Country	Solomon Islands
Request ID#	2017000039
Title	Solomon Water- Energy Efficiency and Self-Generation Plan
NDE	Name: Mr Hudson Kauhiona Position: Director of Climate Change (Acting) Organization: Ministry of Environment, Climate Change, Disaster Management and Meteorology Email: hkhiona@gmail.com Address: P O Box 21, Honiara, Solomon Islands
Proponent	Name: Mr Ian Gooden Position: General Manager Organization: Solomon Islands Water Authority Email: IGooden@solomonwater.com.sb Address: P O Box 1407, Honiara, Solomon Islands

Summary of the CTCN technical assistance

The Solomon Islands Water Authority (SW) is the responsible organisation to provide and ensure water supply and waste water treatment services in Solomon Islands. At present, it provides water supply to four islands namely Honiara, Auki, Noro and Tulagi; and waste water treatment in Honiara. The energy cost is one of the most important considerations in the overall operations of Solomon Water. Further, Solomon Water is mainly dependant on fossil fuels for generation of energy to run its water pumping facilities. With increasing energy costs and the pressure to expand its services, Solomon Water is looking for sustainable energy solutions, which would help in reducing its energy cost while also contributing to greenhouse gas (GHG) reduction targets.

A significant share of energy cost is accounted by the pumping stations, which are used to supply water to end-users in four islands, and waste water pumping stations. Solomon Water has plan to expand its operation to serve larger population in future which includes the widening of the supply to cover the currently un-serviced population and increase of population in urban areas due to internal migration in Solomon Islands as indicated in their 5-year action plan. The current demand has already exceeded the current water production capacity of SW by 8 Million litres per day and the gap is expected to increase leading to 50 Million litres per day in 2040.[1] In the Business as usual scenario, the gap will be bridged by increasing the pumping facilities and water network which will be powered by conventional fuel. In the absence of the EE measures and SGOs (Self generating options of renewable energy) through renewable sources, the project will consume more energy and produce GHG emissions. Besides an increase in energy cost would lead to increased operating cost, resulting in increased cost of water supply to end-users, which may not be sustainable in a long-term. It is therefore, important for SW to reduce its operating costs and GHG footprint by exploring suitable and sustainable options. There are two distinct options, which would suit the requirements of SW:

(1) Improving 'energy efficiency' (EE) through adoption of energy efficient technologies e.g. replacement with energy efficient pumps and energy conservation measures, and

(2) Exploring and implementing 'self-generation options' (SGO) such as solar photovoltaic (SPV)

[1] World Bank Project Note on Urban Water Supply and Sanitation Sector project in Solomon Islands (P165872)

CTCN
CLIMATE TECHNOLOGY CENTRE & NETWORK

Technical Assistance Response Plan – Terms of Reference

The proposed CTCN Assistance would help Solomon Waters in undertaking the following activities: (1) Conducting detailed energy audits for identifying options for energy efficiency; (2) Assessing SGO options, mainly SPVs for off-setting energy generation through fossil fuels (or reducing the reliance on fossil fuels) and any other energy generation options, if applicable;
and efficient operation and monitoring of the energy efficiency measures and renewable energy projects implemented by being benefited from the on job training modules and operational manuals prepared under the TA.
The Assistance would support Solomon Water in selection, procurement, implementation and operation of the EE measures and SGO through preparation of their feasibility reports covering the technical design specifications and economic analysis, the on-job training modules and operational manual respectively.
The Technical Assistance will enable Solomon Water to implement the projects to cater the current as well as the future energy requirements with renewable sources pertaining to their expansion plans. Since the renewable energy penetration (1% of the total energy generation in 2016[2]) and adoption of the energy efficiency measures are low in the country, it can be said that this project will be one of the first of its kind where an energy intensive utility will be reducing the reliance on fossil fuel leading to the reduction of GHG emission and contributing to country's targets under National Energy Policy and INDC. This utility-based model project can be replicated by other state-owned enterprises and commercial setups in Solomon Islands and in other countries in the region.
The assistance will not only lead to substantial savings on energy cost to foster reinvestment in the water services but also complement the ongoing donor support for Solomon Water to increase the access to safe drinking water, improve sanitation and waste water treatment services.

Agreement:

National Designated Entity to the UNFCCC Technology Mechanism

Ministry of Environment, Climate Change, Disaster Management and Meteorology
Name: Mr Hudson Kauhiona
Title: Director of Climate Change (acting)
Date: 15/11/18
Signature:

Proponent (signature of the Proponent is optional)

Solomon Islands Water Authority
Name: Ian Gooden
Title: General Manager
Date: 15-11-18
Signature:

UNFCCC Climate Technology Centre and Network (CTCN)

Name: Jukka Uosukainen
Title: CTCN Director
Date: 31/10/2018
Signature:

[2] Pacific Energy Update 2018 by Asian Development Bank

1. Background and context

Background

Solomon Islands comprise hundreds of islands; of these, the main islands include Honiara (capital of Solomon Islands) and provincial urban centres of Auki, Noro and Tulagi. Solomon Islands Water Authority (SW), a state-owned enterprise, is mandated to operate as the provider of municipal water and waste water services in Solomon Islands under the SIWA Act and State-Owned Enterprise Act. SW supplies and manages water only in these four main islands. It provides water services to an estimated population of about 100,000 in Honiara which is expected to surpass 300,000 within next 30 years due to internal migrations and over 8000 in the provincial centres. The municipal waste water services are provided to about 30,000 people in Honiara only. The water pumping facilities of SW comprises the following: (1) Borehole pumps (in Honiara and Auki), (2) Raw water supply and pumping stations (in all the four islands) and (3) Waste water collection facilities (in Honiara only).

Context

About 95% of total installed capacity of energy generation in Solomon Islands is based on fossil fuels, and the balance 5% is through renewable energy sources. (*source: https://www.worlddata.info/oceania/solomon-islands/energy-consumption.php*). The energy tariff of Solomon Islands is one of the highest[3] in the Pacific, since a major share of energy in the Islands is met through fossil fuels. Solomon Water is using diesel-based generators to meet its energy requirements in its various facilities. Moreover, most of the equipment and system installed in various facilities of SW have not incorporated energy efficiency options.

Thus, installing energy efficient equipment as well as shifting from fossil fuel based energy generation to self generation options using renewable energy sources (e.g. Solar Photovoltaic (SPV) or other options of generating renewable energy that are available and suitable for the operational requirements of the Solomon Water would help in providing water services at competitive rates, while at the same time helping the Island in reducing overall GHG emissions.

2. Problem statement

Energy from sustainable sources and optimization of energy consumption is the key challenge for Solomon Water. In 2013-2014, the expenses towards energy consumption were more than 35% of the total operational expenses of Solomon Water. The total energy consumption of SW (majorly for pump operation), calculated from the share of operational cost and energy cost per unit is almost 10% of the total energy consumption of Solomon Islands. The energy consumption is further expected to increase to cater the projected escalations in demand pertaining to the increasing population and to reach out to the un-serviced population. With the business as usual scenario the energy requirements of the islands, as well as Solomon Water, will be mainly met through fossil fuels, which forms a significant impact on the operating cost and GHG footprint in Solomon Islands. The increase in fuel costs would directly impact the operating costs of various water supply facilities of SW, which in turn would put upward pressure on price charged to consumers for supplying clean water and waste water treatment services, thus impacting the expansion plans of its services. Further, low importance is provided in selection of equipment related to water services, which in turn influences efficiency of the services and increases the operating cost Therefore, it is vital for Solomon Water to explore

[3] https://www.adb.org/sites/default/files/linked-documents/46014-002-ssa.pdf

sustainable energy solutions that would help in reducing energy consumption in various pumping installations of Solomon Water and generation of energy from renewable sources in the islands while contributing to national GHG emission reduction targets.

3. **Logical Framework for the CTCN Technical Assistance:**

	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
Objective: To facilitate adoption of sustainable and viable energy efficiency (EE) and on-site renewable self-generation options (SGO) in Solomon Islands Water Authority												
Outcome: EE and renewable energy technology options which are techno-economic feasibility study in place with the Solomon Islands Water Authority for decision making process												
Output 1: Development of implementation planning and communication documents												
Activity 1: (i) A work plan detailing stepwise activities, respective deliverables, outputs, timelines and responsible persons/organisations and detailed budget to implement the Response Plan, meeting the requirements of the Response Plan. (ii) Monitoring and evaluation plan with specific, measurable, achievable, relevant, and time-bound indicators used for timeliness and appropriateness of the implementation. The plan should apply selected indicators from the Closure and Data Collection report template and enable the lead implementer to complete the CTCN Closure and Data collection report at the end of the assignment (refer to item iv below and section 14 in the Response Plan) (iii) A two-page CTCN Impact Description formulated in the beginning of the technical assistance and update/revised once the technical assistance is fully delivered based on the template provided by CTCN. The template will be provided by CTCN. (iv) A Closure and Data Collection report completed at the end of the technical assistance as indicated to be completed and delivered in 12th month in timeline. The template will be provided by CTCN in the beginning of the activity. (v) Need based technical backup support, as and when required during the TA to Solomon Water in selection of EE and RE equipment and system for the pumping stations												
Deliverable 1: ***D 1.1. Detailed work plan;*** ***D 1.2. Monitoring and evaluation plan;*** ***D 1.3. CTCN Impact Description;*** ***D 1.4. Closure and Data Collection template and report; and*** ***D 1.5. Summary of technical support (backstopping) provided during CTCN TA, if any.***												

	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
Objective: To facilitate adoption of sustainable and viable energy efficiency (EE) and on-site renewable self-generation options (SGO) in Solomon Islands Water Authority												
Outcome: EE and renewable energy technology options which are techno-economic feasibility study in place with the Solomon Islands Water Authority for decision making process												
Output 2: Assessment of energy efficiency and renewable energy options												
Activity 2.1: Collection of historical data (at least for three normal years) on the energy usages vis-à-vis water services, understanding system configurations focussing on the energy consumption points and information from selected pumping stations as discussed and agreed with Solomon Islands and CTCN.												
Activity 2.2: Conducting energy audit of pumping stations and any other relevant energy consumption points, if found from 2.1 and assessing demand management options												
Activity 2.3: Broad assessment of the feasibility of various energy efficiency and renewable energy (SGO) options for selected pumping stations/ any other energy intensive points identified in 2.1 and 2.2. The assessment will also project the energy requirement pertaining to the expansion projected in coming five years for SW[4].												
Activity 2.4: Meeting with key stakeholders to verify data and findings												
Activity 2.5: Presentation of key findings to Solomon Water and other stakeholders												
Deliverable 2: ***D 2.1. Presentation to Solomon Water and other stakeholders on the key findings; and*** ***D 2.2. Report on the list of EE and renewable energy (SGO) options identified with potential energy savings and GHG reductions detailing the underlying data collected, energy audit and assessment conducted for EE and RE options. The report should also incorporate the feedback received from D.2.1***												
Output 3: Shortlist and conduct detail assessments of EE and SGO options for Solomon Water												
Activity 3.1: Detailed feasibility report on short-listed EE and RE (SGO) options												
Activity 3.2: Report on funding requirements and financing options												
Activity 3.3: Preparation of tender documents for EE and RE options												
Deliverable 3: ***D 3.1. A detailed feasibility report with technical and financial analysis and funding options of EE and renewable energy options recommended for Solomon Water; and*** ***D 3.2. Tender documents for EE and renewable energy options***												

[4] As per the 5-year action plan of SW, a desalination plant will be installed to support the water services which will also have operational energy requirements.

	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
Objective: To facilitate adoption of sustainable and viable energy efficiency (EE) and on-site renewable self-generation options (SGO) in Solomon Islands Water Authority												
Outcome: EE and renewable energy technology options which are techno-economic feasibility study in place with the Solomon Islands Water Authority for decision making process												
Output 4: Facilitate capacity building through on-job training of Solomon Waters on the EE and RE measures implemented												
Activity 4.1: Development of training modules to facilitate the training and exchange of information and monitoring & evaluation templates to capture data for performance assessment												
Activity 4.2: Operational Manuals for EE and RE maintenance and templates of transaction documents to cater to the expansion needs of SW												
Activity 4.3: Gender Considerations												
Activity 4.4: Monitoring and evaluation												
Deliverable 4: ***4.1. Training modules;*** ***4.2. Operational Manuals and*** ***4.3. Monitoring and evaluation of Impacts and Outcomes including a report on gender co-benefits***												

4. **Resources required and itemized budget:**

The total estimated resources towards implementing the CTCN assistance for implementing sustainable energy options in Solomon Islands Water Authority is USD 98,700 (minimum) to USD 134,975 (maximum). The activity-wise detailed break-up of the budget in USD is provided below.

Activities and Outputs	**Input: Human Resources**	**Input: Travel**	**Inputs: Meetings/events**	**Input: Equipment/Material**	**Estimated cost**	
					Minimum	**Maximum**
Output 1: Development of implementation planning and	***9,100-12,250***	-	-	-		

Activities and Outputs	Input: Human Resources	Input: Travel	Inputs: Meetings/events	Input: Equipment/Material	Estimated cost	
					Minimum	Maximum
communication documents						
Activity 1.1: Formulation of i) Detailed work plan, ii) Monitoring and evaluation plan, iii) CTCN Impact Description, iv) Closure and Data Collection report.	*9,100-12,250* EE-Expert and RE-Experts (1 SPV), Finalizing planning and communication document (5 days); Additional 2 days for providing technical support to Solomon Water in equipment/ technology selection, etc.	-	-	-	*9,100*	*12,250-*
Sub-total Output 1					*9,100*	*12,250*
Output 2: Assessment of energy efficiency and renewable energy options	***29,800- 42,225*** *(EE-Expert & RE-Experts* (1 SPV)					
Activity 2.1: Collection of historical data, understanding system configurations and information from	*1,650-2,100* *EE-Expert: Field visit for data collection of different pumping stations/ energy*	*350* *Local transport*	-	-	*1,650*	*2,100*

Activities and Outputs	Input: Human Resources	Input: Travel	Inputs: Meetings/events	Input: Equipment/Material	Estimated cost	
					Minimum	Maximum
selected pumping stations	*intensive points (2 days)*					
Activity 2.2: Conducting energy audit of selected pumping stations/ *energy intensive points* (refer **annexure 1**)	*6,500-8,750 EE-Expert: Measurement and analysis of operating data of pumps located/ energy intensive points (10 days)*	-	-	-	*6,500*	*8,750*
Activity 2.3: Assessment of SGO (SPV/ SPV with battery/ other renewable energy generating options, if any) option for selected pumping stations and assessing demand management options (refer **annexure 1**)	*3,250-4,375 RE-Experts: Assessment of* SGO (SPV/ SPV with battery/ other renewable energy generating options, if any) *(5 days)*	-	-	-	*3,250*	*4,375*
Activity 2.4: Meeting with stakeholders	*12,800-18,500 EE-Expert, RE-Expert and Gender Expert: To take into account the views of key stakeholders (6 days)*	*2,500 – 4,000 Travel for Experts*	*2,500 – 4,000 Local travel for participants and meeting costs*	--	*12,800*	*18,500*

Activities and Outputs	Input: Human Resources	Input: Travel	Inputs: Meetings/events	Input: Equipment/Material	Estimated cost	
					Minimum	Maximum
Activity 2.5: Presentation of key findings to Solomon Water	*2,600-3,500 EE-Expert & RE-Expert: Presenting preliminary observations and findings to Solomon Water (2 days)*	*1,500 – 2,500 Travel for Experts*	*1,500-2,500 Local travel for participants and meeting costs*	-	*5,600*	*8,500*
Sub-total Output 2					***29,800***	*42,225*
Output 3: Details of EE-SGO options for Solomon Water pumping facilities	***31,200-42,000*** *EE-Expert & RE-Expert*	-	-	-		
Activity 3.1: Detailed feasibility report on EE and RE options	*19,500-26,250 EE-Expert: Detailed feasibility report on EE options of audited pumping stations and potential RE (SGO) options for SW facilities in three islands (Auki, Noro and Tulagi) (15 days)*	-	-	-	*19,500*	*26,250*
Activity 3.2: Report on funding	*6,500-8,750 EE-Expert & RE-Expert: To assess and*	-	-	-	*6,500*	*8,750*

Activities and Outputs	Input: Human Resources	Input: Travel	Inputs: Meetings/events	Input: Equipment/Material	Estimated cost	
					Minimum	Maximum
requirements and financing options	*prepare a report on funding requirements and financing options for implementation of EE and RE (SGO)options (5 days)*					
Activity 3.3: Preparation of tender documents for EE and RE options	*5,200-7,000 EE-Expert & RE-Expert: Preparation tender documents on technical specifications for identified EE-RE options (4 days)*	-	-	-	*5,200*	*7,000*
Sub-total Output 3					***31,200***	***42,000***
Output 4: Capacity building and on job training of SW	***28,600-38,500***					
Activity 4.1: Development of training modules to facilitate the training and exchange of information for the operators of EE and RE measures.	*13,000-17,500 EE-Expert & RE-Expert: Draft a complete module of training on the technical and operational aspects with case studies,*				*13,000*	*17,500*

Activities and Outputs	Input: Human Resources	Input: Travel	Inputs: Meetings/events	Input: Equipment/Material	Estimated cost	
					Minimum	Maximum
Develop monitoring & evaluation templates to capture data for performance assessment	*examples and toolkits including a session on monitoring and evaluation to facilitate the performance assessment (10 days)*					
Activity 4.2: Operational Manuals and templates of transaction documents to cater the expansion needs of SW	*13,000-17,500 EE-Expert & RE-Expert: Develop handy and user friendly operational manuals that can be referred by the operator (10 days)*				*13,000*	*17,500*
4.3 Gender consideration	*1,300-1750 Gender expert: Assessment of impact of EE and SE actions on women's access to water (2 days)*	-	-	-	*1,300*	*1,750*
4.4 Monitoring & evaluation	*1,300-1750 (2 days)*	-	-	-	*1,300*	*1,750*
Sub-total Outcome 4					***28,600***	***38,500***
Estimated range of costing for the entire Response Plan					***98,700***	***134,975***

5. Profile and experience of experts

Experts required	Brief description of required profile
Energy efficiency expert	The Energy Efficiency Expert (Expert-EE) shall have the following expertise and experience: • He shall have an engineering qualification with at least 10 years work experience in energy efficiency related projects for water pumping installations. • Experts with mechanical/ electrical engineering academic qualifications • He shall have good analytical skills in assessing the performance of water pumping systems, associated auxiliaries. • He shall have experience of implementing energy efficiency measures in the related field and good understanding of economics of the same. • He shall also possess suitable portable instruments such as power analyser, ultrasonic flow meter, etc. and must be able to handle the instruments in taking measurements suitable for the proposed study. • The EE Expert shall have proficiency in reading, writing and speaking English and must be able to communicate with stakeholders effectively.
Renewable energy expert	The Renewable Energy Experts shall have the following expertise and experience: • The Expert shall have an engineering qualification with at least 5 years work experience in renewable energy related projects. • Expert with mechanical/ electrical engineering academic qualifications. • He shall have good expertise in assessing of suitable locations for setting up RE facilities. • He shall have demonstrated experience of assessing solar photovoltaic based systems. Experience of standalone SPV with batteries will be added advantage. • They must be able to assess the potential for power generation using RE technologies and must be able to prepare techno-economic feasibility of identified options along with preliminary technical specifications. • The RE Expert shall have proficiency in reading, writing and speaking English and must be able to communicate with stakeholders effectively.
Gender Expert	The Gender Experts shall have the following expertise and experience:

Experts required	Brief description of required profile
	• Understanding of gender considerations with regards to access to water • The Gender Expert shall have proficiency in reading, writing and speaking English and must be able to communicate with stakeholders effectively.

6. Intended contribution to impact over time

Solomon Islands produced a total of 90 million kWh of energy and consumed about 83.7 million kWh during the year 2014. The total CO_2 emissions of Solomon Islands is 201,685 tonne (source: https://www.worlddata.info/oceania/solomon-islands/energy-consumption.php).

The imported fossil fuels accounted for a major share of energy generation and consequent GHG emissions. Solomon Water is one of the important end-users of energy in the Islands, providing water related services to over 100,000 people through various pumping sites. The current energy demand of Solomon Islands is about 10%[5] of the Solomon Island's total energy consumption. It is projected that the consumer base of Solomon Water will increase to 300,000 within next 30 years. With this projection Solomon Water's demand for energy is expected to double in 20 years which is currently 10% of the total energy consumption of Solomon Islands. So far, the Solomon Water has not implemented any EE/RE projects. The baseline GHG emission for energy consumption is estimated as 8000 tCO_2 which is likely to increase to 15000 tCO_2 within 30 years with the continuation of current baseline scenario of energy consumption from fossil fuel. The technical assistance of CTCN would help in identifying appropriate EE & RE solutions to reduce cost of providing services related to water supply. Pumps of most types and functions used in SW has large potential of reducing GHG emissions through energy savings by EE technology interventions and operational improvements. It is likely to save energy and reduce GHG emissions in the range of 5 to 15% based on the conditions of the pumps used at present by Solomon Water. On the top of it various SGOs to generate energy from renewable sources would help in significant reduction of GHG emissions being accounted by the Solomon Waters. The project will be a demonstration for State owned utilities to opt for renewable energy projects replacing the diesel based energy to meet their energy requirements.

The assistance will financially strengthen Solomon Islands through the savings made on the energy cost and foster reinvestment on the water services. It will enable the water services by Solomon Water at affordable cost, covering more than 300,000 people in Solomon Islands. On a broader landscape, the project will provide support with sustainable energy solutions to the larger investments by donors of about 58 million to Solomon Water to improve access and quality of water supply and sanitation services in Solomon Islands.

7. Relevance to NDCs and other national priorities

Solomon Islands is a Least Developed Country (LDC) and Small Island Developing State (SIDS). The country is a signatory to the Paris Accord and has submitted its 'Nationally Determined Contribution' (NDC) in September 2015. Solomon Islands has committed to reduce its GHG emissions by 12% below 2015 level by 2025 and 30% below 2015 level by 2030 compared to a business-as-usual projection. Solomon Islands' NDC makes a further commitment of 27% reduction of GHG emissions by 2025 and 45% reduction by 2030 compared to a business-as-usual projections, provided international assistance to access financial and technical resources are made available to the islands. The Ministry for Environment, Conservation and Meteorology further reaffirms its interests and commitment towards removal of barriers for the adoption of renewable energy technologies in Solomon Islands.

[5] Based on the data on energy consumption provided by SW from some pumping stations, expenses made on fuel and electricity and energy tariff, the amount of energy consumed by SW is estimated. The total current demand of energy is estimated based on the gap of current gap between production capacity and demand of water. Source for the water supply and demand gap in ML/day: World Bank project- Urban Water Supply and Sanitation Sector Project (P165872)

The National Climate Change Policy 2012-2017 of the Solomon Islands indicates policy intent by the government to develop Nationally Appropriate Mitigation Actions (NAMAs) to include RE and EE options. Further the county's National Development Strategy 2016-2035 confirms energy efficiency is an important issue of the Islands and reiterates the needs for the implementation of innovative, low-oversight solutions in renewable energy technologies.

Thus, Solomon Islands is committed to significant emission reductions and firmly believes EE and RE as a two-pronged approach leading towards a sustainable economy. The Solomon Water, being an important entity in the Islands and engaged in providing water in the main islands, it is important for them to achieve the set goals while providing water related services at affordable costs. The technical assistance by CTCN is expected to help in this direction.

8. Linkages to relevant parallel on-going activities:

There are no specific EE&RE projects either undertaken earlier or on-going with Solomon Water. However, there is a project at concept stage by World Bank with Solomon Water Urban Water Supply and Sanitation Sector project in Solomon Islands. The assistance will complement the project with sustainable energy solutions to meet the energy requirements for urban water supply and improved sanitation in Solomon Islands.
Also, there are a number of projects that are on-going or have been undertaken with Solomon Power, which is the sole entity to provide electricity supply to Solomon Islands. e.g. (1) World Bank's Solomon Islands Sustainable Energy Project (SISEP) and ADB's Provincial Renewable Energy Project (PREP) in Fiu River Hydropower project, (2) UAE/NZ funded 1 MW solar farm project, etc. The proposed CTCN focuses on potential RE options for Solomon Water (which is termed as 'self generation options' or SGOs) along with EE projects. The learnings and experience of Solomon Power can help in addressing local issues while implementing EE and RE projects in Solomon Water. The proposed project will also have linkages with Solomon Power in terms of assessing the supply aspects of energy to Solomon Water and contributing to better management/ balancing of demand-supply networks. The proposed project will support Solomon Water to implement the 5 year action plan (2017-2022) as a part of their 30 year Strategic Plan (2017-2047)

9. Anticipated follow up activities after this technical assistance is completed:

- The TA of CTCN would help Solomon Waters in identifying potential techno-economically viable RE and EE options that would help in reducing specific energy consumption (energy required to pump one unit of water), operating costs and GHG emissions.
- The TA would help Solomon Waters in decision making for selection of energy efficient equipment. For example, the expertise through the TA would help in incorporating energy efficiency in the procurement stage itself, while preparing tender for purchase of equipment procuring energy efficient equipment and system related to the water facilities.
- It would further help in building the internal technical capacities and understanding in selection of energy efficient equipment and systems.
- The TA will help the Solomon Waters in providing water related services in a sustainable way. It is further envisaged that it would help in expanding its water related services to a broad spectrum of people covering more islands in the long run.
- The experience, learning and capacity building of Solomon Water will further strengthen other organisations in undertaking similar activities.

10. Gender and co-benefits:

- There is inadequate water, sanitation and energy infrastructure in rural areas. Women in rural areas are extensively involved in collecting drinking water from communal standpipes or streams. In the long-term, The TA would help SW in extending water supply and covering more population that would help in reducing the stress on women in fetching water from distant locations.
- Clean water supply and proper sanitation will be in place reducing the health risks due to water borne diseases.
- The technical assistance would help in building local technical capacities on EE and RE technologies.
- Enhanced adoption of EE and RE measures would help in reducing the dependency on fossil fuels based energy generation and consequent GHG emissions to meet the Solomon Islands' commitments under NDC.

11. Main in-country stakeholders in implementation of the technical assistance activities:

In country stakeholder	Role in implementation of the technical assistance
Ministry of Environment, Climate Change, Disaster Management and Meteorology	NDE and overall coordinator
Solomon Islands Water Authority	Beneficiary; It would provide necessary logistic support and coordination for collection of data and information from its selected facilities to undertake the technical assistance.
Solomon Islands Electricity Authority	Important stakeholder supplying electricity in Solomon Islands. It will provide details on the supply side and help manage/balance demand-supply networks. It will also share its experience in SPV related areas with Solomon Water.
Ministry of Mines, Energy and Rural Electrification	The Ministry of Mines, Energy and Rural Electrification would share about on-going projects or planned programs in EE and RE areas in Solomon Islands

12. SDG Contributions:

Goal	Sustainable Development Goal	Direct contribution from CTCN TA (1 sentence for top 1-3 SDGs)
1	End poverty in all its forms everywhere	Not directly applicable
2	End hunger, achieve food security and improved nutrition, and promote sustainable agriculture	Not directly applicable
3	Ensure healthy lives and promote well-being for all at all ages	Not directly applicable
4	Ensure inclusive and equitable quality education and promote life-long learning opportunities for all	Not directly applicable
5	Achieve gender equality and empower all women and girls	Not directly applicable
6	Ensure availability and sustainable management of water and sanitation for all	Adoption of EE and RE options would help in enhancing competitiveness of Solomon Water to provide water related services at affordable prices. It would further help them in expanding its services and reaching out to more population in the country.

Goal	Sustainable Development Goal	Direct contribution from CTCN TA (1 sentence for top 1-3 SDGs)
7	Ensure access to affordable, reliable, sustainable, and modern energy for all (consider adding targets for 7)	Not directly applicable
	7.1 - By 2030, ensure universal access to affordable, reliable and modern energy services	Not directly applicable
	7.2 - By 2030, increase substantially the share of renewable energy in the global energy mix	Not directly applicable
	7.3 - By 2030, double the global rate of improvement in energy efficiency	Not directly applicable
	7.a - By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology	Not directly applicable
	7.b - By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support	Implementation of the TA would help Solomon Water in strengthening and expanding its water infrastructure among different locations in Solomon Islands. Adoption of EE and RE measures would be in line with the National Development Strategy 2016-2035 of Solomon Islands.
8	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	Not directly applicable
9	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	Not directly applicable
10	Reduce inequality within and among countries	Not directly applicable
11	Make cities and human settlements inclusive, safe, resilient and sustainable	Not directly applicable
12	Ensure sustainable consumption and production patterns	Not directly applicable
13	Take urgent action to combat climate change and its impacts	*All TAs should indicate relevance to Goal 13 and at least one target below (13.1 to 13.b).*
	13.1 - Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries	Not directly applicable
	13.2 - Integrate climate change measures into national policies, strategies and planning	The technical assistance would lead to initiation of steps by Solomon Waters, which is one of the major consumers of energy in the country, to take counter measures in terms of adoption of EE and RE technologies to reduce its dependency on energy through fossil fuels. The proposed action is in line with the Solomon Island's commitment to NDC to combat climate changes.
	13.3 - Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning	Not directly applicable
	13.a - Implement the commitment undertaken by developed-country parties to the United Nations Framework Convention on Climate Change to a goal of mobilizing jointly $100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalization as soon as possible	Not directly applicable
	13.b - Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities	Not directly applicable
14	Conserve and sustainably use the oceans, seas and marine resources for sustainable development	Not directly applicable
15	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	Not directly applicable
16	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels	Not directly applicable
17	Strengthen the means of implementation and revitalize the global partnership for sustainable development	Not directly applicable

13. Classification of technical assistance:

Please tick off the relevant boxes below	*Primary*	*Secondary*
☑ 1. Decision-making tools and/or information provision	☑	☐
☐ 2. Sectoral roadmaps and strategies	☐	☐
☐ 3. Recommendations for law, policy and regulations	☐	☐
☐ 4. Financing facilitation	☐	☐
☐ 5. Private sector engagement and market creation	☐	☐
☐ 6. Research and development of technologies	☐	☐
☑ 7. Feasibility of technology options	☑	☐
☐ 8. Piloting and deployment of technologies in local conditions	☐	☐
☑ 9. Technology identification and prioritisation	☑	☐

14. Monitoring and Evaluation process

Upon contracting of the implementing partners to implement this Response Plan, the lead implementer will produce a monitoring and evaluation plan for the technical assistance. The monitoring and evaluation plan must include specific, measurable, achievable, relevant, and time-bound indicators that will be used to monitor and evaluate the timeliness and appropriateness of the implementation. The CTCN Technology Manager responsible for the technical assistance will monitor the timeliness and appropriateness of the Response Plan implementation. Upon completion of all activities and outputs, evaluation forms will be completed by the (i) NDE about overall satisfaction level with the technical assistance service provided; (ii) the Lead Implementer about the knowledge and learning gained through delivery of technical assistance; and (iii) the CTCN Director about timeliness and appropriateness of the delivery of the activities and outputs.

Annexure 1

TOR for experts

A. Expert- Energy Efficiency

The following activities will be undertaken by the Expert- Energy Efficiency:

(1) The expert will undertake field visits to each selected sites to carry out energy audit of pumping systems and other energy intensive points.

(2) The expert will arrange her/his own instruments (power analyser, ultrasonic flow meter, etc.) for undertaking measurements of key operating parameters.

(3) The expert will collect historical data of selected facilities from SW such as energy consumption (monthly/yearly) for a period of 3 to 5 years based on availability, energy tariffs, actual/estimated water pumped from each facility, etc. He will study in detail the system configurations, including the stand-by and operating pumps, piping network and sewage system, as applicable.

(4) The performance of pumps in terms of efficiency and specific energy consumption (SEC) will be evaluated. This would include measurement of key operating parameters of the pumps such as water flow, head developed, power consumption and other relevant parameters.

(5) The expert will prepare 'detailed feasibility report' of identified EE options that would help in improving energy efficiency of pumping stations and reducing energy costs. The report shall further include details such as financial analysis of the EE options with energy savings, investment required and GHG reduction potential.

(6) The expert will prepare 'tender documents' for short-listed EE options that would support Solomon Water in the procurement of energy efficient equipment.

(7) SW would provide following support to the consultant during energy audits: (i) Providing the necessary details related to energy consumption of selected pumping stations, (ii) Providing existing technical specifications of pumps being studied, (iii) sharing related details such as pump capacities, number of pumps in operation & standby, (average) hours of operation, maintenance (planned and forced), outage, energy consumption, and (iv) making available a dedicated electrician during the study while undertaking measurements.

(8) The expert will undertake energy audits of pumping stations as provided in table 1.

Table 1. Locations for energy audits of pump stations

S No	Island	Name of pump station	Total number of pumps
1	Honiara	Titinge pump station	30 kW X 3 no.
2	Honiara	Skyline pump station	22 kW X 3 no.
3	Honiara	Tuvaruhu JICA pump station	37 kW X 2 no.
4	Honiara	Kongulai pump station	90 kW X 3 no.
5	Auki	Kwaibala pump station	11 kW X 2 no.

S No	Island	Name of pump station	Total number of pumps
6	Noro	Noro pump station	37 kW X 2 no.
7	Tulagi	Tulagi pump station	7.5 kW X 1 no.

B. Experts - Renewable Energy

The Experts- Renewable Energy will undertake study on feasibility for application of solar photovoltaic (SPV)/ SPV with battery in the following islands as provided in table 2. The expert will assess the space available on ground and on rooftop to install solar PV. The experts will a conduct a preliminary assessment of the feasibility of other RE technologies and potential to generate energy from other sources. The suggested RE technology should be suitable to support the operation of the pumping stations for example intermittent pumping operations may require the SPV plant either connected to grid or with battery storage options. The experts will prepare detailed feasibility report on RE based SGOs that include technical and financial analysis of power generation capacity, investment required, energy generation potential, GHG reduction potential, etc. He further prepare 'tender document' with technical specifications, which can be used as a guide document by the Solomon Waters towards procurement and installation of SPVs in different locations as identified in the TOR. The tender document should be prepared considering the expansion plan of SW e.g. as per the 5year action plan of SW, a desalination plant will be installed to support the water services which will also have operational energy requirements.

Table 2. Locations for feasibility study for application of SPVs

S No	Location
1	Auki island
2	Noro island
3	Tulagi island

C. Common for Expert-Energy Efficiency and Experts- Renewable Energy

The Expert-Energy Efficiency and Expert-Renewable Energy will make a detailed presentation of the activities planned in each of the selected facility and methodology proposed for energy audits. The experts will hold meetings and discussions with key personnel in SW and other key stakeholders, if any, as arranged by SW. The team will present preliminary findings to the Solomon Waters and other key stakeholders as decided by SW to take into their views and finalise the required documents.

Further, the team will prepare a report on overall funding requirements and financing options that would help Solomon water in taking up further activities pertaining to actual implementation of the EE and RE options in the coming years.

CTCN
CLIMATE TECHNOLOGY CENTRE & NETWORK

Technical Assistance Response Plan – Terms of Reference

Country	**Solomon Islands**
Request ID#	2017000039
Title	Solomon Water- Energy Efficiency and Self-Generation Plan
NDE	Name: Mr Hudson Kauhiona Position: Director of Climate Change (Acting) Organization: Ministry of Environment, Climate Change, Disaster Management and Meteorology Email: hkhiona@gmail.com Address: P O Box 21, Honiara, Solomon Islands
Proponent	Name: Mr Ian Gooden Position: General Manager Organization: Solomon Islands Water Authority Email: IGooden@solomonwater.com.sb Address: P O Box 1407, Honiara, Solomon Islands

Summary of the CTCN technical assistance

The Solomon Islands Water Authority (SW) is the responsible organisation to provide and ensure water supply and waste water treatment services in Solomon Islands. At present, it provides water supply to four islands namely Honiara, Auki, Noro and Tulagi; and waste water treatment in Honiara. The energy cost is one of the most important considerations in the overall operations of Solomon Water. Further, Solomon Water is mainly dependant on fossil fuels for generation of energy to run its water pumping facilities. With increasing energy costs and the pressure to expand its services, Solomon Water is looking for sustainable energy solutions, which would help in reducing its energy cost while also contributing to greenhouse gas (GHG) reduction targets.

A significant share of energy cost is accounted by the pumping stations, which are used to supply water to end-users in four islands, and waste water pumping stations. Solomon Water has plan to expand its operation to serve larger population in future which includes the widening of the supply to cover the currently un-serviced population and increase of population in urban areas due to internal migration in Solomon Islands as indicated in their 5-year action plan. The current demand has already exceeded the current water production capacity of SW by 8 Million litres per day and the gap is expected to increase leading to 50 Million litres per day in 2040.[1] In the Business as usual scenario, the gap will be bridged by increasing the pumping facilities and water network which will be powered by conventional fuel. In the absence of the EE measures and SGOs (Self generating options of renewable energy) through renewable sources, the project will consume more energy and produce GHG emissions. Besides an increase in energy cost would lead to increased operating cost, resulting in increased cost of water supply to end-users, which may not be sustainable in a long-term. It is therefore, important for SW to reduce its operating costs and GHG footprint by exploring suitable and sustainable options. There are two distinct options, which would suit the requirements of SW:

(1) Improving 'energy efficiency' (EE) through adoption of energy efficient technologies e.g. replacement with energy efficient pumps and energy conservation measures, and

(2) Exploring and implementing 'self-generation options' (SGO) such as solar photovoltaic (SPV)

[1] World Bank Project Note on Urban Water Supply and Sanitation Sector project in Solomon Islands (P165872)

The proposed CTCN Assistance would help Solomon Waters in undertaking the following activities: (1) Conducting detailed energy audits for identifying options for energy efficiency; (2) Assessing SGO options, mainly SPVs for off-setting energy generation through fossil fuels (or reducing the reliance on fossil fuels) and any other energy generation options, if applicable;
and efficient operation and monitoring of the energy efficiency measures and renewable energy projects implemented by being benefited from the on job training modules and operational manuals prepared under the TA.
The Assistance would support Solomon Water in selection, procurement, implementation and operation of the EE measures and SGO through preparation of their feasibility reports covering the technical design specifications and economic analysis, the on-job training modules and operational manual respectively.
The Technical Assistance will enable Solomon Water to implement the projects to cater the current as well as the future energy requirements with renewable sources pertaining to their expansion plans. Since the renewable energy penetration (1% of the total energy generation in 2016[2]) and adoption of the energy efficiency measures are low in the country, it can be said that this project will be one of the first of its kind where an energy intensive utility will be reducing the reliance on fossil fuel leading to the reduction of GHG emission and contributing to country's targets under National Energy Policy and INDC. This utility-based model project can be replicated by other state-owned enterprises and commercial setups in Solomon Islands and in other countries in the region.
The assistance will not only lead to substantial savings on energy cost to foster reinvestment in the water services but also complement the ongoing donor support for Solomon Water to increase the access to safe drinking water, improve sanitation and waste water treatment services.

Agreement:

National Designated Entity to the UNFCCC Technology Mechanism

Ministry of Environment, Climate Change, Disaster Management and Meteorology
Name: Mr Hudson Kauhiona
Title: Director of Climate Change (acting)
Date:
Signature:

Proponent (signature of the Proponent is optional)

Solomon Islands Water Authority
Name: Ian Gooden
Title: General Manager
Date:
Signature:

UNFCCC Climate Technology Centre and Network (CTCN)

Name: Jukka Uosukainen
Title: CTCN Director
Date: 31/10/2018
Signature:

[2] Pacific Energy Update 2018 by Asian Development Bank

1. Background and context

Background

Solomon Islands comprise hundreds of islands; of these, the main islands include Honiara (capital of Solomon Islands) and provincial urban centres of Auki, Noro and Tulagi. Solomon Islands Water Authority (SW), a state-owned enterprise, is mandated to operate as the provider of municipal water and waste water services in Solomon Islands under the SIWA Act and State-Owned Enterprise Act. SW supplies and manages water only in these four main islands. It provides water services to an estimated population of about 100,000 in Honiara which is expected to surpass 300,000 within next 30 years due to internal migrations and over 8000 in the provincial centres. The municipal waste water services are provided to about 30,000 people in Honiara only. The water pumping facilities of SW comprises the following: (1) Borehole pumps (in Honiara and Auki), (2) Raw water supply and pumping stations (in all the four islands) and (3) Waste water collection facilities (in Honiara only).

Context

About 95% of total installed capacity of energy generation in Solomon Islands is based on fossil fuels, and the balance 5% is through renewable energy sources. (*source: https://www.worlddata.info/oceania/solomon-islands/energy-consumption.php*). The energy tariff of Solomon Islands is one of the highest[1] in the Pacific, since a major share of energy in the Islands is met through fossil fuels. Solomon Water is using diesel-based generators to meet its energy requirements in its various facilities. Moreover, most of the equipment and system installed in various facilities of SW have not incorporated energy efficiency options.

Thus, installing energy efficient equipment as well as shifting from fossil fuel based energy generation to self generation options using renewable energy sources (e.g. Solar Photovoltaic (SPV) or other options of generating renewable energy that are available and suitable for the operational requirements of the Solomon Water would help in providing water services at competitive rates, while at the same time helping the Island in reducing overall GHG emissions.

2. Problem statement

Energy from sustainable sources and optimization of energy consumption is the key challenge for Solomon Water. In 2013-2014, the expenses towards energy consumption were more than 35% of the total operational expenses of Solomon Water. The total energy consumption of SW (majorly for pump operation), calculated from the share of operational cost and energy cost per unit is almost 10% of the total energy consumption of Solomon Islands. The energy consumption is further expected to increase to cater the projected escalations in demand pertaining to the increasing population and to reach out to the un-serviced population. With the business as usual scenario the energy requirements of the islands, as well as Solomon Water, will be mainly met through fossil fuels, which forms a significant impact on the operating cost and GHG footprint in Solomon Islands. The increase in fuel costs would directly impact the operating costs of various water supply facilities of SW, which in turn would put upward pressure on price charged to consumers for supplying clean water and waste water treatment services, thus impacting the expansion plans of its services. Further, low importance is provided in selection of equipment related to water services, which in turn influences efficiency of the services and increases the operating cost Therefore, it is vital for Solomon Water to explore

[1] https://www.adb.org/sites/default/files/linked-documents/46014-002-ssa.pdf

sustainable energy solutions that would help in reducing energy consumption in various pumping installations of Solomon Water and generation of energy from renewable sources in the islands while contributing to national GHG emission reduction targets.

3. **Logical Framework for the CTCN Technical Assistance:**

	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
Objective: To facilitate adoption of sustainable and viable energy efficiency (EE) and on-site renewable self-generation options (SGO) in Solomon Islands Water Authority												
Outcome: EE and renewable energy technology options which are techno-economic feasibility study in place with the Solomon Islands Water Authority for decision making process												
Output 1: Development of implementation planning and communication documents												
Activity 1: (i) A work plan detailing stepwise activities, respective deliverables, outputs, timelines and responsible persons/organisations and detailed budget to implement the Response Plan, meeting the requirements of the Response Plan. (ii) Monitoring and evaluation plan with specific, measurable, achievable, relevant, and time-bound indicators used for timeliness and appropriateness of the implementation. The plan should apply selected indicators from the Closure and Data Collection report template and enable the lead implementer to complete the CTCN Closure and Data collection report at the end of the assignment (refer to item iv below and section 14 in the Response Plan) (iii) A two-page CTCN Impact Description formulated in the beginning of the technical assistance and update/revised once the technical assistance is fully delivered based on the template provided by CTCN. The template will be provided by CTCN. (iv) A Closure and Data Collection report completed at the end of the technical assistance as indicated to be completed and delivered in 12th month in timeline. The template will be provided by CTCN in the beginning of the activity. (v) Need based technical backup support, as and when required during the TA to Solomon Water in selection of EE and RE equipment and system for the pumping stations												
Deliverable 1: ***D 1.1. Detailed work plan;*** ***D 1.2. Monitoring and evaluation plan;*** ***D 1.3. CTCN Impact Description;*** ***D 1.4. Closure and Data Collection template and report; and*** ***D 1.5. Summary of technical support (backstopping) provided during CTCN TA, if any.***												

	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
Objective: To facilitate adoption of sustainable and viable energy efficiency (EE) and on-site renewable self-generation options (SGO) in Solomon Islands Water Authority												
Outcome: EE and renewable energy technology options which are techno-economic feasibility study in place with the Solomon Islands Water Authority for decision making process												
Output 2: Assessment of energy efficiency and renewable energy options												
Activity 2.1: Collection of historical data (at least for three normal years) on the energy usages vis-à-vis water services, understanding system configurations focussing on the energy consumption points and information from selected pumping stations as discussed and agreed with Solomon Islands and CTCN.												
Activity 2.2: Conducting energy audit of pumping stations and any other relevant energy consumption points, if found from 2.1 and assessing demand management options												
Activity 2.3: Broad assessment of the feasibility of various energy efficiency and renewable energy (SGO) options for selected pumping stations/ any other energy intensive points identified in 2.1 and 2.2. The assessment will also project the energy requirement pertaining to the expansion projected in coming five years for SW[4].												
Activity 2.4: Meeting with key stakeholders to verify data and findings												
Activity 2.5: Presentation of key findings to Solomon Water and other stakeholders												
Deliverable 2: ***D 2.1. Presentation to Solomon Water and other stakeholders on the key findings; and*** ***D 2.2. Report on the list of EE and renewable energy (SGO) options identified with potential energy savings and GHG reductions detailing the underlying data collected, energy audit and assessment conducted for EE and RE options. The report should also incorporate the feedback received from D.2.1***												
Output 3: Shortlist and conduct detail assessments of EE and SGO options for Solomon Water												
Activity 3.1: Detailed feasibility report on short-listed EE and RE (SGO) options												
Activity 3.2: Report on funding requirements and financing options												
Activity 3.3: Preparation of tender documents for EE and RE options												
Deliverable 3: ***D 3.1. A detailed feasibility report with technical and financial analysis and funding options of EE and renewable energy options recommended for Solomon Water; and*** ***D 3.2. Tender documents for EE and renewable energy options***												

[4] As per the 5-year action plan of SW, a desalination plant will be installed to support the water services which will also have operational energy requirements.

Objective: To facilitate adoption of sustainable and viable energy efficiency (EE) and on-site renewable self-generation options (SGO) in Solomon Islands Water Authority
Outcome: EE and renewable energy technology options which are techno-economic feasibility study in place with the Solomon Islands Water Authority for decision making process

	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
Output 4: Facilitate capacity building through on-job training of Solomon Waters on the EE and RE measures implemented												
Activity 4.1: Development of training modules to facilitate the training and exchange of information and monitoring & evaluation templates to capture data for performance assessment												
Activity 4.2: Operational Manuals for EE and RE maintenance and templates of transaction documents to cater to the expansion needs of SW												
Activity 4.3: Gender Considerations												
Activity 4.4: Monitoring and evaluation												
Deliverable 4: ***4.1. Training modules;*** ***4.2. Operational Manuals and*** ***4.3. Monitoring and evaluation of Impacts and Outcomes including a report on gender co-benefits***												

4. Resources required and itemized budget:

The total estimated resources towards implementing the CTCN assistance for implementing sustainable energy options in Solomon Islands Water Authority is USD 98,700 (minimum) to USD 134,975 (maximum). The activity-wise detailed break-up of the budget in USD is provided below.

Activities and Outputs	Input: Human Resources	Input: Travel	Inputs: Meetings/events	Input: Equipment/Material	Estimated cost	
					Minimum	Maximum
Output 1: Development of implementation planning and	***9,100-12,250***	-	-	-		

Activities and Outputs	Input: Human Resources	Input: Travel	Inputs: Meetings/events	Input: Equipment/Material	Estimated cost	
					Minimum	Maximum
communication documents						
Activity 1.1: Formulation of i) Detailed work plan, ii) Monitoring and evaluation plan, iii) CTCN Impact Description, iv) Closure and Data Collection report.	*9,100-12,250* EE-Expert and RE-Experts (1 SPV), Finalizing planning and communication document (5 days); Additional 2 days for providing technical support to Solomon Water in equipment/ technology selection, etc.	-	-	-	*9,100*	*12,250-*
Sub-total Output 1					*9,100*	*12,250*
Output 2: Assessment of energy efficiency and renewable energy options	***29,800- 42,225*** *(EE-Expert & RE-Experts* (1 SPV)					
Activity 2.1: Collection of historical data, understanding system configurations and information from	*1,650-2,100* *EE-Expert: Field visit for data collection of different pumping stations/ energy*	*350* *Local transport*	-	-	*1,650*	*2,100*

Activities and Outputs	Input: Human Resources	Input: Travel	Inputs: Meetings/events	Input: Equipment/Material	Estimated cost	
					Minimum	Maximum
selected pumping stations	*intensive points (2 days)*					
Activity 2.2: Conducting energy audit of selected pumping stations/ *energy intensive points* (refer **annexure 1**)	*6,500-8,750 EE-Expert: Measurement and analysis of operating data of pumps located/ energy intensive points (10 days)*	-	-	-	*6,500*	*8,750*
Activity 2.3: Assessment of SGO (SPV/ SPV with battery/ other renewable energy generating options, if any) option for selected pumping stations and assessing demand management options (refer **annexure 1**)	*3,250-4,375 RE-Experts: Assessment of* SGO (SPV/ SPV with battery/ other renewable energy generating options, if any) *(5 days)*	-	-	-	*3,250*	*4,375*
Activity 2.4: Meeting with stakeholders	*12,800-18,500 EE-Expert, RE-Expert and Gender Expert: To take into account the views of key stakeholders (6 days)*	*2,500 – 4,000 Travel for Experts*	*2,500 – 4,000 Local travel for participants and meeting costs*	--	*12,800*	*18,500*

Activities and Outputs	Input: Human Resources	Input: Travel	Inputs: Meetings/events	Input: Equipment/Material	Estimated cost	
					Minimum	Maximum
Activity 2.5: Presentation of key findings to Solomon Water	*2,600-3,500 EE-Expert & RE-Expert: Presenting preliminary observations and findings to Solomon Water (2 days)*	*1,500 – 2,500 Travel for Experts*	*1,500-2,500 Local travel for participants and meeting costs*	-	*5,600*	*8,500*
Sub-total Output 2					***29,800***	***42,225***
Output 3: Details of EE-SGO options for Solomon Water pumping facilities	***31,200-42,000*** *EE-Expert & RE-Expert*	-	-	-		
Activity 3.1: Detailed feasibility report on EE and RE options	*19,500-26,250 EE-Expert: Detailed feasibility report on EE options of audited pumping stations and potential RE (SGO) options for SW facilities in three islands (Auki, Noro and Tulagi) (15 days)*	-	-	-	*19,500*	*26,250*
Activity 3.2: Report on funding	*6,500-8,750 EE-Expert & RE-Expert: To assess and*	-	-	-	*6,500*	*8,750*

Activities and Outputs	Input: Human Resources	Input: Travel	Inputs: Meetings/events	Input: Equipment/Material	Estimated cost	
					Minimum	Maximum
requirements and financing options	*prepare a report on funding requirements and financing options for implementation of EE and RE (SGO)options (5 days)*					
Activity 3.3: Preparation of tender documents for EE and RE options	*5,200-7,000 EE-Expert & RE-Expert: Preparation tender documents on technical specifications for identified EE-RE options (4 days)*	-	-	-	*5,200*	*7,000*
Sub-total Output 3					***31,200***	***42,000***
Output 4: Capacity building and on job training of SW	***28,600-38,500***					
Activity 4.1: Development of training modules to facilitate the training and exchange of information for the operators of EE and RE measures.	*13,000-17,500 EE-Expert & RE-Expert: Draft a complete module of training on the technical and operational aspects with case studies,*				*13,000*	*17,500*

Activities and Outputs	Input: Human Resources	Input: Travel	Inputs: Meetings/events	Input: Equipment/Material	Estimated cost	
					Minimum	Maximum
Develop monitoring & evaluation templates to capture data for performance assessment	*examples and toolkits including a session on monitoring and evaluation to facilitate the performance assessment (10 days)*					
Activity 4.2: Operational Manuals and templates of transaction documents to cater the expansion needs of SW	*13,000-17,500 EE-Expert & RE-Expert: Develop handy and user friendly operational manuals that can be referred by the operator (10 days)*				*13,000*	*17,500*
4.3 Gender consideration	*1,300-1750 Gender expert: Assessment of impact of EE and SE actions on women's access to water (2 days)*	-	-	-	*1,300*	*1,750*
4.4 Monitoring & evaluation	*1,300-1750 (2 days)*	-	-	-	*1,300*	*1,750*
Sub-total Outcome 4					***28,600***	***38,500***
Estimated range of costing for the entire Response Plan					***98,700***	***134,975***

5. Profile and experience of experts

Experts required	Brief description of required profile
Energy efficiency expert	The Energy Efficiency Expert (Expert-EE) shall have the following expertise and experience: • He shall have an engineering qualification with at least 10 years work experience in energy efficiency related projects for water pumping installations. • Experts with mechanical/ electrical engineering academic qualifications • He shall have good analytical skills in assessing the performance of water pumping systems, associated auxiliaries. • He shall have experience of implementing energy efficiency measures in the related field and good understanding of economics of the same. • He shall also possess suitable portable instruments such as power analyser, ultrasonic flow meter, etc. and must be able to handle the instruments in taking measurements suitable for the proposed study. • The EE Expert shall have proficiency in reading, writing and speaking English and must be able to communicate with stakeholders effectively.
Renewable energy expert	The Renewable Energy Experts shall have the following expertise and experience: • The Expert shall have an engineering qualification with at least 5 years work experience in renewable energy related projects. • Expert with mechanical/ electrical engineering academic qualifications. • He shall have good expertise in assessing of suitable locations for setting up RE facilities. • He shall have demonstrated experience of assessing solar photovoltaic based systems. Experience of standalone SPV with batteries will be added advantage. • They must be able to assess the potential for power generation using RE technologies and must be able to prepare techno-economic feasibility of identified options along with preliminary technical specifications. • The RE Expert shall have proficiency in reading, writing and speaking English and must be able to communicate with stakeholders effectively.
Gender Expert	The Gender Experts shall have the following expertise and experience:

Experts required	Brief description of required profile
	• Understanding of gender considerations with regards to access to water • The Gender Expert shall have proficiency in reading, writing and speaking English and must be able to communicate with stakeholders effectively.

6. Intended contribution to impact over time

Solomon Islands produced a total of 90 million kWh of energy and consumed about 83.7 million kWh during the year 2014. The total CO_2 emissions of Solomon Islands is 201,685 tonne (source: https://www.worlddata.info/oceania/solomon-islands/energy-consumption.php).

The imported fossil fuels accounted for a major share of energy generation and consequent GHG emissions. Solomon Water is one of the important end-users of energy in the Islands, providing water related services to over 100,000 people through various pumping sites. The current energy demand of Solomon Islands is about 10%[5] of the Solomon Island's total energy consumption. It is projected that the consumer base of Solomon Water will increase to 300,000 within next 30 years. With this projection Solomon Water's demand for energy is expected to double in 20 years which is currently 10% of the total energy consumption of Solomon Islands. So far, the Solomon Water has not implemented any EE/RE projects. The baseline GHG emission for energy consumption is estimated as 8000 tCO_2 which is likely to increase to 15000 tCO_2 within 30 years with the continuation of current baseline scenario of energy consumption from fossil fuel. The technical assistance of CTCN would help in identifying appropriate EE & RE solutions to reduce cost of providing services related to water supply. Pumps of most types and functions used in SW has large potential of reducing GHG emissions through energy savings by EE technology interventions and operational improvements. It is likely to save energy and reduce GHG emissions in the range of 5 to 15% based on the conditions of the pumps used at present by Solomon Water. On the top of it various SGOs to generate energy from renewable sources would help in significant reduction of GHG emissions being accounted by the Solomon Waters. The project will be a demonstration for State owned utilities to opt for renewable energy projects replacing the diesel based energy to meet their energy requirements.

The assistance will financially strengthen Solomon Islands through the savings made on the energy cost and foster reinvestment on the water services. It will enable the water services by Solomon Water at affordable cost, covering more than 300,000 people in Solomon Islands. On a broader landscape, the project will provide support with sustainable energy solutions to the larger investments by donors of about 58 million to Solomon Water to improve access and quality of water supply and sanitation services in Solomon Islands.

7. Relevance to NDCs and other national priorities

Solomon Islands is a Least Developed Country (LDC) and Small Island Developing State (SIDS). The country is a signatory to the Paris Accord and has submitted its 'Nationally Determined Contribution' (NDC) in September 2015. Solomon Islands has committed to reduce its GHG emissions by 12% below 2015 level by 2025 and 30% below 2015 level by 2030 compared to a business-as-usual projection. Solomon Islands' NDC makes a further commitment of 27% reduction of GHG emissions by 2025 and 45% reduction by 2030 compared to a business-as-usual projections, provided international assistance to access financial and technical resources are made available to the islands. The Ministry for Environment, Conservation and Meteorology further reaffirms its interests and commitment towards removal of barriers for the adoption of renewable energy technologies in Solomon Islands.

[5] Based on the data on energy consumption provided by SW from some pumping stations, expenses made on fuel and electricity and energy tariff, the amount of energy consumed by SW is estimated. The total current demand of energy is estimated based on the gap of current gap between production capacity and demand of water. Source for the water supply and demand gap in ML/day: World Bank project- Urban Water Supply and Sanitation Sector Project (P165872)

The National Climate Change Policy 2012-2017 of the Solomon Islands indicates policy intent by the government to develop Nationally Appropriate Mitigation Actions (NAMAs) to include RE and EE options. Further the county's National Development Strategy 2016-2035 confirms energy efficiency is an important issue of the Islands and reiterates the needs for the implementation of innovative, low-oversight solutions in renewable energy technologies.

Thus, Solomon Islands is committed to significant emission reductions and firmly believes EE and RE as a two-pronged approach leading towards a sustainable economy. The Solomon Water, being an important entity in the Islands and engaged in providing water in the main islands, it is important for them to achieve the set goals while providing water related services at affordable costs. The technical assistance by CTCN is expected to help in this direction.

8. Linkages to relevant parallel on-going activities:

There are no specific EE&RE projects either undertaken earlier or on-going with Solomon Water. However, there is a project at concept stage by World Bank with Solomon Water Urban Water Supply and Sanitation Sector project in Solomon Islands. The assistance will complement the project with sustainable energy solutions to meet the energy requirements for urban water supply and improved sanitation in Solomon Islands.
Also, there are a number of projects that are on-going or have been undertaken with Solomon Power, which is the sole entity to provide electricity supply to Solomon Islands. e.g. (1) World Bank's Solomon Islands Sustainable Energy Project (SISEP) and ADB's Provincial Renewable Energy Project (PREP) in Fiu River Hydropower project, (2) UAE/NZ funded 1 MW solar farm project, etc. The proposed CTCN focuses on potential RE options for Solomon Water (which is termed as 'self generation options' or SGOs) along with EE projects. The learnings and experience of Solomon Power can help in addressing local issues while implementing EE and RE projects in Solomon Water. The proposed project will also have linkages with Solomon Power in terms of assessing the supply aspects of energy to Solomon Water and contributing to better management/ balancing of demand-supply networks. The proposed project will support Solomon Water to implement the 5 year action plan (2017-2022) as a part of their 30 year Strategic Plan (2017-2047)

9. Anticipated follow up activities after this technical assistance is completed:

- The TA of CTCN would help Solomon Waters in identifying potential techno-economically viable RE and EE options that would help in reducing specific energy consumption (energy required to pump one unit of water), operating costs and GHG emissions.
- The TA would help Solomon Waters in decision making for selection of energy efficient equipment. For example, the expertise through the TA would help in incorporating energy efficiency in the procurement stage itself, while preparing tender for purchase of equipment procuring energy efficient equipment and system related to the water facilities.
- It would further help in building the internal technical capacities and understanding in selection of energy efficient equipment and systems.
- The TA will help the Solomon Waters in providing water related services in a sustainable way. It is further envisaged that it would help in expanding its water related services to a broad spectrum of people covering more islands in the long run.
- The experience, learning and capacity building of Solomon Water will further strengthen other organisations in undertaking similar activities.

10. Gender and co-benefits:

- There is inadequate water, sanitation and energy infrastructure in rural areas. Women in rural areas are extensively involved in collecting drinking water from communal standpipes or streams. In the long-term, The TA would help SW in extending water supply and covering more population that would help in reducing the stress on women in fetching water from distant locations.
- Clean water supply and proper sanitation will be in place reducing the health risks due to water borne diseases.
- The technical assistance would help in building local technical capacities on EE and RE technologies.
- Enhanced adoption of EE and RE measures would help in reducing the dependency on fossil fuels based energy generation and consequent GHG emissions to meet the Solomon Islands' commitments under NDC.

11. Main in-country stakeholders in implementation of the technical assistance activities:

In country stakeholder	Role in implementation of the technical assistance
Ministry of Environment, Climate Change, Disaster Management and Meteorology	NDE and overall coordinator
Solomon Islands Water Authority	Beneficiary; It would provide necessary logistic support and coordination for collection of data and information from its selected facilities to undertake the technical assistance.
Solomon Islands Electricity Authority	Important stakeholder supplying electricity in Solomon Islands. It will provide details on the supply side and help manage/balance demand-supply networks. It will also share its experience in SPV related areas with Solomon Water.
Ministry of Mines, Energy and Rural Electrification	The Ministry of Mines, Energy and Rural Electrification would share about on-going projects or planned programs in EE and RE areas in Solomon Islands

12. SDG Contributions:

Goal	Sustainable Development Goal	Direct contribution from CTCN TA (1 sentence for top 1-3 SDGs)
1	End poverty in all its forms everywhere	Not directly applicable
2	End hunger, achieve food security and improved nutrition, and promote sustainable agriculture	Not directly applicable
3	Ensure healthy lives and promote well-being for all at all ages	Not directly applicable
4	Ensure inclusive and equitable quality education and promote life-long learning opportunities for all	Not directly applicable
5	Achieve gender equality and empower all women and girls	Not directly applicable
6	Ensure availability and sustainable management of water and sanitation for all	Adoption of EE and RE options would help in enhancing competitiveness of Solomon Water to provide water related services at affordable prices. It would further help them in expanding its services and reaching out to more population in the country.

Goal	Sustainable Development Goal	Direct contribution from CTCN TA (1 sentence for top 1-3 SDGs)
7	Ensure access to affordable, reliable, sustainable, and modern energy for all (consider adding targets for 7)	Not directly applicable
	7.1 - By 2030, ensure universal access to affordable, reliable and modern energy services	Not directly applicable
	7.2 - By 2030, increase substantially the share of renewable energy in the global energy mix	Not directly applicable
	7.3 - By 2030, double the global rate of improvement in energy efficiency	Not directly applicable
	7.a - By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology	Not directly applicable
	7.b - By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support	Implementation of the TA would help Solomon Water in strengthening and expanding its water infrastructure among different locations in Solomon Islands. Adoption of EE and RE measures would be in line with the National Development Strategy 2016-2035 of Solomon Islands.
8	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	Not directly applicable
9	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	Not directly applicable
10	Reduce inequality within and among countries	Not directly applicable
11	Make cities and human settlements inclusive, safe, resilient and sustainable	Not directly applicable
12	Ensure sustainable consumption and production patterns	Not directly applicable
13	Take urgent action to combat climate change and its impacts	*All TAs should indicate relevance to Goal 13 and at least one target below (13.1 to 13.b).*
	13.1 - Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries	Not directly applicable
	13.2 - Integrate climate change measures into national policies, strategies and planning	The technical assistance would lead to initiation of steps by Solomon Waters, which is one of the major consumers of energy in the country, to take counter measures in terms of adoption of EE and RE technologies to reduce its dependency on energy through fossil fuels. The proposed action is in line with the Solomon Island's commitment to NDC to combat climate changes.
	13.3 - Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning	Not directly applicable
	13.a - Implement the commitment undertaken by developed-country parties to the United Nations Framework Convention on Climate Change to a goal of mobilizing jointly $100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalization as soon as possible	Not directly applicable
	13.b - Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities	Not directly applicable
14	Conserve and sustainably use the oceans, seas and marine resources for sustainable development	Not directly applicable
15	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	Not directly applicable
16	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels	Not directly applicable
17	Strengthen the means of implementation and revitalize the global partnership for sustainable development	Not directly applicable

13. Classification of technical assistance:

Please tick off the relevant boxes below	*Primary*	*Secondary*
☑ 1. Decision-making tools and/or information provision	☑	☐
☐ 2. Sectoral roadmaps and strategies	☐	☐
☐ 3. Recommendations for law, policy and regulations	☐	☐
☐ 4. Financing facilitation	☐	☐
☐ 5. Private sector engagement and market creation	☐	☐
☐ 6. Research and development of technologies	☐	☐
☑ 7. Feasibility of technology options	☑	☐
☐ 8. Piloting and deployment of technologies in local conditions	☐	☐
☑ 9. Technology identification and prioritisation	☑	☐

14. Monitoring and Evaluation process

Upon contracting of the implementing partners to implement this Response Plan, the lead implementer will produce a monitoring and evaluation plan for the technical assistance. The monitoring and evaluation plan must include specific, measurable, achievable, relevant, and time-bound indicators that will be used to monitor and evaluate the timeliness and appropriateness of the implementation. The CTCN Technology Manager responsible for the technical assistance will monitor the timeliness and appropriateness of the Response Plan implementation. Upon completion of all activities and outputs, evaluation forms will be completed by the (i) NDE about overall satisfaction level with the technical assistance service provided; (ii) the Lead Implementer about the knowledge and learning gained through delivery of technical assistance; and (iii) the CTCN Director about timeliness and appropriateness of the delivery of the activities and outputs.

Annexure 1

TOR for experts

A. Expert- Energy Efficiency

The following activities will be undertaken by the Expert- Energy Efficiency:

(1) The expert will undertake field visits to each selected sites to carry out energy audit of pumping systems and other energy intensive points.

(2) The expert will arrange her/his own instruments (power analyser, ultrasonic flow meter, etc.) for undertaking measurements of key operating parameters.

(3) The expert will collect historical data of selected facilities from SW such as energy consumption (monthly/yearly) for a period of 3 to 5 years based on availability, energy tariffs, actual/estimated water pumped from each facility, etc. He will study in detail the system configurations, including the stand-by and operating pumps, piping network and sewage system, as applicable.

(4) The performance of pumps in terms of efficiency and specific energy consumption (SEC) will be evaluated. This would include measurement of key operating parameters of the pumps such as water flow, head developed, power consumption and other relevant parameters.

(5) The expert will prepare 'detailed feasibility report' of identified EE options that would help in improving energy efficiency of pumping stations and reducing energy costs. The report shall further include details such as financial analysis of the EE options with energy savings, investment required and GHG reduction potential.

(6) The expert will prepare 'tender documents' for short-listed EE options that would support Solomon Water in the procurement of energy efficient equipment.

(7) SW would provide following support to the consultant during energy audits: (i) Providing the necessary details related to energy consumption of selected pumping stations, (ii) Providing existing technical specifications of pumps being studied, (iii) sharing related details such as pump capacities, number of pumps in operation & standby, (average) hours of operation, maintenance (planned and forced), outage, energy consumption, and (iv) making available a dedicated electrician during the study while undertaking measurements.

(8) The expert will undertake energy audits of pumping stations as provided in table 1.

Table 1. Locations for energy audits of pump stations

S No	Island	Name of pump station	Total number of pumps
1	Honiara	Titinge pump station	30 kW X 3 no.
2	Honiara	Skyline pump station	22 kW X 3 no.
3	Honiara	Tuvaruhu JICA pump station	37 kW X 2 no.
4	Honiara	Kongulai pump station	90 kW X 3 no.
5	Auki	Kwaibala pump station	11 kW X 2 no.

S No	Island	Name of pump station	Total number of pumps
6	Noro	Noro pump station	37 kW X 2 no.
7	Tulagi	Tulagi pump station	7.5 kW X 1 no.

B. Experts - Renewable Energy

The Experts- Renewable Energy will undertake study on feasibility for application of solar photovoltaic (SPV)/ SPV with battery in the following islands as provided in table 2. The expert will assess the space available on ground and on rooftop to install solar PV. The experts will a conduct a preliminary assessment of the feasibility of other RE technologies and potential to generate energy from other sources. The suggested RE technology should be suitable to support the operation of the pumping stations for example intermittent pumping operations may require the SPV plant either connected to grid or with battery storage options. The experts will prepare detailed feasibility report on RE based SGOs that include technical and financial analysis of power generation capacity, investment required, energy generation potential, GHG reduction potential, etc. He further prepare 'tender document' with technical specifications, which can be used as a guide document by the Solomon Waters towards procurement and installation of SPVs in different locations as identified in the TOR. The tender document should be prepared considering the expansion plan of SW e.g. as per the 5year action plan of SW, a desalination plant will be installed to support the water services which will also have operational energy requirements.

Table 2. Locations for feasibility study for application of SPVs

S No	Location
1	Auki island
2	Noro island
3	Tulagi island

C. Common for Expert-Energy Efficiency and Experts- Renewable Energy

The Expert-Energy Efficiency and Expert-Renewable Energy will make a detailed presentation of the activities planned in each of the selected facility and methodology proposed for energy audits. The experts will hold meetings and discussions with key personnel in SW and other key stakeholders, if any, as arranged by SW. The team will present preliminary findings to the Solomon Waters and other key stakeholders as decided by SW to take into their views and finalise the required documents.

Further, the team will prepare a report on overall funding requirements and financing options that would help Solomon water in taking up further activities pertaining to actual implementation of the EE and RE options in the coming years.

CTCN
CLIMATE TECHNOLOGY CENTRE & NETWORK

Technical Assistance Response Plan – Terms of Reference

Country	**Solomon Islands**
Request ID#	2017000039
Title	Solomon Water- Energy Efficiency and Self-Generation Plan
NDE	Name: Mr Hudson Kauhiona Position: Director of Climate Change (Acting) Organization: Ministry of Environment, Climate Change, Disaster Management and Meteorology Email: hkhiona@gmail.com Address: P O Box 21, Honiara, Solomon Islands
Proponent	Name: Mr Ian Gooden Position: General Manager Organization: Solomon Islands Water Authority Email: IGooden@solomonwater.com.sb Address: P O Box 1407, Honiara, Solomon Islands

Summary of the CTCN technical assistance

The Solomon Islands Water Authority (SW) is the responsible organisation to provide and ensure water supply and waste water treatment services in Solomon Islands. At present, it provides water supply to four islands namely Honiara, Auki, Noro and Tulagi; and waste water treatment in Honiara. The energy cost is one of the most important considerations in the overall operations of Solomon Water. Further, Solomon Water is mainly dependant on fossil fuels for generation of energy to run its water pumping facilities. With increasing energy costs and the pressure to expand its services, Solomon Water is looking for sustainable energy solutions, which would help in reducing its energy cost while also contributing to greenhouse gas (GHG) reduction targets.

A significant share of energy cost is accounted by the pumping stations, which are used to supply water to end-users in four islands, and waste water pumping stations. Solomon Water has plan to expand its operation to serve larger population in future which includes the widening of the supply to cover the currently un-serviced population and increase of population in urban areas due to internal migration in Solomon Islands as indicated in their 5-year action plan. The current demand has already exceeded the current water production capacity of SW by 8 Million litres per day and the gap is expected to increase leading to 50 Million litres per day in 2040.[1] In the Business as usual scenario, the gap will be bridged by increasing the pumping facilities and water network which will be powered by conventional fuel. In the absence of the EE measures and SGOs (Self generating options of renewable energy) through renewable sources, the project will consume more energy and produce GHG emissions. Besides an increase in energy cost would lead to increased operating cost, resulting in increased cost of water supply to end-users, which may not be sustainable in a long-term. It is therefore, important for SW to reduce its operating costs and GHG footprint by exploring suitable and sustainable options. There are two distinct options, which would suit the requirements of SW:

(1) Improving 'energy efficiency' (EE) through adoption of energy efficient technologies e.g. replacement with energy efficient pumps and energy conservation measures, and

(2) Exploring and implementing 'self-generation options' (SGO) such as solar photovoltaic (SPV)

[1] World Bank Project Note on Urban Water Supply and Sanitation Sector project in Solomon Islands (P165872)

The proposed CTCN Assistance would help Solomon Waters in undertaking the following activities: (1) Conducting detailed energy audits for identifying options for energy efficiency; (2) Assessing SGO options, mainly SPVs for off-setting energy generation through fossil fuels (or reducing the reliance on fossil fuels) and any other energy generation options, if applicable;
and efficient operation and monitoring of the energy efficiency measures and renewable energy projects implemented by being benefited from the on job training modules and operational manuals prepared under the TA.
The Assistance would support Solomon Water in selection, procurement, implementation and operation of the EE measures and SGO through preparation of their feasibility reports covering the technical design specifications and economic analysis, the on-job training modules and operational manual respectively.
The Technical Assistance will enable Solomon Water to implement the projects to cater the current as well as the future energy requirements with renewable sources pertaining to their expansion plans. Since the renewable energy penetration (1% of the total energy generation in 2016[2]) and adoption of the energy efficiency measures are low in the country, it can be said that this project will be one of the first of its kind where an energy intensive utility will be reducing the reliance on fossil fuel leading to the reduction of GHG emission and contributing to country's targets under National Energy Policy and INDC. This utility-based model project can be replicated by other state-owned enterprises and commercial setups in Solomon Islands and in other countries in the region.
The assistance will not only lead to substantial savings on energy cost to foster reinvestment in the water services but also complement the ongoing donor support for Solomon Water to increase the access to safe drinking water, improve sanitation and waste water treatment services.

Agreement:

National Designated Entity to the UNFCCC Technology Mechanism	**Proponent** (signature of the Proponent is optional)
Ministry of Environment, Climate Change, Disaster Management and Meteorology	Solomon Islands Water Authority
Name: Mr Hudson Kauhiona	Name: Ian Gooden
Title: Director of Climate Change (acting)	Title: General Manager
Date:	Date:
Signature:	Signature:

UNFCCC Climate Technology Centre and Network (CTCN)

Name: Jukka Uosukainen
Title: CTCN Director
Date: 31/10/2018
Signature:

[2] Pacific Energy Update 2018 by Asian Development Bank

1. Background and context

Background

Solomon Islands comprise hundreds of islands; of these, the main islands include Honiara (capital of Solomon Islands) and provincial urban centres of Auki, Noro and Tulagi. Solomon Islands Water Authority (SW), a state-owned enterprise, is mandated to operate as the provider of municipal water and waste water services in Solomon Islands under the SIWA Act and State-Owned Enterprise Act. SW supplies and manages water only in these four main islands. It provides water services to an estimated population of about 100,000 in Honiara which is expected to surpass 300,000 within next 30 years due to internal migrations and over 8000 in the provincial centres. The municipal waste water services are provided to about 30,000 people in Honiara only. The water pumping facilities of SW comprises the following: (1) Borehole pumps (in Honiara and Auki), (2) Raw water supply and pumping stations (in all the four islands) and (3) Waste water collection facilities (in Honiara only).

Context

About 95% of total installed capacity of energy generation in Solomon Islands is based on fossil fuels, and the balance 5% is through renewable energy sources. (*source: https://www.worlddata.info/oceania/solomon-islands/energy-consumption.php*). The energy tariff of Solomon Islands is one of the highest[3] in the Pacific, since a major share of energy in the Islands is met through fossil fuels. Solomon Water is using diesel-based generators to meet its energy requirements in its various facilities. Moreover, most of the equipment and system installed in various facilities of SW have not incorporated energy efficiency options.

Thus, installing energy efficient equipment as well as shifting from fossil fuel based energy generation to self generation options using renewable energy sources (e.g. Solar Photovoltaic (SPV) or other options of generating renewable energy that are available and suitable for the operational requirements of the Solomon Water would help in providing water services at competitive rates, while at the same time helping the Island in reducing overall GHG emissions.

2. Problem statement

Energy from sustainable sources and optimization of energy consumption is the key challenge for Solomon Water. In 2013-2014, the expenses towards energy consumption were more than 35% of the total operational expenses of Solomon Water. The total energy consumption of SW (majorly for pump operation), calculated from the share of operational cost and energy cost per unit is almost 10% of the total energy consumption of Solomon Islands. The energy consumption is further expected to increase to cater the projected escalations in demand pertaining to the increasing population and to reach out to the un-serviced population. With the business as usual scenario the energy requirements of the islands, as well as Solomon Water, will be mainly met through fossil fuels, which forms a significant impact on the operating cost and GHG footprint in Solomon Islands. The increase in fuel costs would directly impact the operating costs of various water supply facilities of SW, which in turn would put upward pressure on price charged to consumers for supplying clean water and waste water treatment services, thus impacting the expansion plans of its services. Further, low importance is provided in selection of equipment related to water services, which in turn influences efficiency of the services and increases the operating cost Therefore, it is vital for Solomon Water to explore

[3] https://www.adb.org/sites/default/files/linked-documents/46014-002-ssa.pdf

sustainable energy solutions that would help in reducing energy consumption in various pumping installations of Solomon Water and generation of energy from renewable sources in the islands while contributing to national GHG emission reduction targets.

3. **Logical Framework for the CTCN Technical Assistance:**

	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
Objective: To facilitate adoption of sustainable and viable energy efficiency (EE) and on-site renewable self-generation options (SGO) in Solomon Islands Water Authority												
Outcome: EE and renewable energy technology options which are techno-economic feasibility study in place with the Solomon Islands Water Authority for decision making process												
Output 1: Development of implementation planning and communication documents												
Activity 1: (i) A work plan detailing stepwise activities, respective deliverables, outputs, timelines and responsible persons/organisations and detailed budget to implement the Response Plan, meeting the requirements of the Response Plan. (ii) Monitoring and evaluation plan with specific, measurable, achievable, relevant, and time-bound indicators used for timeliness and appropriateness of the implementation. The plan should apply selected indicators from the Closure and Data Collection report template and enable the lead implementer to complete the CTCN Closure and Data collection report at the end of the assignment (refer to item iv below and section 14 in the Response Plan) (iii) A two-page CTCN Impact Description formulated in the beginning of the technical assistance and update/revised once the technical assistance is fully delivered based on the template provided by CTCN. The template will be provided by CTCN. (iv) A Closure and Data Collection report completed at the end of the technical assistance as indicated to be completed and delivered in 12th month in timeline. The template will be provided by CTCN in the beginning of the activity. (v) Need based technical backup support, as and when required during the TA to Solomon Water in selection of EE and RE equipment and system for the pumping stations												
Deliverable 1: ***D 1.1. Detailed work plan;*** ***D 1.2. Monitoring and evaluation plan;*** ***D 1.3. CTCN Impact Description;*** ***D 1.4. Closure and Data Collection template and report; and*** ***D 1.5. Summary of technical support (backstopping) provided during CTCN TA, if any.***												

	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
Objective: To facilitate adoption of sustainable and viable energy efficiency (EE) and on-site renewable self-generation options (SGO) in Solomon Islands Water Authority												
Outcome: EE and renewable energy technology options which are techno-economic feasibility study in place with the Solomon Islands Water Authority for decision making process												
Output 2: Assessment of energy efficiency and renewable energy options												
Activity 2.1: Collection of historical data (at least for three normal years) on the energy usages vis-à-vis water services, understanding system configurations focussing on the energy consumption points and information from selected pumping stations as discussed and agreed with Solomon Islands and CTCN.												
Activity 2.2: Conducting energy audit of pumping stations and any other relevant energy consumption points, if found from 2.1 and assessing demand management options												
Activity 2.3: Broad assessment of the feasibility of various energy efficiency and renewable energy (SGO) options for selected pumping stations/ any other energy intensive points identified in 2.1 and 2.2. The assessment will also project the energy requirement pertaining to the expansion projected in coming five years for SW[4].												
Activity 2.4: Meeting with key stakeholders to verify data and findings												
Activity 2.5: Presentation of key findings to Solomon Water and other stakeholders												
Deliverable 2: ***D 2.1. Presentation to Solomon Water and other stakeholders on the key findings; and*** ***D 2.2. Report on the list of EE and renewable energy (SGO) options identified with potential energy savings and GHG reductions detailing the underlying data collected, energy audit and assessment conducted for EE and RE options. The report should also incorporate the feedback received from D.2.1***												
Output 3: Shortlist and conduct detail assessments of EE and SGO options for Solomon Water												
Activity 3.1: Detailed feasibility report on short-listed EE and RE (SGO) options												
Activity 3.2: Report on funding requirements and financing options												
Activity 3.3: Preparation of tender documents for EE and RE options												
Deliverable 3: ***D 3.1. A detailed feasibility report with technical and financial analysis and funding options of EE and renewable energy options recommended for Solomon Water; and*** ***D 3.2. Tender documents for EE and renewable energy options***												

[4] As per the 5-year action plan of SW, a desalination plant will be installed to support the water services which will also have operational energy requirements.

	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
Objective: To facilitate adoption of sustainable and viable energy efficiency (EE) and on-site renewable self-generation options (SGO) in Solomon Islands Water Authority												
Outcome: EE and renewable energy technology options which are techno-economic feasibility study in place with the Solomon Islands Water Authority for decision making process												
Output 4: Facilitate capacity building through on-job training of Solomon Waters on the EE and RE measures implemented												
Activity 4.1: Development of training modules to facilitate the training and exchange of information and monitoring & evaluation templates to capture data for performance assessment												
Activity 4.2: Operational Manuals for EE and RE maintenance and templates of transaction documents to cater to the expansion needs of SW												
Activity 4.3: Gender Considerations												
Activity 4.4: Monitoring and evaluation												
Deliverable 4: ***4.1. Training modules;*** ***4.2. Operational Manuals and*** ***4.3. Monitoring and evaluation of Impacts and Outcomes including a report on gender co-benefits***												

4. **Resources required and itemized budget:**

The total estimated resources towards implementing the CTCN assistance for implementing sustainable energy options in Solomon Islands Water Authority is USD 98,700 (minimum) to USD 134,975 (maximum). The activity-wise detailed break-up of the budget in USD is provided below.

Activities and Outputs	**Input: Human Resources**	**Input: Travel**	**Inputs: Meetings/events**	**Input: Equipment/Material**	**Estimated cost**	
					Minimum	**Maximum**
Output 1: Development of implementation planning and	***9,100-12,250***	-	-	-		

Activities and Outputs	Input: Human Resources	Input: Travel	Inputs: Meetings/events	Input: Equipment/Material	Estimated cost	
					Minimum	Maximum
communication documents						
Activity 1.1: Formulation of i) Detailed work plan, ii) Monitoring and evaluation plan, iii) CTCN Impact Description, iv) Closure and Data Collection report.	*9,100-12,250* EE-Expert and RE-Experts (1 SPV), Finalizing planning and communication document (5 days); Additional 2 days for providing technical support to Solomon Water in equipment/ technology selection, etc.	-	-	-	*9,100*	*12,250-*
Sub-total Output 1					***9,100***	***12,250***
Output 2: Assessment of energy efficiency and renewable energy options	***29,800- 42,225*** *(EE-Expert & RE-Experts* (1 SPV)					
Activity 2.1: Collection of historical data, understanding system configurations and information from	*1,650-2,100* *EE-Expert: Field visit for data collection of different pumping stations/ energy*	*350* *Local transport*	-	-	*1,650*	*2,100*

Activities and Outputs	Input: Human Resources	Input: Travel	Inputs: Meetings/events	Input: Equipment/Material	Estimated cost	
					Minimum	Maximum
selected pumping stations	*intensive points (2 days)*					
Activity 2.2: Conducting energy audit of selected pumping stations/ *energy intensive points* (refer **annexure 1**)	*6,500-8,750* *EE-Expert: Measurement and analysis of operating data of pumps located/ energy intensive points (10 days)*	-	-	-	*6,500*	*8,750*
Activity 2.3: Assessment of SGO (SPV/ SPV with battery/ other renewable energy generating options, if any) option for selected pumping stations and assessing demand management options (refer **annexure 1**)	*3,250-4,375* *RE-Experts: Assessment of* SGO (SPV/ SPV with battery/ other renewable energy generating options, if any) *(5 days)*	-	-	-	*3,250*	*4,375*
Activity 2.4: Meeting with stakeholders	*12,800-18,500* *EE-Expert, RE-Expert and Gender Expert: To take into account the views of key stakeholders (6 days)*	*2,500 – 4,000* *Travel for Experts*	*2,500 – 4,000* *Local travel for participants and meeting costs*	--	*12,800*	*18,500*

Activities and Outputs	Input: Human Resources	Input: Travel	Inputs: Meetings/events	Input: Equipment/Material	Estimated cost	
					Minimum	Maximum
Activity 2.5: Presentation of key findings to Solomon Water	*2,600-3,500 EE-Expert & RE-Expert: Presenting preliminary observations and findings to Solomon Water (2 days)*	*1,500 – 2,500 Travel for Experts*	*1,500-2,500 Local travel for participants and meeting costs*	-	*5,600*	*8,500*
Sub-total Output 2					***29,800***	***42,225***
Output 3: Details of EE-SGO options for Solomon Water pumping facilities	***31,200-42,000*** *EE-Expert & RE-Expert*	-	-	-		
Activity 3.1: Detailed feasibility report on EE and RE options	*19,500-26,250 EE-Expert: Detailed feasibility report on EE options of audited pumping stations and potential RE (SGO) options for SW facilities in three islands (Auki, Noro and Tulagi) (15 days)*	-	-	-	*19,500*	*26,250*
Activity 3.2: Report on funding	*6,500-8,750 EE-Expert & RE-Expert: To assess and*	-	-	-	*6,500*	*8,750*

Activities and Outputs	Input: Human Resources	Input: Travel	Inputs: Meetings/events	Input: Equipment/Material	Estimated cost	
					Minimum	Maximum
requirements and financing options	*prepare a report on funding requirements and financing options for implementation of EE and RE (SGO)options (5 days)*					
Activity 3.3: Preparation of tender documents for EE and RE options	*5,200-7,000 EE-Expert & RE-Expert: Preparation tender documents on technical specifications for identified EE-RE options (4 days)*	-	-	-	*5,200*	*7,000*
Sub-total Output 3					***31,200***	***42,000***
Output 4: Capacity building and on job training of SW	***28,600-38,500***					
Activity 4.1: Development of training modules to facilitate the training and exchange of information for the operators of EE and RE measures.	*13,000-17,500 EE-Expert & RE-Expert: Draft a complete module of training on the technical and operational aspects with case studies,*				*13,000*	*17,500*

Activities and Outputs	Input: Human Resources	Input: Travel	Inputs: Meetings/events	Input: Equipment/Material	Estimated cost	
					Minimum	Maximum
Develop monitoring & evaluation templates to capture data for performance assessment	*examples and toolkits including a session on monitoring and evaluation to facilitate the performance assessment (10 days)*					
Activity 4.2: Operational Manuals and templates of transaction documents to cater the expansion needs of SW	*13,000-17,500 EE-Expert & RE-Expert: Develop handy and user friendly operational manuals that can be referred by the operator (10 days)*				*13,000*	*17,500*
4.3 Gender consideration	*1,300-1750 Gender expert: Assessment of impact of EE and SE actions on women's access to water (2 days)*	-	-	-	*1,300*	*1,750*
4.4 Monitoring & evaluation	*1,300-1750 (2 days)*	-	-	-	*1,300*	*1,750*
Sub-total Outcome 4					***28,600***	***38,500***
Estimated range of costing for the entire Response Plan					***98,700***	***134,975***

5. Profile and experience of experts

Experts required	Brief description of required profile
Energy efficiency expert	The Energy Efficiency Expert (Expert-EE) shall have the following expertise and experience: • He shall have an engineering qualification with at least 10 years work experience in energy efficiency related projects for water pumping installations. • Experts with mechanical/ electrical engineering academic qualifications • He shall have good analytical skills in assessing the performance of water pumping systems, associated auxiliaries. • He shall have experience of implementing energy efficiency measures in the related field and good understanding of economics of the same. • He shall also possess suitable portable instruments such as power analyser, ultrasonic flow meter, etc. and must be able to handle the instruments in taking measurements suitable for the proposed study. • The EE Expert shall have proficiency in reading, writing and speaking English and must be able to communicate with stakeholders effectively.
Renewable energy expert	The Renewable Energy Experts shall have the following expertise and experience: • The Expert shall have an engineering qualification with at least 5 years work experience in renewable energy related projects. • Expert with mechanical/ electrical engineering academic qualifications. • He shall have good expertise in assessing of suitable locations for setting up RE facilities. • He shall have demonstrated experience of assessing solar photovoltaic based systems. Experience of standalone SPV with batteries will be added advantage. • They must be able to assess the potential for power generation using RE technologies and must be able to prepare techno-economic feasibility of identified options along with preliminary technical specifications. • The RE Expert shall have proficiency in reading, writing and speaking English and must be able to communicate with stakeholders effectively.
Gender Expert	The Gender Experts shall have the following expertise and experience:

Experts required	Brief description of required profile
	• Understanding of gender considerations with regards to access to water • The Gender Expert shall have proficiency in reading, writing and speaking English and must be able to communicate with stakeholders effectively.

6. Intended contribution to impact over time

Solomon Islands produced a total of 90 million kWh of energy and consumed about 83.7 million kWh during the year 2014. The total CO_2 emissions of Solomon Islands is 201,685 tonne (source: https://www.worlddata.info/oceania/solomon-islands/energy-consumption.php).

The imported fossil fuels accounted for a major share of energy generation and consequent GHG emissions. Solomon Water is one of the important end-users of energy in the Islands, providing water related services to over 100,000 people through various pumping sites. The current energy demand of Solomon Islands is about 10%[5] of the Solomon Island's total energy consumption. It is projected that the consumer base of Solomon Water will increase to 300,000 within next 30 years. With this projection Solomon Water's demand for energy is expected to double in 20 years which is currently 10% of the total energy consumption of Solomon Islands. So far, the Solomon Water has not implemented any EE/RE projects. The baseline GHG emission for energy consumption is estimated as 8000 tCO_2 which is likely to increase to 15000 tCO_2 within 30 years with the continuation of current baseline scenario of energy consumption from fossil fuel. The technical assistance of CTCN would help in identifying appropriate EE & RE solutions to reduce cost of providing services related to water supply. Pumps of most types and functions used in SW has large potential of reducing GHG emissions through energy savings by EE technology interventions and operational improvements. It is likely to save energy and reduce GHG emissions in the range of 5 to 15% based on the conditions of the pumps used at present by Solomon Water. On the top of it various SGOs to generate energy from renewable sources would help in significant reduction of GHG emissions being accounted by the Solomon Waters. The project will be a demonstration for State owned utilities to opt for renewable energy projects replacing the diesel based energy to meet their energy requirements.

The assistance will financially strengthen Solomon Islands through the savings made on the energy cost and foster reinvestment on the water services. It will enable the water services by Solomon Water at affordable cost, covering more than 300,000 people in Solomon Islands. On a broader landscape, the project will provide support with sustainable energy solutions to the larger investments by donors of about 58 million to Solomon Water to improve access and quality of water supply and sanitation services in Solomon Islands.

7. Relevance to NDCs and other national priorities

Solomon Islands is a Least Developed Country (LDC) and Small Island Developing State (SIDS). The country is a signatory to the Paris Accord and has submitted its 'Nationally Determined Contribution' (NDC) in September 2015. Solomon Islands has committed to reduce its GHG emissions by 12% below 2015 level by 2025 and 30% below 2015 level by 2030 compared to a business-as-usual projection. Solomon Islands' NDC makes a further commitment of 27% reduction of GHG emissions by 2025 and 45% reduction by 2030 compared to a business-as-usual projections, provided international assistance to access financial and technical resources are made available to the islands. The Ministry for Environment, Conservation and Meteorology further reaffirms its interests and commitment towards removal of barriers for the adoption of renewable energy technologies in Solomon Islands.

[5] Based on the data on energy consumption provided by SW from some pumping stations, expenses made on fuel and electricity and energy tariff, the amount of energy consumed by SW is estimated. The total current demand of energy is estimated based on the gap of current gap between production capacity and demand of water. Source for the water supply and demand gap in ML/day: World Bank project- Urban Water Supply and Sanitation Sector Project (P165872)

The National Climate Change Policy 2012-2017 of the Solomon Islands indicates policy intent by the government to develop Nationally Appropriate Mitigation Actions (NAMAs) to include RE and EE options. Further the county's National Development Strategy 2016-2035 confirms energy efficiency is an important issue of the Islands and reiterates the needs for the implementation of innovative, low-oversight solutions in renewable energy technologies.

Thus, Solomon Islands is committed to significant emission reductions and firmly believes EE and RE as a two-pronged approach leading towards a sustainable economy. The Solomon Water, being an important entity in the Islands and engaged in providing water in the main islands, it is important for them to achieve the set goals while providing water related services at affordable costs. The technical assistance by CTCN is expected to help in this direction.

8. Linkages to relevant parallel on-going activities:

There are no specific EE&RE projects either undertaken earlier or on-going with Solomon Water. However, there is a project at concept stage by World Bank with Solomon Water Urban Water Supply and Sanitation Sector project in Solomon Islands. The assistance will complement the project with sustainable energy solutions to meet the energy requirements for urban water supply and improved sanitation in Solomon Islands.

Also, there are a number of projects that are on-going or have been undertaken with Solomon Power, which is the sole entity to provide electricity supply to Solomon Islands. e.g. (1) World Bank's Solomon Islands Sustainable Energy Project (SISEP) and ADB's Provincial Renewable Energy Project (PREP) in Fiu River Hydropower project, (2) UAE/NZ funded 1 MW solar farm project, etc. The proposed CTCN focuses on potential RE options for Solomon Water (which is termed as 'self generation options' or SGOs) along with EE projects. The learnings and experience of Solomon Power can help in addressing local issues while implementing EE and RE projects in Solomon Water. The proposed project will also have linkages with Solomon Power in terms of assessing the supply aspects of energy to Solomon Water and contributing to better management/ balancing of demand-supply networks. The proposed project will support Solomon Water to implement the 5 year action plan (2017-2022) as a part of their 30 year Strategic Plan (2017-2047)

9. Anticipated follow up activities after this technical assistance is completed:

- The TA of CTCN would help Solomon Waters in identifying potential techno-economically viable RE and EE options that would help in reducing specific energy consumption (energy required to pump one unit of water), operating costs and GHG emissions.
- The TA would help Solomon Waters in decision making for selection of energy efficient equipment. For example, the expertise through the TA would help in incorporating energy efficiency in the procurement stage itself, while preparing tender for purchase of equipment procuring energy efficient equipment and system related to the water facilities.
- It would further help in building the internal technical capacities and understanding in selection of energy efficient equipment and systems.
- The TA will help the Solomon Waters in providing water related services in a sustainable way. It is further envisaged that it would help in expanding its water related services to a broad spectrum of people covering more islands in the long run.
- The experience, learning and capacity building of Solomon Water will further strengthen other organisations in undertaking similar activities.

10. Gender and co-benefits:

- There is inadequate water, sanitation and energy infrastructure in rural areas. Women in rural areas are extensively involved in collecting drinking water from communal standpipes or streams. In the long-term, The TA would help SW in extending water supply and covering more population that would help in reducing the stress on women in fetching water from distant locations.
- Clean water supply and proper sanitation will be in place reducing the health risks due to water borne diseases.
- The technical assistance would help in building local technical capacities on EE and RE technologies.
- Enhanced adoption of EE and RE measures would help in reducing the dependency on fossil fuels based energy generation and consequent GHG emissions to meet the Solomon Islands' commitments under NDC.

11. Main in-country stakeholders in implementation of the technical assistance activities:

In country stakeholder	Role in implementation of the technical assistance
Ministry of Environment, Climate Change, Disaster Management and Meteorology	NDE and overall coordinator
Solomon Islands Water Authority	Beneficiary; It would provide necessary logistic support and coordination for collection of data and information from its selected facilities to undertake the technical assistance.
Solomon Islands Electricity Authority	Important stakeholder supplying electricity in Solomon Islands. It will provide details on the supply side and help manage/balance demand-supply networks. It will also share its experience in SPV related areas with Solomon Water.
Ministry of Mines, Energy and Rural Electrification	The Ministry of Mines, Energy and Rural Electrification would share about on-going projects or planned programs in EE and RE areas in Solomon Islands

12. SDG Contributions:

Goal	Sustainable Development Goal	Direct contribution from CTCN TA (1 sentence for top 1-3 SDGs)
1	End poverty in all its forms everywhere	Not directly applicable
2	End hunger, achieve food security and improved nutrition, and promote sustainable agriculture	Not directly applicable
3	Ensure healthy lives and promote well-being for all at all ages	Not directly applicable
4	Ensure inclusive and equitable quality education and promote life-long learning opportunities for all	Not directly applicable
5	Achieve gender equality and empower all women and girls	Not directly applicable
6	Ensure availability and sustainable management of water and sanitation for all	Adoption of EE and RE options would help in enhancing competitiveness of Solomon Water to provide water related services at affordable prices. It would further help them in expanding its services and reaching out to more population in the country.

Goal	Sustainable Development Goal	Direct contribution from CTCN TA (1 sentence for top 1-3 SDGs)
7	Ensure access to affordable, reliable, sustainable, and modern energy for all (consider adding targets for 7)	Not directly applicable
	7.1 - By 2030, ensure universal access to affordable, reliable and modern energy services	Not directly applicable
	7.2 - By 2030, increase substantially the share of renewable energy in the global energy mix	Not directly applicable
	7.3 - By 2030, double the global rate of improvement in energy efficiency	Not directly applicable
	7.a - By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology	Not directly applicable
	7.b - By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support	Implementation of the TA would help Solomon Water in strengthening and expanding its water infrastructure among different locations in Solomon Islands. Adoption of EE and RE measures would be in line with the National Development Strategy 2016-2035 of Solomon Islands.
8	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	Not directly applicable
9	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	Not directly applicable
10	Reduce inequality within and among countries	Not directly applicable
11	Make cities and human settlements inclusive, safe, resilient and sustainable	Not directly applicable
12	Ensure sustainable consumption and production patterns	Not directly applicable
13	Take urgent action to combat climate change and its impacts	*All TAs should indicate relevance to Goal 13 and at least one target below (13.1 to 13.b).*
	13.1 - Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries	Not directly applicable
	13.2 - Integrate climate change measures into national policies, strategies and planning	The technical assistance would lead to initiation of steps by Solomon Waters, which is one of the major consumers of energy in the country, to take counter measures in terms of adoption of EE and RE technologies to reduce its dependency on energy through fossil fuels. The proposed action is in line with the Solomon Island's commitment to NDC to combat climate changes.
	13.3 - Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning	Not directly applicable
	13.a - Implement the commitment undertaken by developed-country parties to the United Nations Framework Convention on Climate Change to a goal of mobilizing jointly $100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalization as soon as possible	Not directly applicable
	13.b - Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities	Not directly applicable
14	Conserve and sustainably use the oceans, seas and marine resources for sustainable development	Not directly applicable
15	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	Not directly applicable
16	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels	Not directly applicable
17	Strengthen the means of implementation and revitalize the global partnership for sustainable development	Not directly applicable

13. Classification of technical assistance:

Please tick off the relevant boxes below	*Primary*	*Secondary*
☑ 1. Decision-making tools and/or information provision	☑	☐
☐ 2. Sectoral roadmaps and strategies	☐	☐
☐ 3. Recommendations for law, policy and regulations	☐	☐
☐ 4. Financing facilitation	☐	☐
☐ 5. Private sector engagement and market creation	☐	☐
☐ 6. Research and development of technologies	☐	☐
☑ 7. Feasibility of technology options	☑	☐
☐ 8. Piloting and deployment of technologies in local conditions	☐	☐
☑ 9. Technology identification and prioritisation	☑	☐

14. Monitoring and Evaluation process

Upon contracting of the implementing partners to implement this Response Plan, the lead implementer will produce a monitoring and evaluation plan for the technical assistance. The monitoring and evaluation plan must include specific, measurable, achievable, relevant, and time-bound indicators that will be used to monitor and evaluate the timeliness and appropriateness of the implementation. The CTCN Technology Manager responsible for the technical assistance will monitor the timeliness and appropriateness of the Response Plan implementation. Upon completion of all activities and outputs, evaluation forms will be completed by the (i) NDE about overall satisfaction level with the technical assistance service provided; (ii) the Lead Implementer about the knowledge and learning gained through delivery of technical assistance; and (iii) the CTCN Director about timeliness and appropriateness of the delivery of the activities and outputs.

Annexure 1

TOR for experts

A. Expert- Energy Efficiency

The following activities will be undertaken by the Expert- Energy Efficiency:

(1) The expert will undertake field visits to each selected sites to carry out energy audit of pumping systems and other energy intensive points.

(2) The expert will arrange her/his own instruments (power analyser, ultrasonic flow meter, etc.) for undertaking measurements of key operating parameters.

(3) The expert will collect historical data of selected facilities from SW such as energy consumption (monthly/yearly) for a period of 3 to 5 years based on availability, energy tariffs, actual/estimated water pumped from each facility, etc. He will study in detail the system configurations, including the stand-by and operating pumps, piping network and sewage system, as applicable.

(4) The performance of pumps in terms of efficiency and specific energy consumption (SEC) will be evaluated. This would include measurement of key operating parameters of the pumps such as water flow, head developed, power consumption and other relevant parameters.

(5) The expert will prepare 'detailed feasibility report' of identified EE options that would help in improving energy efficiency of pumping stations and reducing energy costs. The report shall further include details such as financial analysis of the EE options with energy savings, investment required and GHG reduction potential.

(6) The expert will prepare 'tender documents' for short-listed EE options that would support Solomon Water in the procurement of energy efficient equipment.

(7) SW would provide following support to the consultant during energy audits: (i) Providing the necessary details related to energy consumption of selected pumping stations, (ii) Providing existing technical specifications of pumps being studied, (iii) sharing related details such as pump capacities, number of pumps in operation & standby, (average) hours of operation, maintenance (planned and forced), outage, energy consumption, and (iv) making available a dedicated electrician during the study while undertaking measurements.

(8) The expert will undertake energy audits of pumping stations as provided in table 1.

Table 1. Locations for energy audits of pump stations

S No	Island	Name of pump station	Total number of pumps
1	Honiara	Titinge pump station	30 kW X 3 no.
2	Honiara	Skyline pump station	22 kW X 3 no.
3	Honiara	Tuvaruhu JICA pump station	37 kW X 2 no.
4	Honiara	Kongulai pump station	90 kW X 3 no.
5	Auki	Kwaibala pump station	11 kW X 2 no.

S No	Island	Name of pump station	Total number of pumps
6	Noro	Noro pump station	37 kW X 2 no.
7	Tulagi	Tulagi pump station	7.5 kW X 1 no.

B. Experts - Renewable Energy

The Experts- Renewable Energy will undertake study on feasibility for application of solar photovoltaic (SPV)/ SPV with battery in the following islands as provided in table 2. The expert will assess the space available on ground and on rooftop to install solar PV. The experts will a conduct a preliminary assessment of the feasibility of other RE technologies and potential to generate energy from other sources. The suggested RE technology should be suitable to support the operation of the pumping stations for example intermittent pumping operations may require the SPV plant either connected to grid or with battery storage options. The experts will prepare detailed feasibility report on RE based SGOs that include technical and financial analysis of power generation capacity, investment required, energy generation potential, GHG reduction potential, etc. He further prepare 'tender document' with technical specifications, which can be used as a guide document by the Solomon Waters towards procurement and installation of SPVs in different locations as identified in the TOR. The tender document should be prepared considering the expansion plan of SW e.g. as per the 5year action plan of SW, a desalination plant will be installed to support the water services which will also have operational energy requirements.

Table 2. Locations for feasibility study for application of SPVs

S No	Location
1	Auki island
2	Noro island
3	Tulagi island

C. Common for Expert-Energy Efficiency and Experts- Renewable Energy

The Expert-Energy Efficiency and Expert-Renewable Energy will make a detailed presentation of the activities planned in each of the selected facility and methodology proposed for energy audits. The experts will hold meetings and discussions with key personnel in SW and other key stakeholders, if any, as arranged by SW. The team will present preliminary findings to the Solomon Waters and other key stakeholders as decided by SW to take into their views and finalise the required documents.

Further, the team will prepare a report on overall funding requirements and financing options that would help Solomon water in taking up further activities pertaining to actual implementation of the EE and RE options in the coming years.