CTCN
CLIMATE TECHNOLOGY CENTRE & NETWORK

Technical Assistance Response Plan – Terms of Reference

Country	**Seychelles**
Request ID#	2016000090
Title	*Formulating a National Grid Code for Seychelles*
NDE	*Mr Will Agricole* *Principal Secretary for Energy and Climate Change,* *Government of Seychelles* *w.agricole@meteo.gov.sc* *P.O. Box 445* *Botanical Garden, Mt. Fleuri* *Victoria* *Mahé, Seychelles*
Proponent	*Dr Laurent Sam* *Energy Engineer* *Public Utilities Corporation (PUC)* *(+248) 2816694* *(+248) 2816694* lsam@puc.sc *P.O. Box 174, Electricity House, Roche Caiman, Victoria, Seychelles*

Summary of the CTCN technical assistance

The Republic of Seychelles has undertaken a process for climate change technology deployment and reduction of CO2 emission. This is aiming to gradually replace current diesel generation that are primary source of electric energy, with Renewable Energy Resources. Targets have been set up for deployments for 2020 and 2030 with a long-term objective of approaching 100% renewable. The small-scale system puts technical challenges on RES deployments; the Independent Power Producer scheme, which has been proposed for RES acceleration and to attract investment in the Island requires a solid regulatory framework for reference to lower investment risks. The purpose of the project is to deliver a unified Grid Code which provides certainty for IPP investors in the Energy sector, in particular: connection rules, technical requirements and performances of RES generation, and the governance of the Planning and Operation processes in the Republic of Seychelles for the future decades. One of the major technical barriers is grid stability: as soon as RES penetration exceeds a threshold, the stability is compromised; this is particularly true starting from the smallest islands that the country is composed of. Furthermore, a technology roadmap will be delivered with particular focus on those actions that facilitate RES integration and control, allowing RES to contribute to system stability.

Agreement:

(If possible, please use electronic signatures in Microsoft Word file format)

National Designated Entity to the UNFCCC Technology Mechanism
Name: **Mr Will Agricole**
Title: **Principal Secretary for Energy and Climate Change**
Date: 19/06/2017
Signature:

Proponent (signature of the Proponent is optional)
Name: Dr Laurent Sam
Title: Energy Engineer

Date: 16/06/2017

Signature: Laurent Sam

UNFCCC Climate Technology Centre and Network (CTCN)

Name: Jukka Uosukainen
Title: CTCN Director
Date: 22 June 2017
Signature:

1. Background and context

Seychelles is an archipelago made up of 115 small islands in the Western Indian Ocean (4° 39' 19" S, 55° 28' 58" E). It has a population of 90,000 people, most of whom live on the three main islands of Mahé (area = 157.3 km2), Praslin (38.5 km2) and La Digue (10 km2). La Digue obtains its electricity by an underwater cable from the power station on Praslin, but the Mahé electricity grid is not interconnected to them. The total electricity consumed in 2016 was 406 GWh, whilst the peak power demand in 2016 on Mahe and Praslin was 57MW and 8.2 MW respectively. The vast majority of the electricity is produced from fossil fuels (HFO), but there is a desire to transition towards using more renewable energy. The effects of this dependence was particularly felt in 2008 when Seychelles was hit hard by oil prices spikes. The Government of Seychelles sees the diversification of the energy sector as an important strategic decision for the country's future.

The Seychelles Energy Policy has set renewable energy targets of 5% penetration in 2020 and 15% in 2030 with an ultimate goal of 100% clean energy. In particular, Seychelles is seeking to exploit its abundance of renewable sources of energy in the medium and long term. The use of renewable energy is a cost-effective way to generate electricity from local resources to cope with the increase demand in the medium and long term. It contributes to achieving a sustainable and environmental friendly development of the country.

In addition, with an appropriate regulatory framework, attracting private investments in the energy sector may help to develop the island further, improving educational skills, jobs and opportunities for the local community in the long term.

2. Problem statement

Giving the size of the Seychelles electricity system, RES integration is a major challenge, both for steady state and stability issues. Load will vary at different times of the year, week or day, and a large penetration of RES could cause curtailments when power is not necessary. Large penetration of RES can offset conventional generation production. In those cases, the reserve margin is a critical parameter to plan the need of hot and spinning reserve in operation. In addition, voltage stability and reactive power control is also required. These control issues shall be addressed by RES itself in term of generation capability requirements for Fault Ride Through (FRT), frequency and voltage regulation.

For this purpose, additional technologies may be coupled with RES connection to optimize the investment and guarantee technical performance without deteriorating the RES potential. A robust Grid Code can act as a confidence-building reference for multiple stakeholders. A RES-compatible Grid Code helps RES investors to have certainty when applying for connection, helps operators to implement the projects and supports the regulator to monitor the RES deployment process as well as to define needs for changes. Such a code is also an opportunity to gather stakeholders' engagement and propose an agreed set of rules valid for the present but flexible to accommodate foreseeable future initiatives. It should be noted that small system RES applications will require, in the short term, more advanced concepts and technologies to overcome barriers and limitations typical of the traditional RES.

The problem statement for this request is:

1. What is a fit-for-purpose, RES-compatible Grid Code for the context of the Seychelles?
2. How to build the right local competences to support deployment of RES under a new Grid Code?

3. Logical Framework for the CTCN Technical Assistance:

(Guidance: Please note that multiple activities lead to one Output, and multiple Outputs lead to one Outcome. There can be several Outputs, but only one Outcome description capturing the CTCN technical assistance. Deliverables are the products or services to be delivered to the NDE/Proponent/CTCN based on the Activities and the Outputs.)

	Weeks											
	1	2	3	4	5	6	7	8	9	10	11	12
Objective: Formulation of a National Electricity Grid Code to accelerate Renewable Energy Sources deployment in Seychelles.												
Outcome: Current practice in Seychelles for renewable Energy connection is performed case by case with the coordination of PUC. PUC coordinates connections based on technical practice. Long Term Scenario put challenges on current Seychelles practice in relation to RES penetration. However, targets within Climate Change initiative has given Seychelles potential to achieve 15% of RES by 2030, with a resource potential to achieve up to 100% in the long term. Purpose of the TA is to provide a framework of discussion, within Seychelles stakeholders to set up common rules for RES connection aiming at maintaining a safe, reliable and economic production, transmission and distribution electric system and ultimately a National Grid Code.												
Output 1: Development of implementation planning and communication documents												
Activity 1: *DNV GL will undertake the following:* i) Prepare a detailed work plan of all activities, deliveries, outputs, deadlines and responsible persons/organisations and detailed budget to implement the Response Plan. The detailed work plan and budget is based directly on this Response Plan; ii) Based on the work plan, prepare a monitoring and evaluation plan with specific, measurable, achievable, relevant, and time-bound indicators used to monitor and evaluate the timeliness and appropriateness of the implementation. The monitoring and evaluation plan will apply selected indicators from the Closure and Data Collection report template and enable the implementer to complete the CTCN Closure and Data collection report at the end of the assignment; iii) Prepare an initial two-page CTCN Impact Description and update/revise once the technical assistance is fully delivered based on the CTCN template; iv) Complete the CTCN Closure and Data Collection report at the end of the technical assistance												
Deliverable 1: i) Detailed work plan ii) Monitoring and evaluation plan iii) CTCN Impact Description (draft and final) iv) Closure and Data Collection report												
Output 2: Review of Available Documents, Studies, Energy Policies, Visions, current practice for Renewable Connection and a GAP analysis *(Guidance: Outputs are new products and/or services that are produced by the implementers of the technical*												

assistance, through completion of activities, and within the control of the CTCN technical assistance).											
Activity 2.1: **Review Present Practice for RES connectivity. Single out the stakeholders that have been involved so far in grid connection**											
Activity 2.2: **Undertake Document Revision System studies (Okinawa and Energynautics). Single out the main points stressed in the study**, particularly around: 2.2.1 Regulatory framework 2.2.2 Technical Challenges 2.2.3 Mitigations and technology applications 2.2.4 Medium, Long Term Planning Scenarios											
Activity 2.3: **Undertake Document Revision of the draft Grid Code by Energynautics, "Seychelles Grid Code" 31.08.2014.** focused on: 2.3.1 Definitions, Stakeholders and Governance 2.3.2 Technical Requirements: Static/Dynamic 2.3.3 System Services 2.3.4 Simulation, Metering, Control and Communications 2.3.5 Applicable Standards and reference documents											
Activity 2.4: **Review current Energy Policies 2010-2030** regarding the following topics: 2.4.1 Definitions, Stakeholders and Governance 2.4.2 Renewable Targets 2.4.3 Definitions of Energy Scenarios 2.4.4 Proposed Renewable Technologies: e.g. Solar, Wind, Biomass. 2.4.5 Other technologies: e.g. Storage Batteries, Smart Grids, combined production of Water and Electricity 2.4.6 Demand participation policies, Demand Side Management (DSM), Demand Control, Solar Roof Initiatives, Prosumers 2.4.7 Electrification of transportation, Electric vehicles, Public Transportation, Charging Points 2.4.8 Water Security											
Activity 2.5: **Undertake Gap Analysis using results of activity 2.1, 2.2, 2.3 and 2.4** in relation to the following: 2.5.1 Stakeholder definitions: Conventional Generators, Renewable Generators, Aggregators, Service											

Providers, Customers, Prosumers 2.5.2 Grid Code Governance 2.5.3 Technical requirements: - Steady state performances: Voltage limits, Reserve margin - Dynamic performances: Frequency limits, Power Quality, Voltage Step, Dynamic reserve - System Services provision: Normal Operation, Emergency, Black starts - Minimum technical requirements for Communication, Security and Cybersecurity 2.5.4 Data Modelling 2.5.5 Testing, verification, connection approval 2.5.6 Additional requirements for special stakeholders other than conventional generators 2.5.7 TSO/DSO relationships.											
Deliverable 2: Through the gap analysis (activity 2.5) a list of contents shall be produced. These will be used: 1) As an index for the new Grid Code 2) As a list of possible stakeholders to which future initiatives will be addressed (System Services, DSM, distributed generation policy, Feed In Tariff, IPP etc.) 3) As input for the discussion on near, medium and long term scenarios 4) As challenges to define a possible technology roadmap 5) As an indication to policymakers of a possible future energy policy roadmap											
Output 3: Near Term and Long Term requirements for the energy system											
Activity 3.1: **Developing scenarios to 2030 and beyond**. Scenarios shall consider deliverable 2. They may incorporate deployment of renewable, bulk and distributed, electrification of transport, application of additional technologies, based on expected success of government energy initiatives. Horizon as well as intermediate years shall be defined											
Activity 3.2: **Analysis of Challenges and Opportunities**. Each scenario shall be examined in terms of possible barriers for implementation. For each scenario, medium and large scale deployment in terms of probability shall be defined for Intermediate years and Horizon years											
Activity 3.3 **Selection of the best scenarios based on SWOT analysis**. Using SWOT and ranking techniques, only the most probable shall be considered											
Deliverables 3: This will indicate several envisaged realistic scenarios towards 2030, that is, trajectories that must be considered for the definition of the Grid Code. Trajectories can focus on one element or a combination of elements. The envelope of the trajectories in this deliverable provides an indication of stakeholders, who need to be addressed in the Grid Code											
Output 4: Define a Technology Road map. Define grid technology that can be applied from now to 2030. Some Technologies are already mature, reliable and cost effective, others may become mature in due											

course, by 2030.												
Activity 4.1: **Identify technologies for RES and possible performances**: Wind turbines: • Size and efficiency • Controllability • Static and dynamic performances, • System services provision, etc. Solar photovoltaic panels (no solar thermal is foreseen in the analysis), • Utility and roof top scales • System services and possible operating flexibilities												
Activity 4.2: **Identify technologies and initiatives for Demand Participation**. • Efficiency initiatives • Demand Response Economic/Reliability • Provision of flexibility, i.e. storage, for Power Quality, i.e. voltage control												
Activity 4.3: **Identify Electrification of Transportation potential**. • Public sector transportation (including specific tourism services), • Private transportation • Commercial transportation												
Activity 4.4: **Identify intersectoral technologies**, e.g. combined electricity and water technology and identify challenges and opportunities. This is to address efficiency together with water security requirements for the future.												
Activity 4.5: **Identify T&D Grid technology**, • Use of Cables and Overhead lines • Subsea cables for interconnection among islands • Voltage level • Economics • Technical challenges • Environmental challenges												
Deliverables 4: Define technical requirements for RES, Demand participation, Distributed Generation, Electrification of Transportation, T&D technologies and cost/benefit benchmark, provide International experience and case studies where possible, technology providers, maturity and perspectives in the long term.												
Output 5: Future Policies Road map												

Activity 5.1: **Define the Expected policies for Renewable Energy Resources, bulk, distributed and a regulatory framework which needs to be addressed**, (i.e. IPP, FIT, System Services, i.e. Reserve, Flexibility, Frequency response, voltage regulation)												
Activity 5.2: **Define Demand Control Policy (DSM), load shifting, Demand response, Peak Shaving and technical requirements to address economics and/or reliability**												
Activity 5.3: **Define Ancillary Services market**: type of service, voltage regulation, reserve, frequency control, and relevant slow, medium and fast dynamic performances, stakeholder for Service provision, flexibility service												
Activity 5.4: **Address Water Security targets** and discuss opportunities to implement up to date efficient technologies which may interface with the Electricity System												
Activity 5.5: **Define auxiliary policies to facilitate implementation**, covering the Smart Grids concept, smart metering deployment, data integrity, cybersecurity and data management												
Deliverables 5: 1. Implementation plan of RES deployment, targets stakeholder timelines over the planning period 2. Implementation plan for DSM, Ancillary Services and Electricity & Water. 3. Regulatory requirements and recommendations 4. Auxiliary initiatives for implementation, i.e. Smart metering, communication system, data management, cybersecurity.												
Output 6: A National Grid Code for the Seychelles												
Activity 6.0: **Define general principles of the Grid Code**: Definitions, Governance, Identification of Stakeholders, Ownership and Changes. A list of definitions is developed as well as a Governance scheme of the Grid Code (GC) in case the GC is changed in the future. In addition, a list of stakeholders that may have to comply to GC rules will be provided according to deliverables 2, 3 and 4.												
Activity 6.1: **Define Planning Procedures for connections, data requirements and modelling**. The planning procedures will be such that users who wish to connect to PUC, will need to provide data and model information on the technology to be connected, compliant to PUC specification. The planning procedures will specify data requirements for each stakeholder type (e.g. prosumers or commercial developers), and technology type (e.g. conventional generators, solar PV, wind, storage, etc.) Applicable standards for connection design will be defined, i.e. earthing resistance, clearances between devices, etc.												
Activity 6.2: **Define the operation procedure for each stakeholder group**. An Operational Planning procedure will be defined for e.g. outage maintenance, generators and T&D and planning resources to match demand forecast. Operation procedure shall handle a situation where a generator is connected at the DSO level. In that case, the stakeholder managing the TSO/DSO connection will need to define the Net Demand Level. TSO/DSO connection is required to define Net Demand level should some generator be												

connected at DSO level. For the operation procedures, PUC will be responsible to provide system services, to maintain system within technical limits. They will be defined in terms of frequency deviation, min and max, voltage deviation for steady state performances and ramp rates for dynamic performances. The GC will indicate which system services will be due, i.e. for Frequency and Voltage control, for black start capability, Reserve slow, medium, and whom is going to provide the service, size of generator, interconnections, storage etc. In addition, instructions will be developed for PUC for network control and actions towards affected stakeholders.												
Activity 6.3: **Define a Data Flow and Communication from/to the field**. In particular, the communication about events, the severity, actions to be taken, stakeholder involved. A coordination procedure between stakeholders will be designed. Also, the minimum technical requirements for communication, security and cybersecurity are described and the applicable International standards will be indicated.												
Activity 6.4: **Define operational testing and emergency procedures, duties and responsibilities and Restoration Plan**. A list of tests will be defined to prove a connection is compliant and accepted in operation. Depending on the stakeholder, the type of user to be connected, the tests may cover: capability curve, black start capability, voltage control, frequency control, power quality, ramp rate up and down. Operational testing shall consider temporary deviations in case of breaches, and actions to be considered by the connecting stakeholder.												
Activity 6.5: **Define the Minimum Technical Requirements for stakeholders and technologies**, e.g. for special generations, Load Controls and other technologies. This specifically addresses each generator type, or grid technology; for instance, the definition of the capability curve for each generator type in term of MW and Mvar, the Fault Ride Through (FRT), ramp rate and flexibility performances and the frequency control capability. Also, we will indicate whether the technology provides primary, ancillary or both services.												
Activity 6.6: **Define regular monitoring, testing and the criteria for compliances or otherwise**. During monitoring, PUC will need to check stakeholder performances to verify compliances with their contractual obligations. Each stakeholder will have the obligation to cooperate by providing required information to PUC.												
Deliverables 6: The National Electricity Grid Code, with procedures and recommendations, and reference to the applicable (international) standards.												
Output 7: Outcome Dissemination												
Activity 7.1: Prepare and deliver a Stakeholder Workshop in the Seychelles												
Activity 7.2: National Delivery of Policies for Renewables. Media advertising of short term initiatives.												
Deliverable 7: Proceedings of the Dissemination: Papers, Panel Sessions, Engagement of Seychelles Community in facilitation of RES deployment, workshop report, feedback form, DNVGL certificate to attendees												

4. Resources required and itemized budget:

Please provide an indicative overview of the resources required and itemized budget required to implement the CTCN technical assistance, including for M&E-related activities, using the table below. Once the Response Plan is completed, a Response Implementation partner(s) will be selected by the Climate Technology Centre (CTC). A detailed activity-based budget for the CTCN assistance will be finalized by the CTCN and selected Implementer.

Activities and Outputs	**Input: Human Resources**	**Input: Travel**	**Inputs: Meetings/events**	**Input: Equipment/Material**	**Estimated cost, USD**	
	(Title, role, estimated number of days)	(Purpose, national vs. international, number of days)	(Meeting title, number of participants, number of days)	(Item, purpose, buy/rent, quantity)	Please accumulate the costing at Activity and Output level and provide an estimated costing range for each activity and the total Response Plan	
					Minimum	**Maximum**
Output 1: Development of implementation planning and communication documents						
Activity 1.1: Work Plan	Senior Consultant, 1 day	none		Conference Call	800	1000
Activity 1.2: Project Schedule	Senior Consultant, 0.5 day	none		Conference Call	400	500
Activity 1.3: Project Progress Report	Senior Consultant, 0.5 days	none		Conference Call	400	500
Activity 1.4: CTCN Impact Description	Senior Consultant, 1 day	none		Conference Call	800	1000
Activity 1.5: Closure and Data Collection Report	Senior Consultant, 1 day	none		Conference Call	800	1000
Deliverable 1				**Subtotal**	3200	4000

Activities and Outputs	Input: Human Resources	Input: Travel	Inputs: Meetings/events	Input: Equipment/Material	Estimated cost, USD	
	(Title, role, estimated number of days)	(Purpose, national vs. international, number of days)	(Meeting title, number of participants, number of days)	(Item, purpose, buy/rent, quantity)	Please accumulate the costing at Activity and Output level and provide an estimated costing range for each activity and the total Response Plan	
					Minimum	**Maximum**
Output 2: Present Status, Current Practice, GAP analysis, Stakeholder Identifications						
Activity 2.1: Review Present Practice for RES connectivity and stakeholder analysis	DNVGL, Principal 0.5day, Senior 1 day	none		Conference Call	1440	1800
Activity 2.2: Undertake Document Revision System studies (Okinawa and Energynautics)	DNVGL, Principal 2 day, Senior 1.5 day	none			2800	3500
Activity 2.3: Undertake Document Revision: drafted Grid Code	DNVGL, Principal 1 day, Senior 0.5 day	none	E-mails with Stakeholders	Conference Call	2080	2600
Activity 2.4: Review current Energy Policies 2010-2030	DNVGL, Principal 0.5 day, Senior 1 day	none	E-mails with Stakeholders	Conference Call	720	900
Deliverable 2				**Subtotal**	7040	8800

Activities and Outputs	Input: Human Resources	Input: Travel	Inputs: Meetings/events	Input: Equipment/Material	Estimated cost, USD	
	(Title, role, estimated number of days)	(Purpose, national vs. international, number of days)	(Meeting title, number of participants, number of days)	(Item, purpose, buy/rent, quantity)	Please accumulate the costing at Activity and Output level and provide an estimated costing range for each activity and the total Response Plan	
					Minimum	**Maximum**
Administrative Logistics and Meetings	DNVGL, Principal 1 day, Senior 1 day	Attend Kick-off meeting at PUC premises	Kick-off meeting: "**Towards a National Grid Code for Seychelles**". 30 participants in Seychelles meeting, duration 1day	Kickoff Meeting in Seychelles, Procurement, rooms and logistics to be provided by Local Organizer Committee (LOC). DNV-Gl will provide $1,375 as co-payment for the workshop	2575	2875
Output 3: Near, Medium Long Term requirements	This output will be delivered in close consultation with planning professionals and we propose to work with a group chaired by the planning department of PUC					
Activity 3.1: Analysis and Definition of Developing Trajectories (Scenarios)	DNVGL Senior, 1 day, 0.5 Principal	none	DNVGL Coordination: calls, minutes	Conference Call	1520	1900

Activities and Outputs	Input: Human Resources	Input: Travel	Inputs: Meetings/events	Input: Equipment/Material	Estimated cost, USD	
	(Title, role, estimated number of days)	(Purpose, national vs. international, number of days)	(Meeting title, number of participants, number of days)	(Item, purpose, buy/rent, quantity)	Please accumulate the costing at Activity and Output level and provide an estimated costing range for each activity and the total Response Plan	
					Minimum	**Maximum**
Activity 3.2: Analyses, Challenges and Opportunities	DNVGL Senior, 1 day, 0.5 Principal	none	DNVGL Coordination: calls, minutes	Conference Call	1520	1900
Activity 3.3: Selection based on a SWOT Analysis	DNVGL Principal, 1.5 days	none	DNVGL Coordination: calls, wrap up, draft report	Conference Call	1200	1500
Deliverable 3				**Subtotal**	5615	6675
Output 4: Technology Road Map	This output will be delivered in close consultation with the private sector and we propose to work with a group chaired by the nominee of the private sector					
Activity 4.1: Technologies for RES	DNVGL Principal, 1. day	none	DNVGL Coordination: calls, minutes	Conference Call	640	800

Activities and Outputs	Input: Human Resources	Input: Travel	Inputs: Meetings/events	Input: Equipment/Material	Estimated cost, USD	
	(Title, role, estimated number of days)	(Purpose, national vs. international, number of days)	(Meeting title, number of participants, number of days)	(Item, purpose, buy/rent, quantity)	Please accumulate the costing at Activity and Output level and provide an estimated costing range for each activity and the total Response Plan	
					Minimum	**Maximum**
Activity 4.2: Technologies for Demand Participation (DSM) & Intersectoral Technologies (i.e. Electricity/Water)	DNVGL Principal, 1. day	none	DNVGL Coordination: calls, minutes	Conference Call	1280	1600
Activity 4.3: Technologies for Ancillary Service Provisions	DNVGL Principal, 0.5 day	none	DNVGL Coordination: calls, minutes	Conference Call	640	800
Activity 4.4: Intersectoral Technologies (i.e. Electricity/Water)	DNVGL Principal, 1. day	none	DNVGL Coordination: calls, minutes wrap up, draft report	Conference Call	1280	1600
Activity 4.5: T&D Grid technology, Use of Cables and Overhead lines, subsea cables, interconnection among islands, voltage level, economics, technical challenges, environmental challenges	DNVGL Principal, 1. day	none	DNVGL Coordination: calls, minutes wrap up, draft report	Conference Call	640	800
Deliverable 4				**Subtotal**	4480	5600

Activities and Outputs	Input: Human Resources	Input: Travel	Inputs: Meetings/events	Input: Equipment/Material	Estimated cost, USD	
	(Title, role, estimated number of days)	(Purpose, national vs. international, number of days)	(Meeting title, number of participants, number of days)	(Item, purpose, buy/rent, quantity)	Please accumulate the costing at Activity and Output level and provide an estimated costing range for each activity and the total Response Plan	
					Minimum	**Maximum**
Output 5: Future policies Roadmap (Chair: SEC/MEECC)	This output will be delivered in close consultation with SEC/MEECC and we propose to work with a group chaired by a nominee of SEC/MEECC					
Activity 5.1: RES schemes (IPP, FIT, others), bulk/distributed	DNVGL Senior, 1 day	none	DNVGL Coordination: calls, minutes	Conference Call	800	1000
Activity 5.2: Demand policies implementation (DSM/DR)	DNVGL Senior, 0.5 day	none	DNVGL Coordination: calls, minutes	Conference Call	400	500
Activity 5.3: Ancillary Services provisions	DNVGL Senior, 1 day	none	DNVGL Coordination: calls, minutes	Conference Call	800	1000
Activity 5.4: Electricity & Water	DNVGL Senior, 1 day	none	DNVGL Coordination: calls,	Conference Call	800	1000

Activities and Outputs	Input: Human Resources	Input: Travel	Inputs: Meetings/events	Input: Equipment/Material	Estimated cost, USD	
	(Title, role, estimated number of days)	(Purpose, national vs. international, number of days)	(Meeting title, number of participants, number of days)	(Item, purpose, buy/rent, quantity)	Please accumulate the costing at Activity and Output level and provide an estimated costing range for each activity and the total Response Plan	
					Minimum	**Maximum**
Activity 5.5: Auxiliary policies to facilitate the implementation: Smart Grids concept, Smart metering deployment, data security, cybersecurity, Data management.	DNVGL Senior, 0.5 day	none	DNVGL Coordination: calls, wrap up, draft report	Conference Call	400	500
Deliverable 5				**Subtotal**	2800	3500
Output 6: Developing National Grid Code						
Activity 6.0: Generals about the Grid Code: Definitions, Governance, identification of Stakeholders, Ownership and Changes	DNVGL Principal, 1.5 days	none	DNVGL Coordination: calls, minutes	Conference Call	1920	2400
Activity 6.1: Definition of Planning Procedures for connections, data requirements, modelling	DNVGL Principal, 1.5 days	none	DNVGL Coordination: calls, minutes	Conference Call	1920	2400

Activities and Outputs	Input: Human Resources	Input: Travel	Inputs: Meetings/events	Input: Equipment/Material	Estimated cost, USD	
	(Title, role, estimated number of days)	(Purpose, national vs. international, number of days)	(Meeting title, number of participants, number of days)	(Item, purpose, buy/rent, quantity)	Please accumulate the costing at Activity and Output level and provide an estimated costing range for each activity and the total Response Plan	
					Minimum	**Maximum**
Activity 6.2: Definition of the Operation procedure for all stakeholders	DNVGL Principal, 1.5 days	none	DNVGL Coordination: calls, minutes	Conference Call	1920	2400
Activity 6.3: Define a Data Flow and Communication from/to the field. Consider appropriate technology for Cybersecurity	DNVGL Senior, 2 day	none	DNVGL Coordination: calls, minutes	Conference Call	1600	2000
Activity 6.4: Define Operational testing, Emergency procedures, duty and responsibility and Restoration Plan	DNVGL Senior, 2 day	none	DNVGL Coordination: calls, minutes	Conference Call	1200	1500

Activities and Outputs	Input: Human Resources	Input: Travel	Inputs: Meetings/events	Input: Equipment/Material	Estimated cost, USD	
	(Title, role, estimated number of days)	(Purpose, national vs. international, number of days)	(Meeting title, number of participants, number of days)	(Item, purpose, buy/rent, quantity)	Please accumulate the costing at Activity and Output level and provide an estimated costing range for each activity and the total Response Plan	
					Minimum	**Maximum**
Activity 6.5: Define Minimum technical Requirement for stakeholders: Special Generations, Load Controls, other Technologies	DNVGL Senior, 1.5 days	none	DNVGL Coordination: calls, minutes	Conference Call	1200	1500
Activity 6.6: Define Monitoring, testing and the criteria for compliances or otherwise	DNVGL Senior, 1 day	none	DNVGL Coordination: calls, minutes	Conference Call	800	1000
Deliverables		none	DNVGL Coordination: calls, wrap up, draft report	**Subtotal**	10560	13200
Output 7: Dissemination		International Workshop Closing of the project 1 day	National/International, 40 participants, 1 day	Meeting organization 1 days, Material, Proceedings, Venue, Rooms, Logistics Certificates of attendance to be provided by LOC	2500	3125

Activities and Outputs	Input: Human Resources	Input: Travel	Inputs: Meetings/events	Input: Equipment/Material	Estimated cost, USD	
	(Title, role, estimated number of days)	(Purpose, national vs. international, number of days)	(Meeting title, number of participants, number of days)	(Item, purpose, buy/rent, quantity)	Please accumulate the costing at Activity and Output level and provide an estimated costing range for each activity and the total Response Plan	
					Minimum	**Maximum**
Activity 7.1: Stakeholder Workshop	DNVGL Principal 0.5 days/Senior 0.5 days	same as above	1 Meeting one day	Sessions Presentations Panelists	960	1200
Activity 7.2: National Delivery of Policies for Renewables. Short term initiatives.	DNVGL Principal 0.5 days/ Senior 0.5 days	same as above	Vision 2030 and beyond: 1) Facilitation of RES. National Grid Code,	Conference Call	960	1200
Activity 7.3: Seychelles Vision 2030 and beyond	DNVGL Principal 1day/Senior 1day	same as above	Technologies, Case of Studies	Conference Call	960	1200
Deliverable 7			1) Proceedings of the Meeting 2) attendance certificate			
				Subtotal	5380	6725
Gender mainstreaming analysis of relevant sections of the grid code and other activities under this Response Plan					400	500
Estimated range of costing for the entire Response Plan					40675	50500

5. Profile and experience of experts

Based on the required Human Resources identified in section 4 (Resources required and itemized budget) please provide a description of the required profile of all involved experts for the implementation of the CTCN Response Plan.

Experts required	Brief description of required profile
Please use the same titles for all experts as applied in section 4.	*Please provide a short description of expertise and experience needed (education, sectors of expertise, years of experience, country experience, language requirements, etc.).*
Principal Consultant	Mr Mansoldo has 26 years of experience, MSC in Electrical Engineering, experienced in Technology for T&D, Deep Knowledge of Cost Benefit Analysis and Techno/economics of Power Systems, Awareness of Technology impact and Mitigation measures, Experience in Electricity market design, Policies for Renewable Integration. Mr Mansoldo is experienced at international level, working with utilities and technology providers. He has good communication skills, ability to multitask, and manage multiscale projects.
Senior Consultant	Mr Trifunovich is a Power Systems consultant with 10 years of experience in the power utility sector in the Middle East. He was awarded with MSc in Power Systems and since then he gained experience in T&D Detailed Design, Procurement and Project Management. He was actively engaged in delivering all aspects of technical submittals, reviews and approvals against contract requirements to enable effective output. Producing reports in a timely and accurate manner to meet requirements, delivering policies and procedures for Transmission and Distribution Companies, developing investment appraisal documents, cost benefit and techno-economic studies, advices on issues related to design and planning, working on preparation of concept designs, tender documents, evaluation of bids and finalization of contracts was his responsibility.
Gender expert	Expert with expertise on gender mainstreaming assessments

6. Intended contribution to impact over time

The grid code will be of national importance that will be used as the reference document for many decades, with periodic minor revisions as deemed necessary by SEC and PUC. After it is created, anyone who wants to connect to the grid will have to follow all the standards set out in the document. This will ensure a safe and stable operation of the grid. It will also reduce uncertainty for investors and enable a rapid increase in the share of renewable energy in Seychelles.

The private sector will be involved in creating the grid code to ensure that they are able to apply the grid code standards when they are designing their installations and preparing to connect to the grid. The grid operator (PUC) will use the grid code to assist in designing its grid and determining whether an applicant can connect to the grid. The regulator (SEC) will ensure that everyone is following the grid code. Furthermore, workshops will be organized to disseminate the information set out in the grid code after it has been finalized.

7. Relevance to NDCs and other national priorities

Seychelles is vulnerable to climate change in respect to energy security in its reliance on fossil fuels. By developing a grid code that will allow the energy sector to more easily accommodate for new sources of energy generation such as renewable energy power, Seychelles will be less vulnerable, and more resilient to shifts in fossil fuel prices and less dependent on foreign energy. It is stated in its Nationally Determined Contributions (NDC) to the UNFCC that the country will deliver in this regard.

In order for Seychelles NDC's to make it possible to track progress and achieve a collective ambitious level sufficient to limit global warming to below 2°C relative to pre-industrial levels, they typically comprise a mitigation goal which represents a progression beyond current undertakings of the Seychelles.

As defined in Seychelles NDC, the Seychelles has embarked on the path to mitigate 5-15% of the GHG emissions by 2030 which will be primarily from solar PV and wind. Due to their intermittency, the stability of the grid will play a vital role in production and consumption of clean energy in the future. One of the challenges to that effect is the ability for the transmission network to absorb the energy produced in the future. As we move forward the vision of the Ministry of Environment, Energy and Climate Change is to surpass the 15% renewable energy intake. Hence with a well-defined grid code this will facilitate the process and allow international standards to be adopted. Seychelles depends primarily on international organizations for assistance due to the lack of local capacity and expertise when it comes to specialized development especially those they have limited experiences in.

The development of a grid code would also support the implementation of the National Energy Efficiency Programme in its aspect of cogeneration possibilities and promotion. It would complement the target put forward in Seychelles Second National Communication to the UNFCCC in its stated developments of technologies for mitigation against the effects of Climate Change in Cogeneration, Solar Energy use, Wind Energy use, and reducing the losses in the supply of electricity in the current system.

The NAP being undertaken by UN Environment Africa will assist in building technology transfer and sharing of information at all levels of society. We need vital standards to be in place during the process. CTCN will play a vital role in emanating all the different component that the climate sensitive areas are experiencing by assistance in the grid code and future endeavors.

8. Linkages to relevant parallel on-going activities:

As per its Energy Strategy core element (Energy Policy 2010-2030), Seychelles is targeting to undertake changes in the Energy Sector to provide a contribution to Climate Change initiative. For example, Seychelles is exploring the introduction of electric vehicles in the future in order to improve its contribution to the "green" image in the Long Term. Furthermore, given the Seychelles' targets to produce 15% of its electrical demand with renewable energy sources by 2030, in 2014 Energynautics GmbH examined if the Seychelles grid could absorb so much renewable generation.

Seychelles has also worked on UNDP-GEF-GOS (Government of Seychelles) supported projects focused on the uptake of small scale solar photovoltaic energy, and improving energy efficiency, both of which address energy security issues in terms of electricity. The connection of the small scale solar PV to the grid will be greatly facilitated by the development of the national grid code. The European Union funded the development of a new Energy Act which has paved the way for the integration of renewable energy sources into the electricity grid.

The PUC also initiated (floated an Expression of Interest) a study on the optimal energy storage size required to maintain stability in the electricity networks of Mahé, Praslin and La Digue. This initiative was due to the increased amount of intermittent renewable energy.

Technical Assistance in developing an unified Grid Code for Seychelles in order to standardize all the connections to the grid, will undoubtedly contribute and facilitate meeting the nation's set energy targets.

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

The grid code document is of strategic importance for PUC who is entitled to play a major role in contributing to Seychelles RES targets. In particular, it is a guidance to the utility for an implementation process of a new power system concept. The document will also help the Regulator in controlling and monitoring the RES integration and deployment as well as that system performances are maintained according to licence obligation signed by PUC. Any breaching can be singled out and trigger a process of revision of the documents and/or a discussion with PUC and other stakeholders. IPP can also refer to this document in case of disputes about RES performances and non-compliances. The document shall also guarantee the deployment of other initiatives for Demand participation. In the future additional technologies as well as DG RES could be installed, in order for the all community to actively participate to the electricity sector. It is noteworthy, the size of the island would require a large number of system ancillary service in order to have large available flexibility in the system. This is recognized to help RES penetration and it is believed a key factor in Seychelles RES deployment. In particular, this is necessary for Seychelles ambitions to move to the 100% targets beyond 2030.

The work done in developing the grid code will be used to demonstrate that solid framework is in place in the energy sector to provide support to a GCF (Green Climate Fund) application in the future.

10. Gender and co-benefits:

Imbedded in design of the activities:	The Technical Assistance is gender neutral and not specifically targeted to focus on specific gender needs.
Gender and co-benefits intended as result of the activities:	The NDE and PUC are to invite female participants to the workshop(s) and various calls with a view to enhanced knowledge transfer and inclusiveness.

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

Using the table below, please list and describe the role of in-country stakeholders, participants and beneficiaries who will be involved in or directly consulted during implementation of the assistance.

In country stakeholder	Role in implementation of the technical assistance
PUC	Supply the drawings and standards used to design the grid so far. Enforce the grid code.
SEC	Define the regulations that must be followed.
Ministry of Environment, Energy and Climate Change	Sets and implements the national policy related to the energy sector.
Private sector	Understand and apply the grid code. Provide installation and after-sale service of equipment.

12. SDG Contributions:

*Instructions: Please complete the grey section below for **a maximum of three SDGs** that will be advanced through this TA. A complete list of SDGs and their targets is available here: https://sustainabledevelopment.un.org/partnership/register/.*

Goal	Sustainable Development Goal	Direct contribution from CTCN TA (1 sentence for top 1-3 SDGs)
1	End poverty in all its forms everywhere	
2	End hunger, achieve food security and improved nutrition, and promote sustainable agriculture	
3	Ensure healthy lives and promote well-being for all at all ages	
4	Ensure inclusive and equitable quality education and promote life-long learning opportunities for all	
5	Achieve gender equality and empower all women and girls	
6	Ensure availability and sustainable management of water and sanitation for all	
7	Ensure access to affordable, reliable, sustainable, and modern energy for all (consider adding targets for 7)	GC documents is key to set rules for implementation of a modern energy system
	7.1 - By 2030, ensure universal access to affordable, reliable and modern energy services	
	7.2 - By 2030, increase substantially the share of renewable energy in the global energy mix	GC has direct impact on this to accelerate the RES deployment and met 15% RES in energy mix.
	7.3 - By 2030, double the global rate of improvement in energy efficiency	GC has direct impact on this to facilitate the implementation of additional technologies that addresses the overall electric energy efficiency
	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	
	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	GC has direct impact on this by stimulated the implementation of modern technologies which enable the facilitation of RES deployment and the additional performances required to the electric system of the future
8	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	
9	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	
10	Reduce inequality within and among countries	
11	Make cities and human settlements inclusive, safe, resilient and sustainable	
12	Ensure sustainable consumption and production patterns	
13	Take urgent action to combat climate change and its impacts	*RES deployment strategy has been recognised as a major to combat climate change. The GC formulation is a big milestone towards the contribution of Seychelles to this issue. 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	
	13.2 - Integrate climate change measures into national policies, strategies and planning	GC it is a pillar for regulation of the Electric Sector and provide guidance for implementation of national policies and future initiatives in the energy sector.
	13.3 - Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning	GC dissemination activity addresses awareness on climate change which is the driver for this TA activity.
	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	
	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	
14	Conserve and sustainably use the oceans, seas and marine resources for sustainable development	
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	
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	
17	Strengthen the means of implementation and revitalize the global partnership for sustainable development	

13. Classification of technical assistance:

Please indicate primary type of technical assistance. Optional: If desired, indicate secondary type of technical assistance.

Please tick off the relevant boxes below	*Primary*	*Secondary*
☐ 1. Technology identification and prioritisation	☐	☒
☐ 2. Research and development of new climate technologies	☐	☐
☐ 3A. Feasibility studies for specific known climate technology options	☐	☒
☐ 3B. Piloting of known technologies in local conditions	☐	☒
☐ 4A. Law, policy and regulatory reform recommendations	☒	☐
☐ 4B. Sector specific roadmap or strategy design	☐	☐
☐ 5. Finance facilitation and market creation	☐	☒

Please note that all CTCN technical assistance contributes to strengthening the capacity of in country actors.

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.