PROJECT TUVALU GRID-CONNECTED SOLAR PV

LOCATION	Tuvalu, Funafuti, Vaiaku. Lat: 8°31'26.99"S / Long: 179°11'56.01"E
TIMELINE	From September 2006 (1 year for studies) to February 2008 (3 months for construction and 1 month for concession).
CATEGORY	GRANT/CSR
TECHNICAL PARAMETERS	Construction of a 40 kW grid-connected PV system on top of the roof of the spectators' sitting area in the football stadium.
OBJECTIVES	• Mitigate island's CO2 emissions and fossil fuel consumption for electricity generation; • Decrease residential electricity tariff (USD 0.5/kWh – 2004) and government subsidies (USD 0.175/kWh – 2004) on the long term; • Transfer know-how/expertise in solar photovoltaic power; • Cover about 5% of Funafuti's (Tuvalu's capital) peak demand and 3% of Tuvalu Electric Corporation's (TEC) annual household consumption; • Promote the use of renewable energy in Small Island Developing States.
PARTNERS & BENEFECIAIRIES	• Government of Japan (Grant); • Tuvalu's' authorities: Government, municipality; • Tuvalu Electricity Corporation (TEC); • Tuvalu's residents.
OPERATOR	Operated by TEC upon total transfer of the project in 2008.

FINANCE	• Total Cost: USD 410,000
	  o GSEP USD 324,000 (grant)
	  o Japanese Government: USD 86,000 (grant)
	• Production costs
	  o Almost the same as fuel according to a 2009 analysis (USD 0.41), however we must account that international fuel prices has increased since.

HUMAN CAPACITY BUILDING & TRAINING	Holding two weeks workshop during 2005 on the use of renewable energy in Small Island Developing States, and two years of monitoring for 2008-2010.
ENVIRONMENT	The project has reduced the risks of diesel spills near the archipelago and Tuvalu's carbon emissions by 50 tonnes per year. We proceeded with an Environmental Impact Assessment addressing several risks and consequences such as foreign organism contamination, construction waste, flooding, and noise and light. Since, no environmental consequence has been reported. No lead batteries were installed given that the solar PV panels are connected to the national grid.
DEVELOPMENT	Annual power generation output of approximately 60MWh with a stable monthly production

OUTCOMES

average.
The Solar Power represents 5% of Funafuti's peak demand in capacity, and it has reduced Tuvalu's fuel consumption by roughly 16,000 litres in 2009.

SUSTAINABILITY

- Projected Direct Sustainability Impacts

- Total wattage provided by electrification	40kW (grid-connected)
- GHG emission reduced/avoided	CO2 50tonnes/year
- Energy efficiency	Availability factor 17%
- Total capital invested (e8 and external)	US$410,000
- Number of HCB training days provided	5 days
- Number of participants who received e8 HCB	Approximately 40 persons

- Projected Indirect Sustainability Impacts (qualitative description)

- Other impacts	To provide momentum in Tuvalu for the shift from full reliance on diesel generation to a hybrid system with a renewable energy source
	To disseminate a symbolic message about the prevention of global warming world wide

The two year monitoring has improved the sustainability of the project; we had to be certain that there will be nothing unexpected for the local engineers.
The continuing rise in fuel price as foreseen is making the project more and more cost effective.
The type of energy exploited (inextinguishable) and materials durability (Solar PV panels have a long life period).
Taken engineering precaution such as: lightning arresters, and robust waterproof frames to protect the material from sea salt erosion and tropical storm; and the installation of self-exciting inverters and a phase reactive power control to harmonize solar station's power in the national grid.

REPLICATION

- Use of standard equipment and no superfluous;
- High solar power availability;
- Presence of trained and qualified engineers;
- Take special engineering measures to prevent weather damage.
- Replicated in another island of Tuvalu
- Training of engineers from other utilities in the region resulted in new PV projects

KEY SUCCESS FACTORS

- Good collaboration with government authorities;
- Strong local political momentum to introduce renewable energy sources;
- Increase in fuel price as foreseen;
- Production of environmental and feasibility studies;
- Collaboration of the island residents, with some of the inconvenient related to solar power such as noise and light reflection;
- Response to local needs and use of available resources;
- Use of standard and cost-competitive equipment;
- Built-in replicability potential;
- Technical training and monitoring.

STATUS

Commissioned in 2008, and assets transferred in the same year to TEC.

In operation.

LESSONS LEARNED

- The implementation of solar power systems on remote islands requires longer time estimation and strong logistical management (i.e. construction material transportation arrangements to the island etc.).
- Preparatory survey prior to construction needs to be very precise to minimise costs associated with over- or under-estimations leading to additional and expensive material transportation.
- Temperature control in the inverter room needs close monitoring in tropical locations like Tuvalu to avoid significant drops in operating rates due to high temperatures.
- Facilities' resistance against salt and water corrosion damage must be addressed during the construction phase and closely monitored upon commissioning.