- Rules for registering the contracts with the Regulator<sup>11</sup> require that the applicant submit three copies of the contract, after which the Regulator checks their compliance with model contracts/agreements,<sup>12</sup> and, within 10 working days, registers it.
- Emergency situations are stated in the Energy Law as force majeure situations when the implementation of economic dispatch of the ordered reserve capacities is infeasible. Only newly adopted amendments to the Energy Law allow the export of electricity at a reasonable price and purchase from the DISCO during emergency situations. Moreover, they empower the Regulator to set the rules for electricity exchanges with other states during emergency situations and for power transits through the territory of Armenia. Being guided by the Energy Law, the Regulator recently adopted the *Procedures for Export and Import of Electric Energy During Emergency Situations and Insurmountable Force Events*;<sup>13</sup> according to which, electricity exchange functions are placed on the TO, while the ISO implements dispatching functions. Being guided by the safety and reliability of the power system, the ISO makes decisions according to the situation, informing the TO, DSO, and Settlement Center.
- Transit is fixed by the Energy Law as transmission of the electric energy (capacity) through the customs territory of Armenia from entry to exit. Transit is regulated by the Energy Law and Customs Regulations Law as well by the secondary legislation. Legal acts and transit procedures were recently adopted by the Regulator.<sup>14</sup> Transit through the territory of Armenia is implemented by the TO, while EPSO and the Settlement Center fulfill their own functions as usual. The TSO signs the agreements approved by the Regulator for transit operations with EPSO and the Settlement Center. Transit service payments for the TSO, EPSO, and the Settlement Center are also regulated by the transit procedures.

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8. RoA Energy Law.

9. [www.arlis.am/DocumentView.aspx?DocID=86891](http://www.arlis.am/DocumentView.aspx?DocID=86891).

10. [www.arlis.am/DocumentView.aspx?DocID=96645](http://www.arlis.am/DocumentView.aspx?DocID=96645).

11. [www.arlis.am/DocumentView.aspx?DocID=85057](http://www.arlis.am/DocumentView.aspx?DocID=85057).

12. [www.arlis.am/DocumentView.aspx?DocID=86355](http://www.arlis.am/DocumentView.aspx?DocID=86355).

13. [www.arlis.am/DocumentView.aspx?DocID=96534](http://www.arlis.am/DocumentView.aspx?DocID=96534).

14. [www.arlis.am/DocumentView.aspx?DocID=100998](http://www.arlis.am/DocumentView.aspx?DocID=100998).

Finally, in summary:

- Licensing procedures take up to 80 working days, which is unreasonably long and generally makes it impossible to conduct effective, short-term (monthly, even seasonal) trade. Required fees and guarantees can significantly influence the financial reasonableness of such contracts, especially in cases of limited import/export power flows.
- Market Rules allow export of electricity only from two TPPs: Hrazdan TPP and Hrazdan Unit5. The Hrazdan TPP, due to its low efficiency, is not able to provide competitive prices and, essentially, Hrazdan Unit5 is the only available exporting capacity.
- The exporter needs to sign contracts at least with EPSO, TSO, and the Settlement Center. There are no defined time limitations for these entities to sign such contracts, which create uncertain risks.
- The export/import contract becomes effective only after the Regulator's registration and takes an additional 10 working days.

Basically, these regulations make the export/import possibilities significantly complicated and, therefore, require fundamental revision from the point of view of their usefulness as a regulatory tool.

### **3.5 STRUCTURE OF THE TARIFFS**

All tariffs in the power sector are regulated, except for tariffs relating to export. The Regulator generally applies the rate of return methodology. All internal tariffs are recalculated on an annual basis. Incentive regulatory mechanisms are poorly structured.

The structure of tariffs is as follows:<sup>15</sup>

- Large generation tariffs are differentiated by capacity charge and energy price. The current average wholesale tariff, inclusive of Value Added Tax (VAT), is about 4.9 U.S. cents (¢) per kilowatt hour (kWh) (23.5 Armenian Drams (AMD)/kWh). The difference of monthly average generation prices is about 20 percent. During September and November, when the Armenian NPP is idle due to regular planned maintenance, the average generation price, inclusive of VAT, reaches about 7.1¢/kWh (35 AMD/kWh). However, this spread will change during the next two years due to the NPP rehabilitation plan. At that time, average generation prices will increase significantly.
- RE is regulated by a price cap tariff methodology with an annual recalculation formula that adjusts for inflation and exchange rates. Currently, PSRC has not yet set solar tariffs. It is expected to identify solar tariffs through tendering of solar photovoltaic (PV) projects under the World Bank Scaling-up Renewable Energy Program (SREP). It is expected this program will help finance the country's first 40 to 50 MW of utility scale solar PV projects through private investors while minimizing the tariff impact by using SREP funds. The current tariff, inclusive of VAT, for small HPPs on drinking water pipelines is 2.6¢/kWh (12.6 AMD/kWh); on irrigation systems, it is 3.9¢/kWh (18.9 AMD/kWh); on water flows, it is 5.8¢/kWh (28.4 AMD/kWh); and, for wind farms and biomass, it is 10.4¢/kWh (50.9 AMD/kWh).
- Transmission tariffs for wholesale market and export (although fixed on the same basis) are about 2.0¢/kWh (1.0 AMD/kWh) inclusive of VAT.

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15. [www.psrc.am/am/announcements/announcement/2142-1](http://www.psrc.am/am/announcements/announcement/2142-1).

- EPSO and Settlement Center tariffs are defined as monthly service fees and as a separate electricity price for export.
- Distribution tariffs are not set yet. The absence of a proper legal framework artificially restricts consumers' rights to import electricity from neighboring countries.
- End-user tariffs are differentiated by voltage levels for day and nighttime tariffs. There are no capacity charges, peak tariffs, or service fees. As a result, customers have no responsibility for defined capacity charges for large generation. End-user tariffs are among the highest in post-soviet union countries.<sup>16</sup> For example, the household average tariff (day and night), inclusive of VAT, is about 9.6¢/kWh (47.0 AMD/kWh). Day and night tariffs for wintertime are set from 11:00 p.m. to 7:00 a.m. and, for summertime, from 10:00 p.m. to 6:00 a.m. Daily evening peak time during winter is from 7:00 p.m. to 9:00 p.m. and, during summer, from 9:00 p.m. to 11:00 p.m. The average difference between day and night tariffs for high voltage customers (35 to 110 kV) is only 12 percent and, for middle (6 to 10 kV) and low voltage (0.22 to 0.4 kV) customers, it is only 26 percent.

Although the Regulator applies the rate of return methodology, the cost of capital for government-owned companies is only 10 percent (before taxes, in local currency). All the major investments in these companies are made through “soft loans” with a government guarantee. Thus, the government-owned companies are not able to take advantage of commercial loans and operate as a standard commercial business unit.

### 3.6 FUTURE DEVELOPMENT PLANS

The GoA and MoENR, with the support of USAID,<sup>17,18</sup> developed new Least-Cost Generation plans. On December 10, 2015, the GoA approved “long-term (until 2036) development perspectives of the energy sector of the Republic of Armenia,”<sup>19</sup> which provides for the following:

- Rehabilitation of the Armenian NPP during 2017 and 2018 for a service lifetime extension up to 10 years and a rehabilitation cost of about \$300 million.

*It should be noted that the rehabilitation will allow not only extending the service lifetime of the Armenian NPP, but also bringing the operating 385 MW capacity closer to the installed 440 MW. As a result, the Armenian NPP, after rehabilitation, will be able to produce about 10 to 15 percent more electricity (250 to 350 GWh annually). The Armenian NPP tariff will significantly grow starting in 2019 to cover the investment costs of the rehabilitation.*

- Construction of a new NPP unit with capacity up to 600 MW.
- The Hrazdan TPP is planned for decommissioning starting in 2019 due to its low efficiency. It is planned to install one 240 MW new CCGT unit in 2019 and one 400 MW unit in 2022. Those units will replace the Hrazdan TPP and will cover the contracted values of electricity-gas exchange agreements. However, the document assumes the final decision for the construction of a second 400 MW unit will be based on the economic indicators/growth of the gross

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16. [www.psrc.am/images/News/PSRC Consulting Services Part 1 Report\\_ARM.pdf](http://www.psrc.am/images/News/PSRC_Consulting_Services_Part_1_Report_ARM.pdf)

17. [http://leds.am/ss/USAID%20SUCCESS%20STORY\\_Strategy%20meeting.pdf](http://leds.am/ss/USAID%20SUCCESS%20STORY_Strategy%20meeting.pdf)

18. [http://leds.am/ss/USAID%20SUCCESS%20STORY\\_LCGP.pdf](http://leds.am/ss/USAID%20SUCCESS%20STORY_LCGP.pdf)

19. <https://www.e-gov.am/protocols/item/582/>

domestic product, extension possibilities of the electricity-gas exchange contracts, and possibilities of economically reasonable import of electricity from Georgia.

*The GoA, in November 2015, signed the memorandum of understanding (MOU)<sup>20</sup> with Renco S.p.A on the construction of a new CCGT unit in Yerevan with 234 MW installed capacity and not less than 50.5-percent efficiency. The MOU obliged parties with several reciprocal responsibilities, among which the most significant are the following: power purchase guarantee for the produced electricity during the next 20 years (starting from the year of operation) given by the GoA, a 30-month period of construction, and a fixed 6.62¢/kWh without VAT price with an appropriate recalculation mechanism provided by Renco S.p.A.*

*During February 2016, the GoA, on the same basis, signed a second MOU<sup>21</sup> with Grange Power LLC. A second CCGT unit, with the same capacity and efficiency factor, will be constructed in the Vanadzor, Lori region.*

*Neither of these decisions is final. During the next four months, companies will check the financial and technical feasibility of the projects and only then will the agreements be finalized.*

- Three new large HPPs will be installed by 2036. The Loriberd HPP, with a planned capacity of 66 MW and annual production of 208 GWh, and the Shnogh HPP, with installed capacity of 70 MW and annual production of 270 GWh, will be in operation starting in 2022. In addition, the Megrhi HPP, with installed capacity of 130 MW and annual production of 800 GWh, will start operating in the system in 2034.

*It should be noted that, for the construction of the Loriberd and Shnogh HPPs, the government is expected to involve private investments. At the same time, the government's development plan for hydro energy<sup>22</sup> suggests that the Regulator, starting in 2016, set up a price cap tariff for these HPPs on the level of 6.5¢/kWh without VAT. The expected investment costs for the Loriberd HPP is about \$160 million and, for the Shnogh HPP, it is about \$190 million. The construction period of such HPPs is about five years. Until now, there were no private investors involved in these projects, and it is necessary to assume that, more realistically, these two HPPs will not be operating in 2022. At the same time, it is questionable if the fixed tariff limitation will attract private investors.*

*The GoA, with USAID assistance, developed the Least-Cost Energy Development Plan (LCEDP) that, among other new generation options, also considered three new large HPPs. The LCEDP provided data on capacity, efficiency, seasonal availability factors, annual maximum generation, investments, fixed and variable costs, and construction periods for the mentioned power plants. Under different scenarios, the energy sector expenditures, developments, swap, export and import options, etc., were analyzed.*

- Renewable development is another important part of the development perspective. About 170 private, small HPPs (under 30 MW) are operating in the system with the installed capacity of 300 MW and annual generation of 700 GWh. About 45 small HPPs are under construction as of January 1, 2016, with a total capacity of 90 MW and annual generation of 315 GWh. Development perspectives set the target to construct up to 150 MW of small HPPs by 2021.

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20. [https://www.e-gov.am/u\\_files/file/decrees/kar/2015/11/15\\_1364\\_1.pdf](https://www.e-gov.am/u_files/file/decrees/kar/2015/11/15_1364_1.pdf)

21. <https://www.e-gov.am/ajax/gfn.php?f=AKV-04-24-02.doc>

22. [https://www.e-gov.am/u\\_files/file/decrees/arc\\_voroshum/09/qax35-12\\_1.pdf](https://www.e-gov.am/u_files/file/decrees/arc_voroshum/09/qax35-12_1.pdf)

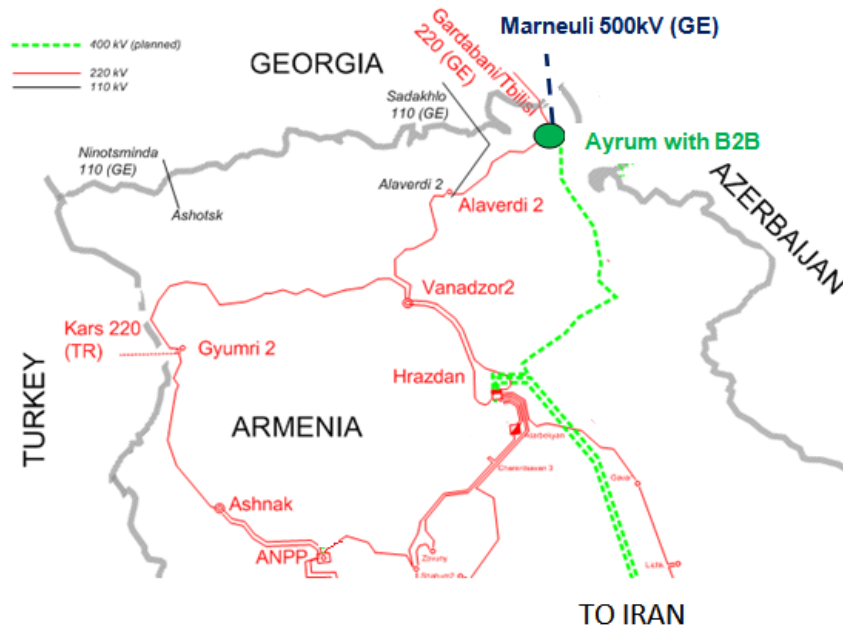
*It is hard to foresee that another 60 MW of new small HPPs can realistically be constructed by 2021 because the economically attractive projects under the current tariff levels seem to be exhausted. In any case, it should be noted that the existing 170 small HPPs have a low capacity factor, 2,200 hours annually, when the projected capacity factor is about 2,800. Finally, small HPPs will produce about 1,000 GWh annually, which can be increased up to 1,200 GWh when the operating small HPPs make new investments to improve their efficiency.*

- The government plans to attract private investments for construction of 40 MW solar and 30 MW geothermal power plants from 2021 through 2024. Wind development is not highlighted in the program.
- The GoA is planning to finally renew the transmission system and increase transmission capacities. The long-term development program (until 2036) is envisioned to use several loans for the rehabilitation of the transmission network; in particular, it is planned to use about \$115 million of the International Bank for Reconstruction and Development (IBRD) loan and \$23 million of the Asian Development Bank loan for renovation of 220 kV and 110 kV substations. In order to increase the reliability of the transmission network, construction is planned for six 220 kV and two 110 kV overhead lines financed by \$39 million of the IBRD loan. About €11 million from the KfW Development Bank (KfW) loan will be used for rehabilitation of 220 kV and 110 kV overhead lines. Several loans and grants from KfW and the EU will cover the construction of the 400 kV Armenia-Georgia interstate transmission line with back-to-back (B2B) loan extensions until 2018, thus enhancing the regional integration of the Armenia power system.
- The market structure and future development of the tariffs are the next important part of the plan. The middle-term perspectives envision increasing liberalization of the Armenia power market in order to increase the efficiency and promote investments. To promote trade with Georgia, several new mechanisms will be needed such as transit, balancing, service provision, regulation of emergency supplies, and inadvertent power flows. The revision of the tariff methodology with the introduction of more efficient seasonal and hourly tariff structures is also part of the middle-term market reforms. All aforementioned activities are planned for the period 2016 through 2019.
- The development of this infrastructure is expected to increase tariffs by about 1.1¢/kWh (5.5 AMD/kWh) and will reach its maximum during the 2020-2021 period.

### **3.7 TRANSMISSION DEVELOPMENT IMPACT ON CROSS-BORDER TRADE**

Armenia has had a reliable transmission infrastructure since Soviet times. During the last few years, one 220 kV interconnection was put into operation and a number of high-voltage substations were reconstructed. In 2015, the transmission tariff, inclusive of VAT, was set at 0.2¢/kWh (1.0 AMD/kWh). The construction of new interconnections will significantly influence transmission costs. These interconnections will serve almost entirely export/import operations, but they increase reliability of supply for internal customers. For cross-border trading, an appropriate infrastructure is needed, and it should be developed strictly in accordance with technical capacities and economic feasibility. Otherwise, this will hinder the development of international trade and will increase the financial burden on the domestic consumers.

Armenia and Georgia are interconnected with 1) 220 kV Alaverdi-Gardabani, 2) 110 kV Ashotsk-Ninotsminda, and 3) 110 kV Alaverdi-Sadakhlo lines (**Figure 1**).



**Figure 1. Armenian Interconnections**

In today's situation, Georgia is synchronized with Russia, and Armenia is synchronized with Iran. Only asynchronous operation between Armenian and Georgian power systems or operation in island mode can be realized. Operation in island mode cannot ensure significant electricity flow (possibly up to 40 MW). Because this situation is unlikely to change in the near future, the option of parallel asynchronous operation of the Armenian and Georgian power systems through B2B converters has been chosen as a feasible option.

This project will achieve an asynchronous power connection between Georgia and Armenia and thereby closing a missing link for a reliable, flexible, and mutually profitable cross-border trade. In addition, the project improves the country's energy infrastructure, facilitates energy security, and enhances power export and transit potential.

The project aims to connect the Armenian and Georgian power grid via a 500/400/220 kV B2B station with a final capacity of 1,050 MW in Ayrum (Armenia), close to the Georgian border. The connection from the Georgian side will be via a 500 kV line from the substation Marneuli (not part of the project) and the connection from the Armenian side via a 400 kV line from Hrazdan (at the first stage via the existing 220 kV line from Alaverdi). The overall project will be carried out in three subsequent stages with construction of transmission infrastructure and 350 MW B2B units during each stage. After the implementation of the first stage, the maximal transfer capacity will reach about 200 MW. The design of the project is based on the *Prefeasibility Study of February 2013* as well the *Feasibility Study of February 2014* carried out by the consulting company Fichtner. The estimated project cost for Stage 1 is approximately €188 million, supported by different KfW soft loans, with a grace period of 5 to 10 years. The final decision for the next two stages will depend on real power exchanges and trade opportunities through the new transmission infrastructure.

If the Regulator continues applying the same methodology of sharing development costs between power flows of the internal market and possible export/import, including transit flows, the transmission tariff



on average will increase about three times compared with 2015. Future levels of the transmission tariff will be very sensitive to the volume of external flows, and projected power flows will influence affordability of the transit and cross-border trade. The current tariff methodology applied by the Regulator provides a more reasonable regime for transit and cross-border trade because internal market participants will cover some part of the development costs.

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# 4. SITUATION IN THE POWER MARKET OF GEORGIA

## 4.1 DOMESTIC MARKET PRINCIPLES AND CROSS-BORDER TRADE

According to current power Market Rules, the licensed carriers of the power sector make short-term (one year) or long-term (five years) contracts on sales and purchases. The contracts are made between the customer and the producer, while the contract on the balance capacity purchase is made with the commercial operator. The purchaser is obliged to have reserve power amounting to 10 percent of its utilized power (a minimum 5 percent of this amount should be supplied by local sources) to ensure energy security of the country. It is possible to supply the reserve power by direct contract, private sources, or commercial operator. A 10-percent quota of the years 2013 to 2015 is to be completely supplied by local sources; the 2016 to 2019 required reserve quota will be raised to 15 percent, which will have to be fully supplied by local sources. The balanced electric power trade is carried out by the commercial operator. The commercial operator balances the difference between the actual consumption and the amount of the electric power specified by the direct contract between customers and producers.

Electric power trading is carried out by the commercial operator in two ways. The first way is either unplanned over-consumption or when a direct contract is not made. In this case, the customer automatically purchases the electric power from the commercial operator. According to the second variant, the commercial operator and the customer make a contract that doesn't specify either the amount or the price of the required electric power. After each concrete request, the sides offer the prices acceptable to them and, in this case, the trading is cleared in the so-called electric power exchange format, which does not affect the consumer tariff. The system's commercial operator renders services according to the tariffs established by GNERC (Georgian National Energy and Water Supply Regulatory Commission). Note that the customer is able to purchase the balanced electric power not just from the commercial operator, but also by direct contract. Direct contracts are available to consumers using seven million kWh per year. Since August 2008, there has been full deregulation of the hydro electrical stations built after August 1, 2008. They have a right to trade the electric power with free (deregulated) tariffs.

Currently, the Georgian domestic market is still functioning on a monthly basis; although, in recent years it has pursued a policy of transition to an hourly market, guided by the signed Association Agreement with the EU. Georgia developed the Electricity Market Model (GEMM2015) and the electricity trade mechanism, adopted the Grid Code, and is working on development of new Market Rules that also contemplates market opening. The market will operate on an hourly basis by the following trade sectors:

- Monthly contracts
- Free negotiations between market participants
- Day-ahead market
- Balancing market

The decision of about 50 large consumers (now 4) that will exit from DISCOs and will be market participants is practically accepted. The generation price for all direct consumers in the market will be higher than for the DISCOs, but they will have the right to sign bilateral contracts after free negotiation, and they will therefore be interested in seeking the cheapest electricity even from external markets. Today, the maximal average wholesale price for DISCOs is about 110 Georgian Lari (GEL) per megawatt hour (MWh) or \$45.8/MWh without VAT.<sup>23</sup>

In recent years, the Georgia power system has undergone various changes. Main indicators of power system balance are presented in **Table 1**.

**TABLE 1. MAIN ANNUAL DATA OF ELECTRICITY BALANCE IN GWh<sup>24</sup>**

	2007	2008	2009	2010	2011	2012	2013	2014	2015
<b>Domestic Consumption</b>	7,815	8,075	7,642	8,441	9,257	9,379	9,690	10,170	10,382
<b>Export</b>	626	680	749	1,524	931	528	451	545	660
<b>Russia</b>	300	433	526	1,117	589	369	371	160	170
<b>Armenia</b>			20	90	117	68	73	141	70
<b>Azerbaijan</b>	110	31	21	14	6	12	7	8	
<b>Turkey</b>	216	216	182	303	219	79		236	420
<b>Generation</b>	8,346	8,451	8,408	10,058	10,104	9,695	10,059	10,370	10,833
<b>Hydro</b>	6,831	7,169	7,417	9,375	7,892	7,223	8,271	8,334	8,454
<b>Thermal</b>	1,515	1,282	991	683	2,212	2,472	1,788	2,036	2,379
<b>Import</b>	433	649	255	222	471	615	484	793	699
<b>Russia</b>	177	560	223	212	448	517	460	607	511
<b>Armenia</b>		54	40					2	86
<b>Azerbaijan</b>	107	35	31	10	23	98	24	184	102
<b>Turkey</b>	149		1						
<b>Transit</b>								59	

In particular, the Georgia-Turkey new interconnection has been developed, thus creating technical conditions for countries in the region to enter the Turkish power market. However, as shown in Table 1, starting in 2013 (network commissioning year), there was fairly small transit and power export flows from Georgia to Turkey. This situation is explained by the following:

- Absence of surplus generation in Georgia and neighboring countries.
- Turkey import limitations during the period of maximal possible export from Georgia from April to June (100 to 350 MW) due to coincidence of “high water” seasons.
- High export prices (including transmission tariff).
- Decline of consumption growth in Turkey, as well as internal market prices.

23. [www.gnnerc.org](http://www.gnnerc.org).

24. [www.esco.ge](http://www.esco.ge).

## 4.2 GENERATION AND TRANSMISSION DEVELOPMENT IMPACT ON CROSS-BORDER TRADE

In recent years, Georgia relied on development of new generation capacities to satisfy domestic market needs and decrease dependence on imports. **Table 2** shows new generation construction completion in Georgia in recent years and to be built in the next two years.

**TABLE 2. NEW GENERATION IN GEORGIA<sup>25</sup>**

Name	Status	Installed Capacity in MW	Year
Khadori 2	Operating	5.4	2012
Silda	Operating	5.0	2013
Bakhvi 3	Operating	9.8	2013
Alazani	Operating	6.2	2013
Larsi	Operating	19.0	2013
Paravani	Operating	85.0	2014
Akhmeta	Operating	9.1	2014
Aragvi	Operating	8.0	2014
Kazbegi	Operating	5.0	2014
Kazreti	Operating	3.5	2014
Racha	Operating	11.0	2014
Nabeglavi	Operating	1.9	2014
Pshavela	Operating	1.9	2015
Gardabani CC (Thermal)	Operating	230.0	2015
<b>TOTAL</b>	<b>Operating</b>	<b>400.8</b>	<b>2012-2015</b>
Abuli	Under Construction	22.0	2016
Arakali	Under Construction	9.0	2016
Dariali	Under Construction	108.0	2016
Goginauri	Under Construction	1.8	2016
Kintrishi	Under Construction	5.0	2016
Okropilauri	Under Construction	1.8	2016
Khelvachauri 1	Under Construction	47.0	2017
Khobi 2	Under Construction	55.0	2017
Kirnati	Under Construction	51.0	2017
Lukhuni 2	Under Construction	17.2	2017
Mtkvari HPP	Under Construction	53.0	2017
Shuakhevi	Under Construction	175.0	2017
<b>TOTAL</b>	<b>Under Construction</b>	<b>545.8</b>	<b>2016-2017</b>

The analysis of new HPPs shows that their capacity factor is not less than 50 percent and, in some cases, even higher, which means the additional generation of new HPPs can be expected to be not less than 800 GWh.

25. Growth for Georgia project (USAID funded), 2015.

These new hydro capacities will lead to expected decreases in supply deficits in Georgia, even during winter months, (Assuming that the average percentage of internal consumption growth in the past 5 years was about 2.9 percent per year (Table 1)).

Until now, especially during wintertime, the generation on TPPs was carried out at the expense of low-efficiency older units with 300 MW capacities at the Mtkvari and Tbilresi TPPs (generation of about 3 MWh burning 1,000 cubic meters (m<sup>3</sup>) of gas). The generation price has been kept at current levels through an agreement with Azerbaijan providing favorable gas prices.

- Residential Consumers: 300 million m<sup>3</sup> at \$167/thousand cubic meters (tcm)
- TPPs: 700 million m<sup>3</sup> at \$143/tcm<sup>26</sup>

Total generation at TPPs during recent years is within a range of 1,800 to 2,500 GWh (Table 1). The upper level corresponds to the highest volume of gas, while the lower level is due to a higher hydro generation in particular years.

A 110 MW capacity gas-turbine unit with low efficiency (about 32 percent) is used for reserve capacity. The new unit at the Gardabani TPP (constructed by the Georgian Energy Development Fund with \$231 million investment) is expected to produce not less than 1,500 GWh when fuel costs are less than \$35/MWh (if the gas price is \$143/tcm). The gas demand in this case would be about 350 million m<sup>3</sup>.

In October 2015, Georgia signed an agreement with a large Chinese company, Dongfang Electric Corporation, for construction of a combined-cycle thermal unit in Tkibuli working on domestic coal (capacity of 150 MW, annual generation of 1,000 GWh, investments of \$180 to \$200 million, and a period of construction of 3 years).<sup>27</sup> In spite of the fact that domestic coal has a low calorific value (4,000 to 4,500 kilocalorie (Kcal)/kilogram (kg)), its low cost (about \$60/ton) would provide a low-level fuel component as well.

These two power plants together will displace old units and provide even more generation than is available today on existing TPPs. At the same time, it will allow savings of about 350 million m<sup>3</sup> of gas and could allow constructing another unit at the Gardabani TPP if necessary. It will also increase the maneuverability of TPPs. Currently, old units are not regulated at all, which affects the electricity price (nighttime electricity in Georgia is more expensive than peak time).

In recent years, Russia appeared to increase its export price to Georgia during wintertime. This situation could change if Georgia can influence prices after completing even some of the planned HPP projects (i.e., construction of an additional 545 MW during the next 2 years (Table 2)) and construction of the Tkibuli TPP.

Starting in 2016, Georgia will probably become a net exporter, given that in 2015 the new Gardabani TPP began generation only in mid-October (analysis of Table 1). Georgian hydropower might be exported to Russia and Armenia due to limitations of export options to Turkey during the spring/summer. The export volume depends only on the availability of water. The growth of the transmission tariff in Georgia, due to large-scale construction of new interconnections to Turkey, might be considered as a constraint for export:

- 500 kV lines Zestaponi-Akhaltzikhe, Gardabani-Akhaltzikhe
- 400 kV line Akhaltzikhe-Turkish border
- 500/400/220 kV SS Akhaltzikhe

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26. <http://factcheck.ge/en/article/what-is-the-aim-of-negotiations-between-georgia-and-gazprom/>.

27. <http://agenda.ge/news/42103/eng>.

- B2B 2x350 MW (expandable to 1,050 MW)

The cost of the first stage of the project (B2B 700 MW) for Georgia was about €230 million. The cost of a total project with B2B extension to 1,050 MW according to the “Regional Power Transmission Extension for Caucasus Countries” (Fichtner, November 2007) was €303 million.

### 4.3 TRADE BETWEEN GEORGIA AND TURKEY

Due to its growth of consumption (forecasted up to an annual 7.5 percent) and the electricity shortage during the last few years, Turkey was considered as a main destination for export. Since synchronous operation with Europe (synchronization was implemented in September 2011), the electricity market has been transformed, and initial prices at the competitive market were fairly high. Currently, the situation has changed and the growth has slowed down (e.g., in 2013 compared to 2012, it was only 1.3 percent).<sup>28</sup> This fact, along with implementation of a competitive market, has led to a decrease of electricity prices on the wholesale market. Turkey’s electricity deficit is unlikely to be sustained.

Figure 2 shows the hydro generation development in Turkey close to the border with Georgia.

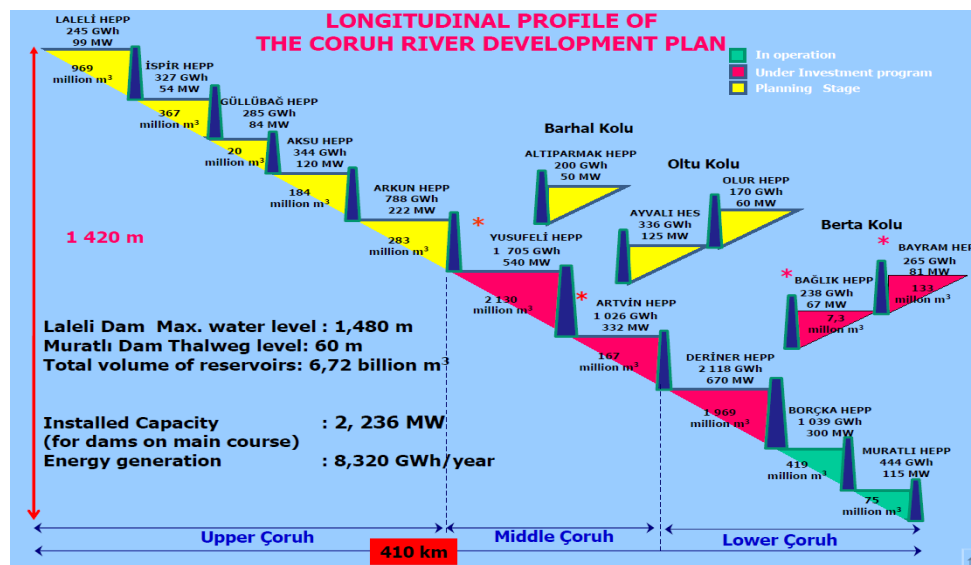


Figure 2. Coruh River HPP Cascade Development Plan<sup>29</sup>

The 670 MW Deriner HPP was also put into operation (2015), and the 540 MW Yusufeli HPP is planned to be commissioned in 2018. It should be noted that large HPPs have a broad adjustment range, and even export is quite possible given that the main load in Turkey is in the central and western parts of the state. The construction of those HPPs should lead to a substantial decrease of import from Georgia during the season when both Turkey and Georgia experience “high water” conditions.

From April to June, Turkey limits the maximum import capacity from Georgia to 300 MW.

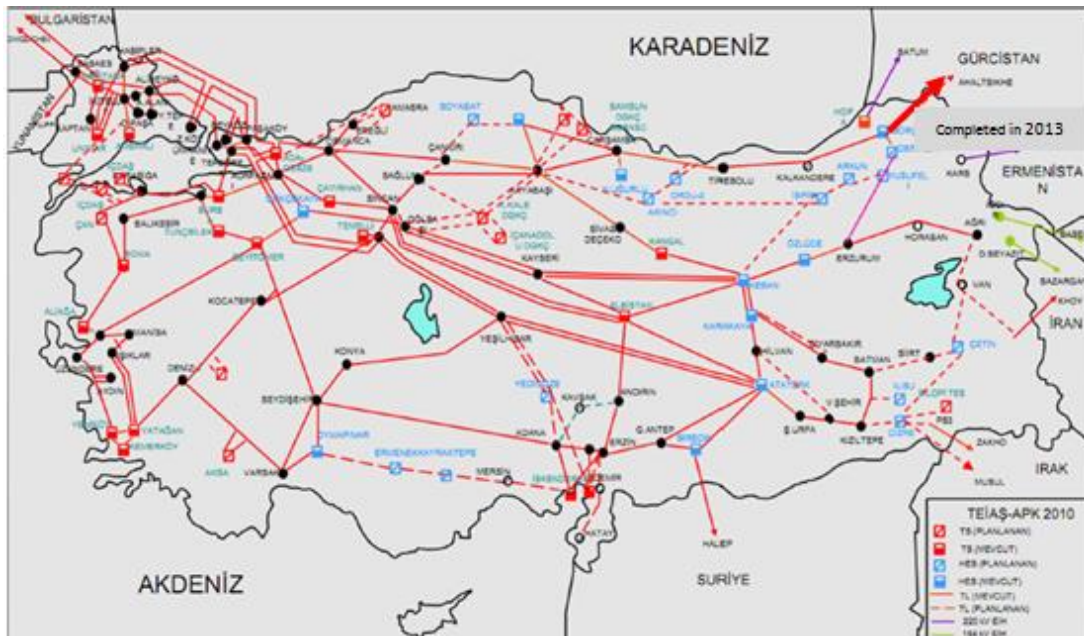
The aforementioned means that Turkey may export electricity to Georgia and purchase more volumes from Bulgaria and Greece (current prices in Europe have decreased substantially as well). Even now, Turkey offers Georgia electricity at 4¢ to 5¢/MWh.

28. 2013 Turkey Energy Report, February 2014.

29. Coruh River Development Plan, Ubeyd Sezer, PPT, Tbilisi, 2009.

The new Georgia-Turkey interconnection is carried out by Georgia (Turkey only constructed a 400 kV line from Borchka to the border, and the expenses do not exceed €20 million). Moreover, the agreement between Turkey and Georgia considers a sale/purchase node at the border. Thus, as in the export and import of electricity, Turkey, even today, has access to reliable infrastructure with 700 MW capacity.

Transmission constraints exist in the east of Turkey<sup>30</sup> where the load is low. Moreover, according to a 20-year energy development strategy (until 2030), about 90 percent of investments will be assigned for generation development, which will lead to growing interest in export to Georgia taking into account that Turkey currently, among other countries in the region, has the closest generation to Tbilisi (Figure 3).



**Figure 3. Turkish Transmission System**

Synchronization with the European Network of Transmission System Operators for Electricity (ENTSO-E) and transition to the competitive market (which lasted more than 10 years) allowed Turkey to increase the efficiency of external trade as well as considerably decrease the prices in the domestic market. Currently, the electricity market in Turkey represents three main sectors of trade:

- Contracting
- Day-ahead market
- Balancing market<sup>31</sup>

It is worth mentioning that export/import agreements will definitely be on an hourly basis, as they are currently used in trade with Georgia. According to the current Market Rules, only companies licensed in Turkey may become market participants, and this fact sometimes requires an intermediary for export operations to Turkey (at extra cost).

30. Update on the Regional Transmission Transfer Capability for Georgia New HPPs Electricity Sales, Final Report (Georgian Recourse Development Service), March 2012.

31. *Turkish Electricity Market Review, Hydropower Investment Promotion Project (HIPP)*, Deloitte, November 2012.



#### 4.4 TRADE BETWEEN GEORGIA AND RUSSIA

Recently, Russia has been the main exporter of electricity to Georgia (see Table 1 and **Table 3**). Relatively small volumes of power flow, and there has been a sharp increase of generation from Georgia's old TPPs since 2011, indicating: 1) a high import price, 2) limited supply capacity, or 3) both together.

**TABLE 3. GEORGIAN IMPORT FROM RUSSIA IN GWh<sup>32</sup>**

	2007	2008	2009	2010	2011	2012	2013	2014	2015
January	–	121	70	11	77	80	127	126	115
February	–	138	25	0	78	74	75	86	63
March	–	79	0	14	22	125	62	4	61
April	–	53	1	–	2	22	–	–	6
May	–	–	4	1	0	0	–	–	1
June	–	–	0	2	0	1	–	1	2
July	–	–	3	2	7	1	–	5	1
August	4	48	3	1	2	0	1		15
September	2	24	3	8	16	22	1	65	–
October	40	3	–	44	6	51	17	83	40
November	65	18	43	62	97	48	85	139	83
December	66	77	72	68	139	94	94	98	123
<b>Year</b>	<b>177</b>	<b>561</b>	<b>224</b>	<b>213</b>	<b>446</b>	<b>518</b>	<b>462</b>	<b>607</b>	<b>510</b>

The exchange of electricity between Russia and Georgia is carried out on a 500 kV Kavkasioni line with 600 MW transfer capacity. Construction is planned for a 500 kV line connecting a Russia and Ksani substation in Georgia, although this project will be realized only upon construction of an HPP in Steptatsminda (about 400 to 500 MW).

As is seen from Table 3, the maximal monthly exchange volumes from Russia during previous years did not exceed 140 GWh with an average capacity of 200 MW, and that might serve as a benchmark since nighttime exchanges often exceed peak time exchanges due to cheap prices and Georgia's ability to accumulate water at regulating HPPs. It is also worth mentioning that, according to synchronous operation agreements, the power flow on this line must be at least 30 to 50 MW in both directions.

The analysis of the situation, with generation development in both Russia and Georgia, shows Russian export capacity is unlikely to increase in the foreseeable future. Considering the size of the power system of Russia, the construction of a separate line (in a considered case of a 500 kV line on the Mozdok-Georgia border) might not have any impact on a transmission tariff and thus on Russia's export price offer.

The electricity exchange between Russia and Georgia (sales by Georgia during summer and purchases during winter) has been conducted on an hourly basis, differentiating the prices by daily time zones. As a result, nighttime electricity has been cheaper than peak time, and volumes were higher. Georgia could use reservoir water at peak times, thus decreasing the average import price.

32. [www.esco.ge](http://www.esco.ge).

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# 5. TRADE POSSIBILITIES BETWEEN ARMENIA AND GEORGIA

## 5.1 EXPORT FROM ARMENIA

During recent years, Armenia and Georgia have evaluated power trading potential and projects to upgrade interconnections. One activity was the USAID-funded ESRI project led by Tetra Tech that studied the option of synchronous operation with Georgia and disconnecting from Iran for the years 2015 to 2020.<sup>33</sup> As a result of multi-option calculations using GTMax software, the possible power exchange volumes between the countries have been defined. The economic efficiency was defined by the criterion of a non-increase of generation prices for domestic consumers of Armenia, and the trading efficiency was defined by reduction of that price. At a maximum in the scenarios, the export from Armenia did not exceed 830 GWh and import did not exceed 500 GWh per year (maximal flow in both directions was no more than 900 MWh in all scenarios).

In the export structure, a benefit was Armenia's low price export combined with its need to avoid drastic unloading of the Armenian NPP in summer, as might be required in isolated operation of the Armenian power system. These conditions would allow Armenia to sell electricity even at nighttime and for Georgia to store additional water for use at peak hours. The low price makes these transactions sustainable despite other new generation in Georgia.

Another possibility is wintertime export from Hrazdan Unit5, but this export is associated with certain difficulties. First, after a 15-percent increase in Russian gas prices, the fuel factor reached about 5.6¢/MWh. The second difficulty is Georgia's commissioning of new highly efficient generation capacities and the potential competitiveness of Turkey in winter because of the new 670 MW Deriner HPP with year-round water availability.

In the end, price competitiveness will be the defining factor for these potential nighttime exports in the region. Today, Turkey can suggest to Georgia electricity at rather low prices (4¢ to 5¢/MWh), but the decisions taken earlier in Georgia represent barriers to that. According to the decisions, the Power Purchase Agreements (PPAs) with the permission to export to Turkey were being signed with newly constructed power plants (e.g., the Paravani HPP). Therefore, export of electricity from that plant (maximum 80 MW) represents a restriction for potential low price import.

## 5.2 SEASONAL IMPORT FROM GEORGIA AND DAILY EXCHANGE

Power import from Georgia during the "high water" season is possible considering the restrictions on the Georgian export to Turkey. More generally, import is possible practically without limitations when daily supply conditions indicate (it is profitable even for "run of river" HPPs of Georgia). TPPs of Armenia could provide seasonal exchanges of power supplies to Georgia in winter. To fulfill their

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33. *Economic Efficiency of Armenia Power System Integration and Analysis of Impacts on New Renewable Development in Armenia*, Tetra Tech, 2012.

obligations on the domestic market, TPPs may act as importers. Having an appropriate legal regulation in effect on such imports can be advantageous both for TPPs and for Armenian consumers. During some periods, import can be competitive for Armenian import considering the increased internal power demand. Armenia may be able to receive additional profit at daily exchanges in summer by getting cheap nighttime electricity from Georgia and by exporting its own surplus to other markets. At peak hours, more expensive electricity can be supplied to Georgia.

# 6. EU REQUIREMENTS FOR INTERNAL POWER MARKET

If Armenia is to be a participant in the regional power market and trade with Georgia, Turkey, and countries beyond, it will be required to implement a power market model that meets the requirements of the EU internal power market. This section of the report summarizes the requirements for trading with Energy Community members. These requirements are equivalent to EU internal requirements and are used later as the basis for the gap analysis - the purpose of this report.

The Energy Community extends the EU internal power market beyond the EU to countries in neighboring jurisdictions. The *Annual Implementation Report* by the Energy Community Secretariat dated September 1, 2015,<sup>34</sup> identifies the principle objectives of the Energy Community as follows:

*“The principle objectives of the Energy Community are to create a regulatory and market framework which is capable of attracting investments for a stable and continuous energy supply. This paves the way for an integrated energy market, allowing for cross-border trade and integration with the EU market. The Energy Community strives to enhance security of supply and competition, and to improve the environmental situation in its Contracting Parties.”*

The treaty establishing the Energy Community was signed in 2005 and entered into force in July 2006. The parties to the treaty are the EU and eight Contracting Parties, including Albania, Bosnia and Herzegovina, Kosovo,<sup>35</sup> the Former Yugoslav Republic of Macedonia, Moldova, Montenegro, Serbia, and the Ukraine.<sup>36</sup> Currently 19 of the 28 EU member states are participants to the treaty, including Austria, Bulgaria, Croatia, Czech Republic, Cyprus, France, Finland, Germany, Greece, Hungary, Italy, Latvia, the Netherlands, Poland, Romania, Slovakia, Slovenia, Sweden, and the United Kingdom. Armenia is an Observer under Article 96 of the Treaty, as are Georgia, Norway, and Turkey. Georgia has applied to join the Energy Community as a full member.<sup>37</sup>

The European Commission’s power market directives are the drivers that have transformed Europe’s energy industry. The focus of the directives has been on unbundling monopoly elements such as network operation from the other functions; ensuring third party transmission access; ensuring independent regulatory oversight, including for cross-border exchanges and trade; and providing that all customers have the right to choose their supplier.

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34. See September 1, 2015, report entitled *Annual Implementation Report* by the Energy Community Secretariat at [https://www.energy-community.org/portal/page/portal/ENC\\_HOME/DOCS/3872267/23B450386A075E64E053C92FA8C0F69F.PDF](https://www.energy-community.org/portal/page/portal/ENC_HOME/DOCS/3872267/23B450386A075E64E053C92FA8C0F69F.PDF).

35. Kosovo is not universally recognized as an independent country.

36. These were the parties to the treaty as of September 1, 2015.

37. Regional Electricity Balkan Infrastructure Study, the Generation Investment Study undertaken under the EU Community Assistance for Reconstruction, Development, and Stabilization framework: [http://siteresources.worldbank.org/INTECAREGTOPPOWER/Home/20551044/Volume%201%20-%20Exec%20sum\\_final.pdf](http://siteresources.worldbank.org/INTECAREGTOPPOWER/Home/20551044/Volume%201%20-%20Exec%20sum_final.pdf).

Many of the countries in the Energy Community are small, leading to an argument that the complex market design and requirements for competition impose too great a burden. However, a study commissioned as part of the regional power integration process determined that the least-cost investment in generation and transmission in Southeast Europe (SEE) would achieve savings of €3 billion in the period between 2005 and 2020.<sup>38</sup> There are numerous potential benefits from increased electricity trade in the SEE region, including:

- Coordination of a regional least-cost investment plan, particularly given the substantial investment requirements in SEE owing to growing demand and old and inefficient generation and transmission infrastructure.
- As many of the countries in the region are small, they are only able to obtain economies of scale through exports to a broader regional market.
- Power exports can provide an additional source of revenue in some countries.
- Enhanced security of supply and economic efficiencies are gained from cross-border trading.

The Energy Community Treaty established government-level institutions supplemented by regulatory and technical working groups. The primary features of the regional power integration process include:

- Competition, over time, in wholesale and retail supply.
- A common regulatory framework with independent national regulators.
- Unbundling of previously vertically integrated utilities.
- Functionally and financially unbundled TSOs.
- Establishment of a regionally integrated network linked to the wider EU network, including a common set of rules governing generation, transmission, and distribution.
- Coordination of regional planning and facilitation of competitive investment.<sup>39</sup>

Significant progress has been made toward meeting the objectives of the Energy Community Treaty. Independent regulation and TSOs generally have been formed and, in some countries, progress has been made toward development of independent distribution network operators. Countries have been harmonizing rules governing national markets with each country adopting the EU directives and establishing Market Rules that permit competition.

Although progress has been made to integrate SEE into a single regional market for wholesale trading, much work remains. Currently, plans are focused on achieving market opening with all consumers having a choice of supplier. The September 2015 *Annual Implementation Report* by the Energy Community Secretariat (referenced earlier) evaluates progress of the Contracting Parties in 10 areas, as follows:

- Electricity
- Gas
- Regulatory Authority
- Oil

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38. Ibid.

39. The treaty itself does not mandate investment.

- RE
- EE
- Environment
- Competition
- Statistics
- Open Infringement Cases

Since the Secretariat has ultimate responsibility for determining if a country meets the requirements of the EU internal power market, it is appropriate to conduct the gap analysis - the subject of this report - on the basis of Armenia's compliance with the Secretariat's criteria. A brief description of the Secretariat's criteria used to review the state of compliance for each of the Contracting Parties follows. Note that oil and gas are not part of this undertaking; neither are open infringement cases. These areas are therefore omitted from further discussion in this report.<sup>40</sup>

## 6.1 ELECTRICITY

Legislation relating to electricity is directed at establishing competitive power markets that are fair, transparent, and nondiscriminatory. The deadline for market opening for households was January 1, 2015, but most Contracting Parties missed the deadline.

1. **Authorization:** Relates to authorization of new generation capacity without concessions and through an independent body.
2. **Unbundling:** Relates to the unbundling of generation, transmission, transmission system operation, distribution system operation, and supply. Transmission system operation must be legally unbundled.
3. **Third Party Access:** Relates to the mandatory provision of fair and nondiscriminatory access to the network. Network tariffs are set and published by the Regulator and should set similar prices for similar services. The methodology for addressing and costing congestion must be addressed, and there should be a transparent process for allocating transmission capacity on interconnections.
4. **Eligibility:** Relates to the granting of rights to all customers for switching suppliers, particularly households.
5. **Market Opening and Price Regulation:** Relates to opening the wholesale and retail market to competition in a gradual manner. Provisions allow for a supplier-of-last-resort to supply those customers that do not exercise their right to choose a supplier or lose their supplier (e.g., because it went out of business, etc.).
6. **Balancing:** Relates to the supply and pricing of deviations between contracted quantities and actual quantities delivered and consumed, including cross-border transactions. Provisions must be made for balancing groups, balancing responsibility, and balancing rules based on objectivity, transparency, and nondiscrimination.

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40. The EU also has technical requirements relating to power system performance documented in the *Operational Handbook*. This brings the standards of electricity supply up to minimum performance standards in all countries while minimizing the potential for an outage in one country to cascade into another. The focus of this report is on harmonization of market models and Market Rules; the technical gap between Armenia and Georgia is not judged to be critical. Further, the construction of the B2B high-voltage direct current facility will allow the two countries to operate asynchronously, thus isolating Georgia from faults in Armenia (and vice versa).

7. **Customer Protection and Protection of Vulnerable Customers:** Relates to the rights and obligations of customers. Vulnerable customers must be defined and a support mechanism developed along with a source of financing for subsidies.

*Armenia generally does not meet any of the abovementioned criteria. The GoA, MoENR, and Regulator authorize new generating capacities and may include concessions. Distribution is not unbundled into DSO and Supply; no customers have a choice of supplier. The market is not open to competition. There is currently no rule guaranteeing third party access to transmission and distribution networks. Balancing is not a separate activity as there are no contracted amounts. All balancing is done by the ISO in cooperation with the DSO, and costs are embedded in tariffs. The only criterion that partially meets EU requirements is the mechanisms used by the GoA for protection of vulnerable customers through the targeted and “means tested” social support mechanisms.*

## 6.2 REGULATORY AUTHORITY

8. **Regulation:** Relates to establishment of a single authority for regulating the power sector. The Third Energy Package places a number of requirements on the Regulator. It should include a Board of Commissioners (i.e., five members) with specified terms of service (i.e., five years, renewable once) with clear criteria pertaining to qualifications for appointment. A rotation scheme is required, and vacancies should be announced publicly. Conditions for dismissal of commissioners should be specified (e.g., conflict of interest, carrying out of a criminal act, etc.) to reduce the potential for political intervention. The Third Energy Package addresses competences of Regulators, the obligation of the Regulator to comply with legally binding Energy Community Regulatory Board decisions, and to publish recommendations (e.g., in relation to compliance of supply prices with public service obligation limits, to impose measures to promote competition, etc.). The level of penalties that a Regulator can impose is also established in the Third Energy Package. The Regulator must have the authority to make binding decisions autonomously and independently; however, its decisions should be open to judicial review, and the Regulator must defend and quantify its decisions in writing. The Regulator should be impartial and transparent by holding meetings open to the public and publishing its decisions. Public and stakeholder review should be reflected in the Regulator’s decisions. Management of the Regulator should be autonomous. The national Regulators should be active on a regional level.

*For the most part, Armenia meets EU requirements in that there is a single regulatory authority that is independent and operates without political interference. It has a Board of Commissioners with specified terms and clear criteria relating to qualifications; nevertheless, there are no limitations on reappointment. Moreover, the regulatory authority has no autonomy in the implementation of its budget and does not have adequate human and financial resources to carry out its duties.*

## 6.3 RENEWABLE ENERGY

Binding national targets to be achieved by the Contracting Parties through the use of RE in the electricity, heating and cooling, and transport sectors by 2020 has been specified using a similar methodology that was applied to the EU member states.

9. **Renewable Energy Action Plan:** Relates to the requirement that a country adopt a National Renewable Energy Action Plan.



10. **Support Schemes:** Relates to the requirement that support be provided to promote a broad spectrum of RE sources such as wind, biomass, solar, and for other sectors in addition to electricity, such as heating and cooling, and transport.
11. **Cooperation Mechanisms:** Relates to provisions for cooperation mechanisms between a country and the Contracting Parties or EU member states to reach the 2020 targets established by the EU.
12. **Administrative Procedures:** Relates to procedures for authorization of new renewable power plants such as the designation of an institution to act as a one-stop shop for handling applications for RE projects to the benefit of investors. There must be a streamlined and simplified procedure for handling such applications.
13. **Access to the Grid:** Relates to the provision of priority and guaranteed access of renewables to the network with priority dispatch. The methodology for determining the costs of connection to the grid must be transparent.
14. **Guarantees of Origin (GOs):** Relates to the issue, transfer, and cancellation of GOs relating to sources of RE. The GO is an instrument defined in European legislation that labels electricity to inform the customers on the source of their energy. It ensures the purchased electricity is green, since GO is then taken out of circulation and discarded (i.e., cancelled).
15. **Renewable Energy in Transport:** Relates to the development and plan for meeting a renewables target by 2020 in the transport sector in compliance with Directive 2009/28/EC. The plan must define a sustainability regime and establish a certification process along with a verification body.

*Armenia has a National Renewable Energy Action Plan and cooperation mechanisms to reach 2020 targets established by the EU. Armenia supports a broad spectrum of RE sources and provides RE guaranteed access to the grid and priority dispatch, and the methodology for connection to the grid is transparent. However, Armenia has not designated an institution to act as a one-stop shop for handling RE applications; does not issue, transfer, or provide for cancellation of GOs for RE; and does not have a plan for meeting RE targets in the transport sector by 2020.*

## 6.4 ENERGY EFFICIENCY

Development of National Energy Efficiency Action Plans are a requirement, as is development of a legal framework for setting minimum energy performance requirements for new and existing buildings and for labeling and consumer information regarding energy consumption for energy-related products. An EE directive, if adopted, would establish binding EE targets of 20 percent in the Energy Community in 2020.

16. **Energy Services Directive 2006/32/EC:** Relates to adoption of a law on EE.
17. **Energy Labeling Directive 2010/30/EU:** Relates to the adoption of a law on information (e.g., labeling of appliances, energy performance of buildings, etc.) pertaining to the consumption of energy and other resources by energy-related products. Implementation of an EE policy requires a strong institutional and financial framework.

*Armenia has a law on EE, although it does not have law governing EE information such as appliance labeling, energy performance of buildings, etc.*

## 6.5 ENVIRONMENT

Identification and assessment of environmental consequences of projects before a building or operating permit is granted is required. The Sulphur in Fuels Directive ensures effective protection from the risks of Sulphur dioxide emissions. All Contracting Parties except Kosovo have accepted the Kyoto Protocol. The goal of the Large Combustion Plants Directive is to reduce emissions of acidifying pollutants, particles, and ozone precursors. It is applicable to new plants from 2018 onward. For existing plants, Contracting Parties must implement these provisions by January 2028 at the latest.

18. **Environmental Impact Assessment Directive:** Relates to the adoption of legal and administrative undertakings to ensure environmental impact assessments are undertaken on major new construction projects with effective oversight.
19. **Sulphur in Fuels Directive:** Relates to ensuring heavy fuel oils are not used if their sulphur content exceeds 1 percent by mass, and gas oils are not used if their sulphur content exceeds 0.1 percent by mass.
20. **Large Combustion Plants Directive:** Relates to meeting and enforcing provisions relating to emissions from large combustion plants.

*Armenia has a legal and administrative framework for ensuring environmental impact assessments are undertaken on new construction projects. Nevertheless, Armenia does not have enforcement provisions relating to emissions from power plants and does not have Sulphur in Fuels Directive.*

## 6.6 COMPETITION

There are three pillars to competition: 1) the prohibition of anticompetitive agreements, 2) the prohibition of abuse of a dominant market position, and 3) the prohibition of granting state aid. Public undertakings must also comply with the above rules. The Contracting Parties are under an obligation to introduce rules prohibiting cartels (e.g., agreements between undertakings, decisions by associations of undertakings and concerted practices); abuses of a dominant position; and rules prohibiting state aid.

21. **Competition Law:** Relates to ensuring free and open competition and guards against the abuse of market power including the assessment of penalties when it has been determined an entity has practiced anticompetitive behavior. The competition rules should include methodologies and economic analyses for assessing if competition rules have been violated.
22. **State Aid Law:** Relates to implementation of an institutional structure and enforcement mechanism for dealing with violators of the competition law, particularly as it relates to state aid and separation of the process for determining the need for state aid from the institutions granting state aid.

*Armenia does not have an explicit competition law ensuring free and open competition, nor does it have an institutional structure and enforcement mechanism for dealing with violators of the Competition Law in the power sector.*

## 6.7 STATISTICS

The statistical acquis ensures the collection, compilation, and dissemination of consistent, accurate, and coherent energy-related data. The annual and monthly statistics must follow a harmonized methodology developed by the Statistical Office of the European Union (EUROSTAT) and the International Energy Agency. Price statistics must follow the EUROSTAT rules and methodology. There is expected to be a requirement introduced that detailed statistics on final energy consumption be generated.

23. **Annual Energy Statistics:** Relates to the publishing of annual energy balance and questionnaires. A country must submit annual questionnaires to EUROSTAT according to accepted methodologies and procedures, primarily on surveying consumption and RE.
24. **Monthly Energy Statistics:** Relates to the obligation to prepare and disseminate monthly statistics on energy. This requires adequate human and financial resources and a clear administrative framework governing the duties and responsibilities for the reporting agencies.
25. **Price Statistics:** Relates to the publishing and dissemination of information on energy tariffs and prices charged to all classes of end-users consistent with the EUROSTAT methodology.

*Armenia developed the energy balance for 2010-2012 according to EUROSTAT and internationally accepted methodologies with USAID assistance. Starting in 2016, the Armenia Renewable Resources and EE fund will collect and provide data for energy balance to the MoENR for further dissemination to the RoA National Statistical Service. Armenia publishes and disseminates information on energy tariffs and prices charged to consumers, but not according to the EUROSTAT methodology. Moreover, Armenia does not prepare and disseminate monthly statistics on energy.*

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# 7. GAP ANALYSIS

As has been documented throughout this report, Armenia’s power market is not competitive. Although some unbundling has taken place, Armenia’s power market remains a monopoly under a single-buyer market structure. Given that competition in wholesale and retail supply is a dominant feature of the Energy Community Treaty and the regional power integration process, it is not surprising that Armenia’s power sector falls well short of meeting those requirements. This is shown clearly in the gap analysis provided in **Table 4**, which, in summary, provides comparison of Armenia’s power sector legal/legislative framework and market design versus the Secretariat’s evaluation criteria.

**TABLE 4. GAP ANALYSIS COMPARING ARMENIAN LEGAL/REGULATORY FRAMEWORK TO EU INTERNAL POWER MARKET REQUIREMENTS**

Criteria	Situation in Armenia	Gap
<b>Electricity</b>		
1 Authorization of new generating capacity without concessions	The GoA, MoENR, and Regulator authorize new generating capacities and may include concessions.	DM
2 Ownership unbundling	Partial unbundling, but distribution is not unbundled into DSO and Supply.	DM
3 Third party access to network	There are currently no rules guaranteeing third party access to transmission and distribution networks.	DM
4 Eligibility - granting of rights to all customers to switch suppliers	No customers have a choice of supplier.	DM
5 Market opening to competition allowing for supplier-of-last-resort	Market is not open to competition. The DSO is the supplier-of-last-resort, but is also the sole supplier. Customers do not have a choice of supplier.	DM
6 Balancing of deviations between contracted and actual amounts delivered	Balancing is not a separate activity as there are no contracted amounts. All balancing is done by the ISO in cooperation with the DSO, and costs are embedded in tariffs.	DM
7 Customer protection and protection of vulnerable customers	Customers have a bill of rights. There are no strict regulatory mechanisms to protect vulnerable customers, but the GoA uses different mechanisms to protect such customers through the targeted and “means tested” social support schemes	PM
<b>Regulatory Authority</b>		
8 A single authority for regulating the power sector	For the most part, Armenia meets EU requirements in that there is a single regulatory authority that is independent and operates without political interference. It has a Board of Commissioners with specified terms and clear criteria relating to qualifications for appointment. It has granted the necessary authorities to regulate the sector with some exceptions, as follows: <ul style="list-style-type: none"> <li>▪ The Energy Law grants the Regulator less responsibilities than Directive 2009/72/EC describes;</li> <li>▪ The regulatory authority has no autonomy in the implementation of its budget and does not have adequate human and financial resources to carry out its duties; and</li> <li>▪ The members of the board of the regulatory authority are appointed for five years without any limitations on reappointment.</li> </ul>	PM

**TABLE 4. GAP ANALYSIS COMPARING ARMENIAN LEGAL/REGULATORY FRAMEWORK TO EU INTERNAL POWER MARKET REQUIREMENTS**

Criteria		Situation in Armenia	Gap
<b>Renewable Energy</b>			
9	Renewable Energy Action Plan	Armenia has a National Renewable Energy Action Plan.	GM
10	Support schemes for promoting RE	Armenia supports a broad spectrum of RE sources.	GM
11	Cooperation mechanisms between country and Contracting Parties	Armenia has cooperation mechanisms to reach 2020 targets established by the EU.	GM
12	Administrative procedures for authorization of RE	Armenia has not designated an institution to act as a one-stop shop for handling RE applications.	DM
13	Priority access to grid	Armenia provides RE-guaranteed access to the grid and priority dispatch, and the methodology for connection to the grid is transparent.	GM
14	Guarantees of origin	Armenia does not issue, transfer, or provide for cancellation of GOs for RE.	DM
15	RE in transport	Armenia does not have a plan for meeting RE targets in the transport sector by 2020.	DM
<b>Energy Efficiency</b>			
16	Adoption of law on EE	Armenia has a law on EE.	GM
17	Adoption of law on information relating to EE	Armenia does not have a law governing EE information such as appliance labeling, energy performance of buildings, etc.	DM
<b>Environment</b>			
18	Legal undertakings ensuring environmental impact assessments on new construction	Armenia has a legal and administrative framework for ensuring environmental impact assessments are undertaken on new construction projects.	GM
19	Sulphur in fuels limitations	Armenia does not have Sulphur in Fuels Directive.	DM
20	Enforcement provisions relating to emissions from power plants	Armenia does not have enforcement provisions relating to emissions from power plants.	DM
<b>Competition</b>			
21	Ensuring free and open competition guarding against abuse of market power	Armenia does not have an explicit competition law ensuring free and open competition in power sector.	DM
22	Institutional structure and enforcement mechanism dealing with violators of competition law	Armenia does not have an institutional structure and enforcement mechanism for dealing with violators of the Competition Law in power sector.	DM
<b>Statistics</b>			
23	Publishing of annual energy balances	Armenia developed the energy balance for 2010-2012 according to EUROSTAT and internationally accepted methodologies with USAID assistance. <sup>41</sup> Starting in 2016, the Armenia Renewable Resources and EE fund will collect and provide data for energy balance to the MoENR for further dissemination to the RoA National Statistical Service.	PM
24	Preparation and dissemination of monthly statistics on energy	Armenia does not prepare and disseminate monthly statistics on energy.	DM
25	Publishing and dissemination of energy tariffs and prices	Armenia publishes and disseminates information on energy tariffs and prices charged to consumers, but not according to the EUROSTAT methodology.	PM

*DM = Does not meets EU criteria*

*PM = Partially meets EU criteria*

*GM = Generally meets EU criteria*

41. <http://energybalancearmenia.am/>.

# 8. MARKET CHALLENGES AND LEGAL BARRIERS

With the exception of RE and EE regulations, Armenia falls well short of meeting requirements of the EU internal power market. This is important because Armenia cannot then reap the benefits of trade with countries that are part of the internal power market. As we noted earlier, there is indeed potential for trade between Armenia and Georgia and, (when political disagreements are resolved) between Armenia and Turkey as well. As both Georgia and Turkey have plans in place to become part of the EU internal power market, Armenia will likewise be required to meet the requirements of the internal power market if it is to realize the benefits of cross-border trade with Georgia. It bears repeating that there are numerous potential benefits from cross-border trade with Georgia, including:

- Coordination of a regional least-cost investment plan, particularly given the substantial investment requirements in Armenia owing to growing demand and aging and inefficient generation and transmission infrastructure.
- As Armenia is a relatively small country, it is better able to obtain economies of scale through exports to a broader regional market.
- Power exports and imports can provide a new source of revenue.
- Enhanced security of supply and economic efficiencies are gained from cross-border trading.

If Armenia is to realize these benefits, it must embark on a path that is conducive to cross-border trade with Georgia, meaning it should design and adopt a plan that transitions Armenia from where it is today to the ultimate goal of joining the EU internal power market. It is important to note that although other countries in the region aspire to become part of the EU internal power market, it is likely to be several years before they become full members. Therefore, Armenia's transition plan should remove current legal, regulatory, and market structure barriers to trade in a manner that ensures reciprocity, thus enabling fair and nondiscriminatory trade with countries in the region in the near and longer term.

Transparency is one of the main drivers of flexible power markets and the only way to attract private investments. EU directives provide the basis for creating a fully transparent and effective power system. The full spirit of transparency is not only the publishing of different reports by the Regulator, but also 1) effective and open public hearings with involvement of customer rights protection organizations, and 2) complete transparency of regulations relating to the market at all levels of legislation. For these reasons, it is necessary to check the usefulness of:

- Areas of Regulation: Where should be regulated?
- Scope of Regulation: What should be regulated?
- Type of Regulation: How should regulation be carried out?
- Regulatory Institutions: Who should be regulating?

Based on such an assessment, it will be possible to create new balanced Specific, Measurable, Assignable, Realistic, and Time (S.M.A.R.T.) regulations at the level of the Energy Law and secondary legislation.

## 8.1 LEGAL BARRIERS

There are a number of legal barriers limiting the ability of stakeholders in Armenia's power sector to deliver electricity to consumers in a reliable, efficient, and cost-effective manner, such as the following:

- While the law grants EPSO responsibility for operating the generation and transmission system, it does not grant it the necessary authority. Secondary legislation, in particular, a comprehensive Grid Code, is needed that documents the roles and responsibilities of EPSO and other stakeholders in the power sector with respect to the efficient operation of the power system, including international interconnections.
- While the law identifies exporters and importers, there is no entity in Armenia with the authority, responsibility, incentive, and human and financial resources to administer and promote electricity imports and exports. Secondary legislation, in particular, a commercial or market code, is needed with respect to the administration and promotion of an efficient trading mechanism both within Armenia and with neighboring jurisdictions. This legislation should also address balancing and the use of international interconnections, including congestion management. Secondary legislation, in particular, a metering code, may form part of the Grid Code. It is understood that, for the most part, a metering code already exists in Armenia, but it should be reviewed to ensure consistency with metering codes elsewhere in the region.
- Secondary legislation is needed that ensures new construction is treated in a manner similar to that in neighboring jurisdictions. For example, the need for environmental impact assessments, limits on sulphur content in fuels, and provisions and enforcement of limits on emissions from large combustion plants should be similar to that in neighboring jurisdictions to ensure a level playing field. Ultimately, this legislation should be consistent with EU internal power market requirements.
- Competition and state aid laws should be modified to be consistent with that in neighboring jurisdictions and ensure a level playing field. Ultimately, this legislation should be consistent with EU internal power market requirements. Secondary legislation should be drafted to gradually open the Armenian power market to competition. Firm deadlines should be established consistent with neighboring jurisdictions that enables customers above a specified size to choose their supplier. Once market opening reaches small customers, legislation should be introduced that provides for a supplier-of-last-resort and ensures vulnerable customers are subject to subsidized tariffs that are transparent and properly funded by mechanisms that do not impact the market price signal.
- The component of the law governing regulation should be modified to ensure consistency with regulation in neighboring jurisdictions and ultimate compliance with EU requirements.
- The law relating to EE should be modified to incorporate the requirement for information on appliance labeling, energy performance of buildings, etc., consistent with that in neighboring jurisdictions and, ultimately, with EU requirements.
- The overriding Energy Law would need to be modified accordingly to ensure consistency with the secondary legislation as it is introduced.

At the same time, some basic steps are necessary:

- Set up distribution tariffs, which is the first basic step for opening the market even for a very small portion of the customers.



- Create an MO that will be responsible for organizing proper trade mechanisms in the internal market and on a regional basis. To ensure full independence of the MO and enhance its impartiality and transparency of decision-making, the GoA could transfer its shares directly to market participants.
- Separate distribution from supply, and create differentiated regulations for those entities.
- Simplify export and import rules.
- Create Network and basic Market Rules, and set up transitional phases for market reform.

## **8.2 MARKET CHALLENGES**

There are a number of market barriers limiting the ability of stakeholders in Armenia’s power sector to deliver electricity to consumers in a reliable, efficient, and cost-effective manner, as outlined below.

The power sector efficiency will be defined by 1) functioning of the power system ensuring reliable power supply to consumers and 2) decrease or at least reduction of growth rates of end-user tariffs. In this report we addressed issues associated with the power market efficiency enabling solution of point #2. Splitting this section into two components, Domestic Market and Cross-Border Trade with Georgia, is conventional (they are closely related), and the required steps should be considered in tandem.

The generation structure of Armenia (Chapter 3), characterized by a diversity of generators with a large diversity of prices, complicates implementation of a fully competitive market as a mechanism to increase the efficiency of the sector. However, it does not mean the use of real market mechanisms will not allow increased efficiency. Moreover, trade with Georgia is likely to serve as a way to increase efficiency.

Considering that end-user tariffs as compared to ability to pay are high, it is necessary to use all possible means to increase their cost-effectiveness and transparency.

### **8.2.1 DOMESTIC MARKET**

#### **8.2.1.1 PLANNING AND TARIFF APPROVAL**

The system used for planning (by volumes per year) may bring serious deviations because the longer the planning period, the lower the accuracy. Under the current regime, payments for the deviations are borne exclusively by domestic consumers, which are not wholesale market participants, whereas the real participants do not bear responsibility.

The two-rate generation tariff (for capacity and energy) really allows covering the fixed costs, and the power plant’s profit does not depend on its output. This is to ensure functionality of generators, and it is fair that the domestic consumer has to pay for it. However, in reality, such an approach does not work completely; for example, the entire profit of the old units of the Hrazdan TPP is assigned to the capacity rate (profit should not depend on the plant’s output and should be defined by the operation aimed to keep the equipment in an in-service state); for the Yerevan TPP, profit is completely assigned to the energy rate; and, for Hrazdan Unit5, only the electricity tariff is used. In contrast to Hrazdan Unit5, the profit from swap for the Yerevan TPP is considered while calculating the price for domestic consumers. Thus, the existing methodologies on tariff calculation for the wholesale market need to be revised and developed from the viewpoint of the new power market model of Armenia when trade with Georgia is expanded and the market is open.

At the same time, structure of the end-user tariffs is another barrier to market efficiency. There are no capacity charges or peak tariffs even for high voltage customers. For this reason, customers have no

responsibility for defined capacity charges of large generation. Current day and night tariffs are ineffective. During summertime, the nighttime tariff covers some part of the peak, which is a conceptual disparity. The day/night tariff ratio of 12 percent for high voltage customers and 26 percent for middle and low voltage customers is too low to be effective. At the same time, it is important to provide peak and night tariffs for the high- and middle-level customers and set up capacity charges for them during the transitional period.

Overall, it is necessary to provide a sufficient rate of return to the government-owned companies, without which they will not be able to attract investments and survive in any competitive market.

#### **8.2.1.2 DECISION-MAKING ON INVESTMENT PROJECTS**

Due to its limited volume, the Armenian market is very sensitive to investments in large projects, the volumes they handle, and other risks, increasing the financial burden on domestic consumers.

Selection of the option for implementing the new line with Georgia should entirely depend on its impact on the domestic market. Therefore, decisions on investment projects should be made based on the actual increase of efficiency of the domestic market.

#### **8.2.1.3 SPECIFIC DECISION-MAKING**

Recently, Hrazdan Unit5 received so-called “privileged access” to interconnection networks. At first glance, the decision seems to be logical given the low demand of this unit on the domestic market. However, even if we do not consider it as a violation of the generally accepted principle of Third Party Access, there may be situations when this decision contradicts the interests of domestic consumers. For example, Armenia receives a considerable proposal on power import and, at the same time, Hrazdan Unit5 decides to export to Georgia a small amount of electricity (it could be electricity generated on “free” gas remaining from swap, which will ensure a competitive price of electricity). As a result, the Armenian market suffers, whereas Hrazdan Unit5 receives additional profit.

Presently, there is no legal regulation for this issue, and it may lead to serious consequences. Usually, market participants receive equal rights on transmission and, in cases of congestion, appropriate auctions are held.

#### **8.2.1.4 SHARING OF RESPONSIBILITIES**

Currently, all possible damages on the wholesale market are incurred by end-users. Market functioning is conducted by actual regimes. The last crisis in the power sector of Armenia has shown that current sharing mechanisms of responsibilities are not effective. Thus, it is obviously necessary to develop new mechanisms of sharing responsibilities between the wholesale market participants and end-users.

### **8.2.2 CROSS-BORDER TRADE**

Cross-border trade with Georgia has an objective to increase the efficiency of the domestic market and should be considered in this context. From the viewpoint of development of generating capacities, most countries follow the principle of self-sufficiency first of all. Export/import transactions are used only to increase the efficiency of domestic market.

#### **8.2.2.1 EXPORT AND IMPORT**

The existing rule about export in Armenia states that the most expensive electricity can be exported only after satisfaction of domestic demand. It relates to the approved tariff of course.

This principle became out of date. Thus, in Armenia the highest generation tariff from the viewpoint of export is for Hrazdan Unit5 (the old units are not counted since they are not in demand for export and can be considered as domestic reserve). Therefore, it would be necessary to correct this principle within the next efforts on market reformation and to assume it as a criterion in assumptions for export of

power, which at least will not increase the average price of generation for the domestic market. In case of availability of efficient opportunities for long-term import, it needs to be considered in the methodologies for tariff calculations for end-users, as should export. It is necessary to check the usefulness of the export and import regulations from the point of their usefulness as a regulatory toll.

### 8.2.2.2 TRANSIT

Transit is an opportunity that may also improve the efficiency indicators for the Armenian domestic market. More transit opportunities may become possible after a resolution of Armenia-Turkey issues. Considering that development of a common regional market is not a concern in the foreseeable future, in the process of addressing issues of transit both technical and legal, it is necessary to be guided, first of all, by the interests of the domestic market.

With regard to the transit tariff at the initial stage, focus needs to be on the contract tariff, meaning that, for using the same transmission tariff inside the country as for cross-border trade, a transitional period is being implemented according to the European regulations. In the case of Armenia, this is extremely important due to sensitive investments in network infrastructure for domestic consumers.

If good opportunities occur for excessively large transit power flows, Armenia should provide for cooperative financing with its neighbors aimed at upgrading interconnection lines.

A list of the strategic market challenges and legal barriers along with recommendations for solutions, taking into consideration the issues focused on in previous chapters of this report, is presented as **Table 5** - first priority actions were presented previously in Section 8.1.

**TABLE 5. LIST OF STRATEGIC MARKET CHALLENGES AND LEGAL BARRIERS**

Tasks	Possible Negative Effect in Current Situation	Legal Basis and Barriers	Recommendation(s)	Gain for:	
				Domestic Market	Cross-Border Trade
The need to revise the methodology of tariff approval for market participants	<ul style="list-style-type: none"> <li>▪ Big deviations based on using annual planned volumes only</li> <li>▪ Unequal conditions for generators</li> <li>▪ Possibility of obtaining preferences</li> </ul>	<ul style="list-style-type: none"> <li>▪ Imperfect methodology as a whole</li> <li>▪ The lack of a uniform methodology for the two-rate tariffs</li> </ul>	Need to improve the methodology using the daily load curves and long-term contracts for export/import, including swaps	✓	
Generator available capacity control	Payment is based on declared capacity	No mechanism	Appropriate mechanism implementation	✓	
Transition to hourly market	Lack of operating experience	No	<ul style="list-style-type: none"> <li>▪ New market model development</li> <li>▪ Cross-border trade principles harmonization</li> </ul>	✓	✓
Domestic wholesale market effective functioning	Due to operating on actual data only, there is: <ul style="list-style-type: none"> <li>▪ Lack of responsibility of the participants for the deviation and, as a result, no incentives for effective operation</li> <li>▪ Lack of protection of domestic consumers</li> </ul>	Barriers include: <ul style="list-style-type: none"> <li>▪ Existing methodology without responsibilities of market participants</li> <li>▪ Lack of negotiated prices permission</li> </ul>	New market model implementation, including long-term bilateral contracts, capacity market, day-ahead market, and balancing mechanism	✓	

**TABLE 5. LIST OF STRATEGIC MARKET CHALLENGES AND LEGAL BARRIERS**

Tasks	Possible Negative Effect in Current Situation	Legal Basis and Barriers	Recommendation(s)	Gain for:	
				Domestic Market	Cross-Border Trade
	<ul style="list-style-type: none"> <li>▪ Possible additional tariff growth for end-users</li> </ul>				
Market opening	The use of monopoly rights on the electricity purchase on the domestic market	Single-buyer model is a barrier	<ul style="list-style-type: none"> <li>▪ Direct access permission to market for large consumers</li> <li>▪ Methodology of willing tariff implementation</li> </ul>	✓	
Optimal dispatch scheduling	Lack of monitoring system	No regulation	Inclusion in the Market Rules/Grid Code	✓	✓
MO creation	Failure of many functions needed in the market	<ul style="list-style-type: none"> <li>▪ Is not provided in the market structure</li> <li>▪ Existing Settlement Center performs the function of providing a metering data acquisition only</li> </ul>	Full-fledged MO creation, the definition of the functions and powers	✓	✓
Market Rules and Grid Code	The lack thereof	Market operation by only actual regimes and approved ceiling tariffs with lack of responsibilities	Market Rules and Grid Code development	✓	✓
Responsibility allocation between market participants and end-users	All responsibility rests with the end-user	No responsibility allocation regulation	New market model with responsibility allocation development	✓	
Market monitoring	Just statement of a fact	No documents regarding market monitoring	Monitoring and transparency system development	✓	
Market structure	The possibility of non-optimal cross-border trade in relation to the domestic market due to the lack of responsible structure	Full market over-regulation	To be created: <ul style="list-style-type: none"> <li>▪ MO</li> <li>▪ Traders</li> <li>▪ Consolidator (for small HPPs)</li> </ul>		✓
Third party access	Possibility of preferences in the absence of this principle	There is no approved procedure for free access	<ul style="list-style-type: none"> <li>▪ Procedure in accordance with EU requirements</li> <li>▪ Transfer capacity allocation</li> </ul>		✓
Market software	It is impossible to have effective market without complex software	No requirements	Appropriate software development	✓	✓
Export	<ul style="list-style-type: none"> <li>▪ Export carried out in contradiction to the current legislation</li> <li>▪ Lack of a mechanism for determining the export impact on efficiency of the wholesale market</li> </ul>	The most expensive generation can be used for export	Change the export admissibility criterion	✓	✓

**TABLE 5. LIST OF STRATEGIC MARKET CHALLENGES AND LEGAL BARRIERS**

Tasks	Possible Negative Effect in Current Situation	Legal Basis and Barriers	Recommendation(s)	Gain for:	
				Domestic Market	Cross-Border Trade
Import	<ul style="list-style-type: none"> <li>▪ Beneficial import disregard in end-users tariffs</li> <li>▪ The lack of a mechanism for determining the import impact on efficiency of the wholesale market</li> </ul>	No regulation	Development of the mechanism for domestic generation substitution by import for market efficiency improvement	✓	✓
Transit	Inconsistent costing principles	No legal and regulatory framework	Development of transit principles without compromising the domestic market	✓	✓
Investment projects	The possible negative impact on the tariffs for domestic consumers	No regulatory documents for complex assessment	Creating a new decision-making methodology	✓	
Application of EU rules on cross-border trade	The limited possibilities of application	No coordinated action plan	Harmonization (not full coincidence) with Georgian Market Rules and EU directives		✓

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# 9. SUMMARY AND RECOMMENDATIONS

Armenia's power sector faces numerous challenges driven by increasing demand and aging infrastructure and inefficient market and poor tariff structure. There are multiple opportunities for trade with Georgia, which could provide numerous benefits and help address many of the challenges in Armenia's power sector. Armenia's last market reforms were implemented more than 10 years ago and currently fall well short of the legal/regulatory and market criteria necessary to trade with the countries in the EU internal power market. Moreover, a coordinated approach to modifying the domestic power market and the legal/regulatory framework with Georgia and gradually increase competition could provide additional benefits to Armenian consumers while it makes the transition to the EU internal power market.

In this regard, we recommend to "Restart the Power Market," giving life to a new transitional market design to be developed with a scenario for gradual market opening to competition. This plan moves forward from "regulation" to "deregulation" and incentive-based regulation instruments, especially price or revenue cap regulation in the case of tariffs. This will require changes not only to the market design, but also to the regulatory framework and tariff design and will help to:

- Protect customer interests and eliminate monopolistic inefficiencies
- Ensure financial viability of industry participants
- Ensure equal conditions and nondiscrimination of all sector participants
- Improve conditions for competition where it is possible and involve private investments

The market design scenario must be consistent with other countries in the region to ensure fairness and a level playing field. Once completed, the transitional market design should be distributed to stakeholders for comment and revised accordingly. When the transitional market design has been agreed upon, an action plan should be developed for harmonizing the legal structure, regulations, and standards to support cross-border trade Georgia. At this point, a joint working group of Armenian and Georgian stakeholders would modify the action plan as necessary to promote fair, efficient, and nondiscriminatory electricity trade mechanism.

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