



**United Nations Development Programme  
Project Document**



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Resilient nations.*

<b>Project Title:</b> Facilitation of the Achievement of Sustainable National Energy Targets of Tuvalu (FASNETT)	
<b>Country:</b> Tuvalu	<b>Implementing Partner:</b> Energy Department - Ministry of Public Utilities and Infrastructure (ED/MPUI)
<b>Management Arrangements:</b> National Implementation Modality (with UNDP CO Support)	
<b>UNDAF Outcome 1.1:</b> Improved resilience of PICTs, with particular focus on communities, through integrated implementation of sustainable environment management, climate change adaptation/mitigation and disaster risk management.	
<b>UNDP Strategic Plan Output:</b> Output 1.5: Inclusive and sustainable solutions adopted to achieve increased energy efficiency and universal modern energy access (especially off-grid sources of renewable energy)	
<b>UNDP Social and Environmental Screening Category:</b> Low	<b>UNDP Gender Marker:</b> 1
<b>Atlas Project Proposal ID:</b> 00097730	<b>Atlas Output ID:</b> 00101338
<b>UNDP-GEF PIMS ID number:</b> 5613	<b>GEF ID number:</b> 9220
<b>Planned start date:</b> June 2017	<b>Planned end date:</b> July 2021
<b>LPAC date:</b> 27 <sup>th</sup> March 2017 (proposed)	
<b>Brief project description:</b> FASNETT is aimed at facilitating the development and utilization of feasible renewable energy resources and application of energy efficiency technologies for achieving the Government of Tuvalu’s updated target of reducing emissions of greenhouse gases from the electricity generation (power) sector by 100% by 2025 based on the country’s INDC in November 2015. The facilitation or enabling objective is meant to address, i.e., eliminate the identified barriers to the cost-effective application of RE technologies using the country’s indigenous RE resources, as well in the effective and extensive application of EE measures and techniques that are also in line with low carbon development and involved in the sustainable development in the country through a barrier removal approach. This will be achieved through the implementation of four project components: (1) Awareness Raising on Renewable Energy and Energy Efficiency Applications; (2) Energy Policy Improvement and Institutional Capacity Building; (3) Applications of Renewable Energy & Energy Efficiency Technologies & Techniques and (4) Financing of Renewable Energy and Energy Efficiency Initiatives. The project is financially supported through the GEF (USD 2,639,725) and co-financed by the UNDP (USD 250,000), the Government of Tuvalu (USD 8,250,000) and Tuvalu Electricity Corporation (USD 7,400,000).	
<b>FINANCING PLAN</b>	
GEF Trust Fund	USD 2,639,725
UNDP TRAC resources	
Cash co-financing to be administered by UNDP	
○ Total Budget administered by UNDP	<b>USD 2,639,725</b>
<b>PARALLEL CO-FINANCING (all other co-financing that is not cash co-financing administered by UNDP)</b>	
UNDP	USD 250,000
Government of Tuvalu	USD 8,250,000
Tuvalu Electricity Corporation	USD 7,400,000
○ Total co-financing	<b>USD 15,900,000</b>
○ Grand-Total Project Financing (1)+(2)	<b>USD 18,539,725</b>
<b>SIGNATURES</b>	

Signature: print name below	Agreed by Government	Date/Month/Year:
Signature: print name below	Agreed by Implementing Partner	Date/Month/Year:
Signature:  Bakhodir Burkhanov, Country Director, UNDP Pacific Office in Fiji	Agreed by UNDP	Date/Month/Year:

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## List of Acronyms and Abbreviations

ADFD	Abu Dhabi Fund for Development
BAU	Business-as-Usual
CO2	Carbon dioxide
DOE	Department of Environment
DBT	Development Bank of Tuvalu
DIM	Direct implementation modality
ED/MPUI	Department of Energy (under the Ministry of Public Utilities & Infrastructure)
EOP	End of the project
EE	Energy Efficiency
FASNET	Facilitation of the Achievement of Sustainable National Energy Targets of Tuvalu
FSP	Full Sized Project
PIR	GEF Project Implementation Report
STAP	GEF Scientific Technical Advisory Panel
GEF	Global Environment Facility
GEFSEC	Global Environment Facility Secretariat
GOT	Government of Tuvalu
GHG	greenhouse gas
INDC	Intended Nationally Determined Contributions
IDA	International Development Association
IUCN	International Union for Conservation of Nature
KW	Kilowatt or 1,000 watts
KWh	Kilowatt-hour
LFA	Logical Framework Analysis
LC	Low carbon
MSP	Medium Sized Project
MWh	Megawatt-hour, 1,000 KWh
MTR	Mid-term review
MFATTEL	Ministry of Foreign Affairs, Trade, Tourism, Environment and Labor
MPUI	Ministry of Public Utilities and Infrastructure
M&E	Monitoring and evaluation
NAPA	National Adaptation Programme of Action
NIM	National implementation modality
OTEC	Ocean thermal energy systems
OTEC	Ocean thermal energy systems
PICs	Pacific Island Countries
PV	Photovoltaic
PPA	Power Purchase Agreement
PMMS	Preventative, Maintenance, and Management System
POPP	Programme and Operations Policies and Procedures
PIF	Project Identification Form
PIR	Project implementation review
PIF	Project Information Form
PMU	Project Management Unit
PPG	Project Preparation Grant
RTA	Regional Technical Adviser
RE	Renewable energy

SIDS Dock	Small Island Development States Initiative
SESP	Social and environmental screening of project
SWH	Solar water heaters
SWAT	Solid Waste Action Team
TE	Terminal Evaluation
TEC	Tuvalu Electricity Corporation
TESDP	Tuvalu Energy Sector Development Project
TMTI	Tuvalu Maritime Training Institute
TNEP	Tuvalu National Energy Policy
UNDP-GEF	UNDP Global Environmental Finance Unit
UNDP	United Nations Development Program
UNFCCC	United Nations Framework Convention for Climate Change

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## II. DEVELOPMENT CHALLENGE

### II.1 Global environmental problems, root causes and barriers that need to be addressed

Tuvalu is a small island nation located in the Pacific Ocean, and is the third-least populous sovereign state in the world (about 10,000 as of end 2014). In terms of physical land size, at just 26 km<sup>2</sup>, it is the fourth smallest country in the world. The country belongs to the category of Least Developed Countries and is one of the most environmentally fragile states in the Pacific region due to its low-lying land (the highest elevation at 5 meters above sea level); its geographical isolation, lack of fertile land and inability to reap economies of scale also affects provision of goods and services. Like most of the Pacific Island Countries (PICs), Tuvalu have many constraints to development and among these is the high dependency on imported energy resources (primarily petroleum products), and it too has to hurdle and eliminate barriers to the optimal utilization of its limited indigenous energy resources. Tuvalu has no conventional energy resources and is heavily reliant on imported oil fuels for transport, electricity generation and household use. High fuel prices and fluctuations have a destabilizing effect on businesses and households, limiting growth and reducing food security, especially in the most isolated outer islands.

Renewable energy (RE) resources such as solar, wind, biomass and ocean energy are recognized as potential energy alternatives in the country. In response to such situation in the world oil market and ensure the country's energy security, and in line with its commitment to contribute to the global effort to reduce greenhouse gas (GHG) emissions, the Government of Tuvalu (GOT) committed to get 100% of its electricity from renewable energy sources by 2020 as declared in the 2009 Tuvalu National Energy Policy (TNEP). The Energy Strategic Action Plan defined and directed current and future energy developments so that Tuvalu can achieve the ambitious target of 100% RE for power generation by 2020. The initial efforts towards this were supported by the e8, a group of 10 electric utilities from developed countries, i.e., G8 countries<sup>1</sup>. This commitment to implement power generation at 100% RE between 2013 and 2020 would be through Solar PV (95% of demand) and biodiesel (5% of demand). But other feasible RE resources in the country such as biomass (biofuels and biogas) and wind were also to be tapped.

In November 2015, the Government of Tuvalu submitted its Intended Nationally Determined Contributions (INDC) to UNFCCC, in updating the goal set in the country's 2009 TNEP, has now sets out the objective to reduce emissions of greenhouse gases from the electricity generation (power) sector, by 100%, i.e. almost zero emissions by 2025 through the use renewable energy sources and energy efficient technologies. With the current economic development situation in the country and the actions that are ongoing and are being planned towards the achievement of this target, there is a need to re-evaluate the target to either confirm or reset it to a more realistic level and lay down the detailed plan that can be achieved by 2020, and beyond up to 2025, in line with the INDC commitments. Furthermore, once this goal is reaffirmed, there is a need to facilitate the achievement of target through the removal of barriers and filling in of the gaps that would bridge the achievement of said RE target initially in what could be realizable in four to five years up to 2020 and then lay the next five year program up to 2025 to finally reach the end goal. The renewable energy and energy efficiency technology applications are expected to support the economic development of the country while minimizing GHG emissions.

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<sup>1</sup> The Group consists of the following countries: Canada, France, Germany, Italy, Japan, Russia, the United Kingdom and the United States of America.

The ED/MPUI has reported that in 2015, the country's overall energy consumption which is predominantly petroleum based is as follows:

**Table 1: 2015 Petroleum Fuel Consumption of Tuvalu**

Fuel Type (in liters, except LPG)	Import	Transport			Electricity	Fishing	Cooking	Others	Total Fuel Consumption
		Land	Sea	Air					
ADF	1,335,800	49,224	552,122		1,643,681			81	2,245,108
ULP	689,600	438,062	20,625			161,788		1,988	622,463
DPK	50,000						30,127	9	30,137
LPG (kg)	144,638						139,183		139,183
Jet A1	92,000			103,514					103,514

As of September 2016, the total electricity generation capacity installed in Tuvalu is 4,826 KW, of which 2,046 KW comes from solar PV.

**Table 2: Total Electricity Generation Capacity Currently Installed in Tuvalu**

	Solar PV Installed (kWe)	Diesel GenSets (kWe)	Total Capacity (kWe)
<b>Funafuti</b>	756	1,800	2,556
<b>Outer Islands</b>	1,290	990	2,270
<b>Total Tuvalu</b>	<b>2,046</b>	<b>2,780</b>	<b>4,826</b>

Note: Diesel GenSets used as backup by the local clinics are not included

The TEC has reported that for the power (electricity) generation, the country's 2015 annual overall electric energy consumption was 6.353 MWh which was supplied mostly by TEC from its diesel generating stations and PV installations and supplemented by non-TEC solar PV installations from different foreign-funded projects. The historical sectoral electricity consumption is shown in Table K.2, **Annex K**. The electricity consumption and the planned capacity additions and projected growth rate are also discussed in said annex.

It is interesting to note that RE contribution reached 42% of the electricity supply capacity mix in Tuvalu in mid- 2016. This is mainly from solar PV as reported by ED/MPUI estimated at 2,046 kWe total capacity consisting of 1,290 kWp in the Outer islands and 756 kWe in Funafuti. But considering the difference in energy generation capability, RE energy contribution would only be at 26% based on the January – September 2016 data with details in **Table K.4, Annex K**.

Another RE comes in the form of biogas which started sometime in 2008, but their contribution to the goals of 100% RE power, albeit not very significant, is in terms of electricity used for cooking as displaced by the biogas fuel. The Department of Energy is also in the process of installing anaerobic digesters that produce biogas for cooking. There are around 50 biogas units currently installed in Tuvalu. Plans to install more units are still pending with the Kaupule (local government).

Nonetheless, it is not smooth sailing for the country towards its 2025 energy target. The country has to overcome barriers that are currently impacting on the realization of that target. These include:

**RE & EE Awareness Barriers:** Despite the many projects on RE and EE that were implemented in the country, the level of awareness regarding the benefits and how to realize such benefits for most of the citizens of the country is still low. Despite the numerous awareness raising activities that have been done in the past, nothing much have changed in regards to attitude towards energy conservation and application of RE in people's daily social and economic activities. For one thing, most of the earlier

capacity building and awareness raising on RE/EE were done only in the main island of Funafuti. Not much has been done for those in the outer islands. Whatever information on RE/EE that were disseminated in the outer islands came from efforts done by other non-energy related projects (e.g., education, health, socio-economic development, disaster management) that somehow mentioned the need to use alternative sources of energy to sustain livelihoods. Most of the previous and ongoing RE projects in the country are on solar PV power generation, and the capacity development interventions are mainly on the installation, operation, repair and maintenance of the required systems. Notwithstanding the information dissemination and awareness raising activities in previous projects, and the GoT's advocacy for the application of RE technologies and EE techniques and practices, the impact on the attitude of the general public as well as with the national and local government authorities, have not significantly changed. Widespread application and practice of RE and EE initiatives among the citizenry is yet to be realized in the country. Knowledge on RE/EE is in the hands of few. There is generally a significant lack of technical, policy and financial skills. In the government, in general the level of expertise in energy planning, and energy-integrated development planning can still be improved. The local technical capacities on RE and EE project development and implementation are generally weak. There is also in general, a low level of knowledge of opportunities and obstacles to the application RE technologies for productive and social uses. On the energy data availability, there is still limited information about the magnitude and availability of indigenous RE resources, and lack of reliable energy production, supply, and distribution and consumption data. Lack of communication and sharing of information among different branches of the government needs to be addressed especially in the promoting RE/EE application in various government programs.

Policy and Regulatory Barriers: The TNEP spells out the objectives and plans of Tuvalu in the area of energy development and utilization, in support to the country's sustainable economic development and of the country's climate change mitigation targets. However, firstly, the TNEP, which was formulated in 2009 needs updating in the light of 2015 INDC commitment and various developments. Secondly, it does not specifically provide detailed action plan for implementing and enforcing the country's energy policy. This is a rather important issue that has to be addressed to enable the actions that would motivate interest in developing and sustaining the energy sector. The country is no exception at all from the other PICs, since these more or less are the same problems in energy policy in the region. Among these are: (a) Lack of specific clear and appropriate policies, strategies and implementing rules and regulations on energy development and utilization, i.e., the policy does not outline detailed plans on how to achieve the goals, nor is there much reference to the role of the private sector; (b) Inadequate enforcement of existing energy policies and strategies, and implementing rules and regulations; (c) Subsidized costs for electrification and petroleum fuels; (d) Government not able to pay its power bills on a regular basis; and, (e) Lack of policies regarding financial/fiscal incentives that would encourage private sector (local and/or foreign) capital in sustainable energy projects in the country. The TNEP targets would not be realized unless these policy-related issues are addressed and eliminated (or at least reduced). Or if these targets are achieved, these may not be sustained. The policies and regulations have to be crafted to consider the limited land resources which are mostly communal for possible RE installations, the lack of local RE resources and the limited logistics to ship big objects to outer islands timely.

Institutional Barriers: The Department of Energy within the Ministry of Public Utilities and Infrastructure (DE-MPUI) is in charge of the development of energy policy, the administration of renewable energy projects and regulation of the storage and sale of petroleum fuels. It is also in charge of sustainable energy programs. The MPUI is not directly involved in such programs although it is in charge of the implementation strategies and work plans for government projects. There is also a separate entity that looks after the petroleum products that comes in and utilized in the country. There is no independent energy regulator; but in 1990 the corporatized TEC (but still 100% state-owned enterprise) was given the sole rights to supply electricity to all of Tuvalu under the Tuvalu



Electricity Authority Corporation Act 1990. The government, mainly through the MPUI, is closely involved in key decisions of the TEC and therefore in energy regulation. There is little interaction among these entities in energy project development and implementation, data sharing or cross-checking, with the result that it is very difficult to create the accurate picture of the sector needed to regulate the sector effectively and understand the opportunities for improvement.

Technical Barriers: The technical barriers come in two forms: technology selection and technical capacity and skills to support development and application of selected technologies. Owing to the country's limited natural resources, land availability, and small generation/consumption scale, selecting RE technologies suitable for Tuvalu has proven to be a difficult task. To date, the only technology that has been deployed in relatively large scale is photovoltaic (PV) solar energy. While PV panels have worked satisfactorily both in Funafuti and on the Outer Islands, the technology has not been tested for a long period. In fact, most of the current installations are only about a year old. Risks regarding long-term operation mainly concern corrosion and rust, possibly augmented by the adverse environmental conditions in Tuvalu, whose air is particularly rich in salt. Small anaerobic gasifiers, literally family-sized gasifiers fed with pig manure, is the only other technology ever tested on the island country. Lastly, the World Bank also has in the pipeline the first wind farm for Tuvalu, a 200 kWe demo which should start construction in 2017. Hence, performances for this technology are still to be evaluated.

The technical capacity of the country's energy sector is mainly based in the TEC, and to some extent within the DE-MPUI. However, the technical capacity that the country should be able to use to facilitate energy's important contribution to sustainable development (i.e., improved energy supply and efficient energy consumption and environmental quality improvement) is generally weak. In TEC, many of the technical applications, including technical design and operations standards and specifications still needs continuous improvements. There may be technical capacity in the other sectors, e.g., public works and utilities, but such capacity may not be available for deployment as an integrated and cohesive group. With fragmented and non-coordinated efforts in implementing RE and EE initiatives, the benefits of a collective technical resource are not fully tapped. On the other hand, due to lack of land for RE such as PV installation, the roofs of the existing buildings intended for roof-mounted arrays need to be reinforced.

Financial Barriers: In Tuvalu, most of the RE and EE initiatives are from the government or from the donor agencies. Many of the installed RE-based power generation projects in the country are funded through bilateral and multi-lateral sources. There are very limited initiatives by the general public and the private sector to implement RE and EE projects. The reasons include: (a) Power generation is within the purview of the TEC being the only legitimate supplier of electricity in the country; and the bilateral and multi-lateral funded solar PV power generation projects in Tuvalu were carried out for the TEC; (b) The private sector relies mainly on electricity supply from TEC for their businesses; and, (c) The residential sector may be aware of the benefits of EE appliances, but their purchase of these items is limited to what are being sold in the country (e.g., from China and similarly from other countries which are cheap and of undetermined energy efficiency). The development and implementation of RE and EE (or even the practice of EE) among the general public is often hampered by their limited: (1) knowledge of planning, designing and implementing it; and, (2) financing it. Financial support from the government for EE and RE initiatives that have always been funded by foreign donors, is also lacking. The financial establishments in the country are also generally not interested in such capital intensive initiatives. The Development Bank of Tuvalu (DBT) is risk-averse to investments for projects similar to the RE projects that TEC has implemented (all donor-funded). Moreover, considering the generally small scale of the possible RE/EE projects, this makes technologies unavailable and financing unattractive. However, multi-country financing opportunities to increase scale have not seem to work efficiently because countries tend to retain full control of the

funds they obtain to meet their own unique needs. Nonetheless, the DBT has a loan program for homeowners in building and renovating houses, as well as purchase of household appliances. The only commercial bank in the country also has financing assistance for homeowners for home improvements and companies for business loans.

## **II.2. Baseline scenario and any associated RE baseline projects**

The project on the Facilitation of the Achievement of Sustainable National Energy Targets of Tuvalu (or the FASNETT Project) will build on several ongoing baseline projects on energy efficiency and renewable energy promotion and application in the country or the situation that will continue to happen as business-as-usual (BAU) trend without the proposed FASNETT interventions. The situation has started to transform from a slower growth rate of RE capacity additions before 2015 resulting to the current level of achievement in energy self-sufficiency goal as reported by ED/MPUI/TEC to be at 26% RE as of September 2016. The original Tuvalu National Energy Policy (TNEP) launched in 2009 has declared the goal of 100% RE by 2020 which is less than 5 years from now. It has been reassessed and is now targeted to be achieved in 2025 based on the INDC commitments. FASNETT will build upon the existing and planned RE/EE related projects and establish working linkages and synergy to come up with an integrated approach that is responsive to Tuvalu's energy needs with emphasis on communities and services in the outer islands which have been started by a number of projects with various sponsors.

The ongoing baseline projects on energy efficiency and renewable energy promotion and application in the country include:

1. *World Bank* – The Tuvalu Energy Sector Development Project (TESDP) consists of grants from the International Development Association (IDA) (US\$ 7 million) and Small Island Development States Initiative (SIDS Dock) Multi-Donor Trust Fund (US\$2.1million) for Tuvalu for assistance through the TEC for:
  - a. Renewable Energy Investments (e.g., Supply and installation, for TEC, of power generation and grid management equipment, such equipment to include, solar PV, wind-power generation, batteries, battery inverters and an integrated power-control system and a satellite-based communications system);
  - b. Energy Efficiency Investments (e.g., Supply and installation of prepayment meters for TEC consumers and smart meters for the largest electricity consumers; Supply and installation of selected energy efficiency investments, such as enhanced insulation in buildings; and replacement of inefficient lighting and appliance; Development of policy, standards and labeling for energy efficiency; and consumer awareness and capacity development programs on EE; and,
  - c. Technical Assistance and Project Management Support for TEC, and for mainstreaming gender dimensions into the Project.
  
2. *New Zealand Aid* - The Joint Commitment for Development provides a framework for underlining New Zealand and Tuvalu's commitment to 6 priority sectors including energy. In the field of energy, NZAid has been supporting the Tuvaluan Government implement the Tuvalu Renewable Energy Project (TREP), which involved the installation of PV arrays in Tuvalu to deliver more efficient, reliable, safe and sustainable electricity supply for Tuvalu. The outcomes include:
  - a. Increased energy generation;
  - b. Reduced reliance on imported fuels and less vulnerability to oil price fluctuations; and,
  - c. Provision of a reliable supply of electricity to outer island communities where irregular fuel.

This NZ Aid-funded project involved the installation of relatively large PV systems with battery storage at Vaitupu (410 kW), Niutao (232 kW), Nanumaga (205kW) and Nanumea (195kW). It also funded the 170kW solar PV grid-connected system on the main Government office building and the Tuvalu Media Building.

3. *UAE-Pacific Partnership Fund* – This is a US\$ 50 million grant financing from Abu Dhabi Fund for Development (ADFD), and carried out through partnership with the UAE. It involves the funding of renewable energy projects in five Pacific island countries: Fiji, Kiribati, Samoa, Tuvalu and Vanuatu. Currently in Tuvalu, the solar PV power generation systems funded (US\$5million) by this partnership for a 500 KW solar PV power plant in Funafuti which has been commissioned in 2015 and will be under the operation of the TEC. The \$50 million UAE-Pacific Partnership Fund was launched in March 2013. The 500kW capacity has been installed as follows; 350Kw was installed at the TEC compound and 150Kw consisting of 75kW connected at the Princess Margret Hospital (PMH) and the other 75kW was installed at the Marine Warehouse. As of 3rd quarter 2016, the systems have generated total of 447,666 KWh and details are as follows: for the 350Kw installation – 285,875kWh, for the 75Kw at the PMH – 86,597 KWh and for the 75kW system at the Marine Warehouse – 75,194 KWh.
4. *EDF-11 Funds for Tuvalu (National Indicative Programme for Tuvalu)* – The EU is currently supporting the outer islands in the renewable energy and energy security sectors, through a €2.5 million project with the installation of solar PV systems in the three small islands of Nukufetau, Nukulaelae and Nui. Continuing with agreement with the European Union that started in 2000 under the ACP-EU Partnership Agreement, a single program for Tuvalu amounting to € 3.8 million will be implemented during the 11<sup>th</sup> EDF period (2014-2020) for water and sanitation. Waste-to-energy potentials can be explored from this.
5. *EU and NZ including EU-New Zealand Energy Access Partnership* – including solar PV mini-grids in several outer islands – The two donors and UAE have agreed to work collaboratively in implementing solar PV projects in Tuvalu. This has seen that all the major equipment that was installed under the three donors' project are all identical. The New Zealand assistance through the Tuvalu Renewable Energy Project (TREP) as detailed in Item 2 above; and the UAE project is also detailed in item 3 above. The EU project through the project on Improving Reliable Access to Modern Energy Services through Solar PV systems for Rural Areas (outer islands) of Tuvalu. The project installed solar PV systems at Nukulaelae (45 KW), Nukufetau (87 KW) and Nui (70 KW) and were all commissioned in 2016. As of 3<sup>rd</sup> quarter 2016, the three systems generated a total of 228,493 KWh composed of the following: Nukulaelae – 39,363 KWh, Nukufetau – 104,613 KWh and Nui – 86,517 KWh.
6. *Tuvalu National Adaptation Programme of Action (NAPA2)* -- This is the second Climate Change Adaptation Projects in Tuvalu which the GOT, with support from UNDP and LDCF/GEF, is implementing various measures to help people cope with such changes. They include strengthened community-based management of coastal fisheries, better monitoring of climate impact on such resources, enhancement of real time communications and early warning dissemination from the capital to all outer islands, and upgrading of evacuation facilities. In all these activities, FASNETT will be linking in terms of possible application of RE technologies for power supply.
7. *All TEC ongoing and planned projects on EE and RE* – The ongoing operations and maintenance of the installed systems under the following TEC projects form part of the national RE/EE program under the FASNETT project.
  - a. UAE-funded Funafuti 500 kW Solar PV Power Generation Project

- b. NZAid-funded Funafuti 170 kW Solar PV Power Generation Project
- c. NZAid-funded Outer Island 1.03 MW Solar PV Power Generation Project.
- d. Finland Tuvalu Maritime Training Institute (TMTI) 8 kW solar PV with storage
- e. Italy Outer Island SHSs and Solar PV Cooling system project
- f. Other ongoing TEC projects that are now among the baseline activities of FASNETT are the following:
  - WB-funded Tuvalu Energy Sector Development Project – This project is at the preparation stage. The activities involving the installation and use of pre-payment meters, installation of 925 kW solar PV, 200 kW, 1 MWh battery storage, installation of communication systems, that will be implemented in 2017 and 2018 are among the activities of this project that are subsumed into the FASNETT project.
  - EU-funded Outer Island 182 kW Solar PV Power Generation Project – The leftover funds of this project will be utilized to increase the installed capacity by 10 kW each the power generation systems at Nukufetau, Nukulaelae and Nui. For each island, this involves the installation of new 10 kW PV system, and security fencing for the facilities.
  - Development of Bank of Tuvalu EE Subsidy Scheme. The scheme is currently under implementation, and will be enhanced and continued to be implemented as part of the FASNETT activities.
  - UNDP-SIDS DOCK Demo EE Fale Project. The project construction phase has been completed, and its operation and maintenance is part of the capacity development activities of the FASNETT project.

There are also ongoing energy projects in the country at various stages of implementation such as those funded by IUCN. These, including the previously stated baseline projects/activities in the areas of RE and EE are mainly on the electricity sector (supply side mainly). There are some activities on EE on the demand side but these are all on electricity use, nothing much on the utilization of other energy forms.

Details of the baseline projects and the estimation of generation capacity, energy generation, savings potential and GHG reduction of the Business-as-Usual (BAU) Scenario are shown in **Annex K**.

With the government's current strategy on the awareness raising and information dissemination, the present rather low level of public awareness of cost-effective RE technology applications not only for electrical energy purposes, and the idea of conserving energy and using energy efficiency will continue as in the past. Without paying attention to this, the country may fall short of reaching its set target of 100% RE for electricity generation. This may even persist for a much longer period of time if the current strategy (and lack of appropriate support policies) would remain as the primary feature of capacity building, awareness raising, and information/data generation and dissemination. The opportunities to achieve the TNEP target levels by 2020 and 2025; and for reducing GHG emissions while improving the living conditions of the people of Tuvalu will just be lost if only these baseline projects/activities will be implemented. The realization of significant GHG emission reduction through the implementation of applicable and feasible RE technologies and EE measures, techniques and practices in support of the socio-economic development of the country will not be realized if an alternative development path that will achieve the TNEP target will not be taken and facilitated.

### ***Electricity Generation/Consumption and Percent Generation Provided by PV as of September 2016***

The pattern of electricity demand and supply situation is changing in terms of structure, growth rate and contribution with an increasing RE penetration in the electricity supply systems in Funafuti and the Outer Islands. The structure is shifting from the former that is primarily diesel mini grids to one that is still diesel based but starting to accommodate or being displaced by additional RE-based PV

generation. Based on the three quarters of 2016, the following generation levels and contribution of diesel and solar PV (details in Table K.4, Annex K) were used in defining the baseline situation.

**Table 3: Electricity Supply and Consumption and Percent Penetration by PV as of September 2016**

Island	Consumption (kWh)	Supply (KWh)			PV Penetration (%)	Estimated Distribution** Losses (%)
		Total Supplied	Diesel	PV		
Funafuti	4,562,670*	4,639,253	4,007,462*	631,791	14%	2%
Outer Islands	692,937	966,549	165,209	801,340	83%	28%
<b>Total Tuvalu</b>	<b>5,255,607</b>	<b>5,605,802</b>	<b>4,172,671</b>	<b>1,433,131</b>	26%	6%

\*Includes also electricity used at TEC.

\*\*Distribution Losses do not include generation losses

### II.3. Most likely Alternative Scenario

As explained above, the baseline activities of the country will only achieve a portion of the 100% RE target. Incremental activities consisting of necessary interventions have to be carried out to reach the target. It is also time to review the practicality of the desired target in the light of present circumstances. The combination of the baseline and incremental activities will bring about the realization of an alternative scenario which features the realization of the committed targets. The proposed project will bring about this alternative scenario wherein there will be enhanced utilization of feasible RE resources and optimal and efficient utilization of energy for supporting of socio-economic development, to contribute to the realization of the country's energy targets.

#### Energy Growth Estimates

In the latest Master Energy Plan<sup>2</sup> for the period 2012-2020 formulated by the GoT in collaboration with TEC, the Government established the 2020 goal to generate 100% of its electricity from renewable sources, and it also forecasted the electricity demand growth for the foreseeable future. In particular, the GoT forecasted a 0% growth for the years 2012-2020, since the demand growth, estimated at 2% yearly growth, at the same pace as the GDP growth, was expected to be completely off-set by an equal improvement in energy efficiency. Additionally, starting from year 2020, the net electricity demand is expected to grow at 2% yearly, again matching the expected GDP growth. TEC has reiterated such estimates and stated that the present socio-economic conditions of Tuvalu would not indicate an increase of the forecasted growth.

However, the 0% growth assumption throughout 2020 that is being assumed previously by TEC needs to be updated. In fact, based on the data provided by TEC, the year-to-year growth in electricity consumption for the period from 2012-2015 (which was part of the period estimated at 0% growth scenario) has been higher than estimated in the Energy Master Plan and has averaged 4.8%, as shown in **Table 4**. Furthermore, the forecasted consumption for 2016, based on the January-September 2016 data, also provided by TEC, is expected to grow about 20% compared to 2015. The main reason for this extremely high growth is due to the fact that while between 2015 and 2016 many new PV plants have been installed and are now operating at full capacity providing air conditioning to all public offices. Efforts aiming to improve the electricity consumption efficiency have not been as aggressive.

**Table 4: Year-to-Year Electricity Consumption Growth**

Year	Tuvalu Total Electricity Consumption (kWh)	Y/Y Growth (%)
2012	4,893,280	
2013	5,153,317	5.3%
2014	5,214,047	1.2%
2015	5,620,167	7.8%
2016 <sup>a</sup>	6,730,387	19.8%
<b>Average Growth 2012-2015</b>		<b>4.8%</b>
<b>Average Growth 2012-2016</b>		<b>8.5%</b>

This aggressive growth is not expected to continue for the future, therefore, the conservative 2% growth, matching Tuvalu’s GDP growth, has been considered starting from 2017, and until 2025, but only for Funafuti. For the Outer Islands a more aggressive and perhaps realistic 4% annual growth rate has been considered to take into consideration that the outer islands only account for 15% of the total electricity consumption in Tuvalu and their inhabitants are more likely to acquire more appliances similarly to Funafuti.

The growth estimate should be completely revised if the GoT decides to convert the entire motor-vehicle fleet in Tuvalu to electric vehicles. The energy growth rate estimates and energy demand growth are discussed in more detail in **Annex K** on possible RE contributions, energy savings and GHG emission reduction estimates.

The proposed GEF project builds on, and incorporates relevant enhancements to the abovementioned baseline projects. The following were considered to be incremental projects that the proposed project focuses on:

- Load management control systems in TEC power plants (in Funafuti and in outer islands) for optimal dispatch of the diesel power gensets in conjunction with the solar PV power generation units
- EE investments in institutional buildings, e.g., air conditioning system in government building, EE retrofits in hospital
- TNEP updating and integrated planning towards developing a comprehensive national energy plan and fully supported by policies and institutional support that will be embodied in an Energy Act including RE and EE program development, implementation and penetration into the predominantly petroleum-based energy supply mix from the baseline scenario
- Additional RE generation capacities and EE technology applications towards the 100% CO<sub>2</sub> reduction goal by 2025 as committed in the Intended Nationally Determined Contributions (INDC)
- Assessment and demonstration of solar thermal systems (for water desalination);
- EE project financing for households, particularly for features that will be showcased in the UNDP SIDS DOCK EE Demo House project such as replacement of old, inefficient refrigerators and freezers and additional pre-payment meters
- Development of biogas energy systems in the households in Funafuti and outer islands as well as biomass energy systems, as maybe feasible, e.g. biogas to replace electric cooking and heating in commercial and small industry applications that could reduce electricity demand and other possible appropriate demand side management activities for the residential and commercial sectors
- Development and demonstration of other future RE systems such as floating Solar PV generating plants, wind energy systems, bio-fuels for diesel gensets, and others as maybe found practical and feasible in Tuvalu

- Taking into consideration in the overall electricity demand the planned conversion of some modes in the transport sector to electricity-driven vehicles (EVs)
- Policy development work on RE/EE applications particularly in line with socio-economic development in the outer islands
- Technology support, access to financing, awareness, and capacity development for RE/EE projects.

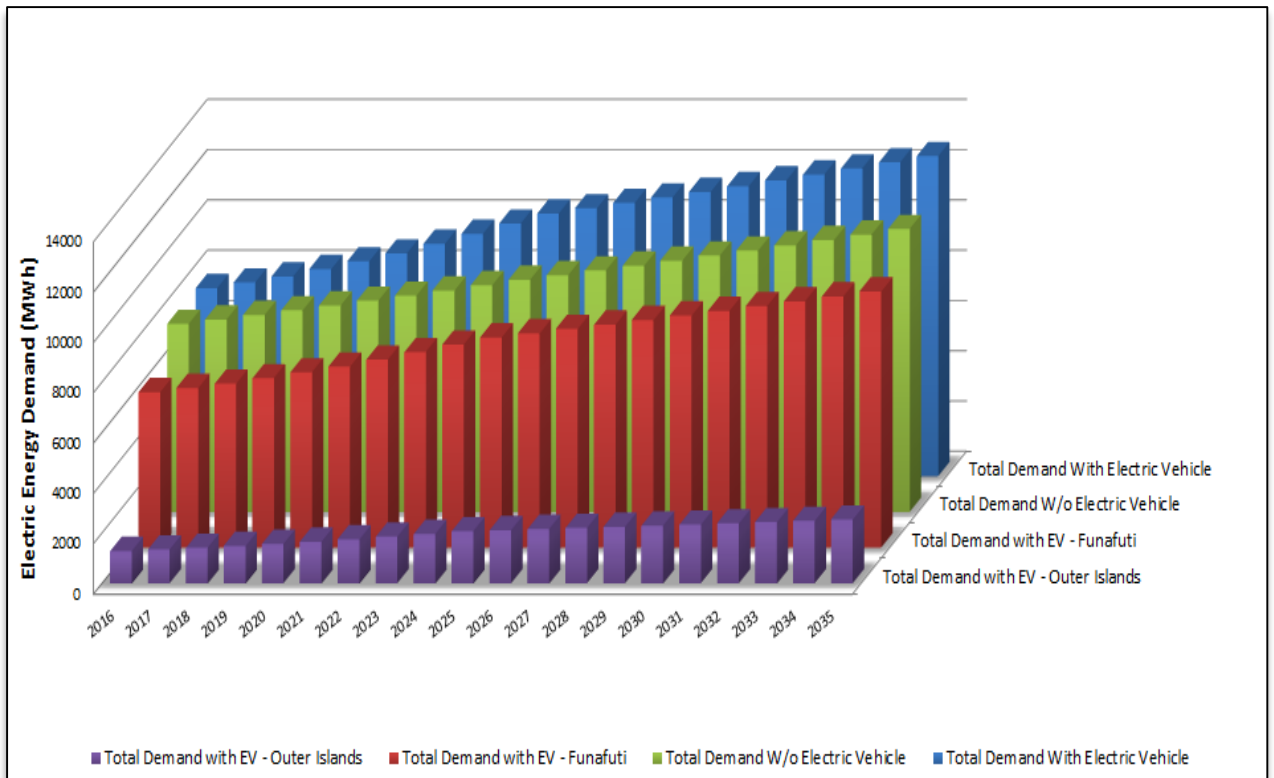
With the additional RE and EE projects that will be implemented as incremental projects to be influenced directly by the FASNETT interventions added together with the above-mentioned Baseline Projects, the whole Alternative Scenario can be projected for 2020 and 2025 to be achieved thereby realizing the country's overall goal of 100% GHG reduction through RE/EE applications.

Assuming the four-year project will start mid 2017 for Year 1, FASNETT is expected to reduce annual petroleum-based electricity by 4,570.9 MWh/yr by mid-2021 or at the end of the project (EOP) in Year 4. It targets to contribute 8,796.3 MWh/yr in 2025 or 5 years after the EOP from RE-based electricity of 8,288.2 MWh/year and from EE applications thereby reducing correspondingly the projected electricity demand by 508.1 MWh/yr and . The equivalent reduction of CO<sub>2</sub> emissions is estimated at 2,619 tons CO<sub>2</sub> per year by mid-2021 and 5,040.3 tons CO<sub>2</sub> per year in 2025. Cumulatively, reduction of CO<sub>2</sub> emissions amounts to 8,488.3 tons CO<sub>2</sub> by mid-2021 and 25,253.9 ktons CO<sub>2</sub> by 2025. More details are in **Annex J**.

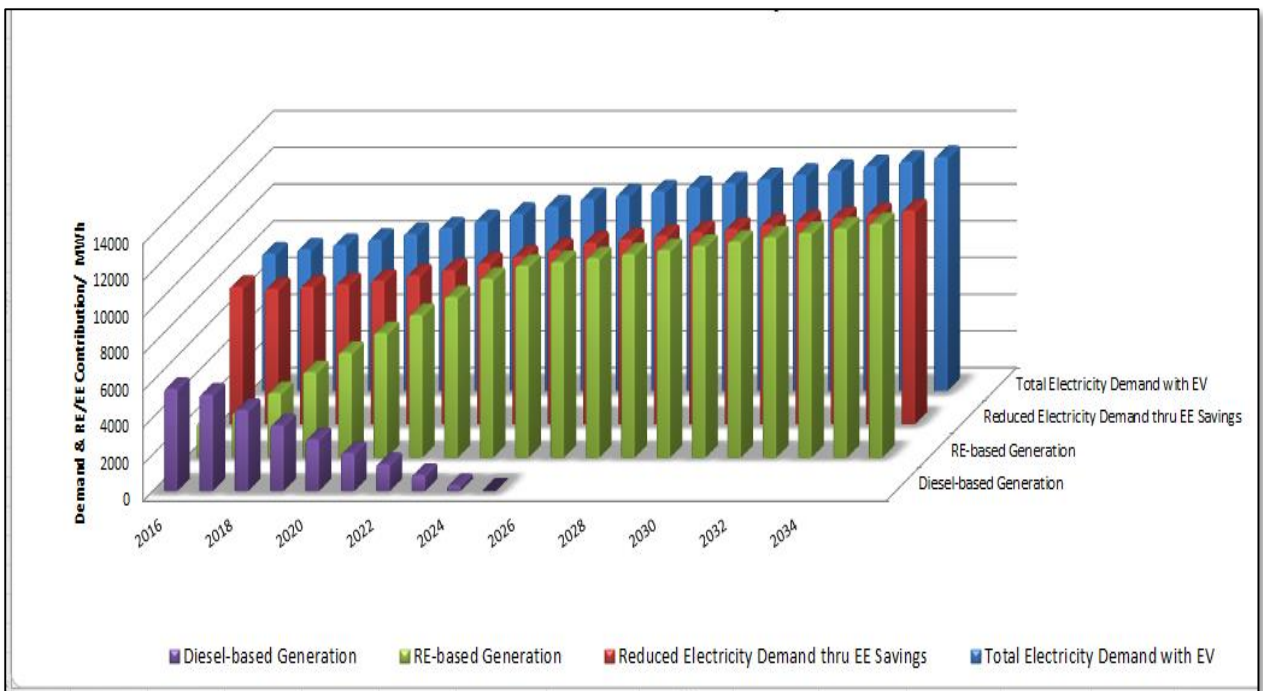
**Table 4: Summary of Expected Results of Baseline and Alternative Scenarios**

Particulars	2016 (Baseline)	2020 EOP Year 4	2025 5 yrs after EOP	2030 10 yrs after EOP
Annual electricity demand (MWh/yr)	7,479.5	8,209.2	9,234.0	10,195.1
Baseline petroleum-based electricity consumption (MWh/yr)	5,574.8			
Alternative petroleum-based electricity consumption (MWh/yr)	5,574.8	2,828.4	Nil	nil
RE-based alternative electricity consumption (MWh/yr)	1,904.8	5,717.3	10,448.2	11,535.6
EE electricity savings reducing petroleum-based demand, MWh/yr		418.1	533.6	661.5
Total RE/EE contribution, MWh/yr		6,135.3	10,981.7	12,197.2
% RE in total electricity supplied	26%	67%	100%	100%
Annual reduction of GHG emissions, tons CO <sub>2</sub> /yr		4,642.5	8,208.7	9,104.6
Cumulative reduction of GHG emissions, tons CO <sub>2</sub>		15,000.0	47,825.7	91,517.7

The following figures, **Fig. 1 to Fig. 5**, illustrate BAU annual electric energy demand, replacement of annual petroleum-based electricity demand with EE savings and RE-based generation to 100% by 2025, %Penetration of Diesel-based Generation by RE-based Generation, annual GHG CO<sub>2</sub> reduction equivalent of RE generation and EE savings and cumulative GHG CO<sub>2</sub> reduction.



**Figure 1: Business as Usual Annual Electric Energy Demand by Islands**



**Figure 2: Reduction of Annual Petroleum-based Electricity Demand to 100% by 2025 through EE Savings and RE-based Generation**



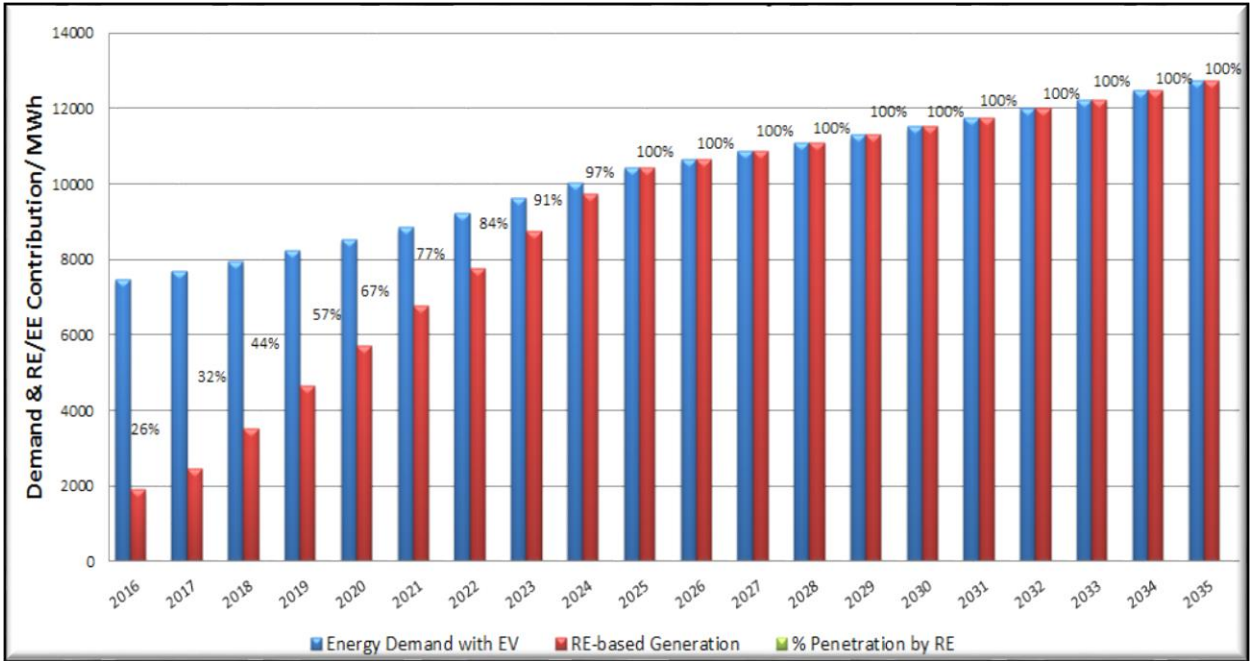


Figure 3: %Penetration of Diesel-based Generation by RE-based Generation

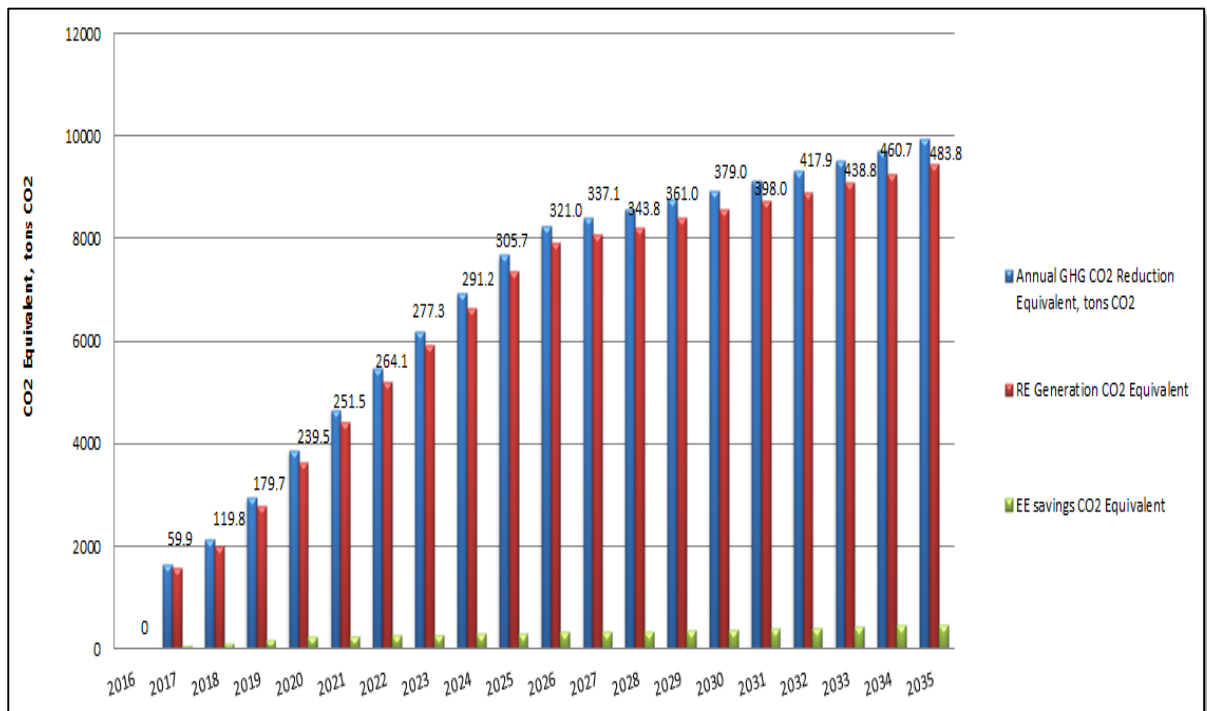
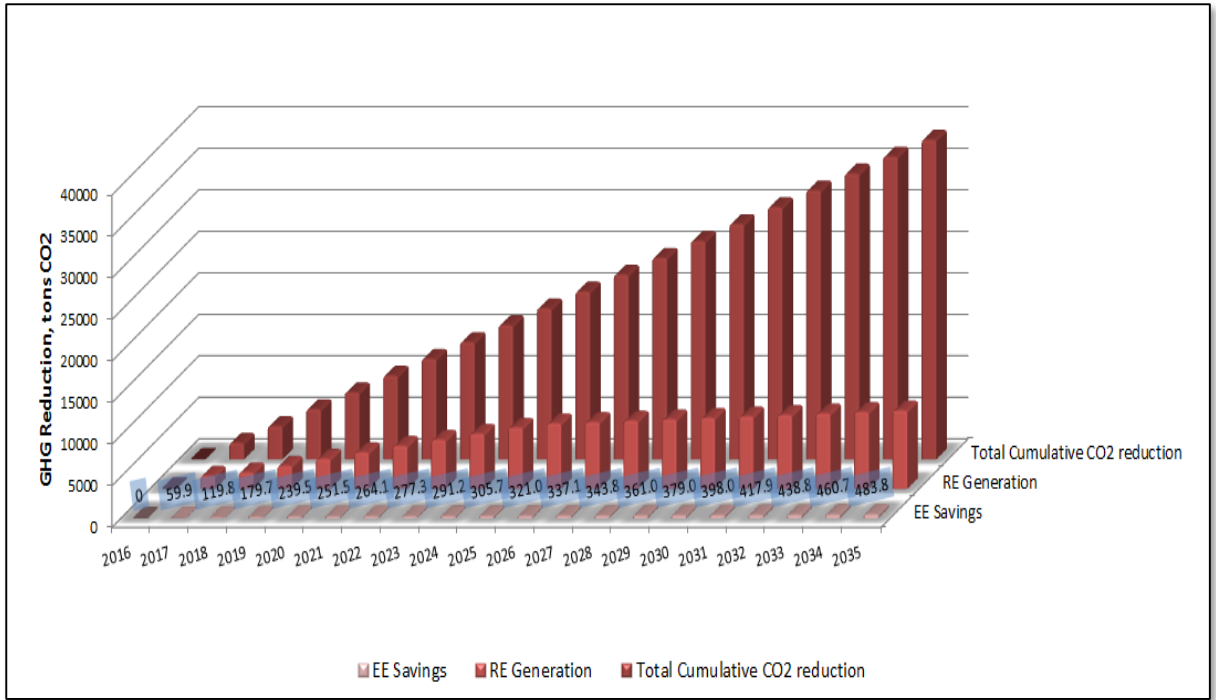


Figure 4: Annual GHG CO<sub>2</sub> Reduction Equivalent of RE Generation and EE Savings



**Figure 5: Cumulative CO<sub>2</sub> Emission Reduction**

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### III. STRATEGY

Owing to the country's limited natural resources, land availability, and small generation/consumption scale, selecting RE technologies suitable for Tuvalu has proven to be a difficult task. During the PPG phase, the application of several RE technologies was considered as demos under the FASNETT project. These included solar PV, concentrating solar power generation, electricity generation from biomass combustion or gasification, and other similar technically and economically feasible RE technologies that are existing in the region. Some RE technologies that are still in the developmental stage have not been considered for various reasons. Since other RE technologies, such as ocean thermal energy, tidal energy, and other similar technologies that may have potential in terms of resources, do not offer any substantial economic advantage over the existing ones which are mostly solar PV. Therefore, the project strategy is to use a mix of technologies that have already been proven or included in energy plans in Tuvalu or in other similarly-situated Pacific island countries in view of the country's 100% RE electricity target. The proposed power generation mix for the country is composed of the following: solar PV installations, wind energy farms, battery storage and back-up bio-diesel generators. Since the previous and current energy efficiency improvement efforts have not been enough to bring down petroleum-based electricity demand, additional EE-related activities and programs have to be carried out. The possible RE and EE technology options for Tuvalu, classified as: (a) for commercial adoption; and, (b) for demonstration for coverage by the FASNETT project, as determined during the FASNETT project development phase are as listed below. Refer also to Annex L.

#### A. For commercial adoption

##### *RE Applications*

- Solar PV systems
- Wind energy generators
- Solar water heaters (SWH) for domestic, commercial and industrial use to substitute for electric water heaters.
- Hybrid power generation systems such as wind/PV hybrid power system for charging backup batteries at several remote sites and wind/PV/diesel hybrid power systems specifically designed for power generation.
- Biomass, biogas, improved cook stoves, bio-diesel and other bio-energy systems that have been found practical for PICs that present fuel substitution possibilities in heating applications and electricity generation to bring down petroleum-based electricity generation.

Although a number of small-scale rural RE-based electrification projects have been carried out in Tuvalu over the last two decades, their impacts have been minimal since they are mostly donor-funded equipment-based demonstrations; some are non-operational now and lack real private sector participation. The Tuvalu Government understands the benefits of developing and utilizing available the RE resources. However, the more widespread utilization and application of RETs is constrained by many closely interrelated and intertwined barriers but will be resolved by the interventions that will be carried out in FASNETT.

##### *EE Applications*

In addition to current EE initiatives in Tuvalu, the project also includes EE activities on the development and implementation of energy efficiency policies, institutional and financial support for initiatives in the following:

- Application of EE technologies for increased demand-side energy efficiency and smart metering systems; and,
- Development and implementation of actions towards increased capacity to replace or modify inefficient power generation systems

## B. For Demonstrations

Proven successful applications of RE and EE technologies in PICs and other SIDS will be demonstrated in a demo program. This program is for showcasing potential applicable RE and EE technologies that can be adopted and replicated in Tuvalu. Based on the study done during the PPG phase, the following RE and EE technology application projects will be demonstrated under FASNETT:

### *RE Application*

- Floating 100 kWe solar PV power generation – This can be scaled-up to 2 MWe, and can potentially serve a significant portion of Funafuti’s electricity demand
- Off-grid solar PV desalination – This generates solar PV electricity which is used to desalinate sea water for the outer islands, e.g. the smallest of Tuvalu’s island, Niulakita.

### EE Application

- Financial incentive mechanism for replacement program for old, inefficient household and commercial appliances and equipment, e.g. refrigerators, freezers, lights, and other major electricity-consuming devices to more efficient models through incentives and rebate schemes following regulations on EE standards and labeling.
- Demand management/response system to augment existing facilities in TEC’s Demo Fale to provide assistance in coming up with updated load demand, technology choice and investment planning.

## **FASNETT Goal, Objectives, Outcomes and Outputs/Activities**

The goal of the FASNETT Project is **optimal growth rate of annual energy consumption and GHG emissions in the energy and energy end-use sectors in Tuvalu.**

The objective of the proposed GEF project is the facilitation of the development and utilization of feasible renewable energy resources and application of energy efficiency technologies for achieving realistic energy targets in Tuvalu. A comprehensive evaluation of the set TNEP target will be done to confirm it or if necessary come up with a more realistic level of target considering the current situation in the energy sector of the country, the ongoing and planned initiatives in the country (by the government, donor agencies, private sector, etc.), and what can potentially be done to enhance the utilization of feasible RE resources and application of EE technologies that will support economic development in Tuvalu. The facilitation or enabling objective is meant to address, i.e., eliminate the identified barriers to the cost-effective application of RE technologies using the country’s indigenous RE resources, as well in the effective and extensive application of EE measures and techniques that are also in line with low carbon development and involved in the sustainable development in the country. In this regard, a barrier removal approach will be applied for this project. With the assistance of the GEF, the proposed project will facilitate the application of appropriate technological, institutional and policy-oriented options that would enable the widespread application of RE and EE technologies for supporting the sustainable development of Tuvaluans in all communities particularly

in the outer islands. This would involve making use, in a rational and cost-effective manner, of available RE and non-RE resources to ensure socio-economic growth that contributes to increased climatic resilience, productivity and income generation of the citizens, and GHG emission reduction. The baseline activities of the country will only achieve a portion of the TNEP target. Incremental activities have to be carried out to reach the target. The combination of the baseline and incremental activities will bring about the realization of the alternative scenario which features the realization of the TNEP targets. The proposed project will bring about this alternative scenario.

The project focuses on the enhanced utilization of feasible RE resources and optimal and efficient utilization of energy for supporting of socio-economic development, to contribute to the realization of the country's energy targets. This will cover the following:

1. Design and implementation of an improved advocacy and promotional program to improve awareness and attitude towards EE and RE applications in the public and energy sectors;
2. Formulation and advocacy work to lobby support for the approval and effective enforcement of policies, regulations and projects on the application of EE and RE technologies in the energy sector;
3. Establishment and implementation of an official institutional framework and mechanism for the regulation of the energy sector and enforcement of energy policies and regulations that among others, support RE and EE applications, and facilitate low carbon development;
4. Showcasing of more community-based application EE and RE technologies, as well as integrated energy planning and policy implementation, including the design and implementation of energy-related aspects of low carbon development; and,
5. Improving the availability/access to financial resources (local and foreign) for financing RE and EE initiatives, including the implementation of a low carbon technology application program and other financial instruments.

The FASNETT objective will be achieved through the implementation of four project components:

- Component 1: Awareness Raising on Renewable Energy and Energy Efficiency Applications
- Component 2: Energy Policy Improvement and Institutional Capacity Building
- Component 3: Applications of Renewable Energy & Energy Efficiency Technologies & Techniques
- Component 4: Financing of Renewable Energy and Energy Efficiency Initiatives

On the overall, the project's success will be reckoned on the basis of the % share of RE in the national power generation mix, cumulative GHG (CO<sub>2</sub>) emission reduction from power generation and number of women actively involved in the planning and implementation of energy services provision in the outer islands, among other indicators. The project assumes that regional oil prices will be at levels that make RE/EE still competitive and cost-effective, political stability of the country is sustained, acceptance of community of RE/EE application and financing institutions will continuously support RE/EE projects.

#### **Component 1: Awareness Raising on Renewable Energy and Energy Efficiency Applications**

This component is intended to address the barrier related to the low level of awareness and knowledge of the local authorities and the general public in Tuvalu both in the main island of Funafuti and in the outer islands about the concepts, principles and technologies and practices associated with low carbon development, which are essential in meeting the country's EE and RE targets.

**OUTCOME 1: Improved awareness and attitude towards sustainable RE & EE technology applications in the public, commercial and energy sectors**

Since the project is intended to assist the country in reaching its EE/RE targets by 2025, improved awareness and attitude will be focused on (1) participation of people in outer island communities; (2) info dissemination and skills uptake on non-solar PV systems; (3) energy uses of other RE resources, e.g., wind, ocean energy, piggery waste, biomass; (4) energy linkages with other socio-economic development projects in the country, including ongoing UNDP-GEF climate change adaptation project activities in the country; and, (5) EE techniques/measures applications in residential households and government buildings. These were identified initially to be areas where the project could contribute greater impact in achieving the RE/EE targets if they are significantly improved.

The following are the expected outputs that will be delivered to result to Outcome 1 and bring about improved awareness and attitude towards renewable energy and energy efficiency applications in the energy and energy end use sectors.

The table below summarizes the activities will be carried out under Component 1 to deliver each of the expected outputs that will collectively bring about Outcome 1.

Output	Activities
<b>Outcome 1: Improved awareness and attitude towards sustainable RE &amp; EE technology applications in the public, commercial and energy sectors</b>	
1.1: Report on impact analysis of previous EE/RE capacity development activities.	1.1: Evaluation of the impacts of past and ongoing RE/EE capacity building activities in Tuvalu
1.2: Completed capacity needs assessment in the area of EE/RE applications	1.2: Conduct of capacity needs assessment in RE/EE technology applications for key stakeholder groups
1.3: Completed design and implementation of suitable EE/RE capacity development programs for key stakeholder groups	1.3.1: Design, organization and conduct of suitable capacity development program on the provision of energy services for RE/EE systems.
	1.3.2: Design, organization and conduct of suitable capacity development program for the public particularly starting with secondary students taking up appropriate RE/EE and climate change subjects in school curricula.
1.4: Comprehensive evaluation report on implemented capacity building programs	1.4: Evaluation of implemented capacity building programs establishing the resulting level of decision making capability within the government and stakeholders on RE/EE
1.5: Published and disseminated information on: (a) Sustainable EE & RE technology applications in island communities; (b) Results of project activities particularly from the EE/RE technology and commercial application pilots and demonstrations; (c) Formulated and approved policies and regulatory frameworks in support of EE/RE applications and low carbon development; and, (d) Mechanics of the established financing schemes.	1.5.1: Development and implementation of a communication plan and coordination mechanism on RE/EE application
	1.5.2: Updating of information on EE & RE technology applications in island communities and results of project activities particularly from the EE/RE technology and commercial application pilots and demonstrations and of information on household survey on usage of EE appliances and devices
	1.5.3: Documentation, publication and dissemination of information on: (a) Sustainable EE & RE technology applications in island communities; (b) Results of project activities particularly from the EE/RE technology and commercial application pilots and demonstrations; (c) Formulated and approved policies and regulatory frameworks in support of EE/RE applications and low carbon development; and, (d) Mechanics of the established financing schemes
	1.5.4: Conduct of public awareness workshops and radio programs on RE/EE

Output	Activities
1.6: Established and operational information exchange network and website for the promotion and dissemination of knowledge on low carbon development	1.6: Establishment and operationalization of an information exchange network and website on RE/EE within and outside Tuvalu
1.7: Established and operationalized energy supply and consumption monitoring and reporting and data banking system	1.7: Design, establishment and operationalization of an energy supply and consumption monitoring, reporting and data banking system in Tuvalu

**Output 1.1: Report on impact analysis of previous EE/RE capacity development activities.**

*Activity 1.1: Evaluation of the impacts of past and ongoing RE/EE capacity building activities in Tuvalu.*

This activity focuses on analyzing what the baseline projects have achieved and what have not been done in terms of capacity development in resource assessment, RE/EE technologies and their application, policy development and institutional strengthening. The evaluation will give attention on how the past and ongoing projects have enhanced the capacity of the country in achieving the goal of 100% RE which was set in 2009 and what areas are still lacking to achieve the goal so that specific capacity development program can be defined.

*GEF support is needed for the technical assistance in the analysis and evaluation of the past and present capacity development for RE/EE.*

**Output 1.2: Completed capacity needs assessment in the area of EE/RE applications**

*Activity 1.2: Conduct of capacity needs assessment in RE/EE technology applications.* This activity involves the conduct of a comprehensive assessment of the information, training and capacity building needs of stakeholders and key players in RE and EE in Tuvalu. The assessment will include the needs in the outer islands through surveys and interviews and will determine barriers on enhancing level of knowledge, capacity and skills of relevant government entities, target users and service providers on the application, design and implementation of RE/EE projects. It should consider the current capacity of the key stakeholders and the magnitude of the RE/EE projects that are being identified in the Government’s RE/EE program to attain its 100% GHG reduction objectives through RE/EE applications. Based on the initial studies of the PPG Project Design Team, the RE/EE projects and the related energy services will be out-sourced since the local service industry on RE/EE is very limited in Tuvalu. It is therefore anticipated that capacity needs assessment will cover, on one hand, the energy supply side which is basically TEC, and the relevant government agencies and their designated personnel undertaking the energy services procurement process and on the other, the energy demand side, the general public and the schools for disseminating relevant information and knowhow.

*GEF support is required for technical assistance in the design and conduct of surveys and interviews and analysis of findings.*

**Output 1.3: Completed design and implementation of suitable EE/RE capacity development programs for key stakeholder groups**

The key stakeholder groups that need capacity development and awareness in the application of RE/EE technologies in the Tuvalu context are the government authorities and technical personnel from the supply side and the public, with a special focus on the role of the schools in disseminating information to increase awareness, from the demand side, as described in the two sets of activities below.

*Activity 1.3.1: Design, organization and conduct of suitable capacity development program.* This activity entails the design and implementation of the capacity development program on the energy supply side for government authorities and technical personnel on low carbon development, integrated energy planning, application of EE/RE technologies, techniques and practices for sustainable development, and based on the conclusions and recommendations of the assessment. It should be noted that the capacity development program included herewith under Output 1.3 is at the individual level, as differentiated from the capacity development in Component 2 which is on the policy and institutional level. In view of the limited local service industry to fully support the RE/EE program in Tuvalu, this activity will involve primarily hands-on specialized training on out-sourcing, procurement and engagement of local and international energy services providers on project development and documentation of terms of reference, bidding, contacting and performance compliance on the provision of services in the proper design, engineering, installation, energy efficient operation and maintenance of RE/EE systems. Based on the detailed recommendations of the capacity needs assessment, the capacity development program will involve the comprehensive workshops on energy services performance contracts (ESPCs). This will consist of the hands-on and on-site training of the members of the ESPC Team that will be organized for the ED/MPUI and TEC so they can train together to effectively define the projects that will be included in the Government's RE/EE program to meet its 100% GHG reduction objectives, to understand the ESPC process, recommend measures on keeping the project implementation on track, evaluate energy savings, and implement the measurement and verification (M&V) system. The workshop will be undertaken in two levels of the ESPC Team: (a) the executive or officers' level, focusing on oversight, leadership, management and administrative aspects and (b) the technical working level which provides the working details of the program and the coordination mechanisms. The design, organization and conduct of this capacity development program will be undertaken with the assistance of the International Sustainable Energy Expert on RE & EE in close coordination with the ED/MPUI and TEC.

*Activity 1.3.2: Design, organization and conduct of suitable capacity development program for the public and targeted users particularly starting with secondary students taking up appropriate RE/EE and climate change subjects in school curricula.* This activity, in recognition of the important role of the schools in the information dissemination and awareness objective of the project, will involve the design and adoption of the appropriate RE and EE technologies and climate change subjects in the school curricula. It caters to the students and the schools in their important role in information dissemination and awareness on the government's RE/EE program vis-à-vis the 100% GHG reduction goal. The ED/MPUI and TEC will coordinate closely with the relevant agencies involved in the education system in Tuvalu, primarily the Ministry of Education, Youth and Sport and the local governments. The design, organization and conduct of this capacity development program will be undertaken with the assistance of the International Sustainable Energy Expert on RE & EE in close coordination with the ED/MPUI, TEC and the Ministry of Education, Youth and Sports. Based on the findings and recommendations of the studies conducted on the information dissemination strategy and tools, the ED/MPUI, TEC and the Ministry of Education will cooperate in developing the policy and detailed implementing guidelines, the team shall develop a cabinet position paper on RE/EE program for cabinet approval; conduct of professional consultations with relevant stakeholders on RE/EE education; design, piloting and evaluation system of the RE/EE segment in the school curriculum; implementation of enhanced RE/EE modules in all schools; and establishment of a scholarship/training program for qualified Tuvalu students and practitioners to undertake studies in applicable and feasible RE alternative sources and EE technologies and techniques in cooperation with reputable international companies.



*GEF support is required for the technical assistance in the preparation of the RE/EE capacity building programs for the key stakeholders and the necessary the training materials, detailed planning, conduct and implementation of the programs.*

#### **Output 1.4: Comprehensive evaluation report on implemented capacity building programs**

*Activity 1.4: Evaluation on implemented capacity building programs.* Towards the continuing improvement and the sustenance of the capacity development program, all training or capacity building interventions will be evaluated in terms of their impacts and relevance, and whether these address the identified capacity development needs. The results of the evaluation are then used as guide in the redesign or modification of the capacity development program to make it more responsive to the capacity development needs towards increased decision making capability within the government and all stakeholders on RE/EE.

*GEF support is required for the technical assistance and materials for developing, adopting, implementing and reporting of the evaluation using standards and tools.*

#### **Output 1.5: Published and disseminated information on RE/EE application**

This output consists of published and disseminated information on results from the various components of the FASNETT Project:

- (a) Sustainable EE & RE technology applications in island communities;
- (b) Results of project activities particularly from the EE/RE technology and commercial application pilots and demonstrations;
- (c) Formulated and approved policies and regulatory frameworks in support of EE/RE applications and low carbon development; and,
- (d) Mechanics of the established financing schemes.

The design and implementation of the information dissemination and promotion program shall involve various innovative strategies to facilitate generation of useful database to various end-users, the expedient exchange of information using the internet, website and utilization of tri-media for promotion and outreach NRE campaign. These activities have an end-goal of facilitating growth of RE/EE applications by enhancing the confidence of target end-users in making decisions on the use of RE/EE systems and by encouraging RE/EE project developers and private investors to supply the needs of consumers with reliable and affordable energy services through RE/EE technologies and techniques.

*Activity 1.5.1: Development and implementation of a communication plan and coordination mechanism on RE/EE application.* This activity involves the formulation, approval and implementation of a communication strategy and plan that will integrate the core essence of all messages that will be communicated to the public domain and other stakeholders on the RE/EE policy and program of Tuvalu through different modes of information dissemination. The plan will include means of coordination to ensure the continuity of existing partnerships with the people and partners in line with the approved communications and coordination strategy.

*GEF support is required for the technical assistance needed to establish the system especially including the needs of the outer islands.*

*Activity 1.5.2: Updating of information on EE & RE technology applications in island communities and results of project activities.* This activity involves firstly, the inventory, review and analysis of performance of existing RE/EE projects to gather lessons learned and best practices from these projects in Tuvalu and compare them with similar RE/EE projects in other PICs. The state-of-the-art

report will be used as inputs to the demonstration pilots and replication projects. Secondly, as the second generation projects are implemented in the second half of the project implementation, there will be a second updating of the information on EE/RE technology application in Tuvalu vis-à-vis experiences in other PICs.

*GEF support is required for technical assistance in the development, production and dissemination of the information packages.*

*Activity 1.5.3: Documentation, publication and dissemination of information.* This activity involves the production of information packages that will be disseminated to the public and stakeholders, particularly on the RE technology and commercial application pilots and demonstrations and information on household survey on usage of appliances and devices that leads to possible EE practices and replacement of old inefficient units. In order to increase awareness and encourage program participants to pursue their own RE/EE applications, the information packages will highlight experiences sharing and necessary information and guidelines on the following, among others:

- (a) RE resources availability
- (b) Household energy and appliance survey and potentials for energy conservation and replacement incentives for old appliances to improve energy efficiency
- (c) Sustainable EE & RE technology applications in island communities;
- (d) Results of project activities particularly from the EE/RE technology and commercial application pilots and demonstrations in Tuvalu vis-à-vis project experiences in other PICs that are similarly situated ;
- (e) Formulated and approved policies and regulatory frameworks in support of EE/RE applications and low carbon development in Tuvalu; and,
- (f) Mechanics of the established financing schemes in Tuvalu.

*GEF support is required for the technical assistance and logistical needs in the development, production and dissemination of the information packages.*

*Activity 1.5.4: Conduct of public awareness workshops and radio programs on RE/EE.* This activity involves the conduct of workshops and radio announcements regarding the relevant information directed towards the target beneficiaries and participants of the project using information and knowledge gathered through the projects information and awareness activities and outputs.

*GEF support is required for the technical assistance in the design, conduct and evaluation of the workshops and radio programs conducted by the project.*

#### **Output 1.6: Established and operational information exchange network and website for the promotion and dissemination of knowledge on low carbon development**

*Activity 1.6: Establishment and operationalization of an information exchange network and website on RE/EE within and outside Tuvalu.* This activity involves the design and development of a practical program on information exchange to be coordinated by the ED/MPUI in cooperation with the different relevant government agencies which are implementing similar mitigation projects in energy as well as agencies involved in adaptation projects in order to have a more focused and directed coverage since both kinds of projects are complementary specially in the outer islands. Information exchange service that will be developed under this activity shall not be limited to usual printed information packages but will also use social media through the internet and broadcast networks. This will also harness the existing and planned information sharing with other countries, especially with other similarly-situated

PICs. Technical reports generated in Outputs 3.1.4 and 3.1.5 can also be uploaded and shared in this information exchange network and website.

*GEF support is required for technical and financial assistance in the design, establishment and operation of the RE/EE information exchanged system and website.*

### **Output 1.7: Established and operationalized energy supply and consumption monitoring and reporting and data banking system**

*Activity 1.7: Design, establishment and operationalization of an energy supply and consumption monitoring, reporting and data banking system in Tuvalu.* A unified database system shall be designed with specifications of its functional, software, hardware and maintenance requirements. The design shall identify the most suitable database linking system that will be linked with other projects that have common target recipients. Special mechanisms shall also be developed to make system accessible to target RE/EE clients through internet. The system shall be used for monitoring and reporting which particular to the needs of the outer islands in line with the government's telecommunication and internet upgrading. Data derived from the PMMS (Output 3.1.4) and the M&E system (Output 3.1.5) will serve as inputs to this data banking system.

*GEF support is required for technical and financial assistance in the design, establishment and operation of the RE/EE data banking system*

Since the project is intended to assist the country in reaching its EE/RE targets by 2020 (which was updated to extend to 2025), for this component, the focus will be more on what the baseline projects have not done in terms of capacity development. For example focusing on: (1) people in outer island communities; (2) info dissemination and skills uptake on non-solar PV systems; (3) energy uses of other RE resources, e.g., piggery waste; (4) energy linkages with other socio-economic development projects in the country, including ongoing UNDP-GEF climate change adaptation (CCA) project activities in the country; and, (5) EE techniques/measures applications in residential households and government buildings.

## **Component 2: Energy Policy Improvement and Institutional Capacity Building**

This component aims to eliminate barriers related to policies and regulations that hinder the sustainable promotion and application of low carbon development initiatives that will contribute to the achievement of Tuvalu's EE and RE targets, as well as barriers related to the weak institutional framework in the cross-cutting areas of energy, utilities and infrastructures in Tuvalu. The coherent and integrated implementation of enhanced policies, regulations and projects on energy development and utilization in support of national economic development is the expected outcome from the expected deliverables under this component.

### **OUTCOME 2: Coherent and integrated implementation of enhanced policies, regulations and projects on energy development and utilization with the country's energy act in support of national economic development**

The table below summarizes the activities will be carried out under Component 2 to deliver each of the expected outputs that will collectively bring about Outcome 2.

Output	Activities
<b>Outcome 2: Coherent and integrated implementation of enhanced policies, regulations and projects on energy development and utilization with the country's energy act in support of national economic development.</b>	
2.1: Completed policy research, analysis and assessment on low carbon community development, as well as institutional mechanisms compatible to the Tuvaluan context	2.1: Conduct of policy research, analysis and assessment on low carbon community development, as well as institutional mechanisms applicable to Tuvalu considering experiences in successful implementation and lessons learned in other similar small island developing states (SIDS) and their impacts (social, economic and environmental)
2.2: Recommended standards, policies and implementing rules and regulations (IRRs) on the promotion and application of EE/RE technologies, and financing schemes for EE/RE applications embodied in an energy bill based on completed researches as well as results of implemented low carbon (EE/RE) technology application demonstrations in Tuvalu and other similar SIDS	2.2.1: Development and enactment of the Energy Act
	2.2.2: Conduct of advocacy work and lobbying for the deliberation and enactment of the energy bill
2.3: Formulated and enforced policies by well-informed legislators and administrators on the provision of energy services, including the publication and dissemination of guides and reference documents for the integrated energy planning and low carbon development in the context of Tuvalu	2.3.1: Development and dissemination of implementing rules and regulations and organizational requirements for all RE resources applicable to Tuvalu and for application of EE technologies and efficient appliances according to approved standards of operation and safety
	2.3.2: Launching and dissemination of relevant information on policy and management of the RE/EE program at the institutional level towards awareness of all sectors regarding the Energy Act and its implementing rules and guidelines
	2.3.3: Capacity building of key officials and staff in the energy organization authorized by the Energy Act and acquisition of necessary tools such as integrated energy planning software, linking with data bases, and other related requirements
	2.3.4: Preparation, facilitation of the approval and implementation of the Tuvalu National Integrated Energy Plan
2.4: Enforcement of the institutional framework and guidelines that support the implementation of low carbon development policies, and IRRs	2.4.1: Conduct of studies and recommendations on the improvement of the institutional working arrangements and implementing guidelines for NEAC.
	2.4.2: Coordination and establishment of technical working groups (TWGs) comprised of the relevant government agencies, local leaders, financial sector and support industry to remove related barriers such as land use, resource mobilization, community-based development for the replication of RE/EE projects of government, community and private entrepreneurs
2.5: Adopted and enforced: (a) sustainable low carbon standards, policies, and IRRs; and (b) suitable institutional mechanisms that integrate low carbon development with the socio-economic, climate change and disaster management objectives of the country	2.5: Formulation and implementation of applicable policies, standards, institutional mechanisms and incentives in the promotion and application of RE/EE technologies
2.6: Performance evaluation report on the adopted institutional framework and mechanisms	2.6: Development and operationalization of a monitoring, reporting, evaluation and enhancement system for sustainable, reliable and self-reliant energy supply based on RE and EE applications consistent with Tuvalu 100% RE goal

Output	Activities
2.7: Approved follow-up and sustainability plan for the enforcement of consistent government development plans, policies and institutional framework and mechanisms on RE/EE applications	2.7: Development and approval of follow-up and sustainability plan for the monitoring, evaluation and enhancement of low carbon development plans and policies, as well as enhancements of the institutional framework and mechanisms for sustainably enforcing consistent government policies on RE/EE to support national development

**Output 2.1: Completed policy research, analysis and assessment on low carbon community development, as well as institutional mechanisms compatible to the Tuvaluan context**

*Activity 2.1: Conduct of policy research, analysis and assessment on low carbon community development, as well as institutional mechanisms applicable to Tuvalu.* This activity involves a comprehensive scanning on policies and implementation regulations considering experiences in successful experiences and lessons learned in previous RE/EE projects in Tuvalu as well as in other similar small island developing states (SIDS) and their impacts (social, economic and environmental). This produce policy monographs that will be circulated among the agencies and discussed in workshops to crystallize the relevant policy recommendations that will be embodied in the energy bill that gives more priority to the development and application EE technologies and techniques that will bring down the petroleum-electricity demand and the deployment of economic and ready RE technologies techniques to increase their penetration in the power supply system of the country, as well as develop guidelines in the retirement of inefficient and old diesel gen-sets as well as fuel substitution by RE-based fuels such as bio-diesel. The various studies on policy and market development that will be conducted under this component shall provide salient provisions that will be recommended for inclusion in the bill. Corresponding legislative lobbying shall also be undertaken to facilitate the immediate passage of the NRE Bill. Promotional support shall also be provided

*GEF assistance is required for the technical assistance in the policy research work, regional mission trips of ED/MPUI/TEC officials involved in the project for gathering country experiences, best practices and lessons learned on policy formulation and institutional strengthening and the production of the RE/EE policy and institutional monographs evolving from the research and strategic discussions.*

**Output 2.2: Recommended standards, policies and implementing rules and regulations (IRRs) to be embodied in an energy bill based on completed researches as well as results of implemented low carbon (EE/RE) technology application demonstrations in Tuvalu and other similar SIDS**

*Activity 2.2.1: Development and enactment of the Energy Act.* This activity involves the development of a legislative agenda and strategy to facilitate the passage of an energy bill in the parliament within the duration of the FASNETT project. The Office of the Attorney general, and the relevant government agencies will be consulted in coming up with the provisions that will be included in the draft bill. This includes the recommended standards, policies and regulations and institutional strengthening based on policy monographs developed that will encourage the realization of the 100% RE goal through investment in RE and EE projects.

*GEF support is required for technical and financial assistance in the conduct of parliament liaison, conferences, workshops, study tours and regional missions in building the capacity, familiarization and developing interest of the parliamentarians and their technical staff on RE and EE technologies and benefits.*

*Activity 2.2.2: Conduct of advocacy work and lobbying for the deliberation and enactment of the energy bill.* This activity involves planning, coordination, managing, lobbying and facilitation of the deliberation and enactment processes. It also entails technical support for hearings, drafting,

documentation for the passage energy law and its rules and regulations vis-à-vis existing policies on petroleum product importation, supply distribution and usage. Politicians will have access to current and well-formulated information to support decision-making.

*GEF support is needed for the technical assistance in the legislative support activities.*

**Output 2.3: Formulated and enforced policies by well-informed legislators and administrators on the provision of energy services, including the publication and dissemination of guides and reference documents for the integrated energy planning and low carbon development in the context of Tuvalu**

*Activity 2.3.1: Development and dissemination of implementing rules and regulations and organizational requirements for all RE resources applicable to Tuvalu and for application of EE technologies and efficient appliances according to approved standards of operation and safety.* This activity involves the parallel drafting and discussions of the implementing guidance, rules and regulations on RE and EE technology application and investment with the corresponding standards and regulatory frameworks and rules to support the enacted Energy Law. Meetings and consultations with concerned stakeholders particularly the regional/local providers of RE and EE systems and products shall be undertaken for the setting up of the performance standards, best practices and the recommended testing procedures. Registration of said standards and practices with concerned government institutions will be pursued. A promotional program for the adoption and widespread use of the prescribed standards and best practices shall be developed and implemented. This may include dissemination of the standards and best practices in official publication, on the internet and other government and industry channels.

*GEF support is required for technical and financial assistance in the production of information packages, guides and reference documents and conduct of training and workshops.*

*Activity 2.3.2: Launching and dissemination of relevant information on policy and management of the RE/EE program at the institutional level towards awareness of all sectors regarding the Energy Act and its implementing rules and guidelines.* This activity involves the introduction, planning and implementation of the campaign and promotion for the new Energy Law and the implementing rules and regulations through workshops and conferences.

*GEF support is required for the technical assistance and resources to launch and disseminate the new Energy Law and the IRR.*

*Activity 2.3.3: Capacity building of key officials and staff in the energy organization authorized by the Energy Act and acquisition of necessary tools such as integrated energy planning software, linking with data bases, and other related requirements.* The capacity of major stakeholders in tapping the country's RE resources and enforcing EE policies towards an integrated approach in the various aspects of RE and EE development and commercialization, needs to be enhanced particularly in the policy/regulatory, institutional, financial, market, technical and operational aspects. This activity involves the acquisition of integrated energy planning system and software, incorporating necessary modification to suit Tuvalu's context and needs and the conduct of necessary training and attendance to conferences for the adoption, establishment and continuing improvement of the integrated energy planning system.

*GEF is required for the acquisition of the integrated energy planning software and planning models and the required computer hardware as well as the capacity building of key official and staff under the new and strengthened energy administration.*

*Activity 2.3.4: Preparation, facilitation of the approval and implementation of the Tuvalu National Integrated Energy Plan.* This activity involves the development of integrated model for the conduct of systematic RE/EE planning that will provide measures and monitoring for the RE/EE market development and penetration in electricity generation. Also, an institutional framework shall also be established to facilitate the participation of other stakeholders in the planning process such as the other related government agencies, the private sector and concerned NGOs as well as outer island and community-based organizations. As a result of various studies and planning simulations in this activity, the ED/MPUI will spearhead the drafting and finalization of the new Five-Year Tuvalu National Integrated Energy Plan 2017-2022. In so doing, the target of 100% RE penetration and zero GHG emissions by 2025 will be validated and similarly, the target RE capacities and energy generation can better be ascertained. Under this activity, a RE penetration and EE electricity demand reduction simulation model shall also be developed to assist ED/MPUI energy planners in designing and planning for RE and EE projects particularly in RE grid-electricity production. On the other hand, the Integrated Energy Planning activity shall involve the formulation of planning framework that will integrate socio-economic and development goals in the developing plans and programs for RE.

*GEF support is required for the: (1) capacity building of key officials and staff who will be in-charge of the energy planning function; (2) technical assistance in developing energy planning models and simulations of the base case and various scenarios; and, (3) preparation and publication of the Tuvalu National Integrated Energy Plan*

**Output 2.4: Formulated and enforced institutional framework that supports the implementation of low carbon development policies, and IRRs**

*Activity 2.4.1: Conduct studies and provide recommendations on the improvement of the institutional working arrangements and implementing guidelines for NEAC.* The operationalization of NEAC is the responsibility of the GOT. However, the country needs support for the strengthening of the RE/EE development and utilization bureau under the reorganized Department of Energy through the conduct of studies and implement the recommendations for the improvement of the NEAC operations. Thus, incrementally, this activity involves the revamp of the organizational setup, roles and responsibilities of the various key stakeholders/players in the energy sector that comprise the NEAC, with particular focus on the optimum application of RE and EE in the energy and energy end-use sectors of the country. The NEAC will regularly coordinate and report on energy policy issues related broadly to policies within the country's overall energy, petroleum (diesel) phase-out, and the necessary coordination between the industry and financial sectors. It will be tasked primarily with the formulation of recommendations on low carbon development policies; setting of energy plan framework, annual targets, budgets and institutional requirements; monitoring of impacts of policy implementation and coordination on the revision and improvement of policies and plans as necessary in pursuit of the country's 100% RE goal by 2025. This organization set-up can be initially developed as the FASNETT Project Steering Committee (PSC) during the implementation of the GEF project, until the PSC's roles and functions shall be broadened into the NEAC and officially confirmed when the Energy Law comes into full force. The timing depends on the readiness of the organization to function as intended to be the NEAC that provides overall advisory and guidance to ED/MPUI.

*GEF support is required for the technical assistance and resources for the operation of the NEAC.*

*Activity 2.4.2: Coordination and establishment of technical working groups (TWGs) comprised of the relevant government agencies, local leaders, financial sector and support industry to remove related barriers such as land use, resource mobilization, and community-based development for the replication of RE/EE projects of government, community and private entrepreneurs.* With the baseline activity

regarding the operation of the NEAC whose members represent the various key stakeholders/players in the energy sector and related sectors of the Tuvalu economy, the needed incremental activities that will directly address the coordination, problem solving and barrier removal actions will be facilitated and directed towards the avowed goal in a timely manner through the deliberations, inputs and recommendations of the TWGs to make the RE/EE program sustainable and responsive to the 100% GHG reduction goals of the country. The TWGs will have regular meetings and recommend measures for decision making and policy to directly address implementation issues. They are still incremental in the form of support for the activities that cannot or were not budgeted in the regular govt. budgeting cycles.

*GEF support is required for technical assistance in coordinating and establishing TWGs.*

**Output 2.5: Adopted and enforced: (a) sustainable low carbon standards, policies, and IRRs; and (b) suitable institutional mechanisms that integrate low carbon development with the socio-economic, climate change and disaster management objectives of the country**

*Activity 2.5: Formulation and implementation of applicable policies, standards and incentive mechanisms in the promotion and application of RE/EE technologies.* Based on the studies conducted by the project, this activity will develop and facilitate the adoption of standards for RE/EE systems and components reaching Tuvalu to address the issues raised by RE/EE stakeholders considering the overarching objectives of the country concerning the socio-economic, climate change and disaster management, The RE/EE standards will be enforced with the provision of incentive mechanisms for good quality and reliable RE/EE products and guidance to consumers in making intelligent decisions for their selection and purchase. The set of standards and guidelines in RE/EE application will also be available in the common language to aid in the promotion and application of RE/EE technology. The project will provide assistance in the implementation of the RE/EE standards through availing of services by testing and verification centers in the region since establishing these centers is not possible in the Tuvalu because of limited volume.

*GEF support is required for technical assistance and financial resources in developing and adopting the RE/EE standards and in availing of testing services in the region.*

**Output 2.6: Performance evaluation report on the adopted policy and institutional framework and mechanisms**

*Activity 2.6: Development and operationalization of a monitoring, reporting, evaluation and enhancement system for sustainable, reliable and self-reliant energy supply based on RE and EE applications consistent with Tuvalu 100% RE goal by 2025.* This activity will involve the development of a monitoring, reporting, evaluation and enhancement system, (or simply referred to as an M&E system) for the assessment of the policy impacts, technology provisions and financing assistance program for RE/EE applications. The M&E reports to be generated in this activity will be at the policy/institutional level and will use data and information and analysis on the operational performance, maintenance and energy saving delivery from the RE/EE demos and other existing RE/EE projects that will be monitored and evaluated in **Activity 3.1.3.2**. The integrated report will be the basis of the national report in the attainment of the 100% GHG reduction through the RE/EE program, the PMO's report to UNDP-GEF as the Annual Project Report/Project Implementation Review (APR/PIR) and in other reports as may be required. The M&E system shall define the framework and parameters that will be used to assess the effectiveness of the policy and institutional adopted by the government as initiated by the FASNETT project. Once developed, the M&E system shall provide recommendations towards the sustainability and future expansions of the program. Based on the said recommendations, a sustainable follow-up program shall be developed in **Activity 2.7** to ensure continuity and success of



RE/EE program in Tuvalu towards the said goal. Towards the end of the project, a plan for integrating all RE/EE M&E systems, e.g. linking the OPMMS developed and operated in **Activity 3.1.3** to this M&E system, will be proposed as an expansion to include all RE and EE project installations and replication projects in all the Tuvalu islands with respect to the Tuvalu goal of 100% GHG reduction through RE-based power generation.

*GEF support is required for the technical assistance in developing and implementing the M&E system.*

**Output 2.7: Approved follow-up and sustainability plan for the enforcement of consistent government policies on RE/EE applications to support national development**

*Activity 2.7: Development and approval of follow-up and sustainability plan for the monitoring, evaluation and enhancement of low carbon development plans and policies, as well as enhancements of the institutional framework and mechanisms for sustainably enforcing consistent government policies on RE/EE to support national development.* Based on the approved policy and institutional framework, the RE/EE program adopted by the government, the reports of the M&E system in **Activity 2.6**, and the institutional structure to implement the program under the Energy Act, a sustainability and follow-up plan and financing scheme for RE/EE program shall be developed and endorsed before the project ends in 2020. This will encourage government commitment on the post-project sustainability and continuing implementation of the RE/EE program with a more defined TNEP along its 100% GHG reduction through RE/EE goal by 2025. Delineation of roles and responsibilities of different agencies and institutions shall be confirmed for the implementation of the said follow-up program. Funding sources to ensure the sustainable implementation of the program shall also be identified and pursued.

*GEF support is required for the technical assistance in development and the post-project arrangement for the implementation of the follow-up and sustainability plan.*

**Component 3: Applications of Renewable Energy & Energy Efficiency Technologies & Techniques**

This component is meant to address the need to enhance the technical capacity of the energy sector (including public works and utility) in the design, engineering, operation and maintenance of low carbon energy generation and supply infrastructures, as well as major energy consuming public infrastructures. It is also intended to address the low level of knowledge of energy consumers in the viability of EE and RE technology applications in public sector infrastructures and services, which will contribute to the realization of the EE and RE targets of the country. There are two (2) Outcomes under Component 3 resulting from the delivery of outputs from two groups of outcomes:

**OUTCOME 3.1: Enhanced energy utilization efficiency and development and application of feasible renewable energy resources in support of national economic development;** and,

**OUTCOME 3.2: Increased application of viable climate resilient renewable energy and energy efficiency technology applications in the country.**

The table below summarizes the activities will be carried out under Component 3 to deliver each of the expected outputs that will collectively bring about Outcomes 3.1 and 3.2.

Output	Activities
<b>Outcome 3.1: Enhanced energy utilization efficiency and development and application of feasible renewable energy resources in support of national economic development</b>	

Output	Activities
3.1.1: Completed evaluation report on applicable LC development technologies including applicable RE sources and EE technologies that can be feasibly applied in the small island environment in Tuvalu	3.1.1.1 Comprehensive evaluation of applicable low-carbon development technologies that can be feasibly applied in the small island environment in Tuvalu as experienced in other SIDS
	3.1.1.2: Conduct feasibility studies and disseminate recommendations on application of proven low-carbon development technologies using RE resources (solar <sup>2</sup> , wind, biomass, etc.), energy efficient (EE) techniques and other potential matured RE technologies
3.1.2: Completed designs, plans of demonstrations of approved RE and EE technologies that promote and support LC development in the country	3.1.2: Preparation of designs and implementation plans for the pilot demonstration and replication of alternative RE energy projects and EE techniques
3.1.3: Successful demonstration of approved EE and RE technologies that promote and support LC development in the country and comparative evaluation report from monitoring of other existing RE/EE installations	3.1.3.1: Development and establishment of a computer-based M&E system for performance, maintenance and energy contributions of RE/EE project demonstrations and other existing RE/EE installations
	3.1.3.2: Evaluation of the design and operating performance and experiences in all demonstration and other existing RE/EE installations
3.1.4: Published energy performance and impact reports on implemented LC projects; including action plan for community-supported LC energy initiatives in island communities	3.1.4: Documentation and dissemination of results and impacts of the RE/EE project demonstrations and the recommended action plan in promoting and replicating RE/EE projects for community-supported LC initiatives in island communities
3.1.5: Completed technical information packages and guidelines based on RE/EE project implementation experience for use in the capacity development program	3.1.5: Development and production of technical information packages and guidelines as inputs to the implementation of training workshops on strategic planning and execution of plans In Component 2 for national government authorities and local leaders
3.1.6: Completed design and implementation plans for the replication of demonstrated successful LC energy projects	3.1.6.1: Development of standard design for replication of RE/EE applications in other areas of the country
	3.1.6.2: Development of technical inputs to the establishment and enforcement of basic design and operating guidance manuals for the RE/EE replication program and policy to be developed in Component 2.
<b>Outcome 3.2: Increased application of viable climate resilient renewable energy and energy efficiency technology applications in the country.</b>	
3.2.1: Completed and operational LC development technology application demonstrations in accordance to established quality standards in pilot tropical coastal communities enhancing market opportunities for RE/EE applications	3.2.1: Implementation of the approved RE/EE demonstration projects to promote LC development in the country
3.2.2: Implemented LC projects in selected communities	3.2.2.1: Formulation and implementation of a technology development and application program for RE/EE in government, community-based and private business projects including technical support services, spare part management/supply, and grid connection, if necessary

<sup>2</sup> For solar PV installations, a feasibility study on the proposed residential and commercial buildings regarding the integrity of the rooftops to carry the additional load of the hardware should be conducted to provide recommendations on what to be done.

Output	Activities
	3.2.2.2: Development and implementation of a technical assistance scheme for individual RE and EE projects through the existing Demo EE House near TEC headquarters which will serve as a one-stop-shop for the project development, registration, application and processing, barrier removal and implementation of investment proposals for such RE/EE projects and the necessary coordination and compliance with existing TEC rules and regulations in case of RE-based power generation

\*\*The PMU will work with Energy Department, Labor Department, Land Use Bureau and Health Department, Solid Waste Action Team (SWAT) and accredited academic institutions

**OUTCOME 3.1: Enhanced energy utilization efficiency and development and application of feasible renewable energy resources in support of national economic development**

**Output 3.1.1: Completed evaluation report on applicable LC development technologies including applicable RE sources and EE Technologies that can be feasibly applied in the small island environment in Tuvalu**

*Activity 3.1.1.1: Comprehensive evaluation of applicable low-carbon development technologies that can be feasibly applied in the small island environment in Tuvalu as experienced in other SIDS.* Further to the PPG studies in connection with the FASNETT project development, this activity entails the evaluation of all possible low carbon (LC) technologies using RE resources (solar, wind, biomass, etc.), EE technologies and other possible mature RE technologies that will be applicable to Tuvalu based on experiences of other small island developing states (SIDS) and classify them into two groups: (a) those that are already commercially proven and mature and can be adopted already (referred herein as commercial RE/EE projects) and (b) those that will need some developmental and adaptive research work to suit Tuvalu’s situation and demonstration because of their significant replication potential (referred herein as demo RE/EE projects). The initial results of the PPG study on the proposed RE/EE projects belonging to either commercial adoption or pilot demonstration is seen in **Annex L**. This evaluation will be supplemented by the adaptive research on RE/EE technologies as part of regular functions of ED/MPUI and TEC.

*Activity 3.1.1.2: Conduct feasibility studies and disseminate recommendations on application of low-carbon development technologies (solar, wind, biomass, etc.) and energy efficient techniques that are proven and mature.* This activity involves the conduct of detailed feasibility studies on the selected RE/EE technologies that are for commercial adoption and for demonstration. The feasibility study shall contain complete information and recommendations on the policy, technical, socio-economic, market, and financial requirements of each proposed RE/EE project to ensure long-term sustainability of the technologies selected. For solar PV installations, a feasibility study on the proposed residential and commercial buildings regarding the integrity of the rooftops to carry the additional load of the hardware should be conducted to provide recommendations on what to be done. The results of the studies will be disseminated in a seminar-workshop among national government, local community leaders and private entrepreneurs to inform on the feasible RE/EE technologies, obtain feedback and encourage participation in the RE/EE commercial and demonstration projects. Based on the feedback, the feasibility studies and their recommendations under the two groups of RE/EE projects will be finalized. For the commercial adoption RE/EE projects, the proposals from TEC and other national government agencies, local community leaders and private entrepreneurs who will be interested to implement them will be processed through a registration system to be developed and organized under **Activity 3.2.2.2**. The projects that will be registered and approved by the GoT will provide baseload power generation for RE projects or decrease power demand by energy-efficient technologies for EE projects. As explained in the financial plan, these commercial RE/EE projects will be funded through co-financing by various proponents from the government, the TEC and private entities. For those proposed RE/EE projects that need some more developmental work through pilot demonstration and

detailed evaluation for their applicability in Tuvalu's situation that are deemed feasible and replicable will be designed and planned for implementation in **Activity 3.1.2**. They will be funded by grants provided by the FASNETT project within the allocated budget in the financial plan. For both groups of projects, the applicable financial mechanisms to make the RE/EE projects feasible and implementable will be studied in further detail in Component 4 to ensure their financial and economic sustainability.

*GEF support is required for the technical assistance and financial resources to conduct the comprehensive evaluation, feasibility studies and the seminar-workshops.*

### **Output 3.1.2: Completed designs, plans of demonstrations of approved EE and RE technologies that promote and support LC development in the country**

*Activity 3.1.2: Preparation of designs and implementation plans for the pilot demonstration and replication of alternative RE energy projects and EE techniques.* This activity involves the final selection of the proposed RE/EE pilot demonstration projects and their detailed design, implementation plan, financial, engineering, procurement and contracting requirements. Based on the PPG studies, the following are the initial concepts for pilot demonstrations that will be verified during the project implementation:

#### *RE Application*

- Floating 100 kWp solar PV power generation unit – This consists of small demo in the Mangrove Pond, in the 100 kWe range. Floating PV is a technology that has been proven and available for several years now and in many locations around the world, including oceans, lagoons, and lakes. The Mangrove pond is approximately a triangle with an area of 30,000 m<sup>2</sup>, with about 15-18,000 m<sup>2</sup> usable for floating PV installations. It will be operated and linked to the Funafuti grid. The power generation capability of floating solar PV is the same as land-based or roof-mounted installations. The Mangrove Pond Floating PV demo plant has the potential for expansion to 2 MW that can provide a significant portion of Funafuti's electricity generation.
- Off-grid Box for solar PV electricity generation and sea water desalination for the outer islands - This is a device that generates electricity with PV panels and desalinates water. It can be accessorized with batteries for electricity storage and with wind turbine for improving the renewable electricity generation capacity. The 5 kWe basic model, which does not include water desalination and wind turbines, but only PV panels and batteries, is quoted at €20-25,000 (or US\$ 21-26,000). A single unit scales up to 15 kWe. The Off-grid Box demo can be located in the smallest of Tuvalu's island, Niulakita.

#### *EE Application*

- Replacement programs for old, inefficient household and commercial appliances and equipment, e.g. refrigerators, freezers, lights, and other major electricity-consuming devices to more efficient models through incentives and rebate schemes following regulations in EE labeling and standards. To improve the efficiency of electricity consumption, funds similar to the Low Carbon Fund should be implemented. The GoT should mandate that all new appliances acquired in Tuvalu have to meet a minimum in terms of energy efficiency standards (e.g., 3.4-Star for refrigerators and freezers, and 4-Star for washing machines), as well as mandate the replacement of all inefficient appliances by the end of 2025, same deadline to achieve the 100% electricity from renewable sources; which would allow over nine years for the replacement. Since this would be a country-wide effort, a floating rebate percentage should be applied based on the annual income of the

applicants (i.e., from 25-50%), and the interest rate applied for the loan should be at an advantageous rate, such as the 3% applied by the Low Carbon Fund.

- Demand management/response system to augment existing facilities in TEC's Demo Fale to provide assistance in coming up with updated load demand, technology choice and investment planning. This EE demo is for testing a demand/response system at the 'Demo Fale' or Demo House that has been built near the TEC headquarters and the facilities can be used for this purpose. The cost of such demo is limited to a consultant and to the cost for a single unit, which is estimated to be in the USD 20,000 - 30,000 range.

The concise descriptions of the proposed RE/EE demo projects are in **Annex L**, which presents the results of the PPG Study on possible RE/EE projects to be covered by the FASNETT Project under commercial adoption or for pilot demonstration.

*GEF support is required for the technical assistance and financial resources for the preparation of detailed engineering designs, implementation plans, financial requirement and replication plan of the demo models based on the proposed pilot demonstration concepts and acquisition of the hardware to be used in the demos.*

**Output 3.1.3: Successful demonstration of approved EE and RE technologies that promote and support LC development in the country and comparative evaluation report from monitoring of other existing RE/EE installations**

*Activity 3.1.3.1: Development and establishment of a computer-based M&E system on operational performance, maintenance and energy contributions of all RE/EE project demonstrations and other existing RE/EE installations.* Considering improper operations and maintenance as one of the main technical barriers on RE/EE projects discussed in the foregoing sections, this activity involves the development of a system to ensure proper operations and preventive maintenance of the installations and timely availability of standard compliant spare parts and services for RE & EE systems. The main output of this activity is the series of published and disseminated reports on the operations and maintenance of all RE/EE projects from which O&M manuals can also be produced for the necessary training of relevant technical and management personnel. Based on the reports, a recommended action plan for all LC initiatives in all Tuvalu islands will be submitted for approval by designated authorities. The M&E system will be installed and be operated by a designated ED/MPUI agency in cooperation with TEC and other RE/.EE project owners.

*Activity 3.1.3.2: Evaluation of the design and operating performance and experiences in all demonstration and other existing RE/EE installations.* This activity involves the development, installation and operation of a project-level monitoring and evaluation (M&E) system for all RE/EE project demos in the country by the designated ED/MPUI agency. The M&E system will keep track of performance and impact of energy contributions of RE/EE project demonstrations. In order to have a more comprehensive coverage of the evaluation of the RE/EE project experience and lessons learned in Tuvalu, the performance and track records of all other RE/EE projects of the country will be included in the evaluation. The results of this project-level monitoring and evaluation in this activity will serve as inputs to the overall RE/EE policy/institutional level M&E that will be done in **Activity 2.6** where all the energy saving and GHG impacts, implementation experience and sustainability plans will be integrated at the national level.

*GEF support is for the technical assistance for the two activities in the development, installation and operationalization of the M&E system, training on the system and detailed evaluation work for the demos and other existing RE/EE installations and report preparation by the appropriate ED/MPUI agency.*

**Output 3.1.4: Published energy performance and impacts reports on implemented LC projects; including action plan for community-supported LC energy initiatives in island communities**

*Activity 3.1.4: Performance evaluation, documentation and dissemination of results and impacts of the RE/EE project demonstrations and the recommended action plan in promoting and replicating RE/EE projects for community-supported LC initiatives in island communities. The results of the annual monitoring and evaluation of all RE/EE projects gathered in **Activity 3.1.3** will be published and shared via internet-based website (Output 1.6) for the project.*

*GEF support is required for the technical assistance in the preparation of the report documents and information packages as well as the publication and dissemination of reports.*

**Output 3.1.5: Completed technical information packages and guidelines based on RE/EE project implementation experience for use in the capacity development program**

*Activity 3.1.5: Development and production of technical information packages and guidelines as inputs to the implementation of training workshops, strategic planning and execution of plans for national government authorities and local leaders in Component 2. This activity involves the synthesis of technical information tools and packages based on implementation experience to aid in for the wider promotion and application of RE/EE technologies for LC town and village development.*

*GEF support is required for the technical and financial assistance in the development and production of technical information and guidelines.*

**Output 3.1.6: Completed design and implementation plans for the replication of demonstrated successful LC energy projects**

*Activity 3.1.6.1: Development of standard design for replication of RE/EE applications in other areas of the country. This activity entails the conduct of the evaluation of the design and operating performance of each demo. The results of the performance analysis and the recommendations from the monitoring and evaluation reports in Activities 3.1.3 and 3.1.4 will serve as basis for continuing improvement of the operational performance of the demos, as well as for the development of the basic designs and action plans for the promotion and replication of successful RE and EE projects for TEC, national-government-supported and community-supported LC initiatives in all island communities.*

*GEF support is required for the technical assistance in the development of basic designs and implementation plans for RE/EE replication program and policy.*

*Activity 3.1.6.2: Development of technical inputs to the establishment and enforcement of basic design and operating guidance manuals for the RE/EE replication program and policy to be developed in Component 2. This activity involves the preparation of technical inputs to the overall policy and institutional development work including other aspects of RE/EE development such as occupational health and safety (OHS) policy and regulations and coordination with other relevant government agencies and institutions regarding land use, permitting process and community-based development.*

*GEF support is required for the technical assistance in the establishment and enforcement of basic design and operating guidance manuals for the RE/EE replication program and policy to be developed*

**OUTCOME 3.2: Increased application of viable climate resilient renewable energy and energy efficiency technology applications in the country**

**Output 3.2.1: Completed and operational LC development technology application demonstrations in accordance to established quality standards in pilot tropical coastal communities enhancing market opportunities for RE/EE applications**

*Activity 3.2.1: Implementation of the approved RE/EE demonstration projects to promote LC development in the country.* This activity includes all appraised and recommended demonstrations of applications of RE-based energy systems (for electricity and non-electricity) that will reduce petroleum-based power using feasible RE resources such as solar energy, and biomass (solid waste, animal waste), as well EE technology applications in lighting and air conditioning systems in major buildings and selected households. This will involve the procurement, delivery, installation, initial operation and debugging of the RE/EE facility as well as the associated technical consultancy and training for the approved RE/EE demonstration projects based on **Output 3.1.2**.

*GEF support is required for the incremental financial requirements for the procurement, delivery, installation, initial operation and debugging of the installed system; and technical assistance for the associated technical consultancy and training.*

**Output 3.2.2: Implemented LC projects in selected communities**

*Activity 3.2.2.1: Formulation and implementation of a technology development and application program for RE/EE in government, community-based and private business projects for selected island communities.* This activity involves the showcasing of more community-based applications of RE and EE technologies as well as application the integrated energy planning and policy implementation that will be developed in Component 2 to accelerate investment decisions to undertake RE and EE projects. This will include provision of technical support services, spare part management/supply, and grid connection, if necessary.

*Activity 3.2.2.2: Development and implementation of a technical assistance scheme for individual commercial and residential RE and EE project investment proposals from national government agencies, local community leaders and private entrepreneurs.* This activity involves the development and organization of a system for registering, processing and approving RE/EE projects proposals from various proponents in addition to centralized power generation already being implemented by TEC. The project will provide technical assistance for individual RE and EE projects through the existing Demo EE House near TEC headquarters which will serve as a one-stop-shop for the project development, registration, application and processing, barrier removal and implementation of investment proposals for such RE/EE projects and the necessary coordination and compliance with existing TEC rules and regulations in case of RE-based power generation This system will serve to simplify and facilitate the processing and approval of RE and EE projects considering several barriers that could affect or delay the implementation of these projects in terms of addressing issues including safety, land use, permitting process, community-based development and other cross-cutting issues. This is linked with **Activity 2.4.2** regarding the tasks of the TWGs on barrier removal process

*GEF support is required for the technical assistance to individual applicants in to encourage them to make their investment decisions on RE and EE projects.*

**Component 4: Financing of Renewable Energy and Energy Efficiency Initiatives**

This component will address the barriers related to the lack of access and available financing for low carbon development initiatives in Tuvalu. Since the implementation EE and RE initiatives is necessary in meeting the EE and RE targets of the country, the availability of financing for such projects is important. There are two (2) Outcomes under Component 4 resulting from the delivery of outputs from two groups of activities:

**OUTCOME 4.1: Improved availability of, and access to, financing for climate resilient renewable energy and energy efficiency, and,**

**OUTCOME 4.2: GoT, the financial sector and donor agencies providing accessible financing for climate resilient renewable energy and energy efficiency projects.**

The table below summarizes the activities will be carried out under Component 4 to deliver each of the expected outputs that will collectively bring about Outcome 4.1 and 4.2.

Output	Activities
<b>Outcome 4.1: Improved availability of, and access to, financing for climate resilient renewable energy and energy efficiency.</b>	
4.1.1: Completed design and development of feasible inclusive <sup>3</sup> financing models and schemes to facilitate financing of EE and RE projects	4.1.1: Preparation of design and development of feasible inclusive financing models and schemes to facilitate financing of EE and RE projects
4.1.2: Completed capacity building to increase confidence of the existing banks (including the Development Bank of Tuvalu) and private sector on technical and financial viability of residential/commercial climate-resilient EE and RE projects	4.1.2: Design and conduct of capacity building program for the existing banks (including DBT) on financing residential/commercial EE and RE projects.
<b>Outcome 4.2: GoT, the financial sector and donor agencies providing accessible financing for climate resilient renewable energy and energy efficiency projects.</b>	
4.2.1: Established and operational low carbon technology application support program.	4.2.1: Establishment and operationalization of a program for providing financial incentives for low carbon (EE and RE) projects.
4.2.2: Developed and recommended financing schemes for implementation and capitalization by the GoT and/or private sector financial institutions.	4.2.2: Conduct of technical and management advisory services to the Development Bank of Tuvalu and other financial institutions in the establishment and operationalization of the financing scheme(s).
4.2.3: Completed RE and EE technologies application projects financed either through the established financing scheme or by private sector investments	4.2.3: Implementation of EE and RE technologies application projects financed either through the established financing scheme; or by private sector investments
4.2. 4: Completed evaluation and continuing enhancement of suggested financing policies and schemes for supporting initiatives on low carbon development.	4.2.4: Comprehensive evaluation of suggested enhanced financing policies for supporting initiatives on low carbon development

**OUTCOME 4.1: Improved availability of, and access to, financing for climate resilient renewable energy and energy efficiency**

**Output 4.1.1: Completed design and development of feasible inclusive financing models and schemes to facilitate financing of EE and RE projects**

<sup>3</sup> Inclusive means including participation and equitable opportunities and benefits for every sector of society particularly women and youth sectors in the outer islands of the country providing direct links between the macroeconomic and microeconomic determinants of economic growth



This output will consist of necessary financial support from GoT and donor-funded initiatives to make them needs-based, available and accessible for more RE and EE projects to be realized. Considering the socio-economic situation in the outer islands, the term “inclusive financing models and schemes” means including participation and equitable opportunities and benefits for every sector of society particularly women and youth sectors in the outer islands of the country providing direct links between the macroeconomic and microeconomic determinants of economic growth as applied to acquisition of RE and EE-related devices and appliances. This could be in the form of grant incentives for rebates and advisory services for those interested to adopt RE and EE projects in the commercial and residential sector.

*Activity 4.1.1: Preparation of design and development of feasible inclusive financing models and schemes to facilitate financing of EE and RE projects.* This will involve consolidation, analysis and comprehensive evaluation of suggested enhanced financing schemes for RE and EE initiatives and design and development of feasible inclusive financing models and schemes to facilitate financing of EE and RE projects as applicable in Tuvalu. There are many financial mechanisms that were already applied and tested in the Pacific Region and they vary according to their effectiveness and efficiency in realizing RE and EE project investments. For FASNETT, since the requirements are small-to-medium-scale only, the proposed financial plan and strategy for RE project development and installation is to encourage internal fund mobilization by the government agencies involved through co-financing scheme. This has been justified by the fact that the relevant government programs will also need energy supply and therefore the GoT has to adopt a government procurement policy in favor of RE and EE projects. In the past, most RE and EE projects are financed through foreign grants. Within the context and fund availability of the FASNETT project, the funds can only provide grant support for limited demos to pave the way for more RE/EE project investment and create confidence among interested parties. For RE projects, FASNETT through the ED/MPUI will recommend the most applicable and practical financing models based on experience in other PICs and SIDs countries and coordinate with Development Bank of Tuvalu for possible adoption and enhancement of incentive rebates window for EE appliances. The project will build upon existing financing models by the DBT and recommend enhancement possibilities and capacity building.

For EE projects, FASNETT will focus on developing an assistance window that will provide financial rebates and incentives for the replacement of old, inefficient refrigerators, freezers and other priority electricity-consuming appliances in the residential and commercial sectors. Initially, incentive/rebate fund of US\$ 320,000 is being budgeted for implementation as a pilot demonstration by DBT. This is in addition to other existing financing programs of similar nature, such as the Low Carbon Fund (US\$ 91,000) implemented by UNEP and IUCN. Another project is funded by the Italian Government under the Energy, Ecosystems and Sustainable Livelihood Initiative (EESLI) for various EE-related projects. Another project is the Pacific Appliance Labeling and Standards (PALS) Project, AU\$ 2.6M funded by the Australian Government, with the Pacific Community (SPC) as Implementing Agency.

*GEF support is required for the technical assistance in the evaluation of possible financial schemes and designing applicable financing models for the promotion of RE and EE projects.*

#### **Output 4.1.2: Completed capacity building for the existing banks (including the Development Bank of Tuvalu) on financing residential/ commercial EE and RE projects**

*Activity 4.1.2: Design and conduct of capacity building program for the existing banks (including DBT) on financing residential/commercial EE and RE projects.* This activity involves the conduct of capacity building for government agencies, local leaders and private sector on technical and financial viability of climate-resilient RE/EE projects to foster high level of confidence and provide information on available financing schemes.

*GEF support is required for the technical assistance in the design and conduct of capacity building program.*

**Outcome 4.2: The GoT, the financial sector and donor agencies providing accessible financing for climate resilient renewable energy and energy efficiency projects**

**Output 4.2.1: Established and operational low carbon technology application support program.**

*Activity 4.2.1: Establishment and operationalization of a program for providing financial incentives for low carbon (EE and RE) projects.* This involves the development of a financial support program for households and businesses in Tuvalu to provide them financial incentives to be able to purchase and utilize EE appliances and/or RE technology equipment (e.g., solar home systems). In concept, the program involves the provision of financial incentives for eligible household and businesses to avail of subsidies (e.g., rebates, discounts) when purchasing EE appliances and RE equipment. The initial program, which will be piloted in FASNETT will involve the purchase of two most common home appliances, i.e. refrigerators and freezers. This will be offered as incentives to be provided for buying EE appliances and replacement of old, obsolete and inefficient refrigerators and freezers. The program can later be expanded to cover other household and commercial appliances, equipment and other electricity-consuming devices, as well as the RE technology equipment (e.g., SHS and solar water pumps). Based on a study conducted during the PPG phase, for example, the minimum energy efficiency standards (e.g., 3.5-Star for refrigerators and freezers, and 4-Star for washing machines) will be followed along with mandate to be developed for the replacement of all inefficient appliances by the end of 2025. The financial incentive program will entail provision of rebates up to an average estimated 35% of cost of higher priced EE appliances to encourage more and more EE appliance owners. The program will be carried out by a sub-contractor working with the TEC in line with the operation of the SIDS DOCK-funded Demonstration EE Sale, which is located within the TEC compound.

*GEF support is required for the financial support for the financial incentive program involving the provision of rebates for the purchase of EE refrigerators and freezers.*

**Output 4.2.2: Developed and recommended financing schemes for implementation and capitalization by the GoT and/or private sector financial institutions.**

*Activity 4.2.2.: Conduct of technical and management advisory services to the Development Bank of Tuvalu (DBT) and other financial institutions in the establishment and operationalization of the financing scheme(s).* This activity involves the provision of technical and management advisory services to the DBT and other financial institutions on the implementation of the financial mechanism developed in Activity 4.1.1 for the country to adapt to the current needs of the RE/EE program in line with the 100% GHG reduction goal. Considering resources from the financial sector, GoT and donor agencies for RE/EE and related projects for their programs with overarching objectives, this activity involves the facilitation of the access to financing for the replication of RE/EE projects of government, community and private entrepreneurs and the RE/EE support industry. Also part of this activity is the provision of advisory services for financing scheme applicants in their preparation of project studies and financing applications. This is to facilitate their access to financing of proposed RE and EE project investments under the government and private sector financing programs, to guide financing applicants to make their projects bankable and the evaluation of financing applications. The assistance also include helping applicants in complying with the requirements of the financing scheme and other forms of technical/financial advice. This will supplement the barrier removal in **Activity 3.2.2.2** by focusing on the financial aspect.

*GEF will provide support for the rendering of advisory services to financing scheme applicants and to ED/MPUI and DBT personnel to enable them to effectively provide assistance to financing applicants.*

**Output 4.2.3: Completed RE and EE technologies application projects financed either through the established financing scheme or by private sector investments**

*Activity 4.2.3: Implementation of EE and RE technologies application projects financed either through the established financing scheme; or by private sector investments.* This activity involves the implementation and monitoring of the RE and EE technologies application demonstrations. It will also involve the carrying out of assistance and support work for encouraging women in owning or operating climate-resilient livelihood or businesses that are powered by RE-based power generation units. Some private investors are interested in investing in RE- based power generation for selling power to TEC in close coordination with TEC in complying with rules on grid stability and application procedures discussed in **Activity 3.2.2.2**.

*GEF support is required for technical assistance in resolving barriers in the adoption of RE- based power generation projects and selected EE projects.*

**Output 4.2.4: Completed evaluation and continuing enhancement of suggested financing policies and schemes for supporting initiatives on low carbon development.**

*Activity 4.2.4: Comprehensive evaluation of suggested enhanced financing policies for supporting initiatives on low carbon development.* This activity involves the evaluation and improvement of financing mechanisms adopted and formulation and implementation of follow-up plan for sustainable and accessible financing policies and schemes to support RE/EE market development.

*GEF support is required for the technical assistance in conducting the evaluation of financing mechanisms and development of follow-up plan.*

The proposed GEF project endeavors to enhance the baseline initiatives of the GoT by including added features that will facilitate the enhanced utilization of the country's RE resources, as well as improved energy efficiency features (practices, techniques and technologies). The facilitation and enabling of the application of RE and EE technologies/techniques and low carbon development will be done through the removal of barriers associated with the low level of enforcement of policies, regulations and institutional mechanisms, limited capacity and knowledge about the application, design, financing and operation of RE and EE initiatives of both the public and private sectors of the country. Most of the incremental activities of the project are the barrier removal activities that the project will carry out particularly those that the GoT will not be, or presently does not have the capacity for, addressing the barriers. Incremental support activities are necessary to facilitate the demonstrations and piloting of the processes and procedures involved in integrated energy planning, application of the energy-saving techniques and technologies that will encourage the major stakeholders in the various energy end use sectors (government, commercial, residential) to embrace, and support these.

Without the incremental barrier removal and enabling activities the achievement of the anticipated alternative scenario in the energy end use sectors in Tuvalu will not be realized. More importantly, incremental activities to establish and enforce policy and regulatory frameworks that are supportive (through effective institutional arrangements, financial/fiscal incentives, information sharing, etc.) will be necessary to sustain the replication of RE, EE and low carbon initiatives in all energy consuming sectors of the country, particularly in the electricity generation sector. The substantial sustainable development benefits that result from the application of such initiatives will not be achieved if the barriers that the GEF can help eliminate will not happen.

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## IV. RESULTS AND PARTNERSHIPS

### i. Expected Results:

The following are the key outcome success indicators and targets of FASNETT by the end of this 4-year project:

- % share of RE in the national power generation mix: 67%
- Cumulative GHG (CO<sub>2</sub>) emission reduction from power generation: 13,412 tons CO<sub>2</sub>
- Cost savings in lesser oil imports: US\$ 800,000 at 2016 regional price of diesel product as delivered
- % decrease in annual growth rate of fossil fuel demand in all islands of Tuvalu: 21% per year

### ii. Partnerships:

FASNETT will develop partnerships with all GEF and non-GEF funded projects of various stakeholders that are related to the development and utilization of feasible renewable energy resources and application of energy efficiency technologies for achieving the RE/EE targets in Tuvalu. This arrangement will harness potential synergies, complementarities and building on best practices and lessons learned and sharing of logistics costs while covering also for the country's outer islands. These projects include ongoing and planned baseline RE and EE projects of ED/MPUI and TEC.

The establishment and realization of working mechanisms that are mutually agreed upon and co-financing arrangements among the implementing partners will build on their respective achievements and provide for consultation, planning and decision making through coordination mechanisms, stakeholder meetings and technical workshops towards achieving RE/EE energy savings and GHG reduction goals during and beyond the project implementation.

### iii. Stakeholder engagement:

The project will follow a participative approach and inclusive strategy for engagement of all stakeholders not only in achieving the energy but also the social and environmental impacts of the project consistent with Tuvalu's development objectives.

The main stakeholders of this project are the Department of Energy - Ministry of Public Utilities and Infrastructure (MPUI), the Department of Environment and the Tuvalu Electricity Corporation (TEC), which together are acting in behalf of and fully designated by the Government of Tuvalu (GOT) in GOT's overall role as the Implementing Partner (IP) in the National Implementation Modality (NIM). The other stakeholders are those involved in public works and infrastructures, water and sanitation, and the banks/financial institutions.

<b>Stakeholder</b>	<b>Roles and Responsibilities in Project Implementation</b>
Department of Energy - Ministry of Public Utilities and Infrastructure (ED/MPUI)	Lead agency for the implementation of RE/EE projects in the government, islands, and private sector and the overall implementation and management of the project including communication and coordination with MOF and UNDP, providing staff

Stakeholder	Roles and Responsibilities in Project Implementation
	and administrative support, liaison with local governments, project management and monitoring and project financial management.
Department of Environment – Ministry of Foreign Affairs, Trade, Tourism, Environment and Labor (DOE/MFATTEL)	Provision of technical support and assistance in the implementation of demonstrations for the promotion of the application of RE/EE technologies and provision of data inputs on plans and programs of the country concerning donor funded sustainable and environment-friendly energy projects.
Tuvalu Electricity Corporation (TEC)	This is the state-owned (100% GoT-owned) national power utility. It will assist the ED/MPUI in the management and implementation of the project. Considering its primary role in the country's electricity sector, specifically, it will take charge of the implementation of project activities involving the demonstrations of EE and RE technology applications in electricity generation systems, and in the promotion of measures for the efficient and conserving use of electricity in households and businesses.
Department of Rural Development	Coordination, communication and provision of data for the implementation of project activities in selected islands, liaison with island Kaupules (councils) and Falekaupule in the design and implementation arrangements for the demonstration activities on islands, sustainable livelihood and community mobilization
Development Bank of Tuvalu	Implementation of existing financing models and recommendations in the enhancement and capacity building and act as the project's fund manager to promote and implement the approved financing/grant schemes, policies, and other operating guidelines
NGO, Social community and the other social/civic groups	Provision of assistance in the identification and analysis of barriers to the application of RE/EE in village development. Provision of advice in the implementation of the barrier removal activities of the project and participation of socio-civic groups in project activities.
Island communities and households	Provision of assistance in the identification and analysis of barriers to the application of RE/EE in village development and engagement of community leaders. Provision of advice in the implementation of the barrier removal activities of the project
Kaupules (outer islands local councils)	Assistance in the implementation of the relevant activities in the project demonstration, replication activities, operation and maintenance, resource mobilization and engagement of local government.
Department of Gender, Tuvalu National Council of Women	Provision of advice on the gender-sensitive implementation of capacity development activities of the project, including the involvement of women in the implementation of demonstration activities and sustainable RE-based livelihood and energy conservation.

iv. Mainstreaming Gender:

The Government of Tuvalu, recognizing the benefits of gender mainstreaming, has issued the Tuvalu National Gender Policy which includes the Strategic Action Plan 2014-2016<sup>4</sup> that focuses on four key policy measures: Institutional strengthening and capacity building, Women's economic empowerment, Women in decision-making and Ending violence against women as a result of the stock taking and analysis in 2013. The FASNETT project development has referred to this policy and guiding framework for multi-sectoral engagement and partnerships towards the overarching goal of gender equality and empowerment of women,

<sup>4</sup> Tuvalu National Gender Policy (2014-2016) and Stock Take of the Gender Mainstreaming Capacity of Pacific Island Governments – Tuvalu by the Secretariat of the Pacific Community (2013).

with particular contribution through application of RE/EE technologies in community-based projects. During the project implementation, updates on relevant gender mainstreaming policy and guidelines shall be incorporated in the action plans and strategies.

Therefore, the proposed GEF project presents opportunities for the involvement of women working in both management and technical departments of the Tuvaluan Government agencies/institutions who can play important roles in the design, development and implementation of the proposed UNDP-GEF project. Potential opportunities to further assess and enhance the role of women in deployment of low carbon technologies and mitigation options, and come up with gender-sensitive policies in the energy sector and the energy end-use sectors of the country will be done, recognizing the possible contributions of women in the management and implementation of climate change mitigation measures, for example, their participation in projects that will promote or enhance women-owned and women-operated businesses that will make use of RE-based energy, or energy efficient appliances. Furthermore, the implementation of the project will also take into account, whenever possible, the contributions, impacts and benefits of community-based EE and RE technology applications, including children and indigenous people.

Additional information on Gender Assessment for Tuvalu that is relevant to the gender mainstreaming of the project is seen in **Annex M**.

v. South-South and Triangular Cooperation (SSTrC):

The project will tap the vast experience of some developing countries, particularly among the PICs in the Pacific region, in the development and utilization of feasible renewable energy resources and application of energy efficiency technologies. These programs have become attractive and interesting to several countries, especially those with the factors that could potentially lead to the development of RE/EE industry in cooperation with these countries, through World Bank, EU, IUCN and other bilateral/multilateral cooperation with New Zealand, Finland, UAE, Italy, etc. A number of RE/EE projects are being implemented, taking into account not only national capacities, but also regional and global market opportunities. Tuvalu has signed a number of agreements on bilateral, regional, interregional and multilateral bases in different levels of cooperation, including technology and knowledge transfer, research and development, and trade and investments. The project will foster cooperation in the exchange of experiences (failures and success) and the support for the implementation of national and regional RE/EE policies for the development and application of RE/EE technologies that involves the concerns and opportunities in this development area towards sustainable results. The project includes studies and projects undertaken by other SIDs in cooperation with other advanced countries on the application of floating solar PV power generation, off-grid power box, replacement of old refrigerators and freezers and demand management in residential and commercial applications.

vi. Knowledge Management

Considering the current capacity of the country in designing and implementing EE and RE projects, the knowledge management system that will be employed in the project will consist of the conduct of training courses for pertinent personnel in the energy and utilities sector, as well as those in the outer island communities. There will be special mentoring sessions for specific group of staff who will be carrying out the operations and maintenance of the various demo/pilot installations that are part of the project. These mentored staff will form the cadre of in-house experts in the TEC and ED/MPUI. Under this project, an information exchange network will be established and operationalized for the promotion and dissemination of

knowledge on low carbon development within and outside of the country (including other PICs and SIDS). Moreover, as part of the design, establishment and operationalization of an energy supply and consumption monitoring and reporting, database development and maintenance will be carried out. This aspect of knowledge management, which involve the drawing on of information from a wide variety of sources, will be implemented, not only for the purpose of the country's energy planning but also to achieve an organized usage of knowledge about the energy situation in the country. This will be made possible through the information exchange network that will be established and operationalized under the project. With such network, data/information on lessons learned and best practices in the application of low carbon development techniques and practices, as well as implementation of EE and RE technologies specifically in small island settings, can be obtained from other PICs and SIDS, and applied to specific situations and localities in the country. The results of the project activities (e.g., EE/RE technology applications) will also be disseminated to other PICs and SIDS through the information exchange network.

Thus, the primary emphasis of the FASNETT knowledge management and communication strategy is to enhance the tools to capture processes, lessons and results of country level demonstrations, the experience of its partners, and enhance sharing and dissemination via innovative knowledge management and communication through tri-media or internet-based information exchange tools linked to FASNETT project network. The KM reports and outputs that will be produced during project implementation include: lessons learned reports, briefing notes, concept notes, how-to technical guides, newsletter, technical papers on best available practices and technologies on RE/EE applications and such advocacy information packages as deemed appropriate and practical in the Tuvalu small-island situation. These are fully covered by the GEF funds and co-financing inputs.

Additional details on the knowledge management strategy for the FASNETT project is seen in **Annex N**.

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## **V. FEASIBILITY**

### **i. Cost Efficiency and Effectiveness:**

The FASNETT project will facilitate the country's efforts in achieving its commitment to have zero GHG emission with the use of locally available RE resources to displace petroleum and applying EE techniques to lower power demand levels as it finally weans away from a largely petroleum-based electricity supply system. Petroleum products are difficult and costly to transport to the outer islands which are at times with uncertain delivery schedules. Though relatively small in terms of economic market sizes in introducing the proven RE technologies, with the complete replacement of diesel by 2025, the country will improve its balance of payments as the RE potentials are tapped maximally. Furthermore, easy access to energy supply and services will definitely improve socio-economic status of the people and opportunities to enhance livelihood and adaptation to adverse effects of climate change. The demonstration of technically and economically viable technologies that include initially floating solar PV power generation, off-grid power box, replacement of old refrigerators and freezers (which can be expanded to other energy-consuming devices) and demand management in residential and commercial applications will have long-term economic benefits.

The lifetime direct GHG reductions expected from this Project are 68,440.4 tons CO<sub>2eq</sub> assuming average lifetimes for RE/EE technologies. The cost of emission reductions resulting from this Project is estimated at USD 18.84 per ton of CO<sub>2</sub> reduced, considering the economies of scale in the Tuvalu situation.

ii. Risk Management:

There were some identified risks that could affect the realization of the outcomes and objective of the project. Therefore the project was also designed to address these risks to mitigate their effects. As per standard UNDP requirements, the Project Manager will monitor risks quarterly and report on the status of risks to the UNDP Country Office. The UNDP Country Office will record progress in the UNDP ATLAS risk log. Risks will be reported as critical when the impact and probability are high (i.e. when impact is rated as 5, and when impact is rated as 4 and probability is rated at 3 or higher). Management responses to critical risks will also be reported to the GEF in the annual PIR. More details on the Risk Log is shown in **Annex H**.

Project Risks					
Description	Type	Impact & Probability	Mitigation Measures	Owner	Status
1. Inadequate local capacity to implement the project activities	<i>Organizational</i>	P = 4 I = 4	Coordination with other ongoing UNDP-GEF projects in the country will be carried out to take advantage of potential synergies in the management of the project implementation. This is in addition to UNDP country office support that the GOT can request.	<i>PMU, ED/MPUI, TEC</i>	<i>Reducing</i>
2. Local communities in Funafuti and in the outer islands may not support the project implementation promptly and sufficiently	<i>Operational</i>	P = 3 I = 3	The ED/MPUI and TEC will be supported by other entities in the execution of this project particularly in the coordination of the project implementation with the project partners. A capable project team comprised of competent local and international experts will be established. The TEC's good working relationship with local communities in Funafuti and the outer islands will be put to good use to actively promote the implementation of this project, and ensure the support of the local communities.	<i>PMU, ED/MPUI, TEC</i>	<i>Reducing</i>
3. The committed level of co-financing for specific activities of the project may not become fully available in time.	<i>Financial</i>	P = 3 I = 3	During project implementation, the project team will closely monitor and ensure the timely availability of co-financing from project partners and co-financers. The project team shall secure government assurance of co-funding prior to project launching.	<i>PMU</i>	<i>Increasing</i>



Project Risks					
Description	Type	Impact & Probability	Mitigation Measures	Owner	Status
4. Relevant GOT agencies fail approve and enforce formulated policies and regulations	<i>Regulatory</i>	P = 2 I = 3	Advocacy to gain adequate support from the parliament on the adoption of the formulated policies and regulations will be carried out by the implementing partners, with the assistance of UNDP if necessary.	PMU, ED/MPUI, TEC	<i>Increasing</i>
5. The outcomes and benefits of GEF investment on the activities implemented will not be fully sustained.	<i>Strategic</i>	P = 3 I = 3	The development of a sustainable follow-up plan is part of the project activities. This will be useful for the replication of the demonstrated applicable and feasible EE & RE technologies in the other islands.	PMU, ED/MPUI, TEC	<i>Increasing</i>
6. Adverse climate-related events may hamper the implementation of hardware-related activities.	<i>Environmental</i>	P = 3 I = 4	Following proper engineering and construction design and construction that ensure not only structural integrity but also climate resilience will be adequately applied in the design and implementation of major EE/RE activities that will involve procurement, design/engineering, installation and operation of EE & RE technology system installations.	PMU, ED/MPUI, TEC	<i>Increasing</i>
7. Change in national government administration may influence government support for project	<i>Political</i>	P = 3 I = 3	The Falekaupule, executing agency and other government departments involved in the project will monitor political dynamics and will try to resolve any misunderstanding within the project. UNDP executive management intervention may be warranted.	PMU, ED/MPUI, TEC, Falekaupule	<i>Reducing</i>
8. Regular access to outer islands is limited and transportation costs are often prohibitive	<i>Operational</i>	P = 3 I = 4	Better planning between government departments (particularly the maritime department) and other UNDP supported projects in carrying out joint outer island missions. Better coordination in the scheduling of the outer island trips will be done taking into account the dry docking schedule of the inter-island ship for repair and maintenance.	PMU, ED/MPUI, TEC, Falekaupule	<i>Increasing</i>

iii. Social and Environmental Safeguards:

Similar to that in the other PICs, the environmental situation in Tuvalu may have some social and environmental factors that could also affect the implementation of, and benefits from, the project. During the course of the implementation of the project, any environmental and social grievance, if any, will be reported to the GEF in the annual PIR reporting to ensure that they are properly addressed.

The PPG Team has amply discussed these issues with the key stakeholders of the project in the Logical Framework Analysis (LFA) workshop in March 2016 and has updated the SESP for any social and environmental risks that have been identified by the UNDP-GEF STA during the pre-screening SESP of the PIF as to the plans in addressing them as seen in **Annex F**. Nevertheless, the execution of the management plans will be monitored and ensure that proper consultations with relevant parties are conducted throughout the project implementation.

iv. Sustainability and Scaling Up:

*Innovation:* The following are the innovative features of the proposed project: (1) community-based application EE and RE technologies, as well as integrated energy planning and policy implementation, including the design and implementation of energy-related aspects of low carbon development; (2) Improvement of the availability/access to financial resources (local and foreign) for financing RE and EE initiatives, including the development of financing schemes and other financial instruments; and (3) Establishment and implementation of an official institutional framework and mechanism through the development and paving the way for the enactment of an energy law to guide the regulation of the energy sector and enforcement of energy policies and regulations that among others, support RE and EE applications, and facilitate low carbon development.

*Sustainability:* The project is designed to enable the Government of Tuvalu and its partners to come up with enabling conditions through the adoption of supportive policies/regulations, organizational strengthening, institutional mechanisms and promotional activities to facilitate the widespread adoption and application of EE & RE technologies in the residential and public sectors particularly at the community level not only in the central island of Funafuti but especially also in the outer islands in Tuvalu to help ensure sustainability of the systems and frameworks that will be established in synergy with the other ongoing and planned RE/EE projects. It is important that the project addresses the sustainability aspect of the RE/EE applications not only in the program level but also at the project level otherwise any failure of the technologies will affect the acceptability of these new technologies. On the other hand, the project also includes in its activities close coordination with other projects of GoT involved in climate adaptation as these projects critically need sustainable power supplies for their operations and sustainability efforts also.

*Potential for Scaling-up:* Tuvalu is comprised of outer islands where the planned community-based EE and RE technology/techniques that will be promoted under the project can be applied. The demonstration of the application of such technologies/techniques that will be among the interventions that will be carried out can be replicated in the outer islands where the communities are keen in improving their energy security. The replication and scaling-up of the project initiatives is necessary for building the RE/EE market towards a more economic level and bring down the cost of energy and access to it. Furthermore, best practices that will come out from the interventions that will be carried out in the project can also be shared with other PICs and SIDS with similar circumstances as Tuvalu.

## VI. PROJECT RESULTS FRAMEWORK

<b>This project will contribute to the following Sustainable Development Goal (s):</b> <i>SDG #7- Ensure access to affordable, reliable, sustainable and modern energy for all</i>					
<b>This project will contribute to the following country outcome included in the UNDAF/Country Programme Document:</b> <i>Area #1: Environmental management, climate change and disaster risk management; Outcome 1.1: By 2017 the most vulnerable communities across the PICTs are more resilient and select government agencies, civil society organizations and communities have enhanced capacity to apply integrated approaches to environmental management, climate change adaptation/mitigation, and disaster risk management</i>					
<b>This project will be linked to the following output of the UNDP Strategic Plan:</b> Output 1.5: Inclusive and sustainable solutions adopted to achieve increased energy efficiency and universal modern energy access (especially off-grid sources of renewable energy)					
	Objective and Outcome Indicators	Baseline	Mid-term Target	End of Project Target	Assumptions
<b>Project Objective:</b> Facilitation of the development and utilization of feasible renewable energy resources and application of energy efficiency technologies in Tuvalu for achieving realistic energy targets in Tuvalu <sup>5</sup>	% share of RE in the national power generation mix <sup>6</sup>	26%	44%	67%	Regional oil prices will be at levels that make RE/EE still competitive and cost-effective
	Cumulative GHG (CO <sub>2</sub> ) emission reduction from power generation, tons CO <sub>2</sub>	nil	5,000	15,000	
	No. of women actively involved in the planning and implementation of energy services provision in the outer islands	0	5	10	Acceptance from community on RE/EE application
<b>Outcome 1</b> Improved awareness and attitude towards sustainable RE & EE technology applications in the public <sup>2</sup> , commercial and energy sectors	No. of communities that are capable of organizing, planning, designing, implementing, operating and maintaining RE-based power generation systems.	0	2	4	Acceptance from community on RE/EE application
	No. of households, schools, public buildings and commercial establishments that are using low carbon technologies (by RE- and EE-based energy systems) <sup>7</sup>	396	400	410	

<sup>5</sup> In November 2015, the Government of Tuvalu submitted its Intended Nationally Determined contributions (INDC) to UNFCCC, updating the goal set in the country's 2009 National Energy Policy (NEP), that now sets out the objective to reduce emissions of greenhouse gases from the **electricity generation** (power) sector, **by 100%, i.e., almost zero emissions by 2025** through the use renewable energy sources and energy efficient technologies. With the current economic development situation in the country and the actions that are ongoing and are being planned towards the achievement of this target, the project will re-evaluate the target to either confirm or reset it to a more realistic level that can be achieved by 2020 within the timeframe of this four-year project, and facilitate the achievement of target through the removal of barriers or filling of the gaps that would bridge the achievement of said RE target by 2020. In this project, both energy efficiency and renewable energy technology applications will be enhanced in supporting the economic development of the country and minimizing GHG emissions.

<sup>6</sup> As an important benefit in the increasing share of the RE and EE contribution, the cost saving in imported oils should also be monitored and reported.

<sup>7</sup> This also includes those that are directly investing their own resources in implementing low carbon technologies (RE & EE).

<b>Outcome 2</b> <b>Coherent and integrated implementation of enhanced policies, regulations and projects on energy development and utilization with the country's energy act in support of national economic development</b>	No. of planned RE & EE projects benefiting from the policies and regulations supported by the Energy Act <sup>8</sup>	0	50	100	Political stability of the country is sustained
<b>Outcome 3</b> <b>3.1 Enhanced energy utilization efficiency and development and application of feasible renewable energy resources in support of national economic development</b>	No. of companies adopting the established standards in supplying or producing RE/EE system equipment or component parts	0	1	2	Regional oil prices will be at levels that make RE/EE still competitive and cost-effective
	% users of RE/EE system equipment and component parts that are satisfied with the quality, cost and operating performance of these items	0	25	80	
<b>3.2 Increased application of viable climate resilient renewable energy and energy efficiency technology applications in the country</b>	Increased no. of low carbon technology projects (new, or replication, or scale-up)	16	20	26	Acceptance from community on RE/EE application
<b>Outcome 4</b> <b>4.1 Improved availability of, and access to, financing for climate resilient renewable energy and energy efficiency</b>	No. of established and operational financing schemes for RE/EE projects	0	1	2	Financing institutions will continuously support RE/EE projects
	No. of private sector RE/EE projects financed by commercial banks and/or by the private sector	0	1	2	
<b>4.2 GoT, the financial sector and donor agencies providing accessible financing for climate resilient renewable energy and energy efficiency projects</b>	Increase in government budget for low carbon technology-based projects, US\$	0	200,000	400,000	Regional oil prices will be at levels that make RE/EE still competitive and cost-effective

<sup>8</sup> Close monitoring of the progress in the enactment process, e.g. number of parliamentarians endorsing the approval and enforcement of the Energy Act and other pertinent indicators shall be done with the objective of passing the act within the two years of project implementation as much as possible.

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## VII. MONITORING AND EVALUATION (M&E) PLAN

The project results as outlined in the project results framework will be monitored annually and evaluated periodically during project implementation to ensure the project effectively achieves these results.

Project-level monitoring and evaluation will be undertaken in compliance with UNDP requirements as outlined in the [UNDP POPP](#) and [UNDP Evaluation Policy](#). While these UNDP requirements are not outlined in this project document, the UNDP Country Office will work with the relevant project stakeholders to ensure UNDP M&E requirements are met in a timely fashion and to high quality standards. Additional mandatory GEF-specific M&E requirements (as outlined below) will be undertaken in accordance with the [GEF M&E policy](#) and other relevant GEF policies.

In addition to these mandatory UNDP and GEF M&E requirements, other M&E activities deemed necessary to support project-level adaptive management will be agreed during the Project Inception Workshop and will be detailed in the Inception Report. Since this Project is being implemented under the National Implementation Modality (NIM) with UNDP support (which is elaborated in Section VIII: Governance and Management Arrangements), [the M&E Plan will be finalized during inception with particular reference to the National Implementation by the Government of UNDP Supported Projects: Guidelines and Procedures \(01 July 2011\) as maybe amended.](#) This will include the exact role of project target groups and other stakeholders in project M&E activities including the GEF Operational Focal Point and national/regional institutes assigned to undertake project monitoring. The GEF Operational Focal Point will strive to ensure consistency in the approach taken to the GEF-specific M&E requirements (notably the GEF Tracking Tools) across all GEF-financed projects in the country. This could be achieved for example by using one national institute to complete the GEF Tracking Tools for all GEF-financed projects in the country, including projects supported by other GEF Agencies.

### **M&E Oversight and monitoring responsibilities:**

**Project Manager:** The Project Manager is responsible for day-to-day project management and regular monitoring of project results and risks, including social and environmental risks. The Project Manager will ensure that all project staff maintain a high level of transparency, responsibility and accountability in M&E and reporting of project results. The Project Manager will inform the Project Board, the UNDP Country Office and the UNDP-GEF RTA of any delays or difficulties as they arise during implementation so that appropriate support and corrective measures can be adopted.

The Project Manager will develop annual work plans based on the multi-year work plan included in Annex A, including annual output targets to support the efficient implementation of the project. The Project Manager will ensure that the standard UNDP and GEF M&E requirements are fulfilled to the highest quality. This includes, but is not limited to, ensuring the results framework indicators are monitored annually in time for evidence-based reporting in the GEF PIR, and that the monitoring of risks and the various plans/strategies developed to support project implementation (e.g. gender strategy, KM strategy etc..) occur on a regular basis.

**Project Board:** The Project Board will take corrective action as needed to ensure the project achieves the desired results. The Project Board will hold project reviews to assess the performance of the project and appraise the Annual Work Plan for the following year. In the project's final year, the Project Board will hold an end-of-project review to capture lessons learned and discuss opportunities for scaling up and to highlight project results and lessons learned with relevant audiences. This final review meeting will also discuss the findings outlined in the project terminal evaluation report and the management response.

**Project Implementing Partner:** The Implementing Partner is responsible for providing any and all required information and data necessary for timely, comprehensive and evidence-based project reporting, including results and financial data, as necessary and appropriate. The Implementing Partner will strive to ensure project-level M&E is undertaken by national institutes, and is aligned with national systems so that the data used by and generated by the project supports national systems.

**UNDP Country Office:** The UNDP Country Office in Pacific will provide support in the project management, including through annual supervision missions. The annual supervision missions will take place according to the schedule outlined in the annual work plan. Supervision mission reports will be circulated to the project team and Project Board within one month of the mission. The UNDP Country Office will initiate and organize key GEF M&E activities including the annual GEF PIR, the *independent mid-term review* and the independent terminal evaluation. The UNDP Country Office will also ensure that the standard UNDP and GEF M&E requirements are fulfilled to the highest quality.

The UNDP Country Office in Pacific is responsible for complying with all UNDP project-level M&E requirements as outlined in the [UNDP POPP](#). This includes ensuring the UNDP Quality Assurance Assessment during implementation is undertaken annually; that annual targets at the output level are developed, and monitored and reported using UNDP corporate systems; the regular updating of the ATLAS risk log; and, the updating of the UNDP gender marker on an annual basis based on gender mainstreaming progress reported in the GEF PIR and the UNDP ROAR. Any quality concerns flagged during these M&E activities (e.g. annual GEF PIR quality assessment ratings) must be addressed by the UNDP Country Office and the Project Manager.

The UNDP Country Office will retain all M&E records for this project for up to seven years after project financial closure in order to support ex-post evaluations undertaken by the UNDP Independent Evaluation Office (IEO) and/or the GEF Independent Evaluation Office (IEO).

**UNDP-GEF Unit:** Additional M&E and implementation quality assurance and troubleshooting support will be provided by the UNDP-GEF Regional Technical Advisor and the UNDP-GEF Directorate as needed.

**Audit:** The project will be audited according to UNDP Financial Regulations and Rules and applicable audit policies on NIM implemented projects,<sup>9</sup> with particular reference to UNDP-supported NIM arrangements, processes and procedures.

#### **Additional GEF monitoring and reporting requirements:**

**Inception Workshop and Report:** A project inception workshop will be held within two months after the project document has been signed by all relevant parties to, amongst others:

- a) Re-orient project stakeholders to the project strategy and discuss any changes in the overall context that influence project implementation;
- b) Discuss the roles and responsibilities of the project team, including reporting and communication lines and conflict resolution mechanisms;
- c) Review the results framework and finalize the indicators, means of verification and monitoring plan;

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<sup>9</sup> See guidance here: <https://info.undp.org/global/popp/frm/pages/financial-management-and-execution-modalities.aspx>

- d) Discuss reporting, monitoring and evaluation roles and responsibilities and finalize the M&E budget; identify national/regional institutes to be involved in project-level M&E; discuss the role of the GEF OFP in M&E;
- e) Update and review responsibilities for monitoring the various project plans and strategies, including the risk log; Environmental and Social Management Plan and other safeguard requirements; the gender strategy; the knowledge management strategy, and other relevant strategies;
- f) Review financial reporting procedures and mandatory requirements, and agree on the arrangements for the annual audit; and
- g) Plan and schedule Project Board meetings and finalize the first year annual work plan.

The Project Manager will prepare the inception report no later than one month after the inception workshop. The inception report will be cleared by the UNDP Country Office and the UNDP-GEF Regional Technical Adviser, and will be approved by the Project Board.

GEF Project Implementation Report (PIR): The Project Manager, the UNDP Country Office, and the UNDP-GEF Regional Technical Advisor will provide objective input to the annual GEF PIR covering the reporting period July (previous year) to June (current year) for each year of project implementation. The Project Manager will ensure that the indicators included in the project results framework are monitored annually in advance of the PIR submission deadline so that progress can be reported in the PIR. Any environmental and social risks and related management plans will be monitored regularly, and progress will be reported in the PIR.

The PIR submitted to the GEF will be shared with the Project Board. The UNDP Country Office will coordinate the input of the GEF Operational Focal Point and other stakeholders to the PIR as appropriate. The quality rating of the previous year's PIR will be used to inform the preparation of the subsequent PIR.

Lessons learned and knowledge generation: Results from the project will be disseminated within and beyond the project intervention area through existing information sharing networks and forums. The project will identify and participate, as relevant and appropriate, in scientific, policy-based and/or any other networks, which may be of benefit to the project. The project will identify, analyze and share lessons learned that might be beneficial to the design and implementation of similar projects and disseminate these lessons widely. There will be continuous information exchange between this project and other projects of similar focus in the same country, region and globally.

GEF Focal Area Tracking Tools: The following GEF Tracking Tool(s) will be used to monitor global environmental benefit results:

The baseline/CEO Endorsement GEF Focal Area Tracking Tool(s) – submitted in Annex D to this project document – will be updated by the Project Manager/Team and shared with *the* mid-term review consultants and terminal evaluation consultants (not the evaluation consultants hired to undertake the *MTR* or the *TE*) before the required review/evaluation missions take place. The updated GEF Tracking Tool(s) will be submitted to the GEF along with the completed Mid-term Review report and Terminal Evaluation report.

Independent Mid-term Review (MTR): An independent mid-term review process will begin after the second PIR has been submitted to the GEF, and the MTR report will be submitted to the GEF in the same year as the 3<sup>rd</sup> PIR. The MTR findings and responses outlined in the management response will be incorporated as recommendations for enhanced implementation during the final half of the project's duration. The terms of reference, the review process and the MTR report will follow the

standard templates and guidance prepared by the UNDP IEO for GEF-financed projects available on the [UNDP Evaluation Resource Center \(ERC\)](#). As noted in this guidance, the evaluation will be 'independent, impartial and rigorous'. The consultants that will be hired to undertake the assignment will be independent from organizations that were involved in designing, executing or advising on the project to be evaluated. The GEF Operational Focal Point and other stakeholders will be involved and consulted during the terminal evaluation process. Additional quality assurance support is available from the UNDP-GEF Directorate. The final MTR report will be available in English and will be cleared by the UNDP Country Office and the UNDP-GEF Regional Technical Adviser, and approved by the Project Board.

Terminal Evaluation (TE): An independent terminal evaluation (TE) will take place upon completion of all major project outputs and activities. The terminal evaluation process will begin three months before operational closure of the project allowing the evaluation mission to proceed while the project team is still in place, yet ensuring the project is close enough to completion for the evaluation team to reach conclusions on key aspects such as project sustainability. The Project Manager will remain on contract until the TE report and management response have been finalized. The terms of reference, the evaluation process and the final TE report will follow the standard templates and guidance prepared by the UNDP IEO for GEF-financed projects available on the [UNDP Evaluation Resource Center](#). As noted in this guidance, the evaluation will be 'independent, impartial and rigorous'. The consultants that will be hired to undertake the assignment will be independent from organizations that were involved in designing, executing or advising on the project to be evaluated. The GEF Operational Focal Point and other stakeholders will be involved and consulted during the terminal evaluation process. Additional quality assurance support is available from the UNDP-GEF Directorate. The final TE report will be cleared by the UNDP Country Office and the UNDP-GEF Regional Technical Adviser, and will be approved by the Project Board. The TE report will be publically available in English on the UNDP ERC.

The UNDP Country Office will include the planned project terminal evaluation in the UNDP Country Office evaluation plan, and will upload the final terminal evaluation report in English and the corresponding management response to the UNDP Evaluation Resource Centre (ERC). Once uploaded to the ERC, the UNDP IEO will undertake a quality assessment and validate the findings and ratings in the TE report, and rate the quality of the TE report. The UNDP IEO assessment report will be sent to the GEF IEO along with the project terminal evaluation report.

Final Report: The project's terminal PIR along with the terminal evaluation (TE) report and corresponding management response will serve as the final project report package. The final project report package shall be discussed with the Project Board during an end-of-project review meeting to discuss lesson learned and opportunities for scaling up.



**Mandatory GEF M&E Requirements and M&E Budget:**

GEF M&E requirements	Primary responsibility	Indicative costs to be charged to the Project Budget <sup>10</sup> (US\$)		Time frame
		GEF grant	Co-financing	
Inception Workshop	UNDP Country Office	5,000		Within two months of project document signature
Inception Report	Project Manager	None	10,000	Within two weeks of inception workshop
Standard UNDP monitoring and reporting requirements as outlined in the UNDP POPP	UNDP Country Office	None	None	Quarterly, annually
Monitoring of indicators in project results framework	Project Manager	16,000		Annually
GEF Project Implementation Report (PIR)	Project Manager and UNDP Country Office and UNDP-GEF team	None	5,000	Annually
NIM Audit as per UNDP audit policies	UNDP Country Office	16,000		Annually or other frequency as per UNDP Audit policies
Lessons learned and knowledge generation	Project Manager			Annually
Monitoring of environmental and social risks, and corresponding management plans as relevant	Project Manager UNDP CO	None		On-going
Addressing environmental and social grievances	Project Manager UNDP Country Office BPPS as needed	None for time of project manager, and UNDP CO		
Project Board meetings	Project Board UNDP Country Office Project Manager			At minimum annually
Supervision missions	UNDP Country Office	None <sup>11</sup>		Annually
Oversight missions	UNDP-GEF team	None <sup>11</sup>		Troubleshooting as needed
Knowledge management	Project Manager	10,000	5,000	On-going
GEF Secretariat learning missions/site visits	UNDP Country Office and Project Manager and UNDP-GEF team	None		To be determined.
Mid-term GEF Tracking Tool to be updated by (add name of national/regional institute if relevant)	Project Manager	10,000	5,000	Before mid-term review mission takes place.
Independent Mid-term Review (MTR) and management response	UNDP Country Office and Project team and UNDP-GEF team	25,000		Between 2 <sup>nd</sup> and 3 <sup>rd</sup> PIR.
Terminal GEF Tracking Tool to be updated by (add name of national/regional institute if relevant)	Project Manager	10,000	5,000	Before terminal evaluation mission takes place

<sup>10</sup> Excluding project team staff time and UNDP staff time and travel expenses.

<sup>11</sup> The costs of UNDP Country Office and UNDP-GEF Unit's participation and time are charged to the GEF Agency Fee.

GEF M&E requirements	Primary responsibility	Indicative costs to be charged to the Project Budget <sup>10</sup> (US\$)		Time frame
		GEF grant	Co-financing	
<b>Independent Terminal Evaluation (TE) included in UNDP evaluation plan, and management response</b>	UNDP Country Office and Project team and UNDP-GEF team	25,000		At least three months before operational closure
<b>Translation of MTR and TE reports into English</b>	UNDP Country Office			
<b>TOTAL indicative COST</b> Excluding project team staff time, and UNDP staff and travel expenses		<b>127,000</b>	30,000	

## VIII. GOVERNANCE AND MANAGEMENT ARRANGEMENTS

Roles and responsibilities of the project's governance mechanism: The project will be implemented and managed following UNDP's National implementation modality (NIM) according to the Standard Basic Assistance Agreement (SBAA) between UNDP, the Government of Tuvalu and the Country Programme), but supplemented by UNDP Country Office (CO) support arrangement covered by applicable guidelines and manual of procedures for such arrangements<sup>12</sup>.

In principle, in the NIM cum UNDP CO support, the Government as Implementing Partner (IP) is responsible for the technical and administrative implementation of a development cooperation project pursuant to UNDP Regulations and Rules. The IP is accountable to UNDP (represented by the CO) for the resources entrusted to it, just as UNDP is accountable to the Government to ensure that its support is in line with national priorities. The IP accountability to UNDP does not imply any delegation of authority on the part of UNDP to the Government, any of its employees or in regard to authorities in charge of the project (NPD or Project Coordinator). The legal instrument is a Project Document (as referred to in the SBAA) with the minimum requirements consisting of the CPAP and AWP. The abovementioned manual of procedures as part of the UNDP POPP will be used together with the UNDP's Handbook on Planning, Monitoring and Evaluating for Development Results,

The **Implementing Partner** for the FASNETT project is the Government of Tuvalu (GOT) represented by the Department of Energy under the policy umbrella of the Ministry of Public Utilities and infrastructure (ED/MPUI). The Implementing Partner is responsible and accountable for managing this project, including the monitoring and evaluation of project interventions, achieving project outcomes, and for the effective use of UNDP resources. Specifically, the IP oversees the management and delivery of project activities to achieve specified results including the procurement and delivery of UNDP program activity inputs and their use in producing outputs, as set forth in the signed FASNETT Project Document between UNDP and the GOT. The IP will designate a Responsible Party who will take charge of the project operations.

The **Responsible Party** for this Project is the Tuvalu Electricity Corporation (TEC), which will act on behalf of and as designated by the Implementing Partner on the basis of a written agreement or contract defining specific roles, duties and responsibilities to act also as the Project Manager purchase

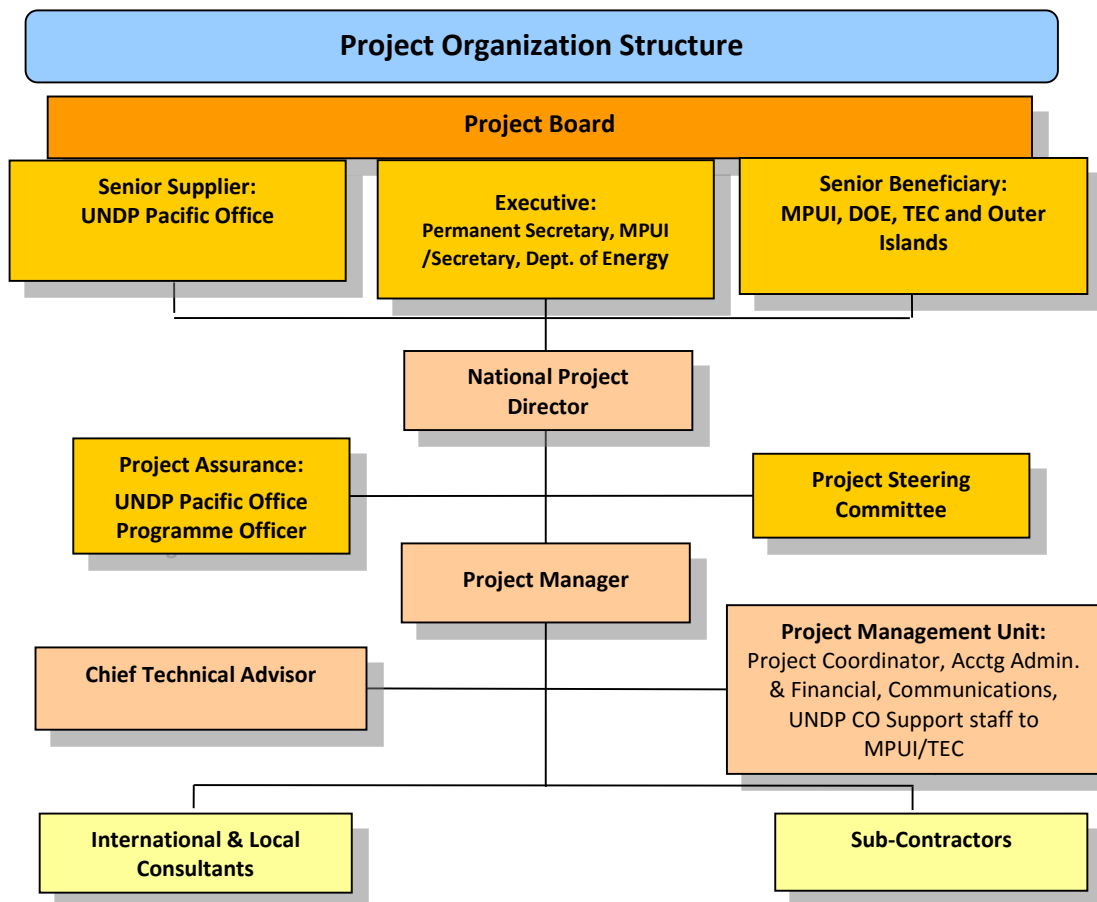
<sup>12</sup> National Implementation by the Government of UNDP Supported Projects: Guidelines and Procedures (01 July 2011)

goods or provide services using the project budget consistent with project goal and objective as defined in this Project Document.

The Responsible Party will provide the following:

- a) Implementing Partner may assign RP to take charge on day-to-day project management and operational support;
- b) Identification of expertise that are available in the international and domestic market;
- c) Recruitment of necessary international and local expertise;
- d) Carrying-out tenders for procuring services and/or goods as per rules and regulations;
- e) Issuance of contracts, management of contracts, and making payments related to expenses incurred as part of project implementation;
- f) Preparation and distribution of periodic reports including quarterly financial and narrative reports, and annual project implementation review reports;
- g) Decision-making responsibilities as part of the Project Board;
- h) Technical advisory responsibilities as part of Project Steering Committee; and

The project organization structure is as follows:



The **Project Board** consisting of designated representatives of UNDP/GEF, UNDP Pacific Office, UN Joint Presence Office in Tuvalu and the Ministry of Public Utilities and Infrastructure/Department of Energy and the Tuvalu Electricity Corporation, is the decision-making authority of the project at the policy level and is responsible for reviewing the project implementation, endorsing the annual work

plans (AWPs), deciding on major and significant changes of the project (such as changes in outputs, activities, baselines, indicators, and targets) including the governance and management arrangements.

The Senior Beneficiary, the ED/MPUI, TEC and Outer Islands will be representing the interests of those who will ultimately benefit from the project. Their primary function within the Board is to ensure the realization of project results. The Project Board is responsible for making by consensus, management decisions when guidance is required by the Project Manager, including recommendation for UNDP Pacific Office approval of project plans and revisions. In order to ensure UNDP Pacific Office's ultimate accountability, Project Board decisions should be made in accordance with standards that shall ensure management for development results, best value money, fairness, integrity, transparency and effective international competition. In case a consensus cannot be reached within the Board, final decision shall rest with the UNDP Pacific Office Resident Representative.

The **National Project Director** (NPD) representing the Implementing Partner, will be in charge of overall responsibilities, including planning, coordination, administration and financial management of the project with support by UNDP-Pacific Center. The NPD will be responsible for the achievement of the project objectives, for all projects' reporting, including the submission of Annual Work Plans (AWP) and financial reports. The NPD will ensure the delivery of the project outputs and the judicious use of the project resources. This will ensure that expected outputs are delivered using the most efficient and cost-effective implementation strategies and procedures. The NPD will be also a member of the PSC.

The Steering Committee (i.e. the existing Committee on Sustainable Energy in Tuvalu) is to support the work of the Project Board and aimed to steer direction of the program implementation at the operational level. It will include the UNDP Pacific Office Energy Specialist, and senior technical officers from within MPUI and TEC with the primary function of providing guidance regarding the technical feasibility and sustainability of outcomes of the project.

The Project Steering Committee is comprised of the following individuals:

Chairman: Director of Energy, Ministry of Public Utilities and Infrastructure

Members: Senior Officer, Department of Energy  
Manager, Tuvalu Electricity Corporation  
Director, Department of Environment  
Director, Planning Bureau  
Director, Department of Home Affairs

The Project Steering Committee will meet at least quarterly or more frequently when necessary. The first Steering Committee meeting will convene following the approval of the Project Document in order to discuss the following matters:

- How to ensure successful implementation in line with the country's energy self-sufficiency goals with the cooperation among all parties involved
- Strategic planning especially in the RE/EE advocacy and support for the needed energy act with its necessary policies, regulations and institutional framework
- Identifying other agencies or units to participate in Project Steering Committee meetings as resource persons on areas relevant to the meeting agenda.
- Maintain knowledge of project status to apply technical applications on the direction of the project

- How to ensure sustainability of the project and to monitor project risks and agree on next steps and follow-up activities.

The **Project Manager** will run the project on a day-to-day basis on behalf of Implementing Partner and/or the Responsible Party and will be appointed by and perform operational functions within the constraints laid down by the Board. The Project Manager function will end when the final project terminal evaluation report, and other documentation required by the GEF and UNDP, has been completed and submitted to UNDP (including operational closure of the project). The Project Manager will coordinate the Project Management Unit (PMU) which will be established by the ED/MPUI and the UNDP Pacific Office in Funafuti, Tuvalu which oversees all UNDP funded and/or managed projects in Tuvalu.

The **Project Assurance** role will be provided by the UNDP Pacific Office specifically to support the Project Board by carrying out objective and independent project oversight and monitoring functions. This role also ensures that appropriate project management milestones are properly managed and completed. Additional quality assurance will be provided by the UNDP Senior Technical Advisor in Regional Center in Bangkok as needed.

Governance role for project target groups: This will provide a forum to collect users' inputs on customer satisfaction with the renewable energy technologies and energy efficient appliances and equipment (RE/EE). They provide feedback on application aspects such as system performance and enhancements needed to help the Project Board, Steering Committee, and the Project Manager understand the user needs and set a strategic direction for ongoing development activities. This will also involve the project role and responsibilities to: identify other stakeholder groups and make sure they are part of the communication, create a strong sense of community in the field, serve as advocates for the RE/EE systems, identify training issues vs. system issues and identify policy impacts. In order to achieve these ends, the project will include in the design the support communication infrastructure and timely feedback system, among other requirements.

UNDP Direct Project Services (DPS) as requested by Government: The UNDP, as GEF Agency for this project, will provide project management cycle services for the project as defined by the GEF Council. In addition the Government of Tuvalu may request UNDP direct services for specific projects, according to its policies and convenience. The UNDP and Government of Tuvalu acknowledge and agree that those services are not mandatory, and will be provided only upon Government request. If requested, the services would follow the UNDP policies on the recovery of direct costs. These services (and their costs) are specified in the Letter of Agreement (Annex J). As is determined by the GEF Council requirements, these service costs will be assigned as Project Management Cost, duly identified in the project budget as Direct Project Costs. Eligible Direct Project Costs should not be charged as a flat percentage. They should be calculated on the basis of estimated actual or transaction based costs and should be charged to the direct project costs account codes: "64397- Services to projects – CO staff" and "74596 – Services to projects – GOE for CO".

Agreement on intellectual property rights and use of logo on the project's deliverables and disclosure of information: In order to accord proper acknowledgement to the GEF for providing grant funding, the GEF logo will appear together with the UNDP logo on all promotional materials, other written materials like publications developed by the project, and project hardware. Any citation on publications regarding projects funded by the GEF will also accord proper acknowledgement to the

GEF. Information will be disclosed in accordance with relevant policies notably the UNDP Disclosure Policy<sup>13</sup> and the GEF policy on public involvement<sup>14</sup>.

Project management: The responsibility for the execution of the project under the national implementation modality is with the Implementing Partner (ED/MPUI) and will work closely with the TEC as the main Responsible Party. The ED/MPUI in cooperation with the TEC will establish a Project Management Unit (PMU) for the overall coordination and managing the resources of this project. The PMU will be organized to include the services of the Project Coordinator, accounting, financial, communications and the Chief Technical Advisor (CTA). As part of the arrangement, the UNDP CO will provide support staff to ED/MPUI and TEC.

The PMU will be very helpful in providing management services by following the procedures of UNDP and funding agencies and the Financial Regulations and Rules of UNDP and providing for the required guidance to ensure best value for money, fairness, integrity, transparency, and effective international competition that UNDP adheres to.

With PMU providing the supportive role, the Project Manager is responsible for:

- Managing the overall conduct of the project
- Implementing activities by mobilizing goods and services
- Checking on progress and watch for plan deviations
- Ensuring that changes are controlled and problems addressed
- Monitoring progress and risks
- Reporting on progress including measures to address challenges and opportunities.

The Project Manager should coordinate with the pertinent programme and operational units of the ED/MPUI and TEC on the follow up of disbursements against obligations and other matters in relation to project implementation and management.

Financial management: In the context of NIM, ATLAS provides the management information system to ensure accuracy and transparency of financial information. The **UNDP Pacific Office** should use ATLAS to keep track of the financial status of the project at all times, to control expenses, to handle outstanding commitments, to make payments and to monitor the performance of contractors. ATLAS shall be used for both financial management and substantive monitoring. This will enable the production of reports that are part of UNDP country office central oversight and monitoring while serving as the building blocks for periodic reviews and communications with stakeholders, such as the web-based reports (Project Progress Report and Project Budget Balance) in the Executive Snapshot. Any adjustments to the initial approved budget shall be reflected as budgetary revisions in Atlas to be finalized for the year(s) affected by the adjustment. The financial reporting and control mechanisms used to monitor UNDP GEF are the Combined Delivery Report (CDR), Project Budget Balance and Project Transactions detail report.

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<sup>13</sup> See [http://www.undp.org/content/undp/en/home/operations/transparency/information\\_disclosurepolicy/](http://www.undp.org/content/undp/en/home/operations/transparency/information_disclosurepolicy/)

<sup>14</sup> See [https://www.thegef.org/gef/policies\\_guidelines](https://www.thegef.org/gef/policies_guidelines)

## IX. FINANCIAL PLANNING AND MANAGEMENT

The total cost of the project is **USD 18,539,725**. This is financed through a GEF grant of **USD 2,639,725** and **USD 15,900,000** in parallel co-financing. UNDP, as the GEF Implementing Agency, is responsible for the execution of the GEF resources and the cash co-financing transferred to UNDP bank account only.

Parallel co-financing: The actual realization of project co-financing will be monitored during the mid-term review and terminal evaluation process and will be reported to the GEF. The planned parallel co-financing will be used as follows:

Co-financing source	Co-financing type	Co-financing amount (USD)	Planned Activities and Outputs	Risks	Risk Mitigation Measures
Government of Tuvalu		8,250,000			
GoT/MFATTEL*	Cash	6,700,000	Procurement of the location sites for RE/EE project pilot demonstrations and RE/EE equipment for their own energy supply in support of their programs	Project may not proceed or get delayed because of land acquisition problems and lack of budget	Facilitate through government acquisition procedures as national priority and government procurement system
	In-kind	750,000	Allocated salaries of personnel, Cost of services, Office space, and Existing equipment and facilities	Change of priorities in direction and assignment of personnel	Include in regular official programming and budgeting
	<i>Total</i>	7,450,000			
ED/MPUI**	Cash	240,000	Procurement of the location sites for RE/EE project pilot demonstrations and RE/EE equipment for their own energy supply in support of their programs	Project may not proceed or get delayed because of land acquisition problems and lack of budget	Facilitate through government acquisition procedures as national priority and government procurement systems
	In-kind	560,000	Allocated salaries of personnel, Cost of services, Office space, and Existing equipment and facilities	Change of priorities in direction and assignment of personnel	Include in regular official programming and budgeting and provide for transitions in case of personnel movements
	<i>Total</i>	800,000			
Tuvalu Electricity Corporation	Cash	7,350,000	Procurement of the location sites	Project may not proceed or get	Facilitate through government

			for the solar PV and wind turbine under the World Bank TESDP project	delayed because of land acquisition problems	acquisition procedures as national priority
	<i>In-kind</i>	50,000	Allocated salaries for project management by designated TEC officials, e.g., GM and Renewable Energy Manager	Change of priorities or personnel movements (e.g. for project coordinators, GM and REM)	Include in regular official programming and budgeting and provide for transitions in case of personnel movements
	<i>Total</i>	7,400,000			
UNDP	<i>Cash</i>	250,000	Project management and M&E	None	
TOTAL		15,900,000			

\*Ministry of Foreign Affairs, Trade, Tourism, Environment & Labor

\*\*Department of Energy/Ministry of Public Utilities & Infrastructure

**Budget Revision and Tolerance:** As per UNDP requirements outlined in the UNDP POPP, the project board will agree on a budget tolerance level for each plan under the overall annual work plan allowing the project manager to expend up to the tolerance level beyond the approved project budget amount for the year without requiring a revision from the Project Board. Should the following deviations occur, the Project Manager and UNDP Country Office will seek the approval of the UNDP-GEF team as these are considered major amendments by the GEF:

- a) Budget re-allocations among components in the project with amounts involving 10% of the total project grant or more;
- b) Introduction of new budget items/or components that exceed 5% of original GEF allocation.

Any over expenditure incurred beyond the available GEF grant amount will be absorbed by non-GEF resources (e.g. UNDP TRAC or cash co-financing).

**Refund to Donor:** Should a refund of unspent funds to the GEF be necessary, this will be managed directly by the UNDP-GEF Unit in New York.

**Project Closure:** Project closure will be conducted as per UNDP requirements outlined in the UNDP POPP. On an exceptional basis only, a no-cost extension beyond the initial duration of the project will be sought from in-country UNDP colleagues and then the UNDP-GEF Executive Coordinator.

**Operational completion:** The project will be operationally completed when the last UNDP-financed inputs have been provided and the related activities have been completed. This includes the final clearance of the Terminal Evaluation Report (that will be available in English) and the corresponding management response, and the end-of-project review Project Board meeting. The Implementing Partner through a Project Board decision will notify the UNDP Country Office when operational closure has been completed. At this time, the relevant parties will have already agreed and confirmed in writing on the arrangements for the disposal of any equipment that is still the property of UNDP.

**Financial completion:** The project will be financially closed when the following conditions have been met:



- a) The project is operationally completed or has been cancelled;
- b) The Implementing Partner has reported all financial transactions to UNDP;
- c) UNDP has closed the accounts for the project;
- d) UNDP and the Implementing Partner have certified a final Combined Delivery Report (which serves as final budget revision).

The project will be financially completed within 12 months of operational closure or after the date of cancellation. Between operational and financial closure, the implementing partner will identify and settle all financial obligations and prepare a final expenditure report. The UNDP Country Office will send the final signed closure documents including confirmation of final cumulative expenditure and unspent balance to the UNDP-GEF Unit for confirmation before the project will be financially closed in Atlas by the UNDP Country Office.

## X. TOTAL BUDGET AND WORK PLAN

Total Budget and Work Plan			
Atlas Proposal or Award ID:	97730	Atlas Primary Output Project ID:	101338
Atlas Proposal or Award Title:	Facilitation of the Achievement of Sustainable National Energy Targets of Tuvalu (FASNETT)		
Atlas Business Unit			
Atlas Primary Output Project Title	Facilitation of the Achievement of Sustainable National Energy Targets of Tuvalu (FASNETT)		
UNDP-GEF PIMS No.	5613		
Implementing Partner	Energy Department - Ministry of Public Utilities and Infrastructure		

GEF Component/Atlas Activity	Atlas Implementing Agent	Fund ID	Donor Name	Atlas Budgetary Account Code	ATLAS Budget Description	Amount Year 1 (USD)	Amount Year 2 (USD)	Amount Year 3 (USD)	Amount Year 4 (USD)	Total (USD)	See Budget Note:
<b>COMPONENT 1: AWARENESS RAISING ON RE &amp; EE APPLICATIONS</b>											
<b>OUTCOME 1:</b>	Energy Dept.-MPUI	62000	GEF	71200	International Consultants	20,000	15,000	10,000	10,000	55,000	1
<i>Improved awareness and attitude towards sustainable RE &amp; EE technology applications in the public2, commercial and energy sectors</i>				71300	Local Consultants	15,000	10,000	10,000	10,000	45,000	2
				71400	Contractual Services – Individual	8,000	8,000	8,000		24,000	3
				72100	Contractual Services-Companies	20,000	10,000			30,000	4
				72800	Information Technology Eqpt.	3,000	3,000	2,000		8,000	5
				72500	Supplies	3,400	3,000	3,000	3,000	12,400	6
				71600	Travel	2,000	2,000	2,000	2,000	8,000	7
				74200	Audio Visual & Print Prod Costs	2,000	2,000	5,000	5,000	14,000	8
				75700	Training, Workshops and Confer	15,000	15,000	15,000	10,000	55,000	9
					<b>TOTAL OUTCOME 1</b>	<b>88,400</b>	<b>68,000</b>	<b>55,000</b>	<b>40,000</b>	<b>251,400</b>	
<b>COMPONENT 2: ENERGY POLICY IMPROVEMENT AND INSTITUTIONAL CAPACITY BUILDING</b>											
<b>OUTCOME 2:</b>	Energy Dept.- MPUI	62000	GEF	71200	International Consultants	30,000	30,000	20,000	20,000	100,000	10
<i>Coherent and integrated implementation of enhanced policies, regulations and projects on energy development and utilization with the country's energy act in support of national economic development</i>				71300	Local Consultants	20,000	20,000	15,000	15,000	70,000	11
				71400	Contractual Services – Individual	20,000	20,000	10,000	15,000	65,000	12
				71600	Travel	15,000	15,000	15,000	10,000	55,000	13
				72100	Contractual Services-Companies	20,000	20,000	15,000	15,000	70,000	14
				72500	Supplies	2,500	2,500	3,000	3,000	11,000	15
				72800	Information Technology Eqpt.	20,000	20,000	5,000	5,000	50,000	16
				75700	Training, Workshops and Confer	20,000	15,000	10,000	15,000	60,000	17
				74500	Miscellaneous Expenses	8,000	5,000	5,000	3,900	21,900	18
					<b>TOTAL OUTCOME 2</b>	<b>155,500</b>	<b>147,500</b>	<b>98,000</b>	<b>101,900</b>	<b>502,900</b>	
<b>COMPONENT 3: APPLICATIONS OF RE &amp; EE TECHNOLOGIES AND TECHNIQUES</b>											

GEF Component/Atlas Activity	Atlas Implementing Agent	Fund ID	Donor Name	Atlas Budgetary Account Code	ATLAS Budget Description	Amount Year 1 (USD)	Amount Year 2 (USD)	Amount Year 3 (USD)	Amount Year 4 (USD)	Total (USD)	See Budget Note:
<b>OUTCOME 3.1:</b>	Energy Dept.-MPUI	62000	GEF	71200	International Consultants	30,000	20,000	10,000		60,000	19
<i>Enhanced energy utilization efficiency and development and application of feasible renewable energy resources in support of national economic development</i>				71300	Local Consultants	15,000	15,000	10,000	5,000	45,000	20
				71400	Contractual Services – Individual	10,000	10,000	10,000	10,000	40,000	21
				72100	Contractual Services-Companies	10,000	10,000	10,000	10,000	40,000	22
				72800	Information Technology Eqpt.	5,000	5,000	2,000	2,000	14,000	23
				74200	Audio Visual & Print Prod Costs	7,000	5,000	3,000	3,000	18,000	24
				75700	Training, Workshops and Confer	15,000	15,000	5,000	5,000	40,000	25
					<b>Sub-total Outcome 3.1</b>	<b>92,000</b>	<b>80,000</b>	<b>50,000</b>	<b>35,000</b>	<b>257,000</b>	
<b>OUTCOME 3.2:</b>	Energy Dept.-MPUI	62000	GEF	71200	International Consultants	30,000	15,000	15,000	15,000	75,000	26
<i>Increased application of viable climate resilient renewable energy and energy efficiency technology applications in the country</i>				71300	Local Consultants	20,000	20,000	20,000	20,000	80,000	27
				71600	Travel	5,000	5,000	3,000	2,000	15,000	28
				71400	Contractual Services – Individual	20,000	20,000	13,000	13,000	66,000	29
				72100	Contractual Services-Companies		10,000	10,000		20,000	30
				72200	Equipment and Furniture	660,000				660,000	31
				72300	Materials & Goods	20,000	20,000	15,000	5,000	60,000	32
				72800	Information Technology Eqpt.	3,000	3,000	3,000	2,000	11,000	33
				74700	Transport, Shipping and handle	4,000	3,000	3,000	3,000	13,000	34
	<b>Sub-total Outcome 3.2</b>	<b>762,000</b>	<b>96,000</b>	<b>82,000</b>	<b>60,000</b>	<b>1,000,000</b>					
	<b>TOTAL OUTCOME 3</b>	<b>854,000</b>	<b>176,000</b>	<b>132,000</b>	<b>95,000</b>	<b>1,257,000</b>					
<b>COMPONENT 4: FINANCING RE &amp; EE INITIATIVES</b>											
<b>OUTCOME 4.1:</b>	Energy Dept.-MPUI	62000	GEF	71200	International Consultants	15,000	10,000			25,000	35
<i>Improved availability of, and access to, financing for climate resilient renewable energy and energy efficiency</i>				71300	Local Consultants	7,000	5,000	5,000	2,000	19,000	36
				71400	Contractual Services – Individual	8,000	5,000			13,000	37
				72100	Contractual Services-Companies	10,000	10,000			20,000	38
				74100	Professional Services	8,000	8,000	3,000	3,000	22,000	39
				74200	Audio Visual & Print Prod Costs	1,000	1,000	1,000	800	3,800	40
					<b>Sub-total Outcome 4.1</b>	<b>49,000</b>	<b>39,000</b>	<b>9,000</b>	<b>5,800</b>	<b>102,800</b>	
<b>OUTCOME 4.2:</b>	Energy Dept.-MPUI	62000	GEF	71200	International Consultants	15,000				15,000	41
<i>GoT, the financial sector and donor agencies providing accessible financing for climate resilient renewable energy and energy efficiency projects</i>				71300	Local Consultants	15,000				15,000	42
				71600	Travel	3,000	3,000	2,000	2,000	10,000	43
				71400	Contractual Services – Individual	15,000				15,000	44
				72100	Contractual Services-Companies	15,000				15,000	45
				72100	Contractual Services-Companies	300,000	20,000			320,000	46
				72800	Information Technology Eqpt.	4,000	2,000	2,000	2,000	10,000	47
	<b>Sub-total Outcome 4.2</b>	<b>367,000</b>	<b>25,000</b>	<b>4,000</b>	<b>4,000</b>	<b>400,000</b>					

GEF Component/Atlas Activity	Atlas Implementing Agent	Fund ID	Donor Name	Atlas Budgetary Account Code	ATLAS Budget Description	Amount Year 1 (USD)	Amount Year 2 (USD)	Amount Year 3 (USD)	Amount Year 4 (USD)	Total (USD)	See Budget Note:
					<b>TOTAL OUTCOME 4</b>	<b>416,000</b>	<b>64,000</b>	<b>13,000</b>	<b>9,800</b>	<b>502,800</b>	
					<b>SUB-TOTAL ALL OUTCOMES</b>	<b>1,513,900</b>	<b>455,500</b>	<b>298,000</b>	<b>246,700</b>	<b>2,514,100</b>	
PROJECT MANAGEMENT	UNDP	62000	GEF	71200	International Consultants		25,000		25,000	50,000	48
				71300	Local Consultants		12,000		12,000	24,000	49
				72500	Supplies	1,000	825	800	800	3,425	50
				71400	Contractual Services – Individual	7,000	7,000	7,000	7,000	28,000	51
				71600	Travel	800	800	800	800	3,200	52
				74598	UNDP Support Services	3,000	3,000	3,000	3,000	12,000	53
				75700	Training, Workshop & Conference	5,000				5,000	54
					<b>TOTAL PMU</b>	<b>16,800</b>	<b>48,625</b>	<b>11,600</b>	<b>48,600</b>	<b>125,625</b>	
	<b>TOTAL PROJECT</b>	<b>1,530,700</b>	<b>504,125</b>	<b>309,600</b>	<b>295,300</b>	<b>2,639,725</b>					

Summary of Funds:

	Amount Year 1	Amount Year 2	Amount Year 3	Amount Year 4	Total
GEF	\$1,530,700	\$504,125	\$309,600	\$295,300	<b>\$ 2,639,725</b>
UNDP	\$62,500	\$62,500	\$62,500	\$62,500	<b>\$ 250,000</b>
Government of Tuvalu (cash and in-kind)	\$2,062,500	\$2,062,500	\$2,062,500	\$2,062,500	<b>\$ 8,250,000</b>
Tuvalu Electricity Corporation (Cash and in-kind)	\$1,850,000	\$1,850,000	\$1,850,000	\$1,850,000	<b>\$ 7,400,000</b>
<b>TOTAL</b>	<b>\$5,505,700</b>	<b>\$4,479,125</b>	<b>\$4,284,600</b>	<b>\$4,270,300</b>	<b>\$ 18,539,725</b>

**BUDGET NOTES:**

NO.	OUTCOME 1
1	The US\$55,000 budget for the International Consultant (IC) in-charge of all information, awareness and capacity building requirements of the project including information gathering, database and networking, consists of engagement costs to provide transport, DSA and professional fees equivalent to 8 trips of average two-week duration per trip for a total of 14 person-weeks that could be allocated as needed during the 4 years of implementation.
2	The US\$45,000 budget for National Consultant, to provide TA support to IC and PMU in information, awareness and capacity building requirements of the project including specifications for information gathering, database and networking, consists of engagement costs to provide transport, DSA and professional fees equivalent to 12 trips of average two-week duration per trip for a total of 28 person-weeks that could be allocated as needed during the 4 years of implementation.
3	For Individual Contractual Services for the detailed design and establishment of websites, information databases, networking and supervision of the production and publication of the information packages, multi-media presentation materials brochures and modules according to the approved communication strategy and plan and for allocated cost of CTA consultancy services
4	For Contractual Services-Companies providing for the actual production, printing and publication of the information packages, multi-media presentation materials brochures and modules according to approved designs.
5	For Information Technology Equipment and attendant software and maintenance
6	For ancillary Supplies and miscellaneous provisions
7	For the International cost of travel for key designated NPM and project coordinator and ED/MPUI & TEC officials for study tours or attendance to workshops/conferences pertinent to FASNETT within the region and the Local Travel required by the Component activities consistent with the approved capacity development plan.
8	For acquisition of camera, audio visual equipment and printing, production costs for documenting and promoting the activities and outputs of the project
9	For the conduct of Training, Workshops and Conferences among the stakeholders and target project beneficiaries and project participants according to the approved capacity development plan, knowledge management plan and communication strategy.
	OUTCOME 2
10	The US\$100,000 budget for International Consultant in-charge of policy development and institutional strengthening towards the updated 100% RE and GHG emissions-free goal, consists of engagement costs to provide transport, DSA and professional fees equivalent to 12 trips of average two-week duration per trip for a total of 28 person-weeks that could be allocated as needed during the 4 years of implementation
11	The US\$70,000 budget for National Consultant, to provide TA support to IC and PMU in policy development and institutional strengthening requirements of the project, consists of engagement costs to provide transport, DSA and professional fees equivalent to 12 trips of average two-week duration per trip for a total of 48 person-weeks that could be allocated as needed during the 4 years of implementation.
12	For Individual Contractual Services for coordination, information lobbying, parliament liaison, hearings and drafting/documentation support for the development and passage of the energy law and implementing rules and regulations (IRR) with emphasis on RE/EE and for allocated cost of CTA consultancy services.
13	For the International cost of travel, DSA and fees for key parliamentarian sponsors of the energy bill and the ED/MPUI and TEC officials for study missions or attendance to strategic workshops/conferences pertinent to FASNETT within the region and the Local Travel required by the Component activities consistent with the approved legislative agenda, strategy and plan towards final passage of the Energy Law within the project duration.
14	For the cost of Contractual Services-Companies and acquisition/development of integrated energy planning system and software and the necessary training and attendance to conferences for the adoption, establishment and continuing improvement of the integrated energy planning system and the drafting and finalization of the new Tuvalu National Energy Plan
15	For the necessary Supplies and ancillary materials in producing the outputs of the component outcomes.
16	For the design specification and acquisition of Information Technology Equipment that will be used for the databases, official project portal, integrated planning software and applications, and planning simulations of different scenarios in attaining the FASNETT 100% RE goal.
17	For the conduct of Training, Workshops and Conferences among the stakeholders and target project beneficiaries and project participants in line with the promotion and support for the development and passage of the energy law and its IRRs.
18	For Miscellaneous Expenses to support the other aspects of the component outputs and as contingency to related inputs to the activities and target outputs.
	OUTCOME 3.1
19	The US\$60,000 budget for International Consultant in-charge of designs and implementation plans for demo of RE/EE technology application consists of engagement costs to provide transport, DSA and professional fees

	equivalent to 8 trips of average two-week duration per trip for a total of 16 person-weeks that could be allocated as needed during the 4 years of implementation
20	The US\$45,000 budget for National Consultant, to provide TA support to IC and PMU in designs and implementation plans of RE/EE technology application requirements of the project, consists of engagement costs to provide transport, DSA and professional fees equivalent to 10 trips of average two-week duration per trip for a total of 30 person-weeks that could be allocated as needed during the 4 years of implementation.
21	For Individual Contractual Services for the conduct of RE resource and site surveys (1 for each for key RE resource – solar, wind, biomass, and another major RE option from ocean or hydro resources) and detailed feasibility studies and investment plans in the high potential RE resources in coordination with the IC and the NC.
22	For the cost of Contractual Services-Companies in performing energy audits and feasibility studies for various energy efficiency applications and techniques in power generation, end-uses in residential, commercial and industrial sectors.
23	For Information Technology Equipment and attendant software and maintenance
24	For acquisition of camera, audio visual equipment and printing, production costs for documenting and promoting the activities and outputs under the project component.
25	For the conduct of Training, Workshops and Conferences among the stakeholders and target project beneficiaries and project participants in selected RE/EE technologies demonstration.
	<b>OUTCOME 3.2</b>
26	The US\$90,000 budget for International Consultant in-charge of the development, finalization and supervision/advisory work of the implementation of the overall plan and specifications for the EPC, installation and operation of the approved RE/EE design and plans for demo RE/EE projects, consists of engagement costs to provide transport, DSA and professional fees equivalent to 8 trips of average two-week duration per trip for a total of 16 person-weeks that could be allocated as needed during the 4 years of implementation
27	The US\$80,000 budget for National Consultant, to provide TA support to IC and PMU in EPC, installation and operation of the approved RE/EE design and planning requirements of the project, consists of engagement costs to provide transport, DSA and professional fees equivalent to 16 trips of average two-week duration per trip for a total of 54 person-weeks that could be allocated as needed during the 4 years of implementation.
28	For the International cost of travel, DSA and fees for NPM and the ED/MPUI and TEC officials for study missions or attendance to strategic workshops/conferences choice of RE/EE technologies and the Local Travel required by the Component activities
29	For Individual Contractual Services, for finalization and implementation of the EPC , installation and operation of the approved RE/EE design and plans for demo RE/EE projects and for allocated cost of CTA consultancy services
30	For the cost of Contractual Services-Companies for site selection, development and civil works requirements of the RE/EE demo projects.
31	For the cost of acquisition including related costs such as related technical consultancy, insurance, tax and duties for the RE/EE Demonstration Equipment and accessories as well as critical spares that will ensure sustainability of operation within the project life and immediate post-project requirements. The US\$ 680,000 includes US 600,000 for 100 kWe floating solar PV; US\$ 50,000 for Off-grid Power Box and US\$ 30,000 for Demand management/response system at Demo Fale.
32	For the cost of Materials & Goods such as fuels, consumables and other operating cost to support the operation of the RE/EE demo facilities.
33	For Information Technology Equipment and attendant software and maintenance
34	For the cost of Transport, Shipping and handling to the islands in conjunction with the cost of acquisition of the RE/EE equipment (item 31) and furniture and the materials and goods (item 32).
	<b>OUTCOME 4.1</b>
35	The US\$25,000 budget for International Consultant in-charge of design, capacity building and TA to clients on financial models consists of engagement costs to provide transport, DSA and professional fees equivalent to 4 trips of average two-week duration per trip for a total of 6 person-weeks that could be allocated as needed during the 4 years of implementation
36	The US\$31,000 budget for National Consultant, to provide TA support to IC and PMU in design, capacity building and TA to clients on financial models requirements of the project, consists of engagement costs to provide transport, DSA and professional fees equivalent to 10 trips of average two-week duration per trip for a total of 18 person-weeks that could be allocated as needed during the 4 years of implementation.
37	For the cost of Individual Contractual Services for the necessary data gathering, survey and analysis of results regarding potential clients for the financial window to be established by the project.
38	For the cost of Contractual Services-Companies for the conduct of cost analysis and financial specifications for all the RE/EE demo projects and recommendations on the financial packaging of said demos to become the basis of the financial arrangement and cost recovery schemes that will serve as a sinking fund for further financial support to other RE/EE initiatives by other proponents beyond the project.
39	For the cost of Professional Services for evaluating the financial performance of the various demo projects and the other financing windows for replacement of old appliances, equipment and lighting through the project and project Audit cost of USD 3,000 per year.

40	For acquisition of camera, audio visual equipment and printing, production costs for documenting and promoting the activities and outputs under the project component.
	<b>OUTCOME 4.2</b>
41	The US\$15,000 budget for International Consultant in-charge of establishment of financial scheme, investment advice, evaluation and follow-up plan consists of engagement costs to provide transport, DSA and professional fees equivalent to 4 trips of average two-week duration per trip for a total of 8 person-weeks that could be allocated as needed during the 4 years of implementation
42	The US\$15,000 budget for National Consultant, to provide TA support to IC and PMU in the establishment of financial scheme, investment advice, evaluation and follow-up plan) requirements of the project, consists of engagement costs to provide transport, DSA and professional fees equivalent to 12 trips of average two-week duration per trip for a total of 28 person-weeks that could be allocated as needed during the 4 years of implementation.
43	For some international travel by the NPM and ED/MPUI and TEC officials in coordination with the UNDP Fiji, and it's Office of the Environment and Energy Program regarding the project financial and grant management and related local travels.
44	For cost of Individual Contractual Services for market surveys and investment studies of target clients and yearly updating to enhance achievement of project goals and for allocated cost of CTA consultancy services.
45	For the cost of Contractual Services-Companies by the bank acting as the fund manager and administrator of the financial window funded by the government or by the partner bank/financial institution.
46	For the cost of implementing the financial support program to be carried out by a contractor company. The contractor will assist in the facilitation of the program and implement it. The initial program will involve the provision of subsidies to eligible Tuvaluan households and businesses to purchase of EE refrigerators and freezers.
47	For the purchase of information technology equipment
	<b>PROJECT MANAGEMENT</b>
48	The US\$ 50,000 budget for International Consultant to undertake mid-term review and terminal evaluation consists of engagement costs to provide transport, DSA and professional fees equivalent to 4 trips of average two-week duration per trip for a total of 16 person-weeks that could be allocated for Year 2 and Year 4 according to UNDP/GEF guidelines.
49	The US\$24,000 budget for National Consultant, to provide TA support to IC and PMU in the conduct of the mid-term review and terminal evaluation the project, consists of engagement costs for transport, DSA and professional fees equivalent to 6 trips of average two-week duration per trip for a total of 15 person-weeks that could be allocated as needed during the 4 years of implementation.
50	For the cost of Supplies and other consumables for the PMU office
51	For the cost of Individual Contractual Services for the Project Manager. There is need to augment this from co-financing sources to be discussed in the Inception Workshop since budget for all Project Management costs is limited to only 5% of total project budget for FSPs. This budget for Contractual Services – Ind. is being augmented from allocated costs from each component budget for contractual Services – Ind. to provide for the services of the CTA as an international consultant. To cover for the CTA's services totaling USD 64,000, coming from Component 1 (US\$ 4,000); Component 2 (US\$ 20,000), Component 3.1 and 3.2 (US\$ 20,000); and transfer of US\$ 20,000 from line item on Equipment cost. This is with the understanding that said equipment cost carries with it the budget intended for the technical support cost of CTA services in purchasing the required equipment. Further, the budget for annual audit is not included here; its cost of USD 3,000 per year is included in Professional Services budget in Outcome 4.1 by reallocating corresponding amount from the Local Consultant budget (Note # 39)
52	For the Travel of the PMU staff
53	For UNDP Support Services under the NIM scheme cum UNDP CO Fiji/Tuvalu support for project management
54	For the cost of Inception Workshop and Conference for the project

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## XI. LEGAL CONTEXT

### **CPAP/UNDAF Action Plan countries where the country has signed the Standard Basic Assistance Agreement (SBAA)**

*[NOTE: The following Legal Context section contains the general provisions and alternative texts for the different types of implementation modalities for individual projects under the CPAP. The respective AWP for the individual projects will refer to the appropriate Alternative that applies to that project's implementation modality]*

This document together with the CPAP signed by the Government and UNDP which is incorporated herein by reference, constitute together a Project Document as referred to in the Standard Basic Assistance Agreement (SBAA); as such all provisions of the CPAP apply to this document. All references in the SBAA to "Executing Agency" shall be deemed to refer to "Implementing Partner", as such term is defined and used in the CPAP and this document.

Consistent with the Article III of the Standard Basic Assistance Agreement (SBAA), the responsibility for the safety and security of the Implementing Partner and its personnel and property, and of UNDP's property in the Implementing Partner's custody, rests with the Implementing Partner. To this end, the Implementing Partner shall:

- a) Put in place an appropriate security plan and maintain the security plan, taking into account the security situation in the country where the project is being carried;
- b) Assume all risks and liabilities related to the implementing partner's security, and the full implementation of the security plan.

UNDP reserves the right to verify whether such a plan is in place, and to suggest modifications to the plan when necessary. Failure to maintain and implement an appropriate security plan as required hereunder shall be deemed a breach of the Implementing Partner's obligations under this Project Document [and the Project Cooperation Agreement between UNDP and the Implementing Partner].

The Implementing Partner agrees to undertake all reasonable efforts to ensure that none of the UNDP funds received pursuant to the Project Document are used to provide support to individuals or entities associated with terrorism and that the recipients of any amounts provided by UNDP hereunder do not appear on the list maintained by the Security Council Committee established pursuant to resolution 1267 (1999). The list can be accessed via [http://www.un.org/sc/committees/1267/aq\\_sanctions\\_list.shtml](http://www.un.org/sc/committees/1267/aq_sanctions_list.shtml). This provision must be included in all sub-contracts or sub-agreements entered into under/further to this Project Document".



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## **XII. MANDATORY ANNEXES**

- A. Multi-year Work plan
- B. Monitoring Plan
- C. Evaluation Plan
- D. GEF Tracking Tool (s) at baseline
- E. Terms of Reference for Project Board, Project Manager, Chief Technical Advisor and other positions as appropriate
- F. UNDP Social and Environmental and Social Screening Template (SESP)
- G. UNDP Project Quality Assurance Report
- H. UNDP Risk Log
- I. Results of the capacity assessment of the project implementing partner and HACT micro assessment
- J. Additional agreements
- K. FASNETT Energy Savings and GHG Emission Reduction Estimates
- L. Results of the PPG Study on possible RE/EE projects to be covered by the FASNETT Project
- M. Additional Background Details on Gender Assessment
- N. Additional Background Details on Knowledge Management Strategy
- O. Annual Targets

### Annex A: FASNETT Multi Year Work Plan:

Task	Responsible Party	Year 1				Year 2				Year 3				Year 4			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
<b>OUTCOME 1</b>																	
Output 1.1	ED/MPUI & TEC																
Output 1.2	ED/MPUI & TEC																
Output 1.3	ED/MPUI & TEC																
Output 1.4	ED/MPUI & TEC																
Output 1.5	ED/MPUI & TEC																
Output 1.6	ED/MPUI & TEC																
Output 1.7	ED/MPUI & TEC																
<b>OUTCOME 2</b>																	
Output 2.1	ED/MPUI & TEC																
Output 2.2	ED/MPUI & TEC																
Output 2.3	ED/MPUI & TEC																
Output 2.4	ED/MPUI & TEC																
Output 2.5	ED/MPUI & TEC																
Output 2.6	ED/MPUI & TEC																
Output 2.7	ED/MPUI & TEC																
<b>OUTCOME 3.1</b>																	
Output 3.1.1	ED/MPUI & TEC																
Output 3.1.2	ED/MPUI & TEC																
Output 3.1.3	ED/MPUI & TEC																
Output 3.1.4	ED/MPUI & TEC																
Output 3.1.5	ED/MPUI & TEC																
Output 3.1.6	ED/MPUI & TEC																
<b>OUTCOME 3.2</b>																	
Output 3.2.1	ED/MPUI & TEC																
Output 3.2.2	ED/MPUI & TEC																
<b>OUTCOME 4.1</b>																	
Output 4.1.1	ED/MPUI & TEC																
Output 4.1.2	ED/MPUI & TEC																

Task	Responsible Party	Year 1				Year 2				Year 3				Year 4			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Output 4.1.3	ED/MPUI & TEC																
<b>OUTCOME 4.2</b>																	
Output 4.2.1	ED/MPUI & TEC																
Output 4.2.2	ED/MPUI & TEC																
Output 4.2.3	ED/MPUI & TEC																

## Annex B: Monitoring Plan

The Project Manager will collect results data according to the following monitoring plan.

Monitoring	Indicators	Description	Data source/Collection Methods	Frequency	Responsible for data collection	Means of verification	Assumptions and Risks
<b>Project Objective:</b> Facilitation of the development and utilization of feasible renewable energy resources and application of energy efficiency technologies in Tuvalu for achieving realistic energy targets in Tuvalu	% share of RE/EE in the national power generation mix	Percentage of total RE power generation and EE savings with total power generation of TEC and other private groups	TEC and private groups with self-generation using various modes and fuels indicating monthly and consolidated into annual energy generation reports by ED/MPUI per resource in an energy mix report	Annually; Reported in DO tab of the GEF PIR	ED/MPUI, TEC, PMO and consultants	PMO/Consultant report  Annual energy mix and consumption reports by ED/MPUI and TEC	Regional oil prices will be at levels that make RE/EE still competitive and cost-effective
	Cumulative GHG (CO <sub>2</sub> ) emission reduction from power generation, tons CO <sub>2</sub>	Equivalent emission reduction derived from the total RE power generation and EE savings using Tuvalu's emission factor	ED/MPUI and TEC reports and calculation according to GEF GHG measurement methodology	Annually; Reported in DO tab of the GEF PIR	ED/MPUI, TEC, PMO and consultants	Reports on GHG (CO <sub>2</sub> ) emission reduction from power generation	
	No. of women actively involved in the planning and implementation of energy services provision in the outer islands	Survey result on persons involved indicating women participation	Survey result on the participation of people, and indicating women involvement in planning and implementation	Annually; Reported in DO tab of the GEF PIR	ED/MPUI, TEC, PMO and consultants	Project M&E reports	
<b>Outcome 1</b> Improved awareness and attitude towards sustainable RE & EE	No. of communities that are capable of organizing, planning, designing, implementing,	Number of communities involved indicating their participation in various aspects of	Survey of communities	Annually; Reported in DO tab of the GEF PIR	ED/MPUI, TEC, PMO and consultants	Project M&E reports	Acceptance of community of RE/EE application

Monitoring	Indicators	Description	Data source/Collection Methods	Frequency	Responsible for data collection	Means of verification	Assumptions and Risks
technology applications in the public, commercial and energy sectors	operating and maintaining RE-based power generation systems.	RE/EE program activities					
	No. of households, schools, public buildings and commercial establishments that are using low carbon technology systems	installations of RE-based systems	Reporting to ED/MPUI and TEC	Annually; Reported in DO tab of the GEF PIR	Dept. of Education, ED/MPUI, TEC, PMO and consultants	Project M&E reports	
<b>Outcome 2 Coherent and integrated implementation of enhanced policies, regulations and projects on energy development and utilization with the country's energy act in support of national economic development</b>	No. of planned RE & EE projects benefiting from the policies and regulations supported by the Energy Act	Listing of planned RE & EE projects consolidated by ED/MPUI resulting from the issuance of RE law and other regulations	Reporting to ED/MPUI and TEC	Annually; Reported in DO tab of the GEF PIR	ED/MPUI, TEC, PMO	Project M&E reports	Political stability of the country is sustained
<b>Outcome 3 3.1 Enhanced energy utilization efficiency and development and application of feasible renewable energy resources in</b>	No. of companies adopting the established standards in supplying or producing RE/EE system equipment or component parts	List of companies adopting established standards	Reporting to ED/MPUI and TEC	Annually; Reported in DO tab of the GEF PIR	ED/MPUI, TEC, PMO	Project M&E reports	<i>As above</i>

Monitoring	Indicators	Description	Data source/Collection Methods	Frequency	Responsible for data collection	Means of verification	Assumptions and Risks
<b>support of national economic development</b>	% users of RE/EE system equipment and component parts that are satisfied with the quality, cost and operating performance of these items	Acceptance ratio regarding satisfaction on use of RE/EE systems	Reporting to ED/MPUI and TEC	Annually; Reported in DO tab of the GEF PIR	Industry associations, ED/MPUI, TEC, PMO	Project M&E reports	
<b>3.2 Increased application of viable climate resilient renewable energy and energy efficiency technology applications in the country</b>	Increased no. of low carbon technology projects (new, or replication, or scale-up)	Listing of RE projects annually	Reporting to ED/MPUI and TEC	Annually; Reported in DO tab of the GEF PIR			Acceptance of community of RE/EE application
<b>Outcome 4 4.1: Improved availability of, and access to, financing for climate resilient renewable energy and energy efficiency</b>	No. of established and operational financing schemes for RE/EE projects	Listing of operational financing schemes	Reporting to ED/MPUI and TEC	Annually; Reported in DO tab of the GEF PIR	DBT, ED/MPUI, TEC, PMO	Project M&E reports	Financing institutions will continuously support RE/EE projects
	No. of local and/or foreign banks or FIs that are interested in funding RE/EE projects using the financial schemes	Listing of local and/or foreign banks or FIs involved in RE/EE financing	Reporting to ED/MPUI and TEC	Annually; Reported in DO tab of the GEF PIR	DBT, ED/MPUI, TEC, PMO	Project M&E reports	
<b>4.2: GoT, the financial sector and donor agencies providing accessible</b>	Increase in government budget for low carbon	Amount of government budget authorized and spent on RE projects	Reporting to ED/MPUI and TEC	Annually; Reported in DO tab	Dept. of Finance, DBT, ED/MPUI, TEC, PMO	Project M&E reports	Regional oil prices will be at levels that make RE/EE still

Monitoring	Indicators	Description	Data source/Collection Methods	Frequency	Responsible for data collection	Means of verification	Assumptions and Risks
financing for climate resilient renewable energy and energy efficiency projects	technology projects (RE/EE projects, US\$			of the GEF PIR			competitive and cost-effective
<i>Mid-term GEF Tracking Tool (if FSP project only)</i>	N/A	N/A	Standard GEF Tracking Tool available at <a href="http://www.thegef.org">www.thegef.org</a> Baseline GEF Tracking Tool included in Annex.	After 2 <sup>nd</sup> PIR submitted to GEF	Project consultant	Completed GEF Tracking Tool	
Terminal GEF Tracking Tool	N/A	N/A	Standard GEF Tracking Tool available at <a href="http://www.thegef.org">www.thegef.org</a> Baseline GEF Tracking Tool included in Annex.	After final PIR submitted to GEF	Project consultant	Completed GEF Tracking Tool	
<i>Mid-term Review (if FSP project only)</i>	N/A	N/A	To be outlined in MTR inception report	Submitted to GEF same year as 3 <sup>rd</sup> PIR	Independent evaluator	Completed MTR	
Environmental and Social risks and management plans, as relevant.	N/A	N/A	Updated SESP and management plans	Annually	Project Manager UNDP CO	Updated SESP	

### ANNEX C: Evaluation Plan

<b>Evaluation Title</b>	<b>Planned start date Month/year</b>	<b>Planned end date Month/year</b>	<b>Included in the Country Office Evaluation Plan</b>	<b>Budget for consultants</b>	<b>Other budget (i.e. travel, site visits etc.)</b>	<b>Budget for translation</b>
<b>Mid-Term Review</b>	November 2018	December 2018	Yes	USD 40,000	USD 20,000	
<b>Terminal Evaluation</b>	March 2021	May 2021	Yes	USD 40,000	USD 20,000	
<b>Total evaluation budget</b>				USD 120,000		



## Annex D: GEF Tracking Tool at Baseline

### Tracking Tool for GEF 6 Climate Change Mitigation Projects (At Baseline)

**Special Notes: Projects need to report on all indicators that are included in their results framework**

**Reporting on lifetime emissions avoided**

**Lifetime direct GHG emissions avoided:** Lifetime direct GHG emissions avoided are the emissions reductions attributable to the investments made **during the project's supervised implementation period**, totaled over the respective lifetime of the investments.

**Lifetime direct post-project emissions avoided:** Lifetime direct post-project emissions avoided are the emissions reductions attributable to the investments made outside the project's supervised implementation period, but supported by financial facilities put in place by the GEF project, totaled over the respective lifetime of the investments. These financial facilities will still be operational after the project ends, such as partial credit guarantee facilities, risk mitigation facilities, or revolving funds.

**Lifetime indirect GHG emissions avoided (top-down and bottom-up):** indirect emissions reductions are those attributable to the long-term outcomes of the GEF activities that remove barriers, such as capacity building, innovation, catalytic action for replication.

Please refer to the following references for Calculating GHG Benefits of GEF Projects.

[Manual for Energy Efficiency and Renewable Energy Projects](#)

[Revised Methodology for Calculating Greenhouse Gas Benefits of GEF Energy Efficiency Projects \(Version 1.0\)](#)

[Manual for Transportation Projects](#)

For LULUCF projects, the definitions of "lifetime direct and indirect" apply. Lifetime length is defined to be 20 years, unless a different number of years is deemed appropriate. For emission or removal factors (tonnes of CO<sub>2</sub>eq per hectare per year), use IPCC defaults or country specific factors.

#### Section A. General Data

	At CEO Endorsement	
Project Title	Facilitation of the Achievement of Sustainable National Energy Targets of Tuvalu (FASNETT)	
GEF ID	9220	
GEF Agency	UNDP	
Agency Project ID	5613	
Country	Tuvalu	
Region	EAP	

Date of Council/CEO Approval	September 14, 2015	Month DD, YYYY (e.g., May 13, 2014)
GEF Grant (US\$)	2,639,725	
Date of submission of the tracking tool	March 3, 2017	Month DD, YYYY (e.g., May 13, 2014)
Is the project consistent with the priorities identified in National Communications, Technology Needs Assessment, or other Enabling Activities (such as Technology Action Plans, Nationally Appropriate Mitigation Actions (NAMA) under the UNFCCC?	1	Yes = 1, No = 0

**Section B. Quantitative Outcome Indicators**

**Target At CEO Endorsement**

<b>Indicator 1: Total Lifetime Direct and Indirect GHG Emissions Avoided (Tons CO2eq)</b>		<b>Identify Sectors, Sources and Technologies. Provide disaggregated information if possible. see Special Notes above</b>
Lifetime direct GHG emissions avoided	68,440.4	Direct emission reduction
Lifetime indirect GHG emissions avoided	255,908.0	Bottom-up approach
<b>Indicator 2: Lifetime Energy Saved (Million Joules)</b>	674,716,100	<b>IEA unit converter: <a href="http://www.iea.org/stats/unit.asp">http://www.iea.org/stats/unit.asp</a> Fuel savings should be converted to energy savings by using the net calorific value of the specific fuel. End-use electricity savings should be converted to energy savings by using the conversion factor for the specific supply and distribution system. These energy savings are then totaled over the respective lifetime of the investments.</b>

<b>Indicator 3: Increase in Renewable Energy Capacity and Production</b>		<b>Disaggregate by type (Wind, Biomass, Geothermal, Hydro, solar, Photovoltaic, Marine power etc.)</b>
<b>Increase in Installed RE capacity per technology (MW)</b>		
Solar PV	5.6	
Wind	1.6	
<b>Lifetime RE production per technology (MWh)</b>		(IEA unit converter: <a href="http://www.iea.org/stats/unit.asp">http://www.iea.org/stats/unit.asp</a> )
Solar PV	130,242	
Wind	46,306	
<b>Indicator 4: Number of Users of low GHG systems (Number, of which female)</b>	500 (100)	<b>Identify Sector, describe the low GHG system and technologies and explain methodology for estimation</b>
<b>Indicator 5: Number of Hectares under Low GHG Management Practices (Ha.)</b>		<b>Identify source (conservation, avoided deforestation, afforestation/reforestation), type of low GHG Management Practice and describe methodology used for estimation</b>
<b>Indicator 6: Time Saved in adoption of low GHG technology (Percentage)</b>		<b>For technologies and practices to be supported under the project (i) estimate baseline time to deployment (without project support), (ii) estimate expected time to deployment with project support and (iii) calculate % of time saved.</b>

Indicator 7: Volume of investment mobilized and leveraged by GEF for low GHG development (co-financing and additional financing) of which		Expected additional resources implies resources beyond co-financing committed at CEO endorsement.
Public	NA	
Private	NA	
Domestic	NA	
External	NA	
Indicator 8: Identify specific GHG reduction target (percent), if any, under any national, sectoral, local plans		Specify plan, area/sector (if subnational), and baseline from which reduction is expected
	100% by 2025 under the TNEP/INDC	

**Section C. Qualitative Indicators**

Indicator 9: Degree of support for low GHG development in policy, planning and regulations	Baseline Rating (1-10)	Target Rating (1-10)	Identify the policy/regulations (national, sectoral, City) relevant to and supported by the project and provide rating. Baseline indicates current status (pre-project), Target is the rating level that is expected to be achieved due to project support. For guidance for qualitative ratings (in comment) move cursor over box or right click to show comment.
National/Regional/Sectoral/City Plan	5	8	Tuvalu Energy Law

<b>Indicator 10: Quality of MRV Systems</b>	<b>Baseline Rating (1-10)</b>	<b>Target Rating (1-10)</b>	Provide details of coverage of MRV systems - area, type of activity for which MRV is done, and of Reporting and Verification processes. Baseline indicates current status (pre-project), Target is the rating level that is expected to be achieved due to project support. For guidance for qualitative ratings (in comment) move cursor over box or right click to show comment.
Monitoring RE Capacity Additions	6	9	PIR
Monitoring EE Projects to reduce electricity demand	6	9	PIR
<b>Indicator 11: Degree of strength of financial and market mechanisms for low GHG development</b>	<b>Baseline Rating (1-10)</b>	<b>Target Rating (1-10)</b>	Provide details of the financial mechanisms and identify the sector and the type of low GHG technology or development activity it supports. Baseline indicates current status (pre-project), Target is the rating level that is expected to be achieved due to project support. For guidance for qualitative ratings (in comment) move cursor over box or right click to show comment.
Replacement of old inefficient appliances and lighting and acquisition of RE/EE technologies and equipment	5	9	Low interest and Financial rebates and other incentives tied to home loan/mortgages

## Annex E: Terms of Reference of Key Project Personnel

### 1. Project Manager (PM)

Duty Station:	Funafuti with travel to Outer Islands as required.
Duration of assignment:	12 person-months with possible extension (part-time).
Direct Supervisor:	UNDP Country Office Environment and Energy Program Coordinator

#### Responsibilities and Duties:

The primary task of the **PM** is to plan, organize and implement the FASNETT project under the direction of the National Project Director. He/she will be responsible for in management of input mobilization and day-to-day project operations including timely resolution of issues, problems or bottlenecks. He/she will supervise the technical and administrative staff under the PMU to be established under supervision of MPUI, in close coordination with the UNDP CO and the General Manager of Tuvalu Electricity Corporation (TEC). The PM should have multidisciplinary capabilities in RE & EE policy and institutional support development, communication and awareness; technical capacity development; energy efficiency services provision support; financing; and demonstration. To assume this overall responsibility, the specific tasks of the PM are as follows:

1. Prepare, update, and submit the required work plan and reports to UNDP CO Director for clearance timely and with satisfactory quality, including: Annual Work Plan (AWP), Quarterly Work Plan (QWP), Annual Project Reports (APR), GEF Project Implementation Review (PIR) Report, the Quarterly Progress Reports (QPR), and the Final Project Reports as scheduled;
2. Finalize detailed ToRs for key outputs (i.e. personnel, consultants, sub-contractors, training, and procurements), within assistance from the International and National Senior Technical Advisers, and submit to NDP and UNDP CO for clearance and approval;
3. Take responsibility for monitoring the overall progress and use of the resources of all outputs and initiative corrective actions if necessary;
4. Assume direct responsibility for managing the project budget on behalf of the NPD, ensuring that:
  - Project funds are made available when needed, and are disbursed properly;
  - Accounting records and supporting documents are kept;
  - Required financial reports are prepared;
  - Financial operations are transparent and financial procedures/regulations, in coordination with PMU, under a National Implementation Modality (NIM) as maybe adopted for FASNETT project;
  - Project Management is ready to stand up audit at any time.
5. Assume direct responsibility for managing the physical resources (e.g. vehicles, office, equipment, furniture, stationary...) provided to the project by UNDP;
6. Keep record and update the Project issues and risks and recommend necessary actions to NPD to effectively cope with identified risks, and coordinate the implementation of the approved risk mitigation actions;
7. Liaison and coordinate the implementation of all project partnership agreements to ensure that partners implement the project components in a collaborative manner with the Project quarterly and annual work plan;
8. Liaison with UNDP CO or designated quality assurance personnel on the project quality management issues;
9. Supervise the project staff and local or international experts/consultants working for the project;
10. Provide back-stopping support for administrative work of the Project Management Unit if necessary; and
11. Organize the Inception Workshop, APR and SPC meetings as well as evaluation missions in coordination with UNDP.

#### Qualifications:

- Minimum of Master's Degree in management, administration, economics, or any other relevant fields with engineering background.
- At least 5 years of proven track record on national or international project management experience, and at least three years of experience in energy project;

- Track record of, or proven experience in successful contract management, supervision and reporting skills;
- Excellent English proficiency, both in written and spoken,
- Knowledgeable about Tuvalu’s energy policies, RE and EE programs and GoT’s administrative structures;
- Familiar with technical assistance projects and GEF/UNDP projects in Tuvalu; and
- Highly self-motivated, with good leadership skills.

## 2. Project Management Unit (PMU) Coordinator

Duty Station: Funafuti with travel to Outer Islands as required.  
 Duration of Assignment: 12 person-months with possible extension (part-time).  
 Direct Supervisor: Project Manager

The Project Management Unit (PMU) will be established and be supervised by UNDP CO, in close coordination with the Secretary of Department of Energy – Ministry of Public Utilities and Infrastructure (ED/MPUI) and the General Manager of Tuvalu Electricity Corporation (TEC). It will be composed of technical and administrative staff to be hired by combined resources of GEF and co-financing under the FASNETT Project.

### Responsibilities and Duties:

The PMU Coordinator shall be responsible for (i) the accurate and appropriate recording of disbursements of Project funds; maintaining the set of books required according to UNDP accounting procedures, classifying and summarizing financial transactions of the project and the generation of required financial reports. He/She will also be responsible in updating all other books of accounts such as subsidiary ledgers and special registers; (ii) administrative support to the operations of PMU, supervising administrative staff and ensuring the smooth functioning of administrative systems under the project. Specifically, he/she will be responsible for the following tasks:

- 
1. Installation and implementation of a GEF financial system that records transactions that utilize GEF Funds in accordance with UNDP’s existing guidelines;
  2. Orientation of staff on the use of the project’s financial systems and procedures;
  3. Proper recording of financial transactions and submit a regular report on the project’s financial status;
  4. Certifying correctness of journals, vouchers, bills, statement of accounts, trial balance, budget estimates and other financial statement and records;
  5. Preparation of certification of the availability of funds and/or allotment of expenses, vouchers and requisition for supplies, materials, etc.;
  6. Preparation of annual and quarterly budgets including the necessary budget revisions based on the corresponding line-item-budgets approved by UNDP CO;
  7. Establishment of a project account and ensure appropriateness and proper record keeping of transactions;
  8. Supervision of the preparation of payroll and general voucher of salaries, and other documentary requirements for disbursements;
  9. Preparation of updated reports on disbursements made by the project, and advise the Project Team on the overall financial status of the project; and
  10. Preparation of a system of accounts those records all the in-cash and in-kind contributions of co-financing entities to the Project.

### Administration tasks:

1. Establishes the administrative system and procedures consistent with UNDP’s National Implementation Modality, to be developed with the UNDP CO in the form of a Manual, for the guidance of project staff, consultants and subcontractors;
2. Establishes a record of management system for the project both in paper and electronic;
3. Maintains files of all personnel, consultants and subcontractors actively engaged in the project;
4. Prepares and arranges travel plans and procurement plans for the project;

5. Supervises the procurement of equipment, supplies and sundries as may be needed in the Project, in accordance with UNDP guidelines;
6. Maintains an updated inventory of all supplies and equipment and prepares guidelines for the proper use and maintenance of office equipment and properties;
7. Supervises the overall administrative activities related to project implementation;
8. Prepares annual and quarterly work plan of activities for approval by UNDP CO; and
9. Secretariat support to workshops, seminars and trainings.

Qualification and Experience:

- Bachelor Degree in accounting or financing, preferably Master's Degree in the same or any other relevant field;
- At least 5-years of experience as accountant, administration, preferably with UNDP/GEF project;
- Proven track record in project management such as in meeting deadlines, timely submission of acceptable deliverables, etc.;
- Excellent English communication skills, both written and verbal;
- Knowledge of the Atlas or any similar systems;
- With satisfactory skills on the use of office software packages such as MS Word, Excel and Power Point; and
- Good interpersonal skills.



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## Project Consultants and other Staff

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### 3. Chief Technical Advisor

Duty Station:	Funafuti with domestic travel to outer islands as required.
Duration of Assignment:	Five (5) person-months output-based contract over 4 years
Direct Supervisor:	UNDP Country Office in coordination with ED/MPUI and TEC and the Regional Technical Adviser

#### Duties and Responsibilities:

The principal responsibility of the **Chief Technical Advisor** is to provide technical assistance in the implementation of the Project under the national implementation mode that would augment the capability of the Implementing Partner, Responsible Party and the PMU in coordination with UNDP in order to ensure the achievement of project objectives following the UNDP-GEF performance standards and practices.

- Assist the NPD, PM and PMU in the specific issues and requirements in project implementation that will be requested to achieve project objectives
- Coordinate and advise on annual work plans for the project
- Coordinate and advise on all consultant, contractor and sub- contractors as maybe requested by project management
- Advise on scheduling, budgeting and monitoring issues
- Provide written advice and comment on policy, technical, financial, market and sustainability issues
- Advise on establishing and managing monitoring and evaluation programs for all aspects of the project following the log frame of the project and on the preparation and finalization of the Annual Project Report/Project Implementation Review as required by the UNDP/GEF M&E system.
- Advise the UNDP, NPD, PM and PMU and independent evaluators in the conduct of the Mid-term Review (MTR) and Terminal Evaluation (TE), exit strategy and the project closure process and other requirements of the UNDP GEF.

#### Deliverables:

- An inception report identifying key issues, tasks and schedules for the FASNETT
- In-country trip reports at the completion of each visit to the Tuvalu
- Specific task and annual reports complete with strategies and key issues to be addressed.

#### Qualification and Experience:

- Required knowledge of RE and EE technology applications, particularly in the island setting
- Proven experience in analyzing baseline scenarios, and formulating realistic alternative scenarios
- Proven experience in working on, or contributing to design and development of climate change mitigation and energy (energy efficiency and renewable energy) projects
- Work experience on development projects in Tuvalu, and/or any small island developing states in the Pacific and other regions
- Technical knowledge and work experience in renewable energy and energy efficiency for at least 10 years
- Demonstrated understanding of issues related to gender and climate change mitigation; experience in gender sensitive and inclusive development
- Ability to function effectively in an international, multi-cultural environment; and
- Fluency in English, both spoken and written.

### 4. International Sustainable Energy Expert on RE & EE

Duty Station: Funafuti with domestic travel to outer islands as required.  
Duration of Assignment: Two (2) person-months output-based contract spread out each for Year 1 & 2 and one (1) person-month each for Year 3 & 4  
Direct Supervisor: UNDP Country Office in coordination with ED/MPUI and TEC and the Regional Technical Adviser

Duties and Responsibilities:

The principal responsibilities of the **International Sustainable Energy Expert** is to provide technical assistance under the project's Components 1, 2 and 4, focusing on policy, institutions, awareness, promotion and financial requirements of the project in coordination with ED/MPUI and TEC.

Deliverables:

- Assessment of the current status of RE development and utilization; the current share of RE-based electricity; the most realistic level of contribution of RE electricity in the national power generation by 2020 and 2025;
- Assessment and recommendations on the of installed and planned RE-based energy systems towards sustainable balance of energy supply and demand in Tuvalu;
- Evaluation of potential innovation approaches for enhancing the share of RE-based electricity in the national power generation considering experiences in similarly-situated island countries
- Report on the technical assistance in:
  - Needs analysis and implementation for capacity building necessary to implement the TNEP
  - Assessment of the feasibility and implementation of the RE technology applications for power generation;
  - National program for the promotion of RE/EE technology applications as feasible investment options in the electricity and energy end-use sectors (inclusive of those in the outer islands) in Tuvalu; including recommendations for feasible information dissemination systems on RE/EE technologies to be developed under the project
  - Recommendation of potential solutions and how to implement such solutions to the identified policy/regulatory and institutional barriers towards institutionalizing the solutions in line with revision of the TNEP that include LC development policies and strategies and drafting of the Tuvalu Energy Act
  - Recommendation of potential EE and RE technology application projects that can be financed either through government financing schemes or by private sector investments
- Mission reports.

Qualification and Experience:

- Required knowledge of RE and EE technology applications, particularly in the island setting
- Proven experience in analyzing baseline scenarios, and formulating realistic alternative scenarios
- Proven experience in working on, or contributing to design and development of climate change mitigation and energy (energy efficiency and renewable energy) projects
- Work experience on development projects in Tuvalu, and/or any small island developing states in the Pacific and other regions
- Technical knowledge and work experience in renewable energy and energy efficiency for at least 10 years
- Demonstrated understanding of issues related to gender and climate change mitigation; experience in gender sensitive and inclusive development
- Ability to function effectively in an international, multi-cultural environment; and
- Fluency in English, both spoken and written.

**5. International Electric Power Systems Design Expert on RE & EE**

Duty Station: Funafuti with domestic travel to outer islands as required.

Duration of Assignment: Two (2) person-months output-based contract spread out each for Year 1 & 2 and one (1) person-month each for Year 3 & 4  
Direct Supervisor: UNDP Country Office in coordination with ED/MPUI and TEC and the Regional Technical Adviser

Duties and Responsibilities:

The principal responsibilities of the **International Electric Power Systems Design Expert** is to provide technical assistance under the project's Component 3 and provide technical inputs to the requirements of Component 1, 2 and 4, focusing on RE and EE technologies applicable to Tuvalu in coordination with ED/MPUI and TEC and the Regional Technical Adviser.

Deliverables:

- Assessment of the current status of RE and EE technologies and their potential contribution to the national power generation by 2020 and 2025;
- Assessment and recommendations on the of installed and planned RE-based energy systems towards grid and non-grid supply and demand in Tuvalu;
- Recommendations in enhancing the share of RE-based electricity in the national power generation considering experiences in similarly-situated island countries
- Identification, planning and implementation of the RE and EE demonstration projects under FASNETT
- Report on the technical assistance in:
  - Assessment of potential of all RE resources in the country and status of development of each RE resource
  - Determination of the feasible technologies for RE-based power generation that are applicable in Tuvalu;
  - Assessment of specific technical capacity development needs in the electricity sector in RE and EE technology applications in power generation and utilization in Tuvalu
  - Estimation and actual deliveries of baseline energy generation and alternative scenario electricity generation and the resultant potential energy savings and CO<sub>2</sub> emission reductions (using the GEF prescribed estimation procedures) from the RE-based power generation demonstrations within the project duration and possible replications for the next 20 years after the project to meet Tuvalu's 100% GHG reduction through RE and EE application
- Mission reports.

Qualification and Experience:

- Required knowledge of RE and EE applications, particularly in the island setting
- Proven experience in analyzing baseline scenarios, and formulating realistic alternative scenarios
- Proven experience in working on, or contributing to design and development of climate change mitigation and energy (energy efficiency and renewable energy) projects
- Work experience on development projects in Tuvalu, and/or any small island developing states in the Pacific and other regions
- Technical knowledge and work experience in renewable energy and energy efficiency for at least 10 years
- Demonstrated understanding of issues related to gender and climate change mitigation; experience in gender sensitive and inclusive development
- Ability to function effectively in an international, multi-cultural environment; and
- Fluency in English, both spoken and written.

## **6. National Sustainable Energy Consultant for RE and EE Technology Application**

Task Location: Funafuti with travel to Outer Islands as required.  
Duration of Assignment: One consultant for about 30 months spread over 4 years  
Direct Supervisor: UNDP Country Office in coordination with ED/MPUI and TEC and the Regional Technical Adviser

### Duties and Responsibilities

The tasks of the **National Sustainable Energy Consultant for RE and EE Technology Application** are the provision of technical assistance to the ED/MPUI and TEC in enhancing their existing and planned RE and EE projects to significantly contribute to the 100% reduction of GHG emissions through RE and EE technology applications along the sustainable and inclusive development in Funafuti and the Outer islands focusing on policy, institutions, awareness, promotion and financial requirements of the project in coordination with ED/MPUI and TEC,

### Deliverables:

- Technical assistance in drafting and follow through of the energy law with emphasis on RE and EE development and utilization programs
- Technical assistance in the formulation of implementing rules and regulations
- Technical assistance in the design and implementation of the M&E system for attaining the 100% RE goal within the project duration and beyond
- Technical assistance in the selection, application and training on integrated energy planning in the Tuvalu context
- Design and implementation guidelines in the follow-up and sustainability of the RE/EE program
- Recommendations on organizational strengthening of the energy sector

### Qualification and Experience:

Minimum requirements for the experts are as follows:

- Knowledgeable and familiar with national energy planning and implementation ;
- At least a degree in Engineering, Business Management, or related fields; and
- Previous experience(s) in RE and EE technology applications

## **7. National Consultant Electric Power Systems**

Task Location: Funafuti with travel to Outer Islands as required.  
Duration of Assignment: One consultant for about 30 months spread over 4 years  
Direct Supervisor: UNDP Country Office in coordination with ED/MPUI and TEC and the Regional Technical Adviser

### Duties and Responsibilities

The tasks of the **National Consultant Electric Power Systems for RE and EE Technology Application** are the provision of technical assistance to the ED/MPUI and TEC in enhancing their existing and planned RE and EE projects to significantly contribute to the 100% reduction of GHG emissions through RE and EE technology demonstration and replication in Funafuti and the Outer islands focusing on RE and RE technology requirements of the project in coordination with ED/MPUI and TEC.

### Deliverables:

- Assessment of the current performance of existing power system (off-grid and on-grid) infrastructures in Tuvalu, focusing on areas that impacts on the stability and reliability of the system;
- Assessment of potential improvements stability, reliability and performance of existing on-grid and off-grid power systems in the country;
- Assessment of the feasibility and implementation of the application of technologies for improving power systems stability, reliability and performance in the country;

- Design of a program for the promotion improving power systems stability, reliability and performance, considering short- and medium term integration of additional RE-based power generation system;
- Estimation of potential energy and energy cost savings that can be realized (e.g., minimized distribution losses); and,
- Design of feasible power system monitoring and maintenance program.
- Design and implementation of capacity building programs for PPL personnel in the optimum load dispatch of system power generation units for achieving overall least generation cost.
- Design of the integration of the demo RE-based power generation systems into the existing TEC grid
- Identification and assistance in the design and implementation of demonstration of the application of feasible power grid system improvements (performance, stability and reliability) as well as monitoring and control systems
- Recommendations and implementation of the net metering technology for on-grid RE systems

Qualification and Experience:

Minimum requirements for the experts are as follows:

- Knowledgeable and familiar with national energy planning and implementation ;
- At least a degree in Engineering, with emphasis on Renewable energy and Energy efficiency , or related fields; and
- Previous experience(s) in power systems and optimization of RE and EE technology applications in island situation
- Demonstrated expertise in applicable advance RE/EE technologies for electricity generation and net metering technology for on-grid RE systems

## Annex F: UNDP Social and Environmental and Social Screening Template (SESP)

### Project Information

<b>Project Information</b>	
1. Project Title	Facilitation of the Achievement of Sustainable National Energy Targets of Tuvalu (FASNETT)
2. Project Number	PIMS 5613
3. Location (Global/Region/Country)	Tuvalu

### Part A. Integrating Overarching Principles to Strengthen Social and Environmental Sustainability

<b>QUESTION 1: How Does the Project Integrate the Overarching Principles in order to Strengthen Social and Environmental Sustainability?</b>
<b><i>Briefly describe in the space below how the Project mainstreams the human-rights based approach</i></b>
The mainstreaming the human rights based approach is not specifically covered in the project, i.e., there are no specific activities on this. However, in general terms, the design and implementation of the project activities will be in line with the principles of human rights based approach.
<b><i>Briefly describe in the space below how the Project is likely to improve gender equality and women's empowerment</i></b>
The proposed GEF project will involve women working in both management and technical departments of the Tuvaluan Government agencies/institutions who can play important roles in the design, development and implementation. The FASNETT project design and implementation plan considered the government-issued Tuvalu National Gender Policy which includes the Strategic Action Plan 2014-2016 policy and guiding framework for multi-sectoral engagement and partnerships towards the overarching goal of gender equality and empowerment of women, with particular contribution through application of RE/EE technologies in community-based projects. During the project implementation, updates on relevant gender mainstreaming policy and guidelines shall be incorporated in the Project's action plans and strategies. It also recognizes the possible contributions of women in the management and implementation of climate change mitigation measures. Lastly, the project has taken into account the contributions, impacts and benefits of community based EE and RE technology applications, including children and indigenous people.
<b><i>Briefly describe in the space below how the Project mainstreams environmental sustainability</i></b>
The proposed project is within the context of sustainable development in Tuvalu, and to ensure the realization of environmental sustainability the Project will take into account best applicable EE/RE policies and strategies that will conserve the natural environment and mitigate GHG effects. The project identifies environmental sustainability as an objective of the development process, while also focusing on compliance with environmental standards as the important condition to the achievement of said objectives. For example, the project requires a focus on proactive investment and demonstration of practical and sustainable RE/EE technologies under the Pacific island situation supported by policies and programs that promote integration of environmental sustainability into development strategies themselves. In other words, the project does not include mere "add-ons" to policies or projects but views everything in the overall environmental sustainability agenda of the country. For example, the selection of RE and EE projects to be demonstrated and supported by the project should have practical applications and long-term impact along the country's target of 100% GHG reduction goal in 2025 as embodied in the INDC commitments. In addition to environmental sustainability, the project will be in line with sustainable development aspirations that will bring about local benefits mainly through contributions to improvement of the living conditions of Tuvaluans particularly in the outer islands and allows them to contribute more productively to the economy; and, protection of the natural environment; diversification of the resource base of the economy. The global environmental benefits (GEBs) from this project would come from GHG emission reductions from the displacement of diesel fuel oil in electricity generation with the installation of RE-based power generation units, and from other fossil fuel substitutions using available feasible renewable energy resources. The improvement of the specific energy consumption of each energy end use sectors in Tuvalu through improved energy utilization efficiency will also contribute to that.

While the RE-based power generation is generally considered environmentally sustainable, it is acknowledged that this can also potentially generate environmental problems that need to be addressed. For example, in this project where solar PV power generation units will be further promoted and deployed, there are potential negative impacts from an improperly designed, engineered, installed and operated systems. Since the project will also be promoting energy efficiency to reduce electricity demand, there are also potential downstream impacts on the increased use of EE appliances which will displace existing relatively energy inefficient appliances/devices that need to be disposed-off. The improper disposal of such items (e.g., CFLs with mercury, air conditioners and refrigerators that utilize ozone depleting refrigerants) can bring about the negative environmental impacts that can negate the energy and environmental benefits from the project. Such potential negative impacts have to be addressed in the design of these showcase projects to ensure that such negative impacts will be mitigated.

## Part B. Identifying and Managing Social and Environmental Risks

<b>QUESTION 2: What are the Potential Social and Environmental Risks?</b> <i>Note: Describe briefly potential social and environmental risks identified in Attachment 1 – Risk Screening Checklist (based on any “Yes” responses). If no risks have been identified in Attachment 1 then note “No Risks Identified” and skip to Question 4 and Select “Low Risk”. Questions 5 and 6 not required for Low Risk Projects.</i>	<b>QUESTION 3: What is the level of significance of the potential social and environmental risks?</b> <i>Note: Respond to Questions 4 and 5 below before proceeding to Question 6</i>			<b>QUESTION 6: What social and environmental assessment and management measures have been conducted and/or are required to address potential risks (for Risks with Moderate and High Significance)?</b>
<b>Risk Description</b>	<b>Impact and Probability (1-5)</b>	<b>Significance (Low, Moderate, High)</b>	<b>Comments</b>	<b>Description of assessment and management measures as reflected in the Project design. If ESIA or SESA is required note that the assessment should consider all potential impacts and risks.</b>
The proposed Project potentially result in the generation of waste (both hazardous and non-hazardous).	1	Low	The concern is the potential pollution from waste solar batteries, and also mercury from replaced fluorescent lamps/CFL, as well as fridges and air conditioners. Improper disposal of these items may result in the release of both hazardous and non-hazardous waste materials.	During project formulation (PPG phase), an assessment of available energy equipment and extent of replacement was undertaken. A strategy to manage waste/obsolete energy equipment will be developed during implementation so as to avoid potential pollution from waste solar batteries, and mercury from replaced fluorescent lamps/CFL, and the proper recovery of refrigerants used in old fridges and air conditioners. Tuvalu has already implemented several solar PV power generation projects from various donors like the WB, and most likely are in compliance with the Bank’s environmental requirements for battery disposal.

Potential adverse biodiversity impacts to habitats in pond areas to be used for floating solar PV plants	1	Low	Proper installation and operation can be planned and implemented to avoid potential impact (albeit to a very limited extent only because the demo facility will cover just a very small portion of the whole lagoon). There is actually no effluents from the installed system, except perhaps from time-to-time washing (spray washing) of the solar PV panels to remove any accumulated dusts on the PV surfaces.	During inception and planning for the floating solar PV demo plants baseline studies will be conducted to define the starting point of M&E and recommendations should be prepared regarding prescribed design and engineering best practices. During installation of facilities, proper engineering and construction practices will be used in order to avoid negative bio-diversity impacts. The relevant GOS agency responsible for environmental protection, particularly in regards the management of the lagoon areas will be regularly overseeing checking on the installed systems.
	<b>QUESTION 4: What is the overall Project risk categorization?</b>			
	<b>Select one (see SESP for guidance)</b>			<b>Comments</b>
	<i>Low Risk</i>		<input checked="" type="checkbox"/>	
	<i>Moderate Risk</i>		<input type="checkbox"/>	
	<i>High Risk</i>		<input type="checkbox"/>	
	<b>QUESTION 5: Based on the identified risks and risk categorization, what requirements of the SES are relevant?</b>			
	Check all that apply			<b>Comments</b>
	<i>Principle 1: Human Rights</i>		<input type="checkbox"/>	
	<i>Principle 2: Gender Equality and Women's Empowerment</i>		<input checked="" type="checkbox"/>	
	<i>1. Biodiversity Conservation and Natural Resource Management</i>		<input type="checkbox"/>	
	<i>2. Climate Change Mitigation and Adaptation</i>		<input type="checkbox"/>	
	<i>3. Community Health, Safety and Working Conditions</i>		<input type="checkbox"/>	
	<i>4. Cultural Heritage</i>		<input type="checkbox"/>	
	<i>5. Displacement and Resettlement</i>		<input type="checkbox"/>	



	<b>6. Indigenous Peoples</b>	<input type="checkbox"/>	
	<b>7. Pollution Prevention and Resource Efficiency</b>	<input checked="" type="checkbox"/>	Potential pollution from waste solar batteries, and also mercury from replaced fluorescent lamps/CFL.

### Final Sign Off

<i>Signature</i>	<i>Date</i>	<i>Description</i>
QA Assessor		UNDP staff member responsible for the Project, typically a UNDP Programme Officer. Final signature confirms they have “checked” to ensure that the SESP is adequately conducted.
QA Approver		UNDP senior manager, typically the UNDP Deputy Country Director (DCD), Country Director (CD), Deputy Resident Representative (DRR), or Resident Representative (RR). The QA Approver cannot also be the QA Assessor. Final signature confirms they have “cleared” the SESP prior to submittal to the PAC.
PAC Chair		UNDP chair of the PAC. In some cases PAC Chair may also be the QA Approver. Final signature confirms that the SESP was considered as part of the project appraisal and considered in recommendations of the PAC.

## SESP Attachment 1. Social and Environmental Risk Screening Checklist

<b>Checklist Potential Social and Environmental Risks</b>	
<b>Principles 1: Human Rights</b>	<b>Answer (Yes/No)</b>
1. Could the Project lead to adverse impacts on enjoyment of the human rights (civil, political, economic, social or cultural) of the affected population and particularly of marginalized groups?	No
2. Is there a likelihood that the Project would have inequitable or discriminatory adverse impacts on affected populations, particularly people living in poverty or marginalized or excluded individuals or groups? <sup>15</sup>	No
3. Could the Project potentially restrict availability, quality of and access to resources or basic services, in particular to marginalized individuals or groups?	No
4. Is there a likelihood that the Project would exclude any potentially affected stakeholders, in particular marginalized groups, from fully participating in decisions that may affect them?	No
5. Is there a risk that duty-bearers do not have the capacity to meet their obligations in the Project?	No
6. Is there a risk that rights-holders do not have the capacity to claim their rights?	No
7. Have local communities or individuals, given the opportunity, raised human rights concerns regarding the Project during the stakeholder engagement process?	No
8. Is there a risk that the Project would exacerbate conflicts among and/or the risk of violence to project-affected communities and individuals?	No
<b>Principle 2: Gender Equality and Women's Empowerment</b>	
1. Is there a likelihood that the proposed Project would have adverse impacts on gender equality and/or the situation of women and girls?	No
2. Would the Project potentially reproduce discriminations against women based on gender, especially regarding participation in design and implementation or access to opportunities and benefits?	No
3. Have women's groups/leaders raised gender equality concerns regarding the Project during the stakeholder engagement process and has this been included in the overall Project proposal and in the risk assessment?	No
4. Would the Project potentially limit women's ability to use, develop and protect natural resources, taking into account different roles and positions of women and men in accessing environmental goods and services? <i>For example, activities that could lead to natural resources degradation or depletion in communities who depend on these resources for their livelihoods and well being</i>	No
<b>Principle 3: Environmental Sustainability:</b> Screening questions regarding environmental risks are encompassed by the specific Standard-related questions below	
<b>Standard 1: Biodiversity Conservation and Sustainable Natural Resource Management</b>	
1.1 Would the Project potentially cause adverse impacts to habitats (e.g. modified, natural, and critical habitats) and/or ecosystems and ecosystem services?  <i>For example, through habitat loss, conversion or degradation, fragmentation, hydrological changes</i>	No <sup>16</sup>
1.2 Are any Project activities proposed within or adjacent to critical habitats and/or environmentally sensitive areas, including legally protected areas (e.g. nature reserve, national park), areas proposed for protection, or recognized as such by authoritative sources and/or indigenous peoples or local communities?	No
1.3 Does the Project involve changes to the use of lands and resources that may have adverse impacts on habitats, ecosystems, and/or livelihoods? (Note: if restrictions and/or limitations of access to lands would apply, refer to Standard 5)	No
1.4 Would Project activities pose risks to endangered species?	No
1.5 Would the Project pose a risk of introducing invasive alien species?	No
1.6 Does the Project involve harvesting of natural forests, plantation development, or reforestation?	No
1.7 Does the Project involve the production and/or harvesting of fish populations or other aquatic species?	No
1.8 Does the Project involve significant extraction, diversion or containment of surface or ground water? <i>For example, construction of dams, reservoirs, river basin developments, groundwater extraction</i>	No

<sup>15</sup> Prohibited grounds of discrimination include race, ethnicity, gender, age, language, disability, sexual orientation, religion, political or other opinion, national or social or geographical origin, property, birth or other status including as an indigenous person or as a member of a minority. References to "women and men" or similar is understood to include women and men, boys and girls, and other groups discriminated against based on their gender identities, such as transgender people and transsexuals.

<sup>16</sup> The floating solar PV demo plant will cover only a small portion of the lagoon. Proper baseline and indicators and M&E procedure will be adopted during the inception and detailed planning stage. Proper engineering and construction practices will be followed during implementation and operation.

1.9	Does the Project involve utilization of genetic resources? (e.g. collection and/or harvesting, commercial development)	No
1.10	Would the Project generate potential adverse trans-boundary or global environmental concerns?	No
1.11	Would the Project result in secondary or consequential development activities which could lead to adverse social and environmental effects, or would it generate cumulative impacts with other known existing or planned activities in the area? <i>For example, a new road through forested lands will generate direct environmental and social impacts (e.g. felling of trees, earthworks, potential relocation of inhabitants). The new road may also facilitate encroachment on lands by illegal settlers or generate unplanned commercial development along the route, potentially in sensitive areas. These are indirect, secondary, or induced impacts that need to be considered. Also, if similar developments in the same forested area are planned, then cumulative impacts of multiple activities (even if not part of the same Project) need to be considered.</i>	No
<b>Standard 2: Climate Change Mitigation and Adaptation</b>		
2.1	Will the proposed Project result in significant <sup>17</sup> greenhouse gas emissions or may exacerbate climate change?	No
2.2	Would the potential outcomes of the Project be sensitive or vulnerable to potential impacts of climate change?	No
2.3	Is the proposed Project likely to directly or indirectly increase social and environmental vulnerability to climate change now or in the future (also known as maladaptive practices)? <i>For example, changes to land use planning may encourage further development of floodplains, potentially increasing the population's vulnerability to climate change, specifically flooding</i>	No
<b>Standard 3: Community Health, Safety and Working Conditions</b>		
3.1	Would elements of Project construction, operation, or decommissioning pose potential safety risks to local communities?	No
3.2	Would the Project pose potential risks to community health and safety due to the transport, storage, and use and/or disposal of hazardous or dangerous materials (e.g. explosives, fuel and other chemicals during construction and operation)?	No
3.3	Does the Project involve large-scale infrastructure development (e.g. dams, roads, buildings)?	No
3.4	Would failure of structural elements of the Project pose risks to communities? (e.g. collapse of buildings or infrastructure)	No
3.5	Would the proposed Project be susceptible to or lead to increased vulnerability to earthquakes, subsidence, landslides, and erosion, flooding or extreme climatic conditions?	No
3.6	Would the Project result in potential increased health risks (e.g. from water-borne or other vector-borne diseases or communicable infections such as HIV/AIDS)?	No
3.7	Does the Project pose potential risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during Project construction, operation, or decommissioning?	No
3.8	Does the Project involve support for employment or livelihoods that may fail to comply with national and international labor standards (i.e. principles and standards of ILO fundamental conventions)?	No
3.9	Does the Project engage security personnel that may pose a potential risk to health and safety of communities and/or individuals (e.g. due to a lack of adequate training or accountability)?	No
<b>Standard 4: Cultural Heritage</b>		
4.1	Will the proposed Project result in interventions that would potentially adversely impact sites, structures, or objects with historical, cultural, artistic, traditional or religious values or intangible forms of culture (e.g. knowledge, innovations, practices)? (Note: Projects intended to protect and conserve Cultural Heritage may also have inadvertent adverse impacts)	No
4.2	Does the Project propose utilizing tangible and/or intangible forms of cultural heritage for commercial or other purposes?	No
<b>Standard 5: Displacement and Resettlement</b>		
5.1	Would the Project potentially involve temporary or permanent and full or partial physical displacement?	No
5.2	Would the Project possibly result in economic displacement (e.g. loss of assets or access to resources due to land acquisition or access restrictions – even in the absence of physical relocation)?	No
5.3	Is there a risk that the Project would lead to forced evictions? <sup>18</sup>	No
5.4	Would the proposed Project possibly affect land tenure arrangements and/or community based property rights/customary rights to land, territories and/or resources?	No
<b>Standard 6: Indigenous Peoples</b>		
6.1	Are indigenous peoples present in the Project area (including Project area of influence)?	No

<sup>17</sup> In regards to CO<sub>2</sub>, 'significant emissions' corresponds generally to more than 25,000 tons per year (from both direct and indirect sources). [The Guidance Note on Climate Change Mitigation and Adaptation provides additional information on GHG emissions.]

<sup>18</sup> Forced evictions include acts and/or omissions involving the coerced or involuntary displacement of individuals, groups, or communities from homes and/or lands and common property resources that were occupied or depended upon, thus eliminating the ability of an individual, group, or community to reside or work in a particular dwelling, residence, or location without the provision of, and access to, appropriate forms of legal or other protections.

6.2	Is it likely that the Project or portions of the Project will be located on lands and territories claimed by indigenous peoples?	No
6.3	Would the proposed Project potentially affect the human rights, lands, natural resources, territories, and traditional livelihoods of indigenous peoples (regardless of whether indigenous peoples possess the legal titles to such areas, whether the Project is located within or outside of the lands and territories inhabited by the affected peoples, or whether the indigenous peoples are recognized as indigenous peoples by the country in question)? <i>If the answer to the screening question 6.3 is “yes” the potential risk impacts are considered potentially severe and/or critical and the Project would be categorized as either Moderate or High Risk.</i>	No
6.4	Has there been an absence of culturally appropriate consultations carried out with the objective of achieving FPIC on matters that may affect the rights and interests, lands, resources, territories and traditional livelihoods of the indigenous peoples concerned?	No
6.5	Does the proposed Project involve the utilization and/or commercial development of natural resources on lands and territories claimed by indigenous peoples?	No
6.6	Is there a potential for forced eviction or the whole or partial physical or economic displacement of indigenous peoples, including through access restrictions to lands, territories, and resources?	No
6.7	Would the Project adversely affect the development priorities of indigenous peoples as defined by them?	No
6.8	Would the Project potentially affect the physical and cultural survival of indigenous peoples?	No
6.9	Would the Project potentially affect the Cultural Heritage of indigenous peoples, including through the commercialization or use of their traditional knowledge and practices?	No
<b>Standard 7: Pollution Prevention and Resource Efficiency</b>		
7.1	Would the Project potentially result in the release of pollutants to the environment due to routine or non-routine circumstances with the potential for adverse local, regional, and/or trans-boundary impacts?	No
7.2	Would the proposed Project potentially result in the generation of waste (both hazardous and non-hazardous)?	No
7.3	Will the proposed Project potentially involve the manufacture, trade, release, and/or use of hazardous chemicals and/or materials? Does the Project propose use of chemicals or materials subject to international bans or phase-outs? <i>For example, DDT, PCBs and other chemicals listed in international conventions such as the Stockholm Conventions on Persistent Organic Pollutants or the Montreal Protocol</i>	Yes <sup>19</sup>
7.4	Will the proposed Project involve the application of pesticides that may have a negative effect on the environment or human health?	No
7.5	Does the Project include activities that require significant consumption of raw materials, energy, and/or water?	No

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<sup>19</sup> Potential pollution from waste solar batteries, and also mercury from replaced fluorescent lamps/CFL.

## Annex G: UNDP Project Quality Assurance Report

<h1>PROJECT QA ASSESSMENT: DESIGN AND APPRAISAL</h1>				
<b>OVERALL PROJECT</b>				
EXEMPLARY (5) ●●●●●	HIGHLY SATISFACTORY (4) ●●●●○	Satisfactory (3) ●●●○○	NEEDS IMPROVEMENT (2) ●●○○○	INADEQUATE (1) ●○○○○
At least four criteria are rated Exemplary, and all criteria are rated High or Exemplary.	All criteria are rated Satisfactory or higher, and at least four criteria are rated High or Exemplary.	At least six criteria are rated Satisfactory or higher, and only one may be rated Needs Improvement. The SES criterion must be rated Satisfactory or above.	At least three criteria are rated Satisfactory or higher, and only four criteria may be rated Needs Improvement.	One or more criteria are rated Inadequate, or five or more criteria are rated Needs Improvement.
<b>DECISION</b>				
<ul style="list-style-type: none"> <li><b>APPROVE</b> – the project is of sufficient quality to continue as planned. Any management actions must be addressed in a timely manner.</li> <li><b>APPROVE WITH QUALIFICATIONS</b> – the project has issues that must be addressed before the project document can be approved. Any management actions must be addressed in a timely manner.</li> <li><b>DISAPPROVE</b> – the project has significant issues that should prevent the project from being approved as drafted.</li> </ul>				
<h2>RATING CRITERIA</h2>				
<b>STRATEGIC</b>				
<b>1. Does the project’s Theory of Change specify how it will contribute to higher level change? (Select the option from 1-3 that best reflects the project):</b> <ul style="list-style-type: none"> <li><b>3:</b> The project has a theory of change with explicit assumptions and clear change pathway describing how the project will contribute to outcome level change as specified in the programme/CPD, backed by credible evidence of what works effectively in this context. The project document clearly describes why the project’s strategy is the best approach at this point in time.</li> <li><b>2:</b> The project has a theory of change. It has an explicit change pathway that explains how the project intends to contribute to outcome-level change and why the project strategy is the best approach at this point in time, but is backed by limited evidence.</li> <li><b>1:</b> The project does not have a theory of change, but the project document may describe in generic terms how the project will contribute to development results, without specifying the key assumptions. It does not make an explicit link to the programme/CPD’s theory of change.</li> </ul> <p><small>*Note: Management Action or strong management justification must be given for a score of 1</small></p>			3	2
			1	
			<b>Evidence</b> See notes	
<b>Evidence:</b>  The Project has definite pathway of developmental theory of change that is designed to achieve the desired project outcomes. It will demonstrate appropriate RE/EE technologies [see <i>Annex L: Results of the PPG Study on possible RE/EE projects to be covered by the FASNETT Project under Commercial Adoption or for Pilot Demonstration</i> ] that are suitable to achieve the objectives of Tuvalu’s National Energy Policy. The energy demand projections, the country’s INDC 2015 commitment for 100% GHG (CO <sub>2</sub> ) reduction in 2025 and the strategies on how to attain them were addressed during the PPG Study. These are explained in detail in the ProDoc [see <i>Annex K: FASNETT Energy Savings and GHG Emission Reduction Estimates</i> ]. The demonstration results together with initial replication initiatives are included in the proposed project implementation period (2017-2020/21). The next level of change will be the replication, sustainability and scaling-up of the application of these technologies (see pages 51-52) that are proven to be techno-economically feasible. These will be addressed within the context of the overall energy supply and demand management strategy (including the planned conversion of vehicle to electricity-driven modes) in the medium- and long-term horizons up to the INDC commitments in 2025. <i>Section III: Strategy</i> (pages 13- 45) of the ProDoc outlines and describes this strategic pathway that is fully supported by the policy (e.g. enactment of the Energy Law, institutional strengthening and				

establishment monitoring systems), capacity building, technology support, and financial requirements to ensure achievement of Outcomes.									
<p><b>2. Is the project aligned with the thematic focus of the UNDP Strategic Plan? (select the option from 1-3 that best reflects the project):</b></p> <ul style="list-style-type: none"> <li><b>3:</b> The project responds to one of the three areas of development work<sup>20</sup> as specified in the Strategic Plan; it addresses at least one of the proposed new and emerging areas<sup>21</sup>; an issues-based analysis has been incorporated into the project design; and the project's RRF includes all the relevant SP output indicators. <i>(all must be true to select this option)</i></li> <li><b>2:</b> The project responds to one of the three areas of development work<sup>1</sup> as specified in the Strategic Plan. The project's RRF includes at least one SP output indicator, if relevant. <i>(both must be true to select this option)</i></li> <li><b>1:</b> While the project may respond to one of the three areas of development work<sup>1</sup> as specified in the Strategic Plan, it is based on a sectoral approach without addressing the complexity of the development issue. None of the relevant SP indicators are included in the RRF. This answer is also selected if the project does not respond to any of the three areas of development work in the Strategic Plan.</li> </ul> <p><b>Evidence:</b></p> <p>The project is aligned with UNDP's first Area of Work on Sustainable Development Pathways, and it supports the following outputs of the Strategic Plan IRRF: output indicator 1.4.2 (Number of countries with comprehensive measures - plans, strategies, policies, programmes and budgets - implemented to achieve low-emission and climate-resilient development objectives), output 2.6. (Legal reform enabled to fight discrimination and address emerging issues, such as environmental and electoral justice), and output 7.2. (Global and national data collection, measurement and analytical systems in place to monitor progress on the post 2015 agenda and sustainable development goals).</p>	<table border="1"> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">2</td> </tr> <tr> <td colspan="2" style="text-align: center;">1</td> </tr> <tr> <td colspan="2"><b>Evidence</b></td> </tr> <tr> <td colspan="2">The project has a strong thematic focus, as described in the project document.</td> </tr> </table>	3	2	1		<b>Evidence</b>		The project has a strong thematic focus, as described in the project document.	
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<b>Evidence</b>									
The project has a strong thematic focus, as described in the project document.									
<b>RELEVANT</b>									
<p><b>3. Does the project have strategies to effectively identify, engage and ensure the meaningful participation of targeted groups/geographic areas with a priority focus on the excluded and marginalized? (select the option from 1-3 that best reflects this project):</b></p> <ul style="list-style-type: none"> <li><b>3:</b> The target groups/geographic areas are appropriately specified, prioritizing the excluded and/or marginalized. Beneficiaries will be identified through a rigorous process based on evidence (if applicable.) The project has an explicit strategy to identify, engage and ensure the meaningful participation of specified target groups/geographic areas throughout the project, including through monitoring and decision-making (such as representation on the project board) <i>(all must be true to select this option)</i></li> <li><b>2:</b> The target groups/geographic areas are appropriately specified, prioritizing the excluded and/or marginalized. The project document states how beneficiaries will be identified, engaged and how meaningful participation will be ensured throughout the project. <i>(both must be true to select this option)</i></li> <li><b>1:</b> The target groups/geographic areas are not specified, or do not prioritize excluded and/or marginalized populations. The project does not have a written strategy to identify or engage or ensure the meaningful participation of the target groups/geographic areas throughout the project.</li> </ul> <p>*Note: Management Action must be taken for a score of 1, or select not applicable.</p>	<table border="1"> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">2</td> </tr> <tr> <td colspan="2" style="text-align: center;">1</td> </tr> <tr> <td colspan="2"><b>Evidence</b></td> </tr> <tr> <td colspan="2">Although the excluded and marginalized are not specifically prioritized, meaningful engagement of stakeholders are clearly described in specific activities (e.g. 1.2, 1.3.2, 1.4, 1.5.1, 1.5.3, 2.3, 2.3.3, 2.3.4, etc.)</td> </tr> </table>	3	2	1		<b>Evidence</b>		Although the excluded and marginalized are not specifically prioritized, meaningful engagement of stakeholders are clearly described in specific activities (e.g. 1.2, 1.3.2, 1.4, 1.5.1, 1.5.3, 2.3, 2.3.3, 2.3.4, etc.)	
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<b>Evidence</b>									
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<p><b>4. Have knowledge, good practices, and past lessons learned of UNDP and others informed the project design? (select the option from 1-3 that best reflects this project):</b></p> <ul style="list-style-type: none"> <li><b>3:</b> Knowledge and lessons learned (gained e.g. through peer assist sessions) backed by credible evidence from evaluation, corporate policies/strategies, and monitoring have been explicitly used, with appropriate referencing, to develop the project's theory of change and justify the approach used by the project over alternatives.</li> </ul>	<table border="1"> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">2</td> </tr> <tr> <td colspan="2" style="text-align: center;">1</td> </tr> <tr> <td colspan="2"><b>Evidence</b></td> </tr> <tr> <td colspan="2">Knowledge and lessons learned are referenced in section 2</td> </tr> </table>	3	2	1		<b>Evidence</b>		Knowledge and lessons learned are referenced in section 2	
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<b>Evidence</b>									
Knowledge and lessons learned are referenced in section 2									

<sup>20</sup> 1. Sustainable development pathways; 2. Inclusive and effective democratic governance; 3. Resilience building

<sup>21</sup> sustainable production technologies, access to modern energy services and energy efficiency, natural resources management, extractive industries, urbanization, citizen security, social protection, and risk management for resilience

<ul style="list-style-type: none"> <li>• <b>2:</b> The project design mentions knowledge and lessons learned backed by evidence/sources, which inform the project's theory of change but have not been used/are not sufficient to justify the approach selected over alternatives.</li> <li>• <b>1:</b> There is only scant or no mention of knowledge and lessons learned informing the project design. Any references that are made are not backed by evidence.</li> </ul> <p>*Note: Management Action or strong management justification must be given for a score of 1</p> <p><b>Evidence:</b></p> <p>Since the DE-MWE is one of the implementing partners, the project development team coordinated with them to determine how these projects can be utilized as baseline activities of the proposed GEF-project. Examples are the activities carried out in Tuvalu under the Pacific Appliance Labelling and Standards (PALS) Programme; and EE projects funded by the Taiwanese Government each year.</p>	<p>(Development Challenges) as major barriers to promoting awareness of renewable energy and energy efficiency in Tuvalu.</p>								
<p><b>5. Does the project use gender analysis in the project design and does the project respond to this gender analysis with concrete measures to address gender inequities and empower women? (select the option from 1-3 that best reflects this project):</b></p> <ul style="list-style-type: none"> <li>• <b>3:</b> A <u>participatory</u> gender analysis on the project has been conducted. This analysis reflects on the different needs, roles and access to/control over resources of women and men, and it is fully integrated into the project document. The project establishes concrete priorities to address gender inequalities in its strategy. The results framework includes outputs and activities that specifically respond to this gender analysis, with indicators that measure and monitor results contributing to gender equality. <i>(all must be true to select this option)</i></li> <li>• <b>2:</b> A gender analysis on the project has been conducted. This analysis reflects on the different needs, roles and access to/control over resources of women and men. Gender concerns are integrated in the development challenge and strategy sections of the project document. The results framework includes outputs and activities that specifically respond to this gender analysis, with indicators that measure and monitor results contributing to gender equality. <i>(all must be true to select this option)</i></li> <li>• <b>1:</b> The project design may or may not mention information and/or data on the differential impact of the project's development situation on gender relations, women and men, but the constraints have not been clearly identified and interventions have not been considered.</li> </ul> <p>*Note: Management Action or strong management justification must be given for a score of 1</p> <p><b>Evidence:</b></p> <p>In the design work, the PPG Team has referred to available gender analysis at the national level gender studies and assessments, e.g. Stock take of the Gender Mainstreaming Capacity of Pacific Island Governments – Tuvalu (SPC 2013) and the Tuvalu National Gender Policy (2014-2016). On this basis, the Logical Framework of the project included gender indicators, e.g. No. of women actively involved in the planning and implementation of energy services provision in the outer islands, to make sure that the project attends to relevant gender issues at least at the Outcome level. The indicator/target can be expounded during the Inception phase when stakeholders meet and plan the details since the gender planning requirement needs to be taken alongside other overarching national objectives contained in the National Gender Policy and Action Plan as mentioned above.</p> <p>In the project, there are opportunities for the involvement of women working in both management and technical departments of the Tuvaluan Government agencies/institutions who can play important roles in the design, development and implementation of the proposed UNDP-GEF project. Potential opportunities to further assess and enhance the role of women in deployment of low carbon technologies and mitigation options, and come up with gender-sensitive policies in the energy sector and the energy end-use sectors of the country will be done, recognizing the possible contributions of women in the management and implementation of climate change mitigation measures. Furthermore, the design and preparation of this project will consider the contributions, impacts and benefits of community based EE and RE technology applications, including children and indigenous people.</p>		<table border="1"> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">2</td> </tr> <tr> <td colspan="2" style="text-align: center;"><b>1</b></td> </tr> <tr> <td colspan="2"><b>Evidence</b></td> </tr> <tr> <td colspan="2">A gender analysis was not undertaken during project design.</td> </tr> </table>	3	2	<b>1</b>		<b>Evidence</b>		A gender analysis was not undertaken during project design.
3	2								
<b>1</b>									
<b>Evidence</b>									
A gender analysis was not undertaken during project design.									
<p><b>6. Does UNDP have a clear advantage to engage in the role envisioned by the project vis-à-vis national partners, other development partners, and other actors? (select from options 1-3 that best reflects this project):</b></p> <ul style="list-style-type: none"> <li>• <b>3:</b> An analysis has been conducted on the role of other partners in the area where the project intends to work, and credible evidence supports the proposed engagement of UNDP and partners through the project. It is clear how results achieved by relevant partners will contribute to outcome level change complementing the project's intended results. If relevant,</li> </ul>	<table border="1"> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;"><b>2</b></td> </tr> <tr> <td colspan="2" style="text-align: center;">1</td> </tr> <tr> <td colspan="2"><b>Evidence</b></td> </tr> <tr> <td colspan="2">As referenced on pages 46-48 of project document, some analysis has</td> </tr> </table>	3	<b>2</b>	1		<b>Evidence</b>		As referenced on pages 46-48 of project document, some analysis has	
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<b>Evidence</b>									
As referenced on pages 46-48 of project document, some analysis has									

<p>options for south-south and triangular cooperation have been considered, as appropriate. <i>(all must be true to select this option)</i></p> <ul style="list-style-type: none"> <li>• <b>2:</b> Some analysis has been conducted on the role of other partners where the project intends to work, and relatively limited evidence supports the proposed engagement of and division of labor between UNDP and partners through the project. Options for south-south and triangular cooperation may not have not been fully developed during project design, even if relevant opportunities have been identified.</li> <li>• <b>1:</b> No clear analysis has been conducted on the role of other partners in the area that the project intends to work, and relatively limited evidence supports the proposed engagement of UNDP and partners through the project. There is risk that the project overlaps and/or does not coordinate with partners' interventions in this area. Options for south-south and triangular cooperation have not been considered, despite its potential relevance.</li> </ul> <p>*Note: Management Action or strong management justification must be given for a score of 1</p> <p><b>Evidence:</b></p> <p>The main stakeholders of this project are the Energy Department - Ministry of Public Utilities and Infrastructure (MPUI) and the Tuvalu Electricity Corporation (TEC). The other stakeholders are those involved in public works and infrastructures, water and sanitation, and the banks/financial institutions. These stakeholders/partners owe critical roles and responsibilities in the project as described in the document.</p>	<p>been conducted on the role of other partners including also options for south-south co-operation.</p>								
<b>SOCIAL &amp; ENVIRONMENTAL STANDARDS</b>									
<p><b>7. Does the project seek to further the realization of human rights using a human rights based approach? (select from options 1-3 that best reflects this project):</b></p> <ul style="list-style-type: none"> <li>• <b>3:</b> Credible evidence that the project aims to further the realization of human rights, upholding the relevant international and national laws and standards in the area of the project. Any potential adverse impacts on enjoyment of human rights were rigorously identified and assessed as relevant, with appropriate mitigation and management measures incorporated into project design and budget. <i>(all must be true to select this option)</i></li> <li>• <b>2:</b> Some evidence that the project aims to further the realization of human rights. Potential adverse impacts on enjoyment of human rights were identified and assessed as relevant, and appropriate mitigation and management measures incorporated into the project design and budget.</li> <li>• <b>1:</b> No evidence that the project aims to further the realization of human rights. Limited or no evidence that potential adverse impacts on enjoyment of human rights were considered.</li> </ul> <p>*Note: Management action or strong management justification must be given for a score of 1</p> <p><b>Evidence:</b></p> <p>Although the project document does not contain specific HRBA terminologies, we can assume from specific project outcome indicators that capacities of project beneficiaries (i.e. the rights holders) will be strengthened through secured access to energy, and reduction of environmental impact through electricity generation. Access to energy, and clean environment is integral to the full enjoyment of a wide range of human rights.</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;">3</td> <td style="width: 50%; text-align: center;"><b>2</b></td> </tr> <tr> <td colspan="2" style="text-align: center;">1</td> </tr> <tr> <td colspan="2"><b>Evidence</b></td> </tr> </table>	3	<b>2</b>	1		<b>Evidence</b>			
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<b>Evidence</b>									
<p><b>8. Did the project consider potential environmental opportunities and adverse impacts, applying a precautionary approach? (select from options 1-3 that best reflects this project):</b></p> <ul style="list-style-type: none"> <li>• <b>3:</b> Credible evidence that opportunities to enhance environmental sustainability and integrate poverty-environment linkages were fully considered as relevant, and integrated in project strategy and design. Credible evidence that potential adverse environmental impacts have been identified and rigorously assessed with appropriate management and mitigation measures incorporated into project design and budget. <i>(All must be true to select this option).</i></li> <li>• <b>2:</b> No evidence that opportunities to strengthen environmental sustainability and poverty-environment linkages were considered. Credible evidence that potential adverse environmental impacts have been identified and assessed, if relevant, and appropriate management and mitigation measures incorporated into project design and budget.</li> <li>• <b>1:</b> No evidence that opportunities to strengthen environmental sustainability and poverty-environment linkages were considered. Limited or no evidence that potential adverse environmental impacts were adequately considered.</li> </ul>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;">3</td> <td style="width: 50%; text-align: center;"><b>2</b></td> </tr> <tr> <td colspan="2" style="text-align: center;">1</td> </tr> <tr> <td colspan="2"><b>Evidence</b></td> </tr> <tr> <td colspan="2">Refer to pages 97-101 of project document</td> </tr> </table>	3	<b>2</b>	1		<b>Evidence</b>		Refer to pages 97-101 of project document	
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<b>Evidence</b>									
Refer to pages 97-101 of project document									



*Note: Management action or strong management justification must be given for a score of 1			
<b>Evidence:</b> Potential social and environmental risks are identified as described in the document (Annex F). Research on low carbon community development policies and measures have been considered and implemented in other small island developing states (SIDS) and their impacts (social, economic and environmental) will be conducted and the analysis will be reflected to the programme.			
<b>9. Has the Social and Environmental Screening Procedure (SESP) been conducted to identify potential social and environmental impacts and risks?</b> The SESP is not required for projects in which UNDP is Administrative Agent only and/or projects comprised solely of reports, coordination of events, trainings, workshops, meetings, conferences and/or communication materials and information dissemination. [If yes, upload the completed checklist. If SESP is not required, provide the reason for the exemption in the evidence section.]		Yes (3)	No (1)
<b>MANAGEMENT &amp; MONITORING</b>			
<b>10. Does the project have a strong results framework? (select from options 1-3 that best reflects this project):</b> <ul style="list-style-type: none"> <li><b>3:</b> The project’s selection of outputs and activities are at an appropriate level and relate in a clear way to the project’s theory of change. Outputs are accompanied by SMART, results-oriented indicators that measure all of the key expected changes identified in the theory of change, each with credible data sources, and populated baselines and targets, including gender sensitive, sex-disaggregated indicators where appropriate. (<i>all must be true to select this option</i>)</li> <li><b>2:</b> The project’s selection of outputs and activities are at an appropriate level, but may not cover all aspects of the project’s theory of change. Outputs are accompanied by SMART, results-oriented indicators, but baselines, targets and data sources may not yet be fully specified. Some use of gender sensitive, sex-disaggregated indicators, as appropriate. (<i>all must be true to select this option</i>)</li> <li><b>1:</b> The results framework does not meet all of the conditions specified in selection “2” above. This includes: the project’s selection of outputs and activities are not at an appropriate level and do not relate in a clear way to the project’s theory of change; outputs are not accompanied by SMART, results-oriented indicators that measure the expected change, and have not been populated with baselines and targets; data sources are not specified, and/or no gender sensitive, sex-disaggregation of indicators.</li> </ul>		3	2
		1	
		<b>Evidence</b>	
		Refer to pages 52-53 of project document	
*Note: Management Action or strong management justification must be given for a score of 1			
<b>Evidence:</b> Project has an elaborated Results Framework as per standard UNDP-GEF format, baselines, targets and data sources are fully specified.			
<b>11. Is there a comprehensive and costed M&amp;E plan in place with specified data collection sources and methods to support evidence-based management, monitoring and evaluation of the project?</b>		Yes (3)	No (1)
<b>Evidence:</b> Refer to pages 57-58 of project document.			
<b>12. Is the project’s governance mechanism clearly defined in the project document, including planned composition of the project board? (select from options 1-3 that best reflects this project):</b> <ul style="list-style-type: none"> <li><b>3:</b> The project’s governance mechanism is fully defined in the project composition. Individuals have been specified for each position in the governance mechanism (especially all members of the project board.) Project Board members have agreed on their roles and responsibilities as specified in the terms of reference. The ToR of the project board has been attached to the project document. (<i>All must be true to select this option</i>).</li> <li><b>2:</b> The project’s governance mechanism is defined in the project document; specific institutions are noted as holding key governance roles, but individuals may not have been specified yet. The ProDoc lists the most important responsibilities of the project board, project director/manager and quality assurance roles. (<i>all must be true to select this option</i>)</li> </ul>		3	2
		1	
		<b>Evidence</b>	
		Refer to pages 58-62 of project document	

<ul style="list-style-type: none"> <li>• <b>1:</b> The project’s governance mechanism is loosely defined in the project document, only mentioning key roles that will need to be filled at a later date. No information on the responsibilities of key positions in the governance mechanism is provided.</li> </ul> <p>*Note: Management Action or strong management justification must be given for a score of 1</p> <p><b>Evidence:</b></p> <p>The project’s governance mechanism is defined, and the roles/responsibilities of the related entities are clearly stated in the project document.</p>		
<p><b>13. Have the project risks been identified with clear plans stated to manage and mitigate each risks? (select from options 1-3 that best reflects this project):</b></p> <ul style="list-style-type: none"> <li>• <b>3:</b> Project risks related to the achievement of results are fully described in the project risk log, based on comprehensive analysis drawing on the theory of change, Social and Environmental Standards and screening, situation analysis, capacity assessments and other analysis. Clear and complete plan in place to manage and mitigate each risk. <i>(both must be true to select this option)</i></li> <li>• <b>2:</b> Project risks related to the achievement of results identified in the initial project risk log with mitigation measures identified for each risk.</li> <li>• <b>1:</b> Some risks may be identified in the initial project risk log, but no evidence of analysis and no clear risk mitigation measures identified. This option is also selected if risks are not clearly identified and no initial risk log is included with the project document.</li> </ul> <p>*Note: Management Action must be taken for a score of 1</p>	<b>3</b>	2
1		
<p style="text-align: center;"><b>Evidence</b></p> <p>Refer to pages 48-49 of project document</p>		
<b>EFFICIENT</b>		
<p><b>14. Have specific measures for ensuring cost-efficient use of resources been explicitly mentioned as part of the project design? This can include: i) using the theory of change analysis to explore different options of achieving the maximum results with the resources available; ii) using a portfolio management approach to improve cost effectiveness through synergies with other interventions; iii) through joint operations (e.g., monitoring or procurement) with other partners.</b></p> <p><b>Evidence:</b></p> <p>Specific cost-efficiency measures have been considered in the proposed RE Pilot Demonstrations and EE demo technologies (replacement of old, inefficient refrigerators and freezers) to be included and funded within the project resources in the Total Budget and Work Plan (TBWP). See <i>Annex L</i> for additional information on cost considerations for the demos. The economies of scale in the choice of technologies, however, tended to be less favorable because of the limited demand that is experienced in small PICs, like Tuvalu. Supplementary supports were identified in the co-financing arrangements which were confirmed in the PPG phase. The selection is based on the significant economic and replication impacts in the achievement of the 100% GHG reduction goal.</p>	Yes (3)	No (1)
<p><b>15. Are explicit plans in place to ensure the project links up with other relevant on-going projects and initiatives, whether led by UNDP, national or other partners, to achieve more efficient results (including, for example, through sharing resources or coordinating delivery?)</b></p> <p><b>Evidence:</b></p> <p>For potential sharing of project resources particularly on transport costs for trips to the country’s outer islands, there are plans in place to link up with some of the DE-MPUI and TEC on-going and planned projects, which include: UAE-funded Funafuti 500 kW Solar PV Power Generation Project; NZAid-funded Funafuti 150 kW Solar PV Power Generation Project; WB-funded Tuvalu Energy Sector Development Project; NZAid-funded Outer Island 1.03 MW Solar PV Power Generation Project; EU-funded Outer Island 187 kW Solar PV Power Generation Project; Finland &amp; Italy Outer Island SHSs Project; Development of Bank of Tuvalu EE Loan Scheme; UNDP-SIDS DOCK Demo EE Fale Project &gt; UNDP-GEF funded Climate Change Adaptation Projects in Tuvalu.</p>	Yes (3)	No (1)
<p><b>16. Is the budget justified and supported with valid estimates?</b></p>	<b>3</b>	2
1		

<ul style="list-style-type: none"> <li>• <b>3:</b> The project’s budget is at the activity level with funding sources, and is specified for the duration of the project period in a multi-year budget. Costs are supported with valid estimates using benchmarks from similar projects or activities. Cost implications from inflation and foreign exchange exposure have been estimated and incorporated in the budget.</li> <li>• <b>2:</b> The project’s budget is at the activity level with funding sources, when possible, and is specified for the duration of the project in a multi-year budget. Costs are supported with valid estimates based on prevailing rates.</li> <li>• <b>1:</b> The project’s budget is not specified at the activity level, and/or may not be captured in a multi-year budget.</li> </ul>	<p style="text-align: center;"><b>Evidence</b></p> <p>Refer to pages 66-68 of project document (as per UNDP/GEF project document template, budget is done at project outcome level (i.e. ATLAS activity level)).</p>	
<p><b>17. Is the Country Office fully recovering the costs involved with project implementation?</b></p> <ul style="list-style-type: none"> <li>• <b>3:</b> The budget fully covers all project costs that are attributable to the project, including programme management and development effectiveness services related to strategic country programme planning, quality assurance, pipeline development, policy advocacy services, finance, procurement, human resources, administration, issuance of contracts, security, travel, assets, general services, information and communications based on full costing in accordance with prevailing UNDP policies (i.e., UPL, LPL.)</li> <li>• <b>2:</b> The budget covers significant project costs that are attributable to the project based on prevailing UNDP policies (i.e., UPL, LPL) as relevant.</li> <li>• <b>1:</b> The budget does not adequately cover project costs that are attributable to the project, and UNDP is cross-subsidizing the project.</li> </ul> <p><i>*Note: Management Action must be given for a score of 1. The budget must be revised to fully reflect the costs of implementation before the project commences.</i></p>	<p style="text-align: center;">3</p>	<p style="text-align: center;"><b>2</b></p>
1		
<p style="text-align: center;"><b>Evidence</b></p> <p>The project budget covers significant project costs. Although the document mentions UNDP’s role in providing implementation support, the commitment that will operationalize this i.e., Letter of Agreement (LoA) template, is missing.</p>		
<b>EFFECTIVE</b>		
<p><b>18. Is the chosen implementation modality most appropriate? (select from options 1-3 that best reflects this project):</b></p> <ul style="list-style-type: none"> <li>• <b>3:</b> The required implementing partner assessments (capacity assessment, HACT micro assessment) have been conducted, and there is evidence that options for implementation modalities have been thoroughly considered. There is a strong justification for choosing the selected modality, based on the development context. <i>(both must be true to select this option)</i></li> <li>• <b>2:</b> The required implementing partner assessments (capacity assessment, HACT micro assessment) have been conducted and the implementation modality chosen is consistent with the results of the assessments.</li> <li>• <b>1:</b> The required assessments have not been conducted, but there may be evidence that options for implementation modalities have been considered.</li> </ul> <p><i>*Note: Management Action or strong management justification must be given for a score of 1</i></p>	<p style="text-align: center;">3</p>	<p style="text-align: center;">2</p>
<b>1</b>		
<p style="text-align: center;"><b>Evidence</b></p> <p>The Capacity Assessment of the Project Implementing Partner and HACT Micro Assessment are now being conducted</p>		
<p><b>19. Have targeted groups, prioritizing marginalized and excluded populations that will be affected by the project, been engaged in the design of the project in a way that addresses any underlying causes of exclusion and discrimination?</b></p> <ul style="list-style-type: none"> <li>• <b>3:</b> Credible evidence that all targeted groups, prioritizing marginalized and excluded populations that will be involved in or affected by the project, have been actively engaged in the design of the project. Their views, rights and any constraints have been analyzed and incorporated into the root cause analysis of the theory of change which seeks to address any underlying causes of exclusion and discrimination and the selection of project interventions.</li> <li>• <b>2:</b> Some evidence that key targeted groups, prioritizing marginalized and excluded populations that will be involved in the project, have been engaged in the design of the project. Some evidence that their views, rights and any constraints have been analyzed and incorporated into the root cause analysis of the theory of change and the selection of project interventions.</li> </ul>	<p style="text-align: center;">3</p>	<p style="text-align: center;"><b>2</b></p>
1		
<p style="text-align: center;"><b>Evidence</b></p> <p>See notes</p>		

<ul style="list-style-type: none"> <li>• <u>1</u>: No evidence of engagement with marginalized and excluded populations that will be involved in the project during project design. No evidence that the views, rights and constraints of populations have been incorporated into the project.</li> </ul>		
<p><b>Evidence:</b></p> <p>The Project has been designed to use the inclusive approach and considered the needs of the communities and remote populations (specially disadvantaged families, etc.) in the Outer Islands that should be prioritized, particularly in economic and social activities that need energy as a basic input, viz., in education, communications, infrastructure development, disaster management, livelihood, domestic household requirements, recreation and other basic human needs,. These concerns were articulated by stakeholders in the consultation done during the LFA Workshop and island visitations and are fully considered in the project design.</p>	<p>Outputs 2.3, 2.4, 2.5. 3.1.1, 3.1.2, 3.1.4, 4.1.1, 4.1.3, 4.2.2, 4.2.3</p>	
<p><b>20. Does the project conduct regular monitoring activities, have explicit plans for evaluation, and include other lesson learning (e.g. through After Action Reviews or Lessons Learned Workshops), timed to inform course corrections if needed during project implementation?</b></p>	<p>Yes (3)</p>	<p>No (1)</p>
<p><b>21. The gender marker for all project outputs are scored at GEN2 or GEN3, indicating that gender has been fully mainstreamed into all project outputs at a minimum.</b></p>	<p>Yes (3)</p>	<p>No (1)</p>
<p>*Note: Management Action or strong management justification must be given for a score of "no"</p>		
<p><b>Evidence:</b></p> <p>Page 46 of project document: Potential opportunities to further assess and enhance the role of women in deployment of low carbon technologies and mitigation options, and come up with gender-sensitive policies in the energy sector and the energy end-use sectors of the country will be done, recognizing the possible contributions of women in the management and implementation of climate change mitigation measures, for example, their participation in projects that will promote or enhance women-owned and women-operated businesses that will make use of RE-based energy, or energy efficient appliances.</p>	<p><b>Evidence</b></p> <p>Refer to page 46 of project document</p>	
<p><b>22. Is there a realistic multi-year work plan and budget to ensure outputs are delivered on time and within allotted resources? (select from options 1-3 that best reflects this project):</b></p> <ul style="list-style-type: none"> <li>• <u>3</u>: The project has a realistic work plan &amp; budget covering the duration of the project <i>at the activity</i> level to ensure outputs are delivered on time and within the allotted resources.</li> <li>• <u>2</u>: The project has a work plan &amp; budget covering the duration of the project at the output level.</li> <li>• <u>1</u>: The project does not yet have a work plan &amp; budget covering the duration of the project.</li> </ul>	<p>3</p>	<p>2</p>
<p>1</p>		
<p><b>Evidence</b></p> <p>Refer to pages 66-68 of project document (as per UNDP/GEF template, multi-year work plan is set at activity-level while budget is set at outcome-level)</p>		
<p><b>SUSTAINABILITY &amp; NATIONAL OWNERSHIP</b></p>		
<p><b>23. Have national partners led, or proactively engaged in, the design of the project? (select from options 1-3 that best reflects this project):</b></p> <ul style="list-style-type: none"> <li>• <u>3</u>: National partners have full ownership of the project and led the process of the development of the project jointly with UNDP.</li> <li>• <u>2</u>: The project has been developed by UNDP in close consultation with national partners.</li> <li>• <u>1</u>: The project has been developed by UNDP with limited or no engagement with national partners.</li> </ul>	<p>3</p>	<p>2</p>
<p>1</p>		
<p><b>Evidence</b></p>		
<p><b>Evidence:</b></p> <p>National partners were consulted during the 1-week formulation mission in 1<sup>st</sup> quarter 2016, and throughout the 1-month detailed formulation mission in late 2016. Although, key implementing and responsible partners were consistently engaged and consulted throughout formulation the process was still led by UNDP through the UNDP-consultants.</p>		
	<p>3</p>	<p>2.5</p>
	<p>2</p>	<p>1.5</p>

<p><b>24. Are key institutions and systems identified, and is there a strategy for strengthening specific/comprehensive capacities based on capacity assessments conducted? (select from options 0-4 that best reflects this project):</b></p> <ul style="list-style-type: none"> <li>• <b>3:</b> The project has a comprehensive strategy for strengthening specific capacities of national institutions based on a systematic and detailed capacity assessment that has been completed. This strategy includes an approach to regularly monitor national capacities using clear indicators and rigorous methods of data collection, and adjust the strategy to strengthen national capacities accordingly.</li> <li>• <b>2.5:</b> A capacity assessment has been completed. The project document has identified activities that will be undertaken to strengthen capacity of national institutions, but these activities are not part of a comprehensive strategy to monitor and strengthen national capacities.</li> <li>• <b>2:</b> A capacity assessment is planned after the start of the project. There are plans to develop a strategy to strengthen specific capacities of national institutions based on the results of the capacity assessment.</li> <li>• <b>1.5:</b> There is mention in the project document of capacities of national institutions to be strengthened through the project, but no capacity assessments or specific strategy development is planned.</li> <li>• <b>1:</b> Capacity assessments have not been carried out and are not foreseen. There is no strategy for strengthening specific capacities of national institutions.</li> </ul>	1	
	<p style="text-align: center;"><b>Evidence</b></p> <p>Refer to the project results framework on pages 51-52 of project document</p>	
<p><b>25. Is there is a clear strategy embedded in the project specifying how the project will use national systems (i.e., procurement, monitoring, evaluations, etc.,) to the extent possible?</b></p>	Yes (3)	No (1)
<p><b>Evidence:</b></p> <p>Being a national project in scope, FASNETT includes and involves many national systems and coordination mechanisms for its activities and outputs, particularly in: policy making (commitment in the 2015 INDC, Energy Law, National Energy Policy, National Gender Policy); RE/EE equipment procurement; monitoring and evaluation (adherence to the 100% GHG reduction goals); capacity development in the outer islands; information dissemination; resource budgeting; etc.,</p>	<p>Outcome 2 is designed to integrate outputs and results at the national level</p>	
<p><b>26. Is there a clear transition arrangement/ phase-out plan developed with key stakeholders in order to sustain or scale up results (including resource mobilization strategy)?</b></p> <p><b>Evidence:</b></p> <p><b>Evidence:</b></p> <p>The project will come up with enabling conditions that through the adoption of supportive policies/regulations and institutional mechanisms to facilitate the widespread application of EE &amp; RE technologies in the residential and public sectors in Tuvalu to help ensure sustainability of the systems and frameworks that will be established. To further ensure sustainability of these systems/frameworks, a suitable follow-up action plan will be developed for approval and enforcement after project completion. The appropriate actions to ensure sustainability of the policies, regulations, and institutional frameworks that will be established and enforced/implemented will be determined during the project preparation stage of this proposed project.</p>	Yes (3)	No (1)

## Annex H: UNDP Risk Log

### OFFLINE RISK LOG

<b>Project Title:</b> Facilitation of the Achievement of Sustainable National Energy Targets of Tuvalu (FASNETT)	<b>Project ID:</b> 97730	<b>Date:</b> Mar 2017
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#	Description	Date identified	Type	Impact & Probability	Countermeasures / Management Response	Owner	Submitted, updated by	Last Update	Status
1	Inadequate local capacity to implement the project activities	Mar 2016	Organizational	P = 4 I = 4	Coordination with other ongoing UNDP-GEF projects in the country will be carried out to take advantage of potential synergies in the management of the project implementation. This is in addition to UNDP country office support that the GOT can request.	PMU, ED/MPUI, TEC	Project Dev't Team	Feb 2017	Reducing
2	Local communities in Funafuti and in the outer islands may not support the project implementation promptly and sufficiently	Mar 2016	Operational	P = 3 I = 3	The ED/MPUI and TEC will be supported by other entities in the execution of this project particularly in the coordination of the project implementation with the project partners. A capable project team comprised of competent local and international experts will be established. The TEC's good working relationship with local communities in Funafuti and the outer islands will be put to good use to actively promote the implementation of this project, and ensure the support of the local communities.	PMU, ED/MPUI, TEC	Project Dev't Team	Feb 2017	Reducing
3	The committed level of co-financing for specific activities of the project may not become fully available in time.	Mar 2016	Financial	P = 3 I = 3	During project implementation, the project team will closely monitor and ensure the timely availability of co-financing from project partners and co-financers. The project team shall secure government assurance of co-funding prior to project launching.	PMU	Project Dev't Team	Feb 2017	Increasing

4	Relevant GOT agencies fails approve and enforce formulated policies and regulations	Mar 2016	Regulatory	P = 2 I = 3	Advocacy to gain adequate support from the parliament on the adoption of the formulated policies and regulations will be carried out by the implementing partners, with the assistance of UNDP if necessary.	PMU, ED/MPUI, TEC	Project Dev't Team	Feb 2017	Increasing
5	The outcomes and benefits of GEF investment on the activities implemented will not be fully sustained.	Mar 2016	Strategic	P = 3 I = 3	The development of a sustainable follow-up plan is part of the project activities. This will be useful for the replication of the demonstrated applicable and feasible EE & RE technologies in the other islands.	PMU, ED/MPUI, TEC	Project Dev't Team	Feb 2017	Increasing
6	Adverse climate-related events may hamper the implementation of hardware-related activities.	Mar 2016	Environmental	P = 3 I = 4	Following proper engineering and construction design and construction that ensure not only structural integrity but also climate resilience will be adequately applied in the design and implementation of major EE/RE activities that will involve procurement, design/engineering, installation and operation of EE & RE technology system installations <sup>22</sup> .	PMU, ED/MPUI, TEC	Project Dev't Team	Feb 2017	Increasing
7	Change in national government administration may influence government	Mar 2016	Political	P = 3 I = 3	The Falekaupule, executing agency and other government departments involved in the project will monitor political dynamics and will try to resolve any misunderstanding within the project. UNDP executive management intervention may be warranted.	PMU, ED/MPUI, TEC, Falekaupule	Project Dev't Team	Feb 2017	Reducing

<sup>22</sup> The design of the systems that will be installed will be based on what the WB and other donors have required for their project. The same standards/requirements that were specified in such projects will be applied, same as what were used in the SIDS DOCK Demo EE House.

During 9 months of the year, the average speed of trade winds that pass through the country is about 5 m/s. Cyclonic storms or fully developed cyclones are rare as most of these occur south of the country and develop full strength during their southern paths between 15 and 20 latitudes south. Most severe cyclone happened in 1972 with max winds of 50 m/s. On that basis, max wind speed of 50 m/s was assumed for our demo EE house project as this being the one in 50 years worst scenario.

	support for project								
8	Regular access to outer islands is limited and transportation costs are often prohibitive	Mar 2016	Operational	P = 3 I = 4	Better planning between government departments (particularly the maritime department) and other UNDP supported projects in carrying out joint outer island missions. Better coordination in the scheduling of the outer island trips will be done taking into account the dry docking schedule of the inter-island ship for repair and maintenance.	PMU, ED/MPUI, TEC, Falekaupule	Project Dev't Team	Feb 2017	Increasing



## Annex I-A: Results of the Capacity Assessment of the Project Implementing Partner

### GEF Operational Focal Point: Department of Environment, Ministry of Foreign Affairs, Trade, Tourism, Environment and Labor

The Department of Environment (DOE) was established in 1990 with the aim to facilitate and address national and global environmental issues such as climate change, pollution, waste management, biodiversity conservation. It was first established with one full time staff which was partly funded through an AusAID project.

Late in 1992, after the first world summit on sustainable development in Rio, the government of Tuvalu agreed and signed the Convention of Biological Diversity. Tuvalu has actively participated in various national, regional, and international capacity-building environmental initiatives. One such initiative is the UNDP-funded South Pacific Regional Capacity 21 programmes through which the country focused its efforts on the development and formulation of a National Environmental Strategy (NEMS).

The NEMS 1997 provided a framework for environmental efforts in Tuvalu and enabled the development of key environmental policies that have guided the management of Tuvalu's limited resources over the last 12 years.<sup>23</sup>

Up until now the DoE has heavily relied on funding through projects that are facilitated under the department to provide support for staffing and implement activities on the ground. The DoE has strengthened and now comprises three full time staff (Director, EIA officer and Biodiversity officer) and an administrative clerk.

Below, highlights the number of staff under each project:

NAME OF PROJECT	No. staff	Donor	Starting date	Status as of Dec 2012
National Adaptation Action Plan (NAPA)	11	UNDP	2003	Completed
Second National Communication	2	UNDP	2007	1 staff remaining
Ozone Depleting Substance	1	UNEP	2010	Ongoing
NAPA-I Project	2	UNDP	2008	Ongoing

### Implementing Partner: Department of Energy, Ministry of Public Utility & Industry

Within the context of the implementation framework for the proposed project, i.e. National Implementation Modality (NIM), the Government of Tuvalu (GOT) represented by the Department of Energy under the policy umbrella of the Ministry of Public Utilities and infrastructure (ED/MPUI) is the Implementing Partner (IP) for the project. The main responsibilities and accountabilities of the IP are for the general management of this project, including the monitoring and evaluation of project interventions, achieving project outcomes, and for the effective use of project resources. Specifically, the IP oversees the management and delivery of project activities to achieve specified results including the procurement and delivery of UNDP program activity inputs and their use in producing outputs, as set forth in the signed FASNETT Project Document between UNDP and the GOT. The IP will designate a Responsible Party who will take charge of the project operations.

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<sup>23</sup> CBD, 2009

### *Background of the Department of Energy as the IP*

The Department of Energy (DE) is the lead agency for the implementation of RE/EE projects, among other energy-related areas in the government, islands, and private sector and the overall implementation and management of the project including communication and coordination with MOF and UNDP, providing staff and administrative support, liaison with local governments, project management and monitoring and project financial management. The Department of Energy within the policy umbrella of the Ministry of Public Utilities and Infrastructure (DE-MPUI) oversees the development of energy policy, the administration of renewable energy projects and regulation of the storage and sale of petroleum fuels. It is also in charge of sustainable energy programs. The MPUI is not directly involved in such programs although it oversees the implementation strategies and work plans for government projects.

While the ED/MPUI is fully responsible and accountable for the overall project success and use of project resources in behalf of the Government of Tuvalu under the NIM arrangement, it will need support in undertaking this role. In addition to designating TEC as the Responsible Party, this implementation and management arrangement needs to be supported in terms of monitoring and evaluation of project interventions, achieving project outcomes, and for the effective use of project resources. In this connection, based on the above background and assessment, it is recommended that the NIM arrangement be augmented by UNDP Support Services.

### **Responsible Party: Tuvalu Electricity Corporation**

The Responsible Party (RP) will act on behalf of and as designated by the Implementing Partner on the basis of a written agreement or contract defining specific roles, duties and responsibilities and to act also as the Project Manager and purchase goods or provide services using the project budget consistent with Project goals and objectives defined in the Project Document. **The engagement shall follow the government rules and regulations. The Tuvalu Electricity Corporation (TEC), a state-owned enterprise,** is proposed to be the Responsible Party for the project.

### Background of TEC vis-à-vis the RP role

The Tuvalu Electricity Corporation (TEC) takes charge in the implementation of demonstrations for the promotion of EE and RE technology applications in electricity generation systems. There is no independent energy regulator; but in 1990 the corporatized TEC was given the sole rights to supply electricity to all of Tuvalu under the Tuvalu Electricity Authority Corporation Act 1990. The government, mainly through the MPUI, is closely involved in key decisions of the TEC and therefore in energy regulation. At present, there is little interaction among these entities in energy project development and implementation, data sharing or cross-checking, with the result that it is very difficult to create the accurate picture of the sector needed to regulate the sector effectively and understand the opportunities for improvement. The proposed FASNETT project will address this by strengthening the policy and organizational structure and facilitate the enactment of the Tuvalu Energy Act to provide the principles and direction of the national energy development strategy.

### *Assessment of TEC in its RP Capacity in implementing FASNETT*

The TEC has wide experience in implementing RE/EE projects with foreign-assistance and multilateral funding. In order to further ensure the proper management and implementation of the project, that the NIM arrangement be augmented by UNDP Support Services and project quality assurance check.

### **Beneficiary: Department of Rural Development**

The Department of Rural Development (DRD) is under the Ministry of Home Affairs and Rural Development (MoHARD). It derives its main responsibilities from: (i) Te Kakeega II; (ii) Falekaupule Act and (iii) other arrangements that formalize donor assistance and support for a particular strategic area. The Falekaupule Act gives comprehensive statutory recognition for the Falekaupule and vests in them greater control over the activities and affairs of the islands by transferring to them the functions of the local government councils. The Act also confers greater autonomy on the islands in the conduct of their affairs, as regards finance, staff and decision making generally. It retains certain powers for the Minister of MoHARD but in most cases, the Minister's powers can only be exercised after consultation with each Falekaupule.

The DRD is responsible for undertaking activities and programmes to realize the policy objectives under Strategic Area 4 of Te Kakeega II which include reconciling/integrating traditional and modern governance institutions and structures and increasing stakeholder participation in outer island development process. Through other formal arrangements such as those detailed under the SBAA, UNDAF and CPAP, the DRD implements a Supporting Local Governance Project which envisions the enhancement of decentralization of governance and participatory decision making. The DRD is also the focal point for the Commonwealth Local Government Forum (Pacific Project) and receives funding and technical support through such membership for the implementation of its national activities.

Total staffing is 11 including: 1 Director of Rural Development, 1 Project Development Officer and Rural Trainer; 1 Rural Development Planner; 3 Local Government Officers and 5 Project Officers (SLG II Project Officers, 2009 - 2012).

The DRD is exposed to the challenges imposed by the isolation of Tuvalu and the geographical distance between the Department and its key stakeholders – the outer islands. The coordination and implementation of central government interventions in the form of on-site policy and technical assistance, monitoring of outer island projects and ongoing on-site trainings for Kaupule Staff is dependent on a reliable shipping schedule and effective telecommunications systems both of which are beyond the control of the DRD. The DRD and each Kaupule have a mutual interest in ensuring the smooth implementation decentralization through the Falekaupule Act. However, with issues such as staff movement and turnover, meaningful intervention requires a backstopping capability to be available within the DRD.

**Involvement of NGOs and their Role in the FASNETT Project**

There are 48 Tuvaluan NGOs/CBOs members of the Tuvalu Association of NGOs (TANGO) (as of 2010) is provided below (source: 2010 TANGO Annual report). The FASNETT Project will work closely with the NGO sector to fill the shortfall of government capacity and provision of services, especially in the Outer Islands. This will be particularly important with respect to the ongoing need for sustained awareness raising on outer islands in light of the predicted reduced frequency (increased intensity) cyclonic events. NGOs with a permanent outer island presence will be particularly important in this regard.

NGO/CBO members from the eight Tuvaluan islands, Nanumea, Nanumaga, Niutao, Nui, Vaitupu, Nukufetau, Funafuti, and Nukulaelae include the following:

<p><b>NATIONAL</b></p> <ul style="list-style-type: none"> <li>• Tuvalu Pre School Council</li> <li>• Tuvalu Girl Guides Association</li> <li>• Tuvalu Boys Scouts Association</li> <li>• Tuvalu National Council of Women</li> </ul>	<p><b>FUNAFUTI</b></p> <ul style="list-style-type: none"> <li>• Millennium 2000 Choir</li> <li>• Ala Tuu</li> <li>• Vai ote Olaa</li> </ul> <p><b>NANUMEA</b></p>
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<ul style="list-style-type: none"> <li>• Tuvalu Family Health Association</li> <li>• Chamber of Commerce</li> <li>• Tuvalu Red Cross</li> <li>• Island Care</li> <li>• Tuvalu National Youth Council</li> <li>• Ahmadiyya Muslim Association</li> <li>• Bahai</li> <li>• Seventh Day Adventist Church</li> <li>• Catholic Church</li> <li>• Ekalesia Kelisiano Tuvalu (EKT) Church</li> <li>• EKT Women’s Fellowship</li> <li>• EKT Youth Council</li> <li>• EKT Boys Brigade</li> <li>• EKT Girls Brigade</li> <li>• The Tuvalu Association of Sports (TAS)</li> <li>• Women in Business</li> <li>• Tuvalu Overseas Seaman’s Union</li> <li>• Assembly of God Church</li> <li>• Maritime Credit Union</li> <li>• Tuvalu National Fishermen</li> </ul>	<ul style="list-style-type: none"> <li>• Voluntia</li> <li>• Lafogaki</li> <li>• Talaofenua</li> <li>• Sikuleogali</li> <li>• Tama Seilona</li> <li>• Seimeana (based on Funafuti)</li> </ul> <p>NANUMAGA</p> <ul style="list-style-type: none"> <li>• Tafemai</li> <li>• Fale Magatai</li> <li>• Fale Kalava</li> <li>• Mouhala</li> <li>• Mamafa</li> <li>• Poiteloto</li> <li>• Talafai (based on Funafuti)</li> </ul> <p>NUI</p> <ul style="list-style-type: none"> <li>• Lototasi</li> </ul> <p>NUKULAEAE</p> <ul style="list-style-type: none"> <li>• Lotomalosi</li> </ul> <p>VAITUPU</p> <ul style="list-style-type: none"> <li>• Oita</li> <li>• Niukita</li> <li>• Tevaka</li> </ul> <p>NIUTAO</p> <ul style="list-style-type: none"> <li>• Moemitinga</li> </ul> <p>NUKUFETAU</p> <ul style="list-style-type: none"> <li>• Lolipukupuku</li> </ul> <p>Tamaine</p>
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## OVERALL ASSESSMENT AND RECOMMENDATION

Given capacity constraints within government outlined above, particularly within the ED/MPUI acting as the Implementing Partner, in cooperation with TEC, as the designated Responsible Party, it is recommended that the FASNETT project follow the National Implementation Modality (NIM) but significantly augmented with UNDP Project Support Services in project management and implementation arrangements. This will be further reinforced by the UNDP Pacific Office/Tuvalu in the Project Quality Assurance support. On the beneficiary side, the FASNETT Project will work closely with the NGO sector to fill the shortfall of government capacity and provision of services.

## **Annex I-B: Results of HACT Micro Assessment**

NOTE: This will be carried out during the Project Inception Phase.

**Annex J: Additional Agreements**  
**Commitment Letter of Government of Tuvalu – MFATTEL**



**GOVERNMENT OF TUVALU**  
**MINISTRY OF FOREIGN AFFAIRS, TRADE, TOURISM,**  
**ENVIRONMENT & LABOUR**  
**Headquarters**

Private Mail Bag, Funafuti, TUVALU. Telephone: +688 20117 Email: [staukici@gmail.com](mailto:staukici@gmail.com)

Ref:

5 October 2016

Subject: Confirmation of Co-financing and Support for the FASNETT Project of Tuvalu

Chief Executive Officer and Chairperson  
Global Environment Facility (GEF)  
1818 H Street, NW, MSN G6-602  
USA, Washington, DC 20433

Dear Dr. Naoko Ishii,

With this letter, we wish to confirm the formal intention and commitment of the **Ministry of Foreign Affairs, Trade, Tourism, Environment and Labour (MFATTEL)** of Tuvalu to support the project proposal to GEF for funding of the full-size project on **Facilitation of the Achievement of Sustainable National Energy Targets of Tuvalu (FASNETT)** as it pursues the objective of facilitation of the development and utilization of feasible renewable energy resources and application of energy efficiency technologies for achieving realistic energy targets in Tuvalu.

In order to manifest our cooperation to further develop and subsequently implement the FASNETT Project, we will provide US\$ 750,000 of in-kind resources in terms of allocated salaries of personnel, cost of services, office space and existing equipment and facilities and US\$ \$ 6,700,00 in-cash in terms of procurement of the location sites for RE/EE Project pilot demonstration or a total resources of US\$ 7,450,000 as our co-financing inputs and act as implementing partner of FASNETT project activities and other roles that will be designated in behalf of the Department of Environment of MFATTEL, in support of the FASNETT Project components and activities.

We are looking forward to the commencement of this very laudable project.

Yours sincerely,

  
**Ms. Simalua Enele**

Acting Permanent Secretary

Ministry of Foreign Affairs, Trade, Tourism, Environment and Labour (MFATTEL)

cc: GEF Tuvalu Focal Point  
UNDP Pacific Office Resident Representative

**Commitment Letter of Government of Tuvalu – Department of Energy - MPUI**



## GOVERNMENT OF TUVALU

### MINISTRY OF PUBLIC UTILITIES & INFRASTRUCTURE

VAIAKU, FUNAFUTI, TUVALU

Tel : (688) 20060 / 20056 Fax: (688) 20207 email: energy@gov.tv

G.P.O.

**Ref: MPUI**

5 October 2016

Subject: Confirmation of Co-financing and Support for the FASNETT Project of Tuvalu

Chief Executive Officer and Chairperson  
Global Environment Facility (GEF)  
1818 H Street, NW, MSN G6-602  
USA, Washington, DC 20433

Dear Dr. Naoko Ishii,

With this letter, we wish to confirm the formal intention and commitment of the Ministry of Public Utilities and infrastructure (MPUI) of Tuvalu to support the project proposal to GEF for funding of the full-size project on **Facilitation of the Achievement of Sustainable National Energy Targets of Tuvalu (FASNETT)** as it pursues the objective of facilitation of the development and utilization of feasible renewable energy resources and application of energy efficiency technologies for achieving realistic energy targets in Tuvalu.

In order to manifest our cooperation to further develop and subsequently implement the FASNETT Project, we will provide US\$ 560,000 of in-kind in terms of allocated salaries of personnel, cost of services, office space, and existing equipment and facilities and US\$ 240,000 in-cash in terms of procurement of the location sites for RE/EE project pilot demonstrations or a total resources of US\$ 800,000 as our co-financing inputs and act as implementing partner of FASNETT project activities and other roles in support for the management and administration that will be designated in behalf of the Department of Energy of the Ministry of Public Utilities and infrastructure, covering the entire FASNETT Project components and activities.

We are looking forward to the commencement of this very laudable project.

Yours sincerely,

Avafoa Irata

Permanent Secretary  
Ministry of Public Utilities and infrastructure

cc: GEF Tuvalu Focal Point  
UNDP Pacific Office Resident Representative

Commitment Letter of Tuvalu Electricity Corporation

# TUVALU ELECTRICITY CORPORATION



Private Mail Bag 32, Vaiaku, Funafuti, Tuvalu  
Telephone: (688) 20352 Facsimile: (688) 20351  
Email: [mafaluloto2@gmail.com](mailto:mafaluloto2@gmail.com) / [mlotlua@tectuvalu.tv](mailto:mlotlua@tectuvalu.tv)

Ref:

14 December 2016

Subject: Confirmation of Co-financing and Support for the FASNETT Project of Tuvalu

Chief Executive Officer and Chairperson  
Global Environment Facility (GEF)  
1818 H Street, NW, MSN G6-602  
USA, Washington, DC 20433

Dear Dr. Naoko Ishii,

With this letter, we wish to confirm the formal intention and commitment of the Tuvalu Electricity Corporation (TEC) to support the project proposal to GEF for funding of the full-size project on Facilitation of the Achievement of Sustainable National Energy Targets of Tuvalu (FASNETT) as it pursues the objective of facilitation of the development and utilization of feasible renewable energy resources and application of energy efficiency technologies for achieving realistic energy targets in Tuvalu.

In order to manifest our cooperation to further develop and subsequently implement the FASNETT Project, we will provide US\$ 50,000 of in-kind resources in terms of allocated salaries for project management by designated TEC officials and US\$ 7,350,000 in-cash in terms of procurement of solar PV, wind turbine, batteries and control system under the World Bank TESDP project or a total resources of US\$ 7,450,000 as our co-financing inputs and act as implementing partner of FASNETT project activities and other roles that will be designated, with its relevant assigned FASNETT Project components and activities.

We are looking forward to the commencement of this very laudable project.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Mafalu Lotolua', is enclosed in a light blue rectangular box.

Mafalu Lotolua  
General Manager  
Tuvalu Electricity Corporation

cc: GEF Tuvalu Focal Point  
UNDP Pacific Office Resident Representative

Mafalu Lotolua, General Manager, Tuvalu Electricity Corporation  
Postal Address: Tuvalu Electricity Corporation, P.O. Box 32 Funafuti, TUVALU  
Phone: +688 20352 | Email: [mafaluloto2@gmail.com](mailto:mafaluloto2@gmail.com)



## Commitment Letter of UNDP Pacific Office

United Nations Development Programme



Empowered lives.  
Resilient nations.

File Ref: PRO/300/TUVALU  
Letter No: 079/17

27 March 2017

Dear Ms. Dinu,

**Subject: Confirmation of Co-financing for Tuvalu FASNETT Full Size Project**


This is to indicate our commitment to collaborating with the implementation of the full-size project entitled *Facilitation of the Achievement of Sustainable National Energy Targets of Tuvalu (Tuvalu FASNETT)* for the period 2018 to 2021.

We are pleased to confirm our commitment to provide co-financing in the amount of US\$250,000 towards the realization of objectives of the project over the four-year timeframe. This amount will be in the form of cash support to supplement the capacity development activities (Outcome 2) of the FASNETT project specifically in the establishment of an Energy Act of Tuvalu, inclusive of the formulation and enforcement of the associated implementing rules and regulations. Such capacity development support will benefit the country in the better management of climate change mitigation projects. Moreover, the co-financing will also be for supplementary support in the management of the implementation of the project activities particularly those in the outer islands.

We look forward to working with the GEF, and UNDP colleagues in addressing this important portfolio.

With kind regards.

Yours sincerely,



**Bakhodir Burkhanov**  
Country Director, UNDP Pacific Office in Fiji  
and Head of Pacific Regional Programme and Policy

Ms. Adriana Dinu  
Officer-in-Charge, UNDP-GEF  
United Nations Development Programme (UNDP)  
New York  
**United States of America**

UNDP Pacific Office in Fiji | Level 8, Kadavu House, 414 Victoria Parade, Suva, Fiji  
Tel: +679 3312 500 | Fax: +679 3301 718 | E-mail: [registry.fj@undp.org](mailto:registry.fj@undp.org) | [www.undp.org.fj](http://www.undp.org.fj)

**Annex: Letter of Agreement between UNDP and Government of Tuvalu for the provision of support services**

**Project Title:** “Facilitation of the Achievement of Sustainable National Energy Targets of Tuvalu (FASNETT)”

**ATLAS Project Proposal ID: 00097730, ATLAS Output ID: 00101338, UNDP/GEF PIMS ID Number: 5613**

Excellency,

1. Reference is made to consultations between officials of the Government of *Tuvalu* (hereinafter referred to as “the Government”) and officials of UNDP with respect to the provision of support services by the UNDP country office for nationally managed programmes and projects. UNDP and the Government hereby agree that the UNDP country office may provide such support services at the request of the Government through its institution designated in the relevant programme support document or project document, as described below.
2. The UNDP country office may provide support services for assistance with reporting requirements and direct payment. In providing such support services, the UNDP country office shall ensure that the capacity of the Government-designated institution is strengthened to enable it to carry out such activities directly. The costs incurred by the UNDP country office in providing such support services shall be recovered from the administrative budget of the office.
3. The UNDP country office may provide, at the request of the designated institution, the following support services for the activities of the programme/project:
  - (a) Identification and/or recruitment of project and programme personnel;
  - (b) Identification and facilitation of training activities;
  - (a) Procurement of goods and services;
4. The procurement of goods and services and the recruitment of project and programme personnel by the UNDP country office shall be in accordance with the UNDP regulations, rules, policies and procedures. Support services described in paragraph 3 above shall be detailed in an annex to the programme support document or project document, in the form provided in the Attachment hereto. If the requirements for support services by the country office change during the life of a programme or project, the annex to the programme support document or project document is revised with the mutual agreement of the UNDP resident representative and the designated institution.
5. The relevant provisions of the Standard Basic Assistance Agreement (SBAA) between the Authorities of the Government of *Tuvalu* and the United Nations Development Programme (UNDP) (the "SBAA") including the provisions on liability and privileges and immunities, shall apply to the provision of such support services. The Government shall retain overall responsibility for the nationally managed programme or project through its designated institution. The responsibility of the UNDP country office for the provision of the support services described herein shall be limited to the provision of such support services detailed in the annex to the programme support document or project document.
6. Any claim or dispute arising under or in connection with the provision of support services by the UNDP country office in accordance with this letter shall be handled pursuant to the relevant provisions of the SBAA.
7. The manner and method of cost-recovery by the UNDP country office in providing the support services described in paragraph 3 above shall be specified in the annex to the programme support document or project document.
8. The UNDP country office shall submit progress reports on the support services provided and shall report on the costs reimbursed in providing such services, as may be required.
9. Any modification of the present arrangements shall be effected by mutual written agreement of the parties hereto.
10. If you are in agreement with the provisions set forth above, please sign and return to this office two signed copies of this letter. Upon your signature, this letter shall constitute an agreement between your Government and UNDP on the terms and conditions for the provision of support services by the UNDP country office for nationally managed programmes and projects.

Yours sincerely,

---

Signed on behalf of UNDP

*Mr. Bakhodir Burkhanov*

*UNDP Country Director*

Date:

---

For the Government of **Tuvalu**

*Secretary*

*Ministry of Public Utilities and Infrastructure*

Date:

Attachment: Description of UNDP Country Office Support Services

1. Reference is made to consultations between the Ministry of Utilities and Infrastructure the institution designated by the Government of **Tuvalu** and officials of UNDP with respect to the provision of support services by the UNDP country office for the nationally managed programme or project “Facilitation of the Achievement of Sustainable National Energy Targets of Tuvalu (FASNETT)” project (*ATLAS Project Proposal ID: 00097730, ATLAS Output ID: 00101338, UNDP/GEF PIMS ID Number: 5613*).

2. In accordance with the provisions of the letter of agreement signed and the programme support document (*project document*), the UNDP Pacific Office in Fiji shall provide support services for the Programme as described below.

3. Support services to be provided:

Support services (insert description)	Schedule for the provision of the support services	Cost to UNDP of providing such support services (where appropriate)	Amount and method of reimbursement of UNDP (where appropriate)
1. Identification and/or recruitment of project personnel * Project Manager * Chief Technical Advisor * Project Coordinator * Project Administration/Finance Assistant * Project Communications Officer	January – April 2018	As per the UPL: US\$ 876.82	UNDP will directly charge the project upon receipt of request of services from the Implementing Partner
2. Procurement of goods: * Data show * PCs * Printers	January – March 2018	As per the UPL: US\$ 500 for each purchasing process	As above
3. Procurement of Services Contractual services for companies	Ongoing throughout implementation when applicable	As per the UPL: US\$ 486.12 each hiring process	As above
4. Payment Process	Ongoing throughout implementation when applicable	As per the UPL: US\$ 31.62 for each	As above
5. Staff HR & Benefits Administration & Management	Ongoing throughout implementation when applicable	N/A	N/A
6. Recurrent personnel management services: Staff Payroll & Banking Administration & Management	Ongoing throughout implementation when applicable	N/A	N/A
8. Ticket request (booking, purchase)	Ongoing throughout implementation when applicable	As per the UPL: US\$ 164.04for each	As above
10. F10 settlement	Ongoing throughout implementation when applicable	As per the UPL: US\$ 31.62 for each	As above
	<b>*Total (minimum):</b>	<b>\$2,364</b>	

(\*) Cost to UNDP of providing support service will be charged on transactional basis and based on effective UNDP Fiji Universal Price list at the time that transaction occurs. The total estimated cost should not exceed the Direct Project Cost amount of USD 12000.

4. Description of functions and responsibilities of the parties involved:

UNDP will conduct the full process while the role of the Implementing Partner (IP) will be as follows:

- The Implementing Partner will send a timetable for services requested annually/ updated quarterly
- The Implementing Partner will send the request to UNDP for the services enclosing the specifications or Terms of Reference required
- For the hiring staff process: the IP representatives will be on the interview panel,

For Hiring CV: the IP representatives will be on the interview panel, or participate in CV review in case an interview is not scheduled.

## Annex K: FASNETT Energy Savings and GHG Emission Reduction Estimates

### 1. BASIC ASSUMPTIONS

The basic assumptions in the calculation of the impacts on energy saving and GHG (CO<sub>2</sub>) emission reductions of the FASNETT are the following:

#### *Assumed Capacities of Baseline Electricity Generation in 2016*

**Table K.1: Total Electricity Generation Capacity Currently Installed in Tuvalu**

	PV Installed (kWe)	Diesel GenSets (kWe)	Total Capacity (kWe)
Funafuti	756	1,800	2,556
Outer Islands	1,290	990	2,270
<b>Total Tuvalu</b>	<b>2,046</b>	<b>2,780</b>	<b>4,826</b>

Note: Diesel GenSets used as backup by the local clinics are not included

The above total generating capacities are based on the following data for Funafuti and the Outer islands and the contribution of solar PV in electricity supply in which were used for the GHG computations as baseline projects:

**Table K.1a: Electricity Generation & Storage Baseline Projects for Funafuti**

Status	Location	Technology	Sponsor	Capacity (kWp)
Installed	TEC Head Quarter	PV	UAE	350
Installed	Princess Margaret Hospital	PV	UAE	75
Installed	Marine Warehouse	PV	UAE	75
Installed	Government Building	PV	New Zealand	130
Installed	Tuvalu Media Center	PV	New Zealand	40
Installed	Public Works Dept.	PV	Japan (PEC)	66
Installed	Playground	PV	Japan (E8)	20*
	<b>Total PV</b>			<b>756</b>
Installed	TEC Head Quarter	Diesel GenSet		600
Installed	TEC Head Quarter	Diesel GenSet		600
Installed	TEC Head Quarter	Diesel GenSet		600
	<b>Total Diesel GenSets</b>			<b>1,800</b>
	<b>Total Installed Funafuti</b>			<b>2,556</b>
Pipeline	TBD	PV	World Bank	925
Pipeline	TBD	Wind	World Bank	200
Pipeline	TBD	Battery Storage	World Bank	1000 kWh
Pipeline	TBD	Meters	World Bank	
Pipeline	Maritime Institute	PV	Finland	8
Pipeline	Maritime Institute	Battery Storage	Finland	96 kWh
Dismissed	Airstrip	PV	Russian Govt.	42^

Status	Location	Technology	Sponsor	Capacity (kWp)
Installed	Wharf	Diesel GenSet		
Installed	Princess Margaret Hospital	Diesel GenSet		
Installed	Maritime Institute	Diesel GenSet		180

**Table K.1b: Electricity Generation & Storage Baseline Projects for Outer Islands**

Island	Status	Location	Technology	Sponsor	Capacity (kWp)
Nanumaga	Installed		PV	New Zealand	195
			PV		10
Nanumea	Installed		PV	New Zealand	195
Niutao	Installed		PV	New Zealand	232
Vaitupu	Installed		PV	New Zealand	410
	Installed	MSS <sup>b</sup> (Off-Grid)	PV	Italy	46
Nui	Installed		PV	EU	70
Nukufetau	Installed		PV	EU	87
Nukulaelae	Installed		PV	EU	45
		<b>Total PV Installed O.I.</b>			<b>1,290</b>
Nanumaga	Installed		Battery Storage		1584 kWh <sup>^</sup>
Nanumea	Installed		Battery Storage		1440 kWh <sup>^</sup>
Niutao	Installed		Battery Storage		1728 kWh <sup>^</sup>
Vaitupu	Installed		Battery Storage		2880 kWh <sup>^</sup>
	Installed	MSS	Battery Storage		576 kWh <sup>^</sup>
Nui	Installed		Battery Storage		881 kWh <sup>^</sup>
Nukufetau	Installed		Battery Storage		1029 kWh <sup>^</sup>
Nukulaelae	Installed		Battery Storage		731 kWh <sup>^</sup>
		<b>Total Batteries O.I.</b>			<b>10,849 kWh</b>
Nanumaga	Installed		Diesel GenSet		128
Nanumea	Installed		Diesel GenSet		128
Niutao	Installed		Diesel GenSet		128
Vaitupu	Installed		Diesel GenSet		128
		MSS	Diesel GenSet		48
Nui	Installed		Diesel GenSet		140
Nukufetau	Installed		Diesel GenSet		140
Nukulaelae	Installed		Diesel GenSet		140
		<b>Total Diesel GenSets O.I.</b>			<b>980</b>
Niulakita	Pipeline		PV	Italy	0.24
Funafala	Pipeline		PV	Italy	0.24
Outer Islands	Pipeline		Diesel GenSet		8*

**Table K.1c: Electricity Generation/Consumption & Percent Generation Provided by PV**

Island	Jan-Sep 2016 Consumption (kWh)	Jan-Sep 2016 Sent Out (kWh)	Jan-Sep 2016 Diesel Sent Out (kWh)	Jan-Sep 2016 PV Sent Out (kWh)	Jan-Sep 2016 PV Sent Out (%)	Jan-Sep 2016 Distribution Losses (%)
Funafuti	4,562,670*	4,639,253	4,007,462*	631,791	14%	2%
Nanumaga	88,110	98,720	3,604	95,116	96%	11%
Nanumea	94,287	99,591	4,451	95,140	96%	5%
Niutao	116,092	124,728	26,326	98,402	79%	7%
Nui	87,491	118,595	33,898	84,697	71%	26%
Nukufetau	86,877	126,746	22,133	104,613	83%	31%
Nukulaelae	58,002	63,734	24,371	39,363	62%	9%
Vaitupu	283,029 <sup>e</sup>	325,731	58,820	266,911	83%	16%
Vaitupi - MSS		12,543		12,543		
Outer Islands <sup>a</sup>	813,888	970,388	173,603	796,785	82%	16%
Outer Islands <sup>b</sup>	692,937	966,549	165,209	801,340	83%	28%
<b>Total Tuvalu<sup>c</sup></b>	<b>5,255,607</b>	<b>5,605,802</b>	<b>4,172,671</b>	<b>1,433,131</b>	<b>26%</b>	<b>6%</b>

<sup>a</sup>: Figures taken from the excel file provided by TEC and broken down per individual island

<sup>b</sup>: Figures taken from the summary pdf file also provided by TEC

<sup>c</sup>: Uses Figures from the summary pdf file, the same used for the Figures for Funafuti

\*: Includes also electricity used at TEC, as if the generation source would change, TEC would still require electricity

## 1) Historical Energy Consumption in Tuvalu

As reported by the ED/MPUI, the total petroleum product consumption for 2013-2015 is shown in the following:

**Table K.2: 2013-2015 Total Petroleum Product Consumption in Tuvalu (in liters)**

2015	Import	Transport			Electricity	Fishing	Cooking	Others	Fuel consumption
		Land	Sea	Air					
ADF	1,335,800	49,224	552,122		1,643,681			81	2,245,108
ULP	689,600	438,062	20,625			161,788		1,988	622,463
DPK	50,000						30,127	9	30,137
LPG (kg)	144,638						139,183		139,183
Jet A1	92,000			103,514					103,514
2014	Import	Transport			Electricity	Fishing	Cooking	Others	Fuel consumption
		Land	Sea	Air					
ADF	3,014,524	68,615	552,122		1,737,689			870	1,807,174
ULP	977,870	552,344	20,625			134,301		6,981	693,626
DPK	26,000						36,441	9	36,450
LPG (kg)	631,217						61,656		61,656
Jet A1	92,000			98,857					98,857
2013	Import	Transport			Electricity	Fishing	Cooking	Others	Fuel consumption
		Land	Sea	Air					
ADF	2,248,559	69,892			1,682,490				1,752,382
ULP	876,604	349,206				93,519		1,174	443,899
DPK	44,000						35,699	70	35,769
LPG (kg)	119,160						27,560		27,560
Jet A1	88,000			96,597					99,597

As reported by TEC, the historical annual electricity energy consumption (in kWh) of the different sectors in Tuvalu is shown in the following:

**Table K.3a: Historical Annual Electricity Energy Consumption in Different Sectors in Tuvalu**

Year	Overall	Public Sector	Residential Sector	Commercial & Industrial Sector
2006	5,038,222	1,485,791	2,004,316	1,547,115
2007	5,089,239	1,685,918	1,875,482	1,527,844
2008	4,994,497	1,134,658	2,167,420	1,692,419
2009	4,594,182	921,728	2,028,101	1,462,562
2010	5,406,609	1,463,280	2,428,701	1,515,428
2011	5,083,294	1,254,706	2,251,937	1,526,651
2012	4,893,280	1,238,012	2,016,633	1,638,635
2013	5,153,317	1,330,486	2,207,903	1,614,928
2014	5,214,047	1,393,223	2,288,353	1,532,471
2015	5,620,167	1,473,136	2,605,368	1,575,142

Under consumption, It has been included also the electricity used by TEC. Their consumption cannot be assimilated to a generation loss, like the electricity used to operate all the auxiliary equipment to the diesel generators. In fact, if the electricity generation would be switched to another source of energy, the electricity consumed by the auxiliary equipment would not be required, but the electricity necessary to operate the TEC offices should still be generated.

## 2) Estimated Emission Factor

The estimated emission factor (EF) for the whole of Tuvalu is to be calculated based on the generation profile of the country using actual sources of energy comparatively between Funafuti, as the main island, and the Outer Islands.

**Table K.3b**

EE Savings/RE generation	Emission Factors, ton CO <sub>2</sub> /MWh
Funafuti	<b>0.627</b>
Outer Islands	<b>0.221</b>
Total Tuvalu	<b>0.573</b>

## 3) Estimated Energy Demand Growth Rate

The usual 0% growth rate assumption throughout 2020 that is being assumed previously by TEC needs to be updated. In fact, based on the data provided by TEC, the year-to-year growth in electricity consumption for the period from 2012-2015 (which was part of the period estimated at 0% growth scenario) has been higher than estimated in the Energy Master Plan and has averaged 4.8%, as shown in **Table K.4**. Furthermore, the forecasted consumption for 2016, based on the January-September 2016 data, also provided by TEC, is expected to grow about 20% compared to 2015. The main reason for this extremely high growth is due to the fact that while between 2015 and 2016 many new PV plants have been installed and are now operating at full capacity providing air conditioning to all public offices. Efforts aiming to improve the electricity consumption efficiency have not been as aggressive.

**Table K.4: Year-to-Year Electricity Consumption Growth**

Year	Tuvalu Total Electricity Consumption (kWh)	Y/Y Growth (%)
<b>2012</b>	4,893,280	
<b>2013</b>	5,153,317	5.3%



<b>2014</b>	5,214,047	1.2%
<b>2015</b>	5,620,167	7.8%
<b>2016<sup>a</sup></b>	6,730,387	19.8%
<b>Average Growth 2012-2015</b>		<b>4.8%</b>
<b>Average Growth 2012-2016</b>		<b>8.5%</b>

This aggressive growth is not expected to continue for the future. Therefore, the conservative 2% growth, matching Tuvalu's GDP growth, has been considered starting from 2017, and until 2025, but only for Funafuti. For the Outer Islands, a more aggressive and perhaps realistic 4% annual growth rate has been considered to take into consideration that the outer islands only account for 15% of the total electricity consumption in Tuvalu and their inhabitants are more likely to acquire more appliances similarly to Funafuti.

Assuming a 2% growth for Funafuti from 2017 until the target year 2025, and 4% growth for the Outer Islands over the same period, the electricity consumption will increase as shown in **Table K.5**.

**Table K.5. Total Estimated Electricity Consumption at 2% Annual Growth for Funafuti and 4% Annual Growth for the Outer Islands**

Island	2016 (kWh)	2017 (kWh)	2018 (kWh)	2019 (kWh)	2020 (kWh)	2021 (kWh)	2022 (kWh)	2023 (kWh)	2024 (kWh)	2025 (kWh)
Funafuti <sup>a</sup>	6,185,671	6,309,384	6,435,572	6,564,283	6,695,569	6,829,480	6,966,070	7,105,391	7,247,499	7,392,449
Nanumaga	131,627	136,892	142,367	148,062	153,985	160,144	166,550	173,212	180,140	187,346
Nanumea	132,788	138,100	143,624	149,368	155,343	161,557	168,019	174,740	181,730	188,999
Niutao	166,304	172,956	179,874	187,069	194,552	202,334	210,428	218,845	227,599	236,702
Nui	158,127	164,452	171,030	177,871	184,986	192,385	200,081	208,084	216,407	225,064
Nukufetau	168,995	175,754	182,785	190,096	197,700	205,608	213,832	222,385	231,281	240,532
Nukulaelae	84,979	88,378	91,913	95,589	99,413	103,390	107,525	111,826	116,299	120,951
Vaitupu	434,308	451,680	469,748	488,537	508,079	528,402	549,538	571,520	594,380	618,156
Vaitupu MSS	16,724	17,393	18,089	18,812	19,565	20,347	21,161	22,008	22,888	23,803
<b>Outer Islands</b>	<b>1,293,851</b>	<b>1,345,605</b>	<b>1,399,429</b>	<b>1,455,406</b>	<b>1,513,622</b>	<b>1,574,167</b>	<b>1,637,134</b>	<b>1,702,619</b>	<b>1,770,724</b>	<b>1,841,553</b>
<b>Total Tuvalu</b>	<b>7,479,521</b>	<b>7,654,989</b>	<b>7,835,001</b>	<b>8,019,689</b>	<b>8,209,191</b>	<b>8,403,647</b>	<b>8,603,204</b>	<b>8,808,010</b>	<b>9,018,223</b>	<b>9,234,002</b>

<sup>a</sup>: Includes electricity used by the TEC

#### **4) Growth Estimates Assuming the GoT Mandates a Switch to Electric Vehicles by 2025**

The growth estimate should be completely revised if the GoT decides to convert the entire motor-vehicle fleet in Tuvalu to electric vehicles.

In this section, Electricity Consumption Growth will be estimated after making the assumption that the GoT will mandate a complete switch of the entire Tuvalu motor vehicle fleet to Electric Vehicles (EV's) by the end of year 2025. Based on the data provided by the ED/MPUI for the period 2013-2015, it is obvious that there is not a clear trend for the consumption of transportation fuel; therefore, in order to minimize errors, an average of the available three-year period 2013-2015 is considered as a base for future estimates. **Table K.6a** summarizes these figures.

All the estimates for future growth over the period 2016-2025 are based on the calculated average. To be conservative three assumptions are made: (1) the replacement will have the following pace: 5% in each of the years 2017 and 2018, 10% in each of the years 2019-2021, and 15% in each of the years 2022-2025; (2) for simplicity, each year the replacement will be accounted for at the beginning of the year, this would assure that enough electricity is available regardless of when the actual replacements take place; and (3) similarly to the GDP, a 2% year-over-year growth will be considered for the transportation sector as well. These estimates are shown in **Table K.6b**.

**Table K.6a. Average Transportation Fuel Consumption for the 3-Year Period 2013-2015**

Year	ADF (Liters)	ULP (Liters)
2013	69,892	349,206
2014	68,616	552,344
2015	49,224	438,062
<b>Average 2013-2015</b>	62,577	446,537

ADF: Automotive Diesel Fuel – used for cars

ULP: Un-Leaded Petrol – used for scooters

**Table K.6b. Estimated Transportation Fuel Consumption 2016-2025 (2% Y/Y Growth) & Fuel Replacement Rates**

Year	ADF (Liters)	ULP (Liters)	Cumulative Replaced ADF (Liters)	Cumulative Replaced ULP (Liters)	Annual Replacement (%)
<b>Average 2013-2015</b>	62,577	446,537			
2016	63,829	455,468	-	-	-
2017	65,105	464,577	3,320	23,693	5
2018	66,408	473,869	6,774	48,335	5
2019	67,736	483,346	13,818	98,603	10
2020	69,090	493,013	21,142	150,862	10
2021	70,472	502,874	28,753	205,172	10
2022	71,882	512,931	40,326	287,754	15
2023	73,319	523,190	52,350	373,557	15
2024	74,786	533,653	64,839	462,678	15
2025	<b>76,281</b>	<b>544,327</b>	<b>76,281</b>	<b>544,327</b>	15

Fuel efficiencies are taken from the internet for both fossil fuels powered and electric vehicles<sup>3-7</sup>. Again a conservative approach has been chosen, leading to the following efficiencies: (1) for ULP scooters the range is 60-100+ miles per gallon (mpg), equivalent to 25-40+ km/L, a fuel efficiency of 40 km/L has been chosen; (2) for ADF cars the range is 12-45 mpg, equivalent to 5-19 km/l, a fuel efficiency of 18 km/L has been chosen; (3) for electric scooters rates of 20 mi/kWh are quoted, equivalent to 32 km/kWh, an efficiency of 25 km/kWh has been chosen; and finally (4) for electric cars rates of 3 mi/kWh are quoted, equivalent to 4.8 km/kWh, an efficiency of 4.0 km/kWh has been chosen. Under these assumptions, the additional electricity that will have to be generated every year for the entire country is summarized in **Table K.6c**.

**Table K.6c. Estimated Additional Electricity Generation 2017-2025 for Transportation Fuel Replacement**

Year	ADF (Liters)	ULP (Liters)	Cumulative Replaced ADF (Liters)	Cumulative Replaced ULP (Liters)	Electricity to Replace ADF (kWh)	Electricity to Replace ULP (kWh)	Total Electricity (kWh)
2016	63,829	455,468	-	-	-	-	-
2017	65,105	464,577	3,320	23,693	14,942	37,910	52,851
2018	66,408	473,869	6,774	48,335	30,481	77,335	107,816
2019	67,736	483,346	13,818	98,603	62,181	157,764	219,946
2020	69,090	493,013	21,142	150,862	95,138	241,379	336,517
2021	70,472	502,874	28,753	205,172	129,387	328,276	457,663
2022	71,882	512,931	40,326	287,754	181,465	460,407	641,872
2023	73,319	523,190	52,350	373,557	235,575	597,692	833,267
2024	74,786	533,653	64,839	462,678	291,776	740,284	1,032,060
2025	76,281	544,327	76,281	544,327	343,266	870,922	1,214,189

The additional electricity that needs to be generated can be distributed over Tuvalu's eight islands by using the same proportionality of the electricity generation for the period Jan-Sep 2016. **Table K.7** shows the new growth estimates under this new scenario.

**Table K.7. Total Estimated Electricity Consumption if GoT Mandates the Switch to EV's for All Motor Vehicles by 2025**

Island	2016 (kWh)	2017 (kWh)	2018 (kWh)	2019 (kWh)	2020 (kWh)	2021 (kWh)	2022 (kWh)	2023 (kWh)	2024 (kWh)	2025 (kWh)
Funafuti <sup>a</sup>	6,185,671	6,352,945	6,524,131	6,744,313	6,970,038	7,201,414	7,485,798	7,777,585	8,076,915	8,364,490
Nanumaga	131,627	137,837	144,327	152,123	160,297	168,865	178,976	189,598	200,756	211,980
Nanumea	132,788	139,053	145,600	153,465	161,711	170,355	180,555	191,271	202,527	213,850
Niutao	166,304	174,150	182,350	192,200	202,527	213,353	226,127	239,548	253,645	267,827
Nui	158,127	165,587	173,383	182,749	192,569	202,863	215,008	227,769	241,173	254,657
Nukufetau	168,995	176,968	185,300	195,310	205,804	216,805	229,786	243,424	257,749	272,160
Nukulaelae	84,979	88,988	93,178	98,211	103,488	109,020	115,547	122,405	129,609	136,855
Vaitupu	434,308	454,919	476,461	502,452	529,708	558,287	592,117	627,669	665,022	702,568
Vaitupu MSS <sup>b</sup>	16,724	17,393	18,089	18,812	19,565	20,347	21,161	22,008	22,888	23,803
Outer Islands	1,293,851	1,354,895	1,418,686	1,495,322	1,575,670	1,659,896	1,759,278	1,863,693	1,973,369	2,083,701
Total Tuvalu	7,479,521	7,707,840	7,942,817	8,239,635	8,545,708	8,861,310	9,245,076	9,641,277	10,050,284	10,448,191

<sup>a</sup>: Includes electricity used by the TEC

<sup>b</sup>: Secondary school does not supply electricity to replace fuels

**Table K.8: Estimated Electricity Generation Capacity Growth – Including EV's**

Island	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Funafuti <sup>a</sup>										
Diesel (kWe)	1,800	1,800	1,800	1,800	2,400	2,400	2,400	2,400	2,400	2,400
PV (kWe)	756	1,227*	1,689**	1,989	2,289	2,589	2,889	3,189	3,489	3,789
Wind (kWe)	-	-	200^	400	600	800	1,000	1,200	1,400	1,600

Island	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Batteries (kWh)	-	1,096	3,596	6,096	8,596	11,596	14,596	17,596	20,596	24,596
Nanumaga										
Diesel (kWe)	128	128	128	128	128	128	128	128	128	128
PV (kWe)	205	205	205	205	205	205	205	205	205	205
Batteries (kWh)	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584
Nanumea										
Diesel (kWe)	128	128	128	128	128	128	128	128	128	128
PV (kWe)	195	195	195	195	195	195	195	195	195	195
Batteries (kWh)	1,440	1,440	1,440	1,440	1,440	1,440	1,440	1,440	1,440	1,440
Niutao										
Diesel (kWe)	128	128	128	128	128	128	128	128	128	128
PV (kWe)	232	232	232	232	232	232	232	232	232	232
Batteries (kWh)	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728
Nui										
Diesel (kWe)	140	140	140	140	140	140	140	140	140	140
PV (kWe)	70	100	100	130	130	160	160	190	190	220
Batteries (kWh)	881	881	881	881	881	881	881	881	881	881
Nukufetau										
Diesel (kWe)	140	140	140	140	140	140	140	140	140	140
PV (kWe)	87	117	117	147	147	177	177	207	207	237
Batteries (kWh)	1,029	1,029	1,029	1,029	1,029	1,029	1,029	1,029	1,029	1,029
Nukulaelae										
Diesel (kWe)	140	140	140	140	140	140	140	140	140	140
PV (kWe)	45	65	65	80	80	95	95	110	110	130
Batteries (kWh)	731	731	731	731	731	731	731	731	731	731
Vaitupu										
Diesel (kWe)	128	128	128	128	128	128	128	128	128	128
PV (kWe)	410	410	410	410	480	480	480	480	560	560
Batteries (kWh)	2,880	2,880	2,880	2,880	2,880	2,880	2,880	2,880	2,880	2,880
Vaitupu MSS										
Diesel (kWe)	48	48	48	48	48	48	48	48	48	48
PV (kWe)	46	46	46	46	46	46	46	46	46	46
Batteries (kWh)	576	576	576	576	576	576	576	576	576	576
Outer Islands										
Diesel (kWe)	980	980	980	980	980	980	980	980	980	980
PV (kWe)	1,290	1,370	1,370	1,445	1,515	1,590	1,590	1,665	1,745	1,825
Batteries (kWh)	10,849	10,849	10,849	10,849	10,849	10,849	10,849	10,849	10,849	10,849
Total Tuvalu										
Diesel (kWe)	2,780	2,780	2,780	2,780	3,380	3,380	3,380	3,380	3,380	3,380
PV (kWe)	2,046	2,597	3,059	3,434	3,804	4,179	4,479	4,854	5,234	5,614
Wind (kWe)	0	0	200	400	600	800	1,000	1,200	1,400	1,600
Batteries (kWh)	10,849	11,945	14,445	16,945	19,445	22,445	25,445	28,445	31,445	35,445

°: Includes electricity Used by the TEC

\*: Half of the 925 kWe from the World Bank plus the 8 kWe funded by Finland

\*\* : The other half of the 925 kWe from the World Bank

^: The 200 kWe Wind Farm from the World Bank

**Table K.8** shows a possible scenario of capacity installation growth to meet the consumption growth over the period 2017-2025 for the more aggressive case, which includes a complete switch to EV's. Aside for the World Bank projects<sup>8</sup> and the projects funded by Finland listed as "Pipeline" in **Table K.1a & b** (which have been all accounted for by 2018), there are no other projects scheduled for Tuvalu for the foreseeable future. Timing and size of new installations have been solely dictated by the need of meeting electricity demand.

As shown in **Table K.1c**, some of the Outer Islands have been able to provide 96% of their total demand with a combination of PV installations and Lead-Acid Batteries backed up by a Diesel GenSet. The presence of batteries allow to provide nearly 100% of electricity from renewable sources, since sudden changes in weather conditions and abrupt decreases in electricity generation from PV panels can be rapidly compensated for by electricity coming from the battery pack. The employment of such a predominant percentage of electricity from RE is possible thanks to a continuous monitoring of the battery charge level, which is always kept above 70-75% in the morning, ideally at 80%. This prevents any grid instability, which would arise if sudden declines in PV generations would be balanced directly with diesel GenSets.

A similar grid control would be desirable for Funafuti as well, however the significantly larger scale together with the lack of battery pack presently installed (the only two projects are in the pipeline) call for caution. While in Table a full operation with a mix of PV Panels, Wind Turbines and Batteries, with diesel GenSets as backup, is envisioned, it would be preferable to conduct a study of the grid stability when the 30% threshold of electricity from RE has been passed.

Finally, it is noteworthy that some of the Outer Islands already have built so much overcapacity, both in terms of PV panels and batteries as well as backup GenSets, that even with a 4% annual growth no new installation are required to meet the 100% goal of electricity from RE by 2025. Furthermore, most of the islands can significantly improve their annual electricity consumption per kWe. According to a NASA website, averaged over a period of 22 years, Tuvalu has over 1900 sun-hours/year<sup>9</sup>; **Table K.9** sums up the yearly kWh generated per kWe installed for each island, showing in some cases a much lower number of yearly sun-hours. While for Nanumaga and Nanumea the main reason is overcapacity, for all other islands there have been maintenance issues with inverters and other equipment (**source: TEC**). For the future, higher generation efficiencies have been estimated.

**Table K.9. Estimated Yearly kWh Generated per kWe Installed**

Island	2016 (Sun-Hrs/Yr)
<i>Funafuti</i>	1,114
Nanumaga	619
Nanumea	651
Niutao	566
Nui	1,613
Nukufetau	1,603
Nukulaelae	1,166
Vaitupu	868
Vaitupu MSS	364

**Table K.10** summarizes the breakdown of electricity generation by energy source.

**Table K.10. Estimated Electricity Generation Growth by Energy Source – Including EV's, in MWh**

Island	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Funafuti <sup>a</sup>										
Diesel	5,343.3	5,064.3	4,283.3	3,477.8	2,761.5	2,021.0	1,440.3	867.1	301.5	
PV	842.4	1,288.6	2,040.9	2,666.6	3,208.5	3,780.5	4,245.5	4,710.5	5,175.5	5,364.5

Island	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Wind			200.0	600.0	1,000.0	1,400.0	1,800.0	2,200.0	2,600.0	3,000.0
Batteries										
Nanumaga										
Diesel	4.8	4.4	3.9	3.5	2.9	2.2	1.7	1.0	0.5	
PV	126.8	133.5	140.4	148.6	157.4	166.7	177.3	188.6	200.3	212.0
Batteries	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
Nanumea										
Diesel	5.9	5.5	4.4	3.7	3.2	2.5	1.9	1.3	0.7	
PV)	126.9	133.6	141.2	149.8	158.5	167.9	178.6	189.9	201.8	213.9
Batteries	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Niutao										
Diesel	35.1	25.7	16.5	11.2	7.6	5.7	3.4	2.2	1.0	
PV)	131.2	148.5	165.9	181.0	194.9	207.6	222.7	237.3	252.6	267.8
Batteries	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Nui										
Diesel	45.20	42.34	33.38	22.90	14.47	10.74	5.41	3.77	1.77	
PV	112.93	123.25	140.00	159.85	178.10	192.13	209.60	224.00	239.40	254.66
Batteries	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Nukufetau										
Diesel	29.5	24.0	16.8	11.8	7.4	6.2	5.0	3.4	1.1	
PV	139.5	153.0	168.5	183.5	198.5	210.6	224.8	240.0	256.7	272.2
Batteries	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Nukulaelae										
Diesel	32.5	25.2	19.7	14.1	8.3	5.8	3.4	2.5	0.9	
PV	52.5	63.8	73.5	84.1	95.2	103.3	112.1	119.9	128.7	136.9
Batteries	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Vaitupu										
Diesel	78.4	61.3	41.9	31.0	22.4	15.9	11.3	7.0	3.1	
PV	355.9	393.6	434.6	471.5	507.3	542.4	580.8	620.6	662.0	702.6
Batteries	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
Vaitupu MSS										
Diesel		3.6	2.4	1.6	0.7	0.6	0.5	0.3	0.1	
PV	16.7	13.8	15.6	17.3	18.9	19.8	20.7	21.7	22.8	23.8
Batteries	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Outer Islands										
Diesel	231.5	191.9	139.0	99.8	66.9	49.5	32.6	21.6	9.1	-
PV)	1,062.4	1,163.	1,279.7	1,395.5	1,508.8	1,610.4	1,726.7	1,842.1	1,964.3	2,083.7

Island	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Batteries	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8
Total Tuvalu										
Diesel	5,574.8	5,256.3	4,422.3	3,577.6	2,828.4	2,070.5	1,473.0	888.7	310.5	-
PV	1,904.8	2,451.6	3,320.5	4,062.1	4,717.3	5,390.8	5,972.1	6,552.6	7,139.8	7,448.2
Wind			200.0	600.0	1,000.0	1,400.0	1,800.0	2,200.0	2,600.0	3,000.0
Total RE	<b>1,904.8</b>	<b>2,451.6</b>	<b>3,520.5</b>	<b>4,662.1</b>	<b>5,717.3</b>	<b>6,790.8</b>	<b>7,772.1</b>	<b>8,752.6</b>	<b>9,739.8</b>	<b>10,448.2</b>
Total Electricity Supply	7,479.5	7,707.8	7,942.8	8,239.6	8,545.7	8,861.3	9,245.1	9,641.3	10,050.3	10,448.2

A feasibility study conducted in Tuvalu<sup>10</sup>, determined that wind blows in Tuvalu for 2,150 hours a year. In **Table K.10** a more conservative 2,000 hours a year has been assumed.

The battery capacities at year 2025 have been estimated by considering the maximum average load recorded in the period January-September 2016 for each of the Tuvaluan islands. Then the maximum average load for year 2025 has been estimated by taking a 2% annual growth for Funafuti and a 4% annual growth for the Outer Islands. A maximum of 24 hours of storage has been assumed for all islands. Results are displayed in **Table K.11**. The Energy Master Plan calls for 1-2 days of storage for Funafuti and 2-3 days, which are extremely expensive and conservative. Even 24 hours is a relatively conservative assumption, considering the existence of backup diesel GenSets; in alternative 18-20 hours of storage could be considered for the Outer Islands and 15-18 hours of storage for Funafuti, since PV and Wind tend to average each other out throughout the day.

**Table K.11. Estimated Battery Storage Capacity Considering 2% Growth for Funafuti and 4% Growth for the Outer Islands, and 24 Hours of Storage for All Islands**

Island	2016 Peak Load (kWp)	2016 Max Average Load (kWp)	2025 Max Average Load (kWp)	Battery Pack Capacity - Year 2025 (kWh)
Funafuti	<b>1,243</b>	<b>853</b>	<b>1,019</b>	<b>24,466</b>
Nanumaga	28	17	24	<b>581</b>
Nanumea	33	22	31	<b>752</b>
Niutao	34	23	33	<b>786</b>
Nui	24	16	23	<b>547</b>
Nukufetau	34	18	26	<b>615</b>
Nukulaelae	19	13	19	<b>444</b>
Vaitupu	90	72	102	<b>2,459</b>
Vaitupu MSS*				<b>576</b>

\*: Vaitupu Secondary School's Battery Capacity is taken as for Year 2016

The 2015 existing and some planned RE projects in Tuvalu is seen in **Table K.12a** in the following page.

**Table K.12: Present and Planned Projects in Renewable Energy in Tuvalu as of September 2016**

No	Location	Project title	Funding source	Ownership & Operation	Grid Connection	Mounting	Capacity (kWp)	Average Power Generation	Project Start	Commissioning date	Monitoring Data available
<b>Existing (Installed)</b>											
<b>A. Funafuti</b>											
1	Funafuti	Tuvalu Energy Project	NZMFAT(Grant)	TEC	Grid	Roof-top	170	20,282	Jan-15	June 2015	Yes
2	Funafuti (TEC compound, PMH & +A10:F13Marine Shed)	Photovoltaic plant	UAE (Grant)	TEC	Grid	300kW on raised structure; others on rooftop	500	50,293	Nov-14	Oct 2015	Yes
3	Funafuti	Solar PV Desalination Plant	Japan Government (Grant)	PWD	Grid	Ground	66	n.a.		2013	No
4	Funafuti, Kavatoetoe	Solar Desalination Plant	Russian Government (Grant)	PWD (damaged during Cyclone PAM)	Grid	Roof-top	42	n.a.		2012	No
5	Funafuti (Football Stadium & adjacent transport containers)	e8 Tuvalu Solar Power Project	e8 donation (75%)/ Japanese Govt 25%)	TEC	Grid	Roof-top	20	35 MWH/yr	2006	2008	Yes
6	Funafuti	USP Tuvalu	USP	USP	mini-grid	Roof-top	10.78	n.a.	2012	2013	Not sure
Total Installed – Funafuti							828.78				
<b>B. Outer Islands</b>											
7	Nanumea	Tuvalu Energy Project	NZMFAT (Grant)	TEC	mini-grid	Ground	195	11,828	2015	2015	Yes
8	Nanumaga	Tuvalu Energy Project	NZMFAT (Grant)	TEC	mini-grid	Ground	208	10,452	2015	2015	Yes
9	Niutao	Tuvalu Energy Project	NZMFAT (Grant)	TEC	mini-grid	Ground	232	10,812	2015	2015	Yes
10	Vaitupu	Tuvalu Energy Project	NZMFAT (Grant)	TEC	mini-grid	Ground	410	27,126	2015	2015	Yes
11	Vaitupu - Motufoua Secondary School	Tuvalu Photovoltaic Integration Project (TPVIP)	Italian Gov't (Grant)	TEC	mini-grid	On raised structure	46	1,580	2009	Nov-09	No
12	Nukulaelae	Improving reliable access to modern energy services through Solar PV systems for rural (outer islands) of Tuvalu	EU - Energy Facility II	TEC	mIni-grid	Ground/roof top	45	4,160	2014	2015	To be installed under WB project
13	Nukufetau		EU - Energy Facility II	TEC	mIni-grid	Ground/roof- top	77	11,952	2014	2015	
14	Nui		EU - Energy Facility II	TEC	mIni-grid	Ground/Roof-top	60	10,756	2014	2015	
<b>Total Installed – Outer Islands</b>							1,273				
<b>Planned Projects</b>											
1	Funafuti	Tuvalu Energy Sector Development Project (TESDP)	World Bank/SID DOCK (Grant)	TEC	Grid	Roof-top/ground	925	n.a.	Yet to start	2018	Yes



No	Location	Project title	Funding source	Ownership & Operation	Grid Connection	Mounting	Capacity (kWp)	Average Power Generation	Project Start	Commissioning date	Monitoring Data available
2	Amatuku, Tuvalu Maritime Training Institution (TMTI)	Solar PV grid connected at Amatuku	Finland Government (Grant)	TEC	Off-grid	Ground	8	n.a.	Yet to install	n.a.	No
3	Niulakita	Solar Home Standalone(SHS) System and PV Cooling Facility	Italian Government (Grant)	TEC	Off-grid	Ground	n.a.	n.a.	2016	2017	No
4	Funafala	Solar Home Standalone (SHS) System and PV Cooling Facility	Italian Government (Grant)	TEC	Off-grid	Ground	n.a.	n.a.	2016	2017	No
Total Planned							933				

Funafuti	601	920	1,600	2,332	3,004	3,698	4,316	4,933	5,551	5,971
Outer Islands	985	1,078	1,187	1,294	1,399	1,493	1,601	1,708	1,821	1,932
<b>Tuvalu Annual CO2 Reduction though RE-Based Generation under FASNETT</b>	<b>1,586.0</b>	<b>1,998.0</b>	<b>2,786.0</b>	<b>3,626.0</b>	<b>4,403.0</b>	<b>5,191.0</b>	<b>5,917.0</b>	<b>6,641.0</b>	<b>7,372.0</b>	<b>7,903.0</b>
<b>Cumulative Tuvalu CO2 reduction under FASNETT</b>	<b>1,586.0</b>	<b>3,585.0</b>	<b>6,371.0</b>	<b>9,997.0</b>	<b>14,400.0</b>	<b>19,592.0</b>	<b>25,508.0</b>	<b>32,150.0</b>	<b>39,522.0</b>	<b>47,425.0</b>
<b>Emission Factor (Ton CO<sub>2</sub>/MWh)</b>	<b>0.538</b>	<b>0.493</b>	<b>0.402</b>	<b>0.314</b>	<b>0.239</b>	<b>0.169</b>	<b>0.115</b>	<b>0.067</b>	<b>0.022</b>	<b>0</b>

**Table K.13a: Summary of Calculations**

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035		
		<b>FASNETT Project Intervention</b>									<b>TNEP Goal</b>											
<b>Annual Electric Energy Demand including EVs (MWh)</b>																						
Funafuti	6,185.7	6,352.9	6,524.1	6,744.3	6,970.0	7,201.4	7,485.8	7,777.6	8,076.9	8,364.5	8,531.8	8,702.4	8,876.5	9,054.0	9,235.1	9,419.8	9,608.2	9,800.3	9,996.3	10,196.3		
Outer Islands	1,293.9	1,354.9	1,418.7	1,495.3	1,575.7	1,659.9	1,759.3	1,863.7	1,973.4	2,083.7	2,125.4	2,167.9	2,211.2	2,255.5	2,300.6	2,346.6	2,393.5	2,441.4	2,490.2	2,540.0		
Total Tuvalu	7,479.5	7,707.8	7,942.8	8,239.6	8,545.7	8,861.3	9,245.1	9,641.3	10,050.3	10,448.2	10,657.2	10,870.3	11,087.7	11,309.5	11,535.6	11,766.4	12,001.7	12,241.7	12,486.6	12,736.3		
<b>Total Electricity Supplied</b>																						
Diesel	5,574.8	5,256.3	4,422.3	3,577.6	2,828.4	2,070.5	1,473.0	888.7	310.5	-												
RE																						
PV	1,904.8	2,451.6	3,320.5	4,062.1	4,717.3	5,390.8	5,972.1	6,552.6	7,139.8	7,448.2	7,597.2	7,749.1	7,904.1	8,062.2	8,223.4	8,387.9	8,555.6	8,726.7	8,901.3	9,079.3		
Wind	-	-	200.0	600.0	1,000.0	1,400.0	1,800.0	2,200.0	2,600.0	3,000.0	3,060.0	3,121.2	3,183.6	3,247.3	3,312.2	3,378.5	3,446.1	3,515.0	3,585.3	3,657.0		
Total RE Contribution	1,904.8	2,451.6	3,520.5	4,662.1	5,717.3	6,790.8	7,772.1	8,752.6	9,739.8	10,448.2	10,657.2	10,870.3	11,087.7	11,309.5	11,535.6	11,766.4	12,001.7	12,241.7	12,486.6	12,736.3	Total RE 2021-2035 <b>160,196.3</b>	
Batteries	10.8	11.9	14.4	16.9	19.4	22.4	25.4	28.4	31.4	35.4	36.2	36.9	37.6	38.4	39.1	39.9	40.7	41.5	42.4	43.2		
Direct Post Project - RE		9.1	11.7	419.4	804.3	1,356.7	1,903.8	2,546.7	3,156.1	3,772.4	3,847.2	3,924.2	4,002.7	4,082.7	4,164.4	4,247.7	4,332.6	4,419.3	4,507.6	4,597.8	DPPEE-RE <b>54,861.8</b>	
Total Estimated Annual EE Savings, MWh		104.5	209.0	313.5	418.1	439.0	460.9	483.9	508.1	533.6	560.2	588.2	600.0	630.0	661.5	694.6	729.3	765.8	804.1	844.3	DPPEE-EE 4,651.7	
Cumulative EE Savings, MWh		104.5	313.5	627.1	1,045.1	1,484.1	1,945.0	2,428.9	2,937.1	3,470.6	4,030.9	4,619.1	5,219.1	5,849.1	6,510.6	7,205.2	7,934.5	8,700.3	9,504.3	10,348.6		
Total Annual Equivalent CO <sub>2</sub> Reduction through EE, tons		59.9	119.8	179.7	239.5	251.5	264.1	277.3	291.2	305.7	321.0	337.1	343.8	361.0	379.0	398.0	417.9	438.8	460.7	483.8	Est. Forecast EE CO <sub>2</sub> (2021-2030) <b>3,131.7</b>	
Cumulative CO <sub>2</sub> reductions for EE, tons		59.9	179.7	359.3	598.9	850.4	1,114.5	1,391.8	1,682.9	1,988.7	2,309.7	2,646.7	2,990.5	3,351.5	3,730.6	4,128.6	4,546.5	4,985.3	5,446.0	5,929.7		
Tuvalu Annual CO <sub>2</sub> Reduction	1,586.0	1,998.0	2,786.0	3,626.0	4,403.0	5,191.0	5,917.0	6,641.0	7,372.0	7,903.0	8,061.1	8,222.3	8,386.7	8,554.5	8,725.6	8,900.1	9,078.1	9,259.6	9,444.8	9,633.7	Est. Forecast RE CO <sub>2</sub>	

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	
though RE-Based Generation under FASNETT																					(2021-2030) 74,974.1
Total Annual RE & EE Contribution in Energy Savings (MWh)	1,904.8	2,556.1	3,729.5	4,975.6	6,135.3	7,229.8	8,233.0	9,236.5	10,247.9	10,981.7	11,217.4	11,458.5	11,687.7	11,939.5	12,197.2	12,460.9	12,731.0	13,007.5	13,290.6	13,580.6	
Cumulative RE & EE Contribution in Energy Savings, MWh		2,556.1	6,285.6	11,261.2	17,396.6	24,626.3	32,859.3	42,095.9	52,343.8	63,325.5	74,542.9	86,001.4	97,689.1	109,628.6	121,825.8	134,286.7	147,017.7	160,025.2	173,315.8	186,896.4	Lifetime Energy Saved (MJ) 674,716,099.5
Total Annual RE and EE GHG CO <sub>2</sub> Reduction, tons		2,057.9	2,905.8	3,805.7	4,642.5	5,442.5	6,181.1	6,918.3	7,663.2	8,208.7	8,382.1	8,559.3	8,730.5	8,915.5	9,104.6	9,298.1	9,496.0	9,698.4	9,905.5	10,117.5	
Cumulative RE and EE GHG CO <sub>2</sub> Reduction, tons		2,057.9	4,963.7	8,769.3	13,411.9	18,854.4	25,035.5	31,953.8	39,616.9	47,825.7	56,207.7	64,767.1	73,497.6	82,413.1	91,517.7	100,815.7	110,311.7	120,010.1	129,915.6	140,033.1	

## Contributions from EE Projects in Reducing Electricity Demand

Application of energy efficient technologies were also estimated in contributing to the lowering of total energy demand that will be replaced by RE projects discussed above. In the course of the PPG studies, the EE contributions would come from: (a) Load management control systems in TEC power plants (in Funafuti and in outer islands) for optimal dispatch of the diesel power gensets in conjunction with the solar PV power generation units; (b) EE investments in institutional buildings that will not be covered by the baseline projects, e.g., air conditioning system in government building, EE retrofits in hospital; (c) Replacement of old and inefficient Refrigerators and Freezers which if based on UNDP Household Survey 2014 - Total Ref buyers in 409 and for Freezers is 790 and average consumption of ref of 300-500Kwh/year and for freezers is 200-400 kwh/year; and (d) Enercon campaign and smart metering. However, because the impact of these EE projects will depend on the customer response, they are considered to be buffer contributions in reducing total electricity demand. Therefore, for conservatism in estimating the EE contribution in the emission reduction impact of the FASNETT project, 10% of annual residential and commercial electricity consumption by 2020; with total saving increasing by 5% yearly.

### Summary of EE and RE Contributions

The results of the estimation of the EE savings contribution base on the above assumptions and the RE-based generation (Table K.10) are summarized below:

**Table K.13b: Contributions from EE Projects in Reducing Electricity Demand and RE-based Generation**

	2017	2020	2025
<b>EE Savings</b>			
Total Estimated Annual EE Savings, MWh	104.5	418.1	533.6
Reduced Electricity Demand thru EE Savings	7,375.0	7,821.6	9,516.7
Cumulative EE Savings, MWh	104.5	1,045.1	3,470.6
Total Annual Equivalent CO <sub>2</sub> Reduction through EE, tons	59.9	239.5	305.7
Cumulative CO <sub>2</sub> reductions for EE, tons	59.9	598.9	1,988.7
<b>RE-based Generation</b>			
Total Estimated Annual RE Generation, MWh	2,451.6	5,717.3	10,448.2
Cumulative RE Generation, MWh	4,356.4	18,256.2	61,759.7
Total Annual Equivalent CO <sub>2</sub> Reduction of RE, tons	1,998.0	4,403.0	7,903.0
Cumulative CO <sub>2</sub> reductions for RE, tons	3,585.0	14,400.0	47,425.0
<b>Total EE and RE Contributions</b>			
Total Estimated Annual EE & RE Generation, MWh	2,556.1	6,135.4	10,981.8
Cumulative EE & RE Generation, MWh	4,460.9	19,301.3	65,230.3
Total Annual Equivalent CO <sub>2</sub> Reduction of EE & RE, tons	2,057.9	4,642.5	8,208.7
Cumulative CO <sub>2</sub> reductions for EE & RE, tons	3,644.9	14,998.9	49,413.7

Finally, **Table K.13** shows how the 100% goal of electricity generation by year 2025 is achieved, and can be used as tracking tool to check if milestones are achieved. Results are given by year and by island.

**Table K.13c: Roadmap to Achieving 100% Electricity Generation from RE by Year 2025 in Percent Penetration**

Island	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Funafuti	14%	20%	34%	48%	60%	72%	81%	89%	96%	100%

Island	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Nanumaga	96%	97%	97%	98%	98%	99%	99%	99%	100%	100%
Nanumea	96%	96%	97%	98%	98%	99%	99%	99%	100%	100%
Niutao	79%	85%	91%	94%	96%	97%	98%	99%	100%	100%
Nui	71%	74%	81%	87%	92%	95%	97%	98%	99%	100%
Nukufetau	83%	86%	91%	94%	96%	97%	98%	99%	100%	100%
Nukulaelae	62%	72%	79%	86%	92%	95%	97%	98%	99%	100%
Vaitupu	83%	87%	91%	94%	96%	97%	98%	99%	100%	100%
Vaitupu MSS		79%	86%	92%	96%	97%	98%	99%	100%	100%
Outer Islands	82%	86%	90%	93%	96%	97%	98%	99%	99.5%	100%
Total Tuvalu	26%	32%	44%	57%	67%	77%	84%	91%	97%	100%

## 2. RESULTS OF THE CALCULATIONS ON CO2 EMISSION REDUCTION

### Direct CO<sub>2</sub> Emission Reductions (DER)

The details of the annual electricity generation /savings of the RE and EE projects are seen in Table K.10 and K.12b, respectively.

#### Baseline Scenario (No FASNETT)

2016 Electricity Generation Capacity	kW
<b>Funafuti</b>	
Diesel Gensets	1,800
Solar PV	756
<i>Total Funafuti</i>	2,556
<b>Outer Islands</b>	
Diesel Gensets	980
Solar PV	1,290
<i>Total Outer Islands</i>	2,270
<b>TOTAL TUVALU</b>	<b>4,826</b>

2016 Electricity Generation	MWh
<b>Funafuti</b>	
	2016 (Est. from 3 Qtrs.)
Diesel	5,343.3
Solar PV	842.4
Total Funafuti	6,185.7
<b>Outer Islands</b>	
Diesel	220.3
Solar PV	1,068.5
Total Outer Islands	1,293.8
Total TEC electricity supplied	7,479.5
% RE (Solar PV) in Total Electricity Supplied	

Funafuti	14%
Outer Island	83%
Total Tuvalu at Baseline % RE	26%

#### Baseline Scenario (No FASNETT Project)

- Projected Annual Energy Consumption of the country at EOP = **8,545.7 MWh/yr**, which is around 74% diesel-based power generation.

#### Alternative Scenario

(Due to FASNETT intervention with support and facilitation for ongoing Baseline RE projects as subsumed to FASNETT)

In summary, the values due to FASNETT project intervention at the end of the FASNETT project (2020) are as follows:

- A. Energy Savings (Table K.13a)
  - Annual EE Savings contributing to bring down petroleum-based electricity demand = 418.1 MWh/yr
  - Annual RE generation to replace petroleum-based electricity generation = 5,717.3 MWh/yr
  - Cumulative EE savings and RE Generation = 19,301.3 MWh
  
- B. GHG CO<sub>2</sub> Equivalent Emission Reduction (Table K.13a)
  - Direct Annual GHG CO<sub>2</sub> equivalent reduction from EE savings ( $DER_{EOP-EE}$ ) = 239.5 tons CO<sub>2</sub>/yr
  - Direct Annual GHG CO<sub>2</sub> equivalent reduction from RE generation ( $DER_{EOP-RE}$ ) = 4,403.0 tons CO<sub>2</sub>/yr
  - Total Direct Annual GHG CO<sub>2</sub> Equivalent Reduction ( $DER_{EOP-TOT}$ ) = 4,642.5 tons CO<sub>2</sub>/yr
  - Direct Cumulative GHG CO<sub>2</sub> equivalent reduction ( $DER_{CUM-EOP-TOT}$ ) =  $DER_{EOP-RE} + DER_{EOP-EE} = 598.9 + 14,400 = 14,998.9$  tons CO<sub>2</sub>  $\approx$  15,000 tons CO<sub>2</sub>

#### Lifetime DER ( $DER_{TOTAL}$ )

- Average lifetime of RE (solar, wind) = 15 years & EE facilities = 10 years
- $DER_{TOTAL}$  (all FASNETT-influenced projects) =  $DER_{EOP-RE} * 15 + DER_{EOP-EE} * 10 = 4,403.0 * 15 + 239.5 * 10 = 66,045.0 + 2,395.4 = 68,440.4$  tCO<sub>2</sub>

#### Direct Post-Project CO<sub>2</sub> Emission Reductions (DPPER)

Assuming direct assistance/support provided by FASNETT to any RE/EE users during the 4-year project but were implemented after the EOP.

For RE-based generation projects, this is the expected additional Solar PV and wind energy systems capacity installed attributable to the FASNETT project by EOP as direct project influence. This consists of RE generation for the period 2021-2035 which is amounting to 54,861.8 ton CO<sub>2</sub>.

For EE application, these are projects attributable to FASNETT is estimated to be 50% share of the total yearly energy savings from 2021-2035 that are to be the EE projects that were assumed to be directly contributed by FASNETT. For conservatism, since the level of impact is dependent on users'

behaviors, it can be assumed at 50% of cumulative value of the estimated annual savings, which is 50% of the sum of the FASNETT projected savings = 4,651.7 tons CO<sub>2</sub>

- $DPPER_{TOT} = DPPER_{RE} + DPPER_{EE} = 54,661.8 + 4,651.7 \text{ tons CO}_2$

### Consequential CO<sub>2</sub> Emission Reductions

#### Bottom-up Approach (BUA)

In estimating the Lifetime Consequential Emission Reductions using the bottom-up approach (CER<sub>BUA</sub>), the sum of the Lifetime DER and Lifetime DPPER is multiplied by a replication factor (RF). As a market transformation and demonstration project, the GEF prescribed RF value is 2. In this case:

$$CER_{BUA} = (\text{Lifetime DER} + \text{Lifetime DPPER}) \times 2$$

For EE Technology Application

$$CER_{BUA-EE} = (2,395.4 + 4,651.7) \text{ tCO}_2 \times 2 = 14,094.3 \text{ t CO}_2$$

For RE-based Generation

$$CER_{BUA-RE} = (66,045.0 + 54,861.8) \text{ tCO}_2 \times 2 = 241,813.7 \text{ t CO}_2$$

$$CER_{BUA-TOT} = IER_{BUA-EE} + IER_{BUA-RE} = 255,908.0 \text{ t CO}_2$$

#### Top-Down Approach

- The Causality Factor (CF) considering that the FASNETT Project is the only enabling project in Tuvalu. Hence, the CF should at least be 0.75 to 0.80. The CF used is 0.75.
- Estimated Forecast Total CO<sub>2</sub> ERs for top down approach (ER<sub>TDA</sub>) from using EE technologies and from RE-based generation during the 10 year influence period (2021-2030) will provide the indirect emission reductions

$$CER_{TDA} = \text{Lifetime Indirect CO}_2 \text{ Emission Reductions, tCO}_2 = ER_{TDA} * CF$$

For EE Technology application (Table K.13a)

$$CER_{TDA-EE} = ER_{TDA-EE} * CF = 3,131.7 \times 0.75 = 2,348.8 \text{ t CO}_2.$$

For RE-based generation (Table K.13a)

$$CER_{TDA-RE} = ER_{TDA-RE} * CF = 74,974.1 \times 0.75 = 56,230.6 \text{ t CO}_2$$

$$IER_{TDA-TOT} = 58,579.3 \text{ t CO}_2$$

### Summary of CO<sub>2</sub> Emission Reductions

CO <sub>2</sub> Emission Reduction Type	Quantity, tCO <sub>2</sub>
End-of-Project Direct CO <sub>2</sub> Emission Reduction (DER <sub>EOP</sub> )	15,000.0
Lifetime Direct CO <sub>2</sub> Emission Reduction (DER <sub>TOTAL</sub> )	68,440.4
Lifetime Direct Post Project CO <sub>2</sub> Emission Reduction (DPPER <sub>TOTAL</sub> )	59,513.5

Lifetime Consequential CO <sub>2</sub> Emission Reduction - BU Approach (IER <sub>BUA</sub> )	255,908.0
Lifetime Consequential CO <sub>2</sub> Emission Reduction - TD Approach (IER <sub>TDA</sub> )	58,579.3

**Range of Lifetime Indirect CO<sub>2</sub> Emission Reduction: 58,579.3 – 255,908.0 tons CO<sub>2</sub>**

FASNETT Project Impact Calculations	Amount	Reference
<b>I – Direct</b>		
Cumulative emission reductions during project duration, t CO <sub>2</sub>		
EE technology applications	598.9	Table K.13a
RE technology applications	14,400.0	Table K.13a
<b>TOTAL</b>	14,998.9 ≈ 15,000	Table K.13a
Lifetime Direct CO <sub>2</sub> emission reduction (t CO <sub>2</sub> )		
EE technology applications (10 years avg. lifetime)	2,395.4	Based on total EE savings in Table K.12b, K.13a and EF in Table K.3a
RE technology applications (15 years avg. lifetime)	66,045.0	Based on EE savings for RE (Table K.13a)
<b>TOTAL</b>	68,440.4	
<b>II - Direct post project</b>		
Direct post project CO <sub>2</sub> emission reductions (ktons CO <sub>2</sub> ) [if anticipated]		
EE technology applications	4,651.7	Calculated as 50% of the total annual energy savings from 2021-2035 (Table K.13a)
RE technology applications	54,861.8	Solar PV and wind capacity installed attributable to the FASNETT project by EOP as direct project influence (Table K.13a)
<b>TOTAL</b>	59,513.5	
<b>III - Consequential</b>		
Consequential CO <sub>2</sub> emissions - bottom-up (tCO <sub>2</sub> )		
EE technology applications	14,094.4	As estimated above
RE technology applications	241,813.6	As estimated above
<b>TOTAL</b>	255,908.0	
Consequential CO <sub>2</sub> emissions – top-down (tCO <sub>2</sub> )		
EE technology applications	2,348.8	As estimated above
RE technology applications	56,230.5	As estimated above
<b>TOTAL</b>		



## **Annex L: Results of the PPG Study on possible RE/EE projects to be covered by the FASNETT Project under Commercial Adoption or for Pilot Demonstration**

### **The Existing Renewable Electricity Generation Scenario in Tuvalu**

Owing to the limited natural resources, land availability, and small generation/consumption scale, selecting RE technologies suitable for Tuvalu has proven to be a difficult task.

To date, the only technology that has been deployed in relatively large scale is solar photovoltaic (PV) energy. While PV panels have worked satisfactorily both in Funafuti and on the Outer Islands, the technology has not been tested for a long period. In fact, most of the current installations are only about a year old. Risks regarding long-term operation mainly concern corrosion and rust, possibly augmented by the adverse environmental conditions in Tuvalu, whose air is particularly rich in salt. Small anaerobic gasifiers, literally family-sized gasifiers fed with pig manure, is the only other technology ever tested on the island country.

Lastly, the World Bank also has in the pipeline the first wind energy farm for Tuvalu, a 200 kWe demo which should start construction in 2017. Hence, performances for this technology are still to be evaluated.

Resulting from the Project Preparation Grant (PPG) study during the FASNETT project development phase, the possible RE/EE projects that can be covered by the FASNETT project are classified as to their commercial adoption readiness or for possible pilot demonstration because of significant replication potential in Tuvalu.

#### *Renewable Energy Applications*

- Solar PV systems were first used as power source for telecommunications and continue to be used throughout the Pacific for powering remote repeaters and island telephones. Rural electrification programs using solar PV have been widely used for Solar Home Systems (SHS). At the same time system costs have gone down and better and more reliable components are now available in the market. Since land space is very limited, a program that would use additional location sites such as the rooftops and floating structures are worth pursuing.
- Wind generators have been installed in the Pacific over the years, only a few very small privately owned or Telecom-owned units have remained in service more than four or five years. Currently, some installations are generating electricity for small grids
- Solar water heaters (SWH) for domestic, commercial and industrial use are commercially available in the PICs to substitute for electric water heaters.
- Hybrid power generation systems vary depending on the resources available. Wind/PV hybrid power system for charging backup batteries at several remote sites and wind/PV/diesel is specifically designed for power generation.
- Biomass, biogas, improved cook stoves, bio-diesel and other bio-energy systems that have been found practical for PICs which offer fuel substitution possibilities in heating applications and electricity generation to bring down petroleum-based electricity demand

Although a number of small-scale rural RE-based electrification projects have been carried out in the PICs over the last two decades, as described above, their impacts have been minimal. Most of these previous projects, by their nature (i.e., donor-funded equipment-based demonstrations) were not designed for sustainability; some are non-operational now and lack real private sector participation. Despite this overall discouraging experience, the PIC governments understand the benefits of developing and utilizing their respective countries RE resources, but the more widespread utilization

and application of RETs is constrained by many closely interrelated and intertwined barriers. In addition to existing RE technologies in Tuvalu, a demo program for potential RE technologies is necessary to explore other RE technology approaches that will have big replication possibilities.

### *Energy Efficiency Applications*

In addition to current initiatives, the project aims to have the following EE projects and activities through the development and implementation of an energy efficiency policy and financial assistance plan:

- Technologies for increased demand-side energy efficiency and smart metering systems;
- Development and implementation for increased capacity to replace or modify inefficient power generation systems.

Based on the PPG study, there is need to provide technical and financial assistance to residential, commercial and industrial entities in coming up with updated load demand, technology choice and investment planning and replacement programs for old, inefficient household and commercial appliances and equipment, e.g. refrigerators, freezers, lights, and others to more efficient models through incentives and rebate schemes following regulations in EE labeling and standards.

### **Selection of Possible RE and EE Demos**

During the FASNETT PPG study, several technologies have been considered for a demo as part of the FASNETT project. The following is a short overview of the technologies examined and the reason for discarding them is provided.

- Concentrating Solar Power Generation:* as opposed to solar PV, thermo-solar generation allows for relatively cheap energy storage and allows for reliable load following and therefore grid control, which is crucial for any country that wants to obtain the majority of its electricity consumption from renewable sources. Particularly interesting was a version of this technology that employs fluidized sand as thermal vector. The small scale of Tuvalu, combined with the difficulty of digging underground insulated storage tanks and fast mirror deterioration (due to the high salt concentration in the atmosphere) made this option unavailable.
- Electricity from Biomass combustion:* this would have possibly been the preferred option, since it is a relatively easy technology to scale up or down, and it is a very reliable controllable electricity generation technology. However, the limited size of Funafuti, where about 85% of the electricity is consumed, makes difficult to cultivate most of the fast-growing trees on a scale sufficient to meet their needs. Some fast-growing grasses are available, but the explored technologies did not work well with grass. The likelihood of using selected waste such as landscaping, kitchen and manure in any possible combination has also been explored. But Tuvalu seems to be already in a virtuous cycle where kitchen waste is fed to pigs, while pig waste is used as fertilizer. The lack of large amounts of waste only allows some small biogas applications as described above.
- Ocean Thermal Energy Conversion (OTEC):* OTEC was also considered a viable and controllable electricity generation technology, especially because Tuvalu is located right in the middle of the warmest portion of the ocean in the world, and it offers very steep drops in depth, where to find relatively cold water, not too far from the coast. To hamper the possibility of a demo for such a technology, which has had a pilot in Nauru in the early 1980s, is the extremely high cost of this technology. The University of Saga, Japan, who has developed a pilot in Japan and it is involved in most of the major pilots presently pursued in the Pacific Ocean, has quoted a cost of \$7.5+M for a 250 kWe installation (40% of which, or 100 kWe, are needed to operate the plant itself).

Since other non-controllable RE technologies, such as tidal energy, do not offer any substantial advantage over the existent ones, it would be advisable to use a mix of technologies that have been already proven or pipelined in Tuvalu.

The proposed energy mix will be composed of the following: solar PV Installations, wind energy farms, battery storage and back-up biodiesel generators.

Wind is strongest at night, while solar energy is only available during the day time, therefore a development of the two would partially compensate the intermittent nature of these two energy sources. As to the biodiesel to use in the back-up generators, this would need to be acquired. In fact, the only local feedstock in relatively large quantities suitable for *in-situ* biodiesel production would be coconut oil, but Tuvaluans prefer to destine coconuts to more profitable industries, namely food and cosmetics. The other option could be to use the exhausted lubricant oil, but based on data from Pacific Energy and from the Solid Waste Agency of Tuvalu (SWAT), every year only 12,000 liters of spent lubricant oil are collected, compared to the 1.6-1.7 million liters of diesel currently used for electricity generation. Therefore, even if successful, this technology would displace less than 1% of the present diesel fuel used for electricity generation.

Tuvalu, owing it to its small scale, does not have transmission lines, but only distribution lines. Electricity distribution losses are often very high in small country islands. However, Tuvalu has extremely limited distribution losses (below 10%) which are very low especially compared to similar countries where distribution losses can exceed 30-40% of the total electricity generated. These concerns were also raised with Mr. Andrew Daka, Chairman and Executive Director of the Pacific Power Association, who confirmed that Tuvalu is well ahead of its peers when it comes to managing distribution losses. Therefore, no efforts are necessary to improve this aspect of energy efficiency.

### ***Proposed RE Pilot Demonstrations***

As mentioned earlier, Funafuti is a small island with a high population density. Approximately 50% of Tuvaluans live in Funafuti and about 85% of electricity is consumed here. Furthermore, of all the Tuvaluan's islands, Funafuti generates the lowest percentage of its electricity from renewable sources; therefore, the RE demo should be located in Funafuti.

The little land available is communal, which means it is owned by extended families (often 25+ members) and decisions on its use and destination has to meet consensus, not just majority. Therefore, finding available real estate for RE installations is not easy. Most of the large public buildings (e.g., the Government Building, the Media Center, the Department of Public Works, The Tuvalu Electricity Corporation, The Princess Margaret Hospital, and the Warehouse) are already hosting PV plants, while new buildings under construction are designed capable of accommodating PV installations (e.g., the new Airport Terminal, the new Fishery Building, and the extension of the Primary School). In the Energy Master Plan, the GoT and the TEC have proposed the 1,000 roofs projects, where 1,000 houses, or *fales*, will be used to host small PV installations. The success of such enterprise is highly questionable, since *fales* in Funafuti have not been designed to support PV installations. In addition, it is not clear what advantages would the owners of the chosen *fales* receive in exchange for letting TEC use their roofs for public electricity generation, as well as access to the installations in case of maintenance and repairs, not it is clear who would own the panels.

Public soil would be preferable, and although available land is scarce, there is an extensive pond, between the airstrip and the ocean side, suitable for floating PV plants. **Figure 1** below gives an idea of the size of the pond.

The only problem with the pond is that a large portion of the panels would be located in a relatively small area, and in case of sudden appearance of clouds this large portion of panels would be shadowed over a relatively short time, making it a bit harder to control the grid. For this reason, as also mentioned earlier, a thorough study on grid stability when about 30% of the electricity in Funafuti is generated via RE should be conducted.

- *Floating Solar PV Demo Plant:* Floating PV is a technology that has been proven and available for several years now and in many locations around the world, including oceans, lagoons, and lakes. A small demo in the Mangrove Pond, in the 100 kWe range, would be very useful, because if successful could provide a significant portion of Funafuti's electricity generation. In fact, based on the image from Google Earth, the Mangrove pond is approximately a triangle with an area of 30,000 m<sup>2</sup>, with about 15,000 -18,000 m<sup>2</sup> usable for floating PV installations, which is enough for well over 2 MWe of PV installed. Furthermore, floating PV installations could be extended to the lagoon side, as well as transferred to the Outer Islands.

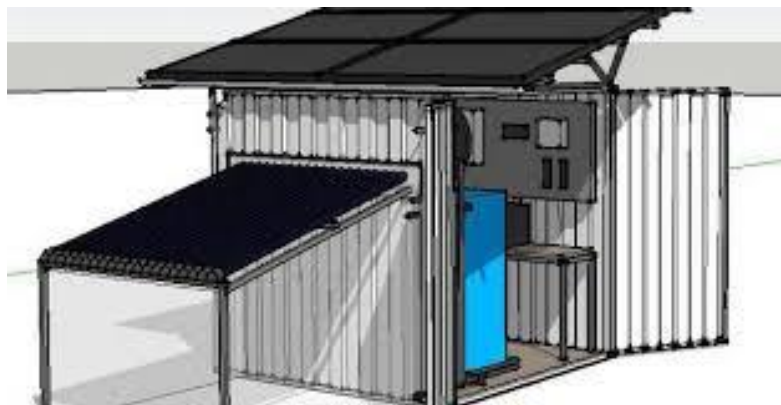
Estimates for PV floating installations change over a relatively wide range. Based on a case-study conducted in South Korea for a 1 MWe power plant, the cost is about US\$3,000/kWe installed. Taking into consideration that smaller installations would have a higher cost per kWe, and that Tuvalu requires a premium, both due to its remote location and to limited local expertise, a more conservative cost of US\$6,000/kWe is assumed, which would bring to a total cost for the 100 kWe installation to US\$ 600,000. If during the design stage it would turn out that the cost is lower, i.e. US\$4-5,000/kWe, a larger demo could be installed (i.e., 120-150 kWe). Similarly, if the cost would turn out to be higher, i.e. 8,000/kWe, a smaller demo could be installed (i.e., 80 kWe). In any case, the demo would demonstrate the technology.

While a wind energy farm demo is also desirable, there is already a project of the World Bank in the pipeline. Ancillary projects could be designed together with the World Bank. For example, as an alternative to batteries, flywheels could be tested, especially if the rotating mechanisms of the wind turbine turn out to work well under the highly corrosive conditions of Tuvaluan air.

- *Off-Grid Box:* For the smallest of Tuvalu's island, Niulakita, an all-in-one solution would be represented by the Off-Grid Box<sup>17</sup>, a device that generates electricity with PV panels and desalinates water. The Off-Grid Box can be accessorized with batteries for electricity storage and with Wind turbine for improving the renewable electricity generation capacity. The 5 kWe basic model, which does not include water desalination and wind turbines, but only PV panels and batteries, is quoted at €20-25,000 (or US\$ 21-26,000). A single unit scales up to 15 kWe. An investment of US\$40,000 -50,000 for a unit provided with water desalination and wind turbines was considered for the demo projects.



**Figure L.1: Mangrove Pond, Funafuti – Tuvalu (Source: Google Earth)**



**Figure L.2: Off-Grid Box**

### **Existing Energy Efficiency Programs in Tuvalu**

There are currently two programs active in Tuvalu to encourage people to replace old, inefficient appliances with new and efficient ones. Both programs are coordinated by the Tuvalu Development Bank (TDB).

The Low Carbon fund is provided through GEF SRAT4 allocations. The fund is approximately US\$91,000 and can be allocated for both loans and rebates, without limitations on how to spend the money in terms of rebates versus loans. The Implementing Agency is UNEP, with IUCN as executing agency. It includes freezers, refrigerators, and washing machines. Customers can access the fund in two different

ways: (1) buy the new appliance paying upfront and then applying for a 25% rebate; or (2) request a loan to pay for the appliance, obtaining a 10% rebate, and 3% interest rate on the remaining portion. As on now, the fund has not been activated yet, and it will be completed when all the money has been allocated.

The other project has been funded by the Italian Government under the Energy, Ecosystems and Sustainable Livelihoods Initiative (EESLI). The fund is approximately US\$100,000, and it covers the appliances above, plus housing renovations (windows, verandas, and ventilation), CFL/T5 fluorescent lighting fixtures, bicycles, and solar water pumps. The EESLI fund gives people a 50% subsidy on bicycles, with the balance loaned at 7% interest rate (the current interest rate applied by the National Bank of Tuvalu), while all other appliances are subsidized at 20%, with the balance loaned also at 7% interest rate. The fund has been already accessed by people from Funafuti as well as from the Outer Islands.

There is also another initiative, the Pacific Appliance Labeling and Standards (PALS) Project, AU\$ 2.6M funded by the Australian Government, with the South Pacific Community (SPC) as Implementing Agency. The fund started in 2012 and will end in June 2017, and can be accessed by all Pacific Island Countries (PICs), without a specific budget allocation for any country, but funds are given to countries based on their request for funds to implement their proposed activities. PALS Program not only facilitates the drafting and implementation of an appliance standards and labeling legislation, but can also provide funds for loans subsidy. Tuvalu has received US\$ 36,590 for their activities, which only include legislations, and this figure could increase to about double that amount.

### ***Proposed EE Demos***

- *Financial incentive mechanism for replacement programs for old, inefficient household and commercial appliances and equipment, e.g. refrigerators, freezers, lights, and other major electricity-consuming devices to more efficient models through incentives and rebate schemes following regulations in EE labeling and standards.*

To improve the efficiency of electricity consumption, funds similar to the Low Carbon Fund should be implemented. The GoT should mandate that all new appliances acquired in Tuvalu have to meet a minimum in terms of energy efficiency standards (e.g., 3.4-Star for refrigerators and freezers, and 4-Star for washing machines), as well as mandate the replacement of all inefficient appliances by the end of 2025, same deadline to achieve the 100% electricity from renewable sources; which would allow over nine years for the replacement. Since this would be a country-wide effort, a floating rebate percentage should be applied based on the annual income of the applicants (i.e., from 25-50%), and the interest rate applied for the loan should be at an advantageous rate, such as the 3% applied by the Low Carbon Fund.

In a recent UNDP report, 434 households were surveyed in Funafuti, equivalent to 51.4% of the total households in Funafuti, focusing on electric appliances and lighting. In **Table L.1** are summarized the estimates to replace and purchase the two most common appliances, refrigerators and freezers. Few assumptions are made: (1) assume that all buyers opt for rebates without loans (for simplicity); (2) the appliances with no label have the same distribution between efficient and non-efficient as the appliances with labels (this would overestimate the efficient appliances, since appliances with no label are more likely to be inefficient); (3) 20% of households that does not own the appliance decides to buy the appliance; (4) after extending the sample to 100% of the households, another 50% of buyers is added to account for the people who live in the Outer Islands; and (5) the average rebate is assumed to be 35%.

At the end the total amount is doubled to consider all other appliances for which the survey does not give a breakdown between efficient and non-efficient (e.g., washing machines, televisions, fans, lightings, etc.), which brings the total to US\$ 500,000 for the fund.

**Table L-1: Estimate of the Fund Based on Surveyed Electric Appliances Owners in Funafuti**

	Refrigerators	Freezers	Total
Households Surveyed	434	434	
% of Total Households	51.4%	51.4%	
Do Not Own Surveyed Appliance	301	150	
Own Surveyed Appliance	120	281	
Appliance Has Efficiency Label	48	91	
Efficient Appliance	16	13	
Non Efficient Appliance	32	78	
Appliance Does Not Have Efficiency Label	72	190	
Efficient Appliance	24	27	
Non Efficient Appliance	48	163	
Total Appliance (With and Without Label)	120	281	
Efficient Appliance	40	40	
Non Efficient Appliance	80	241	
Estimate Over 100% Households	233	547	
Efficient Appliance	78	78	
Non Efficient Appliance	156	469	
Households Without Appliance that Purchase It	117	58	
Total Appliance Buyers in Funafuti	273	527	
x 1.5 to Include Outer Islands	409	790	
Average Appliance Cost (US\$) <sup>20-21</sup>	900	500	
Cost of Total Rebates at an Average of 35%	USD 110,469	USD 138,327	<b>USD 248,796</b>

- *Demand management/response system* to augment existing facilities in TEC's Demo Fale to provide assistance in coming up with updated load demand, technology choice and investment planning

Another EE demo that could be performed is testing a demand/response system at the 'Demo Fale' that has been built near the TEC headquarters and the facilities can be used for this purpose. The cost of such demo is limited to a consultant and to the cost for a single unit, which is estimated to be in the USD 20,000 - 30,000.

#### Estimated Costs of RE and EE Demos

Table L.2 shows the costs of all the RE and EE demos proposed as well as the total cost.

**Table L.2: Estimated Costs of the RE and EE Demos**

Technology	Size	Cost (US\$)
<b>RE</b>		
Floating 100KWe Solar PV	100 kWe	600,000

<b>Power-Box</b>	1 Unit	50,000
<b>EE</b>		
<b>Fund</b>		500,000
<b>Demand/Response</b>	1 at Demo Fale	30,000
<b>Total</b>		<b>1,180,000</b>

Although it is not an activity that falls under the RE or EE demos, during the implementation stage, improved training for technicians in Funafuti and especially in the Outer Islands should be included, as well as better maintenance of the existing and future installations, which is to be covered by Component 1, Output 1.3.



## Annex M: Additional Background Details on Gender Assessment

### Policy basis

In line with gender assessment as required in GEF project development, the PPG Team has referred to the 2013 Tuvalu National Gender Policy (NGP 2013, which is the latest in a series of efforts that started in 1999). The NGP 2013 includes the Strategic Action Plan 2014-2016<sup>24</sup> that focuses on four key policy measures: Institutional strengthening and capacity building, Women's economic empowerment, Women in decision-making and Ending violence against women as a result of the stock taking and analysis in 2013. This policy instrument provides the guiding framework for multi-sectoral engagement and partnerships towards the overarching goal of gender equality and empowerment of women. For the project, women's participation in the application of RE/EE technologies will be tapped in community-based projects.

The Department of Gender Affairs (formerly the Department of Women) will continue the implementation of NGP in the five years to 2020. Outputs foreseen include the training of gender trainers; setting up a Gender Information Database (GID); implementation and legal enforcement of the Family Protection and Domestic Violence Act; and increasing efforts to include more women in decision-making roles, both in national and local government institutions. The DGA will pursue amending the Falekaupule Act to emphasize woman's affairs in local government, and enshrine more political participation of women at the national level by having a special allocation of two extra seats in Parliament under Temporary Special Measures.

In 2012, fewer women were in wage employment than men, 51% to 68%, respectively (Census, 2012, based on labor force participation rates), though the gap has closed significantly since 1994. On Funafuti, the gap is narrower 60% (female) to 73% (male), but work remains to close the gap further.

The NGP included as one of its key policy objectives, 'To promote gender equity and to expand the role of women in development' and identified the following key issues for women:

- Burden of traditional chores;
- Lack of proper marketplaces to sell products including handicrafts;
- Need to improve representation of women in community decision-making; and
- Need to revise laws governing the distribution of lands and unfair custodial rights.

The government also identified the need to:

- Integrate the role of women and the issue of gender and development in implementing Te Kakeega II (TK II) strategies; and
- Provide women with small business and entrepreneurial training and access to appropriate credit facilities.

Tuvalu has also acceded to regional and international conventions guaranteeing women's rights and human rights and is party to the many gender-related agreements.

The 2015 estimate of the *population* of Tuvalu is 10,869 with a total population ratio of 0.97 male/female or nearly 50/50 distribution.

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<sup>24</sup> Tuvalu National Gender Policy (2014-2016) and Stock Take of the Gender Mainstreaming Capacity of Pacific Island Governments – Tuvalu by the Secretariat of the Pacific Community (2013).

## Indicator of Gender Mainstreaming in the Project Objective

Among the primary outcome indicators at the project objective level is on women participation and involvement, i.e.:

*“No. of women actively involved in the planning and implementation of energy services provision in the outer islands”*

FASNETT through the ED/MPUI will recommend the most applicable and practical financing models and coordinate with Development Bank of Tuvalu for possible adoption and facilitate the development and establishment of a financing program by the Government of Tuvalu and the private sector which will be augmented by the incremental grant funds for rebate incentives in acquisition of EE appliances and provision of advisory services. The project will build upon existing financing models by the DBT and recommend enhancement possibilities, integration and capacity building in which women’s participation is important.

### Specific areas of women participation

During the FASNETT LFA workshop, the capacity of the women, particularly the mothers of the family, has been pointed to be generally weak in dealing with financial matters in terms of interest, understanding and participation in even in simple banking, loan arrangements and saving for payment of the loans. And they are most likely to influence the decision on acquiring and using RE- and EE-based applications in the household. As can be seen in the project design, for instance, the project will be involved in designing and implementing a financing mechanism for households shift to more efficient models of the two most common appliances, i.e. refrigerators and freezers. This will be offered as incentives to be provided for the replacement of old, obsolete and inefficient refrigerators and freezers (which can be expanded later to cover other household and commercial appliances, equipment and other electricity-consuming devices) in the form of rebates and incentives that, aside from paying for their basic utility value, the incremental cost can be recovered most likely out of the energy cost savings from the use of such EE appliance/devices. Because of this, the project includes information drive and orientation programs for women in addition to other target user groups, who aside from being recipients of information can also be trained to be providers of information.

### Project Activities and Gender Consideration in Women Participation

The project offers many opportunities to women for their participation and direct involvement in the project activities as described below:

Activities	Description	Gender Considerations	Participation	Responsibility
1.2: Conduct of capacity needs assessment in RE/EE technology applications for key stakeholder groups	Capacity needs assessment in the area of EE/RE applications	The needs of women as a stakeholder group will be considered particularly in their role in the appreciation, acquisition and financing of RE/EE devices and appliances	√	√
1.3.1: Design, organization and conduct of suitable capacity development program on the provision of energy services for RE/EE systems.	Attendance and participation in training and orientation activities	Women will be among the invited participants in the training courses	√	

Activities	Description	Gender Considerations	Participation	Responsibility
1.4: Evaluation of implemented capacity building programs establishing the resulting level of decision making capability within the government and stakeholders on RE/EE	Application of knowledge gained in capacity building programs	Women will be among the respondents to the evaluation of the capacity building programs regarding how they apply the knowledge gained	√	
1.5.2: Updating of information on EE & RE technology applications in island communities and results of project activities particularly from the EE/RE technology and commercial application pilots and demonstrations and of information on household survey on usage of EE appliances and devices	Information dissemination on RE/EE technology applications	Women will be included among the stakeholder groups	√	
1.5.4: Conduct of public awareness workshops and radio programs on RE/EE	Mass media information drive for RE/EE applications	Women will be trained as providers of information	√	√
2.5: Formulation and implementation of applicable policies, standards, institutional mechanisms and incentives in the promotion and application of RE/EE technologies	Development and implementation of RE/EE policies	Qualified and trained women can take active part in the policy making, planning and implementation in relevant areas	√	√
3.2.2.1: Formulation and implementation of a technology development and application program for RE/EE in government, community-based and private business projects for selected island communities.	Application program in community-based and own acquisition of RE/EE-based appliances and devices	Women who have relevant background and training can be involved in technical activities and support services in RE/EE applications	√	√
4.1.1: Preparation of design and development of feasible inclusive financing models and schemes to facilitate financing of EE and RE projects	Design and development of feasible inclusive financing models and schemes to facilitate financing of EE and RE projects	Participation and involvement for women and youth sectors in the outer islands of the country in the acquisition and use of RE- and EE- based appliances or devices through the inclusive* approach	√	√
4.2.2: Implementation of EE and RE technologies application projects financed either through the established financing scheme; or by private sector investments.	RE and EE technologies application projects financed either through the established financing scheme or by private sector investments	Carrying out of assistance and support work for encouraging women in owning or operating climate-resilient livelihood or businesses that are powered by RE-based power generation units.	√	√

\**Inclusive* means including participation and equitable opportunities and benefits for every sector of society particularly women and youth sectors in the outer islands of the country providing direct links between the macroeconomic and microeconomic determinants of economic growth.

## **Women as Stakeholder Group**

In order to ensure gender mainstreaming in the project activities and results, the project has involved Department of Gender, Tuvalu National Council of Women among its stakeholders to provide advice on the gender-sensitive implementation of capacity development activities of the project, including the involvement of women in the implementation of demonstration activities and sustainable RE-based livelihood and energy conservation.

The proposed project presents opportunities for the involvement of women working in both management and technical departments of the Tuvaluan Government agencies/institutions who can play important roles in the design, development and implementation of the proposed UNDP-GEF project. Potential opportunities to further assess and enhance the role of women in deployment of low carbon technologies and mitigation options, and come up with gender-sensitive policies in the energy sector and the energy end-use sectors of the country will be done, recognizing the possible contributions of women in the management and implementation of climate change mitigation measures, for example, their participation in projects that will promote or enhance women-owned and women-operated businesses that will make use of RE-based energy, or energy efficient appliances. Furthermore, the implementation of the project will also take into account, whenever possible, the contributions, impacts and benefits of community-based EE and RE technology applications, including children and indigenous people.

## **Next Steps**

During the project inception, updates on relevant gender mainstreaming policy and guidelines will be introduced and shall be incorporated in the action plans and strategies for gender mainstreaming activities of the project that will commence with a baseline updating and target setting. In the inception workshop, the stakeholder representatives, including women, should be able to contribute more detailed ideas and suggestions on how to integrate the gender mainstreaming activities of the FASNETT project into the national gender mainstreaming agenda in pursuit of the overarching objectives towards common economic, social and environmental goals.

A gender assessment will be conducted at least once during project implementation to highlight the fact that renewable energy projects such as FASNETT are not only strictly related to technology, equipment and scientific measurement of GHG emission reductions but ultimately the purpose of the investments and activities under such projects are to have a positive impact on people's daily lives – in this case for people living in most isolated islands in Tuvalu. Given that the gendered division of labor and energy usage can vary significantly between men and women in any community, investigation of the gender impacts and implications of the FASNETT project, can help clarify how it can best contribute to tangible improvements in the lives of the Tuvaluan men and women involved. The gender-related considerations within the project activities as described in the above table and the one-time gender assessment shall be fully covered under the GEF funds and co-financing inputs as budgeted and planned.

## **Annex N: Additional Background Details on Knowledge Management Strategy**

### **KM context and design**

The Knowledge Management Strategy will address the barrier related to the low level of awareness and knowledge of the local authorities and the general public in Tuvalu both in the main island of Funafuti and in the outer islands about the concepts, principles and technologies and practices associated with low carbon development, which are essential in meeting the country's EE and RE targets. The expected outputs that will be delivered by the project will bring about improved awareness and attitude towards renewable energy and energy efficiency applications in the energy and energy end use sectors.

The knowledge management of FASNETT and its partners will highlight success stories that are well documented through the project activities. The project has included gathering and exchange of knowledge within Funafuti and the Outer Islands and also between FASNETT and related projects which endeavor to advance the feeling of common goals and objectives, of belongingness, enthusiasm, and drivenness that inspires the communities and their constituents to participate in the project activities to create the results and outputs. The KM system will also serve to bridge the communication gaps between the source and the recipient of the knowledge on RE/EE applications.

Knowledge gathering and dissemination is a major key for the success of the project through its components and activities. The facilitation and enabling of the application of RE and EE technologies/techniques and low carbon development to be done by the project will be accomplished through the removal of barriers associated with the low level of enforcement of policies, regulations and institutional mechanisms, limited capacity and knowledge about the application, design, financing and operation of RE and EE initiatives of both the public and private sectors of the country.

### **KM Strategy**

The project design therefore included activities to ensure that the necessary knowledge and information are disseminated and shared for decision making and achievement of project outputs and outcomes. Just like other projects that are being implemented in Tuvalu, the following are basically the common setbacks that need to be addressed and corresponding solutions put in place:

- a) Failure of the project to keep to its timelines;
- b) Failure to deliver all promised aspects of the project;
- c) Confusion or misunderstandings of what the project has promised to deliver;
- d) Confusion or misunderstandings of what kinds of engagement are expected or needed by the communities themselves, and who should be involved; and
- e) Failure to share materials or outputs from the project with the communities.

Therefore, a community engagement strategy should be developed and adopted for the Project. It should be noted that FASNETT is not the only project being implemented by UNDP and other financing institutions in Tuvalu. Hence, the community engagement approaches have to be synchronized and programmed very well in coordination with other projects being implemented in the same focal area of energy and any other focal areas since in most cases the same set of stakeholders are involved. There are also very important opportunities for synergy in the approach to avoid duplication of efforts and to improve the quality and ownership of the activities that are serving to attain the overarching objectives.

## **KM Challenges in Tuvalu's small and distributed communities in the Outer Islands**

1. Low-keyed perception by the communities regarding EE/RE technologies
2. Difficulty and irregularity of access and transportation
3. Inadequate communication infrastructure and facilities and related operating budgets
4. Limited information technology application through multi media

### **Basic KM Steps**

The basic steps in the strategy (and the project activities where these KM steps are subsumed) include the following:

1. Inventory RE/EE projects and information available and other base line information especially linked to the key project success indicators listed in the project log frame (Inception preparations; Activity 1.5.2; 1.5.3)

During the inception stage, an inventory of knowledge and a systematic base lining work should be accomplished. Existing databases should be identified and areas for improvement in line with the project requirements should be determined. These should be taken up at the Inception Meeting and recommendations should be taken up at the initial Project Steering Committee meeting. Specific activities for the inventory work are also included as project activities.

2. Policy dialogue, planning and coordination (Activity 2.1; 2.3.1; 2.3.2; 2.4.2; 2.5; 2.7)

Knowledge management in FASNETT will cut across all areas of program activity starting with policy and planning and coordination and collaboration when the plan is implemented. The project involves inter-related KM cycle activities i.e., planning, doing, learning and improving. It should support ED/MPUI and TEC in its regular functions in RE/EE thus invariably supporting their organizational and program objectives through capacity development and information management. A lot depends on the organization keep relevant information on experiences and lessons learned flowing to keep the KM cycle active and regular. The project should help all stakeholders make more informed decisions when the KM cycle is fully supported and amply resourced.

3. KM and communication framework and corresponding action plan developed and approved by the PSC (Activity 1.5.1; 1.5.2)

The basic messages that results from the project activities, outputs and reports should be captured and disseminated through a KM and Communication Plan that will be developed by the project with the assistance of consultants. This will be backed by available results of surveys done by other projects and the government and the additional studies commissioned by the project.

4. Collection of Knowledge (Activity 1.5.3)

The basic data to be collected shall be in line with the Project Log Frame and the timeframe for gathering, analysis and reporting shall follow the UNDP/GEF M&E plan. Partners at the island and community levels should have a common report format that is simple and to be accomplished at pre-determined regularity and from which information and knowledge can be derived for M&E purposes and can be made as publications for the project. The project can then organize regular trips to communities according to the agreements made with them and establish a simple system for collection of information and reports.

5. Managing knowledge assets and technical systems of the project and networking with other projects (Activity 1.6 and Activity 1.7)

This will include among others, development of a centralized data base system (Activity 1.7) that will be building upon existing databases of and administered by the ED/MPUI, TEC and other partner agencies and stakeholders.

Anyone can access the general collection according to the corresponding interests of the partners and other interested parties. Classified information will be internal use of the Project Management in decision making and M&E purposes.

Information networking (Activity 1.6) will be done by the project in cooperation with agencies and stakeholders that are operating in the RE/EE focus area or with other agencies and projects in the links or chain of supply and demand and technology application.

6. KM dissemination and training (Activity 1.1; 1.2; 1.3.1; 1.3.2; 1.5.4)

Based on the communication plan adopted by the project through the PSC review and approval, the knowledge gathered and processed into KM products and services can be disseminated through: a) Tri- Media information (pamphlets, printed info materials, audiovisual in the common language) and, b) Transfer of knowledge through training seminars and workshops, fairs, road-shows, competitions, web site hosting and other knowledge events. These activities will allow the community and individuals interested in RE/EE technologies to gain vital knowledge with the assistance of experts for effective transfer the packaged knowledge to the communities and individuals using appropriate and effective transfer of knowledge methods and techniques. All reports, pamphlets and simplified info materials such as comics illustrations, produced under the project will be disseminated by the project team to communities as soon as they were available.

7. Monitoring and evaluation of the KM activities and results (Activity 1.4; 1.7)

The project will develop a system for monitoring and evaluation for knowledge capturing, effectiveness of KM access, sharing and application regarding RE/EE technology application towards the ultimate measures of the desired energy savings and CO<sub>2</sub> reduction objectives consistent with the project log frame and target values and APR/PIR reporting. It will involve measurement of achievement levels with the corresponding data and analysis and use the results in calibrating the KM strategy to keep track of the progress of implementation of knowledge management activities.

These KM steps are built-in and imbedded in the various activities in the relevant Project components and outputs. Thus, it is very important that the KM strategy for FASNETT project be integrated towards a coherent and relevant KM strategy in order to produce the expected project outcomes. As can be seen in the above activities where the KM-related activities are included, these are fully covered by the GEF funds and co-financing inputs to produce what are the actual main outputs of the project also.

### Annex O: Annual Targets

	Objective and Outcome Indicators	Baseline	Year 1	Year 2 (Mid-term)	Year 3	Year 4
<b>Project Objective:</b> Facilitation of the development and utilization of feasible renewable energy resources and application of energy efficiency technologies in Tuvalu for achieving realistic energy targets in Tuvalu	% share of RE in the national power generation mix	26%	32%	44%	57%	67%
	Cumulative GHG (CO <sub>2</sub> ) emission reduction from power generation, tons CO <sub>2</sub>	<i>nil</i>	2,058	5,000	8,770	15,000
	No. of women actively involved in the planning and implementation of energy services provision in the outer islands	0	3	5	8	10
<b>Outcome 1</b> Improved awareness and attitude towards sustainable RE & EE technology applications in the public, commercial and energy sectors	No. of communities that are capable of organizing, planning, designing, implementing, operating and maintaining RE-based power generation systems.	0	1	2	3	4
	No. of household, schools, public buildings and commercial establishments that are using low carbon technologies ( by RE- and EE-based energy systems	396	400	400	405	410
<b>Outcome 2</b> <b>Coherent and integrated implementation of enhanced policies, regulations and projects on energy development and utilization with the country's energy act in support of national economic development</b>	No. of planned RE & EE projects benefiting from the policies and regulations supported by the Energy Act	0		50	75	100
<b>Outcome 3</b> <b>3.1 Enhanced energy utilization efficiency and development and application of feasible renewable energy resources in support of national economic development</b>	No. of companies adopting the established standards in supplying or producing RE/EE system equipment or component parts	0		1	2	2
	% users of RE/EE system equipment and component parts that are satisfied with the quality, cost and operating performance of these items	0		25%	50%	80%
<b>3.2 Increased application of viable climate resilient renewable energy and energy efficiency technology applications in the country</b>	Increased no. of low carbon technology projects (new, or replication, or scale-up)	16	19	20	23	26
<b>Outcome 4</b>	No. of established and operational financing schemes for RE/EE projects	0	0	1	1	2



	<b>Objective and Outcome Indicators</b>	<b>Baseline</b>	<b>Year 1</b>	<b>Year 2 (Mid-term)</b>	<b>Year 3</b>	<b>Year 4</b>
<b>4.1: Improved availability of, and access to, financing for climate resilient renewable energy and energy efficiency</b>						
	No. of private sector RE/EE projects financed by commercial banks and/or by the private sector	<i>0</i>	<i>1</i>	<i>1</i>	<i>2</i>	<i>2</i>
<b>4.2: GoT, the financial sector and donor agencies providing accessible financing for climate resilient renewable energy and energy efficiency projects</b>	Increase in government budget for low carbon technology -based power generation projects, US\$	<i>0</i>	<i>100,000</i>	<i>200,000</i>	<i>300,000</i>	<i>400,000</i>