CTCN
CLIMATE TECHNOLOGY CENTRE & NETWORK

Technical Assistance
Response Plan – Terms of Reference

Country	Mauritius
Request ID#	2015000025
Title	Assessment and identification of technology needs and best practices for reducing the GHG emitting potential of the energy sector in Mauritius
NDE	Mrs Sin Lan NG YUN WING Director of Department of Environment Ministry of Environment, Sustainable Development, and Disaster and Beach Management
Applicant	Mrs Sin Lan NG YUN WING Director of Department of Environment Ministry of Environment, Sustainable Development, and Disaster and Beach Management

Summary of the CTCN Technical Assistance
The CTCN Technical Assistance to the Government of Mauritius will assist national priorities for enhancing national monitoring environmental performance of the country's five thermal power plants while transitioning towards increased application of renewable energy in thermal power production. The Outcome of the CTCN Technical Assistance will be a further strengthening of national capacities to monitor environmental and energy related performance of the thermal power plants and to assess options for enhanced energy efficiency learning from international best practices and technologies.

Agreement:

National Designated Entity to the UNFCCC Technology Mechanism for which the Climate Technology Centre and Network is the operative arm

Name: *Mrs Sin Lan NG YUN WING*

Title: *Director of Department of Environment,*

Ministry of Environment, Sustainable Development, and Disaster and Beach Management

Date: *26 July 2016*

Signature:

UNFCCC Climate Technology Centre and Network (CTCN)

Name: Jukka Uosukainen

Title: CTCN Director

Date: 18 August 2016

Signature:

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Background and country/sector context

As per the Mauritius Second National Communication to the UNFCCC, the energy sector in Mauritius is the largest contributor of GHG emissions in the country. In 2013, CO_2 emissions have increased by 2.6% as compared to 2012 with the energy sector accounting for some 61.6% of total CO_2 emissions. During the past decade with the sustained economic growth, the national energy requirement has grown on average at an annual rate close to 5%. Electricity generation, for instance, has increased by 3.1% between 2012 and 2013 with coal (52.8%) and fuel oil (25.9%) being the most dominant fuels. If the trend in energy demand continues and given than the energy mix of Mauritius is heavily reliant on fossil fuels, it is expected that the per capita CO_2 emissions may reach approximately 4.5 tonnes in 2020 and 10.25 tonnes by 2050 compared to 2.8 tonnes in 2012.

Presently in Mauritius, about 56% of electricity generation in the national grid is produced in four power plants making use of bagasse and coal (40.5 MW to 83 MW) and one power plant operating solely on coal (34.5 MW), using the grate type stocker boiler technology. Some 683,000 tonnes of coal and 1,000,000 tonnes of bagasse were applied for electricity production in 2013. The current utilisation of bagasse enables the country to reduce its import of some 375,000 tonnes of coal, thereby preventing approximately 1,200,000 tonnes of CO_2 emissions. However, over the past decade, the area under cultivation of sugar cane has significantly decreased and so has the amount of bagasse available. It has moreover been observed that the amount of coal used for electricity production in recent years has increased. For instance, between 2012 and 2013, the amount of coal used has increased by 5%.

Problem statement

Mauritius is determined to reduce its national GHG emissions. The current energy challenge in Mauritius is to provide reliable affordable energy while transitioning towards more renewable sources thereby meeting the energy needs of its growing economy with the minimum environmental and climatic impact. Whilst renewable energy is expected to form an increasing proportion of the energy mix, it will still be necessary to use utilize coal in the national energy mix. Convention power production using coal will need to abide by environmental and energy related safeguards. These safeguards will, among other benefits, help to decrease the CO2 emissions of the country. However, the national authorities and operational managers at the power plants are facing technical constraints and assistance will be required to:

- Monitor and evaluate the environmental and related performance of the coal based power plants using international best practices;

- Assess the exiting coal based boiler technologies and advise on international best practices and best available techniques to reduce local pollution and GHG emissions from the power plants.

1. 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 TA. Deliverables are the products or services to be delivered to the NDE/Proponent/CTCN, based on the activities and the Outputs.)

	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
Objective: The objective of the CTCN TA is to support the Government of Mauritius and thermal power producers to enhance their capacities for monitoring of environmental and energy related performance and to promote energy efficiency of the power plants.												
Outcome: The Outcome of the CTCN TA will be a further strengthening of the Government and the wider national capacities to implement and monitor climate change mitigation efforts thereby contributing to the national targets for climate change mitigation and nationally intended contributions under the UNFCCC Paris Agreement.												
Output 1: A report containing a comprehensive analysis on environmental performance requirements, formats and parameters for periodic reports, applied technical methodologies to assess environmental performance, and processes applied by the Government of Mauritius to grant license(s) for thermal power production plants. The report should also include recommendations on how to improve monitoring methodologies, formats and processes using best international practices.												
Activity 1.1: Undertake a review of the national and sectoral environmental and energy-related performance requirements relevant for thermal power plants. The review must include requirements and processes for issues government license(s) for the thermal power plants.												
Activity 1.2: Undertake a review of the methodologies, reporting formats and processes applied by the thermal power												

producers to submit period reports on environmental and energy-related performance.	
Activity 1.3: Based on international best practices, provide operational commendations on improved methodologies, reporting formats and processes for assessing environmental and energy-related performance by the thermal power plants and the Government of Mauritius.	
Deliverable 1: Final and nationally consolidated report (or as part of a larger report addressing several Outputs/activities) addressing all items under Output 1 and Activity 1.1 to 1.3.	
Output 2: An analytical report containing a comprehensive baseline study of the existing thermal power plants in Mauritius focusing on technical configurations, applied fuels and plant/boiler specific environmental and energy-related performance. The technical configuration and performance of the thermal power plants are mapped against international best practices.	
Activity 2.1: Undertake a detailed background and baseline study using empirical performance data covering five years from the five thermal power plants on environmental and energy-related performance, power plant configuration and boiler technologies, application of fuels and fuel mix with seasonal variations. The activity will include site visits to all five plants, interviews with operational managers, site-specific data collections, etc. The site visits may be combined with Activity 3.1.	
Activity 2.2: Conduct research on international best practices and best available technologies for improving environmental and energy-related performance using comparable plant configurations, boiler technologies and fuels as present in Mauritius.	

Deliverables 2: Final and nationally consolidated report (or as part of a larger report addressing several Outputs/activities) addressing all items under Output 2 and Activity 2.1 and 2.2. The delivery also includes presentations where key findings and recommendations are discussed and consolidated by national stakeholders and summary of meetings.	
Output 3: Report on technology, process and operational related recommendations to improve the environmental and energy related performance of the five thermal power plants.	
Activity 3.1: Undertake rapid audits of the five power plants in the context on environmental and energy related performance and provide a set of recommendations to improve the performance of the plants in line with international best practices and best available technologies. The recommendations should be factory or boiler specific and include both operational, process and technology related improvements. To the extent possible, the audits and following analysis should include estimated impact of the recommendations using the baseline parameters as applied in Activity 2.1. The activity will include site visits to all five plants, interviews with operational managers, site-specific data collections, etc. The site visits may be combined with Activity 2.1.	
Deliverables 3: Final and nationally consolidated report (or as part of a larger report addressing several Outputs/activities) addressing all items under Output 3 and Activity 3.1. The delivery also includes presentation made at the factories and brief site/plant visit reports.	
Output 4 Training package for capacity building of national and local officials on monitoring and assessment of environmental and energy related performance	
Activity 4.1: Design a modular and open-access training programme aimed for raising capacities of the	

government officers on monitoring of environmental and energy related performance of thermal power plants. The training programme should be open access, transferable and updatable enabling future application by the national authorities without the guidance of the implementing partner.	
Activity 4.2: Implement the training programme by conducting a three-day training-of-trainers workshop with approximately 20-30 participating officers from the government and relevant municipalities.	
Delivery 4: Final and nationally consolidated report (or as part of a larger report addressing several Outputs/activities) addressing all items under Output 4 and Activity 4.1 and 4.2. The training programme should be delivered to Ministry of Environment and Sustainable Development and the CTCN.	

2. Resources required and itemized budget:

Please provide an indicative overview of the resources required and itemized budget required to implement the CTCN 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 Response Implementer.

Outputs	**Indicative Human Resources** *(Type, profile/level, role, estimated number of days)*	**Travel** *(Purpose, national vs. international, number of days)*	**Meetings/ events** *(Meeting title, number of participants, number of days)*	**Equipment/ Material** *(Item, purpose, buy/rent, quantity)*	**Indicative estimated cost range** *Please accumulate the costing at Output level and provide an estimated costing range for the total Response Plan*	
					Indicative costing range	
Output 1	Senior expert with a background within engineering or similar technical field to lead the assessment. Required professional experience within coal based thermal power generation, implementation of	No mission required for Output 1	Only remote communication is expected for Output 1.		Senior expert: $2,500 Technical officer: $1,500	Senior expert: $4,000 Technical officer: $3,000

	technical solutions and environmental reporting. Number of workdays for Output 1: 5 workdays --- Technical officer with a background in engineering or similar technical field to assist the assignment. Main tasks will be related to desk studies. Number of workdays for Output 1: 5 workdays					
Output 2	A senior expert and a technical officer with the same qualifications as described in Output 1. Number of workdays for the senior expert for Output 2: 5	Two international missions to Mauritius will be required in support of Output 2-4. Tentatively, the first mission have a duration of ten working days with the	Technical meetings with national authorities, plant managers and other stakeholder.	Local car rental for site visits.	Senior expert: = $2,500 --- Technical officer: $1,500 Travel costs for two missions to	Senior expert: $4,000 Technical officer: $3,000 Travel costs for two missions to

	workdays. Number of workdays for the technical officer for Output 2: 5 workdays.	objective to undertake meetings with national stakeholders and site visits. The second mission will have a duration of five working days in total with the objective to present findings and recommendations to Ministry of Environment and Sustainable Development. The second mission will also include a three-day training programme (output 4).			Mauritius: $3,000 Local travel incl. car rental: $500 Per diems:$216/day * 15 days: $3,240	Mauritius: $6,000 Local travel incl. car rental: $1000 Per diems:$216/day * 15 days: $3,240
Output 3	A senior expert and a technical officer with the same qualifications as described in Output 1. Number of workdays for the senior expert for Output 3: 5	See Output 2 for international missions.	Technical meetings with national authorities, plant managers and other stakeholder.	Local car rental for site visits.	Senior expert: $2,500 Technical officer: $1,500	Senior expert: $4,000 Technical officer: $3,000

	workdays. Number of workdays for the technical officer for Output 3: 5 workdays.					
Output 4	A senior expert and a technical officer with the same qualifications as described in Output 1. Number of workdays for the senior expert for Output 4: 5 workdays. Number of workdays for the technical officer for Output 4: 5 workdays.	See Output 2 for international missions.	A three-day technical training workshop of national and local authorities.	Venue for workshop	Senior expert: $2,500 Technical officer: $1,500 Workshop venue and other workshop costs: $2,000	Senior expert: $4,000 Technical officer: $3,000 Workshop venue and other workshop costs: $4,000
Estimated range of costing					**$ 24,740**	**$ 42,240**

3. Relevance to NDCs and other national priorities

A Maurice Ile Durable. In 2008, the Prime Minister, Dr. The Honourable Navinchandra Ramgoolam announced the Maurice Ile Durable concept, as being the new long term vision for making Mauritius a sustainable island. Together with the MID concept, a National MID Vision and MID Consultative Working Groups were established in 2011 addressing a number of sectors and themes promoting national sustainability. From the Working Group on Energy a final report was released in 2011 which sets a national target for minimum 17% application of bagasse in the national energy mix for electricity production. From the report, a further increase electricity production from bagasse/biomass is anticipated towards 2025. The CTCN TA can assist the further utilization of bagasse in order to reach the national targets. Furthermore, the CTCN TA will assist national capacities to monitor the applied fuel mix at the power plants whereby progress towards the national targets on renewable energy can be validated.

Long-Term Energy Strategy of the Republic of Mauritius 2009 – 2025.
The long-term energy strategy is the country's energy roadmap to address energy and environmental challenges. It lays emphasis on the development and application of renewable energy, reduction of the country's dependence on imported fossil fuel and the promotion of energy efficiency. The plan presents the envisioned energy mix of Mauritius and provides linkages between the energy sources and new technologies to reduce the environmental impact (including reduction of GHG emissions). Similar to the Maurice Ile Durable, the CTCN TA will contribute to the Long-Term Energy Strategy by promoting awareness about energy efficiency in the existing power plants and enhance capacities to monitor the environmental and energy related performance of the plants.

The Intended Nationally Determined Contribution For The Republic Of Mauritius. The INDC was submitted to the UNFCCC in September 2015 and includes an increase in biomass energy production as a national mitigation action. Furthermore, the INDC promotes efficient use of energy through the deployment of appropriate technologies in all sectors of the economy and awareness raising on energy conservation. The CTCN TA will contribute to an increased application of biomass in the thermal power production as well as information on best international practices and best available technologies for energy efficiency.

4. Linkages to relevant parallel on-going activities:

In the context of reducing GHG emissions in the energy sector, the Government of Mauritius has adopted a Long Term Energy Strategy for the period 2009-2025 and an Energy Strategy (Action Plan) 2011 – 2025 that outlines a series of actions that pertains to increasing the share of renewable in the energy mix, energy conservation and energy efficiency. The salient points addressed in Strategy relevant for power generation are:

- Increase the share of renewable sources of energy in electricity supply (from about 21% presently to 35% in 2025);
- Improve energy efficiency and conservation in all sectors through demand-side management measures (with targeted energy efficiency gains of 10% by 2025 over the 2008 baseline); and
- Create a financially sound and self-sustainable modern electricity sector and a transparent and fair regulatory environment.

About 60 MW of renewable energy projects are currently in the pipeline with a gross private investment of Rs 5 billion and a subsidy of about Rs 235 million per year provided by the Government for the next 20 years. As evident in the forthcoming pipeline, Mauritius has a significant potential for renewable energy production but is facing financial barriers in form of high upfront investment costs.

Mauritius, through the Energy Efficiency Management Office (EEMO) is also implementing a series

of measures with the objective to decreasing the energy demand in various sectors thereby decoupling economic growth from energy demand in the country.

Furthermore, other mitigating measures are being implemented in Mauritius for instance several reforestation programmes that shall increase carbon dioxide sequestration in the country.

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

With the expected technical analysis, recommendations and capacity building, a better understanding will be achieved about best practices and technologies for enhancing energy efficiency and monitoring of environmental performance.

This will eventually result in the following:

- Improved capacities by the ministry and other relevant institutions ensuring effective and appropriate measures to reduce GHG emissions and enhance environmental performance of the thermal power plants.
- Reinforce capacities for Environmental Impact Assessments processes related to energy production.
- Strengthen the mainstreaming of climate mitigation into national policies through a better knowledge of gaps, challenges and solutions for reducing GHG emissions and providing the environmental performance of the energy sector.

6. Gender considerations:

Imbedded in design of the activities:	Gender considerations will be embedded as an essential cross-cutting element throughout the implementation of all activities. More specifically, gender considerations will be integrated in the assessment of the baseline situation in Mauritius as well as in the recommendations provided by the CTCN Technical Assistance. Gender elements and considerations will likewise be evident in the capacity building training module and following training sessions.
Co-benefits intended as result of the activities:	The CTCN Technical Assistance will foster a number of co-benefits for he involved stakeholders and beneficiaries. The enhanced capacities for monitoring environmental performance of the energy sector are likely to be replicable and scalable with the possibility of addressing other sectors. Furthermore, enhanced management of the monitoring processes and proposed international best practices will result in better environmental performance by the energy sector for the benefit of the local environment.

7. 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
Ministry of Environment & Sustainable Development	Coordinate and facilitate stakeholder consultations as well as provide knowledge on local environmental aspects and relevant legislation (Will act as the Lead counterpart of CTCN experts)

Ministry of Energy and Public Utilities	Provide information on the energy sector of Mauritius and on measures or projects implemented to reduce CO2 emissions in the country with particular attention to the energy sector
Ministry of Local Government and Outer Islands	Provide information on any developments, settlements and activities in the surrounding of the project site
Local Authorities in charge of the five thermal power plants.	Provide information on any developments, settlements and activities in the surrounding of the project site
Mauritius Sugar Producers Association	Provide information on the operation of coal fired plants in Mauritius and best environmental management practices in view of limiting GHG emissions
Power plant managers	Plant managers will collaborate with the CTCN Technical Assistance team and share information on baseline technologies, production data, reforming format and process and technical interventions for energy efficiency within the specific plants

8. SDG Contributions:

Instructions: Please complete the grey section below for a maximum of 3 SDGs that will be advanced through this TA. A complete list of SDGs and their targets and indicators 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)	
	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	The CTCN TA will support an accelerated utilization of bagasse by the thermal power plants.
	7.3 - By 2030, double the global rate of improvement in energy efficiency	The CTCN TA will support and provide concrete recommendations on how to improve the energy efficiency at the power plants by using international best practices.
	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	

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	The CTCN TA will support GHG reduction actions within the power sector and thereby contribute to mitigation of global climate change.
	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	
	13.3 - Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning	
	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	

9. 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	☐	☐

10. Monitoring and Evaluation expectations

Upon contracting of the implementing partners to implement this Response Plan, the lead implementer will produce a detailed work plan of activities, deliveries, outputs, dates and specific responsibles. This detailed work plan will be based directly on this Response Plan. The CTCN Technology Manager responsible for this 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 (1) NDE about overall satisfaction level with the technical assistance service provided; (2) the Lead Implementer about the knowledge and learning gained

through delivery of technical assistance; and (3) the CTCN Director about timeliness and appropriateness of the delivery of the activities and outputs.