Technology Fact Sheet for Mitigation

Small Hydro-Power Plants[i]

Sector	Alternative energy sources
Sub-sector	Small hydro-power plants
Technology name	Small hydro-power plants at mountain rivers
Option name	
Scale	Medium-scale
Availability	Available
Technology to be included in prioritization?	Yes

Background/notes

Small hydro-power potential in Azerbaijan is about 5 bln kWh. Economically efficient resources are about 1.7 bln kWh. Currently, small HPPs are partially running in different regions of the country, such as the 1.6 MW Sheki HPP, 1.2 MW Gusar HPP, 3.0 MW Chichekli HPP, 0.8 MW Chinarly HPP, 8.8 MW Zeykhur HPP, 0.8 MW Nyugedi HPP and 3.8 MW Mugan HPP. These small HPPs have been provided for privatization in 2001 by AR Presidential Decree; three small HPPs are already privatized. In general, the operating life of these small HPPs is over as they had been erected between 1950-1960 and they are currently over 70-80% deteriorated. Some of them are fully dismantled. Future construction of 173 small HPPs with an annual output of 3.2 bln kWh of electric energy is in the works. More reasonable is the construction of 61 small HPPs, which are efficient and economical in the short- term perspective. These HPPs may be erected on irrigation canals, trained (control-flow) rivers, or near the water-storage reservoirs.

There are relevant governmental programs for the development of small hydro-power energy in the country. Azerbaijan has adopted State Program on utilization of alternative energy, including the small hydro-power energy sources (2005 – 2013). The objective of this State Program is to promote power generation from renewable and environmentally sound sources and to more efficiently utilize hydrocarbon energy sources. According to the program, Azerbaijan has set a target to have 20% share of renewable energy in electricity and 9.7% share of RE in total energy consumption by 2020. On 29 December 2011, the President of Azerbaijan Republic issued an order on preparation of National Strategy on the use of alternative energy for the period of 2012-2020. The main objectives of the strategy are to identify main directions of electricity from small hydro-power energy sources and legal framework for usage of small hydro-power energy sources.

- There is cooperation with international companies on the production of small hydro-power plants;
- The practices of small hydro plants were gained;
- There is experience on preparation of national technical specialists.

Advantages of the technology:

- They may be located close to energy consumers;
- Losses occurring during the long distance transportation of the energy are low;
- Smaller HPPs conserve the natural landscape;
- Smaller HPPs eliminate the possibility of GHG emissions.

Disadvantages of the technology*:*

- The technology depends on the geographical climate and relief conditions.

Implementation assumptions (How the technology will be implemented and diffused across the sub-sector)	Construction of hydro-power plants has an important role in resolution of country-level issues such as regulation of floodwaters, environmentally sound electricity generation and creation of new irrigation systems. It is possible to locate dozens of small hydro-power plants on rivers and water facilities, and these plants can generate up to 3.2 billion kWh annually. The technical potential for energy production is 4.9 billion kW-hours and economic cost-effective potential is 1.7 billion kW-hours. The amount of fuel economy is 0.57 million tons. There are sample opportunities to use small HPPs to supply power to establishments that are lacking permanent electric energy as well as

	those located far from the State energy system.
Impact statements (How the options impact countries development priorities)	
Countries social development priorities	• Creates employment opportunities. • The implementation of small hydro-power energy sources would have a positive influence on public opinion, which would realize the necessity to protect the environment and reduce consumption of energy resources.
Countries economic development priorities	• There is investment opportunity for 8-10% of bank interest annually. • The price of 1 kWh energy ranges from 1.5-5.7 USD.
Countries environmental development priorities	• Technology is zero emission and environmentally sound.
Reduction in GHG emission by 2030	• Reduction of carbon dioxide emissions by 2030 is 3.24 mln ton CO_2.
Costs	
Capital costs	By 2030, 164 small HPPs with an average power of 2 MW are planned on being established. Taking into account that the investment cost for production of 1 kW of electricity is around 2000 USD, total capital costs will be around 656,000,000 USD.
Operational & maintenance costs	There will be a need for operation and maintenance costs to establish small hydro-power stations, such as salary for staff, repair and protection, etc.
Cost of GHG reduction	- Emission factor of the grid is 0.62 kg CO_2 /kWh (in 2006) - Price of the produced energy power is 25 – 75 USD/kW - Price of the produced energy (0.011÷0.078) USD/kWh Therefore, cost effectiveness for mitigation is (0.011÷0.078)/0.62 = (0.018÷0.126) USD per kg (CO_2)
Other costs	***

[i] **This fact sheet has been extracted from TNA Report – Technology Needs Assessment Reports For Climate Change Mitigation – Azerbaijan. You can access the complete report from the TNA project website http://tech-action.org/**