

## **Annex 2: Outline of Expression of Interest (EOI) to Participate in SREP3**

### **I. COUNTRY AND GOVERNMENT AGENCY SUBMITTING EOI**

Tuvalu Islands, Government of Tuvalu through the Ministry of Public Utilities & Infrastructures

### **II. DESCRIPTION OF THE COUNTRY AND ENERGY SECTOR CONTEXT**

Please provide a summary of the country and energy sector context, including resource potential for deploying renewable energy, status of energy access (population with access to electricity), renewable energy policies, targets, and implementation measures.

Tuvalu lies about 1100 km due north of the Fiji Islands and is centered at about 8° south latitude and 177° east longitude. The EEZ is 900,000 km<sup>2</sup> in area. The total land area of 26 km<sup>2</sup> is spread over 8 islands. The largest, Vaitupu, has an area of about 5.6 km<sup>2</sup> while the smallest, Niulakita, has only 0.42 km<sup>2</sup> of land. Funafuti atoll is the centre of government as well as the centre for air and sea transport. There are about 1570 households with nearly 6 persons per household. Funafuti with 4492 people has more than 48% of the total population. Vaitupu with 1591 is a distant second and the other islands range from 400-700 people except for tiny Niulakita with only 35 residents.

The energy sector is managed by the Department of Energy within the Ministry of Public Utilities and Infrastructures (MPUI). The Government established the TEC in 1991 and in 2010 TEC became a fully State Owned Enterprise (SOE), with the responsibility for managing and supplying electricity on the main island as well to the outer-islands.

In 2010, Pacific Island Green Gas Abatement of Renewable Energy Project (PIGGAREP) and GEF funded a regional project which provided financial assistance to carry out a Technical Study by Ridgeway (New Zealand) on the appropriateness to establish the Renewable Energy and Energy Efficiency unit at TEC. The study recommended the need for the establishment of the unit and it was approved by the TEC Board that year, 2010. The unit is responsible for the implementation, maintenance and overall management of all renewable energy projects in the country. The unit is presently manned with one staff and supported by the General Manager and other division Managers - the Manager of Distribution and Generation. There are ongoing plans in place to deploy TEC staffs to increase the capacity and capability to cater for the challenges on renewable energy needs of Tuvalu in the years to come.

Tuvalu has a policy to provide adequate, efficient and cost effective economic infrastructure to its population, including electricity. It aims to improve the provision and quality of services to the outer islands, and ensure more efficient and less subsidized services overall. Currently 94% of households in Tuvalu are connected to the utility grid network and 6% are off-grid and these are mainly in the outer islands.

The Tuvalu National Energy Policy (TNEP) was formulated in 2009 which clearly defines and directs current and future energy developments. The TNEP highlighted an ambitious target of 100% renewable energy for power generation by 2020. Seven strategic areas were identified to ensure that the objectives of the policy improve the livelihood of the people. In implementing the TNEP, an Energy Strategic Action Plan was developed as a guide to ensure that the target of TNEP can be achieved by 2020. In addition, a detailed 'Master Plan for Renewable Electricity and Energy Efficiency 2012-2020' was developed with assistance from New Zealand Ministry of Foreign Affairs and Trade (NZ MFAT). The plan is to guide and facilitate the development of the sector towards the 100% renewable energy target. This document is directly linked to the Government Sustainable Development Plan called "Te Kakeega II 2015", "Te Kaniva (Climate Change Policy) 2012." This will guide the Government of Tuvalu in the development of

renewable energy and energy efficiency to achieve Tuvalu's vision. As stated in the The Tuvalu National Energy Policy 2009 ;

*"By the year 2020, guided by the principles in the "Te Kakeega II" and the "Malefatuga Declaration", Tuvalu shall attain a prosperous living standard that is fostered through an energy policy that promotes the provision of socially, financially, economically, technically, politically and environmentally sustainable energy systems and is within the framework of the Tuvalu Initial National Communication under the United Framework on Climate Change (Oct 1999)"*

### **III. RATIONALE FOR SELECTED SECTORS FOR SREP FINANCING**

Please identify barriers for the deployment of renewable energy, potential sector, sub-subsectors, and technologies for possible SREP financing as well as the rationale for prioritizing them for SREP interventions.

Tuvalu is a young poor nation and the challenges and constraints in terms of development in Tuvalu are listed as: limited natural resource base; widely scattered and sparsely populated island geography; small domestic market with little potential for economies of scale; access to international markets is expensive; increasingly competitive international markets for tourism and investment; social and cultural system with limited understanding and experience of business concepts and practices; limited business opportunities in the domestic economy; land and capital market development constrained by small size, social values and traditions; and poor absorptive capacity for major investment.

The major barriers to the development of renewable energy in Tuvalu are as follows:

- Limited experience with renewable energy technologies, especially with regard to electricity generation;
  - Lack of familiarity with the operation and maintenance of renewable energy and hybrid renewable electricity systems;
  - High initial capital cost of renewable energy technologies;
  - No experience with power purchase agreements and independent power generation;
  - Lack of experience with project finance investments and joint venture operations between electric utilities and the private sector; and
  - Difficult access to finance for renewable energy technologies that are new to Tuvalu due to high perceived risks.

To achieve the goal of 100% renewable energy, the New Zealand Government through the Ministry of Foreign Affairs and Trade assisted the Government of Tuvalu in developing the Master Plan that maps out clearly the implementation plan on how Tuvalu will achieve this target.

The implementation principles are as follows:

- Photovoltaic – 60-95% of demand
- Wind – 0 – 40% of demand (if feasible)
- Bio-diesel – 5% of demand (import)
- Energy Efficiency – improvements of 30% of current annual demand of Funafuti.

As listed below, most of the Tuvalu development partners are on solar PV and there is a need to develop other potential renewable energy as listed above.

Tuvalu Government has the interest in the development of wind by 40% and bio-diesel by 5%. Wind resource assessment has been carried out on Funafuti for 2 years and the average wind speed is approximately 5.79m/s.

The New Zealand Ministry of Foreign Affairs has carried out the feasibility studies on the development of wind in Tuvalu and there is a potential for it.

The World Bank will fund the study which will involve an analysis of the viability of coconut oil being used as a bio-fuel for electricity generation in Tuvalu. The study could include analysis of outer island resources, inter-island supply chain, financial and economic modeling and social, cultural and environmental issues. The study could drive investment in bio-diesel.

#### **IV. ENABLING POLICY AND REGULATORY ENVIRONMENT**

Please provide an overview of the existing policies, legal framework, market and regulatory structure for renewable energy development and the potential impacts of public and private sector interventions in addressing the barriers. Discuss the existing regulatory environment for attracting private investments in renewable energy technologies and governance within the energy sector, including commercial performance of relevant institutions, pricing and tariff practices, competitive procurement of goods and services, the transparency and accountability of these practices and the degree to which they are subject to public oversight.

The Government of Tuvalu has made a strong commitment to replace diesel generation with generation from renewable energy sources as quickly as possible. The Prime Minister of Tuvalu, the Honourable Willy Telavi, announced at the Rio+20 conference in June 2012 that the goal of the Government of Tuvalu is that by 2020, 100% of electricity generation will be by renewable energy.

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The following is the current status:

##### ***Photovoltaic***

Presently a total capacity of 194kWp solar PV has been installed in Tuvalu contributing 6% of the total generation of 3.2MW.

##### ***Wind***

Wind resource has been monitored for two years and the data being analyzed by Ecology Management APS Renders, Denmark found it to be 5.79m/s. The report of this analysis also recommended for small turbines in the range of 20kW to 50kW.

##### ***Bio-diesel***

Apart from demonstration work, there has not been any power generation from bio-diesel.

##### ***Energy Efficiency***

There has not been much effort in energy efficiency till todate. However, fund has been secured from the Small Island Development States (SIDS) Dock through UNDP for a renewable energy and energy efficiency demonstration house. The goal is to demonstrate energy efficient appliances like freezers and refrigerators, lights, air-conditioning unit and fans and compare

with non-efficient ones. This is a demonstration project for the local population to physically see the consumption pattern of these appliances and to assist in their motivation to buy efficient appliances. The demonstration house will also serve as an educational tool for school children in Tuvalu. Bids are presently evaluated for the successful contractor and hopefully to be finalized by the end of April 2014.

The Energy department located under the MPUI is responsible for energy policy, the Renewable Energy and Energy Efficiency Master Plan and overall management of the energy sector.

The TEC operation is further strengthening by the enacted Public Enterprise Performance and Accountability Act 2009/PEPA Act 2009 which states the principal objective of every Public Trading Enterprise shall be:

- (a) To operate as a successful business; and
- (b) Be as profitable and efficient as comparable business that are good owned by the state.

TEC is categorized under the PE Act as a Trade Enterprise in which it has to operate in accordance with the principle objective as mentioned above. TEC is guided by a capable Board of Directors who is made up of reputable public officers and members of the community. The Board is full responsible for overall management of the enterprise however its decision is subject to the approval of the Minister. In the past years, board members are mostly government civil servants. Since the enactment of PEPA 2009 all civil servants were removed from positions of directorship of trade enterprises.

We have a law relating to Foreign Direct Investment. The purpose of the act is to provide a legal framework to facilitate, consolidate and streamline direct foreign investment proposal and projects in order to stimulate growth, employment, and productivity in the private sector economy and to remove discriminatory impediments to direct investment in Tuvalu.

The act further lay down the procedure in the event a person or entity wishes to invest in Tuvalu.

## **V. INSTITUTIONAL AND TECHNICAL CAPACITY**

Please provide an analysis of the institutional and technical capacity for implementation, including the government's ability to effectively absorb additional funds. Please also provide a preliminary assessment of potential implementation risks.

The following projects, capacity building was done on the management and maintenance of all the projects mentioned above, and in brief below:

1. Grid connected solar PV in Funafuti, 2008
2. PV/Hybrid/generator plant in Vaitupu, 2009
3. Grid connected solar PV desalination plant in Funafuti, 2012
4. Grid connected solar PV desalination Plant in Funafuti, 2012

The training component was part and parcel of the projects listed below:

### **Existing Projects**

1. **Project Title:** Grid connected Solar PV Project
  - **Location** – Funafuti
  - **Scope** – Installation of grid connected solar PV.
  - **Size** – 40kWp
  - **Cost** – US\$512,000
  - **Funding Source** – e8 group/Japan Government
  - **Date** – 2008.

2. **Project Title:** Hybrid solar-battery-diesel generation plant
  - **Location** – Motufoua Secondary School at Vaitupu
  - **Scope** – Installation of PV/hybrid/generator plant.
  - **Size** –46kWp
  - **Cost** – US\$800,000
  - **Funding Source** – Italy/Austria Government
  - **Date** – 2009
  
3. **Project Title:** Grid-connected Solar PV Desalination Plant
  - **Location** – Funafuti
  - **Scope** – Installation of grid-connected solar PV 100m<sup>3</sup> desalination plant.
  - **Size** – 42kWp
  - **Cost** - ???
  - **Funding Source** – Russian Government
  - **Date** – 2012
  
4. **Project Title:** Grid-connected Solar PV Desalination Plant
  - **Location** – Funafuti
  - **Scope** – Installation of grid-connected solar PV 100m<sup>3</sup> desalination plant.
  - **Size** – 66kWp
  - **Cost** – US\$4million
  - **Funding Source** – Japan Government
  - **Date** – June 2013
  
5. **Project Title:** Standalone Solar PV Desalination Plant
  - **Location** – Funafuti
  - **Scope** – Installation of standalone solar PV desalination plant.
  - **Size** – 8kWp
  - **Cost** - ???
  - **Funding Source** – AusAid/UK
  - **Date** – 2012

Upcoming solar PV projects by the European Union, New Zealand Government, and United Arab Emirates, will provide specialized hands-on training on RE to the staff of TEC but also to staff of other government agencies working on energy, the private sector, NGO etc.

In addition, TEC has commissioned the 11kWp solar PV mini-grid capacity of 3,000Ah batteries demonstration system on Funafuti purposely for capacity building of TEC staff, other government agencies working on energy, the private sector, NGO etc. This will enhance and knowledge and skills of TEC staff and others in mini-grid and grid-connection generation. This can formed the pool of expertise on the island. Furthermore two of TEC staff will further enhance their knowledge and skills at the Global Sustainable Energy Solutions (GSES) Pty Ltd in Sydney Australia for hands-on training on solar PV systems.

The Finance department within the Government dealt with all project funds and provides acquittal reports to SPREP.

Tuvalu faces a number of constraints with respect to the introduction of renewable energy technology as a commercial venture. These include:

1. Limited natural resource base;
2. Widely scattered and sparsely populated island geography;
3. Small domestic market with little potential for economies of scale;
4. Access to major international markets is expensive;

5. Increasingly competitive international markets for seamen, tourism and investment;
6. Social and cultural system with limited understanding and experience of business concepts and practices;
7. Limited economic opportunity in the domestic economy;
8. Land and capital market development constrained by small size, and social values and traditions;
9. Low absorptive capacity for major investments.

The project and other projects will aim to overcome these constraints and provide a viable electricity production system that will increase Tuvalu's self sufficiency in energy generation and supply thus achieve its 100% target by 2020.

## VI. PROGRAMS OF MDBS AND DEVELOPMENT PARTNERS

Please describe briefly the ongoing and planned programs of the relevant multilateral development banks (MDBs) and other development partners relevant to energy access and renewable energy and how the proposed interventions for SREP would link to and build upon these programs.

To achieve the Government vision of 100% renewable energy by 2020, the Government of Tuvalu proposes for the harvesting of wind technology and bio-diesel development would could achieve 40% wind and 5% bio-diesel.

The list below provides projects that have been secured for funding by Tuvalu development partners.

1. **Project Title:** Improving reliable access to modern energy services through solar PV systems for rural areas (outer islands) of Tuvalu
  - **Location** – Outer Islands of Nukulaelae, Nukufetau and Nui
  - **Scope** – Installation of PV/hybrid/generator plant
  - **Size** – 180kWp
  - **Cost** – euro 2.5million
  - **Funding Source** – EU and Tuvalu Government with Partners
  - **Date** – Now in progress and commissioned by year end 2014.
  
2. **Project Title:** Outer Islands Renewable Electricity Generation
  - **Location** – Outer Islands of Nanumea, Nanumaga, Niutao and Vaitupu, and also Funafuti
  - **Scope** – Installation of PV/hybrid/generator plant
  - **Size** –Outer Islands - 743kWp and Funafuti – 433kWp.
  - **Cost** – US\$6.9million
  - **Funding Source** – New Zealand Government and its Partners
  - **Date** – Contract awarded and commissioned by year end 2014
  
3. **Project Title** - Photovoltaic Plant on Funafuti in Tuvalu
  - **Location** – Funafuti
  - **Scope** – Installation of 350kWp Solar PV Grid-connected
  - **Cost** – US\$5million
  - **Funding Source** – United Arabs Emirates (UAE)
  - **Date** – In progress and to be commissioned by year end 2014
  
4. **Project Title** – Tuvalu Energy Sector Development Project
  - **Location** – Funafuti
  - **Scope** – As mentioned below

- **Size** – 3 major components
- **Cost** – US\$7million
- **Funding Source** – World Bank
- **Date** – 2015

**Component 1: Improving the efficiency of TEC’s electricity system** – Estimated cost 0.8 million USD.

This component will involve two subcomponents:

- *Pre-payment Meter System:* The project will finance the procurement and installation of a metering system including pre-payment meters on all accounts, with smart meters being considered for large accounts. The project will also include a capacity building program for TEC staff and a program to raise awareness of consumers.
- *Communications system, data and voice communications:* The project will finance the installation of a satellite and wireless communication system to facilitate voice and data communications between the outer islands and the head office in Funafuti. The capacity of TEC staff in the outer islands to operate and maintain the communications system will be built under the project.

**Component 2: Renewable Energy and Energy Efficiency** – Estimated cost 5.9 million USD

In line with the MPREEE and the Government of Tuvalu’s vision for 100 percent renewable energy generation and a 30 percent improvement in energy efficiency by 2020, this component will focus on increasing renewable energy (RE) penetration and energy efficiency in Funafuti, Tuvalu.

This component will involve two sub-components:

- *Renewable energy generation:* This sub-component aims to further increase RE penetration by installing additional renewable energy generators, battery storage and an integrated power control system. As the energy generation system becomes more complex (with the addition of multiple new sources of energy and smart meters), the design of an integrated power control system to automatically dispatch the new generation sources and manage demand becomes essential. The goal is to build a robust modular framework into the existing grid, able to incorporate and operate efficiently and securely any additional renewable energy generation facilities added in the future, to reach 100 percent renewable energy generation by 2020. The integrated control system will also help to minimize diesel oil cost and extend battery life.
- *Energy efficiency plan:* This subcomponent will help to finance the activities recommended by the energy efficiency studies and audits performed in advance under proposed Asia Sustainable and Alternative Energy Program (ASTAE) funded studies (see below). These studies will also evaluate the characteristics of the financial support required in order to implement the recommended measures. The Tuvalu MPREEE has a target of achieving a 30 percent improvement in energy efficiency by 2020. The benchmark for this target and the method of calculation of this indicator is still yet to be determined. The Ministry of Public Utilities provided the mission with data collected during an energy audit conducted in 2003, which can be used to help design the energy efficiency audits.

**Component 3: Technical Assistance and Project Management** – Estimated cost 0.3 million USD, which will likely increase once more detailed estimates are produced.

This component will support:

- Project implementation and management (e.g., procurement; financial management; environmental and social safeguards; designing and implementing a project management system, integrated with current TEC’s operations, to collect, process and produce all the

essential data and information [e.g., financial, operational, execution progress, etc.] of key activities required to implement the project, monitor its performance and facilitate corrective actions, reporting, etc.);

- Capacity building of TEC and staffs of the Department of Energy in implementation of project, data and information system,3 governance and performance (operational, financial, technical, commercial, and institutional) and Department of Energy of the Ministry of Public Utilities including the training needs assessment.
- Strengthening energy planning activities under a whole of the sector approach, such as a Comprehensive Fuel Feasibility Study (e.g., efficiency gain in petroleum use, supply chains, pricing, etc.) and a Waste-to-Energy Feasibility Study.

Five studies are proposed in advance of the project to be funded under ASTAE multi-donor trust fund to prepare Component 2. The studies identified to date are:

- *Study 1 will focus on identifying and evaluating energy efficiency measures for the island of Funafuti, supporting Tuvalu towards its goal to achieve a 30 percent improvement in energy efficiency in Funafuti. Study 1 will cover the auditing of buildings, industrial and commercial facilities, evaluation of electrical appliance efficiency and its availability in the local market, and evaluation of the potential use of electric motorcycle, scooters and bicycles for individual transportation.*
- *Study 2 will involve the structural evaluation of roofs in Funafuti to identify potential roof space for the installation of additional solar PV generation. A structural/civil engineer will be hired to perform the work.*
- *Study 3 will involve an analysis of the viability of coconut oil being used as a bio-fuel for electricity generation in Tuvalu. The study could include analysis of outer island resources, inter-island supply chain, financial and economic modeling and social, cultural and environmental issues.*
- *Study 4 will involve the definition of the technical and operational conditions to be met by the renewable energy package to be acquired, in order to contribute to supply the demand of the Funafuti Island at the required quality level. The result of the study will be used as an input for the preparation of the bidding documents for the acquisition of the renewable energy equipment included in Component 2.*
- *Study 5 will involve the detailing of the technical specifications required to prepare the tender documents for Component 2 of the project.*

The proposed intervention by SPREP would enable the Government of Tuvalu achieved its target of 100% renewable energy by 2020. The ambitious target can only be achieved through the support and assistance of Tuvalu's development partners.

3. The expression of interest should not exceed 10 pages, including tables, charts, and annexes