TECHNOLOGY FACTSHEET

PASSIVE SOLAR ENERGY (HOT WATER) AND SOLAR PHOTOVOLTAIC (ELECTRICITY)

1) **Sector:** Alternative energy sources

2) **Sub-sector:** Solar energy

3) **Technology name:**

4) **Option name:** Passive solar energy (hot water) and solar photovoltaic (electricity)

5) **Scale:** Large-scale

6) **Availability:** Available

7) **Technology to be included in prioritization?** Yes

8) **Background/notes**

Solar energy has great resources potential in the most of the territory of Republic of Azerbaijan. Number of sunny hours is 2400-3200 on the Azerbaijan territory. Quantity of solar energy received by each square meter of the earth surface during a year is 1500-2000kWh/m^2. Annual specific electric energy production of photovoltaic unit is 246 kWh/m^2 over the Nakhchivan AR area and 230 kWh/m^2- over the Kur- Absheron area and number of sunny hours per year is 3200 in Nakhchivan AR and 2500-in Kur- Absheron area, respectively. Quantity of annual solar energy per square meter is 2200-2600 kWh in Nakhchivan AR and 1900-2200 kWh-in Kur-Absheron area, respectively.

There is relevant governmental programs for the development of solar energy in the Republic. Azerbaijan has adopted State Program on utilization of alternative energy, including the solar energy sources (2005 – 2013). The objective of State Program is to promote the power generation from renewable and environmentally sound sources and to more efficiently utilize hydrocarbon energy sources. According to the program, Azerbaijan has taken 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, President of Azerbaijan Republic issued an order on preparation of National Strategy on the use of Alternative energy for the periods of 2012-2020. The main objectives of the strategy is to identify main directions of electricity from solar energy sources and legal framework for usage of solar energy sources:

- Institutional level was created. The State Company on alternative energy was established recently by the Presidential degree.
- Development technical capacity for the solar techniques is going. Established the new company called as Sumgait Technology Park, that produce the solar collectors for production of hot water.
- There is good cooperation with international industry companies on producing of wind techniques.
- The practices of solar collectors and panels was gained. Solar collectors used by SOCAR and widely used by population for private purposes
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There are experience on preparation of national technical specialists.

9. Advantages of the technology:

- The technology can be used at regions located far from the industrial centers.
- Can be used for the electricity and heat supplying of individual citizens or used with combined regime with electricity grid.
- The technology economy the grid electricity consumption and decreasing of the organic fuel using and environmental effects, due to emission reductions to soil, water and atmosphere air (CO_2, SO_2, NO_x etc.).
- Technological is ready to for industrial application.

10. Disadvantages of the technology:

- Relatively high cost of the equipments.
- There are needs for financial support .
- Weak development of the national industry for production of solar techniques.
- Weak public awareness on solar energy advantages.
- Depends on weather conditions
- Don't working in night period
- Needs for combined regime of operating
- Needs for the area

11. Implementation assumptions (How the technology will be implemented and diffused across the subsector)

a) Solar installations for the hot water production
   - area of the collector – 219 m^2
   - volume of the reservoir – 5 m^3

- specific price – 637 USD/m^2
- volume of the produced energy – 2,25 MWh/year
- price of thermal energy 0,102 USD/kWh

By 2030, use of collectors with the area of 10.000 m^2 there will be a need for 637 USD/m^2 x 10.000 m^2 = 6.370.000 USD

b) photoelectric system
   - Investment - 3700 – 6800 USD kW
   - price of produced energy – 0,12 – 0,53 USD kWh at 3%

By 2030, investment for construction of 3000 kWh average 5.000 USD = 15.000.000 USD

12. Impact statements (How the options impact countries development priorities)

a) Countries social development priorities
   - Create the new work places
   - The implementation of the solar energy sources would also have a positive influence on the public opinion, which would realize the necessity to protect the environment and to consume rationally energy resources.

b) Countries economic development priorities
   - The economic effect depends on technological application (Solar stations for water heating, installations for drying fruits and vegetables, photovoltaic electricity)

c) Countries environmental development priorities
   - Technology is zero emission
   - Technology is environmentally-friendly
   - Produced thermal or electricity substitutes the organic fuel using in grid

d) Reduction in GHG emission over 30 years
   417 thousand ton CO_2

13. Costs

a) Capital costs over 10 years

21.370.000 USD

b) Operational & maintenance costs over 10 years

Amortization costs of the solar equipment may be considered as 10% of total cost per year

c) Cost of GHG reduction

- Emission factor of the grid is 0,62 kg CO2 /kWh (in 2006)
- Price of the produced energy:
    - Solar installations for the hot water production) is 0,102 USD/kWh
        - So, cost effectiveness for mitigation is 0,102/0,62 =0,16 USD per kg(CO2)
    - photoelectric system
        - So, cost effectiveness for mitigation is (0,12÷0,53)/0,62 = 0,19÷0,85 USD per kg(CO2)

d) Other costs over 10 years

Additional costs may be needed to provided awareness raising activities among local population and commercial sector in order to promote application of solar energy