TECHNOLOGY FACTSHEET

SOLAR REFLECTOR CUM TRACKER TO ENHANCE ENERGY OUTPUT FROM SOLAR PV SYSTEMS[1]

1. **Sector:** Energy Supply

2. **Introduction**:

The Sri Lanka Sustainable Energy Authority (SEA) has commissioned a 500 kW (peak) and another 737 kW (peak) Solar PV power plants connected to the national electricity grid. These projects have been implemented as a total grant from the Governments of South Korea and Japan respectively. The above systems use a set of static solar PV modules.

SEA has established a solar park. Private developers will be invited to install Solar PV systems in this park and feed the energy generated to the national grid under the Standardized Power Purchase Agreement (SPPA).

The output from a solar panel depends on the intensity of light falling on the panel. This intensity could be increased by rotating the panel to face the Sun in the perpendicular direction and by providing simple reflectors (concentrators). By incorporating a tracker arrangement for the solar panels to face the Sun in the perpendicular direction and by incorporating suitable reflectors, the electrical output from a PV system could be enhanced by around 40%. In a Solar PV system the solar panel and the inverter-interconnector assembly are the costly items. The costs of solar tracker and reflectors are relatively much smaller. Hence it is proposed to install a demonstration Solar PV system incorporating solar tracker and reflectors to this demonstration model. The purpose is to illustrate the benefits of solar tracker and reflector so that future developers of solar PV based electricity generating projects in Sri Lanka would incorporate this technology in their projects.

3. **Technology Name**: Solar Reflector cum Tracker to Enhance Energy Output from Solar PV Systems.

4. **Technology Characteristics: (Feasibility of technology and operational necessities)**

Feasibility of Technology:

The Solar Tracker system consists of a clock-work mechanism linked to all the solar panel modules installed in a system. The clock-work mechanism and mechanical linkages constantly rotate all the solar panels in such a way the panels face the Sun in a perpendicular direction. The reflector/ concentrator is a simple assembly made of suitable light reflecting material

[1] **This fact sheet has been extracted from TNA Report – Mitigation for Sri Lanka. You can access the complete report from the TNA project website** http://tech-action.org/

permanently attached to each solar panel to capture additional sunlight and reflect such light on to the Solar Cell.

A disadvantage of the solar reflector / concentrator is that the a Solar PV project would require a larger land area. In the context of Sri Lanka, cost of land is much smaller than the cost of Solar panels. Hence implementation of this technology is justified.

These two technologies are readily available in the international arena. If necessary, it could be developed locally.

Operational Necessity

Under the Standardized Power Purchase Agreement (SPPA) formulated by the SEA, the price payable for Solar PV based electricity is Rs. 20 and cents 77. However, as the cost of solar PV systems including the inverter/ grid interconnector is around US$ 8 per peak Watt and the expected plant factor is around 20%, a proposal to generate and sell electricity to EB with the existing technology is not viable. By incorporating this technology, we could increase the output of energy by 50 to 100%. With such improvements, it would be feasible to implement such a project.

5. Country Specific Applicability:

Electrical Energy Generation Sector

The data provided by the Sri Lanka Sustainable Energy Authority (SEA) in their web: www.energy.gov.lk show that the present the national peak electricity demand is 2033 MW (28th September 2011) and the corresponding daily electrical energy consumption is 33.35 GWh/ day. The same data published during this year (2011) also show that the annual electricity peak demand growth is growing at about 400 MW per year and the daily electrical energy demand is growing at around 8 GWh/day/year.

In order to meet the above mentioned growth, the Ceylon Electricity Board (CEB), the sole utility responsible for the generation and distributing most of the electricity generated to the final consumers have been annually preparing and releasing their Long Term Generation Plan (LTGP). According to the last published LTGP, most of the future generation of electricity would be generated from coal based power plants as shown in figure 1.

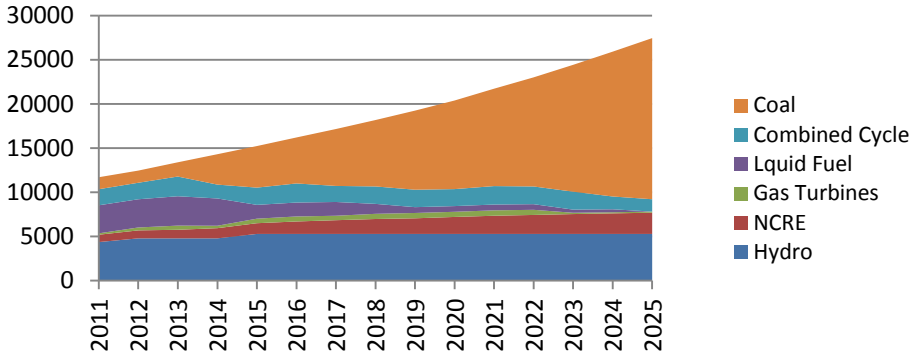

Figure 1: Annual Energy Generation (GWh/y)

In fact as per the above plan, EB has already commissioned and operating a 300 MW coal based power plant. The second phase of coal based power plant with a capacity of 2x300MW is under construction. Action has been initiated to construct another 2 x 500 MW coal based power plant in the country.

While the state owned utility CEB is planning to commission as many coal based power plants as necessary to meet the growing demand for electricity, the Ministry of Power and Energy, through the SEA is encouraging the private investors to develop renewable energy based power plants. In an attempt to generate at least 10% of the electrical energy requirements by the 2015, the SEA has offered an incentive scheme for the private sector to harness renewable energy resources and generate electrical energy and feed the national grid. A concessionary tariff based on the estimated cost of generation has been offered for each of the following technologies:

- Small Hydro: Rs. 13.04 / kWh
- Wind: Rs. 19.43 / kWh
- Biomass: Rs. 20.77 / kWh
- Agro/Industrial Waste: Rs. 14.60 / kWh
- Municipal Waste: Rs. 19.73 / kWh
- Other (Solar PV, Wave etc.) Rs, 20.77 / kWh

Apart from the 500 kW Solar PV project commissioned with a grant by the Government of Korea and a few SR projects, there aren't any commercial Grid-Connected Solar PV project commissioned in Sri Lanka. The implementation of this technology should resolve this issue.

6. Status of the technology in the country and its future market potential:

Status of Technology in Sri Lanka

This technology is in its infancy. A prototype plant need to be constructed to convince the authorities concerned the merits of this concept.

Future Market Potential

The price of Solar PV is declining all the time. In the future, with the incorporation of this technology and with the decline in the price of Solar PV technology, electricity generation with Solar PV should reach "Grid Parity". When this status is reached, we should expect a significant part of our electrical energy is generated through this technology.

7. Barriers: -

8. Benefits: (How the technology could contribute to socio-economic development and environmental protection)

Social Benefits

The implementation of this technology would result in the engagement of skilled and unskilled labour forces for the following tasks:

- Construction of tracking devises.
- Construction of reflecting devises.
- Installation, operation and maintenance of tracking and reflecting devices.

Economic Benefits

- Increase in the amount of electricity generated from renewable and indigenous energy resources based power plants.
- Decrease in the amount of electricity generated imported fossil fuel based power plants.

Environmental Benefits

- Lesser SOX and NOX and particulate emissions due to reduction in fossil fuel based electricity generation.
- Less GHG emissions

9. Operations: -

10. Costs

The estimated cost of the tracker and reflector assembly per peak Watt of installed capacity would be around US% 0.5 per peak Watt. For a MW system the cost would be US$ 500,000.

11. References

1. Renewable Energy World , July-August 2011.

2. Standardized Power Purchase Tariff, 2011. Sri Lanka sustainable Energy Authority.
3. Long Term Generation Expansion Plan, 2009-2022. Ceylon Electricity Board. December 2008.
4. Long Term Transmission Development Plan 2005-2014. Ceylon Electricity Board. 2005.
5. Energy Sector Master Plan, Sri Lanka. Interim Report. Asian Development Bank, April 2004.
6. National Energy Policies and Strategies of Sri Lanka. Ministry of Power and Energy. October 2006.
7. Statistical Digest 2010. Ceylon Electricity Board, 2011.
8. Mahinda hinthanaya: Vision for a New Sri Lanka. A 10 Year Horizon Development Framework, 2006 -2016, Department of National Planning, Ministry of finance and Planning.
9. http://www.energyservices.lk/statistics/esd_rered.htm