Small Hydropower CDM Projects in Armenia

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CDM and JI developments in Eastern Europe and Central Asia
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EC “Technical Assistance to Armenia, Azerbaijan, Georgia and Moldova with respect to their Global Climate Change Commitments” Project
Review of energy sector in Armenia

### Installed capacities

<table>
<thead>
<tr>
<th>Facility</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Armenian NPP</td>
<td>815 (440) MW</td>
</tr>
<tr>
<td>Hrazdan TPP</td>
<td>1100 MW</td>
</tr>
<tr>
<td>Yerevan TPP</td>
<td>550 MW</td>
</tr>
<tr>
<td>Sevan-Hrazdan cascade of HPPs</td>
<td>550 MW</td>
</tr>
<tr>
<td>Vorotan cascade of HPPs</td>
<td>400 MW</td>
</tr>
<tr>
<td>Small HPPs</td>
<td>55 MW</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3480 MW</strong></td>
</tr>
</tbody>
</table>

#### Sevan-Hrazdan cascade HPP
- Sevan HPP – 34 MW
- Hrazdan HPP – 82 MW
- Arge HPP – 224 MW
- Arzni HPP – 71 MW
- Kanaker HPP – 102 MW
- Yerevan HPP – 44 MW

#### Vorotan cascade HPP
- Spandaryan HPP – 76 MW
- Shamb HPP – 171 MW
- Tatev HPP – 157 MW
The share of HPPs in annual power generation

<table>
<thead>
<tr>
<th>Station</th>
<th>Generation mln kWh</th>
<th>Share, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPP</td>
<td>2716.3</td>
<td>43</td>
</tr>
<tr>
<td>TPPs</td>
<td>1827.2</td>
<td>29</td>
</tr>
<tr>
<td>HPPs</td>
<td>1772.9</td>
<td>28</td>
</tr>
<tr>
<td>Total</td>
<td>6316.4</td>
<td>100</td>
</tr>
</tbody>
</table>

Including 34 small HPPs:
153 mln kWh (2.42%)
Armenia’s hydro power potential

The country’s hydro power capacity is estimated as 21.8 billion kWh per year

- Large and medium rivers – 18.6 billion kWh per year
- Small rivers - 3.2 billion kWh per year

Technically available capacity - 7-8 billion kWh per year

In June 2005, the Government of RA approved the Energy Sector Development Strategies in the Context of Economic Development in Armenia.

The strategy envisages the construction of three large scale HPPs as well as a small HPP with the total capacity of 75 MW.

According to the Public Services Regulatory Commission Decree N167 adopted in November 2005, the “Armenian Electric Network” company is to buy the electricity produced by the small greenland run-of-river HPPs (up to 10 MW) within 15 years upon the power generation license has entered into force. The cost of purchased energy is USD 0.045/kWh.

From 1997 to 2006, 35 small HPPs with the total capacity of 54 MW were constructed and are currently operating.
Large Scale Investment Projects in the Hydro Power Sector

Construction of Loriberd HPP
The feasibility study has been developed by FICHTNER
Installed capacity – 66 MW
Annual power generation – 216 mln. kW
Total investment – 149 mln USD
The launch of organizational and design works – end of 2006
Construction launch – 2007
Construction duration – 6 years
Possible source of funding – KfW, EBRD and other financial institutions

Construction of Meghri HPP
Installed capacity – 140 MW
Annual power generation – 800 mln KWh
Total investment – 180 mln USD
Construction duration – 6 years
# Small HPP CDM Projects in Armenia

<table>
<thead>
<tr>
<th></th>
<th>Name of the project</th>
<th>Installed capacity MW</th>
<th>Annual Generation GWh</th>
<th>Cap. Investments Mln USD</th>
<th>PDD developers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gegharot Small HPP</td>
<td>2.49</td>
<td>10.61</td>
<td>~ 3</td>
<td>TACIS</td>
</tr>
<tr>
<td>2</td>
<td>Vardenis Small HPP</td>
<td>6.74</td>
<td>18.36</td>
<td>~ 4.5</td>
<td>TACIS</td>
</tr>
<tr>
<td>3</td>
<td>The construction of Eghvard-2 Small HPP</td>
<td>9.31</td>
<td>18.21</td>
<td>~ 7.8</td>
<td>TACIS</td>
</tr>
<tr>
<td>4</td>
<td>Yeghegis Small HPP</td>
<td>3.16</td>
<td>5.8</td>
<td>-</td>
<td>EcoSecurities</td>
</tr>
<tr>
<td>5</td>
<td>The construction of Argichi Small HPP</td>
<td>8.56</td>
<td>29.1</td>
<td>~ 5.5</td>
<td>DEPA</td>
</tr>
<tr>
<td>6</td>
<td>The construction of Jradzor Small HPP</td>
<td>4.0</td>
<td>14</td>
<td>~ 2.8</td>
<td>DEPA</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>34</td>
<td>96</td>
<td>24</td>
<td></td>
</tr>
</tbody>
</table>
CDM PDDs developed by the TACIS Project

The list of 25 potential CDM projects in the hydro power sector has been developed and reviewed within the framework of the TACIS project. Three of them have been selected, namely, Gegharot, Vardenik and Eghvard-2.

Memorandums that envisage possible co-operation at joint development of these projects under the CDM have been signed by projects owners.

The first PDD, namely, “The construction of the Gegharot Small HPP in Armenia” developed by the TACIS Project has been officially submitted to the Ministry of Nature Protection of RA (DNA) on May 29, 2006.

Currently, the Ministry of Nature Protection is carrying out negotiations on submitting the PDD to the Japanese Shimizu Corporation and Hokkaido Electric Power Company which propose financing and implementation of the project under the CDM.

The other two PDDs are envisaged to be finalized within two months and transferred to MoNP as the main beneficiary of the project.
Small Hydro Power CDM Projects in Armenia

**Yeghegis Small HPP**

Installation of the second turbine with the capacity of 3.16 MW on the operating Yeghegis Small HPP.

The project is being financed by EBRD

The first CDM project in the hydro power sector approved by the Armenian DNA (May 29, 2006).

**Argichi Small HPP**

The construction of a small HPP with the capacity of 8.56 MW on the Argichi river.

Endorsed by the DNA of Armenia on January 9, 2006

The project is being implemented with the assistance of DEPA.

**Jradzor Small HPP**

The construction of a small HPP with the capacity of 4 MW on the irrigation canal.

Endorsed by the Armenian DNA on January 26, 2006

The project is being implemented with the assistance of DEPA.
Main Requirements of the DNA to Small HPP CDM Projects

- Water consumption permit
- Land tenure permit
- Availability of the construction license
- Availability of fish conservation structures
- Environmental impact assessment
- Organization of projects public hearings with the involvement of all stakeholders.
At the beginning of 2006, a new project on “Support to the Energy Policy of Armenia” was launched with financial aid of the European Commission.

**Project objectives:**

Assessment of technical and economic potential for RE options (hydro) in the Lake Sevan basin, as well as preparation of comprehensive feasibility studies for the most promising options, taking into consideration the potential for investments created under the CDM.

Development of relevant feasibility studies and their presentation to potential investors and other donors and/or purchasers of Emission Reduction Units related to Kyoto Protocol.
Prospects for Development and Implementation of New CDM Projects in the Field of Renewable Energy

In 2006, the Renewable Energy Fund was established.

Aim: Increase privately owned and operated power generation utilizing renewable energy

Mechanism: Financing of construction of small HPPs via provision of long-term credits

- EBRD – 7 mln USD
- The World Bank – 5 mln USD
- GEF - 3 mln USD
- Cascade Credit – 3 mln USD

Interest is felt in project implementation under the CDM.
THANK YOU!

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