Regulation of Hydropower

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Hydro Resources

- There are 26,000 rivers in Georgia with the overall length of 60 thousand km and the annual runoff of 65.8 cubic km (including 49.7 cubic km in Western Georgia and 16.1 cubic km in Eastern Georgia)
- 319 of those rivers can be used to produce electricity
- Total potential generating capacity is 15,000 MW
- Potential output is 50 billion KWh annually
- There is 1,943 KWh hydropower per each square km of Georgian territory
Existing Hydropower Capacities

• By 1990, the installed capacity of all existing power plants in Georgia was 4,388 MW; the capacity of HPPs was 2,674 MW or 61% of total installed capacity

• According to 2009 data, the installed capacity of all existing power plants was 3,449.3 MW, while the capacity of HPPs was 2,623.3 MW or 76% of total installed capacity

• In 1989, HPPs were responsible for 43% of the total production, while in 2009 this indicator grew to 88.4%.

• The number of annual operating hours is about 3,500-5,500;
Engurhesi

- Located underground – hydroelectric power plant of seasonal regulation
- Reservoir – 1,100 million m³
- Installed capacity – 1,300 MW
- Units - 5 X 260 MW
- Estimated annual output – 4,330 million KWh
- Average annual output – 3,000 million KWh
- Specific usage of water resources – 1.21 m³/KWh
- Average annual water runoff – 4,888 million m³

- The government holds 100% of shares
- Put into operation in 1978
- Derivative type (located by the dam)
- Design head – 325 m
- Design charge – 450 m³/sec
Vardnilhesi - 1

- The government holds 100% of shares
- Put into production in 1971
- Derivative type (located by the dam)
- Design head – 59 m
- Design charge – 425 m³/sec
- Hydroelectric power plant of seasonal regulation
- Reservoir – 145 million m³
- Installed capacity – 219.9 MW
- Units - 3 X 73.3 MW
- Estimated annual output – 700 million KWh
- Average annual output – 433 million KWh
- Specific usage of water resources – 7.4 m³/KWh
- Average annual water runoff – 5209 million m³
Jhinvalhesi

Hydroelectric power plant of annual regulation;
Reservoir – 520 million m³;
Installed capacity - 134 MW;
Units – 4 X 33.5 MW;
Estimated annual output – 500 million KWh;
Average annual output – 344 million KWh;
Specific usage of water resources – 3.6 m³/KWh
Average annual water runoff - 1384 million m³.

• The government holds 100% of shares
• Put into production in 1985
• Derivative type (located by the dam)
• Design head– 128 m
• Design charge– 110 m³/sec
General Directions in Energy Policy

- **General objectives**
  - To fully meet the demand of industry and the utility sector for energy resources
  - To achieve the independence and stability of the power sector
  - To ensure safety (technical, economic, and political factors)

- **Long term perspective**
  - To fully meet local demand for power by using local hydro resources, first by importing and later by replacing the imports with thermal generation
Regulatory Frameworks for Hydropower

- According to Georgian Law on Electricity and Natural Gas:
  - All HPPs built after August 1, 2008, will be regulated. Purchasing price for the electricity will be determined based on the agreement signed by the government, the commercial system operator (CSO), and the interested party.
  - The operation of the plants regulating the power grid will be fully regulated by GNERC (they are subject to licensing and fixed tariffs – 2 HPPs).
  - Power plants under 13 MW are fully regulated (more than 30 HPPs).
  - The rest of the HPPs are partially regulated. GNERC sets the ceiling for tariffs (15 HPPs).
The Law on Government Support of Investments

Georgian Government:
- Order 232 – approves the regulation of deadlines and rules governing the issuance of preliminary licenses and permits
- Order 120 – Promotion of Investments in the Georgian Power Generating Sector

GNERC will issue a preliminary license based on the technical operational plan and appropriate documentation showing proof of ownership.

The preliminary license becomes effective once the license applicant submits documentation, which proves that he met the terms established by GNERC. The license will be confirmed by a statement from GNERC.

After the issuance of the preliminary license, license terms cannot be changed without the consent of the license holder.

If the requirements set by Law on Licenses and Permits have changed, the changes will not be applicable to the license holder without his consent for 5 years after the issuance of the license.
Market Rules for the Power Sector

- In order to participate in the wholesale power market, the licensed companies and low capacity power plants must register with the CSO;
- Power is purchased and sold through direct agreements, which are registered with the system dispatcher, as well as through the CSO in a balancing market;
- Small-scale power plants can also sell electric energy to individual consumers, whose annual consumption does not exceed 7 mln KWh;
- Power exports are fully regulated;
- Power exchange agreements are also used. When the system accumulates an excess of hydro resources, it is allowed to export electricity abroad; and when there is a deficit of hydro resources, mainly in the fall and winter, it imports electricity. The volume of imported power cannot be less than 80% of the exported volume.
Rules Governing the Delivery and Use of Power

• The purchase and sale relationships between low capacity power plants and their retail consumers are regulated.

• A retail consumer is entitled to connect his 100 KW power plant to the company’s distribution network free of charge and to supply the distribution network with the electricity produced by him.

• Electricity delivered to the distribution network by the retail consumer will be deducted from the cost of electricity acquired by the retail consumer from the distribution network. The price of electricity delivered to the network will equal the rate for the electricity consumed from the network minus the distribution rate.
According to Georgian Law on Licenses and Permits and the rules governing the power sector operations developed by GNERC based on that law:

- GNERC closely monitors the rational use of the HPPs’ capacity and water resources (licensed companies and small power plants):
  - Installed capacity utilization rate
  - Specific use of resources
  - The amount of spilled (untreated) water
  - The amount of unprocessed energy
Imported Power and Power Produced by HPPs and TPPs in 2005-2010 (%)
Electric energy produced by regulating, regulated, and partially regulated HPPs and Thermal Power Plants - 2009 (mil KWh)

- Regulating HPPs (Engurhesi, Vardnilhesi): 963.50, 12%
- Partially Regulated: 248.50, 3%
- Regulated: 3,601.00, 43%
- Thermal Power Plants: 3,465.10, 42%
## Possible Connectivity with Neighboring Power Systems

<table>
<thead>
<tr>
<th>Neighboring Power System</th>
<th>System Links</th>
<th>Maximum capacity (MW)</th>
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<tr>
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<td>Name of the Electric Power Transmission Grid</td>
<td>Nominal Voltage (kv)</td>
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<td>Turkey</td>
<td>Achara</td>
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Total installed capacity: Export - 1395 MW; Import – 1425 MW
Black Sea 500/400 KW Transmission System Project

Line length: C/V Gardabani to C/V Zestafoni - 246.06 km;
Number of towers - 859

500 KW EPTL Tbilsresi – South Georgia – Zestafoni

- 500 KW sub-stations
- 500/400 KW substations to be designed
- HPP

Areas to be designed
Areas under suspended construction
Constructed areas
500 KW EPTLs

500 KW sub-stations to be designed

500/400 KW substations to be designed

HPP

Areas to be designed
Areas under suspended construction
Constructed areas
500 KW EPTLs

500 KW EPTLs

500 KW EPTLs

500 KW EPTLs
The Purpose of the 500/400 KW Power Transmission Line

- Strengthening the stability of the Georgian transmission system
- Facilitation of Georgian energy safety by promoting the production of local hydro power resources
- Export of the excess of hydro power from Georgia to the highest paying markets
- The possibility of electricity transit from Russia and Azerbaijan
General Components of the Black Sea Transmission System

- Construction of the 400 KW Meskheti power line to Akhaltsikhe-Turkish border (34 km)
- Completion of the existing 500 KW Vardzia power line from Gardabani-500 to Akhaltsikhe (188 km)
- Completion of the existing 500 KW Zekari power line from the Zestafoni-500 Substation to Akhaltsikhe (59 km)
- Construction of 500/400/220 KW Akhalstikhe substation – by building a direct line in its territory
- System capacity – 800 MW
Export of Electricity in 2005-2010 (Kwh)

- 2006: 82,642,167
- 2007: 629,470,079
- 2008: 679,559,400
- 2009: 749,428,866
- 2010: 1,158,700,000
Import of electricity in 2005-2010 (thousand KWh)

- 2005: 1,398,638
- 2006: 777,568
- 2007: 433,264
- 2008: 649,048
- 2009: 254,802
- 2010: 277,800
Short-Term Perspective

• In 2009, the deadline for the construction of the 78 MW Paravanhesi was established in the 2007 memorandum between the Georgian Urban Energy Company and the Georgian Government. (The construction was scheduled to begin in August).

• Under the memorandum signed by the Georgian Government and the Zoti Hydro Company (Company Energo-Pro Georgia with 95% share ownership), the construction of 41.2 MW cascade will begin in 2010.

• In 2009, a memorandum was signed between the Caucasus Energy and Infrastructure Company for the construction of 28 MW Mtkvarikhihesi.

• An important event of 2009 was signing a memorandum between the Georgian Government and the Nural Energy Production and Marketing (Turkey), Korea Electric Power Corporation, and SK Engineering and Construction Co., Ltd (Korea) for the construction of the Namakhvani Cascade (with 450 MW installed capacity and annual output of 1.5 billion KWh). The construction is scheduled to commence in 2011.

• A Turkish company Colin won the 2010 bid for the construction of 105.7 MW cascade of four HPPs on the Tekhura River. A memorandum with this company was signed. The company took the responsibility of obtaining all construction permits and licenses within 9 months and then putting the cascade into operation within the following 3 years. Annual output of the cascade is 490 million KWh.
Long-Term Goals

- According to an existing plan, Khudonhesi will be built in the north on the Enguri River, 75 km from the city of Zugdidi and 35 km from Enguri Dam.
- The construction of the power plant started in 1979, but was suspended in 1989.
- The installed capacity of Khudonhesi is estimated to be 750 MW and the annual power output will be 1.455 billion KWh.
Potential Sources of Renewable Energy (HPPs)

- An order by the Georgian Minister of Energy entitled: “Expressing interest in the construction, operation, and ownership of power plants from the List of Potential Sources of Renewable Energy in Georgia”
- The list of potential HPPs to be built in Georgia:
  - 83 medium and small capacity HPPs
  - Total installed capacity – 802.3 MW
  - Total expected annual output – 4 billion KWh
Terms and Rules for the Construction of New HPPs

- General information about the construction of HPPs can be found on the website of the Ministry of Energy - www.minenergy.gov.ge
- Detailed information about the constructions plans for new HPPs can be found on the same website at: http://hpp.minenergy.gov.ge/
- Investor has the right to sell and export electric power generated by the power plant built by the investor at a regulated price;
- During the first 10 years of a new power plant’s operation, in winter (October – February), and for at least three months every year the total amount of generated power must be sold to local consumers in Georgia.