



Renewable Energy in the Republic of Armenia

2009

*Ministry of Energy and Natural Resources
Republic of Armenia*



The Government of Armenia,
Ministry of Energy and Natural
Resources

Energy community of Armenia

Greets all participants of 20th session of the Steering Committee of the Energy Efficiency 21 Project and wishes fruitful and effective work aimed to develop renewable energies in our countries!

Review of the Energy Sector

- Energy is the most developed sector in Armenia with qualified specialists
- The Armenian energy sector was and is developing as a regional center of energy
- We have a significant practices in design, construction, operation and maintenance of nuclear, thermal and hydro stations, and of parallel work with integrated energy system

Four Pillars of Armenian National energy strategy

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

RE Development Supporting Policy

- 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.
- Preferential tariffs: 6.3 € cents per kWh for wind and “bio” electricity;
3.3 € cents per kWh for the river small hydro power plants (excluding VAT).

Annual Balance of the Armenian Energy system, 2008

Electricity generation, Kwt/h

| | |
|-------------------------------------|---------------|
| Total: | 6,114,095,673 |
| including: | |
| nuclear(40%)- | 2,461,658,858 |
| thermal(30%)- | 1,831,857,349 |
| Renewable, total(30%)- | 1,820,579,466 |
| including: | |
| Sevan-Hrazdan cascade of HPPs- | 576,189,870 |
| Vorotan cascade of HPPs- | 907,614,948 |
| Dzora HPP- | 77,128,368 |
| Small HPPs (plus wind power plant)- | 259,646,280 |
| Total consumption, Kwt/h : | 5,740,934,730 |

Renewable energy resources in Armenia under the current developments

- Hydro energy
- Wind Energy
- Solar Energy
- Geothermal Energy
- Biomass Energy

Hydro energy

Existing HPPs in Armenia

- Sevan-Hrazdan HPPs Cascade: 556MW / 2320 million kWh
- Vorotan HPPs Cascade: 404MW / 1157 million kWh
- Dzora HPP: 25MW / 90 million kWh

HPPs Foreseen in Armenia

- Meghri HPP: 130MW / 800 million kWh
- Shnogh HPP: 75MW / 300 million kWh
- Loriberd HPP: 66MW / 200 million kWh

Small HPPs in Armenia

There are:

- 70 Existing SHPPs: 81 MW / 278 million kWh
- 64 SHPPs under construction: 152 MW / 548 million kWh
- 115 foreseen SHPPs: 147 MW / 540 million kWh

Wind Energy

The first wind power plant in Armenia and in TransCaucasus

- Lori-1 Wind Power Plant: 2,6 MW / 5 million kWh

Wind Energy Resource Atlas of Armenia (NREL)

Justified total potential is 490 MW / 1.28 billion kWh

Confirmed by Wind Monitoring Results

Pushkin pass: 20 MW / 50 mln. kWh

Karakhach pass (Eastern gates): 90 MW / 320 mln. kWh

Zod pass: 50 MW / 120 mln. kWh

Simyonovka pass: 15 MW / 25 mln. kWh

Wind monitoring is not completed yet

Karakhach pass(Western gates): 125 MW / 320mln. kWh

Sissian pass (Bichanag pass): 140 MW / 420-430 mln. kWh

Charentsavan region: 50 MW / 45 mln. kWh

Solar Energy

- The average annual amount of solar energy flow per square meter of horizontal surface is about 1720 kWh/m² (the average European is 1000 kWh/m²)
- One fourth of the country's territory is endowed with solar energy resources of 1850 kWh/m².

Development of Actual Solar PV Energy in Armenia

- Certain experience in PV technologies
- Deployment of PV industry technologies at the national level.

Attractive factor for investors: existence of raw materials and infrastructure to set up industry that can include the whole technological chain

Geothermal Energy

Geothermal energy sources

- Projects under the development:
 - Jermaghbyur: 20-25 atmosphere pressure
250°C/2500-3000 meter in depth/25 MW
 - Gridzor and Qarqar: geological and geophysical explorations
- Investigation of other perspective sites

Biomass Energy

- Biogas

Solid Waste Landfill Gas Capture and Power Generation CDM Project in Yerevan- 56000 t CO₂ emissions/1,4 MW

- Bioethanol

Project development at the national level: Bioethanol Production, Potential Utilization and Perspectives in Armenia- 7000-14000 t/annually

Legislative and regulative documents

Some of the important documents are the followings:

- “Energy Law of the Republic of Armenia”
- “The Law of the Republic of Armenia on Energy Saving and Renewable Energy”
- “National Plan of the Republic of Armenia on Energy Saving and Renewable Energy”
- Public Services Regulatory Commission Decision: “Definition of 2009 sale tariffs of Electricity Delivered from Plants that Generates Electricity by Utilization of Renewable Energy Resources at the Territory of the Republic of Armenia”,
and many other regulative decisions.

Barriers for development of renewable energy resources

- Armenia Renewable Energy and Energy Efficiency Fund (R2E2 Fund) survey on barriers by branch ministries for development of renewable energy in Armenia.
- PA Government Services Inc. survey on the barriers for development of renewable energy in Armenia.
- Enertech International Incorporated and BBI International survey on existing in Armenia barriers and necessary political measures for organization of bio-ethanol production as motor fuel.
- Danish Energy Management A/S Organization and SolarEn CJSC survey on existing in Armenia barriers for development of solar PV energy.

Some of the barriers from different surveys

- uncertainty in calculations of ecological flows in rivers and water basins
- water utilization permit validity short period for small HPPs
- environmental impact assessment long period
- procedures for changing the land category that does not clearly define the whole process by stages, the responsible entities and timeframes.

Some of delivered recommendations for institutional reforms

- Develop EU standards for fuel by 2009.
- To meet mandated not later than 2014 for bioethanol blending with petrol nationwide
- classify bio-ethanol as motor fuel and neither as ethanol for use in alcoholic drink, for which 600 AMD/liter(1.16Euro/liter) excise tax is applicable.
- utilization of existed raw materials for production of photo elements
- attractive tariff for grid-connected solar PV applications
- simplified licensing procedures

Reforms to promote development of renewable energy sources in Armenia

- Study of the existing barriers for development of renewable energy and finding the appropriate solutions by the activity of Inter-agency Committee created on that purpose.
- By implementation of the measures towards implementation of the “National Plan of the Republic of Armenia on Energy Saving and Renewable Energy”.
- By International Cooperation aimed to support the development of sustainable energies in RA.
- By promotion of the Renewable Energy Sector in Armenia.

Activities of Inter-agency Committee

- **The principal decisions on the matter of discussed issues was accepted during the forth meeting of Committee hold on 10 April 2009.**
 - Definition of new methods for ecological flows in rivers and water basins
 - Draft of RA law on “Amendments in Water Code of the Republic of Armenia”
 - Draft of RA Law on “Ammendments in RA Law on Environmental Impact Assessment”
 - Draft of RA law on “Amendments in RA Law on Excise Tax”
- After receiving the appropriate established order of Prime Minister the drafts of the mentioned normative documents will be submitted for GoA’s consideration.

Some of the measures towards implementation of the “National Plan of the Republic of Armenia on Energy Saving and Renewable Energy”.

- For accumulation of financial means for financing/co-financing of energy saving projects the fixed payments from energy carriers' (petroleum, diesel oil) taxes will accumulate in Armenian Renewable Energy and Energy Efficiency Fund equal to 5 per cent of payable amounts
- Clarification of energy monitoring mechanisms – Amendments in The Law of the Republic of Armenia on Energy Saving and Renewable Energy
- Elaboration of normative acts and standardization documents of the Republic of Armenia on the basis of EU and international standards

Deployment of renewable energy technologies at the national level

- Development of photovoltaic industry in Armenia
- Bio-ethanol Production, Potential Utilization and Perspectives in Armenia

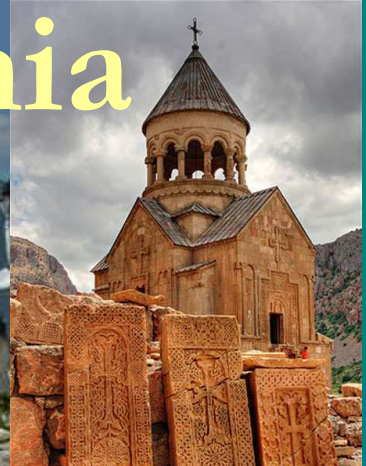
Conclusion

Utilization of some of the above mentioned measures will allow to maintain 30% of renewable electricity production in the Republic of Armenia in 2025.

Even more ambitious goal than famous EU plan : 20% in 2020!



Thanks for the attention
and



Welcome to Armenia