STRATEGY OF ENERGY SECURITY OF ARMENIA

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2. Four Pillars of Armenian Energy Strategy

- development of nuclear energy;
- utilization of renewable energy sources and improving of energy efficiency;
- diversification of primary energy sources and import/export routes;
- regional integration and cooperation.
INVESTMENT PROJECT

- Title of the project: *Construction of the new nuclear power unit in Armenian NPP*
- Customer of the project: *The Ministry of Energy and Natural Resources of RA on behalf of the Government of the Republic of Armenia*
- Place of realization of the project: *Armenian NPP square, Metsamor city, Armavir region, RA*
- Goal of the project: *Construction of the third power unit in Armenian NPP*
- Range of the project: *Approximately 5 billion USA dollar (including the sum for covering the percentage of the borrowed capital)*
- The commencement date of the project: *2010*
- The completion date of the project: *2017*
- Methods of attracting the investors (type of the competition: open/close): *Open competition*
INVESTMENT PROJECT

- Undertaking participant, that can participate in the project: **Investor(The Government, Bank, Private Company)**

- Financing methods (e.g. market share of the state budget, banks, private companies, etc.): **Mixed financing**

- Status of the project at present (e.g. Interested person, with whom it is already being carried negotiations for investments and so on): **Feasibility Study for the construction of new nuclear unit is completed and study on assessment of environmental impact is elaborated, negotiations are commenced with investment companies RF and EC.**
Background

- An update to the Armenian Power Sector Least Cost Generation Plan (LCGP), completed in 2006, concluded that a new nuclear power plant would enhance Armenia’s energy security at the least-cost.

- The primary objective of New Nuclear Unit Initial Planning Study (IPS) and Environmental Background Information Document (EBID) are to support the MoENR of RA and other GoA organizations in implementing an integrated approach to evaluating a nuclear power plant project.

- The existing ANPP should be shut down for decommissioning in 2016 at the end of design life, but only if replacement nuclear generation is available.

- The new nuclear unit would be constructed on the ANPP site and would begin operation in 2017.
Conclusions of the IPS

- The cost of construction of the new unit is between $5.2 billion (2007 $), depending on unit size and cost of interest during construction. The only feasible source of debt finance for the project is from export credit agencies of the countries supplying the equipment and construction services.

- The equity finance for the project could come from GoA public funds, private investors, or a public-private partnership. Another potential source of funds is neighboring governments.

- The wholesale tariff for electricity from the new nuclear unit is estimated to be:
  - 7.5 cents/kWh if GoA owned (GoA),
  - 9.7 cents/kWh for a public private partnership (PPP),
  - 12.7 cents/kWh for investor owned (IPP).
Conclusions of the IPS

- There is no economic alternative to the nuclear generation expansion plan for Armenia. A comparison of the total cost for generation in the Armenia system was calculated assuming a 1000 MW NPP versus thermal power plants (TPP) with natural gas price at 80% of the price in Europe. Under all finance scenarios, the total cost of system generation is significantly less with the NPP in operation than with the equivalent TPP generation.

- The 1000 MW NPP will also reduce CO2 emissions by about 3.2 million tons per year as compared to the TPP generation.


- Till 2014 put into operation 140 MW Meghri HPP (800 mln kWh)
- Till 2015 put into operation 60 MW Loriberd HPP (200 mln kWh) and 75-100 MW Shnogh HPP (200 mln kWh)
- Till 2025 put into operation in total 260 MW of Small HPPs (600 mln kWh)
- Till 2025 put into operation in total 300 MW of Wind Power (800 mln kWh)
Utilization of the above mentioned renewable energy resources will provide about 30% of electricity demand of the Republic of Armenia in 2025. Even more ambitious goal than famous EU 20x20 plan!
5.1. RE Development Supporting Policy: Market

For stimulating the development of renewable energy resources all electricity (capacity) generated at small hydro power plants, wind and biomass plants shall be mandatory purchased pursuant to the Energy Law with fixed tariff during 15 years from the operation starts.
5.2. RE Development Supporting Policy: Preferential Tariffs.

The following preferential tariffs are set by the Public Services Regulatory Commission of the Republic of Armenia (don’t include VAT):

• 31-32 AMD per kWh (10.1-10.6 US cent per kWh) for wind and “bio” electricity;
• 17.5 AMD per kWh (5.5 US cent per kWh) for the river small hydro power plants.
6. Other RE Resource Utilization

Currently active works are carried out in the following directions:

- **Solar Power (Thermal and PV)**
- **Geothermal Power (direct and indirect use)**
- **Biomass (Methane capturing)**
- **Bio-fuels (Bioethanol)**
WB supported project indicate presence of pure silicon mines, necessary infrastructure and skilled workforce for PV technology and industry development.
Pre-feasibility analysis of 25 MW Jermaghbure geothermal power plant is carried out. GEF/GeoFund will launch extensive field surveys in Armenia in 2009.

Depth of mine: 2.5 - 3.0 km

6 Production wells

2 Injection wells

> 250°C

25 MW installed capacity
2.1 Power Sector Overview

- Electricity shortage in 1955-70.
- Energy crisis, beginning of 90-s.
- Regional Hub: Export of electricity, 1972-89.
- Post-Soviet regional exchange and export.
Intersystems connections

[Map of Armenia showing connections between Gyumri, Vanadzor, and other cities.]
Exchange Capacity Prospects up to 2007

- 80 MW from Russia to Georgia
- 400 MW from Russia to Iran
- 100 MW from Iran to Azerbaijan
- 170 MW from Georgia to Armenia
- 90 MW from Turkey to Azerbaijan
- 200 MW from Azerbaijan to Iran

Connection types:
- Synchronous connection
- Asynchronous connection (radial or DC)
Exchange Capacity Prospects 2007-2010

- **80 MW**
- **100 MW**
- **350 MW**
- **1000 MW (*)**

*) maximum capacity

- **Synchronous connection**
- **Asynchronous connection (radial or DC)**
Exchange Capacity Prospects 2011-2015

- **CASPIAN SEA**
- **IRAN**
- **ARMENIA**
- **AZERBAIJAN**
- **TURKEY**
- **BLACK SEA**
- **GEORGIA**

- **RUSSIA**: 1500 MW *
- **GEORGIA**: 500 MW *)
- **TURKEY**: 300 MW
- **IRAN**: 1000 MW
- **AZERBAIJAN**: 600 MW

*) maximum capacity

- Synchronous connection
- Asynchronous connection (radial or DC)
Exchange Capacity Prospects 2016-2020

- Russia: 1500 MW *
- Georgia: 500 MW *
- Azerbaijan: 800 MW
- Armenia: 600 MW
- Turkey: 180 MW *
- Iran: 1140 MW
- Black Sea: 80 MW

*) maximum capacity

Synchronous connection
Asynchronous connection (radial or DC)
THANK YOU