Technology Fact Sheet for Mitigation

Technology Fact Sheet – Solar PV [i]

Sector	**Power generation**
Technology name	Solar PV
Subsector GHG emission (mn mt CO2 equivalent	11.9 mn mt of CO_2 equivalent from power generation in 2005
Background/short description of technology	The following describes a nominally 7 MW-AC Photovoltaic ("PV") Facility. In contrast to solar thermal electricity generation, in case of solar photovoltaic, solar energy is directly converted into electrical energy. The PV Facility uses numerous arrays of ground-mounted, fixed-tilt PV modules which directly convert incident solar radiation into DC electricity, which can then be inverted to AC. the basic structure of a photovoltaic cell consisting of p-conducting base material and an n-conducting layer on the topside. The entire cell rear side is covered with a metallic contact while the irradiated side is equipped with a finger-type contact system to minimise shading losses. Also full cover, transparent conductive layers are used. To reduce reflection losses the cell surface may additionally be provided with an anti-reflecting coating. A silicon solar cell with such construction usually has a blue colour. By the incorporation of inverse pyramids into the surface reflection losses are further reduced. The inclination of the pyramid surfaces is such that photons are reflected onto another pyramid surface, and thus considerably enhance the possibility of photon penetration into the crystal. **Based on:** U. S. Energy Information Administration Office of Energy Analysis, *Updated Capital Cost Estimates for Electricity Generation Plants, November 2010*; Kaltschmitt, Martin, Wolfgang Streicher and Andreas Wiese, Renewable *Energy; Technology, Economics and Environment.*
Implementation assumption, how the technology will be implemented and diffused across the sub-sector	Till recently, solar power generation has been limited to installation of rather small solar PV systems at homes and small establishments in rural and off-grid areas. However, the Government is aware that despite limitations, there may be scope for power generation based on solar energy. Given that space is a constraint in this country; such facilities need to be small such as the proposed plant here so that solar panels do not take much space. The plants are small and therefore may be put up by the private sector with either a contract to sell the electricity to PDB's grid; or, if put up enterprises, they may sell any surplus electricity to the grid. The negative aspect of the solar PV is the high per unit cost. In fact, it is costliest in terms of capital requirement on a per MW basis.

	The nominal capacity has been assumed to be 7MW.
Reduction in GHG emission	Solar energy does not emit any GHG. In that sense, whatever power generation based on fossil fuel a solar unit replaces, the emission due to the fossil-fuel based power generation unit is totally reduced. If the size of operation is considered, the replaced unit is likely to be one run with reciprocating engine which in Bangladesh is usually operated with diesel or furnace oil.
Impact Statements – How this option impacts the country development priorities	
Country social development priorities	Each of the small solar unit will produce more or less 7 MW. Being small, these may be suitable in off-grid areas for small communities as well as for commercial enterprises. This may allow a quality supply and ensure access of the people in poorer and remote region. With new supply of electricity, and consequent access to it, it may be used for all kinds of economic and domestic uses including lighting. Lighting for studies will improve leading to better education prospects as well as security. The process of women's empowerment will be better served as with new access to electricity they may enjoy facilities to which their access was limited previously.
Country economic development priorities	*Productivity* may increase as with new or better supply of electricity new technology may be introduced or the run time of factories may lengthen. On the other hand, new or better supply may spur the establishment of new factories and facilities and various service centres. *Job creation* will be facilitated because of productivity increase or the establishment of new enterprises. Both direct and indirect job creation may happen. *Poverty* will be reduced as more and more jobs are created and people are gainfully employed. *BoP* may be negatively impacted; however, as the machineries need to be imported from abroad and more sophisticated technology may be costlier. In fact, the proposed technology is the costliest on per MW capacity basis.
Country environment development priorities	The Solar PV is an environmentally benign technology as there is no emission of GHGs or SO_2 or NOx.
Other considerations and	-

priorities	
Costs	
Capital costs	The costs of a small solar PV is US$ 6050 /kw compared to the costliest gas-based technology of US$2060/kw and costliest coal-based technology of US$ 5348 both including carbon capture and storage and state of the art technology. The total costs are, however, not large as the capacity is small.
Operation and maintenance costs Fixed O&M	Fixed O&M costs are not comparatively high, at US$ 26.04/kw-year.
Cost of GHG reduction	The total cost of a solar PV is the cost of GHG reduction from plants that it replaces which is not unique by country. But as the capital costs are rather high, for equivalent power production the costs of zero emission under solar PV are rather high.

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