olade

Organización Latinoamericana de Energía
Latin American Energy Organization
Organisation Latino-americaine d'Energie
Organização Latino-Americana de Energia

Jamaica RE NAMA MRV Project

Final Report:

Jamaica Renewable Energy NAMA MRV Plan

Prepared by: Dr. Oscar Coto

Presented to: OLADE

July 2017

Table of Contents

List of Acronyms

CCD	Climate Change Division
CDM	Clean Development Mechanism
CDM DNA	Designated National Authority to the CDM
CE	Coordinating Entity of a NAMA
COP	Conference of the Parties
ER	Emissions reductions
GEF	Grid emission factor
GHG	Greenhouse gases
GoJ	Government of Jamaica
IFI	International Financing Institution
JPS	Jamaica Public Service Company
MEGJC	Ministry of Economic Growth and Job Creation
MRV	Measure/Monitor Reporting and Verification
MSET	Ministry of Science Energy and Technology
NAMA	Nationally Appropriate Mitigation Action
NDC	Nationally Determined Contribution to the UNFCCC
NRCMS	Non regulated carbon market schemes
OLADE	Latin American Energy Organization
OUR	Office of Utilities Regulation
PCJ	Petroleum Corporation of Jamaica
PIOJ	Planning Institute of Jamaica
RE	Renewable Energy
RCMS	Regulated carbon market schemes
VCS	Voluntary Carbon Standard
VE	Verification Entity

Executive Summary

The Latin American Energy Organization (OLADE) has been providing support to the Ministry of Science, Energy and Technology (MSET) in Jamaica in the development of a proposal for a Nationally Appropriate Mitigation Action (NAMA) within the energy sector and in particular focusing on scaling-up renewable energy contributions to the grid generation mix.

The Jamaica Renewable Energy NAMA is embedded within a strong set of national aspirations as well as energy sector policies that are currently aiming at a 30% contribution from renewable energy electricity within the grid by 2030.

The proposed NAMA has been mentioned within the scope of the First Jamaica Nationally Determined Contribution (NDC) to the UNFCCC that was submitted by the country in April of 2017 upon ratification of the Paris Agreement in April 2017.

The current phase of support provided by OLADE to MSET pertains to the development of a Measuring/Monitoring, Reporting and Verification (MRV) Plan for the proposed NAMA.

The primary objectives of the MRV Plan of the Jamaica Renewable Energy NAMA are:

- Establish the follow-up to the implementation of the NAMA and the achievement of its proposed objectives.
- Respond to the reporting obligations under the Conference of the Parties (COP) of the United Nations Framework Convention on Climate Change (UNFCCC).
- Contribute to the achievement of the country objectives under the Jamaica Nationally Determined Contribution (NDC) to the UNFCCC.

The scope of the Measurement, Reporting and Verification described in the MRV Plan is:

- At a national scale; including initiatives developed within the territory of Jamaica.
- Including activities that contribute to renewable energy interconnection to the electricity grid in Jamaica that have a direct impact in GHG emissions reductions (through application of a sound methodological basis).
- Including activities that could be developed in the future that could have an indirect impact on GHG reductions (through indicators and performance variables).
- With an initial scope that is inclusive of both RE project interconnections as well as the existing Net Billing Scheme, which are currently the preferred policy instruments in place for RE electricity interconnection in the electricity grid of the country.

It is also important to note that under the implementation of the Jamaica RE NAMA, different RE technologies are likely to be included as policy, capacity building, technology transfer and market support efforts are implemented by the government.

The MRV system is configured as a procedure for the collection and aggregation of the necessary information for calculation, measurement, reporting and verification of the emissions reductions (ER) to be produced as a consequence of the different actions to be implemented under the NAMA. “Actions” make reference to those interventions to be

developed under the NAMA that are to be implemented in order to scale up the contribution from renewable energies to the electricity generation mix in the country.

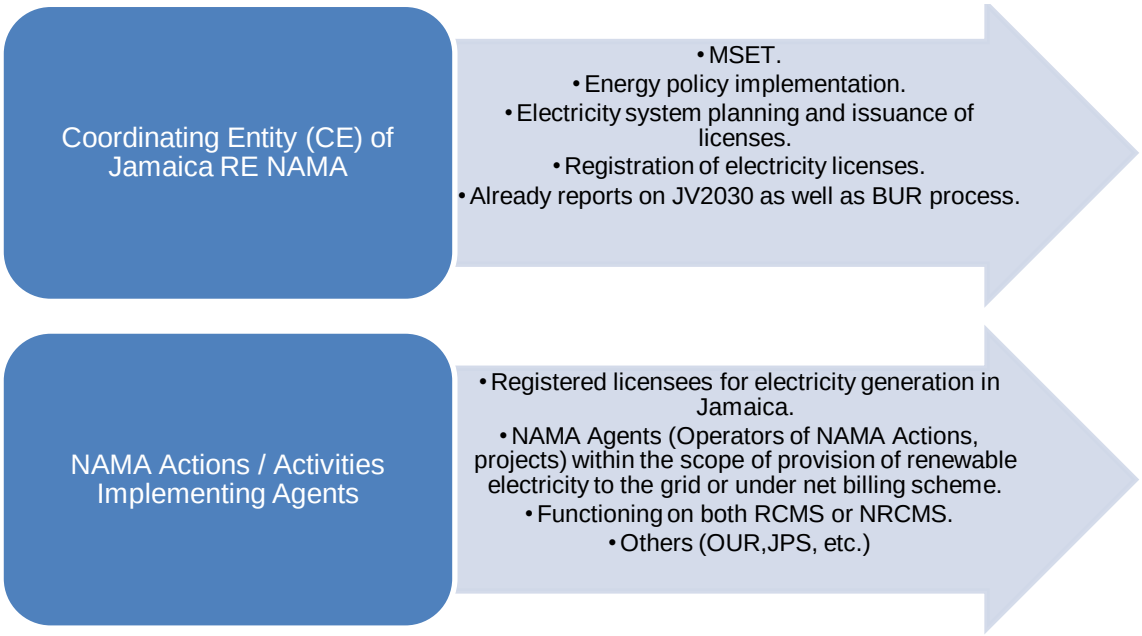
The measurement of both emissions as well as emissions reductions is an important element of the NAMA and it should be done with as much precision as possible. In order to do so, data capture, is the sound basis for any MRV system.

Emissions reductions as well as NAMA co-benefits need to be calculated on a periodical basis for internal in-country tracking and in order to meet UNFCCC reporting needs, based on progress indicators that can allow for re-evaluation and adjustment of emissions trajectories.

The design of the MRV Plan includes the definition of sound metrics for GHGs as well as co-benefits, that can be measured within reasonable uncertainty; and the reporting of the NAMA incorporates general lines of information that are required from the NAMA Coordinating Entity (CE) in order for integration within the country´s Biennial Update Reports (BURs) and NDC. In order to respond to so many demands, the MRV Plan is based on sound transparency, consistency, precision, comparability, integrity, and avoidance of double counting.

In order to address the avoidance of double counting of emissions reductions (ER), the plan proposes to establish a series of 4 carbon emissions accounts that relate to specific paths taken by projects generating ER, and which need to be tracked taking into consideration if the emissions reductions are associated to regulated or not regulated carbon market schemes.

The most relevant participants within the NAMA MRV are the NAMA Coordinating Entity (CE) as well as the NAMA Agents, although there is a myriad of other stakeholders of interest for the MRV implementation; and roles and responsibilities are described in the document.



Data capture of the MRV Plan starts at a first tier with specific templates that are provided and which need to be completed by the NAMA CE and participating NAMA Agents, followed

by integration to a data base that should be kept by the NAMA CE in order to track information. The NAMA data base needs to include the identification of NAMA Agents (proponents, developers, and plant operators), an inventory of NAMA Actions, and an inventory of specific technologies included in the NAMA Actions. At a second level tier, specific information needs to be assembled in order to properly assess the emissions reductions from generating RE projects.

Such information relates to operation data hours of operation, capacities, net grid interconnected electricity, etc.), coming from projects not under regulated carbon market schemes, as well as specific data related to the emissions reductions associated to those projects that may be under a regulated carbon market scheme (information to be acquired from the specific verification reports from those schemes).

A data base framework is included in the document, with the aim of assisting the NAMA CE in developing the specific tool to be used for all data capture efforts within the MRV Plan.

Step	Description of Database Considerations for the Jamaica NAMA
1	Structure a first tier classification of NAMA Actions based on type of participation within regulated or non-regulated carbon market mechanisms.
2	Structure a second tier classification of NAMA Actions within each typology of carbon market mechanism that relates to the type of participation instrument within Jamaica (RE purchase mechanism such as bids, net Electricity Bill, or other to be established by the NAMA).
3	Structure a third tier level of classification of NAMA Actions within the above in order to classify projects under different categories of renewable energy technologies, such as wind, solar of different types (PV, concentrating solar power), or other sources (hydro, biomass, etc. That may be develop in the timeframe horizon of the NAMA
4	Within each of the tiers of classification, information related to the different NAMA Actions (projects) could be entered. Information normally entered should correspond to the different data that the NAMA Agents (project developers) will be providing to the NAMA CE in relation to two main areas: project operation and emissions reductions, support received. Data requirements on those categories are discussed in following sections of this Plan).
5	Database should allow for the representation of individual NAMA Action (project) information as well as allowing for the aggregation of information in each tier level.
6	The database should allow for the totalling of relevant information, which could serve the purpose of overall reporting as well as to cross check with other sector information.
7	The database shall contemplate a section for emission reduction estimations done within the different tiers of classification and both at the project level as well as aggregation to be used for reporting within the MRV.

The purpose of the MRV information processing relates to the organization and review of data received, development of required calculations for emissions reductions estimations, and due preparation of information for the reporting purposes of the NAMA.

The MRV plan proposes to use methodologies for estimation of emissions reductions for renewable energy interconnections based on the CDM taking into account that such derivations have been successfully verified in terms of their certainty to determine emissions reductions, and have proof easiness of implementation in the context of developing countries. In particular this MRV plan uses considerations from:

- AMS ID[1]. Small-Scale Methodology: Grid Connected Renewable Electricity Generation Version 18.0 (for projects under 15 MW).
- ACM 0002[2]. Large-Scale Consolidated Methodology Grid-Connected Electricity Generation from Renewable Sources Version 17.0 (for projects larger to 15 MW).
- Tool 07[3]. Methodological Tool to Calculate the Emission Factor for an Electricity System Version 05.0.

Emissions reductions from projects operating under regulated carbon market schemes (CDM, Gold Standard and VCS); the project participants have to provide the Verification Reports of the projects by a Designated Operational Entity (DOE). It is from such reports that the NAMA Coordinating Entity is to extract directly the value of GHG emissions reductions associated to the project activity.

For all other NAMA Actions (projects) that do not belong within a regulated carbon market; the NAMA CE has to aggregate data from each of the activities, will conduct a quality control and then will calculate the emissions reductions associated to each project. Data manipulation regards two most important parameters to be considered for emissions reductions estimations: quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project activity in year y (MWh); and the combined margin CO2 emission factor for grid connected power generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system” (t CO2/MWh).

The quantity of net electricity generation (MWh) that is produced and fed into the grid as a result of the implementation of the project activity in year (y), is to be extracted from the information provided by the project participant and verified through the information system that exists within the reporting procedures established between MSET and JPS as part of monitoring of electricity grid. The NAMA CE may alternatively decide to use the information from the reports directly provided by JPS on a yearly basis, but in doing so JPS will become a subject of the verification process of the NAMA.

As per the grid emission factor (GEF) to be used, taking into account the experience gained from the CDM, and the acceptance on its methodological development in this regard, it is recommended that the proposed NAMA should use a CDM grid emission factor estimation

[1] https://cdm.unfccc.int/filestorage/2/P/7/2P7FS6ZQAR84LG3NMKYUH50WI9ODBC/EB81_repan24_AMS-I.D_ver18.pdf?t=NVJ8b3MweHZkfDCFiJ612g6sz-3I_ELQ2x0u

[2] https://cdm.unfccc.int/filestorage/D/5/Y/D5YFS9I3VKBT18MQNGX0LPZ6U7AWCO/ACM0002_%28v17%200%29_clean.pdf?t=dmR8b3MweHllfDCuuwPfQv69rKb6u5qUxAxy

[3] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v5.0.pdf

approach based on the determination of a combined margin that takes into consideration the impacts that a build margin (types of recent plants installed) and an operating margin (overall operation of the grid) may have on the emissions associated to the operation of the dispatch. Taking into account the different contributions related to potential integration of intermittent sources in the generation, the CDM approach considers the allocation of specific weight factors to the expected impact of both the operating as well as build margins of the GEF calculation. The Emission Factor of the Grid needs to be estimated for the purpose of determination of emissions reductions, for which there are several options:

- The NAMA CE could estimate the grid emission factor (directly/subcontract/agreement with third party) using the relevant Tool 07[4]. Methodological Tool to Calculate the Emission Factor for an Electricity System Version 05.0.

- Through the CDM DNA in the country, a request for registration of an Standardized Baseline[5] for the Grid Emission Factor of Jamaica (3 year validity) can be validated and register within the CDM. This could allow for not having to perform the calculation every year, as well as for using standardized simplified approaches likely to be useful in the context of such estimation in a country like Jamaica. For example Grenada has done such estimation and registration of its own grid emission factor for the electricity grid[6].

- As interim value while the above is implemented, Jamaica could decide to use the factor determined by the Wigton Windfarm II Project which has a valid crediting period until Feb 2019 (pending assessment of conservativeness with respect to recent developments in the country). Such a value can be used during road mapping the implementation of the NAMA MRV on a temporary base while the new estimation of the factor is concluded.

A procedure for estimation of emissions reductions associated to the NAMA is presented that considers types of NAMA Actions, precluding any potential double counting of emissions reductions.

Emissions reductions (ER) of the NAMA	=	Sum of ER due to projects not operating in a carbon market mechanism	–	Sum of ER from projects operating under carbon market mechanisms that have transferred their reductions	+	Sum of ER from projects that have voluntarily cancelled issuance from such mechanisms

The MRV Plan includes the establishment and quantification of a set of NAMA Indicators. Such parameters allow the NAMA Coordinating Entity (MSET) to perform a follow-up of the actions as well as to permit the visualization of the achieved effects of the NAMA.

The indicators proposed are:

[4] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v5.0.pdf
[5] https://cdm.unfccc.int/methodologies/standard_base/index.html
[6] https://cdm.unfccc.int/filestorage/e/x/t/extfile-20170117160400515-ASB0031_PSB0023.pdf/ASB0031_PSB0023.pdf?t=ZmJ8b3MxMnQxfDDIlfivjDaiOTnkZ0Kz8LZE

- Indicator #1: % Participation of Renewable Energy Generated Electricity in the Total Electricity Mix of the Country. This indicator is linked to overall contribution of Renewable Energy, and it is aligned to current Energy Sector Policy and the Jamaica Vision 2030.

- Indicator #2: Yearly Number of NAMA Actions Undertaken. This indicator is linked to assessing the continuous efforts of the NAMA in achieving its transformational efforts in support of the framework policies to be implemented as the NAMA moves forward.

- Indicator #3: Degree of Participation (evenness of contribution) of Different Renewable Energy Sources in the Generation Mix. This indicator is linked to the transformational effort of the NAMA related to assisting the creation of energy security through diversification of generation sources, presenting how relative development and hence contribution is being developed by the action of the NAMA.

The MRV Plan also proposes to establish a sustainable development co-benefit indicator related to employment creation related to the development of the renewable energy industry. This indicator is to be initially determined based on international benchmarks for installation as well as operation & maintenance components, but will need to be assessed on a derived form from local data, taking into account that both RE electricity from larger scale Re projects as well as from distributed generation are already in place and MSET can conduct an assessment on perceived job creation from the industry.

The NAMA CE needs to track information on support received (Financing, Capacity Building and Technology Transfer).The required tracking of such support has to consider: accords by implementing agents and climate change financing sources; and any other support received from other international agents (IFIs, bilateral agencies and other multilateral agencies). The support for the NAMA is to be expressed through a statement of aggregated expenditure that shall account for both types of sources.

The MRV Plan includes sections for NAMA reporting templates, aspects to be considered for sound quality control and verification requirements to be establish by the NAMA CE. Although there are no current regulations emanating from the UNFCCC with respect to NAMA reporting, a discussion is done on the perceived reporting needs from different mechanisms of country reporting, and a suggested template is presented for consideration.

It is suggested and discussed that the NAMA shall include a two tier approach for verification, firstly through yearly document verification and by-yearly through in situ verifications. Until the NAMA CE and the country fully decide if the NAMA will go for international funding; an in-country verification process through a local third party seems like the obvious choice for implementation.

1. Introduction

The Latin American Energy Organization (OLADE) has been providing support to the Ministry of Science, Energy and Technology (MSET) in Jamaica in the development of a proposal for a Nationally Appropriate Mitigation Action (NAMA) within the energy sector and in particular focusing on scaling-up renewable energy contributions to the grid generation mix.

The Jamaica Renewable Energy NAMA is embedded within a strong set of national aspirations as well as energy sector policies that are currently aiming at a 30% contribution from renewable energy electricity within the grid by 2030.

The proposed NAMA has been mentioned within the scope of the current Jamaica Nationally Determined Contribution (NDC) to the UNFCCC that was submitted by the country in April of 2017.

As part of the energy sector policy and program development, MSET is currently conducting different activities related to the support of RE electricity generation in the country; implementing amongst others the 2015 Electricity Bill, implementation of bidding processes for contracting up to 115 MW of renewable energy projects, implementation of net billing and power wheeling schemes for distributed generation from renewable energy sources, etc.

The current phase of support provided by OLADE to MSET pertains to the development of a Measuring/Monitoring, Reporting and Verification (MRV) Plan for the proposed NAMA.

MRV associated to Greenhouse Gases (GHG) mitigation from a NAMA operates at different levels, including level of emissions and mitigation actions implemented as well as at the level of support received by the NAMA. The MRV of the NAMA responds to questions such as:

- Why undertake MRV? Addressing the objectives and purpose of the MRV.
- How will MRV needs to be performed? Focusing on methodological issues as well as technical guidelines to conduct the MRV.
- When to perform the MRV? Defining the timeframes and periodicity required.
- Who carries on with the MRV? Identifying clearly the participants and their responsibilities.

The main components of an MRV Plan presented in this document include:

- Measure or Monitor (M) data and information on emissions, mitigation actions and support. This may entail direct physical measurement of GHG emissions, estimating emissions or emissions reductions utilizing activity data and emissions factors, calculating changes relevant to sustainable development and collecting information about support for climate change mitigation.
- Report (R) by compiling this information in inventories and other standardized formats to make it accessible to a range of users and facilitate public disclosure of information.
- Verify (V) by periodically subjecting the reported information to some form of review or analysis or independent assessment to establish completeness and reliability. Verification helps to ensure accuracy and conformance with any establish procedures, and can provide meaningful feedback for future improvement.

1.1. Objectives of the MRV Plan

The primary objectives of the MRV Plan of the Jamaica Renewable Energy NAMA are:

- Establish the follow-up to the implementation of the NAMA and the achievement of its proposed objectives.
- Respond to the reporting obligations under the Conference of the Parties (COP) of the United Nations Framework Convention on Climate Change (UNFCCC).
- Contribute to the achievement of the country objectives under the Jamaica Nationally Determined Contribution (NDC) to the UNFCCC.

At a second level the following objectives are also important within the MRV:

- Support dialogue between different stakeholders (authorities, NAMA agents, international organizations, etc.) with the idea of establishing technical cooperation, training development opportunities as well as financial facilitations in support of the NAMA development.
- Support in reinforcing institutional infrastructure towards improved reporting on different aspects of activities undertaken under the NAMA, in order to strengthen national capacities on management of information (emissions factor determinations, GHG emissions reductions estimation methodologies, etc); that are important for GHG mitigation.

1.2. Scope of the MRV Plan

The tasks of Measurement, Reporting and Verification described in this MRV document will be implemented:

- At a national scale; including initiatives developed within the territory of Jamaica.
- Including activities that contribute to renewable energy interconnection to the electricity grid in Jamaica that have a direct impact in GHG emissions reductions (through application of a sound methodological basis).
- Including activities that could be developed in the future that could have an indirect impact on GHG reductions (through indicators and performance variables).
- With an initial scope that is inclusive of both RE project interconnections as well as the existing Net Billing Scheme, which are currently the preferred policy instruments in place for RE electricity interconnection in the electricity grid of the country.

It is also important to note that under the proposed implementation of the Jamaica RE NAMA, the following should also be included within the scope of the MRV Plan:

- Specific RE technologies may include hydro, wind, solar, bio-energy, etc.
- Specific project activities may opt to or not to be registered within different carbon market schemes (either regulated or non-regulated).

2. Jamaica Renewable Energy NAMA MRV Plan Design

The MRV system is configured as a procedure for the collection and aggregation of the necessary information for calculation, measurement, reporting and verification of the emissions reductions (ER) to be produced as a consequence of the different actions to be implemented under the NAMA. "Actions" make reference to those interventions to be developed under the NAMA that are to be implemented in order to scale up the contribution from renewable energies to the electricity generation mix in the country.

The measurement of both emissions as well as emissions reductions is an important element of the NAMA and it should be done with as much precision as possible. In order to do so, data capture, is the sound basis for any MRV system.

Emissions reductions as well as NAMA co-benefits need to be calculated on a periodical basis for internal in-country tracking and in order to meet UNFCCC reporting needs, based on progress indicators that can allow for re-evaluation and adjustment of emissions trajectories.

The design of the MRV Plan includes the definition of sound metrics for GHGs as well as co-benefits, that can be measured within reasonable uncertainty; and the reporting of the NAMA incorporates general lines of information that are required from the NAMA Coordinating Entity (CE) in order for integration within the country´s Biennial Update Reports (BURs) and NDC.

The Jamaica Renewable Energy NAMA Concept Document[7] serves as the guide for development of this MRV Plan, and permits the reader to become acquainted with the overall scope and considerations including in the proposed NAMA as a scaling-up programme for the contribution of RE electricity generation to the grid in Jamaica.

2.1. Principles of the MRV Plan

The fundamental pillars of the MRV Plan are:

Transparency: guarantees understanding of involved stakeholders in the NAMA on appropriate development, and facilitates implementation and verification of activities.

Consistency: addresses coherency of the different elements on an inter-temporal basis (methodological basis for GHG emission reductions estimations and determination of NAMA co-benefits)

Precision: looks at the relative exactitude of NAMA results from GHG ER to co-benefits and NAMA indicators; through systematized conservative estimations using appropriate methodological basis from the rich experience of the Clean Development Mechanism (CDM) within renewable energy electricity interconnections to a national grid.

Comparability: respect to intended contributions from the NAMA activities, requiring the use of common units such as tCO2e, hours of operation, types of projects, types of technologies, etc.

[7] See Annex VI to this Document: Concept Document of the Jamaica Renewable Energy NAMA. November 2014.

Integrity: attempting to cover all of significant sources of GHGs within the different actions of the NAMA.

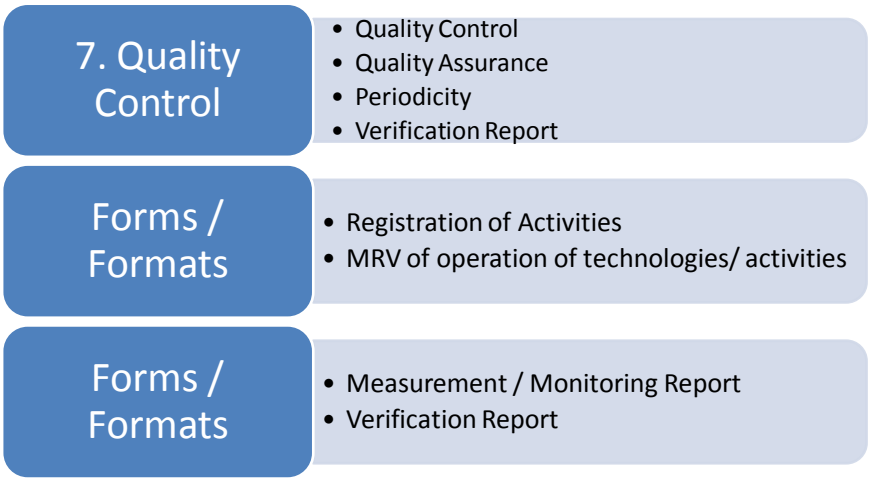
Avoidance of double counting: as a critical aspect of contributing to the overall aggregation of GHG concentrations in the atmosphere, the MRV needs to identify potential areas of ER double counting and provide due management for the reporting of such situations.

The main building blocks of the NAMA MRV System are as follows:

Building Blocks for the MRV

1.Introduction	• Objectives • Scope
2. MRV Design	• Principles • Description of Activities/Actions • Registries to be established • Phases of MRV
3. Definitions of Roles and Resposibilities	• Coordinating Entity • Implementing Agents (activity level)

4.Methods and Data Capture	• Identification of agents involved • Inventory of activities • Inventory of technologies • Support (financial/CB/TT
5.Information Processing	• Emissions Reductions • Indicators • Cobenefits • Support
6. Reporting	• GHG NationalCommunication • Bienal Update Reports • Nationally Determined Contribution • Jamaica Vision 2030 • Overall Reporting of the NAMA



2.2. Description of the NAMA Actions

All NAMA actions have the goal of resulting in renewable energy electricity generation to be incorporated within the Jamaica electricity grid. For such matter, NAMA Actions will results in projects being implemented towards the stated goal of the NAMA, which is:

"The objective of the NAMA is to promote the incorporation of renewable energy based generation in Jamaica, assisting in the creation of a sustainable enabling environment that is adequate for early stage development of the renewable energy industry in the country, as well as contributing to the realization of the long term contributions associated to the use of renewable energy resources of the country.

The Implementation of the NAMA will contribute in assisting the creation of a smooth transition into an energy system that is in tune with the proposed Jamaica Vision 2030 of being "Jamaica, the place of choice to live, work, raise families and do business".

Jamaica has strong renewable energy potential and renewable energies could be used to meet an important percentage of the electricity demand. The NAMA aims at assisting in the creation of an enabling environment for the deployment of renewable energy generation technologies such as solar, wind, hydro and biomass in the country, contributing to the achievement and potentially scale up the contribution from renewable energy in the overall energy matrix.

The main source of emissions addressed by the NAMA is the reduction of CO_2 emissions due to renewable energy generation displacing fossil fuel generation at the grid level or in captive applications."[8]

In order to attain the transformational goal of the NAMA, the Government of Jamaica (GoJ) is using different policy mechanisms and associated regulations in order to assist in the proposed scaling-up of the contribution from RE sources to electricity generation. Currently and for the mid-term, those mechanisms are within the considerations under the Electricity

[8] OLADE. Draft NAMA Proposal: Jamaica Renewable Energy NAMA, 2014.

Act of 2015 and the Net Billing Scheme. Initially it is envisaged that NAMA Actions will be implemented within such framework, therefore creating a first set of definitions for NAMA Actions:

- Renewable Energy electricity from projects incorporated under the mechanisms for RE purchases by the grid (that includes different RE sources, scales and procedures for purchase).
- Renewable energy electricity incorporated to the grid from the Net Billing Scheme through distributed generation projects (including potentially different RE sources and scales).

The above classification is important in order to create the initial block of registration of NAMA Actions for registry purposes.

Another important distinction with respect to types of NAMA Actions arises from the fact that project implementation (from an emissions reduction recognition point of view) can happen inside or outside of regulated carbon market schemes (RCMS) and non-regulated carbon market schemes (NRCMS). This is an important distinction for the consideration of avoidance of double counting of ER within a NAMA. Taking into account that the NAMA Coordinating Entity in Jamaica has not at this time issued a definition of relevant criteria for inclusion of NAMA Actions in this respect, the MRV Plan allows for the respective classification with respect to account destiny of ERs within different carbon market segments. Therefore the following are considered:

- NAMA **Actions not registered under regulated carbon financing schemes (NRCMS)**: such actions may have or not internal procedures for monitoring of the emissions reductions. Due to this, the MRV system establishes a procedure for such estimations.
- **NAMA Actions registered under the regulated carbon finance mechanisms (RCMS)**: includes projects or programs registered or that could be registered under regulated markets such as CDM, VCS, and the Gold Standard. Such actions follow structured methodologies for estimation of emissions reductions as well as monitoring and verification. Emissions reductions for these actions are to be extracted from the reporting requirements established by each specific market mechanism.

2.3. Design of Emissions Reductions Accounts

Taking into account that there is no clarity at present, from the international climate negotiations, with respect to specific procedures for the quantification of emissions and emissions reductions in the context of NDC implementation in developing or SIDS countries, the MRV Plan proposes at this point in time a procedure for accounting, that will likely need to be adjusted as the international directives become clearer and definitive.

The procedure includes the creation of four accounts related to registration and reporting of emissions reductions (ER) under the NAMA:

a. Account for issued ER in RCMS.
b. Account of issued and transferred ER in RCMS.

c. Account of issued and cancelled ER in RCMS (before being transferred to third parties).
d. Account of ER achieved in NRCMS.

Account for issued ER in RCMS: This account includes the ER units issued under RCMS and the associated project participants will have to provide information such as: name and reference of the project under the specific RCMS, copy of verification and certifications approved by the credited mechanisms, copy of communications on any issued ER under the specific RCMS.

Account of issued and transferred ER in RCMS: Includes emissions reductions accrued under RCMS that have been transferred to ER buyers located outside the Jamaica territory. Project participants shall provide information such as: name and reference of the project, volume of ER transferred, series numbers of transferred ERs, country of origin of buyer.

Account of issued and cancelled ER in RCMS: Includes ERs issued under RCMS that have been cancelled in a voluntary manner by the participants before being transferred to any third party. Project participants therefore will provide information such as: name and reference of the project, volume of cancelled ERs, series numbers of cancellations, copy of cancellation notifications by the specific carbon market registry.

Account of ER achieved in NRCMS: This account registers ERs achieved outside of the RCMS (which in the case of Jamaica is anticipated to be the most common case). The NAMA CE, based on information provided by the project developers (in the NAMA jargon called the NAMA Agents) will create and maintains this account and will determine the associated ERs.

The aforementioned accounts are important for the purpose of avoiding double counting of emissions reductions eventually. Al though it is not envisaged that NAMA Actions are likely to happen within regulated carbon market mechanism, unless the policy of the government is established there is a likelihood of such happening and therefore the MRV system should considered such case.

2.4. Phases of the MRV Plan

The complete cycle of the MRV system is composed of the following phases:

Registration of NAMA Actions: the Coordinating Entity of the NAMA is to be charged with registering NAMA Actions, and therefore shall define registration procedures (in accordance to other relevant responsibilities assigned to the CE role).

Data Capture: Each NAMA Agent (project implementers/developers) provides information through the appropriate forms (detailed in subsequent sections of this report) for both quantitative and qualitative descriptions of the actions (projects) that are related to contact details, specific project details and technical data (required to perform ER estimations, assessment of co-benefits as well as support received (if any).

Information Processing: The NAMA CE undertakes data capture, aggregation, and processing in a data base that shall be created. The information comprises two main areas:

- An inventory of projects, under each participation mechanism, and if desired with relevant allocation under different types of RE sources (wind, solar, biomass, etc.).
- Gathering of information regarding operation and emissions reductions, co-benefits and support received by the projects.

Reporting: The NAMA CE shall periodically report to relevant instances within the system in a way that the needed information for compliance with Jamaica reporting to the UNFCCC is to be provided.

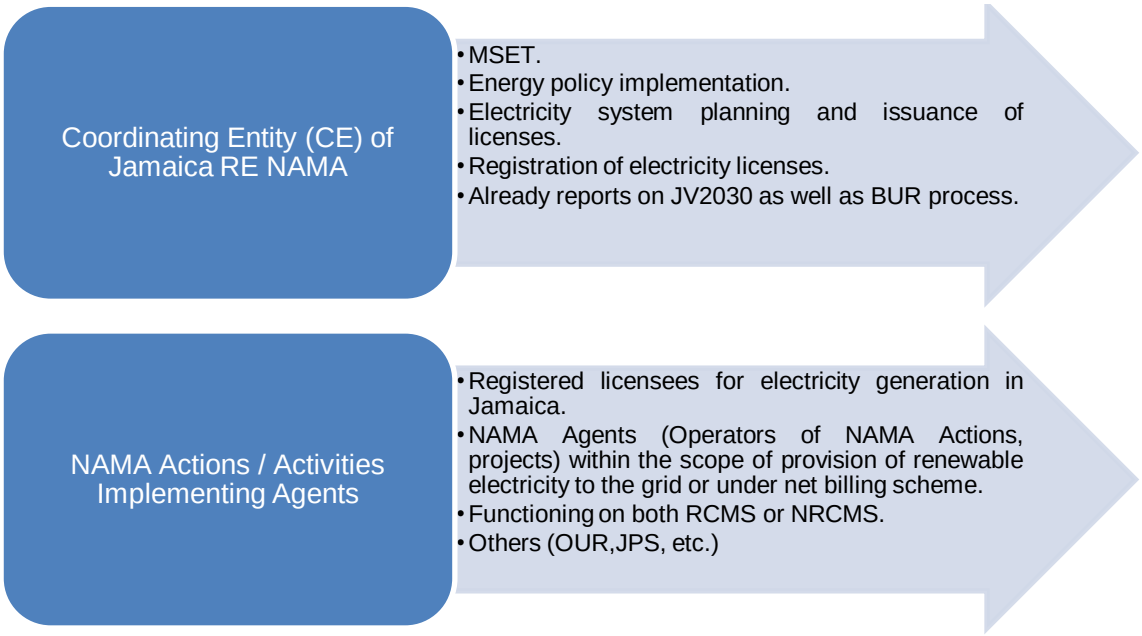
Verification: An arrangement for verification is important for the NAMA, the decision on whether internal or external verification is to be used is described later on within this plan.

3. Definition of Roles and Responsibilities in the MRV Plan

The definition of roles and responsibilities of all agents involved in the NAMA has the following objectives:

- Identification of stakeholders, participating institutions, and other interested parties; involved in the NAMA.
- Definition of their roles and responsibilities.

The most relevant participants within the NAMA MRV are presented below, followed by a more detailed description.



3.1. The NAMA Coordinating Entity: The Ministry of Science, Energy and Technology (MSET)

The natural choice for the function of NAMA Coordinating Entity is MSET. It has the assigned responsibilities for coordination and development of the energy sector in the country, and it also is charged with the development of scaling up activities for renewable energy development in the country.

The Government of Jamaica's policy[9] is that 30% of energy to the national grid will be renewable sources by the year 2030. The Ministry of Science Energy and Technology (MSET) is charged with the corresponding competences[10] in the energy sector of the country as stated below:

Mission: To develop science, energy and technology policies that Fuel Growth.

[9] http://mset.gov.jm/how-do-i
[10] http://mset.gov.jm/mission

Vision: To create an environment, through policy development and a progressive legislative framework, that facilitates investment, creates jobs and meaningfully improves the well-being of each Jamaican.

Mandate: The MSET is currently mandated to:

a. Encourage private sector innovation in the science, technology, energy sectors;
b. Lead legal and regulatory reform of the electricity and gas sectors;
c. Improve national energy efficiency and conservation;
d. Increase the percentage of electricity generation from renewable sources, thereby reducing dependence on imported fuels and increasing Jamaica's energy security;
e. Create a single ICT regulator;
f. Streamline Government ICT operations (GovNet);
g. Make access to Government services more convenient and efficient using ICTs (e-Gov);
h. Draft legislation to facilitate competitiveness in ICT;
i. Promote the use of free and open source software in Government; and
j. Increase the access to and usage of ICT through the "Tablets in Schools" programme.

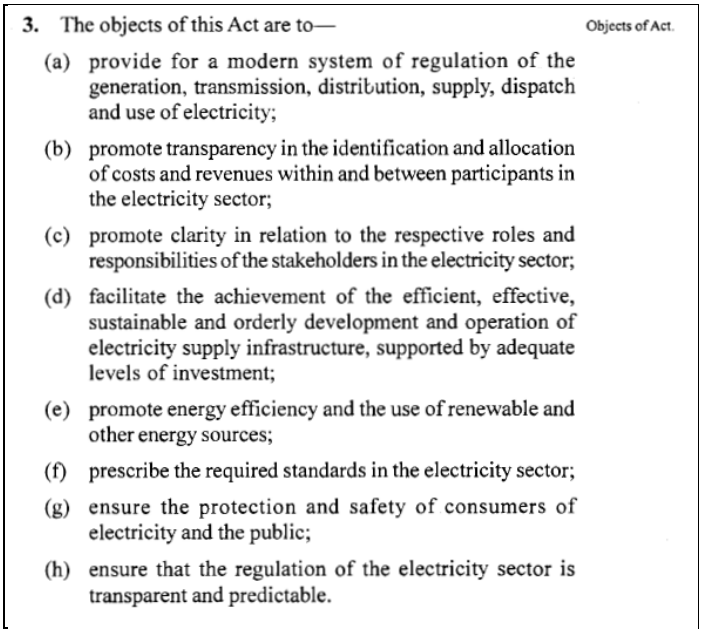
Under item (d) of the MSET's mandate there is clear reference to the competence and directive related to increasing the percentage of electricity generation from renewable sources, which is the subject of the proposed NAMA.

MSET has been also very active in supporting different programs aimed at delivering scaling up of RE sources in the country, and it is natural that a program such a NAMA for RE generation in the country fits well with overall planning and program development in this regard.

The Electricity Act of 2015[11] also establishes several important aspects that are important for consideration of the broad base of roles and responsibilities of the NAMA MRV; which are supportive to the role of NAMA CE within MSET:

- As part of the objects of the Act, it states the directive to promote the use of renewable energy sources.

[11] http://mstem.gov.jm/sites/default/files/Electricity%20Bill%20%202015.pdf



3. The objects of this Act are to— Objects of Act.

(a) provide for a modern system of regulation of the generation, transmission, distribution, supply, dispatch and use of electricity;

(b) promote transparency in the identification and allocation of costs and revenues within and between participants in the electricity sector;

(c) promote clarity in relation to the respective roles and responsibilities of the stakeholders in the electricity sector;

(d) facilitate the achievement of the efficient, effective, sustainable and orderly development and operation of electricity supply infrastructure, supported by adequate levels of investment;

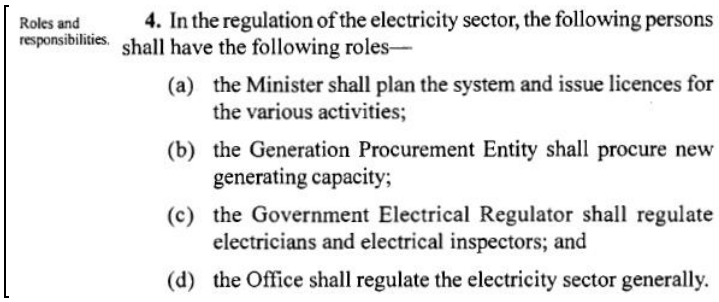
(e) promote energy efficiency and the use of renewable and other energy sources;

(f) prescribe the required standards in the electricity sector;

(g) ensure the protection and safety of consumers of electricity and the public;

(h) ensure that the regulation of the electricity sector is transparent and predictable.

- Furthermore it is stated that MSET is responsible for planning the system and issuance of licensees which is important since this directive provides for the basis of relationships with NAMA agents which in fact are licensees for electricity generation in the country:



Roles and responsibilities.

4. In the regulation of the electricity sector, the following persons shall have the following roles—

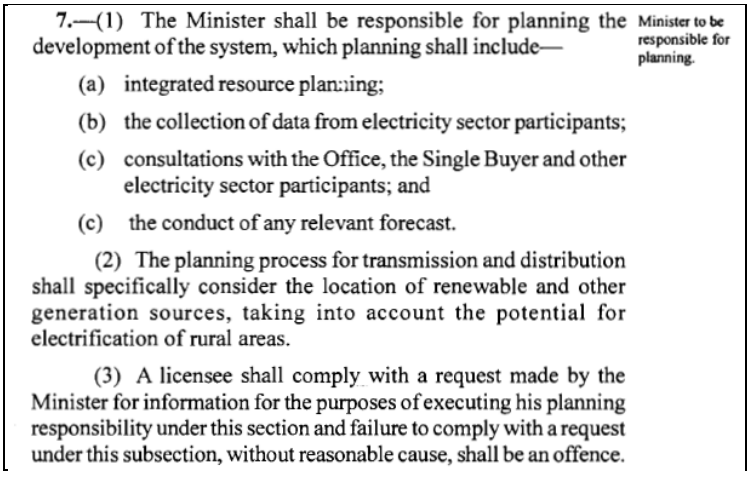
(a) the Minister shall plan the system and issue licences for the various activities;

(b) the Generation Procurement Entity shall procure new generating capacity;

(c) the Government Electrical Regulator shall regulate electricians and electrical inspectors; and

(d) the Office shall regulate the electricity sector generally.

- MSET is responsible for the collection of data from electricity sector participants, and electricity licensees have to comply with requests for provision of information which is an issue relevant to the NAMA transparency,



Minister to be responsible for planning.

7.—(1) The Minister shall be responsible for planning the development of the system, which planning shall include—

(a) integrated resource planning;

(b) the collection of data from electricity sector participants;

(c) consultations with the Office, the Single Buyer and other electricity sector participants; and

(c) the conduct of any relevant forecast.

(2) The planning process for transmission and distribution shall specifically consider the location of renewable and other generation sources, taking into account the potential for electrification of rural areas.

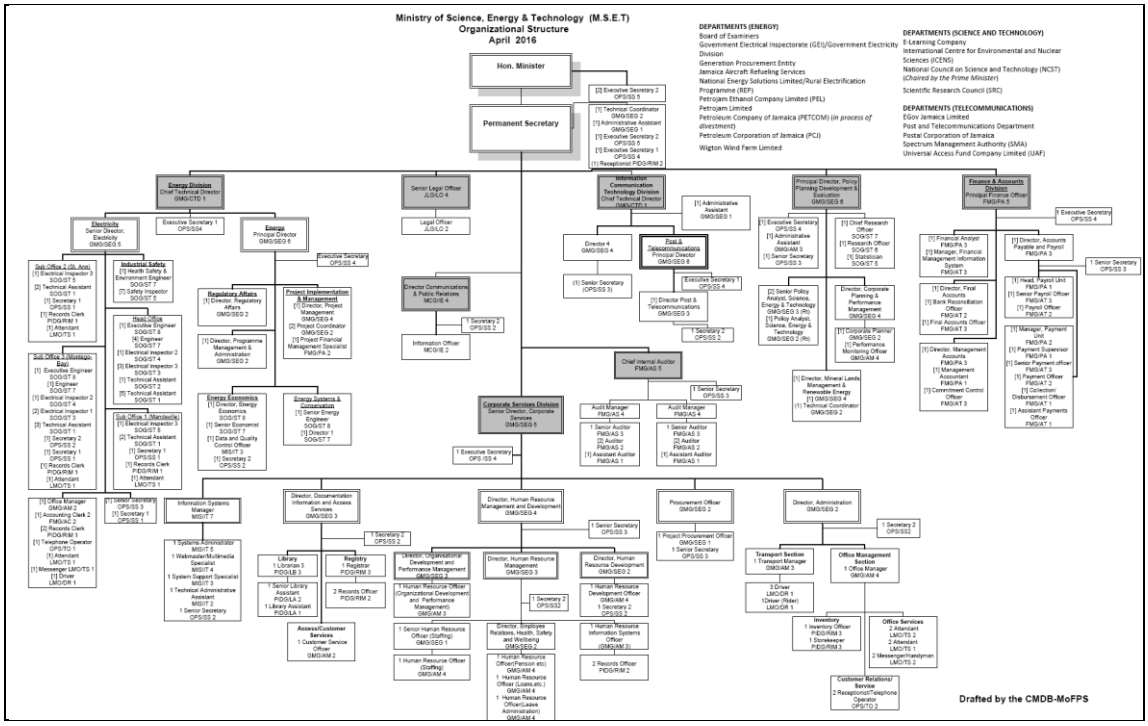
(3) A licensee shall comply with a request made by the Minister for information for the purposes of executing his planning responsibility under this section and failure to comply with a request under this subsection, without reasonable cause, shall be an offence.

- MSET has to establish and keep a register of electricity licenses in the country,

> **11.** The Minister shall cause a Register to be established and maintained in which the particulars of each electricity licence shall be entered. **Register to be kept.**

The above mentioned provisions within relevant electricity regulations in the country allow MSET to be able to conduct a transparent MRV Plan for the proposed NAMA.

Moreover the organizational chart of MSET (provided by MSET as of early 2017) as presented below indicates that the Ministry has operational units within the Energy Division (i.e. Project Implementation and Management) as well as within the Directorate for Documentation, Information and Access Services that may be relevant to the MRV of the NAMA. Additional to these, MSET has a Climate Change Liaison Officer that is charged with appropriate flow of communication with the Ministry of Economic Growth and Job Creation (MECJC) where governmental responsibilities for climate change are centred, as well as with the role of spearheading climate change mitigation and adaptation themes within MSET.



MSET also has an established information communication channels with the Jamaica Public Service Company (JPS), entity that operates the dispatch of electricity in the country and manages the information on generation of electricity in the country. Periodic information reports at different temporal basis (hourly, daily, weekly, monthly and yearly) basis are generated by JPS and a report format exists on the electricity generated by different electricity generation assets including renewable energy generating plants.

As an example, the following figure presents a type of available JPS reporting for the month of October 2016, including total aggregates of renewable energy generation for the period considered as well as for generation per specific RE plant in the country.

Taking into account that the Office of Utilities Regulations (OUR) is charged with regulation of the electricity sector in Jamaica, discussion will have to be established with respect to the correct procedure for having complete transparency in data management related to the

monitoring aspects of the electricity to be produced by renewable energy projects that become part of the NAMA program, that is whether or not data on generation from RE sources in the grid will have to come from OUR or if the current reporting from JPS to MSET is sufficient according to current practices.

3.2. NAMA Agents

In the context of the NAMA a separation is to be established between implementing agents acting within regulated carbon markets and implementing agents acting under non-regulated carbon markets. By creating this initial separation the NAMA will be open to manage and consider emissions reduction from different carbon market segments; in part due to the fact that there may be projects in the country that will decide to have their emissions reduction be registered in existing schemes like the CDM, Gold Standard, VCS or others in order to gain economic benefits from their emissions reductions in different carbon market segments.

Annex I presents the form for the registration of NAMA Actions that can serve the basis for registration of activities. This form may be used also by the CE of the NAMA, in order to adjust the register that is currently kept for licenses for electricity generation pertaining to renewable energy sources.

The existing regulations in the electricity sector of Jamaica require licensees for electricity generation to comply with requests for information to be made by MSET; therefore any specific information has to be provided, creating a space of compliance that is very important for the correct operation of the MRV Plan of the NAMA.

The above description of roles and responsibilities for the NAMA participants is clear, further descriptions of specific areas of engagement within the MRV will be treated specifically in the different chapters of the MRV Plan regarding data capture, processes for estimation of emissions reductions, quality control, and reporting and verification.

Currently, within the envisaged lines of existing mechanisms to promote RE generation in Jamaica (purchases from projects under provisions of directed government purchases and those from the net billing scheme under implementation), the implementing agents of the NAMA will come from the registries existing in country as per the allocation of electricity generation licenses (currently existing those registries within MSET).

3.3. Other Relevant Stakeholders for the NAMA MRV

The most important stakeholders have been described in the preceding sections, but the institutional mechanism of the NAMA may include relationships with other important actors in Jamaica:

Ministry of Economic Growth and Job Creation (MEGJC): plays an important role since it houses the Climate Change Division (CCD) which houses the different focal points for different mechanisms under the UNFCCC. On one side, at the moment the CE and the country will be ready to discuss any registration of the NAMA; some registration directive should be in place to be followed by the MSET as a NAMA CE. Furthermore, as part of the reporting needs of the different mechanisms and commitments under the convention, good understanding of those needs is important in order for the NAMA to be producing adequate information useful to those endeavours. The approach recommended in this plan is to ex

ante define a reporting structure suitable for those purposes, envisaging the types of information likely needed; but that will likely need to be adjusted as the NAMA progresses and the DCG also implements the reporting to the UNFCC on NAMA matters. Another point of important relationship relates to the fact that Jamaica may make use of the procedures for the development of a standardized baseline for the electricity sector; procedure that will need the support from the registered CDM DNA within the institution.

Planning Institute of Jamaica (PIOJ): PIOJ is charged with the follow up to the implementation of Jamaica Vision 2030 (Jamaica's National Development Plan). Since JV2030 establishes certain specific indicators for the in-country reporting, it is a very important actor that can provide support to the NAMA in developing the implementation of the proposed to be indicators of the NAMA.

Jamaica Public Services Company (JPS): JPS is responsible for the operation of the electricity grid in Jamaica and it also is a generator itself. As part of responsibilities to MSET, it reports on a diverse temporal base (daily, weekly, monthly and yearly) on net electricity generation from different plants in the country. Records of any reporting of net electricity generator are in place within JPS as well as within MSET assuring that any verification can take place. As such, JPS also keeps records of any inspections and logs from project operators related to their operation as a generator. This is also important since verification of plants on a biennial term will also be part of the NAMA verification.

Petroleum Corporation of Jamaica (PCJ): PCJ as responsible entity for refining in country is the provider of relevant information on the net calorific values of fuels used in the country, including those used for electricity generation. PCJ has already provided such information to specific CDM projects in Jamaica as part of their own estimations relevant to determination of emission factors for the Jamaica electricity grid.

Office of Utilities Regulations (OUR): The OUR provided information on fuel consumption by specific power plants in the country, to the Wigton Wind Farm Project during its registration process to the CDM; in order to estimate the emission factor of the grid. As part of the potential development of a CDM based standardized grid emission factor that could simplify the implementation of the MRV Plan of the NAMA, it is to be assessed if the OUR may continue providing the required data (in case MSET as NAMA CE does not have such data).

Annex II presents a complementary listing of stakeholders of interest to the NAMA in the context of the implementation of the NAMA MRV with special attention to the NAMA Actions related to distributed generation contributions to electricity generation from RE technologies.

4. Methods and Information Data Capture

Data capture starts with specific templates that need to be completed by the NAMA CE and participating NAMA Agents, followed by integration to a data base that should be kept by the NAMA CE in order to track information. The data base needs to be established including the following components:

- Identification of NAMA Agents (proponents, developers, operators participating),
- Inventory of NAMA Actions,
- Inventory of specific technologies included in the NAMA Actions.

4.1. Data Capture on Identification of NAMA Agents

This stage consists of correctly identifying persons, groups, organizations or entities that could be directly or indirectly involved in the implementation of the specified NAMA Actions. Information of this type is very important for adequate coordination and exchange of information amongst players. The NAMA CE should be responsible for incorporation of data into the data base as well as to keep updated records incorporating at least the following information.

Information for Identification of NAMA Agents

Contact Data of NAMA Agent	Description
Name of NAMA Action	Name of project.
Organization	Project leading organization taking responsibility for information flows in the MRV system.
Person of Contact	Person acting as leader in the participation process with the MRV (officer responsible for information).
Contact Details	Contact information of the designated person (Physical and electronic).
Date of Registry in the NAMA	Date of registration of the action in the NAMA.
Declaration of Confidentiality Issues	Any conditions on use and disclosure of information.

4.2. Data Capture on Inventory of NAMA Actions and Emissions Reductions Related Information

The database shall include each one of the NAMA Actions. A template is included, that needs to be filled by the NAMA CE with detailed information on each action; based on information to be provided by NAMA Agents (project developers).

Information for Inventory of NAMA Actions (projects)

Information	Description
Name of NAMA Action (Project)	Title of project.
Objectives	Brief description of the project, detailing the regulatory schemes applicable (RE purchases, Net Billing Scheme (RCMS/NRCMS).
Location	Physical and GPS coordinates.
Status	Design, implementation, operation, interconnected.
Timeline	Date of entry into operation, any date of finalization if applicable.
Quantitative Data	Capacity, ex ante estimated electricity generation per year estimated to be interconnected to the grid.
Existence of Monitoring Data	In this section, the project operator informs on the existence or not of any monitoring related to: • Information on the technology installed: capacities, name plate information. • Information related to any data available for operation of the plant: hours of operation, electricity generated, net electricity interconnected to the grid, existence of monitoring equipment, records of operation.

Based on the information provided, the NAMA CE may want to categorize the database according to types of renewable energy technologies as well as for scales of implemented generation capacity of each of the NAMA Actions. The latter will be important if as part of the NAMA monitoring, the CE is interested in tracking evenness of contribution as well as participatory disparity from renewable energies in the assessing of the scaling-up activities of the NAMA.

The NAMA coordinating entity should update the information on a yearly base through contacting each of the NAMA Agents (project developers/operators).

Once data capture is completed, the MRV system will conduct the estimation of emissions reductions, assessment of co-benefits and determination of the NAMA implementation indicators. Depending on the type of action, either for projects under RCMS and NRCMS, project operators should provide the following information:

For projects under regulated carbon market schemes (CMRS): the project operators need to provide the monitoring/verification reports associated to the market mechanism it is registered, from which the NAMA CE can extract information into the database of the NAMA.

Specific Information Regarding NAMA Actions within Regulated Carbon Market Schemes (RCMS)

Performance information for each NAMA Action under RCMS	Year x	Year x + 1	Year n...	Cumulative
Obligatory information				
tCO_2e reduced				
tCO_2e transferred (if any)				
tCO_2e cancelled (if any)				
Optional information				
Hours of yearly operation (h/year)				
Installed power capacity (kW)				
Net electricity generation interconnected to the grid in the year (kWh/year)				

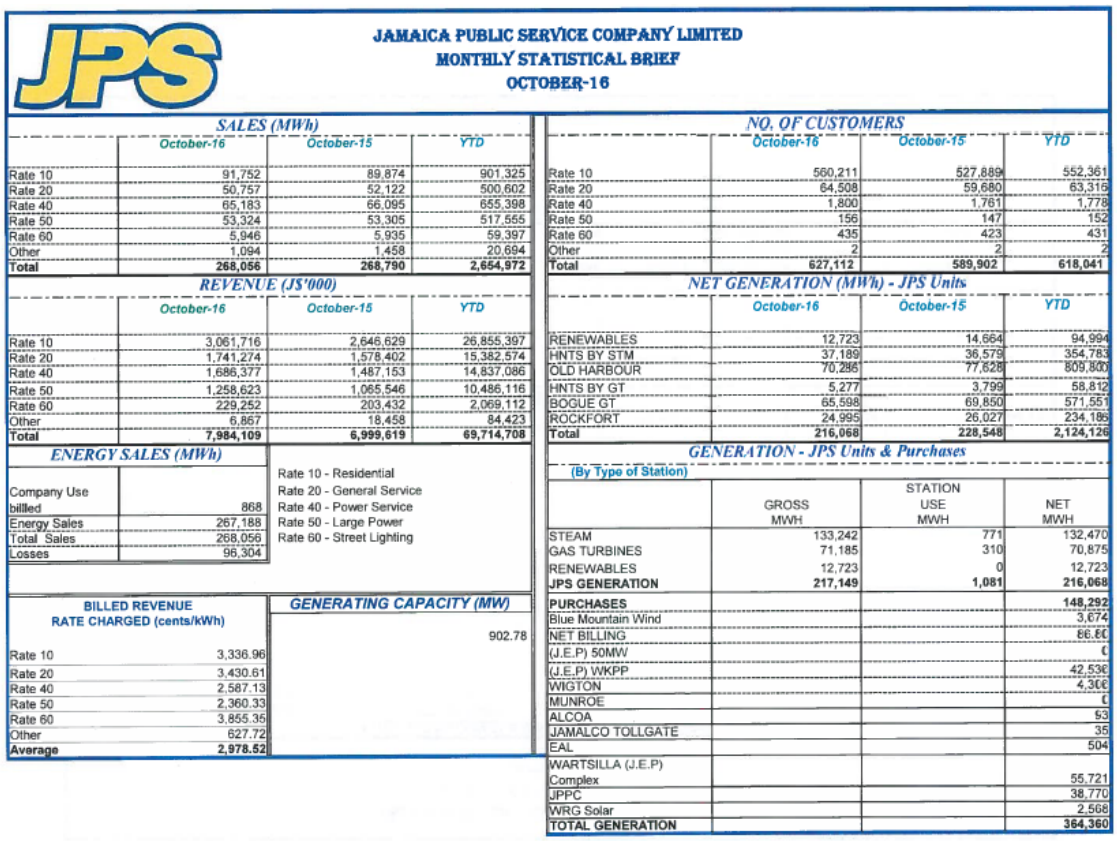
For projects under non-regulated carbon market schemes: the project operators need to provide information regarding yearly total electricity production interconnected to the Jamaica Electricity Grid such as hours of operation, net electricity generated and interconnected.

Specific Information Regarding NAMA Actions within Non Regulated Carbon Market Schemes (RCMS)

Performance information for each NAMA Action under NRCMS	Year x	Year x + 1	Year n...	Cumulative
Obligatory information				
Hours of yearly operation (h/year)				
Installed power capacity (kW)				
Net electricity generation interconnected to the grid in the year (kWh/year)				

MSET as the CE of the NAMA may enter into agreement for purposes of data capture and management. For example, in the case of the operation of the grid in Jamaica; JPS already

provides hourly, daily, weekly, monthly and yearly reports on net electricity generation from different power projects in the country. Such information and the associated tracking systems can be utilized by the NAMA, provided that such data use is verifiable within the inter-institutional arrangement. At a first tier, the NAMA may choose to use the data as provided to MSET by JPS, but as a second tier approach the NAMA may choose to go down the information ladder all the way to the project operation level allowing for full disclosure and tracking of emissions and the associated transparency of involving the NAMA Agents (which is suggested as the preferred approach).



JAMAICA PUBLIC SERVICE COMPANY LIMITED
MONTHLY STATISTICAL BRIEF
OCTOBER-16

SALES (MWh)

	October-16	October-15	YTD
Rate 10	91,752	89,874	901,325
Rate 20	50,757	52,122	500,602
Rate 40	65,183	66,095	655,398
Rate 50	53,324	53,305	517,555
Rate 60	5,946	5,935	59,397
Other	1,094	1,458	20,694
Total	**268,056**	**268,790**	**2,654,972**

NO. OF CUSTOMERS

	October-16	October-15	YTD
Rate 10	560,211	527,889	552,361
Rate 20	64,508	59,680	63,316
Rate 40	1,800	1,761	1,778
Rate 50	156	147	152
Rate 60	435	423	431
Other	2	2	2
Total	**627,112**	**589,902**	**618,041**

REVENUE (J$'000)

	October-16	October-15	YTD
Rate 10	3,061,716	2,646,629	26,855,397
Rate 20	1,741,274	1,578,402	15,382,574
Rate 40	1,686,377	1,487,153	14,837,086
Rate 50	1,258,623	1,065,546	10,486,116
Rate 60	229,252	203,432	2,069,112
Other	6,867	18,458	84,423
Total	**7,984,109**	**6,999,619**	**69,714,708**

NET GENERATION (MWh) - JPS Units

	October-16	October-15	YTD
RENEWABLES	12,723	14,664	94,994
HNTS BY STM	37,189	36,579	354,783
OLD HARBOUR	70,286	77,828	809,800
HNTS BY GT	5,277	3,799	58,812
BOGUE GT	65,598	69,850	571,551
ROCKFORT	24,995	26,027	234,186
Total	**216,068**	**228,548**	**2,124,126**

ENERGY SALES (MWh)

Company Use	
billed	868
Energy Sales	267,188
Total Sales	268,056
Losses	96,304

Rate 10 - Residential
Rate 20 - General Service
Rate 40 - Power Service
Rate 50 - Large Power
Rate 60 - Street Lighting

GENERATION - JPS Units & Purchases

(By Type of Station)

	GROSS MWH	STATION USE MWH	NET MWH
STEAM	133,242	771	132,470
GAS TURBINES	71,185	310	70,875
RENEWABLES	12,723	0	12,723
JPS GENERATION	**217,149**	**1,081**	**216,068**
PURCHASES			**148,292**
Blue Mountain Wind			3,674
NET BILLING			86,80
(J.E.P) 50MW			0
(J.E.P) WKPP			42,536
WIGTON			4,306
MUNROE			0
ALCOA			93
JAMALCO TOLLGATE			35
EAL			504
WARTSILLA (J.E.P) Complex			55,721
JPPC			38,770
WRG Solar			2,568
TOTAL GENERATION			**364,360**

BILLED REVENUE RATE CHARGED (cents/kWh)

Rate 10	3,336.96
Rate 20	3,430.61
Rate 40	2,587.13
Rate 50	2,360.33
Rate 60	3,855.35
Other	627.72
Average	**2,978.52**

GENERATING CAPACITY (MW)

902.78

4.3. Data Capture Related to Support for the NAMA

As it was mentioned, tracking information on support provided to the NAMA is useful as an input-output assessment of the sources and flows of resources within the NAMA. This is especially useful in case the NAMA becomes internationally funded (decision that has not yet been taken in Jamaica, since no financial mechanism has been proposed for any set or sub-set of NAMA Actions). The NAMA CE is responsible for the data capture of such information, in the case of MSET, through the ministry´s internal channels of information regarding sources and funding received in order to support NAMA readiness and future activities.

The input/output approach suggested within the MRV Plan includes:

- Input consideration of sources and flows of resources coming from international funders of the NAMA, and
- Output consideration of the use of the resources accrued for the purpose of financial support, capacity building and technology transfer.

4.4. Data Capture Related to Support Received Directly by NAMA Agents

In the case that a NAMA Agent (project developer) directly (not through the government or the NAMA CE) receives resources from climate change international finance; they should proceed to the capture of relevant information. These developers or project operators should provide to the NAMA CE the total amount of financing received on a yearly basis; taking into consideration that this information does not need to include the expenditures, destination and use of resources, since that could be part of a bilateral agreement between the project operator and the funding source.

4.5. Data Capture Related to Support for Capacity Building and Technology Transfer

The NAMA CE needs to gather data on the scope of technology transfer and capacity building support to the NAMA.

In the case of Technology Transfer: it includes non-monetary support for provision of technical assistance, provision of pre-investment studies, information and knowledge transfer.

In the case of Capacity Building: in case international cooperation organizations, international financing institutions, or others provide financing for capacity building programs; such information needs to be aggregated by the NAMA CE.

In the case of Jamaica, MSET has an existing platform for the monitoring of projects within the Ministry and within the NEAP structure which can be utilized for the purpose of documenting support received.

4.6. Establishment of a Database for NAMA information

The NAMA CE needs to establish a database for all data capture and information processing of the NAMA for the purpose of implementing the MRV system. It is understood that MSET in Jamaica is currently developing its own internal database for project tracking, but it has not been presented or discussed with the consultant for this work; therefore a suggested logical framework is presented in order to support efforts for a viable approach to such design of a database.

The following table presents a sequence of steps that could be considered by the NAMA CE in the development of the NAMA database.

Logical Framework of the NAMA Database

Step	Description
1	Structure a first tier classification of NAMA Actions based on type of participation within regulated or non-regulated carbon market mechanisms.
2	Structure a second tier classification of NAMA Actions within each typology of carbon market mechanism that relates to the type of participation instrument within Jamaica (RE purchase mechanism such as bids, net Electricity Bill, or other to be established

Step	Description
	by the NAMA).
3	Structure a third tier level of classification of NAMA Actions within the above in order to classify projects under different categories of renewable energy technologies, such as wind, solar of different types (PV, concentrating solar power), or other sources (hydro, biomass, etc. That may be develop in the timeframe horizon of the NAMA
4	Within each of the tiers of classification, information related to the different NAMA Actions (projects) could be entered. Information normally entered should correspond to the different data that the NAMA Agents (project developers) will be providing to the NAMA CE in relation to two main areas: project operation and emissions reductions, support received. Data requirements on those categories are discussed in following sections of this Plan).
5	Database should allow for the representation of individual NAMA Action (project) information as well as allowing for the aggregation of information in each tier level.
6	The database should allow for the totalling of relevant information, which could serve the purpose of overall reporting as well as to cross check with other sector information
7	The database shall contemplate a section for emission reduction estimations done within the different tiers of classification and both at the project level as well as aggregation to be used for reporting within the MRV.

5. Information Processing for MRV Purposes

The purpose of any information processing relates to the organization and review of data received, development of required calculations for emissions reductions estimations, and due preparation of information for the reporting purposes of the NAMA.

Currently, there are several methodologies for estimation of emissions reductions for renewable energy interconnections to the grid under the CDM; and not only such methodologies have been applied in many, literally hundreds of projects internationally; and have been successfully verified in terms of their certainty to determine emissions reductions.

Important and relevant methodological approaches for the estimation of emissions reductions to bear in mind include:

- AMS ID[12]. Small-Scale Methodology: Grid Connected Renewable Electricity Generation Version 18.0 (for projects under 15 MW).
- ACM 0002[13]. Large-Scale Consolidated Methodology Grid-Connected Electricity Generation from Renewable Sources Version 17.0 (for projects larger to 15 MW).
- Tool 07[14]. Methodological Tool to Calculate the Emission Factor for an Electricity System Version 05.0.

Although there may be other methodologies applicable to other types of renewable energy electricity generation projects, the above mentioned resource base presents a sound approach for emissions reductions estimations in the framework of the NAMA.

5.1. Determination of Emissions Reductions for Projects under Regulated Carbon Market Schemes

For these types of projects, which typically include projects under the CDM, Gold Standard and VCS; it has been mentioned before that project participants have to provide the Verification Reports of the projects by a Designated Operational Entity (DOE). It is from such reports that the NAMA Coordinating Entity is to extract directly the value of GHG emissions reductions associated to the project activity.

5.2. Determination of Emissions Reductions Outside Regulated Carbon Market Schemes

For all other NAMA Actions (projects) that do not belong within a regulated carbon market; the NAMA CE has to aggregate data from each of the activities, will conduct a quality control and then will calculate the emissions reductions associated to each project.

As a first approximation to the estimation of emissions reductions from the NAMA, Actions are going to be Greenfield[15] type projects, the MRV Plan will use the methodological approach used by the CDM. Furthermore, taking into account that the types of projects to be

[12] https://cdm.unfccc.int/filestorage/2/P/7/2P7FS6ZQAR84LG3NMKYUH50WI9ODBC/EB81_repan24_AMS-I.D_ver18.pdf?t=NVJ8b3MweHZkfDCFiJ612g6sz-3l_ELQ2x0u

[13] https://cdm.unfccc.int/filestorage/D/5/Y/D5YFS9I3VKBT18MQNGX0LPZ6U7AWCO/ACM0002_%28v17%200%29_clean.pdf?t=dmR8b3MweHllfDCuuwPfQv69rKb6u5qUxAxy

[14] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v5.0.pdf

[15] Greenfield Project refers to a new project adding capacity to the grid or electricity provision to the grid.

interconnected are likely going to be small hydro, wind or solar capacity additions, the recommended approach for emissions reductions estimations will be:

$$ER_y = EG_{PJ,y} \times EF_{grid,y}$$

Where:

ER_y = Baseline emissions in year *y* (t CO_2)

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project activity in year *y* (MWh)

$EF_{grid,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (t CO_2/MWh).

It is important to mention that in case other types of projects such as combined heat and power from biomass sources, generation due to dedicated new biomass plantations, geothermal and large scale; the MRV should use the methodological provisions from the ACM0002 Large Scale Methodology for Grid Connected Electricity or other applicable methodologies.

It is recommended that the initial set of NAMA Actions during the first year of implementation should consist, if possible, of projects whereby project emissions as well as emissions due to leakage can be taken as zero (that is small hydro, wind, solar).

The quantity of net electricity generation (MWh) that is produced and fed into the grid as a result of the implementation of the project activity in year (*y)*, is to be extracted from the information provided by the project participant and verified through the information system that exists within the reporting procedures established between MSET and JPS as part of monitoring of electricity grid. The NAMA CE may alternatively decide to use the information from the reports directly provided by JPS on a yearly basis, but in doing so JPS will become a subject of the verification process of the NAMA.

As per the grid emission factor (GEF) to be used, taking into account the experience gained from the CDM, and the acceptance on its methodological development in this regard, it is recommended that the proposed NAMA should use a CDM grid emission factor estimation approach based on the determination of a combined margin that takes into considerations of the impacts that a build margin (types of recent plants installed) and an operating margin (overall operation of the grid) may have on the emissions associated to the operation of the dispatch. Taking into account the different contributions related to potential integration of intermittent sources in the generation, the CDM approach considers the allocation of specific weight factors to the expected impact of both the operating as well as build margins of the GEF calculation. The Emission Factor of the Grid needs to be estimated for the purpose of determination of emissions reductions, for which there are several options:

- The NAMA CE could estimate the grid emission factor (directly/subcontract/agreement with third party) using the relevant Tool 07[16]. Methodological Tool to Calculate the Emission Factor for an Electricity System Version 05.0.

[16] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v5.0.pdf

- Through the CDM DNA in the country, a request for registration of an Standardized Baseline[17] for the Grid Emission Factor of Jamaica (3 year validity) can be validated and register within the CDM. This could allow for not having to perform the calculation every year, as well as for using standardized simplified approaches likely to be useful in the context of such estimation in a country like Jamaica. For example Grenada has done such estimation and registration of its own grid emission factor for the electricity grid[18].

- As interim value while the above is implemented, Jamaica could decide to use the factor determined by the Wigton Windfarm II Project which has a valid crediting period until Feb 2019 (pending assessment of conservativeness with respect to recent developments in the country). Such a value can be used during road mapping the implementation of the NAMA MRV on a temporary base while the new estimation of the factor is concluded.

The following insert taken from the Wigton Windfarm II CDM Project Design Document presents the information regarding the estimated GEF at the time of registration of that project.

Wigton Windfarm II Jamaica Estimated Grid Emission Factor[19]

Data / Parameter:	$EF_{grid, CM, y}$
Data unit:	tCO_2/ MWh
Description:	Combined margin CO_2 emission factor in year *y*
Source of data used:	The raw data presenting the annual electricity generation and the annual fuel consumption of each generation unit was provided by the Office of the Utility Regulator (OUR) The fuel weight and NCV were provided by the fuel supplier PetroJam. The Combined Margin (CM) was calculated based on above data as per the "*Tool to calculate the emission factor for an electricity system*"
Value applied:	0.7324 tCO2/MWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per the "*Tool to calculate the emission factor for an electricity system*"
Any comment:	

It is important to note the importance of creating the adequate capacities in the country for the determination of the grid emission factor. There have been efforts in Jamaica for such determination. The Wigton Wind Farm Project has been successful in such determination and it is well acquainted with the estimation process. It is understood that the UNFCCC RCC Centre in Grenada has been involved in initial considerations for the estimation of the grid emission factor in Jamaica, which can assist in creating and maintaining the capacities for continuing evaluation of the factor.

The estimation of the factor is a critical condition for the estimation of emission reductions in the Jamaica RE NAMA. The most important data that will likely be needed for this estimation is included in Annex III.

[17] https://cdm.unfccc.int/methodologies/standard_base/index.html
[18] https://cdm.unfccc.int/filestorage/e/x/t/extfile-20170117160400515-ASB0031_PSB0023.pdf/ASB0031_PSB0023.pdf?t=ZmJ8b3MxMnQxfDDIlfivjDaiOTnkZ0Kz8LZE
[19] https://cdm.unfccc.int/filestorage/I/O/H/IOHRFE1CPWGYDAJ6NXLQ57T390UVMB/Ref.%201l%20-%20PDD%20Wigton%205%203%203?t=cXl8b3MxM2Q3fDBMrHzisThRqbScgjyUN2M_

The other most important data required for estimation of emissions reductions associated to NAMA Actions is related to the quantity of net electricity generation supplied by a project plant/unit to the grid in any given year. The following insert presents the consideration given internationally to this parameter.

Data / Parameter:	$EG_{PJ,facility,y}$
Data unit:	MWh
Description:	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y*
Source of data	Electricity meter(s)
Measurement procedures (if any):	This parameter should be either monitored using bi-directional energy meter or calculated as difference between (a) the quantity of electricity supplied by the project plant/unit to the grid; and (b) the quantity of electricity the project plant/unit from the grid. In case it is calculated then the following parameters shall be measured: (a) The quantity of electricity supplied by the project plant/unit to the grid; and (b) The quantity of electricity delivered to the project plant/unit from the grid
Monitoring frequency:	Continuous monitoring, hourly measurement and at least monthly recording
Any comment:	-

Taking into account that there are two existing types of programs for RE generated electricity to be interconnected to the grid in Jamaica (direct purchases and distributed generation), there may different mechanisms in place for determination of net electricity generation supplied to the grid. Any specific regulations applicable must be taken into consideration at the time of determining this parameters, that is taking into consideration aspects related to specific RE electricity purchases through direct contracts as well as through the NET BILLING, ELECTRIC POWER WHEELING AND AUXILIARY CONNECTIONS GRID-INTERCONNECTION PROGRAMME[20]

5.3. Estimation of NAMA Emissions Reductions

Preceding sections have discussed the procedure for estimating emissions reductions for both cases of possible carbon market or not participation of the project activities.

The overall estimation of emissions reductions must take into account if a project activity that operates within a regulated carbon market scheme has issued, transferred or voluntarily cancelled its emissions reductions within such market scheme.

Utilizing the aggregation of NAMA projects within the different carbon accounts allows for such determination which is expressed by the following calculation procedure:

20 http://www.mstem.gov.jm/sites/default/files/pdf/Net%20Billing%20Power%20Wheeling%20etc%20Programme%20%28December%2019%2C%202016%29_0.pdf

Emissions reductions (ER) of the NAMA	=	Sum of ER due to projects not operating in a carbon market mechanism	–	Sum of ER from projects operating under carbon market mechanisms that have transferred their reductions	+	Sum of ER from projects that have voluntarily cancelled issuance from such mechanisms

5.4. Estimation of Relevant NAMA Indicators

The MRV Plan includes the establishment and quantification of a set of NAMA Indicators. Such parameters allow the NAMA Coordinating Entity (MSET) to perform a follow-up of the actions as well as to permit the visualization of the achieved effects of the NAMA.

It is suggested that the following indicators should be used:

- **Indicator #1: % Participation of Renewable Energy Generated Electricity in the Total Electricity Mix of the Country.** This indicator is linked to overall contribution of Renewable Energy, and it is aligned to current Energy Sector Policy and the Jamaica Vision 2030.
- **Indicator #2: Yearly Number of NAMA Actions Undertaken.** This indicator is linked to assessing the continuous efforts of the NAMA in achieving its transformational efforts in support of the framework policies to be implemented as the NAMA moves forward.
- **Indicator #3: Degree of Participation (evenness of contribution) of Different Renewable Energy Sources in the Generation Mix.** This indicator is linked to the transformational effort of the NAMA related to assisting the creation of energy security through diversification of generation sources, presenting how relative development and hence contribution is being developed by the action of the NAMA.

Construction of indicators is to be done on the basis of the information provided by implementing agents and also based on other information available for the NAMA. A more detailed description of the indicators follows:

Indicator # 1	**% Participation of Renewable Energy Generated Electricity in the Total Electricity Mix of the Country**
Unit	%
Description	Presents the aggregated percentage participation of RE electricity generated, interconnected to the grid; coming from different RE sources and types of projects as part of total electricity in the country on a yearly basis
Estimation Methodology	Results from the summation of electricity generated from NAMA Actions (projects) that are interconnected and in operation divided by the total amount of electricity in the grid for the given year
Data Sources	Information provided by each project participant, entered into NAMA

Indicator # 1	% Participation of Renewable Energy Generated Electricity in the Total Electricity Mix of the Country
	database. Validated by the NAMA CE
Frequency of Estimation	Yearly
Information to be Supplied by NAMA Agents	Each implementing agent will provide net electricity generated interconnected to the grid
Evidences	MRV database Form completed by implementing agents

Indicator # 2	Yearly Number of NAMA Actions Undertaken
Unit	Number
Description	Presents the yearly number of NAMA Actions undertaken or NAMA Actions registered within the NAMA
Estimation Methodology	Summation of NAMA Actions registered in the NAMA on a yearly base coming from either RE purchases established or from the Net Billing Scheme
Data Sources	NAMA Database
Frequency of Estimation	Yearly
Information to be Supplied by NAMA Agents	None
Evidences	NAMA Database Registration of NAMA Action form completed by project developers in the registry of the NAMA CE

Indicator # 3	Degree of Participation (evenness of contribution) of Different Renewable Energy Sources in the Generation Mix
Unit	% for participation from RE sources, types of projects under NAMA mechanisms

Indicator # 3	Degree of Participation (evenness of contribution) of Different Renewable Energy Sources in the Generation Mix
Description	Presents the disaggregated percentage participation of RE electricity generated, interconnected to the grid; coming from different RE sources (solar, wind, etc.) and types of projects (under RE purchases by GoJ or from the Net Billing Scheme or other future mechanism) as part of total electricity in the country on a yearly basis
Estimation Methodology	Depending on the selected disaggregation approach to be decided by the NAMA CE, the indicator results from the disaggregated summation of electricity generated from NAMA Actions (projects) that are interconnected and in operation divided by the total amount of electricity in the grid for the given year
Data Sources	Information provided by each project participant, entered into NAMA database. Validated by the NAMA CE
Frequency of Estimation	Yearly
Information to be Supplied by NAMA Agents	Each implementing agent will provide net electricity generated interconnected to the grid
Evidences	MRV database Form completed by implementing agents

5.5. Estimation of NAMA Co-Benefit Indicators

Currently, there is ample discussion on approaches for the estimation of co-benefits derived to the society from renewable energy scaling-up activities. As IRENA[21] mentions, in general there are two main types of approaches from which specific indicators can be derived for use within the Jamaica RE NAMA:

- Gross type assessments that focus on the renewable energy sector alone, and
- Net impact assessments that focus on the whole economy in which the deployment of renewable energy happens.

Gross impact assessments can be done based on employment creation only considerations and by doing input-output and supply chain analysis. Those based on employment creation have a lower relative cost and are applicable in quick assessments requiring relatively simple monitoring of employment in the Re industry. On the other hand the approaches based on input-output and supply chain analysis are costlier and require more sophisticated monitoring of value added in the RE industry.

[21] http://www.irena.org/DocumentDownloads/Publications/Socioeconomic_benefits_solar_wind.pdf

Net impact assessments require assessing not only employment but also economic performance based on rough economy wide assessments on the short run and also short to long term economic assessments based on more complex modelling of the economy in general.

In general the first type presents simpler approaches but do not serve the purpose of determining value added to the economy in general. The gross type analysis requires less complex data and models to assess contributions to the society.

For the purpose of this NAMA and taking into account the early stage of the participation of RE in Jamaica, it is intended that NAMA co-benefit indicators should concentrate in gross type analysis which are described in the following figure.

Assessment of societal benefits from renewable energy based on gross analysis of the RE sector in Jamaica

Gross Approach	Employment Factors
Key variables	Employment only. Only direct jobs in the RE industry.
Applicability	Quick assessments and simple monitoring of employment in the RE industry.
Resources needed	Low to medium (depending on whether employment factors are easily available) or high (if they have to be derived).
Critical assumptions/data requirements	Imports (domestic production), exports (if any), labour input by RET.

The co-benefits indicators proposed for use within the Jamaica RE NAMA are based on a first tier approach based primarily on employment factors. This selection of approach is also consistent with recommendations from the Planning Institute of Jamaica (PIOJ), indicating that an important criterion from the perspective of the GoJ is related to contribution to the creation of employment opportunities. As the NAMA progresses in implementation and more information becomes available, the choice of approach could be adjusted to reflect more complex variables related to value added creation in the Jamaican economy.

Taking into account the information provided by IRENA at an international level, for wind and solar PV industries, values of employment creation from renewable energies range internationally as can be seen in the following table:

International Data on Employment Creation in Renewable Energies

Renewable Energy Technology	Manufacturing & Installation (Job-year/MW)	Operation & Maintenance (Jobs/MW)
Wind		
Minimum	2.6	0.1
Maximum	15	0.6
Solar PV		
Minimum	7.1	0.1
Maximum	43	0.7

The employment related co-benefit indicator for the NAMA is as follows:

<table>
<tr><th>NAMA Co-Benefit Indicator</th><th>Contribution to Creation of Employment Opportunities in Jamaica</th></tr>
<tr><td>Unit</td><td>Number of Jobs Created.</td></tr>
<tr><td>Description</td><td>Presents the contribution to job creation from the perspective of manufacturing & installation as well as operation & maintenance in the developing wind and solar industries in the country.</td></tr>
<tr><td>Estimation Methodology</td><td>At the start of NAMA implementation, default factors (based on minimum values internationally for manufacturing and average value for operation & maintenance) will be used for both types of industries established as the average of international trends:

<table>
<tr><td>Type of technology</td><td>Manufacturing & Installation

(jobs-years/MW)</td><td>Operation & Maintenance

(jobs/MW)</td></tr>
<tr><td>International Wind Average</td><td>2.6</td><td>0.35</td></tr>
<tr><td>International Solar Average</td><td>7.1</td><td>0.4</td></tr>
</table>
Estimation should be based on total installed capacity from the NAMA Actions in MW.

It is suggested that the NAMA CE should conduct a local assessment of employment creation opportunities from the targeted RE technologies entering the NAMA in order to have better locally informed data on this subject in order to re assess the default values that are hereby recommended. Such study can be commissioned, jointly conducted with other stakeholders (PIOJ, universities). Taking into account that the country has experience with implementation of RE projects under the GoJ RE electricity purchases programs (bids) and also on the side of the Net Billing Scheme, there is an existing pool of projects that could be interviewed through a statistical instrument in order to assess the merits of the proposed default values.

It is recommended that such assessment should be conducted within the first year of implementation of the NAMA (taking into consideration that there is information available from implementation of both bidding process as well as the net billing scheme, which provide an initial target population to engage in assessing job creation opportunities by the RE industry).</td></tr>
</table>

NAMA Co-Benefit Indicator	Contribution to Creation of Employment Opportunities in Jamaica
Data Sources	NAMA database
Frequency of Estimation	Yearly
Information to be Supplied by NAMA Agents	As per registration of their own facilities in the NAMA,
Evidences	NAMA database NAMA Action registration forms validated by the NAMA CE

5.6. Estimation of Support Received by the NAMA

The Coordinating Entity needs to track and estimate at least the following sources of support:

- Information on support received (Financing, Capacity Building and Technology Transfer) by actions under the NAMA (projects) based on: i) accords by implementing agents and climate change financing sources, ii) other support received from other international agents (IFIs, bilateral agencies and other multilateral agencies).

The support for the NAMA is to be expressed through a statement of aggregated expenditure (AE NAMA), which is be defined as follows:

$$AE\ NAMA = AEIO + AECF$$

Where:

AE NAMA, is the aggregated expenditure of actions under the NAMA.

AEIO, is the expenditure from actions sustained by international organizations (IOs) whose participation in the NAMA is not direct (i.e. international cooperation).

AECF, is the expenditure from IOs as direct financing of NAMA and whose origin comes from climate financing directly.

6. NAMA Reporting

In the context of implementation of the NAMA, the MRV system places special attention to the reporting requirements related to the determination of the emissions reductions associated to the NAMA Actions, the NAMA indicators and reporting of NAMA co-benefits and support received.

Taking into account that reporting of a program such as a NAMA may have different requirements (both internally as externally), the MRV Plan proposes a common Report Template that should provide transparent information to other engaged stakeholders either within climate change or not areas.

Taking into account that as for the time being, there are no standardized definitions on reporting for NAMAs; it is intended that the Report Template will be adequate to supply information that different reporting needs may have and be able to aggregate for different reporting needs.

Some of those perceived reporting needs from different stakeholders in the climate change area are:

Perceived Reporting Needs for the Jamaica RE NAMA

Mechanism	Perceived Reporting Needs
National GHG Communications to the UNFCCC	Jamaica is preparing a new National Greenhouse Gases Inventory under the UNFCCC. Within this inventory, there are reporting needs related to: **National Circumstances**: NAMA information could assist in the inclusion of information related to the energy system characteristics that can have an impact on mitigation capabilities as well as on how mitigation response mechanisms may be working on the ground. **GHG Inventory**: information provided by the NAMA will be useful in the area of supporting assessments on the energy situation of the country and the role of RE in the generation mix. **Description of measures adopted**: Being the NAMA a dedicated mitigation program, it plays an important role on the mitigation efforts of Jamaica. For example, the NAMA reporting includes strategic information on issues such as general description of actions undertaking that will be beneficial to this reporting need. **Programs that include measures for climate mitigation**: the NAMA can provide information on implementation of specific actions, sub programs and projects, as well as from the documentation of capacity building and technology transfer

	actions and support received.
Biennial Update Reports to the UNFCCC	Within the reporting needs for BUR preparation, the NAMA Report can provide information relevant to: • Monitoring of parameters that may be useful to the BUR, like net electricity generation from plants, fuel consumptions, hours of operation of power plants, etc. • Information regarding the implementation of mitigation activities and their performance, as the NAMA database tracks on a yearly base the operation of NAMA Actions (that is re projects). • Information on level of support received.
Nationally Determined Contribution Reporting to the UNFCCC	The NAMA is directly mentioned within the scope of mitigation activities included within Jamaica´s First Nationally Determined Contribution (NDC) submitted to the UNFCCC on 10/04/2017. The NAMA is embedded within national policies and CC aspirations. Although at this point in time, there is no specific format for NDC reporting, The NAMA Report is configured in a manner that considers possible reporting needs arising from such NDC reporting in due time.
Reporting under Jamaica Vision 2030	The Jamaica Vision 2030 includes direct indicators to be reported on the scaling of the renewable energy contribution in the country. The NAMA Report provides systematized information that will be useful for such reporting needs through the emission reductions achieved, NAMA indicators, co-benefit indicators.

6.1. NAMA Report Template

The general template of the NAMA Report is intended to serve as a guide of the proposed reporting to be prepared by the NAMA CE. Annex IV presents the template for the NAMA Report.

Contents of the NAMA Report Template

Section	Name
1	**Description of the NAMA**: Description of NAMA Objectives and Scope, location of NAMA Actions (projects) implemented, listing of NAMA Actions and involved NAMA Agents (project developers) in the period under consideration.

2	**Implementation Status of the NAMA**: Description of NAMA Actions undertaken as well as any outstanding changes that may have occurred in the period under consideration.
3	**Description of Measuring System**: Detailed description of the database used in the NAMA MRV, as well as any other system used for measurements employed by implementing agents.
4	**Data and Parameters**: Presents details of all the parameters used for estimation of emission reductions, as well as any default parameters used. Proposed format of each parameter is to be included.
5	**Estimation of GHG Emissions Reductions**: Detail presentation of the emission reduction estimations. Methodological aspects need also to be incorporated.
6	**Co-Benefits**: Presentation of the aggregated information from all NAMA Actions and the parameters associated to estimation of co-benefits.
7	**Cooperation and Support**: Presentation of the information related to financial, capacity building and technology transfer support received directly or indirectly from international organizations and specific climate change financing facilities.
8	**Monitoring of NAMA Indicators**: This section includes the selected NAMA indicators in the tabular format described in the text coupled to a description of the observed trend within accumulated time periods of reporting.
9	**Other Data Reported**: This section is left open for the consideration of any other information that may be requested from the NAMA CE by other stakeholders associated to link reporting, such as BUR, NDC, JV 2030.

7. Quality Control/Quality Assurance

The MRV Quality Control/Quality Assurance component is intended to contribute to increase the quality of data through the data capture, quantification, monitoring, reporting and verification phases of the system.

Quality control activities are implemented during the data capture, processing of information and NAMA reporting, while quality assurance activities are to take place during the verification activities.

7.1. Quality Control (QC)

Quality control refers to routine controls and coherency checks aimed at reducing the three major categories of risks within the NAMA:

- Human risk resulting from the incorrect registration of information, within the database of the MRV system.
- Equipment risk affecting the database through inadequate design of the database or the forms used for requesting information from NAMA Agents.
- Information transmission risk due to lack of transparency or lack of compliance with required periodicity for data gathering and performing of activities of the system.

In order to minimize such risks, the QA component should involve activities in the following areas:

Estimation Methodologies: Clearly differentiating the issues between NAMA Actions within the RCMS and the NRCMS. For the first type, the QC is done through the requirement that emissions reductions must have been already verified by an accepted third party and that a due report of such review has been performed and accepted by the RCMS. For the second type, a calculation approach is suggested and a procedure for checks on data and procedures is established in the MRV system.

Data Validation: the MRV database should include specific cells for cross review of data, in order to assure the NAMA CE that appropriate estimations are performed. The NAMA CE should implement a procedure for dealing with cases of perceived discrepancies in estimations.

Constant Communication for Information Transmission: the NAMA CE needs to have constant channels of communication with the implementing agents. In doing so, consideration needs to be given to for example: establishment of a specific liaison officer responsible for follow up with NAMA Agents, preparation of users' manual for NAMA Agents detailing procedures (not recommended here), and organization of activities (meetings, workshops) to provide adequate information to NAMA Agents.

7.2. Quality Assurance (QA)

The main purpose of QA activities is to assure that any declaration from the NAMA is complete, exact, coherent, transparent, and with no noticeable discrepancies.

Taking into account that the Jamaica RE NAMA has not yet define whether or not is going to be an internationally funded NAMA or if it is going to be nationally funded, it is hard to define the best suited approach for verification of the NAMA, since costs implications may be high.

It is suggested therefore that in case the NAMA becomes internationally funded, verification should preferably be done through an independent third party (normally internationally based, but could be locally sourced if well qualified for the verification process).

In case the NAMA becomes domestically funded, then the verification process may be done internally within the country.

The verification process should be aimed at:

- Understand and evaluate the potential risks associated to methodologies used,
- Improve the image of the NAMA through sound verification principles,
- Assure the credibility, coherency, and transparency of the estimations performed.

It is suggested that the verification of the Jamaica RE NAMA should have the following components:

- Yearly documentary verification and
- Biennial (or at other adequate periodicity) in situ verification.

7.3. Annual Documentary Verification

At the beginning of the verification process the verification entity (VE) should prepare a Verification Plan detailing at least the following:

- Dates for the verification.
- Number of days anticipated.
- Identification of the verification team, associated capabilities and skills.
- Proposal of the documentation to be reviewed.
- Proposal on the stakeholders to be interviewed.

During the process, the VE will analyse available information provided by the NAMA CE and attention shall be centred in the following actions:

Components of the Yearly Documentary Verification

Verification Actions	Description
Evaluation of procedures	Review of the procedures used for data control, centred on the NAMA database, and procedures for information flows between the NAMA CE and the NAMA Agents.
Analysis of monitored parameters	Review listing of parameters considered for the ER estimations as well as other indicators.
Review of emissions	Verification of estimation formulae, including consistency,

Verification Actions	Description
reduction calculations	traceability, and transparency. Formulae in the database must be open
Validation of data sources	Verification of data sources on three categories: inherent to the NAMA, default values and externally sourced data.
Indicators	Evaluation of correct definition and application of estimations.
Co-benefits	Review of correct application of the method for estimation.
Support	Evaluation of at least: • Financing agreements of the NAMA • Application of the capacity building components has been done according to the established plans and schedules. • Application of technology transfer components have been done according to established plans and schedules.
Review of evidences	Review of the archives established by the NAMA CE in support of the NAMA database and other information.

7.4. Biennial (or at other adequate periodicity) in situ verification

This verification is complimentary to the yearly documentary verification, achieved through visits to targeted (statistically selected) number of NAMA Actions.

Components of the In Situ Verification

Verification Activities	Description
Verify the exactitude of the information provided by NAMA Agents (projects)	Analysis through a statistically representative base of reported data, looking at the flow of information from NAMA Agent to the NAMA CE.
Verification in situ of the information regarding the operation of the NAMA Actions	Check on the operation of the project, review of operational logs and assessment of calibration of relevant monitoring equipment in case required.

7.5. Verification Report

The objective of the verification report is to summarize the details of the assessment conducted, including a final verification opinion.

A Verification Report Template is included in Annex V with the idea of assisting MSET in due consideration of recommended sections of this type of reporting. Nevertheless the VE shall propose a specific template for the monitoring performance. During testing stages of the MRV Plan, MSET may use the proposed template in order to assess how effective the implementation of the MRV is being conducted as the MAMA moves forward towards implementation.

Annex I

Form for Registration of NAMA Actions (projects)

Form for Registration of NAMA Actions	
Name of NAMA Action (project)	
Name of Organization	
Main area of activity	
Fiscal ID	
Person of contact	
Position	
Phone	
Mobile Phone	
e-mail	
Type of entity	
Details regarding confidentiality needs	
Observations	
Date of application	
Signature	
Information Regarding the NAMA Action (project)	
Brief description of the proposed action	
Scope	
Expression of compliance to requested periodicity to provide information to the NAMA CE (yearly)	
Type of project (project or programme)	
Carbon scheme (CDM, Gold Standard, Verified Carbon Standard, other, no regulated carbon market)	
Identification number in case the action is currently registered within a regulated carbon market	

Location	
GPS coordinates of action/activity location	
Status of Action/Activity	
Starting date	
Type of renewable energy generation technology	

Annex II

Stakeholders Associated to Distributed Generation in Jamaica

Key Stakeholders	Responsibilities
Ministry of Science, Energy and Technology (MSET)	• Establishing policies and set RE targets • Developing legislations and regulations • Monitoring and evaluation • Planning • Issuing of Electricity Generation Licences • Maintain registry of all Electricity Licences • Public Awareness
Generation Procurement Entity (GPE)	• To procure new generation capacity • To issue approval of Renewable Energy supply to the grid after consultation with JPS
Office of Utilities Regulation (OUR)	• Regulate the electricity sector • Investigation of complaints relating to Electricity Generation Licences • Approve Standardized Contracts Setting rates • Determine the Use of System Charge for net billing, auxiliary connections and electric power wheeling • Apply penalties for underperformance • Public Awareness
Government Electrical Regulator (GER)	• Recommend the issue of Licences to Electrical Inspectors and electricians including recommending amendments, suspensions and revocations • Regulation of Licensed Electrical Inspectors and electricians • Dispute Resolution between Self-Generators and Licensed Electrical Inspectors • Maintain record of Approved Training Institutions (ATIs) for Licence Electrician and Inspectors • Public Awareness
Bureau of Standards Jamaica (BSJ)	• Perform testing of Energy Devices • Promulgate a list of approved meters and flocking devices • Public Awareness
Jamaica Public Service Company (JPS)	• Maintain and operate the electric grid • Conduct initial verification of Applicants • Supply and purchase electricity • Enter into standardized contracts • Provision of Utility Meters and blocking devices • Reporting Public Awareness
Licensed Electrical Inspectors (LEIs) and electricians with Renewable Energy Certification	• Inspect installed RE and Non-RE Systems in reference to established codes and standards • Issue certificate to qualified RE and Non-RE Systems • Reporting
Self-Generators (SG)	• Make application for Licence to net bill, connect for auxiliary purposes and or enter into a wheeling arrangement • Pay application fee, non-refundable processing fee and use of system charge • Negotiate and execute standardized contract.

Annex III

Monitoring Data for Grid Emission Factor Estimation

The Tool for estimation of the grid emission factor includes several approaches for the estimation, and related to those approaches there will be different sets of data to be capture and monitored. This Annex presents the overall perspective on data requirements and not necessarily all data reflected here is needed in the case of Jamaica. Only, after careful evaluation of the approach as well as decisions on the methodological base, the specific data to be monitored will be establish.

7. Monitoring methodology

95. All data collected as part of monitoring should be archived electronically and be kept for at least two years after the end of the last crediting period. One hundred per cent of the data should be monitored if not indicated otherwise in the tables below. All measurements should be conducted with calibrated measurement equipment according to relevant industry standards.

96. Some parameters listed below under "data and parameters" either need to be monitored continuously during the crediting period or need to be calculated only once for the crediting period, depending on the data vintage chosen, following the provisions in the baseline methodology procedure outlined above and the guidance on "monitoring frequency" for the parameter.

97. The calculation of the operating margin and build margin emission factors should be documented electronically in a spread sheet that should be attached to the CDM-PDD. This should include all data used to calculate the emission factors, including:

    (a) The following information for each grid-connected power plant/unit:

        (i) Information to clearly identify the plant;

        (ii) The date of commissioning;

(iii) The capacity (MW);

(iv) The fuel type(s) used;

(v) The quantity of net electricity generation in the relevant year(s);[9]

(vi) If applicable: the fuel consumption of each fuel type in the relevant year(s);

(vii) In cases where the simple OM or the simple adjusted operating margin is used: information whether the plant/unit is a low-cost/must-run plant/unit;

(b) Net calorific values used;

(c) CO_2 emission factors used;

(d) Plant efficiencies used;

(e) Identification of the plants included in the build margin and the operating margin during the relevant time year(s);

(f) In case the simple adjusted operating margin is used: load data (typically in MW) for each hour of the year *y*;

(g) In case the dispatch data operating margin is used: for each hour h where the project plant is displacing grid electricity:

(i) The dispatch order of all grid-connected power plants;

(ii) The total grid electricity demand;

(iii) The quantity of electricity displaced by the project activity;

(iv) Identification of the plants that are in the top of the dispatch and for each plant information on electricity generation and, where hourly fuel consumption data is available, data on the types and quantities of fuels consumed during that hour.

98. In case off-grid power plants are included, the guidance for monitoring data and parameters related to off-grid plants provided in appendix 2 should also be followed.

99. The data should be presented in a manner that enables reproducing of the calculation of the build margin and operating margin grid emission factor.

Data / Parameter table 1.

Data / Parameter:	**$FC_{i,m,y}$, $FC_{i,y}$, $FC_{i,k,y}$, $FC_{i,n,y}$ and $FC_{i,n,h}$**
Data unit:	Mass or volume unit
Description:	Amount of fuel type *i* consumed by power plant/unit *m*, *k* or *n* (or in the project electricity system in case of $FC_{i,y}$) in year *y* or hour *h*
Source of data:	Utility or government records or official publications

Measurement procedures (if any):	-
Monitoring frequency:	(a) Simple OM, simple adjusted OM, average OM: Either once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option) or annually during the crediting period for the relevant year, following the guidance in Step 3 above; (b) Dispatch data OM: If available, hourly (as per Step 3 above), otherwise annually for the year *y* in which the project activity is displacing grid electricity. Further guidance can be found in Step 3 above; (c) BM: For the first crediting period, either once ex ante or annually ex post, following the guidance included in Step 5. For the second and third crediting period, only once ex ante at the start of the second crediting period
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 2.

Data / Parameter:	**$NCV_{i,y}$**
Data unit:	GJ/mass or volume unit
Description:	Net calorific value (energy content) of fuel type *i* in year *y*
Source of data:	The following data sources may be used if the relevant conditions apply:

Data source	**Conditions for using the data source**
Values provided by the fuel supplier of the power plants in invoices	If data is collected from power plant operators (e.g. utilities)
Regional or national average default values	If values are reliable and documented in regional or national energy statistics/energy balances
IPCC default values at the lower limit of the uncertainty at a 95 per cent confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories	

Measurement procedures (if any):	-

Monitoring frequency:	(a) Simple OM, simple adjusted OM, average OM: Either once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option) or annually during the crediting period for the relevant year, following the guidance in Step 3 above; (b) Dispatch data OM: Annually for the year *y* in which the project activity is displacing grid electricity or, if available, hourly. Further guidance can be found in Step 3 above; (c) BM: For the first crediting period, either once ex ante or annually ex post, following the guidance included in Step 5. For the second and third crediting period, only once ex ante at the start of the second crediting period
QA/QC procedures:	-
Any comment:	The gross calorific value (GCV) of the fuel can be used, if gross calorific values are provided by the data sources used. Make sure that in such cases also a gross calorific value basis is used for CO_2 emission factor

Data / Parameter table 3.

Data / Parameter:	**$EF_{CO2,i,y}$ and $EF_{CO2,m,i,y}$**
Data unit:	t CO_2/GJ
Description:	CO_2 emission factor of fuel type *i* used in power unit *m* in year *y*
Source of data:	The following data sources may be used if the relevant conditions apply:

Data source	**Conditions for using the data source**
Values provided by the fuel supplier of the power plants in invoices	If data is collected from power plant operators (e.g. utilities)
Regional or national average default values	If values are reliable and documented in regional or national energy statistics/energy balances
IPCC default values at the lower limit of the uncertainty at a 95 per cent confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories	

Measurement procedures (if any):	-

Monitoring frequency:	(a) Simple OM, simple adjusted OM, average OM: Either once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option) or annually during the crediting period for the relevant year, following the guidance in Step 3 above; (b) Dispatch data OM: Annually for the year y in which the project activity is displacing grid electricity or, if available, hourly. Further guidance can be found in Step 3 above; (c) BM: For the first crediting period, either once ex ante or annually ex post, following the guidance included in Step 5. For the second and third crediting period, only once ex ante at the start of the second crediting period
QA/QC procedures:	-
Any comment:	For biofuels the value applied to the CO_2 emission factor is zero

Data / Parameter table 4.

Data / Parameter:	**$EG_{m,y}$, EG_y, $EG_{k,y}$ and $EG_{n,h}$**
Data unit:	MWh
Description:	Net electricity generated by power plant/unit *m, k* or *n* (or in the project electricity system in case of *EGy*) in year *y* or hour *h*
Source of data:	Utility or government records or official publications
Measurement procedures (if any):	-
Monitoring frequency:	(a) Simple OM, simple adjusted OM, average OM: Either once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option); or annually during the crediting period for the relevant year, following the guidance in Step 3 above; (b) Dispatch data OM: Hourly. Further guidance can be found in Step 3 above; (c) BM: For the first crediting period, either once ex ante or annually ex post, following the guidance included in Step 5. For the second and third crediting period, only once ex ante at the start of the second crediting period
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 5.

Data / Parameter:	**$EG_{PJ,h}$ and $EG_{PJ,y}$**
Data unit:	MWh
Description:	Electricity displaced by the project activity in hour *h* of year *y*, or in year *y*
Source of data:	As specified by the underlying methodology
Measurement procedures (if any):	As specified by the underlying methodology

Monitoring frequency:	Hourly or yearly, as applicable
QA/QC procedures:	As specified by the underlying methodology
Any comment:	-

Data / Parameter table 6.

Data / Parameter:	**$\eta_{m,y}$ and $\eta_{k,y}$**
Data unit:	-
Description:	Average net energy conversion efficiency of power unit *m* or *k* in year *y*
Source of data:	Use either: (a) Documented manufacturer's specifications (if the efficiency of the plant is not significantly increased through retrofits or rehabilitations); or (b) For grid power plants: data from the utility, the dispatch center or official records if it can be deemed reliable; or (c) The default values provided in the table below in appendix 1 (if available for the type of power plant)
Measurement procedures (if any):	-
Monitoring frequency:	Once for the crediting period
QA/QC procedures:	If the data obtained from the manufacturer, the utility, the dispatch center of official records is significantly lower than the default value provided in appendix 1 for the applicable technology, project proponents should assess the reliability of the values, and provide appropriate justification if deemed reliable. Otherwise, the default values provided in appendix 1 shall be used
Any comment:	-

Data / Parameter table 7.

Data / Parameter:	**CAP_m**
Data unit:	MW
Description:	Total capacity of off-grid power plants included in off-grid power plant class *m*
Source of data:	Survey on off grid-power plants, as per appendix 2
Measurement procedures (if any):	As per appendix 2
Monitoring frequency:	As per the provisions in Step 3 of this tool
QA/QC procedures:	-
Any comment:	Only applicable if Option II is chosen in Step 2 of this tool

Data / Parameter table 8.

Data / Parameter:	**$PLF_{default,off\text{-}grid,y}$**
Data unit:	Dimensionless
Description:	Plant load factor for off-grid generation in year *y*

Source of data:	Default value of 300 hours per year, or calculate on the basis of equation (7)
Measurement procedures (if any):	-
Monitoring frequency:	As per the provisions in Step 3 of this tool
QA/QC procedures:	-
Any comment:	Only applicable if Option II is chosen in Step 2 of this tool and if Option 3 is chosen to determine *EGm,y* in Step 4 of this tool

Data / Parameter table 9.

Data / Parameter:	$T_{grid,y}$
Data unit:	hours
Description:	Average time the grid was available to final electricity consumers in year *y*
Source of data:	Utility or government records or official publications
Measurement procedures (if any):	-
Monitoring frequency:	-
QA/QC procedures:	-
Any comment:	Only applicable if Option II is chosen in Step 2 of this tool and if Option 3 is chosen to determine *EGm,y* in Step 4 of this tool and if equation (7) is applied

Data / Parameter table 10.

Data / Parameter:	Other parameters related to off-grid power plants
Data unit:	As per appendix 2
Description:	As per appendix 2
Source of data:	As per appendix 2
Measurement procedures (if any):	As per appendix 2
Monitoring frequency:	As per appendix 2
QA/QC procedures:	As per appendix 2
Any comment:	-

Annex IV

NAMA Report Template

Jamaica Renewable Energy NAMA Measurement/Monitoring Report	
Report version	
Date	
Measurement/monitoring period	
NAMA Coordinating Entity Person of contact	
Total Emission reductions calculated for the NAMA (t CO2e)	
Emissions reductions calculated under non regulated carbon market mechanisms (t CO2e)	
Emissions reductions calculated under regulated carbon market mechanisms (t CO2e)	
Emission reductions cancelled under regulated carbon market mechanisms (t CO2e)	

Section 1. NAMA Description

1.1. NAMA Description

1.2. NAMA Actions and NAMA Agents Included

NAMA Agent Name	Implemented and Monitored NAMA Action	Type of NAMA Action

1.3. Location

Section 2. NAMA Implementation Status

2.1. Description of the Implementation of NAMA

2.2. Significant Changes Observed or Implemented during Monitoring Period

Section 3. Description of Measurement System

Section 4. Data and Parameters

4.1. Monitoring Parameters

For each of the monitoring parameters, a corresponding table has to be filled.

Data/Parameter	**Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the NAMA Actions (aggregated of all project activity in year *y)***
Unit	
Description	
Data source	
Applied value	
Measurement/monitoring method	
Frequency of measurement/monitoring	
comments	

Data/Parameter	**Combined margin CO_2 emission factor for grid connected power generation in year *y***
Unit	
Description	
Data source	
Applied value	
Measurement/monitoring method	
Frequency of measurement/monitoring	

Data/Parameter	Combined margin CO_2 emission factor for grid connected power generation in year *y*
comments	

Section 5. Estimation of GHG Emissions Reductions

5.1. NAMA Activities Register within Regulated Carbon Market Schemes (if any)

NAMA Action Project Name	Net Electricity connected to the grid	Ton CO2e Reduced	Data source (calculated/verification report)	Ton CO2e cancelled (if any)
Total				

5.2. NAMA Actions under Non Regulated Carbon Market Schemes

NAMA Action Project Name	Net Electricity connected to the grid	Ton CO2e Reduced	Data source (calculated/verification report)
Total			

Section 6. Co-Benefits

Co-Benefit Indicator	Contribution to Creation of Employment Opportunities in Jamaica
Unit	
Description	
Data source	

Applied value	
Method of estimation	
Frequency of measurement/monitoring	
Additional comments	

Section 7. Cooperation and Support

7.1. Statement of aggregated expenditure

Expenditure from actions sustained by international organizations (IOs) whose participation in the NAMA is not direct ($)	Expenditure from IOs as direct financing of NAMA and whose origin comes from climate financing directly ($)	Aggregated expenditure of actions under the NAMA ($)

Section 8. Monitoring of NAMA Indicators

8.1. Estimation of NAMA indicators

NAMA Indicator # 1	% Participation of Renewable Energy Generated Electricity in the Total Electricity Mix of the Country
Unit	
Description	
Data source	
Applied value	
Method of estimation	
Frequency of measurement/monitoring	
Additional comments	

NAMA Indicator # 2	Yearly Number of NAMA Actions Undertaken

Unit	
Description	
Data source	
Applied value	
Method of estimation	
Frequency of measurement/monitoring	
Additional comments	

NAMA Indicator #3	Degree of Participation (evenness of contribution) of Different Renewable Energy Sources in the Generation Mix
Unit	
Description	
Data source	
Applied value	
Method of estimation	
Frequency of measurement/monitoring	
Additional comments	

Section 9. Other Data Reported

Annex V

Template for the Jamaica NAMA Verification Report

Verification Report Template

1. General data

This section needs to be completed with the general data corresponding to the verification process.

General Data	
Name of Verification Entity	
Names and responsibilities of verification team	
Number of verification	
Monitoring period	
Date	
Verification Report Version	

2. Scope of the Verification

This section should indicate if verification is of document type or an in situ verification

Scope

Annual Documentary Verification

In Situ Verification

2.1. Identification of Participants

NAMA Actions Subject to Verification	
NAMA Actions	Implementing Agent

2.2. Specific Actions/Activities under Verification

Projects under Verification		
Name	Description	Location

3. NAMA Action Sampling Plan

In case of an in situ verification, a summary of sampling plan is to be included.

Sampling Plan	
Type of sampling applied	
Size of the sample	
Precision/ confidence intervals	
Criteria for acceptance/reject	
Other	

4. Documentation Reviewed

Documentation Reviewed			
Name of document	Version	Date	Comments

5. Interviews Conducted

Interviews Conducted				
Name	Position	Entity	Purpose	Conclusions

6. Parameters Verified

Parameters Verified				
Parameter	Reported Value	Verified Value	Source	Comments

7. Emissions Reductions

Emissions Reductions			
Verification Period	Reported Emissions Reductions	Verified Emissions Reductions	Errors/Irregularities

8. Other Verified Parameters

9. Verification Findings

Verification Findings			
Non Conformity / Observation	Description	Corrective Action	Resolved Yes/No

10. Other Relevant Apects of the Verification Process

11. Conclusions and Verification Opinion

Conclusions and Verification Opinion	
Parameters have been monitored in a complete and correct way	Yes/No
Reported values for monitored parameters are correct	Yes/No
Emissions reductions calculations are correct and transparent	Yes/No
Sampling Plan (if appropriate for in situ verification) is adequate	Yes/No
Any non-conformity has been positively resolved	Yes/No
Others	
Verification opinion	Positive/negative

Annex VI

Concept Document of the Jamaica Renewable Energy NAMA

Ministry of Science, Technology, Energy and Mining

Ministry of Land, Water, Environment and Climate Change

Draft NAMA Proposal

Jamaica Renewable Energy NAMA

November 2014

Table of Contents

SECTION 1: NAMA Overview

1. Basic information

<table>
<tr><td colspan="2">Title of NAMA :Jamaica Renewable Energy NAMA</td></tr>
<tr><td colspan="2">Country/ies: Jamaica</td></tr>
<tr><td>NAMA Implementation Coordinating entity:
Entity in charge of NAMA implementation (i.e. overall coordination for implementing the NAMA)
Ministry of Science, Technology, Energy and Mines
http://www.mstem.gov.jm/
Government of Jamaica (MSTEM)</td><td>National NAMA Approver[22]:
Mention name of national NAMA Approver if one has already been designated in your country (if not, leave blank)
As of 26th November 2013, Jamaica has not yet reported to UNFCCC and official entity responsible for NAMA approval
http://unfccc.int/files/cooperation_support/nama/application/pdf/nama-approver.pdf
Jamaica has a Ministry of Water, Land, Environment and Climate Change that has a Division of Climate Change
http://www.mwh.gov.jm/</td></tr>
<tr><td colspan="2">Name of person(s)/organisation responsible for developing the NAMA proposal:
Name of the person(s)/organisation responsible for the analysis and identification of measures for the NAMA proposal. If a working group is responsible, please name the members of the working group.
NAMA development is supported through a Technical Assistance to Jamaica provided by the Latin American Energy Organization (OLADE) under the request from MWLECC and the concurrence of MSTEM. Currently the following persons are involved in the NAMA preparation:

Government of Jamaica:
Dr. Hillary Alexander, JP. Permanent Secretary. Ministry of Science, Technology, Energy and Mining (MSTEM).
Mr. Gerald Lindo. Senior Technical Officer Mitigation. Ministry of Water, Land, Environment and Climate Change (MWLECC).

OLADE:
Mr. Byron Chiliquinga. Gerente, Proyecto Energía Sostenible para América Latina y Caribe 2012-2017. OLADE.
Mr. Mentor Poveda. Consultor Desarrollo Sostenible y Eficiencia Energética. OLADE.
Mr. Oscar Coto. NAMA Consultant. EMA S.A.
Mr. Luis Roberto Chacón. NAMA Consultant. EMA S.A.</td></tr>
<tr><td colspan="2">Sector/Subsector:
Sector/subsector in which NAMA takes place

Energy/Electricity/Renewable energy</td></tr>
<tr><td colspan="2">Greenhouse Gas covered by the Action (marked x):
CO_2 x CH_4
N_2O HFCs
PFCs SF_6
NF_3</td></tr>
<tr><td colspan="2">Status of Endorsement by appropriate National Authority: Not yet submitted for National Approval</td></tr>
</table>

[22] NAMA Approval authority is the designated national focal point/entity for submitting NAMAs to the UNFCCC NAMA Registry.

2. Overview of the key aspects of the NAMA

2.1 Brief description of the objectives of the proposed NAMA and summary of measures to be included in the NAMA

Describe the purpose of the NAMA by describing the current situation and the situation after NAMA implementation. Refer to technologies which would be implemented under the NAMA. Describe the objectives of the proposed NAMA in a clear manner.

Briefly describe the measures that will be implemented as part of the NAMA.

Explain what sources of emissions will be addressed by the proposed NAMA and how the proposed measures in the NAMA will impact GHG emissions. Refer to the GHG NAMA boundary.

The objective of the NAMA is to promote the incorporation of renewable energy based generation in Jamaica, assisting in the creation of a sustainable enabling environment that is adequate for early stage development of the renewable energy industry in the country, as well as contributing to the realization of the long term contributions associated to the use of renewable energy resources of the country.

The Implementation of the NAMA will contribute in assisting the creation of a smooth transition into an energy system that is in tune with the proposed Jamaica Vision 2030 of being "Jamaica, the place of choice to live, work, raise families and do business".

Jamaica has strong renewable energy potential and renewable energies could be used to meet an important percentage of the electricity demand. The NAMA aims at assisting in the creation of an enabling environment for the deployment of renewable energy generation technologies such as solar, wind, hydro and biomass in the country, contributing to the achievement and potentially scale up the contribution from renewable energy in the overall energy matrix.

The main source of emissions addressed by the NAMA is the reduction of CO2 emissions due to renewable energy generation displacing fossil fuel generation at the grid level or in captive applications.

2.2 Relevance to the national sustainable development plan(s) or

Explain why the NAMA is relevant for national development plan/strategies and sectoral plans/strategies. In doing so, please provide information on the following:

- *Describe the national sustainable development context and*

national strategies and/or to the sectoral mitigation goals

objectives. Refer to relevant existing national sustainable development plan/strategies.

- *Describe the sectoral context (sector in which NAMA would be implemented) by referring to relevant existing sectoral plan/strategies.*
- *Describe sectoral mitigation goals, if any.*
- *Explain how the NAMA contributes to attaining the national sustainable development objectives and sectoral mitigation goals.*

The Jamaica Energy Policy (NEP) 2009-2030 incorporates a vision for the participation of renewable energy in the energy mix of the country, stated to be: 12.5% by 2015 and 20% by 2030 (which is currently being revised to a 30% participation of renewable energy in the electricity generation of the country); in contrast to a 5.6% participation in 2008. It is stated also that GHG emissions of the energy sector should target 4.5 MtCO2/year in 2015 and 3.5 MtCO2/year by 2030, from an estimated 5 MtCO2/year in 2008. The NEP is also clear in stating that the targets are based on realistic strategies but are projections and therefore may be subject to change based on introduction of new and renewable energy sources.

Jamaica´s energy sector is at a crossroads. Currently the country depends on petroleum imports for over 95% of its electricity generation, bringing enormous economic and environmental costs and necessitating a transition to a more sustainable energy system. Recently, as of 2011, Jamaica spent up to 15% of its GDP on petroleum imports and electricity prices for Jamaican residents are amongst the highest in the world at around 40 US cents per KWh, being a major barrier for the country´s sustainable development, issue that it shares with many small island states worldwide.

Through a series of actions resulting in the implementation of measures, the NAMA will both contribute to the energy sector policies, the country´s vision; by contributing to the consolidation of an enabling environment that will responsive from the policy/regulatory frameworks, provision of support for strengthening of technical capabilities, and contribution to assure a vibrant investment climate in support of renewable energy electricity generating technologies.

2.3 Brief description of relevant existing mitigation initiatives and their synergies with the proposed NAMA

Describe briefly any national and international (with international support) mitigation initiatives under implementation in the country that are relevant for the NAMA.

For each of them, explain what are the link and synergies between the initiative and the NAMA. For each of them explain how coordination will be

ensured with the NAMA.

There are different on-going activities on mitigation to climate change in Jamaica. The GoJ is implementing a policy of 10% ethanol on gasoline, a tender organized by the Office of Utilities Regulations allocated 78MW out of a 115 MW target to renewable energy projects (3/wind and solar), there is a net billing pilot project with over 200 licences issued. Through the National Housing Trust well over 2000 domestic solar water heaters have been installed. The Ministry of Land, Water , Environment and Climate Change has enacted a transportation fuels working group and with the collaboration of the USAID the country is embarking in the development of a Low Emission Development Strategy

Provide a summary of the information detailed in point 5.5

2.4 Brief description of the transformational impact, including its sustainability

The main transformational impact of the NAMA centres in keeping the focus of the country in the important long terms multi-dimensional contribution of renewable energy. Taking into account the resource endowments of the country, over time the contribution of renewable energy can become strategically very important. From the point of view of the energy system itself, the scaling-up of the RE contribution, although posing important challenges to the system architecture and associated set of actors and stakeholders, offers a unique opportunity to contribute to increase the robustness and resilience at different levels.

The NAMA has direct connection to the economic competitiveness of the country as it targets macro-economic factors associated to energy security, diversification, and improvement of balance of payments.

In an emerging context of dynamic changes, the Jamaican society is striving to be more resilient and robust to adapt to change and impacts from the climate change phenomena. The NAMA contributes to achieve new sets of properties within the energy sector such as reflexive governance, agile institutions, responsive/flexible/adaptable infrastructure, responsive coordination, diversification of portfolios, flexible strategy development; all of which contribute inherently to overall efforts towards adaptation. It is transformational in pushing agenda development from perhaps current marginal actors with capacity to push for more flexible strategies than incumbent actors (for example consolidated renewable energy associations vs. traditional incumbent utilities).

SECTION 2: NAMA DETAILS

1. Introduction

1.1 Description of the general context of the country, including overview of national development and climate change policies

(2 pages)

a) Describe the general social, economic and environmental context of the country as this is relevant for the NAMA.

Describe the human development challenges that the country faces.

Describe the national development strategies and list the national priorities and objectives relevant for the NAMA.

Not more than 2 -3 paragraphs explaining the general context of sustainable development in the country, the priorities for development, key challenges to achieve development, etc. This sections helps clarify how the objective of the NAMA is aligned with national sustainable development priorities. The information should provide references to key national development planning or strategy documents.

As it is described within the Jamaica Vision 2030 (http://www.vision2030.gov.jm/), Jamaica is the largest English speaking island in the Caribbean and is known worldwide for its vibrant culture, sporting prowess and physical beauty; and boasts of its political stability, favourable climate, geographic location and abundant natural resources; with a population of talented, warm hearted and diverse people. The country has made considerable progress in many different social indicators including life expectancy, near universal enrolment in primary and junior secondary education, access to potable water and electricity services, being the country on course to meet several Millennium Development Goals by 2015.

In spite of these achievements, the country´s development has been characterized by paradoxes, where periods of expansion have alternated with periods of poor economic performance where growth has occurred alongside social issues of inequity in wealth and opportunity. Over the recent years, the country has experienced an economic turndown that compares unfavourably with regional and international counterparts; resulting in a deterioration of indicators related to different dimensions of life in the country.

INDICATORS	1970	1980	1990	2000	2005	2006	2007
Real GDP[1] (Growth) %	11.9	-5.7	6.3	0.9	1.0	2.7	1.4
Debt/GDP (%)		107.4	128.7	88.7	119.1	117.5	111.4
Average Annual Unemployment Rate (%)		27.4	15.3	15.5	11.2	10.3	9.9
Average Annual Exchange Rate (J$=US$1.00)	0.83	1.78	7.24	43.08	62.50	65.88	69.06
Inflation (%)		28.6	29.8	6.1	12.6	5.7	16.8
Population ('000)	1,861.3	2,183.8	2,414.9	2,597.1	2,656.7	2,669.5	2,682.1
Population Growth Rate (%)	1.5	1.1	1.0	0.6	0.5	0.5	0.5
Life Expectancy at Birth (years)				72.2	73.3	73.3	72.4
Adult Literacy (% of ages 15 and older)				79.9	79.9	85.5	86.0
Gross Primary Enrolment ("000)		427.3	339.0	325.3	326.4	318.7	310.0
% Population below Poverty Line				18.9	14.8	14.3	9.9
Access to Piped Water (%)				66.6	n/a	67.8	70.2

More recently, the country has being shocked by an economic crisis derived from the international crisis of 2007, that has limited the country´s access to capital markets, reduce the profitability of local business therefore reducing some key employment opportunities and delivering an overall worsening of the balance of payments. All of this having a negative impact in the social development agenda of the country. Recently the GoJ has signed an agreement with the International Monetary Fund[23], in order to regain formal borrowing arrangements pending the implementation of several types of measures over the next four years, which includes relevant energy targets related to diversification and promotion of renewable energies.

Jamaica's Human Development Index value for 2012 was 0.730—in the high human development category—positioning the country at 85 out of 187 countries and territories worldwide.

Jamaica´s energy sector is at a crossroads. Although almost having universal access to electricity services, currently the country depends on petroleum imports for almost 93% of its electricity generation[24], bringing enormous economic and environmental costs and necessitating a transition to a more sustainable energy system. Recently, as of 2011, Jamaica spent up to 15% of its GDP on petroleum imports and electricity prices for Jamaican residents were amongst the highest in the world at around 40 US cents per KWh, being a major barrier for the country´s sustainable development.

The Jamaica Vision 2030is the strategic guide or roadmap to achieve a secure and prosperous future encapsulated in the vision statement: "Jamaica the place of choice to live, work, raise families and do business".

The Jamaica Vision 2030 contains meaning, outcomes, strategies and target indicators that are designed to guide long term country action towards sustainable development of the country.

[23] https://www.imf.org/external/np/loi/2013/jam/041713.pdf
[24] http://global-climatescope.org/en/country/jamaica/#/details

The NAMA contributes to the Government of Jamaica (GoJ) efforts in scaling-up the contribution of renewable energy as stated in the Jamaica Vision 2030, by supporting a range of measures and programmes in alignment within National Objective #10 related to Energy Security and Efficiency; and also contribute to the effort of reducing the rate of Climate Change within the National Objective #14 related to Hazard Risk Reduction and Adaptation.

b) Describe the national context related to climate change, and in particular the mitigation aspects:

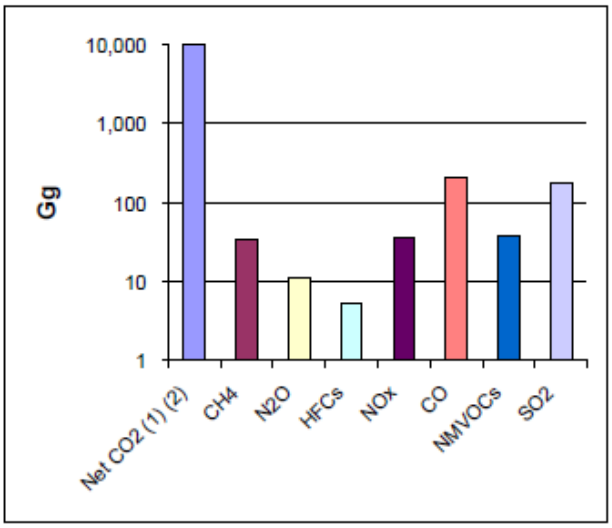
i. Describe briefly total national GHG emissions and key sources of emissions. Also describe available information on projections of national GHG emissions and key areas where growth is expected

Jamaica, as a small island developing state, is particularly vulnerable to the impacts of climate change not only in terms of its natural resources, but also its economic development, as sectors such as tourism, agriculture, fisheries, forestry and water are climate sensitive. Jamaica's susceptibility to natural disasters has proven to be a major threat to the social well being; as well as for the stability of human settlements and infrastructure.

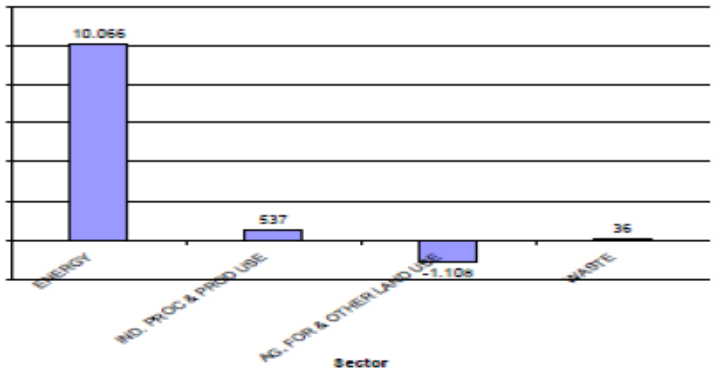
Between 2001 and 2012 Jamaica experienced 11 storm events (including 5 major hurricanes) and several flood events. These events combined resulted in loss and damage amounting to approximately $128.54 billion and in one case (Hurricane Ivan, 2004) the loss was equivalent to8.0 per cent of GDP. Hurricane Sandy (2012) accounted for $9.7 billion or 0.8% of 2011GDP in direct and indirect damage. The social sector (health, housing and education) had the largest impact accounting for 48% of the total costs. One death and 291 injuries resulted from Hurricane Sandy.

The Second National Communication of Jamaica to the United Nations Framework Convention on Climate Change (SNC)[25], provides the National Inventories for Greenhouse Gases in a report prepared as a requirement for Jamaica as a Party to the UNFCCC, also assessing climate change impacts for the key sectors of health, human settlements, and tourism, in addition to revisiting agriculture, water, and coastal zones, for the years 2015, 2030, and 2050. Jamaica's SNC also includes an assessment of potential mitigation options to reduce Green House Gas (GHG) emissions over the period 2009 to 2030. The SNC provides an outline of awareness raising requirements, a review of the national systematic observation systems, and a technology needs assessment for the country.

The most recently submitted SNC (2011) uses as a reference the year 2000. Net CO2 emissions increased from 8,418 Giga-grams (Gg) in 1994 to 9,532 Gg in 2000. The energy sector accounted for nearly 86 per cent of the 2000 CO2emissions, down from 97 per cent in 1994.

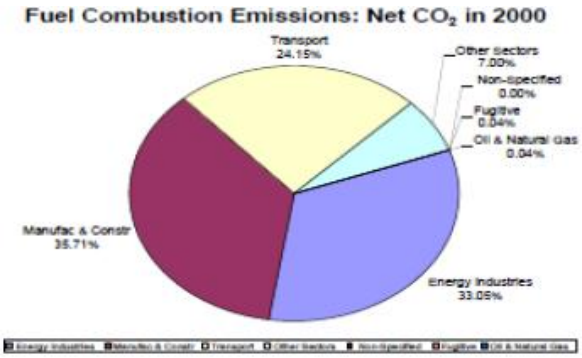


The energy sector is the dominant sector in terms of GHG emissions in the country.



The fuel combustion emissions for the year 2000 were:

[25] http://unfccc.int/resource/docs/natc/jamnc2.pdf



Manufacturing and construction accounted for 35.7 per cent of net CO2 fuel combustion emissions, followed by **energy industries (electricity generation and petroleum refining), 33.1 per cent**, and transport, 24.2 per cent.

As part of the SNC, within the Jamaica´s Greenhouse Gases Mitigation Assessment[26], estimations have been performed on projections of national GHG emissions for 2035 on key areas where growth is expected. The overall CO2 emissions in the overall energy demand for the different scenarios show increases that range from 29 percent, 52 percent and up to 98 percent respectively with respect to the 2000 GHG emissions inventory which was 10,046 Gg of CO2.

ii. Describe briefly the existing national climate change (mitigation) policies/strategies/plans and specify the national emissions reductions objectives.

The Ministry of Land, Water, Environment and Climate Change (MWLECC) is responsible for overseeing climate change issues in the country, through the Division of Climate Change; which is a new division created in 2012.

Climate Change is a relevant component of the Jamaica Vision 2030 and one specific output objective of the vision towards 2030 specifically addresses hazard risk reduction and adaptation to Climate Change, linking to specific strategies in:

1. Improving resilience to all forms of hazards,
2. Improve emergency response capabilities,
3. Developing measures to adapt to climate change,
4. Contribution to reduction of the global rate of climate change.

For each of the above, the Jamaica Vision 2030 includes national strategies that are identified as early drivers to guide action over the framework period of the implementation of the vision. Of particular interest to mitigation, it indicates the following key national strategies:

- Promote energy conservation and non-carbon-based forms of energy,
- Reduce deforestation rate through mechanisms such as reforestation programmes,
- Conduct research on Jamaica's levels and sources of greenhouse gas emissions with a view to further reducing the emissions,
- Promote the use of clean technologies in the manufacturing sector,
- Maximize the benefits of the Clean Development Mechanism (CDM) under the Kyoto Protocol,

[26]Claude Davies and Associates. Jamaica´s Greenhouse Gases Mitigation Assessment. Prepared for National Meteorological Service (2010).http://www.metservice.gov.jm/Climate%20Change/Final%20Report-Jamaica's%20Greenhouse%20GAs%20Mitigation.pdf

- Lobby at the international level for high greenhouse gas-producing countries to become more energy and resource efficient.

The Jamaica Vision 2030 also establishes key specific strategies and actions to be undertaken for the initial period of 3 years from 2009-2012, which for the output objective related to contribution to reduction of the global rate of climate change is directed to a strategy of lobbying at the international level for high greenhouse gas producing countries to become more energy and resource efficient and a related key action on preparation of the second National communication to the UNFCCC.

The GoJ is currently discussing the adoption of a Climate Change Policy Framework proposed by the MWLECC that was tabled to the Parliament in February 2014.The Vision Statement of the Draft Climate Change Policy Framework indicates that "Jamaica achieves its goals of growth and prosperity for its people while meeting the challenges of climate change as a country with enhanced resilience and capacity to adapt to the impacts and to mitigate the causes in a coordinated, effective and sustainable manner". This Policy Framework will create a sustainable institutional mechanism to facilitate the development, coordination and implementation of policies, sectoral plans, programmes, strategies, and legislation to address the impacts of climate change. These sectors may include, but are not limited to: water, energy, agriculture, fisheries, forestry, coastal and marine resources, health, mining, tourism, transportation, solid waste management, planning and disaster risk reduction and response management.

Possible mitigation and adaptation actions based on recommendations from stakeholder consultations are included for consideration within the policy framework proposed. The specific objectives are:

a. To mainstream climate change considerations into sectoral and financial planning and build the capacity of sectors to develop and implement their own climate change adaptation and mitigation plans.
b. To support the institutions responsible for research and data collection at the national level on climate change impacts to Jamaica to improve decision-making and prioritization of sectoral action planning.
c. To improve communication of climate change impacts so that decision makers and the general public will be better informed.

It is expected that, on the basis of this policy framework, the relevant sectors will develop or update, as appropriate, plans addressing climate change adaptation and/or mitigation. Actions related to the Ministry of Water, Land, Environment and Climate Change based on the Medium Term Socio-Economic Framework of the country are outlined and recommendations from stakeholder consultations are included for consideration in the development of plans.

The Ministry of Water, Land, Environment and Climate Change will oversee and support the implementation of this Climate Change Policy Framework. The Climate Change Division (CCD) will have administrative oversight and responsibility for climate change initiatives The CCD, in its coordinating role, will ensure the systematic dissemination of information among ministries, departments and agencies and the provision of technical support and guidance to facilitate the development of sectoral adaptation and mitigation plans.

Climate change focal points are being named within the ministries, departments and agencies related to the relevant sectors will be responsible for managing, monitoring, evaluating and reporting on the development of their sectoral strategies and actions with respect to climate change. The MDAs are requested to share with the CCD, relevant information and reports necessary for the proper collaboration, coordination, integration, monitoring and evaluation of climate change initiatives.

Legislation will be enacted to provide a framework for climate change mitigation and adaptation. This legislation will institutionalize the coordinating role of the CCD with regard to matters relating to climate change.

The MWLECC will present to Cabinet an annual report on measures that have been undertaken by the CCD to implement this policy. On the fifth anniversary of the date of this policy, the CCD shall conduct a public review of this policy to determine its effectiveness in achieving its goals and objectives.

The Government of Jamaica has identified an initial list of Special Initiatives covering both adaptation and mitigation measures. Out of those, one relates to low carbon development that have a clear relationships with renewable energy development in the country.

The **Special Initiative for Low Carbon Development**: Climate change threatens the efficient production of energy and given the high dependence on foreign energy sources across all sectors, this could increase Jamaica's overall economic vulnerability. MSTEM will play the lead role in this Special Initiative to develop programmes that include the scaling up of renewable energy and energy conservation programmes.

Some of the recommended actions within the energy sector that are included in the Draft Policy Framework on Climate Change, amongst others, include:

1. Identify and where possible provide incentives for private sector organizations to develop and implement renewable technologies including wind and solar supported by the development of an enabling legislative and regulatory framework.
2. Promote the development and implementation of energy regulatory standards and measures that focus on renewable energy development, energy conservation and the provision of sustainable energy supply (e.g. solar energy, biofuels, waste-to-energy and carbon emissions trading).
3. Explore opportunities for the implementation of projects that avoid or reduce the use of fossil fuels and the implementation of a carbon tax.
4. Improve institutional capacity to implement CDM projects and programmes by facilitating workshops and seminars led by technical experts.
5. Establish and enforce national emission standards for emitting sectors (e.g. transport, bauxite and manufacturing sectors).
6. Conduct energy audits annually across all public sector agencies to determine overall energy usage and identify measures to conserve on the use of electricity.
7. Promote energy efficiency in building construction and standards.
8. Develop an integrated energy plan across sectors to ensure that future energy demands are understood across the country

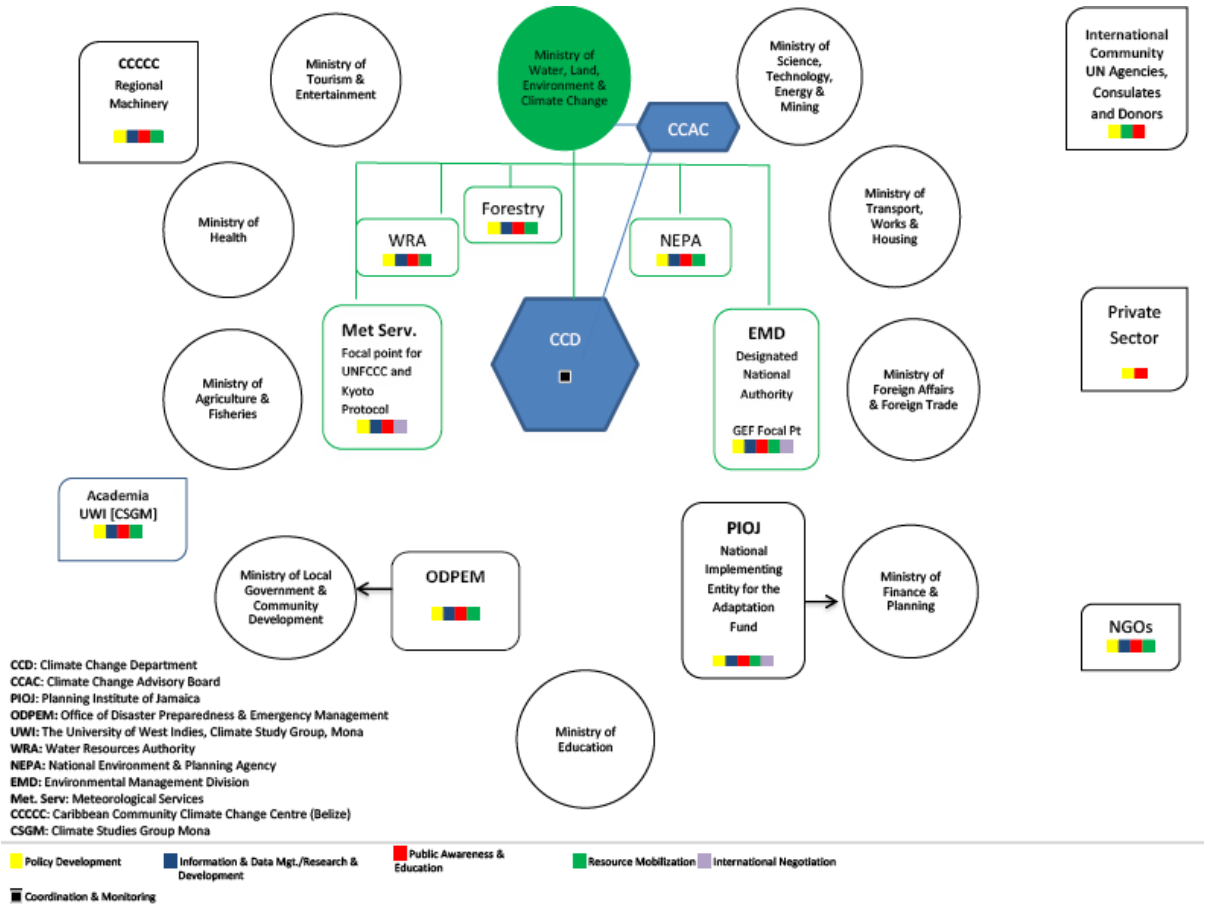
The Jamaica Vision 2030 incorporates targets for the percentage participation of renewable energy in the energy mix of the country, stated to be: 12.5% by 2015 and 20% by 2030; in contrast to a 5.6% participation in 2008. It is stated also that GHG emissions of the energy sector should target 4.5 MtCO2/year in 2015 and 3.5 MtCO2/year by 2030, from an estimated 5 MtCO2/year in 2008. The NEP is also clear in stating that the targets are based on realistic strategies but are projections and therefore may be subject to change based on introduction of new and renewable energy sources. Currently, the Ministry of Science, Technology Energy and Mines is revisiting the target to a contribution of 30% from renewable Energy electricity generation to 2030.

iii. Describe briefly the national institutional context existing in the country to manage the climate change issue, in particular for GHG mitigation.

As a UNDP[27] report indicated in July 2013, the national institutional context existing in the country to manage climate change issues includes the MWLECC, several of its divisions and other institutions/agencies within the GoJ. It is important to note the role to be provided by the Climate Change Division (CCD) which is in the process of being implemented.

The mission statement for the CCD is established as "to facilitate integrated and inclusive development in Jamaica to advance an equitable and climate resilient society with adaptive capacity in a low carbon economy and in line with Vision 2030 Jamaica".

Climate Change Mitigation aspects within CCD / MWLECC are dealt with through the Senior Technical Officer for Mitigation position with low carbon development competences in carbon mitigation including renewable energy sources and demand side management of energy as well as knowledge in international cooperation and negotiations. Currently, the Climate Change Focal Point Network within relevant ministries and agencies involved within the institutional map is now operational.



Jamaica is a signatory of the UNFCCC and has also signed and ratified the Kyoto Protocol, according to the following ratification status:

[27] http://www.jm.undp.org/content/dam/jamaica/docs/researchpublications/crisisprevention/EstablishingAClimateChangeDeptInJamaica2012.pdf

Climate Change Convention (UNFCCC)	
Date of signature:	12 June 1992
Date of ratification:	06 January 1995
Date of entry into force:	06 April 1995

Kyoto Protocol	
Date of signature:	
Date of ratification:	28 June 1999
Date of entry into force:	16 February 2005

MWLECC is the Designated National Authority for the CDM; and Jamaica has 2 projects dully registered under the Clean Development Mechanism.

Registered	Title	Reductions (t CO2eq/year)
19 Mar 06	Wigton Wind Farm Project (WWF)	52540
21 Dec 11	Wigton Wind Farm II	40348

The NAMA is aligned with the proposed Draft Climate Change Policy Framework and Action Plan proposed by the Ministry of Land, Water, Environment and Climate Change (MWLECC), which is currently being discussed in Jamaica. As part of the denominated flagship programmes within such policy framework, special mention is done on a proposed special Initiative for Low Carbon Development; in which is recognized that Climate Change threatens the efficient production of energy and given the high dependence on foreign energy sources across all sectors, this could increase Jamaica's overall economic vulnerability. MSTEM will play the lead role in this Special Initiative to develop programmes that include the scaling up of renewable energy and energy conservation programmes.

1.2 Detailed description of the current situation in the sector/sub-sector, including the relevant existing legal, regulatory and institutional framework, where NAMA would be implemented

(2-3 pages)

i. Briefly describe the contribution and importance of the sector (where the NAMA would be implemented) in the country to national economic growth, and also its contributions to social (human development) and the environment. This should be a brief explanation to highlight how this sector is related to the national human development challenges, as well as the national priorities and objectives mentioned in 3.1.

As indicated by IADB[28], Jamaica is the third largest island in the Caribbean, after Cuba and Hispaniola and is home to a population of 2.83 million people. The country's largest contributors to the national GDP are the bauxite industry, the tourism sector, agriculture and the manufacturing sector. The tourism sector is an important source for foreign exchange. Jamaica does not have notable hydrocarbon reserves and relies fully on imports to meet its petroleum and coal requirements. The country consumes about 60,000 barrels of oil per day (2010).

Like most island states in the Caribbean, Jamaica's energy imports as a share of overall imports has grown significantly over the past decade. In 2007 energy imports represented 34.5 percent of all imports, a doubling

[28] http://blogs.iadb.org/caribbean-dev-trends/2013/11/18/jamaicas-energy-market/

over the previous five years. The economic cost of energy imports can´t be overstated and the value of energy imports exceeds the value of total Jamaican exports. Oil consumption has grown at 3.75 percent per year since 2003, almost 8 times faster than population growth. With no domestic supply of hydrocarbon resources and the energy intensive bauxite and alumina industries, per capita oil consumption exceeds that of other Caribbean Island States.

Similar to the electricity sector in most Caribbean countries, Jamaica's electricity sector is highly dependent on fossil fuels, mainly fuel oil and diesel, for the generation of electricity. Steam and diesel account for 71 percent of overall generation, followed by combined cycle gas turbines at 17.2 percent, and gas turbines at 6.6 percent.

Regarding electricity charges, Jamaica's residential, commercial and industrial electricity prices are among the highest in the Latin American and Caribbean (LAC) Region. This is partly because 93% of electricity generation uses the more expensive petroleum fuel for generation. The cost of fuel and IPP charges which is approximately 2/3 of the electricity charge to the consumer is a pass through item and electricity delivered has been sold for approximately US$ 0.25/kWh in 2013. Service charges and tax are then added for a total charge amounting to US$ 0.40 – 0.42/kWh. This is further compounded by high total system losses of 23% (9.9 % technical losses and 13.0 % non-technical loses by electricity theft - 2009 data). The economic impact on the society from this fossil fuel generation is exacerbated by the necessary periodic increases in its tariff rates for central generation. The combination of global oil prices, pass through fuel charges, and generation and transmission inefficiencies makes electricity an expensive energy option for the average Jamaican household and especially for citizens in a low socio-economic grouping. The overall price of electricity is however expected to decrease by 20 – 30 % in the medium term (3 years) following the planned addition of 6.3 MW of hydro at the Maggoty Hydro Power site and nearly 360 MW of new liquefied natural gas (LNG) to the mix.

ii. Briefly explain the strategy and plans for development of the sector in which the NAMA would be implemented, as well as key objectives for the sector. Refer to the national strategy/development plans, as well as any sector-specific strategy or development plans.

The Government of Jamaica (GOJ) through the National Energy Policy (2009 – 2030) has promulgated several long term strategies; chief among them is energy diversification together with the achievement of price reductions in tariffs to end-users in the country. The policy defines that "Energy diversification will involve moving from an almost total dependence on petroleum to other sources, including natural gas, coal, petcock, nuclear, and renewable energy such as solar, wind, and bio-fuels. In the short to medium term, natural gas would be the fuel of choice for generation of electricity and the production of alumina". The fundamental objective of these interventions is to diversify the country's fuel mix so as to reduce the exposure and heavy dependence associated with any one fuel source for energy production while simultaneously improving the security of the country's energy supply.

Over the period towards 2030, and under different expansion plan evaluations; the Office of Utilities Regulation, OUR[29] estimates that around 1,400 MW of new installed power capacity is needed in the country in order to provide the required expected energy consumption, satisfy the system peak, maintain the necessary reserve capacity and manage loss of load probabilities in the Jamaican grid. Approximately 800 MW of this new capacity needs to be constructed in the coming decade, highlighting the urgency of the issue. The capital requirements for the new power plant fleet are in the range of US$ 6 to 8 billion depending on the mix of technologies that will be deployed, being the path based on natural gas deemed the lower cost available to the country in comparison to an expansion plan based on coal and the continuation of a fuel oil based expansion which comes to be the most expensive within the next 20 years.

There are many issues currently under discussion in country with respect to the diversification path, especially with regard to selection of fossil fuel of choice between natural gas, coal or continuation of current fuel oil trajectories. Those discussions will not only affect the price expected for the customers, but also overall investment; but also different elements that can make the penetration of renewable energy easier or difficult depending on response of the grid to accept intermittent energy, price to be paid to renewable suppliers into the system, etc. One other issue of importance of selection of fossil fuel diversification is related to the

[29] http://www.our.org.jm/ourweb/sites/default/files/documents/sector_documents/generation_expansion_plan_2010_0.pdf

capacity of any given system to up take renewable energy intermittent power and energy and should be accounted for in the process of realizing the goals expressed in the Jamaica Vision 2030 with respect to expected penetration of renewable energy.

The implementation strategy of MSTEM for the National Energy Policy is to manage its outputs through a targeted approach of seven three year National Energy Action Plans (NEAPs). These plans are aimed at bringing focus to government priorities taking into consideration the local social, economic and political climate through the development and implementation of flagship projects and sub-projects. A first NEAP was prepared for the period 2009-2012 and currently there is a Second NEAP Draft for the period 2013-2016.

Flagship projects within each NEAP are in alignment with the seven policy goals of the NEP, and anchored in:

- Priority strategies and actions identified in the NEP 2009-2030,
- Key strategies and actions for the energy sector enunciated in Jamaica Vision 2030, national Development Plans and Socio-Economic Policy MTF 2012-2015,
- Priorities as expressed in the Corporate Plan of MSTEM, and
- Development objectives of other Ministries and agencies impacting energy production and use.

The current Draft Second NEAP 2013-2016 includes 16 flagship projects which include several projects related to renewable energy.

Priority No	Project title	Supporting NEP Goal
1	Power Sector Development and Capacity Replacement	2
2	Improvement of Electricity Distribution and Transmission Efficiency	2
3	Facilitating Private Investment in Sustainable Energy	6
4	Jamaica´s Renewable Energy Programme: Increase in Wind Generation Capacity	3
5	National Energy Efficiency and Conservation Education Programme	1
6	The Renewable Energy and Efficiency Technology Training Programme	1
7	Jamaica´s Renewable Energy Programme: Increased Application of Solar (photovoltaic, solar cooling and thermal) Technologies	3
8	Strengthening of the Policy, Legislative and Regulatory framework	5
9	Promulgation of the Energy Sector Policies	5
10	Comprehensive Review of Energy Pricing-Fuels and Electricity	5
11	Generation Expansion Plan and Long Term Planning in the Energy Sector	2
12	Energy Efficiency and Conservation Programme for National Water Commission	1
13	Jamaica´s Renewable Energy Programme: Implementation of Hydro Power Capacity	3
14	The Development of Energy Service Companies (ESCOs)	1

Priority No	Project title	Supporting NEP Goal
15	Institutional Strengthening and improved Governance in Rural Electrification programme	5
16	Development of Smart Grid Road Map	2

According to the NEAP #2[30], several barriers affected the performance and implementation of the NEAP 2009-2012. The NEAP 2009-2012 was the first of seven three year NEAPs that will be implemented over the period to 2030. The first NEAP earmarked for implementation a total of 31 projects- 19 flagship projects and their sub-projects. While a number of projects were not implemented, there were activities to suggest that efforts were made towards their implementation.

Furthermore the documentation aforementioned, indicates "that as a result of the First NEAP, commercial entities and residential customers have now an avenue where their RE and EE needs may be met, even though is not fully utilized. Entities such as the Development Bank of Jamaica (DBJ) and the National Housing Trust (NHT) provide support through loan and grant facilities for RE and EE projects. These investments have resulted in avoidance of imported petroleum products and also in carbon emission reductions. A low emission pathway was forged with two notable actions: the introduction of 10% ethanol blended gasoline and the expansion of the Wigton Wind Farm by 18 MW. From the policy perspective, the following can be regarded as small yet positive steps towards the low carbon emissions pathway: the amendment of the electricity license to allow for up to 25 MW production without competitive tender by Jamaica Public Services Co., the Standard Offer Contract to allow renewable energy solutions up to 2% peak demand to be grid connected and the amendment of the Petroleum Act to remove the exclusive rights of the Petroleum Corporation of Jamaica to execute renewable energy and energy efficiency programmes in the public sector."

In the most recent presentation to the "Sectoral Presentation: Building the Platform for Sustainable Development and Growth", in July 2014[31], the Hon. Phillip Paulwell MP, Minister of MSTEM indicated important updated status of actions and strategies in the energy sector, reinforcing plans through its National Energy Policy (NEP) 2009-2030, to continue to pursue fuel diversification, and renewable electrical energy and capacity from renewable sources and in keeping with Government's vision of having 12.5 per cent electrical energy from renewable energy sources by 2015.

[30]MSTEM. Draft National Energy Policy Action Plan #2. Jamaica 2014.
[31]

Mr. Speaker, I am pleased to announce that the Government of Jamaica and the Jamaica Public Service have signed off on an amendment to the JPSCo. Licence. This will allow for the Cabinet to manage the procurement process through the Electricity Sector Enterprise Team (ESET). It will also grant the JPSCo. the right of first refusal in relation to the replacement of any of its existing generation facilities. The amendments and related matters are pertinent to the critical and urgent issue of the procurement of the new base load generation capacity. It removes constraints on the ability of ESET to proceed with its mandate.

Mr. Speaker, in 2011, the previous administration amended the JPS Licence to confer the management and administration of the procurement of new generation capacity on the OUR. We do not believe that this is a role for the regulator. The role of the OUR as the overall regulator of prescribed electricity services, as outlined in the OUR Act, will be maintained.

As has been announced, I have written to Energy World International (EWI) to indicate that I have formally revoked the licence to construct the 381-megawatt power plant. Consistent with the provision of the licence, the revocation takes effect on July 21, 2014. However, the Government regards the new base-load generation plant as a large-scale major project. As a result, all steps are being taken to give momentum to efforts to make this a reality, and allow for Jamaicans to benefit from cheaper electricity rates.

In this regard, the Cabinet has been advised by ESET that consultancy services are being engaged to complete, within two (2) months, the following:

- a least cost generation plan;
- power plant site options; and
- the business model and projected financial long term plan for JPS.

Mr. Speaker, even as we move post-haste with the process of acquiring the mega-generation plant, we must not lose sight of developments and achievements with regard to conservation measures, and the efforts to tap into non-traditional sources of energy.

New projects for renewable energy supply are set to be implemented within 12 – 15 months, and I must dispel any notion that renewables will result in higher electricity rates to the consumer. Renewable energy enhances the energy security of Jamaica, and reduces the heavy reliance the country has had on fossil fuels.

In fact, by mid-2015, Jamaica will be among the top countries in the region in terms of its use of renewables when, in addition to the 40 megawatts of wind that we now generate, plus approximately 20 megawatts of existing hydropower, there will also be 78 additional megawatts of renewable energy to be linked to the national grid. Further, I have previously reported that I have signed 166 licences with a combined capacity of over 2.6 MW for Net Billing. Mr. Speaker, in total, these additional 80.6 MW generated from renewable sources will avoid the importation of 1,085,000 barrels of oil annually, and save approximately US$108.5 Million per.

The additional 78MW will be generated from two wind projects that will offer 58MW, with the remaining 20MW to come from solar. Recommendations for licences for the projects are expected by my ministry from the Office of Utilities Regulation (OUR) shortly, while the Power Purchase Agreements (PPAs) with the JPS are being finalized. The three bidders have been selected for these projects. They are:

- Blue Mountain Renewables LLC, to supply 34MW of capacity from wind power at Munro, St. Elizabeth;
- Wigton Windfarm Limited, to supply 24MW of capacity from wind power at Rose Hill, Manchester; and
- WRB Enterprises Inc., to supply 20MW of capacity from Solar PV from facilities in Content Village, Clarendon.

The Government of Jamaica is committed to the development of a short term mega generation project involving a fossil fuel switch natural gas in order to diversify fossil fuels in the energy matrix as well as to deliver on a price reduction for electricity services in the country. Recent evaluations on current, as well as future, levelized cost of energy from different sources are indicative of the potential implications ahead, especially for some of the RE technologies (solar) that without proper addressing of market distortions may not get to participate in the power market delivering long term sustainable development benefits to the society. An important issue to bear in mind is that current evaluations of levelized cost done for the country do not include on one side for fossil fuel based options the costs associated to introduction of new diversified fuels such as coal or natural gas; and in the case of renewable energy intermittent sources, the cost associated to upgrading of transmission facilities or capacities to up take electricity at the distribution level under distributed generation technologies. Renewable energy technologies can have a significant impact in assisting the objectives of diversification of the energy mix in the country.

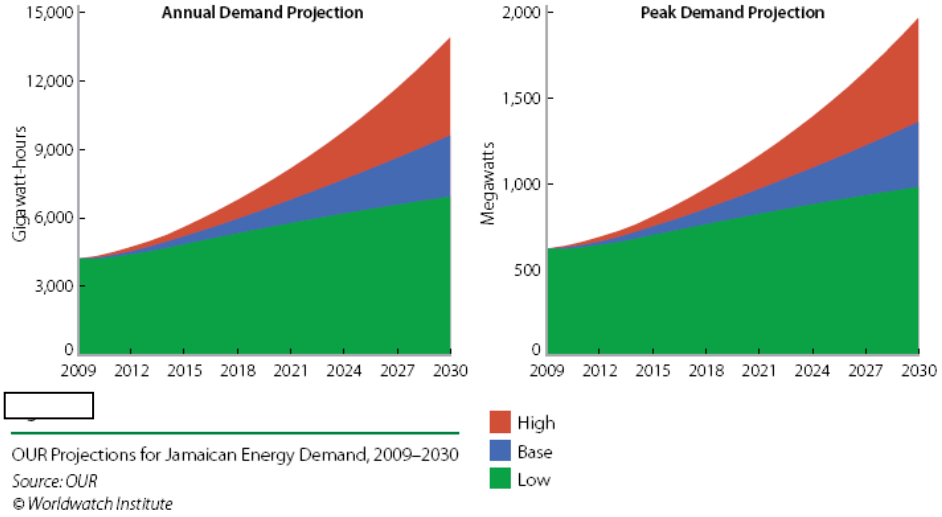
iii. Briefly describe the GHG emissions for the sector in which the NAMA would be implemented and key sources of GHG emissions. Further, provide an assessment of project growth in GHG emissions, and if possible the implications of achieving the growth strategy for the sector. Briefly present the national/sectoral strategy or approaches to addressing GHG emissions from the sector.

Studies by Worldwatch Institute[32], UNEP DTU Partnership[33] and OLADE[34] have been done on the issue of electric sector projected growth, potential participation of renewable energy in the generation matrix and estimated sector emissions as well as potential emissions reductions associated to the scaled up participation of renewable technologies in the country. Most of the assessments conducted utilize OUR's base-growth demand projections because these best reflect historical developments (the high-growth scenario has become very unlikely given Jamaica's faltering economic performance in the recent years since the projections were made). Electricity demand has the opportunity to be lower—approximating the levels in the low-growth scenario—if the country can make use of its energy efficiency potentials, but for normal consideration of this NAMA proposal a base case is to be used.

[32]ShakuntalaMakhijani, Alexander Ochs, et al., Jamaica Sustainable Energy Roadmap: Pathways to an Affordable, Reliable, Low-Emission Electricity System (Washington, DC: Worldwatch Institute, 2013). http://www.worldwatch.org/system/files/Jamaica-Sustainable-Energy-Roadmap-112013.pdf

[33] Zaballa, Mauricio (editor). Climate change mitigation opportunities in the energy sector for the Caribbean region. UNEP-DTU Partnership (2014)file:///C:/Users/Toshiba/Downloads/CC%20Mitigation-Energy-Caribbean_URC_Web_Feb-2014.pdf

[34]Coto, Oscar (author); Chiliquinga, Byron; Parra, Cristian (collaborators).Study on the Identification of Potential Project Portfolios Associated to Programmatic CDM and NAMAs in Jamaica. (2013). http://www.olade.org/sites/default/files/CIDA/Final%20OLADE%20Consultancy%20Report%20Jamaica%20POA%20and%20NAMA%20Study.pdf

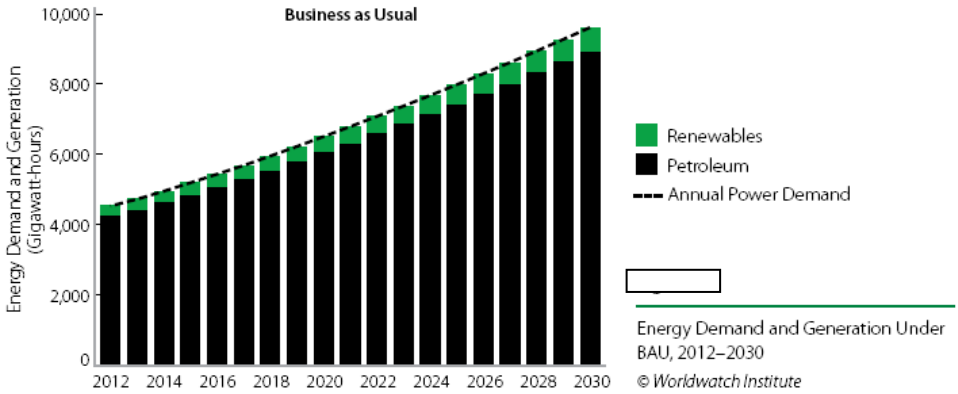


Worldwatch's scenarios assess how growing shares of renewable energy can be used to meet future energy demand. The scenarios are differentiated by the level of penetration of renewables by 2030 and the conventional fuel used in the transitioning phase. All renewable energy transition scenarios are compared to a business-as-usual (BAU) scenario that assumes that, despite growing demand, Jamaica's current electricity mix of 93% oil-based generation and 7% renewable sources remains unchanged to 2030, and that all new generation would come from efficient combined-cycle gas power plants. The scenarios are:

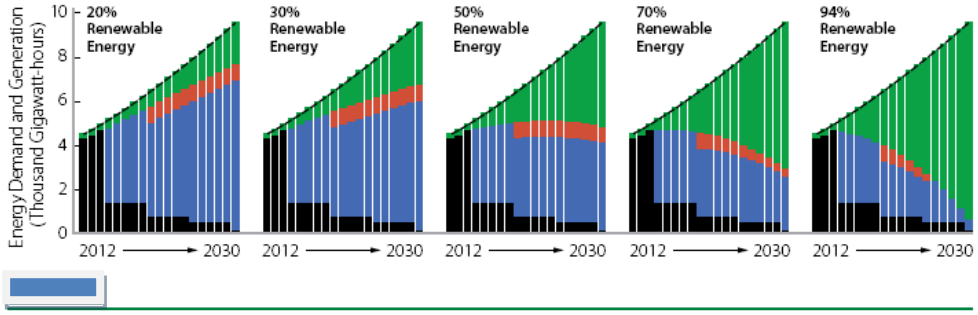
- Scenario 1: Building new natural gas power plants and repowering newer oil-based generation in addition to renewable energy expansion.
- Scenario 2: Building new coal power plants in addition to renewable energy expansion.
- Scenario 3: Extending the lifetime of existing oil-based generation in addition to renewable energy expansion.

For each of the scenarios a simulation was done for different rates of renewable energy penetration ranging from 20% up to very high potential penetration of nearly 90%.

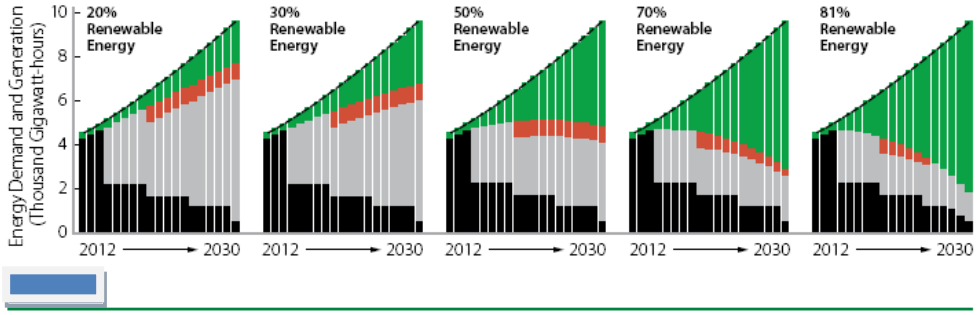
The yearly projected results of the business as usual scenario indicate the continuous trend of contribution by sources in line with the current situation in the country.



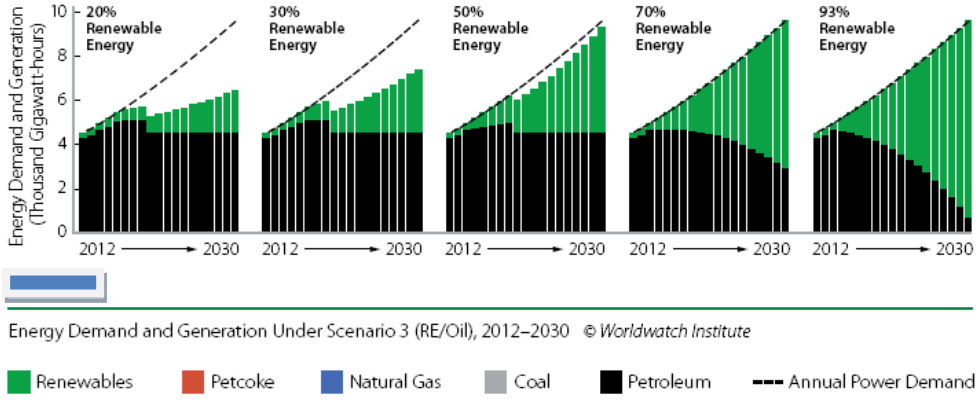
.The following figure presents all the scenarios developed by the World Watch Institute study on the participation of renewable energy for different target penetration rates.



Energy Demand and Generation Under Scenario 1 (RE/Gas), 2012–2030 © *Worldwatch Institute*



Energy Demand and Generation Under Scenario 2 (RE/Coal), 2012–2030 © *Worldwatch Institute*



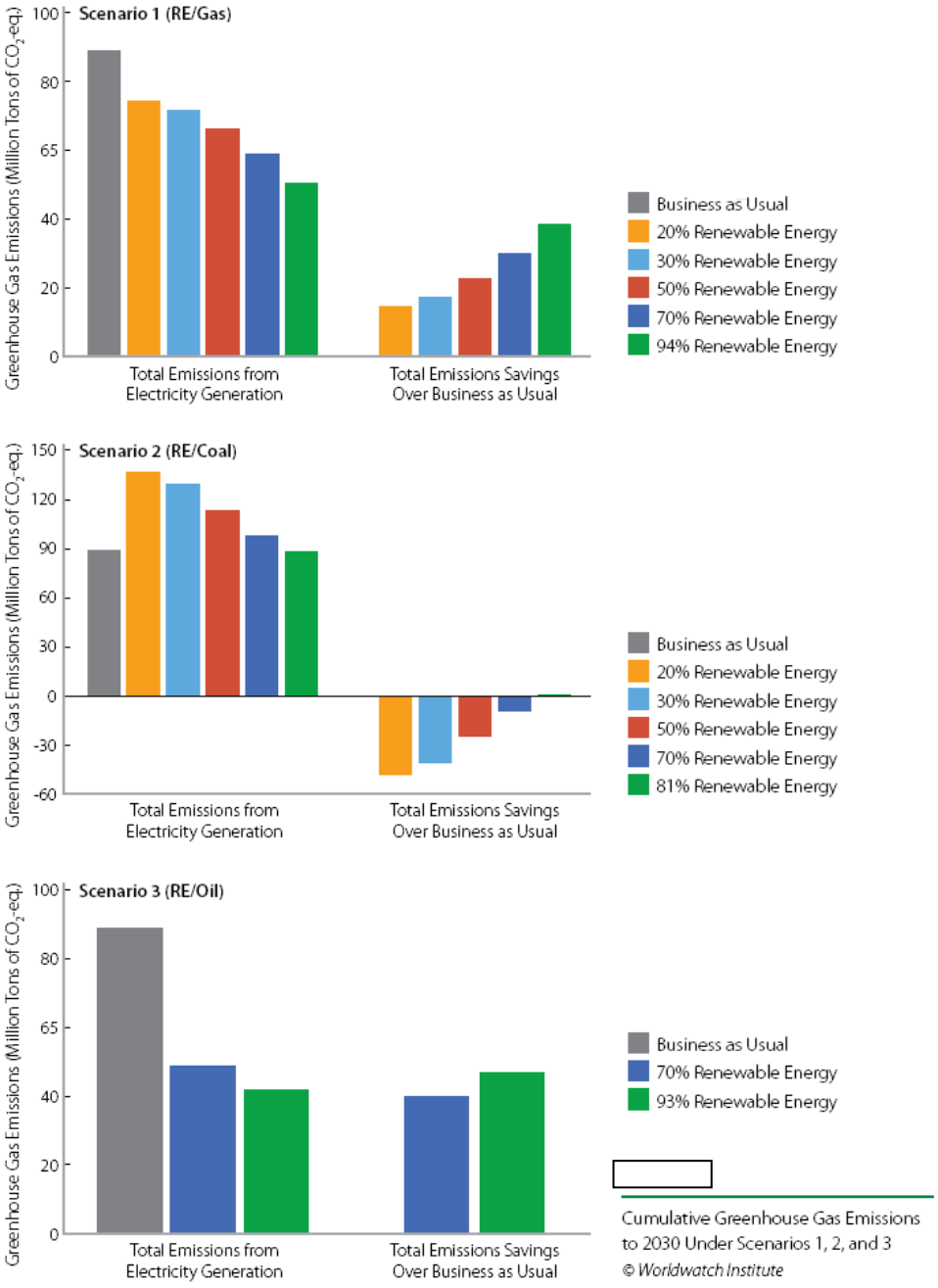
Energy Demand and Generation Under Scenario 3 (RE/Oil), 2012–2030 © *Worldwatch Institute*

It has to be restated that currently the GoJ has a vision target for a 20% contribution from RE and is assessing whether or not to adjust any goals based on consideration given to the results of the different studies conducted and also in alignment with targets established as part of the Regional Caribbean Sustainable Energy Roadmap[35] and Strategy (C-SERMS), through the Council for Trade and Economic Development (COTED) of CARICOM that has approved a 20%, 28% and 47% for years 2017, 2022 and 2027 respectively, for the contribution of renewable energy to total electricity generation. Taking into account recent studies[36] conducted by MSTEM the current target is indicative of a 30% RE penetration in grid connected electricity, and therefore this value will be used for the purpose of NAMA design considerations.

The results of the estimations performed by WorldWatch Institute are indicative and the levels of emissions projected into the future due to the participation of renewable energy are presented in the following figure.

[35] http://www.caricom.org/jsp/pressreleases/press_releases_2013/pres50_13.jsp

[36] MSTEM. Grid Impact Analysis and Assessment for Increased Penetration of Renewable Energy into the Jamaican Electricity Grid Final report `Prepared by EDF and HINICIO. November 2013



Results from other studies conducted on projections of emissions of GHG in the power sector are within a 20% of the results presented by the WorldWatch study depicted above.

iv. Describe briefly the current legal/policy framework, the existing institutional framework and the existing regulatory framework, as well any policies directly relevant to addressing energy efficiency use of renewable energy and addressing GHG emissions.

The key Institutions / Stakeholders in the energy sector are the following:

The Office of the Prime Minister. In late 2006, a Technical Inter-Ministerial Committee on Energy Policy and Analysis was empanelled. It is comprised of representatives from the Cabinet Office, the Office of the Prime Minister, the Ministry of Science, Technology, Energy and Mines (MSTEM), the Office of the Attorney General, the Petroleum Corporation of Jamaica (PCJ), the Office of Utilities Regulation (OUR) and Petrojam.

The Planning Institute of Jamaica (PIOJ). Since January 2007 this agency of the Office of the Prime Minister has led the preparation of a National Development Plan (NDP), named Jamaica Vision 2030. Twenty-seven task forces were appointed to develop plans for each sector. Among these, the Energy Task Force prepared an Energy Sector Plan to guide the development of the sector in the next decades.

The Ministry of Science, Technology, Energy and Mines (MSTEM). Has overall responsibility for the formulation and review of energy policy, including energy efficiency and conservation, identifying consumption trends and forecasting future demand scenarios. The Energy Division within the Ministry implements policy and monitors the functioning of the energy sector.

The Jamaica Energy Council. Serves as an energy decision-making forum that brings together diverse government and non-governmental stakeholders. MSTEM established the Council in early 2012 as a bipartisan, multi-stakeholder platform with the goal of reducing energy costs for households and businesses and increasing competition in the electricity sector. The Council is co-chaired by MSTEM Minister and the opposition party's Spokesman on Energy. Other members include representatives from the American Chamber of Commerce of Jamaica, the Jamaica Chamber of Commerce, the Private Sector Organisation of Jamaica, the Jamaica Manufacturers' Association, the Small Business Association of Jamaica, and renewable energy experts.

The Office of Utilities Regulation (OUR).Associated with the Office of the Prime Minister, the OUR has as its main functions the regulation of public utilities, including electricity. The OUR has recently acquired a role in the planning of the electricity sector and is responsible for the Long-Term Expansion Plan of the energy sector, which was formerly produced by the private utility company, Jamaica Public Service (JPSCo).

The Petroleum Corporation of Jamaica (PCJ). Under the MSTEM this statutory corporation plays an important role in the development of renewable energy through its Centre for Excellence in Renewable energy (CERE). PCJ also manages the oil refinery portfolio (through Petrojam) and the government-owned gasoline distribution company PETCOM and oversees exploration of crude oil.

The electricity sector is governed by a series of regulatory framework documents: the Electric Lighting Act of 1890, the Utilities Regulation Act of 1995 and the All-Island Electric License of 2001; as well as the OUR's Regulatory Policy on Guidelines for the addition of Generating Capacity to the Public Electricity Supply System and the Generation Expansion Plan 2010.

The Electric Lighting Act anchors the government's role in the sector. It holds the power to regulate prices and quality of the energy supply and to grant licenses to local authorities, companies or individuals to generate electricity. The Utilities Regulation Act of 1995 establishes the Office of Utilities Regulation as regulatory body allowing it determine price structure or fares, and to establish standards for the quality and safety, environment, reliability and efficiency of electricity service. The All-Island Electric License of 2011 regulates the distribution and transmission of electricity. It grants exclusive rights to JPSCo to function as sole transmitter and distributer of electricity for the next 20 years.

Outside the existing regulatory framework, the Rural Electrification Program Limited (REP), which functions as an executive agency of the government, has been providing rural electrification since 1975.

Jamaica Public Service Company Ltd is the dominant player in generation approximately 588 megawatts (MW) or over 66% of the total current generation capacity, some of which comes from renewable energy. By 2011, annual electricity generation alone from renewable energy sources accounted for approximately 5.6 % of total system generation with contributions of 3.5% and 2.1 % from hydro and wind respectively. Three hundred megawatts (300 MW) of this capacity has been provided by independent power producers (IPP) who sell power to JPS via power purchase agreements (PPA) for delivery unto the grid. These IPPs are Jamaica Energy Partners (JEP) = 124 MW; Jamaica Private Power Company (JPPC) = 60 MW; Wigton Wind Farm Limited = 38.7 MW; and Jamalco (bauxite company) = 11 MW. The utility recently added 3 MW of wind from its own generation and has a total of 21.3 MW of hydropower from previous generation plus some refurbished plants.

The gross peak demand to date is on the order of 640 MW (and gross generating capacity of 920 MW) but is projected to grow at an average rate of 3.8%[37] per annum over a twenty year (20) year planning horizon (2010 to 2029). Over the next 20 years, approximately 1,400 MW of new fossil fuel power plant capacity will have to be constructed in Jamaica including distributed generation system; to meet the projected demand for electricity and approximately 800 MW of this new capacity needs to be constructed in the coming decade.

JPS has an extensive transmission and distribution system which includes approximately 400 km of 138 kV lines and nearly 800 km of 69 kV lines. The system consists of twelve (12) 138/69 kV inter-bus transformers with a total capacity of 798 MVA and fifty-three (53) 69 kV transformers (total capacity of 1,026 MVA) which supplies the primary distribution system at 24 kV, 13.8 kV and 12 kV. The coverage of the overall electricity infrastructure of 14,000 km for transmission and distribution results in over 95% electrification of the country. Total system losses inclusive of technical and non-technical losses declined from 23% in 2009 to an average of 22.3% in 2011.

Electricity Sector Enterprise Team (ESET)38 has been appointed as of June 2014, The purpose of the ESET is to lead and manage the procurement process in consultation with the OUR, JPS and the Minister for the development of additional base load generation capacity and related facilities in the short term in order to significantly reduce the cost of electricity to consumers while ensuring diversification in the fuel supply mix, and to review and recommend changes to the current procurement policy. The objectives of the ESET are to:

(I) Lead and manage the implementation of a comprehensive programme to urgently replace base load generation with more efficient plants, utilizing lower cost fuel in order to ensure that electricity is reliably provided to Jamaicans at affordable rates, including advice to the Minister on the terms of Licence(s) to be issued;

(ii) review the current policy for the procurement of additional generation capacity to the national grid; and

(iii) recommend, in accordance with principles of good governance, such changes in the said policy which it considers to be necessary to achieve a procurement process which has clarity, is fair, effective, and consistent. With best practices, responsive to the national requirements, and which is designed to minimize or prevent similar failures to secure a suitable solution in the future.

The specific policies in the Energy Sector include:

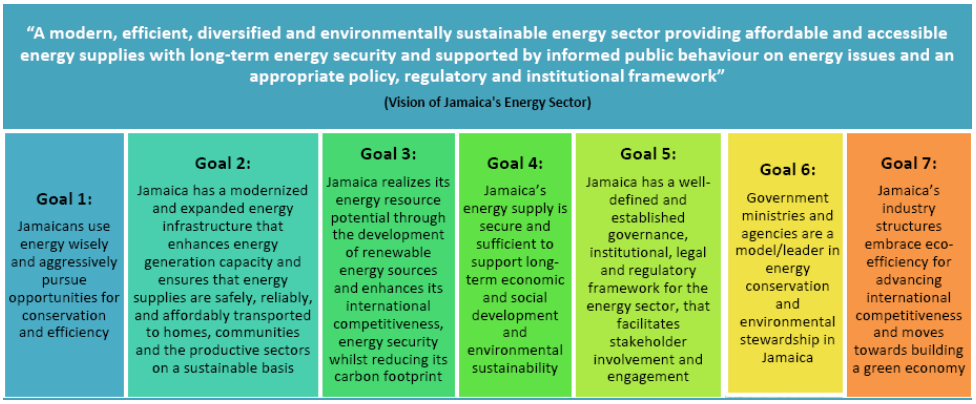
National Energy Policy 2009-2030

The Jamaica Energy Policy[39] (NEP) developed by the Ministry of Science, Technology, Energy and Mines (MSTEM):

[37] Although it is recognized that demand projections may be lower as indicated in recent studies, for the purpose of the NAMA; the data as presented by OUR in its base demand growth scenario will be used throughout this document.

[38] http://jis.gov.jm/media/ESET-TOR-Final-June-3-2014-.pdf

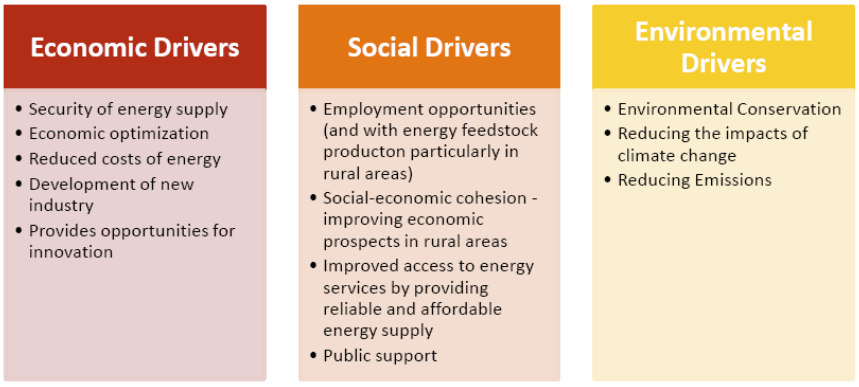
[39] http://www.mstem.gov.jm/sites/default/files/documents/national_energy_policy.pdf



National Renewable Energy Policy 2010-2030

Policy Vision: A well developed, vibrant and diversified renewable energy sector that contributes to Jamaica´s energy security and a sustainable future. The policy framework is underpinned by a strategic framework which sets the goals, strategies and specific actions required to achieve the vision. There are 5 goals articulated as:

The most important drivers for RE development and use in Jamaica are identified as:



National Energy from Waste Policy 2010-2030

Policy Vision: Jamaica is the regional leader in providing affordable and clean energy from waste contributing to a sustainable future. The 4 goals are:

Goal 1:	**Jamaica creates economic infrastructure and planning conductions conducing to the development of the energy-from-waste sector**
Goal 2:	**Jamaica builds its energy-from-waste sector on the most appropriate technologies that are environmentally-friendly, producing a clean reliable renewable source of energy**
Goal 3:	**Jamaica creates partnerships between the energy sector and the waste management and agriculture sectors to facilitate the continuous streams of waste into the energy from waste**
Goal 4:	**Jamaica has a well-defined governance, institutional, legal and regulatory framework for the generation of energy from waste**

The drivers for the waste to energy policy are:

Social	Economic	Environmental
• Generation of clean electric power • Reduced land space used for landfills • Sustainable economic growth and development • Job creation	• Reduced costs for users of electricity and bio-diesel • Increased supply of bio-diesel • Increased independence and less reliance on imported petroleum • Improved balance of payments • Sustainable economic growth and development • Job creation • Stimulated industrial development • Reduced costs for solid waste management	• Environmentally safe waste management and disposal • Reduction in disease vectors such as vermin and insects • Reduced greenhouse gas (GHG) emissions • Reduction in the overall waste quantities requiring final disposal

National Biofuels Policy 2010-2030

Policy Vision: A modern, efficient, diversified and environmentally sustainable biofuels sector that contribute to Jamaica´s long term energy security and socio economic development. The stated goals of the policy are:

Goal 1:	The economic, infrastructural and planning conditions conducive to the sustainable development of the biofuels sector, supported by intersectoral collaboration
Goal 2:	Innovative and clean technologies facilitating a secure supply of biofuels into local and national distribution systems
Goal 3:	A well-defined governance, institutional, legal and regulatory framework for the development of the biofuels sector
Goal 4:	Jamaicans have the technical capacity and knowledge for the development, deployment, management and use of biofuels

National Energy Efficiency and Conservation Policy 2010-2030

Policy Vision: Jamaicans in all sectors conserve and use energy efficiently and continuously seek opportunities to use renewable energies … towards a sustainable energy future. The goals of the policy are:

Goal 1:	Households and businesses aggressively and continuously adopt energy conservation and efficiency practices towards reducing Jamaica's carbon footprint
Goal 2:	An enabling environment buttressed by dynamic legislation and regulations that facilitates the promotion of energy conservation and efficiency
Goal 3:	The Government of Jamaica is the leader in energy conservation and efficiency and sets the standard for all other sectors
Goal 4:	Jamaica has modern and efficient energy plants

The drivers for the policy are:

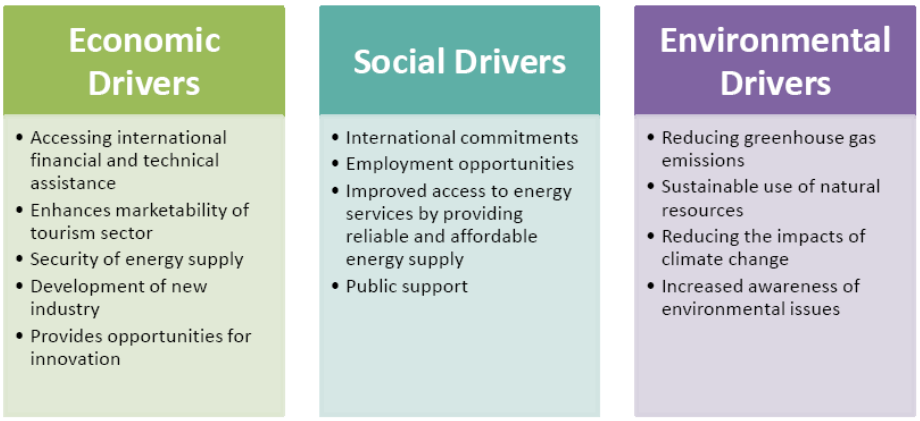
Economic Drivers	Social Drivers	Environmental Drivers
• Supports broard economic growth • Reduce dependence on oil • Maintain reliability of grid infrastructure • Make the best use of existing supply capacities to improve the access to energy • Reduce need for large-scale capital investments in power supply • Savings in foreign exchange	• lower utility bills to consumers • Attracts jobs	• Protects public health • Reduces carbon emissions

National Policy for the Trading Carbon Credits 2010-2030

Policy Vision: A competitive, diversified, efficient and investment-conducive carbon credits trading sector that fosters socio economic development and induces a less carbon-intensive economy. The goals of the policy are:

Goal 1:	A clear, flexible legal and regulatory framework for the carbon credits trading sector that is responsive to changes in the international arena
Goal 2:	A well-developed governance and institutional framework that leads to the maximization of opportunities for carbon credits trading
Goal 3:	Diverse initiatives implemented to reduce carbon emissions and generate carbon credits through the regulatory and voluntary markets as well as contributing to the social, economic and environmental development of the country
Goal 4:	A carbon credits trading sector that attracts investment through a financial and economic system in which benefits and risks are distributed equitably

The drivers for the policy are:



2. Description of scope and objectives of NAMA to address the current situation

1-2 pages

Starting from the current situation describe in 3.2, describe in detail the general and specific objectives of the NAMA, including the main source of GHG emissions that would be reduced.

Describe the scope of the NAMA by describing where in the country the NAMA will be implemented (national, sectoral, local level) and how large will be the results/impacts (national, sectoral, local level).

Describe how the NAMA supports the existing legal/policy framework, the existing institutional framework and the existing regulatory framework.

Describe how the NAMA objectives contribute to the sustainable development objectives and sectoral mitigation goals.

The overall objective of the NAMA is to **contribute to GHG mitigation by the establishment of a long term enabling environment that will allow permanence of the scale-up contribution from Renewable Energy Generation Systems in Jamaica, while assisting in the creation of capacities for the development of a Renewable Energy Sector in the country.**

The specific objectives of the NAMA are:

a) Facilitate efforts towards the implementation of the Jamaica Vision 2030, through the GHG mitigation associated to renewable energy scaling-up; and contributing to the establishment of the monitoring protocols necessary for tracking the renewable energy climate related mitigation contributions.

b) Contribute to the streamlining and implementation of key regulations supporting the development of the RE sector in the country, inclusive of a framework of relevant incentives appropriate for the context of the country.

c) Assist the GoJ in implementing financial instruments and financing facilities that could be supportive of the perceived needs to catalyze investment in RE project development, inclusive of risk mitigation

schemes that could assist the private sector investment (mainly local) in RE electricity generation projects.

d) Assist in removing perceived barriers for RE project development related to permitting required by project developers in order to comply with national and local ordinances.

e) Provide targeted support for the removal of technical barriers and grid infrastructure deployment that is essential for improving the absorptive capacity of the Jamaica grid to speed the uptake of variable power renewable energy generation.

The main source of GHG addressed with the NAMA relates to CO_2 emissions generated due to the use of fossil fuels for generation (both grid or non grid connected) that will be displaced due to the use of generation of renewable energy electricity, to be incorporated to the national grid or used directly as captive generation by the targeted end use sectors.

The NAMA will be implemented at the National / Sectoral level, with sectoral pertaining to the electricity sector of the country mainly generation side and possibly at relevant end use sectors (commercial / industrial / residential).

The NAMA contributes to the Government of Jamaica (GoJ) efforts in scaling-up the contribution of Renewable Energy as stated in the Jamaica Vision 2030, by supporting a range of measures and programmes (previously listed) aimed at scaling up the contribution of Renewable energy to the energy mix in the country within the National Objective #10 related to Energy Security and Efficiency; and also contribute to the effort of reducing the rate of Climate Change within the National Objective #14 related to Hazard Risk Reduction and Adaptation (inclusive of contribution to slow down climate change through mitigation).

The NAMA is aligned with other relevant National Policies within the energy sector as well as with the Proposed Draft Climate Change Policy Framework and Action Plan, previously listed.

3. Identification of barriers and implementation options

3.1Analysis of barriers (financial, legal, regulatory, institutional, capacity, technology, etc.) that impede achievement of the NAMA objectives

(3 pages)*Starting from the key source of emissions addressed by the NAMA and from the existing legal/institutional/regulatory framework, explain the barriers that impede the achievement off the NAMA objectives. This chapter 4.1 should describe the barriers in detail.*

The groups of barriers covered could include:

- *Economic and financial*
- *Market failures*
- *Policy and legal*
- *Regulatory*
- *Institutional and organisational capacity*
- *Human capacity*
- *Social and cultural*
- *Others*

Several recent reports in Jamaica make assessments of barriers to renewable energy in country, for example in the Draft National Energy Policy Action Plan #2 (2013-2016), a review of the implementation of the First NEAP

in Jamaica is included, identifying several common barriers that impede the progress of energy policies, programmes and projects:

- Renewable Energy Projects not fully pursued due to their initial cost (but long term life cost not considered).
- Lack of human and technical capacity to undertake / implement the tasks.
- Limited technical and management capacity within the GoJ to develop, implement, enforce and monitor initiatives.
- Lack of consumer awareness, which is the case of current financial facilities to improve solar penetration in the island.
- Perception that commercially viable funding is not available to potential investors.
- Low priority placed on some areas by central government where budgetary support is necessary.
- Lack of fiscal space in the national budget to pursue energy initiatives.
- Inadequate legal and regulatory frameworks.

Other important reference on barriers to the scaling-up contribution of Renewable Energy are analyzed in a recent report by WorldWatch Institute[40].

Having considered previous existing information available on barrier analysis and root cause assessments done on the issue of development of Renewable Energy in Jamaica, this section presents the most important barriers that the proposed NAMA intends to address through implementation:

1. Due to the critical and important short term quest to fulfil power sector objectives of diversification of the generation mix based on incorporation of other fossil fuels (likely to be natural gas), as well as reduction of end use tariffs to customers, *the longer term contributions and co-benefits of Renewable Energy may not be realized or scaled-up due to the lack of a strong renewable energy sector adequately supported by an effective and streamlined regulatory framework structure for promotion and incentives allocations*.

2. Renewable Energy Project Developers in Jamaica face different levels of entry barriers due to interconnection issues as well as lack of facilitating conditions related to permitting processes in the different institutions and ordinances currently existing at different stages of project development.

3. Although the capacity within the Jamaican financial system to provide sustainable energy financing has improved somewhat over the last few years, there is still a *lack of full use of available financial instruments or facilities, reduced uptake of existing financing by project developers of such facilities and lack of other innovative financial approaches and facilities that could assist in reducing the perceived risks associated to RE lending in the country.*

4. The uptake of renewable energy in Jamaica is linked to the capacity of the electricity grid to accommodate and properly manage different effects that renewable energy generation may have on a grid. The Jamaican grid will surely require upgrades and expansions to not only accommodate the growing energy demand but also in pursuing the long term RE adscription goals proposed in the country. Although some studies on RE generation absorptive capacity are currently under development, there is a perceived barrier related to technical issues as well as on the infrastructure investment required to deploy the readiness at the grid level to manage variable renewable energy generation.

[40]ShakuntalaMakhijani, Alexander Ochs, et al., Jamaica Sustainable Energy Roadmap: Pathways to an Affordable, Reliable, Low-Emission Electricity System (Washington, DC: Worldwatch Institute, 2013). http://www.worldwatch.org/system/files/Jamaica-Sustainable-Energy-Roadmap-112013.pdf

5. The energy sector institutional map in the country is complex with several layers of interacting institutions and organizations. Maintaining the focus on the expected targets for the contribution of RE towards 2030, requires further alignment of existing institutions in order to support the required coalitions and alliances that will deliver the synergies of change towards the proposed diversification sustaining the long term vision in the country.

3.2 Identification of possible options to address the barriers and selection of preferred options (=measures) to be implemented through the NAMA

(3 pages) *Starting from the barriers identified in 3.1, identify and describe in details the proposed solutions (=measures) to remove the barriers that will be addressed through the NAMA. Each barrier covered should be separately described, providing details of the background analysis undertaken in identifying the issue and designing the barrier. For example, if the barrier is a quality product, then provide an assessment of what the issues are in terms of the quality of the product, what measures could be taken to ensure quality and which of these measures will be implemented under the NAMA.*

For each solution (=measures), describe what the expected outputs of implementing the measure.

The Jamaica Renewable Energy NAMA is a policy instrument to realize GHG emissions reductions due to the scaling-up of renewable energy generation through enabling regulatory and institutional deployment frameworks.

The selected options to address the identified barriers in the proposed NAMA are include into the following strategic components:

a) **Stakeholder Alliance Integration (public-public, public-private):**This component aims at supporting the strengthening of the long term institutional setting, coalitions and alliances both public-public and public – private required for effective coordination and action oriented support to enable long term up take of renewable energy projects . It also looks at the required enhancement of coordination and regulations for the removal of entry level interconnection barriers for RE at the grid level by assuring adequate exchange and discussion of issues relevant to RE development at the level of the electricity market stakeholders. **The outcome** of this component relates to a strengthen institutions focusing on relevant regulations, capacity to assess and implement actions to remove barriers of entry type to renewable energies and assure the Vision 2030.

b) **Capacity Building for Renewable Project Development Action:** This component looks at capacity building in general but also concentrated towards removing identified barriers related to: the risk perceptions on renewable energy investment in Jamaica, specially from local investors, the improvement of provision of information in two critical areas of sound technical studies on the absorptive capacities of the Jamaican grid for RE scaling up and also on the development of Monitoring-Reporting and Verification schemes that are likely going to be required for assessing the implementation of the NAMA and the measures, reporting internally in-country and internationally of the climate benefits derived from the implementation of the NAMA. The sector will be strength with more capable human resources and RE Associations participating in the NAMA. **The outcome** expected from this component looks at enhancing human capacities for projects and sector, delivering technical solutions to the introduction of variable power renewable electricity to the grid and also in the area of MRV required to continuously assessment of progress and identification of actions to keep focus on the long term contribution of RE to Jamaica according to Jamaica Vision 2030.

c) **Innovative Financial Mechanisms:** This component is aimed at supporting a first portfolio of projects, which will lower risk by means of demonstration and by means of the training and experience provided to stakeholders in the market —developers, financial institutions and communities— to create a catalytic transformation in the sector. In particular, it will use NAMA resources for three purposes: (i) provide financial capacity building and technical assistance to projects and local banks; (ii) catalyze and maximize the amount of finance available from MDBs and other partners, as well as commercial financing available for investment in grid-connected RE-projects, and (iii) support strategic finance for the necessary investment in grid upgrades for uptake of variable power renewable energy projects in the country. To catalyze commercial financing, a fund will be created/ or support will be provided to the existing efforts on the creation of a Jamaica Energy Fund with resources from climate finance, multilateral banks (with the possible involvement of other sources including pension funds, private investors and/or commercial banks), which will provide temporary and necessary financial support, including in the form of equity, to projects to enhance their bankability, as well as risk mitigation special purpose financial vehicles. **The outcome** of this component is a well articulated funding strategy and implementation for financial facilitating actions across technologies and project scales favouring investment development for RE projects.

d) **Streamlined Regulations in Support of Renewable Energy Scaling-Up**: The objective of this component is to support the development and implementation of policies, laws, regulations, rules, standards and incentive schemes aimed at improving the integration of renewable energy in the energy sector by reducing risks and transaction costs and encouraging investment in renewable energy. In particular, it will support the consolidation of a long-term energy policy to promote a higher mix of RE and a low-carbon development strategy; legislation and secondary regulations for promoting RE development; standards and specifications appropriate for each renewable technology; incentives model (including tariffs) for the effective development of each renewable technology, and which fully reflects their associated benefits; technical standards for renewable energy technologies; guidelines for obtaining construction, operation and supply permits; definition of intra and inter-agency responsibilities, and development of capacities of governmental and nongovernmental agencies to allow for future expansion of mitigation activities, including renewable energy. **The outcome** expected from this component is a set of well articulated regulations with buy-in and coordination of stakeholders in support of diverse aspects of RE project development.

4. Description of the NAMA Action Plan

4.1 Description of detailed activities to implement the mitigation measures included in the NAMA and work plan for the detailed activities (2 pages)

Based on the measures identified in 3.2, describe the key output that will be achieved for each measure. Describe in detail the key activities to be implemented to achieve the respective output for each of the identified measure.

Describe how the outputs will contribute to the NAMA objectives beyond the limits of the mitigation measures, and how these objectives will promote the desired impacts.

An indicative presentation of suggested key activities of the NAMA as well as the indicative proposed work plan of the NAMA is presented in the following table.

NAMA Component	Outcome	Outputs and mechanisms	Indicative Related Activities	Coordinator or leader of the activity	Key stakeholders involve for coordination and negotiation	Implementation years													
						1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. NAMA Readiness	NAMA ready for implementation	NAMA Design	NAMA Design	MWLECC	MSTEM														
		NAMA Funding	NAMA Funding	MWLECC	MSTEM														
		MRV design	MRV design	JIP	MWLECC														
2. Stakeholder Alliance Integration	Strengthen institutions to remove barriers of entry type to RE and assure the Vision 2030	Institutions readiness for RE support	Institutional framework assessment for the energy sector	MSTEM	JIP														
		Alliances and partnerships in place	Agreements for institutional arrangement	MSTEM	MWLECC														
		Coordination spaces integrated	Awareness raising campaign design	MSTEM	MWLECC														
		Campaigns and stakeholder awareness raising	Execution of campaigns	MSTEM	Public Communication Entity														
		Improved process , protocols for RE projects development	Review of the RE project cycle in Jamaica	MSTEM	Ministry of Industry, Investment and Commerce of Jamaica, MIIC														
			Coordination for responsive regulatory action	MSTEM	MIIC														
			Regulatory improvement		MIIC														
3. Capacity Building for Renewable Project Development Action	Enhancing human capacities for project development and financing; and also in the area of MRV	Training programs (RE/financing)	Studies of capacity needs, based on inputs from Components 2, 4 and 5.	RE Association	Ministry of Education														
		Grid studies and proposal to improve and manage integration of variable renewable energy	Design of training programs	RE Association	International cooperation														
		Promotion of RE Sector association	Implementation of training programs	Education entities	International cooperation														
		MRV	Financial support for RE associations	MSTEM	International cooperation														
		Technical and financial services for RE project developers	Coordination with NEAP-MSTEM, JAMAICA Vision 2030 and Climatescope for MRV adjustment	MSTEM	MWLECC/JIP														
		Grid infrastructure capacity building	MRV implementation	MSTEM	MWLECC/JIP														
		Procurement protocols	MRV application	MSTEM	MWLECC/JIP														
			Design of services	RE Association	RE investors														
			Finance the services	RE Association	RE investors														

NAMA Component	Outcome	Outputs and mechanisms	Indicative Related Activities	Coordinator or leader of the activity	Key stakeholders involve for coordination and negotiation	Implementation years													
						1	2	3	4	5	6	7	8	9	10	11	12	13	14
			Implement the services	RE Association	RE investors				■	■	■	■	■	■	■	■	■	■	■
			Grid studies	MSTEM	JPS			■	■										
			Protocols and restriction definition	OUR	JPS				■	■									
			Grid Investments	JPS	Multilateral Banks and MOF					■	■	■	■	■	■	■	■	■	■
4. Innovative Financial Mechanisms	Well articulated funding strategy and implementation for financial facilitating actions favouring investment for development of RE projects	Risk/Guarantee Capital Fund Energy Fund Financial institutions readiness Pilot portfolio of RE projects Grid upgraded financial solutions	Assessment studies for design of financial mechanisms	DBJ	Multilateral Banks			■											
			Design of Risk fund	DBJ	RE Association			■											
			Design of Energy Fund	MSTEM	DBJ			■											
			Negotiate Both Funds	Financial institutions	Funding institutions				■										
			Implement Funds	Financial institutions	RE association				■	■	■	■							
			Support financial institutions	Academy	Financial institutions				■										
			Design new products	Financial institutions	DBJ			■	■										
			Increase capacities	Financial institutions	DBJ			■	■										
			Define a pilot portfolio	MSTEM	RE Association		■												
			Design a support program	MSTEM	RE Association		■												
			Support pilot projects	MSTEM	RE Association			■	■	■	■	■	■	■					
			Define a Grid financial solution for grid infrastructure investment	JPS	Multilateral Banks and MOF				■										
5. Streamlined Regulations in Support of Renewable Energy Scaling-Up	A set of well-articulated regulations with buy-in and coordination of stakeholders in support of diverse aspects of RE project development	New Financial incentives New other incentives Reinforcement of existing incentives Procurement process New standards to support RE	Technical assessment about options of incentives	MOF	MSTEM		■												
			Reinforce existing regulations	MSTEM	MOF/MIIC			■	■										
			Design new mechanisms, regulations and incentives	MOF	MSTEM/MIIC			■	■	■									
			Built a favourable procurement framework	MSTEM	ESET			■	■										
								■	■										

4.2 Implementation arrangements: roles and responsibilities of different entities and stakeholders involved in implementation of NAMA, including institutional arrangements (2 pages)

Describe the actors in the implementation of NAMA. Describe their role and their responsibilities.

Describe the arrangements to coordinate the functioning of key actors in implementing NAMA. Describe the process of coordination to ensure continuous oversight and management of the implementation.

Provide a diagrammatic representation of the institutional arrangements put in place for NAMA coordination and implementation.

Describe the role of the private sector in the NAMA (if relevant).

The implementation of the NAMA requires a multi stakeholder effort involving existing institutions and organizations. It is envisaged that the NAMA requires at least the following governance bodies and arrangements to coordinate the functioning of key stakeholders within the key actions in the NAMA implementation. The different arrangements to be undertaken involve at least the following:

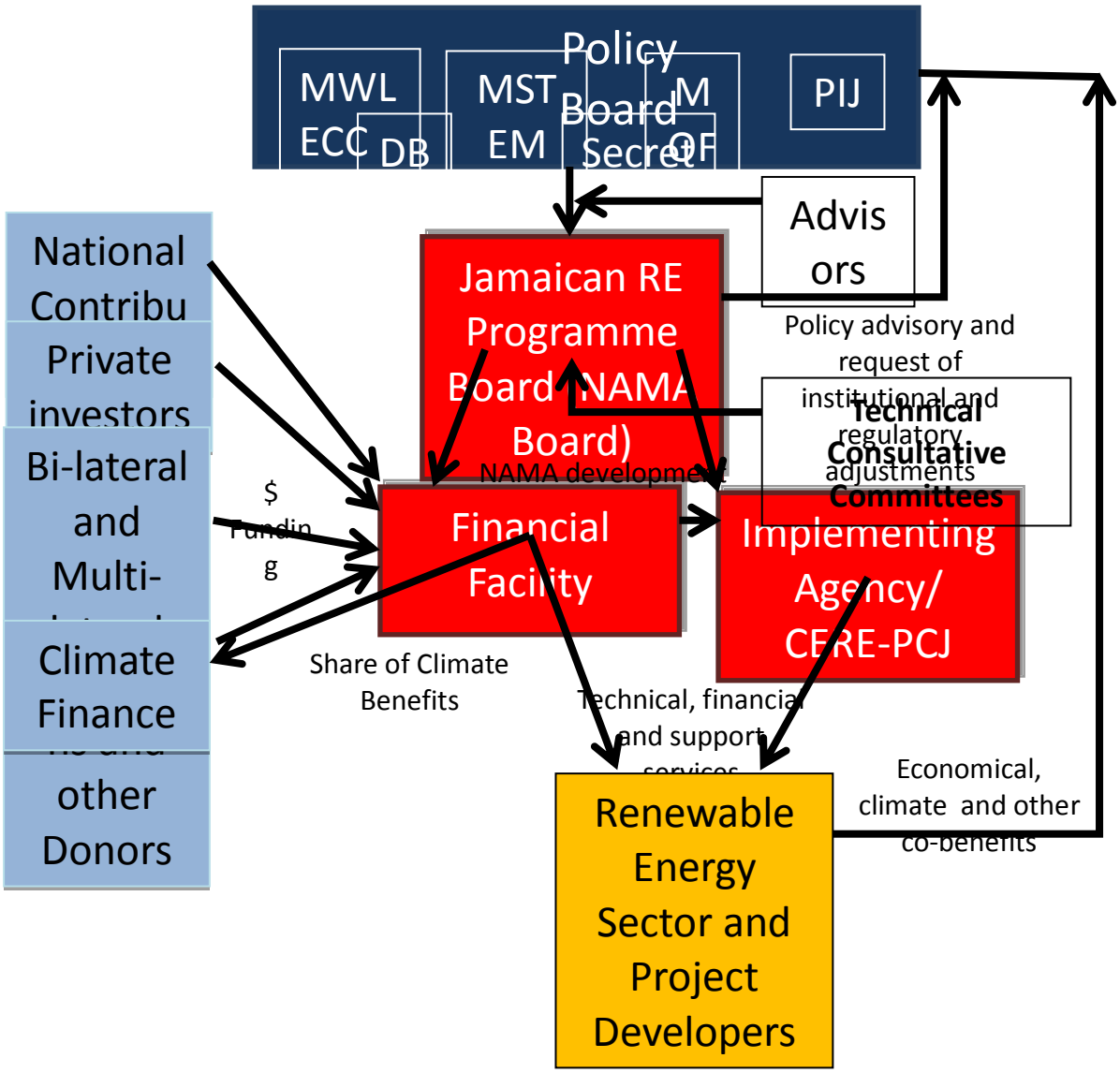
- At the upper level there needs to be a new, **NAMA related Political/Policy Board** (to be focused on Renewable Energy and mitigation) to be integrated by different institutions including high ranking policy/strategy ranks from MSTEM and MWLECC as NAMA supporters and the Ministry of Finance (MoF), the Planning institute of Jamaica (PIJ) and the Development Bank of Jamaica supporting financial and planning from the national perspective. This Board needs to have support (for logistics, integration of stakeholders, etc.) in terms of a secretariat (whose secretary needs to be integrated into the Board), as well as input from advisors, and other relevant stakeholders. The Board needs to develop a program of work since it meets normally on a bi annual basis to assess overall route and implementation of the NAMA during the different phases and assuring coherence with the Jamaica Vision 2030.

- Next, there is the **Jamaica Renewable Energy NAMA/Programme Board (NAMA Board)** whose main function is to galvanized interests, provision of technical support, facilitation of coordination and provision of key early push and support. The denominated NAMA Board provides key programmatic development guideline to the NAMA Implementing Agency as well as policy advice and also funnels requests for institutional alignments supportive of implementation. The NAMA Board should likely be integrated by technical ranks with implementation/executing managerial capabilities from the institutions referred above.

- **Technical Consultative Committees** are the platform for technical definitions, consultations and validations with other stakeholders not included in the other boards. These could be integrated by a wide representation from stakeholders in the country on a per request basis to provide consultation support on issues relevant to the NAMA.

- At the implementation level of the NAMA there are two distinct set of players. On one side the needs to be an **Implementing Agency** chartered with the NAMA Implementation, together with a Financial **Facility** chartered with the implementation of financial instruments supportive to renewable energy project development. These two players could be integrated but due to the relative boundaries of their purpose, it is likely that they will have to be separate entities associated through an implementation agreement.

The next figure is an institutional proposal describing the arrangements to coordinate the functioning of key actors in implementing Jamaica RE NAMA and put in place those for NAMA coordination and implementation. The organizational chart of the NAMA governance could be depicted as follows:



	Direct Beneficiaries	Small capital	Indicative of service, resource or action
	Policy Board	→	Indicative of hierarchy or/and flow of service, resource or action
	Executing entities		Funding Source
	Advisory Board or stakeholder consultation		

Roles and responsibilities associated to stakeholders in the NAMA are depicted in the following table:

Type of actor	Stakeholder	Role	Responsibility
Governmen	MSTEM	NAMA leadership, participates in the	Overall performance of the NAMA

Type of actor	Stakeholder	Role	Responsibility
t of Jamaica		Policy and NAMA Boards	related to the Renewable Energy scaling-up and associated penetration target in electricity generation
	MWLECC	NAMA leadership, participates in the Policy and NAMA Boards	Overall performance of the NAMA related to the GHG mitigation target
	MOF	Participates in the Policy and NAMA Boards.	Approval of National Contributions as well as contribution to assure fiscal incentives counterparts. Assistance in streamlining cooperation with MDBs
	PIJ	Participates in the Policy and NAMA Boards. Competence role to support the NAMA, mainly in the MRV.	NAMA insertion into the national Planning system, including MRV
	Secretariat	Agenda and follow up of agreements from the Policy and NAMA Boards	Overall follow up of the NAMA performance and functionality, supporting MSTEM and MWLECC
Other public entities	OUR	Potential participation in the Technical Consultative Committees	Regulator know how support objectives
	PCJ and CERE	Potential participation in the Implementing Agency	
	DBJ	Participate in the Policy and NAMA Boards. Competence role to support the NAMA. Participating in the financial facility at the technical and funding side	Supporting financial issues for the NAMA development
Financial entities	Commercial banks	Funding of NAMA financial facility	Financing through debt availability to project development
	Multi-laterals	Funding of NAMA financial facility, provision of support for the capacity building and support for technical support. Contribution to MRV design and implementation	Technical, capacity building and financial contributions
Private sector	RE Associations	Potential participation in the Technical consultative Committees. Direct beneficiary. Pushers of the NAMA programme	Represent the sectorial interest and creation of capacities for development of the RE sector in country
	JPS	Potential participation in the Technical Consultative Committees	Coordination and participation in the needs of grid improvement, grid investments and relation with the energy system operation for RE.

Type of actor	Stakeholder	Role	Responsibility
			Protocols for RE interconnection
	RE Developers	NAMA participant/ direct beneficiary. They are pushers of the NAMA programme	Project development and investment of equity capital.
	RE Technology Suppliers	Pushing of the NAMA programme	Support the RE sector development

5. Estimate of National Sustainable Development Benefits and GHG Impacts

5.1 Baseline Scenario: narrative description of baseline situation in absence of planned NAMA measures

(1-2 pages) *Describe the scenario that would occur in the absence of the NAMA. The baseline section should cover the following information:*

1. *Description of existing situation in the sector/sub-sector in which the NAMA is being implemented.*
2. *Provide information on the key parameters influencing the GHG emission sources that are to be addressed by the NAMA. Provide projections of these key parameters. For example, if the NAMA is to implement Solar Home Systems, the emissions are from the use of energy for electricity. The section should provide information on the scenario for population change, the sources of electricity, the level of growth in electricity availability etc.*
3. *Describe the existing policies influencing the key parameters identified above and describe how these policies will affect the key parameters.*
4. *If there are mitigation policies, describe the impact of the implementation of these policies on the GHG emission sources related to the NAMA.*

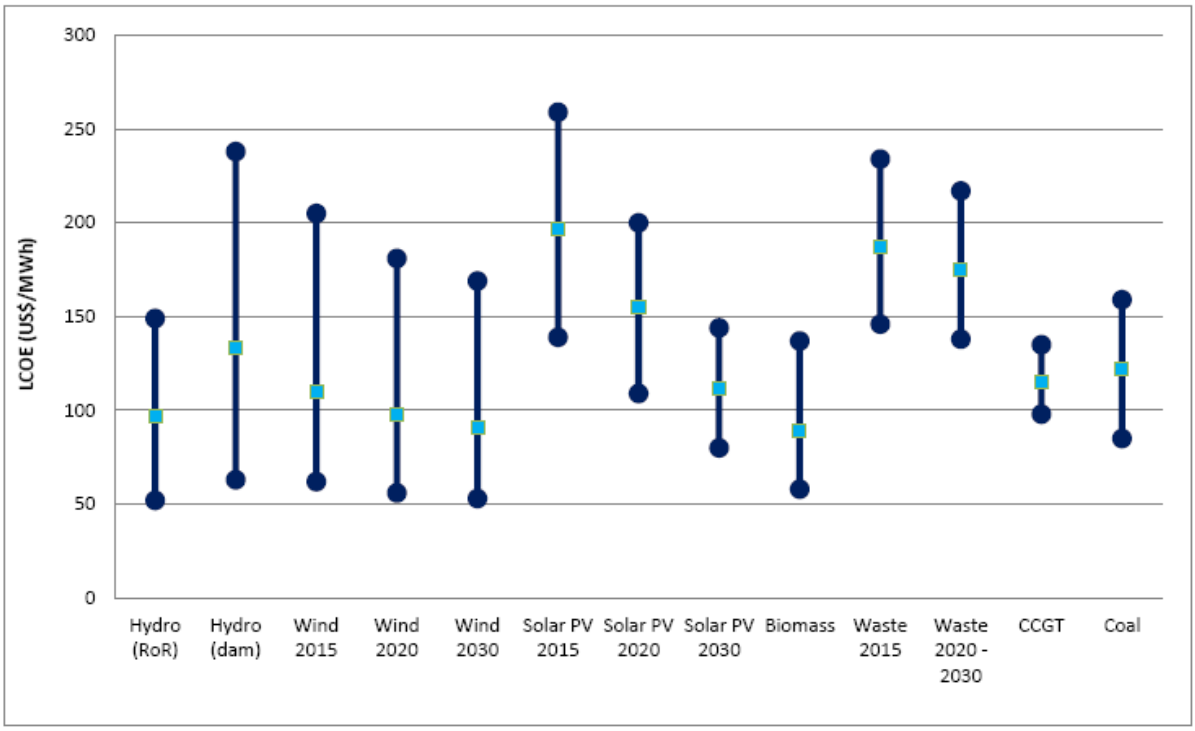
Jamaica currently generates most of its electricity through the use of traditional fossil fuel plants that are largely inefficient. This has resulted in very high and increasing costs to the society and an overall impact on balance of payments as well as economic turndown and competiveness. Electricity consumption continues to increase at elevated rates yearly according to planning documents by OUR. The demand growth is spearheaded by specific sectors within the society inclusive of the public, commercial and tourism. Within this context, the GoJ has being working towards achieving a diversification of fossil fuel generation based on a decision towards a lower cost fuel likely to be natural gas and also on the incorporation of renewable energies in the generation mix using different technologies as well as project scales.

Jamaica has an installed power capacity on the order of around 850 MW and expected capacity additions to the year 2030 indicate that nearly another 1,400 MW of new capacity need to be installed (with nearly a 44% to be incorporated by 2020 and the rest in the next decade).

The baseline scenario of the NAMA for the period towards 2030 indicates that most fossil fuel power plant investment in the country will be natural gas based. Both politically where there is convergence towards natural gas adoption and also according to the OUR 2010 Expansion Plan, where natural gas becomes the least cost expansion scenario; this is the fuel of choice in the country for the period considered.

The GoJ is supporting the incorporation of RE generation in the mix, and that for such purpose has already conducted a first procurement process based on a bidding process for both firm as well as non firm RE generation, in which the ceiling for bids is based on recognizing disparity of sources compared to the existing price signals for oil based generation.

Levelized cost of energy (LCOE) has been calculated in Jamaica for different sources of generation, as presented by MSTEM[41] in a recent report for the case of the baseline scenario based on natural gas.



Taking into account the expected LCOE of gas as well as its likely spread in comparison with the expected LCOE of different renewable technologies, it becomes apparent that once gas starts coming to be part of the matrix several technologies and ranges of projects may hardly be competitive to develop solely on the base of LCOE; therefore requiring further assistance in terms of incentives, capacity building and other barrier removal initiatives.

5.2 NAMA Scenario: narrative description of situation with the implementation of NAMA measures

Describe the scenario that would occur with the implementation of the NAMA. Describe, based on the activities identified above in section 5, how NAMA implementation will influence the key parameters identified in section 6.1.

The implementation of the NAMA measures will result in the fostering of an enabling environment for renewable energy project development in Jamaica. A portfolio of RE projects proposed will be implemented and therefore the country will reach the proposed target for a 30% participation in the generation of electricity in the country. Such portfolio will include several types of RE technologies as well as scales of implementation with a component of variable renewable energy participation at the grid level, that will be coming in line as effective regulation and procurement, innovative financing, capacity building and partnerships are developed.

[41] MSTEM. Grid Impact Analysis and Assessment for Increased Penetration of Renewable Energy into the Jamaican Electricity Grid Final report `Prepared by EDF and HINICIO. November 2013

5.3 Description of the benefits in terms of development (social, economic, and environmental)

(1 page) *Based on the descriptions in 6.1 and 6.2, describe the development benefits obtained from NAMA implementation:*

Social benefits: human benefits (health, education, etc.)

Economic benefits: jobs created, any costs reduced, national economic benefits, etc.

Environmental benefits (other than GHG reductions): positive impacts on forests, land degradation, biodiversity protection, any other natural resources, reducing pollution, etc.

Sustainable Development Benefits associated to the implementation of the NAMA are:

Social Benefits: The most important benefits in this category are related to the impacts in the education system in the country due to the improved value added for clean energy chains that will be establish through the NAMA implementation. It is likely that this effect will be noticeable not only for higher education professionals but also can create a new segment of technical training skills normally associated to different stages of project development.

On the institutional side, benefits can be expected within the institutional establishment related to the knowhow on improved coordination, overall management of transformational processes, coordination of public-public and public-private ventures, all of which are important to maintain focus on a long term vision for the sustainable Development of the country.

Economic Benefits: Contribution to the generation of a new set of business practices resulting in the local creation of value added and development of the human capital of the country through creation of new spaces in the energy sector resulting in job creation to the Jamaican population. The number of jobs added in the Jamaican society due to the renewable energy industry may be on the level of up to 1,000-2,000 depending on the final target RE penetration, but enough to make a sound case for the social, economic and gender implications of the path towards scaling-up of renewable energy.

Based on estimated levelized cost of energy including environmental externalities, the NAMA is likely to deliver expected economic benefits to the population based on the long term vision towards energy security and diversification, in terms of reduced balance of payments needs for business as usual practices

Due to the action oriented approach to improve regulatory framework it is expected that benefits can be accrued from the expected results related to reducing development costs to renewable energy projects, contributing to a more effective and efficient project development learning process in the country.

Mobilizing private sector financing for energy infrastructure creating investment opportunities for different target sectors in the country (from private to equity, social pension funds, etc.); as well as innovative development of risk management facilities that could have spill over effects to other important sectors needing investment in the country.

Environmental Benefits: The most important benefits derived on this category are likely to occur in the reduction of point source pollutants associated to the operation of fossil fuel power plants that otherwise will have to be installed or operated at larger capacity factors, understanding the potential trade-offs associated to the issues of larger Renewable Energy project development associated to risks perceptions associated to interconnection of such plants.

5.4 Estimate of GHG emission reductions resulting from implementation of NAMA measures, including description of methodology to estimate GHG emissions impact

(2 pages)*Calculate/estimate the GHG emissions related to the baseline scenario. Explain how the calculation/estimate has been made by explaining the methodology used, the hypothesis made, the formula used, etc.*

Calculate/estimate the GHG emissions related to the NAMA scenario. Explain how the calculation/estimate has been made by explaining the methodology used, the hypothesis made, the formula used, etc.

Calculate the potential of GHG emissions reductions by comparing the baseline and the NAMA scenario.

The information should be quantitative and should be linked to the descriptive narration of the baseline and NAMA scenarios described in the sections above. The section should provide detailed information on the data sources used, assumptions made, and methods used for estimating various data.

Baseline Scenario

The plausible proposed baseline scenario is based on continuation of current practices using existing oil based generation plants followed by introduction of natural gas plants that will gradually substituting and replacing as well as expanding the generation capacity of the country in order to satisfy expected demand towards 2030.

The energy demand growth in the baseline scenario is The Base Forecast – Net Generation and Net System Peak (2010 – 2029)[42], shown in the following table.

Year	Net Gen (MWh)	Net Gen Growth Rate (%)	Load Factor (%)	Net System Peak (MW)	Peak Growth Rate (%)
2009	4,213,981	-	77.6	619.9	-
2010	4,253,796	0.94%	77.6	625.8	0.95%
2011	4,373,845	2.82%	77.96	640.5	2.35%
2012	4,531,735	3.61%	78.28	660.8	3.17%
2013	4,725,330	4.27%	78.57	686.5	3.89%
2014	4,951,437	4.78%	78.84	717.0	4.44%
2015	5,190,379	4.83%	79.07	749.3	4.50%
2016	5,434,953	4.71%	79.28	782.6	4.44%
2017	5,681,720	4.54%	79.47	816.1	4.28%
2018	5,949,989	4.72%	79.64	852.8	4.50%
2019	6,223,245	4.59%	79.8	890.3	4.40%
2020	6,502,098	4.48%	79.93	928.6	4.30%
2021	6,786,213	4.37%	80.06	967.7	4.21%
2022	7,075,842	4.27%	80.17	1007.6	4.12%
2023	7,370,946	4.17%	80.27	1,048.3	4.04%
2024	7,671,693	4.08%	80.35	1,089.9	3.97%
2025	7,978,175	3.99%	80.43	1,132.3	3.89%
2026	8,290,569	3.92%	80.51	1,175.6	3.82%
2027	8,609,043	3.84%	80.57	1,219.8	3.76%
2028	8,933,808	3.77%	80.63	1,264.9	3.70%
2029	9,265,086	3.71%	80.68	1,310.9	3.64%

[42]Page 27 of Office of Utility Regulation, OUR. Generation Expansion Plan.2010.

The optimum generation expansion plan based on Natural Gas-only strategy from OUR Generation Expansion Plan 2010, presented in the following table is used as baseline assumption for new natural gas plants entry into operation.

Year	Plant Type to be added to the System	No. of units x Capacity (MW)
2014	Natural Gas-fired Combined Cycle Gas Turbine unit	3 x 120
2016	Natural Gas-fired Combined Cycle Gas Turbine unit	1 x 120
2017	Natural Gas-fired Simple Cycle Gas Turbine unit	1 x 40
2018	Natural Gas-fired Combined Cycle Gas Turbine unit	1 x 120
2019	Natural Gas-fired Simple Cycle Gas Turbine unit	1 x 40
2020	Natural Gas-fired Combined Cycle Gas Turbine unit	1 x 120
2022	Natural Gas-fired Combined Cycle Gas Turbine unit	1 x 120
2024	Natural Gas-fired Combined Cycle Gas Turbine unit	1 x 120
2025	Natural Gas-fired Simple Cycle Gas Turbine unit	1 x 40
2026	Natural Gas-fired Combined Cycle Gas Turbine unit	1 x 120
2028	Natural Gas-fired Simple Cycle Gas Turbine unit	1 x 40
2029	Natural Gas-fired Combined Cycle Gas Turbine unit	1 x 120

Within the NAMA baseline scenario, there is some degree of renewable energy plants that will be entering the power mix, for example the current plants associated to the bid put out by OUR. It is also expected that other renewable plants are highly likely to enter into operation by the time or shortly after the entry into operation of the first mega generation natural gas plant.

The already established as well as proposed renewable plants (described in the MSTEM recent report on grid analysis for incorporation of variable renewable energy cited above) are included in the baseline scenario; although the timing of entry into operation is decided based on the expert criteria of the NAMA designer reflecting the respective LCOE and the time required for implementation typical of such plants. Annex II presents a table depicting the proposed indicative addition of power plant capacity for each year of the baseline scenario (as well as the NAMA scenario). Potential project sites are included as part of the NAMA scenario later on.

The MSTEM alternative portfolio selected for the variable renewable energy grid analysis with its capacity factor and indicative annual energy generation is presented below.

#	Technology	Site	Status	Selected capacity (MW)	Capacity Factor	Annual Energy (GWh)
1	Wind	Wigton I	existing	20,7	30%	54,4
2	Wind	Wigton II	existing	18	38%	59,1
3	Wind	Munro	existing	37	29%	92,4
4	Wind	Rose Hill	proposed	30	35%	92
5	Wind	Winchester	potential	98,5	40%	345,1
6	Hydro	Rio Bueno A	existing	2,5	60%	13,1
7	Hydro	Rio Bueno B	existing	1,1	60%	5,8
8	Hydro	Maggoty Falls	existing	6,3	60%	33,1
9	Hydro	Upper White River	existing	3,8	60%	19,9
10	Hydro	Lower White River	existing	4	60%	21
11	Hydro	Roaring River	existing	3,8	60%	19,9

#	Technology	Site	Status	Selected capacity (MW)	Capacity Factor	Annual Energy (GWh)
12	Hydro	Constant Spring	existing	0,8	60%	4,2
13	Hydro	Ram's Horn	existing	0,6	60%	3,1
14	Hydro	Great River	proposed	8	60%	42
15	Hydro	Laughlands	proposed	2	60%	10,5
16	Hydro	Back Rio Grande	proposed	10	60%	52,5
17	Hydro	Martha Brae	potential	12,9	33%	37,3
18	Hydro	Rio Cobre	potential	1	60%	5,2
19	Hydro	Negro River	potential	1	60%	5,2
20	Hydro	Yallahs River	potential	2,6	60%	13,6
21	Hydro	Wild Cane River	potential	2,5	60%	13,1
22	Hydro	Morgan's River	potential	2,3	60%	12,1
23	Hydro	Spanish River	potential	2,5	60%	13,1
24	Solar	Paradise 1	potential	49,5	22%	93,2
25	Solar	Paradise 2	potential	30	22%	56,5
26	Solar	Old Harbour	potential	30	21%	55,7
27	Solar	Kelly's Pen A	potential	20	22%	38,4
28	Solar	Micham	potential	25	21%	46,2
29	Solar	Parnassus	potential	43	21%	80,2
30	Co-gen.	Appleton	potential	20,5	61%	109,5
31	Co-gen.	Monymusk	potential	15	52%	68,3
32	Co-gen.	Frome	potential	27,5	53%	127,7
33	Waste	Riverton (Kingston)	potential	45	77%	301,6
34	Waste	Retirement	potential	20	77%	134
			Total	597,4		2079

The majority of bulk emissions reductions in the period are associated to the introduction of the diversification into LNG and this is part of the baseline scenario.

Therefore it is considered that the renewable capacity first and a set of NG plants will enter into operation, some of which are to displace existing thermal fuel oil capacity, with renewable displacing less efficient thermal plants.

The estimation process starts by using the simulated value of electricity to be generated by the fossil fuel plants (both oil and natural gas) and multiplying by an emission factor that is estimated based on a proposed operational mix of such plants using the normal approaches used within greenhouse inventory development and CDM methodologies. An Excel spreadsheet has been developed showing the methodological approach used for the estimations included.

The approach for emission factor estimation is based on:

$$EF_{conv\ ,y} = \frac{\sum_k EG_{k,y} \times EF_{EL,k,y}}{\sum_k EG_{k,y}}$$

Where EGk, y is the energy generated by each source operating with each fossil fuel KY EFEL, k, obtained from:

$$EF_{EL,k,y} = \frac{3{,}6\ EF_{CO\,2,i}}{\eta}$$

Where 3,6, is a conversion factor (TJ/GWh),EFCO2,iis CO2 emission factor of fossil fuel type i, (tCO2/GJ) (IPCCC default values)and η = default efficiencies for source, CDM.

The defaults values are:

Default efficiency factors for sources (CDM, EB 35, Annex 12, version 01.1)

	Old (before 2000)	**New (after 2000)**
Oil		
Open cycle	30%	40%
Combined cycle	46%	46%
Natural gas		
Combined cycle	46%	60%

EFCO2,i = CO2 emission factor of fossil fuel type i (tCO2/TJ) IPCC Guidelines 2006

Fuel Type	**tCO2/TJ**
Diesel oil	72,6
Residual fuel oil	75,5
Natural gas	64,2

The results of estimations for the baseline scenario are presented below:

Year	**Electricity supplied by conventional (fuel based) plants to the grid in Baseline, year y (MWh)**	**Average CO_2 emission factor of conventional plants, in Baseline in year y ($t CO_2/MWh$)**	**Baseline scenario emissions ($t CO_2$)**
2014	4.546.825	0,688	3.128.676
2015	4.704.825	0,688	3.237.396
2016	4.916.425	0,513	2.523.292
2017	5.061.425	0,518	2.623.066
2018	5.311.425	0,472	2.508.523
2019	5.586.425	0,466	2.602.228
2020	5.861.425	0,427	2.504.887
2021	6.146.425	0,411	2.529.116
2022	6.436.425	0,389	2.505.889
2023	6.731.425	0,398	2.680.195
2024	7.031.425	0,386	2.716.449
2025	7.336.425	0,388	2.843.091
2026	7.661.425	0,385	2.951.181
2027	7.961.425	0,386	3.074.694
2028	8.311.425	0,386	3.209.281

Year	Electricity supplied by conventional (fuel based) plants to the grid in Baseline, year y (MWh)	Average CO_2 emission factor of conventional plants, in Baseline in year y (t CO_2/MWh)	Baseline scenario emissions (t CO_2)
2029	8.626.425	0,386	3.331.064
2030	8.626.425	0,386	3.330.617

NAMA scenario

The NAMA scenario of introduction of RE is estimated in order to show the stated policy objectives, with a target stated as "percentage of renewable generation in the energy generation mix" (targeting 30% by 2030[43]).

The NAMA Scenario raises the level of incorporation of RE to an order of nearly an additional 760 MW, most of which would likely come from Solar Energy generation technologies from 2020, with the baseline being LNG as a fuel of choice. It is worth noting that emissions levels of 2015 are maintained over the period, therefore achieving the objective of decoupling emissions growth from overall economy/sector growth, which can be a major low carbon development goal within the natural gas implementation path. It is worth suggesting that it can be possible to maintain emissions levels of 2017 by 2030, which clearly represents a transformation for the electricity sector of the country.

The estimation process for the NAMA scenario follows an approach similar to the other one presented before, taking into account the path of entry into operation of the renewable plants.

The results of estimations for the NAMA scenario are presented below:

Year	Electricity supplied by conventional (fuel based) plants to the grid in NAMA, year y (MWh)	Average CO_2 emission factor of conventional plants, in NAMA in year y (t CO_2/MWh)	NAMA scenario emissions (t CO_2)
2014	4.546.825	0,688	3.128.676
2015	4.704.825	0,688	3.237.396
2016	4.916.425	0,513	2.523.292
2017	5.061.425	0,518	2.623.066
2018	5.263.725	0,470	2.475.701
2019	5.154.825	0,447	2.305.243
2020	5.307.225	0,385	2.044.343
2021	5.523.925	0,385	2.127.816
2022	5.536.525	0,385	2.132.669
2023	5.474.225	0,385	2.108.671
2024	5.513.825	0,385	2.123.925
2025	5.726.374	0,385	2.205.799
2026	5.957.910	0,385	2.294.987
2027	6.145.752	0,385	2.367.344

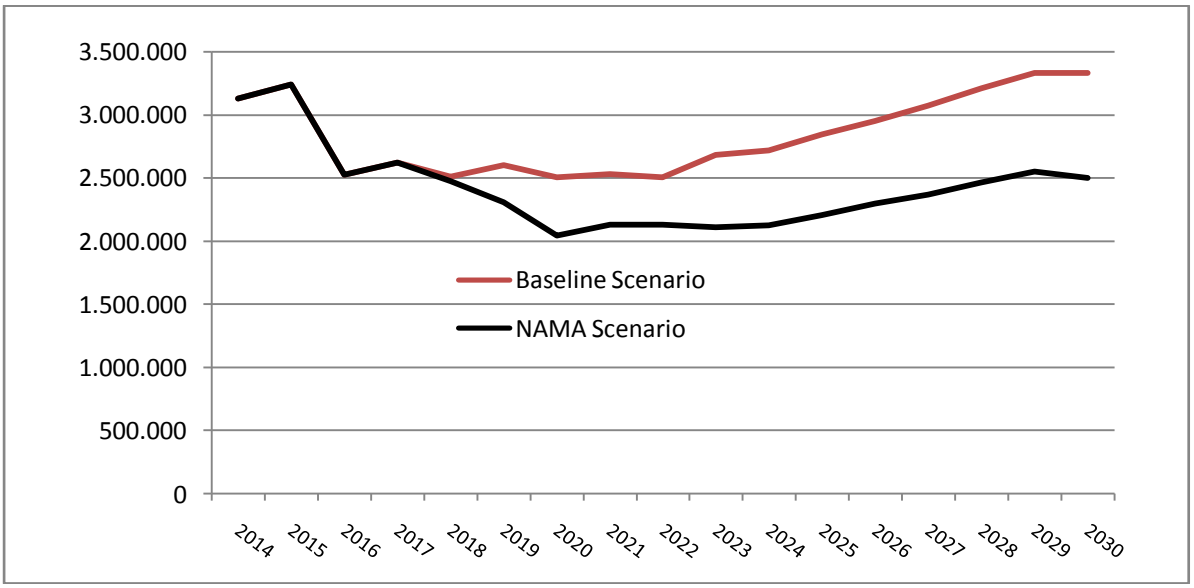
[43]Government of Jamaica, MSTEM.Grid Impact Analysis and Assessment for Increased Penetration of Renewable Energy into the Jamaican Electricity Grid.2013.

2028	6.402.287	0,385	2.466.161
2029	6.623.822	0,385	2.551.496
2030	6.492.971	0,385	2.501.093

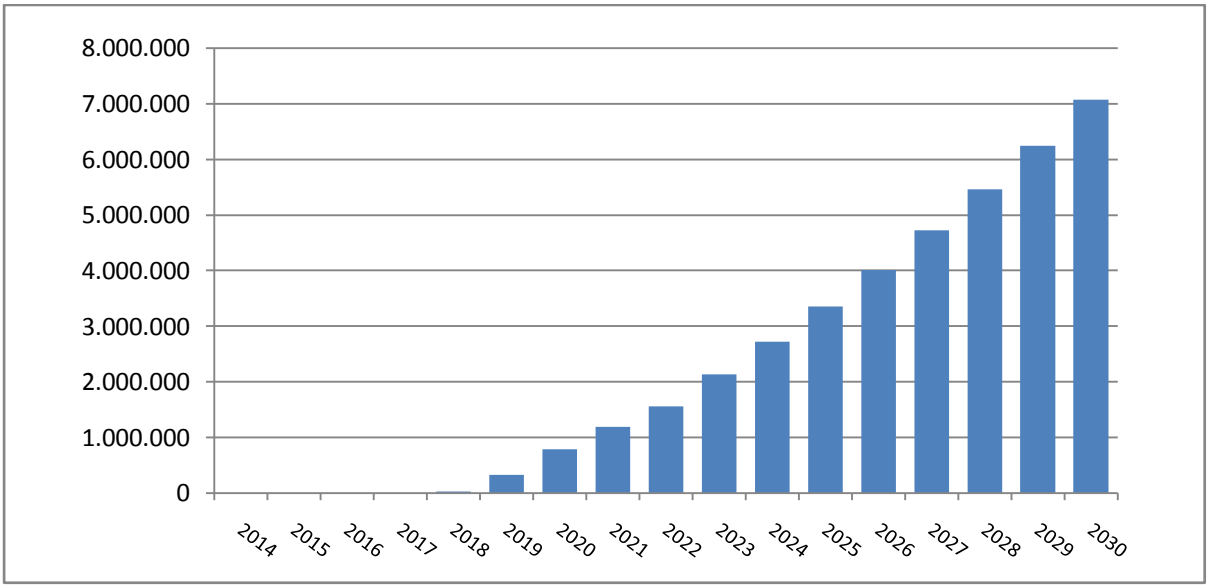
The Baseline scenario, NAMA scenario and reduction emissions (yearly and accumulated) resulting from the estimation are shown in the following table and figures.

Year	Baseline Scenario	NAMA Scenario	Reduction Emission	Accumulated Reduction Emission
	ton CO_2e/year	ton CO_2e/year	ton CO_2e/year	ton CO_2e/year
2014	3.128.676	3.128.676	0	0
2015	3.237.396	3.237.396	0	0
2016	2.523.292	2.523.292	0	0
2017	2.623.066	2.623.066	0	0
2018	2.508.523	2.475.701	32.822	32.822
2019	2.602.228	2.305.243	296.985	329.807
2020	2.504.887	2.044.343	460.544	790.351
2021	2.529.116	2.127.816	401.300	1.191.651
2022	2.505.889	2.132.669	373.219	1.564.870
2023	2.680.195	2.108.671	571.524	2.136.394
2024	2.716.449	2.123.925	592.524	2.728.917
2025	2.843.091	2.205.799	637.292	3.366.209
2026	2.951.181	2.294.987	656.194	4.022.403
2027	3.074.694	2.367.344	707.350	4.729.753
2028	3.209.281	2.466.161	743.120	5.472.873
2029	3.331.064	2.551.496	779.567	6.252.440
2030	3.330.617	2.501.093	829.524	7.081.965

The expected pattern of baseline scenario and NAMA scenario emissions is depicted below.



The yearly accumulated reductions from the NAMA implementation are shown below, indicating a total accumulated emissions reductions in the order of 7 million tonnes of CO2.



5.5 Description of the transformational impact of NAMA, including its sustainability

(1 page)*For each solution (=measure) identified in 4.2, describe what will be the expected impacts (long term) of implementing the measure. Further, describe how the planned measures will have a long-term impact on the way different stakeholder make choices. For example, how will the implementation of NAMA change the private sector's choice of options, and how will it influence policy- and strategy-making for sustainable development.*

Explain how the measures suggested in the NAMA will be sustained beyond the implementation of the NAMA. For example, if funding is requested for a standard setting and testing lab, how will the activities of this lab continue beyond the NAMA implementation?

The Jamaica Renewable Energy NAMA contributes to transformational change in Jamaica through its rooting in bringing the country on a low-carbon development trajectory with (climate) benefits. At the international level, the NAMA is also rooted in the Jamaica Vision 2030 related to contributing effectively in the effort to reduce the global rate of climate change. The NAMA becomes an enabler of significant evolution in terms of scope (e.g. scaling-up the use of renewable energy), favouring a faster change or a significant shift from one state to another (attaining a deviation from business as usual practices). In alignment with international observations on transformational impacts[44] of NAMAs, the Jamaica case implies development of catalytic effects and leverage as well as coordination to ensure the sustainability of the impacts, local ownership and political will, the use of innovative technologies or approaches, etc.

[44] http://nama-facility.org/fileadmin/user_upload/pdf/NAMA_Facility_General_Information_Document_April2014.pdf

Transformational Aspect of the NAMA	Comment
Is the NAMA an element of a broader programme or policy framework, which contributes to achieve a sectoral or national emission reduction target or implement a low emission development strategy?	The NAMA is an element of a broader program represented by the Jamaica Vision 2030 which in two specific national outcomes (#10 for energy security and efficiency and #14 for hazards risk reduction and adaptation) include specific actions and targets related to sectoral objectives as well as emission reduction targets.
Would the achievement of the emission reduction target or implementation of the low emission development strategies imply transformational change?	Taking into account the existing practices in the energy sector, achieving the emissions reductions proposed in the NAMA is directly related to a transformational change in different strategic areas related to development of alliances and partnerships for effective regulation, development of innovative mechanisms for financing, capacity building within organizations and maintenance of a long term vision for a energy sector with improved resilience.
Does the NAMA fit into a broader context of mitigation activities in the respective sector?	As stated within the Jamaica Second National Communication to the UNFCCC, the emissions contribution of the energy sector and the electric generation are of the most single importance to address within mitigation efforts in the country.
Does the NAMA contribute to changing the prevailing structures of the sector?	Certainly, in many respects the NAMA provides assistance in transforming prevailing structures associated to the regulatory path, development of partnerships for project action, financing structures and vehicles for sound investment in new emerging technologies, etc.
Does the NAMA help to over-come systemic barriers to the reduction of emissions?	Through the specific components the NAMA is responsive to perceived critical barriers for renewable energy scaling up in the country, the barriers to attaining emissions reductions from renewable energy are correlated to the systemic barriers for renewable energy development.
Does the NAMA develop capacities to reduce future GHG emissions beyond the scope of the project?	The NAMA is instrumental in spearheading the development of an MRV system that needs to be aligned with what is established in the country´s vision and provides for an initial test ground for the approaches, scaling and replicability within other sectors related to climate change mitigation.
Is the NAMA replicable with respect to its applicability in other regions, countries and internationally?	Being Jamaica a Small Island State located in the Caribbean, the NAMA can be replicable within the Caribbean context in many respects related to application of measures, coordination of similar types

Transformational Aspect of the NAMA	Comment
	of stakeholders and implementation of larger targets (i.e. the ones suggested by CARICOM) across technologies and territories. As such, the NAMA could be the initial step in the design consideration for regional mitigation activities in the Caribbean, mobilizing different levels of stakeholders and coalitions.
Does the NAMA serve to strengthen national systems?	One particular area of national strengthening relates to increase capacities for monitoring performance of programs and partnerships, for example it is expected that as result of the NAMA, the NEAP process in Jamaica can significantly improve in the short term.
Does the NAMA use an innovative approach for the reduction of emissions, which can have impacts beyond itself (e.g. technology transfer; general support approach)?	Critical innovative approaches of the NAMA involve the development of alliances and partnerships, both public to public and public to private, as well as targeted development of critical financial vehicles to catalyze investment in specific Re technologies; therefore the spill over effects can be commanding in creating new spaces to tackle other important areas of investment, technology development and also climate mitigation.
Does the NAMA Support foresee the participation and/or development of the private sector?	The NAMA intends to create enabling spaces required for private sector development and as cornerstone of sustainability the NAMA focuses in assisting the development of a strong private sector engagement, development of renewable energy value added chains and a representative sector responding to the needs of renewable energy project development.

6. Measuring, Reporting and Verification

6.1 Description of key parameters to assess progress of implementation of the NAMA

(1 page) *List and define the parameters/indicators that will be used to measure the progress of the NAMA implementation. Indicators should be identified for each of the outputs of the NAMA.*

For each of them, specify whether it is a qualitative or quantitative parameter. In the case of qualitative parameters, define the qualitative scale that will be used. In the case of quantitative parameters define the units.

6.2 Description of key parameters to assess the national sustainable development benefits and GHG emission impacts

There are 2 distinctive directions for the MRV of the NAMA: MRV of the GHG benefits and MRV of the proposed sustainable development benefits.

6.2.1 *List and define the parameters/indicators that will be used to measure the national sustainable development benefits of the NAMA implementation.*

For each of them, define whether it is a qualitative or a quantitative parameter. In the case of qualitative parameters, define the qualitative scale that will be used. In the case of quantitative parameters, define the units.

The NAMA Sustainable Development Benefits are associated to the economic, social and local environmental contributions. A first assessment of the types of criteria that could be used is presented below, depicting whether or not within the NAMA MRV, the criteria is to be monitored or not.

Sustainable Development Criteria	Possible Indicator	Monitoring within the NAMA
Economic Benefits		
Increased job creation due to enhance renewable energy sector and project development activities	Estimated number of job posts associated to implementation of value chains in the renewable energy sector	Monitored
Increase degree of attractiveness for renewable energy project development	Renewable energy installed capacity Growth rate of renewable energy installed capacity Structure of value chains in the renewable energy sector (possibly by type of technology) indicating developments in service sectors	Monitored
Increased mobilization of private investment	Amount of local private investment in terms of associated project activities Number of projects participating in national procurement processes for renewable energy Number of local developers participating within national procurement processes	Monitored

Sustainable Development Criteria	Possible Indicator	Monitoring within the NAMA
Increased development of new financial facilities and instruments for renewable energy project development	Number of financial facilities implemented (loans, grants, grants programs, risk management facilities, etc.)	Monitored
Social Benefits		
People with new skills acquired in technical and financial areas related to RE	Number of training programs and people (disaggregated by gender) implemented both in higher education as well as technician level Number of training programs and people (disaggregated by gender) trained in financing for renewable energy projects	Monitored
New or improved institutional coordination for the objective	Number of public-public and public-private partnerships developed Number of policies, regulatory instruments and incentives proposed Number of policies, regulatory instruments and incentives adopted Number of policies, regulatory instruments and incentives effectively implemented	Monitored
Environmental		
Local pollution reduction	Aerial pollutants	Not monitored

6.2.2 *List and define the parameters/indicators that will be used to measure the GHG emissions impacts of the NAMA implementation.*

For each of them, specify whether it is a qualitative or a quantitative parameter. In the case of qualitative parameters, define the qualitative scale that will be used. In the case of quantitative parameters, define the units.

Taking into account that the GHG emission impacts will be due to the implementation of specific RE projects, the most conservative reliable approach will be the use of parameters used in the monitoring of CDM renewable energy projects.

The typical project involved in the NAMA involves the construction and operation of power plants that use renewable energy sources and supply electricity to the grid (Greenfield projects). The retrofit, capacity additions of existing renewable energy plants could also be present in this context.

The parameters to be used for monitoring are:

1. Participation of renewable energy in the generation mix of Jamaica in %,
2. Electricity supplied to the grid for each renewable energy projects part of the NAMA in MWh, and
3. Emissions reductions in tones of CO2.

6.3 Measuring and Reporting Plan

(2 pages)

For each of the parameters defined above:

- *Give the baseline value*
- *Explain how the parameters will be measured*
- *Explain who will perform the measurement*
- *Explain how many times the parameters will be measured*
- *Describe the system for storing the data*

Describe how the values of the different parameters will be collected together and who are the stakeholders involved in this process. Explain who will be in charge of writing the report on/compiling the parameters measured.

Use the following table to summarize the information

The following table includes information on the different target values, and data collection/Reporting involved in the Jamaica Renewable Energy NAMA MRV.

		Target Values			**Data Collection and Reporting**		
	Baseline	**YR5 (2020)**	**YR10 (2025)**	**YR14 (2030)**	**Frequency and Reports**	**Data Collection Instruments**	**Responsibility for Data Collection / Reporting**
Impacts indicators							
GHG Reductions							
Participation of renewable energy in the generation mix of Jamaica in %	8.1%	18.4%	28.2%	30%	Yearly frequency, reported annually for performance, for 2015 and 2030 for the Jamaica Vision reporting; and bi annually for National	Reports from grid system operator	MSTEM

					Contributions reported under BURs within the UNFCCC		
Electricity supplied to the grid by renewable energy projects part of the NAMA in MWh	400,000	6,500,000	2,240,000	2,270,000	Yearly, only reported for the NEAP	Reports from grid system operator	MSTEM
Emissions Reductions in tones CO2	0	460,000	637,292	829,524	Yearly frequency, reported annually for performance and bi annual for National Contributions reported under BURs	Reports from grid system operator and protocols for methodological estimation based on conservative practice	MSTEM and MWLECC
Sustainable Development Benefits	To be determined as the NAMA readies it design and conceptualization	To be determined	To be determined	To be determined	Yearly, reported annually for the NAMA performance and assessment of transformational aspects	Collection instruments include consultations with relevant stakeholders, protocols and methodologies like those available in ClimateScope, as well as other instruments as developed in country at the NAMA level and with support from Jamaica Vision MRV processes	MSTEM and MWLECC The responsibility for data collection includes the appropriate coordination with the MRV component of Jamaica Vision 2030 as well as the development of an strategic alliance with ClimateScope in order to strengthen the coherence of MRV approaches and information management and processing
Progress indicators							

6.4 Description of verification process

(1 page)

Describe who will be in charge of the verification process and how the information will be exchanged between the stakeholder in charge of writing the report and the stakeholder in charge of the verification.

The NAMA is to be verified locally in-country, through the reporting done by MSTEM and MWLECC. The verification of the NAMA is proposed to be under the coordination from the Planning institute of Jamaica (PIJ), the Statistical Institute of Jamaica (STATIN) and the Jamaica National Agency for Accreditation (JANAAC).

7. Non-financial support required

7.1 Description of the technical and the capacity-building needs

(1 page)

Describe in detail any international support needed on technical and/or capacity-building issues. This section should provide information on the nature of technical assistance activity and scope of capacity development, as well as the technical expertise required to support the activities. The financial requirement for these should be included in the financial section. Please also provide a paragraph on how this enables capacity development in country to sustain the change beyond NAMA implementation. This would be connected to the barriers identified in earlier sections.

According to a recently published report by Climate Scope 2014[45], Jamaica places 39th among the 55 nations surveyed for Climatescope 2014, and within the 26 Latin American and Caribbean nations it ranked 18th. Assessing technical and capacity building needs is normally associated to the level of development of the institutions charter with the policy and regulatory aspects that define the vision and its implementation. It also should assess the state of development of value chains associated to different renewable energy technologies in relation to service providers (ancillary products & services, developers & utilities, marketing services, financial &legal services), sector value chains (presence of specific segments normally needed in order to develop projects in different renewable energy technologies) and status of presence of financial institutions (banks, special purpose funds, corporate finance and private equity/venture capital).

Jamaica has a sound vision incorporating longer term policies and targets both for participation of renewable energies as well as GHG mitigation contributions in order to move into a sustainable development path. It has a set of institutions that aim at responding effectively to the task ahead of diversification, tariff reduction in the energy sector. Nevertheless the country, as it readies to move into a low carbon development path needs to strengthen several key aspects related to institutional coordination, focus on long term vision goals and development of frameworks that could enable the desired implementation of the renewable energy sources of the country.

In the area of value chains, the country needs to strengthen a varied portfolio of components in the areas of increasing capacities at the service provider level, composition and capabilities within different Re technologies, and increase presence of financial facilities and stakeholders.

Most of the capacity building needed in this aspect of institutions and regulations is centred at the development of increased coordination, command and control structures for effective regulations and incentives setting, and promotion of partnerships for project development action (public-public and public-private).

This effort requires capacity building and technical support directed at responding at new paradigms which are inclusive of:

a. Legitimacy needed to provide coherent alignment of interests,
b. Reflexive governance within the sector,
c. Agile institutions capable of realigning models, networks and practices,
d. Adaptable infrastructures with transformative capacities to accommodate change,
e. Responsive coordination based on good information and attention capabilities,
f. Flexible strategies that can revert “lock-in” in commitments, and

[45] http://global-climatescope.org/en/country/jamaica/#/details

g. Capacities to manage diverse portfolios mixing varieties of apparently disparate technologies, regulatory approaches and financial choices.

International cooperation is needed in order to address these set of perceived areas of strengthening at the level of institutions and value chains for the NAMA to be effective as it becomes ready to support the country´s vision and implementation.

8. Financial resources

8.1 Full cost of implementing the NAMA

(1 page)

Include detailed information about the total cost of NAMA implementation by each proposed measure and the respective costs for each measure.

In this section include information about specific financing instruments (loans, concession loans, risk insurance, subsidies, and equity) for financing the proposed measures. For example, if activity is to implement EE technology, indicate the loan part, equity by investors, subsidies, etc.

Also include an analysis of the likely risks that may threaten cash flows and delay or hinder the implementation and successful operation of the NAMA.

The full cost of implementation of the required portfolio of renewable energy projects needed in order to satisfy the target of 30 % participation from renewable energy electricity generation is depicted below in the following table. The suggested investment CAPEX is derived from the recent grid analysis report for VRE additions in the Jamaica grid described elsewhere in this document.

	RE Power Capacities (MW)				**CAPEX (US$/KW)**			**Investment (US$ Million)**				
	Short Term	**Medium Term**	**Long Term**	**Total Power Capacities Added**	**Short Term**	**Medium Term**	**Long Term**	**Short Term**	**Medium Term**	**Long Term**	**Total Investment per RE Technology**	**Contributions to Power Installed by RE Technologies**
	Before 2020	**Before 2025**	**Before 2030**		**2020**	**2025**	**2030**	**2020**	**2025**	**2030**		
Hydro Run of River	22,3	2,5	0,0	24,8	3500	3500	3500	78,1	8,8	0,0	$87	5,1%
Wind	98,5	0,0	0,0	98,5	2080	1825	1700	204,9	0,0	0,0	$205	12,1%
Solar PV	0,0	177,5	330,0	507,5	2690	2100	1500	0,0	372,8	495,0	$868	51,4%
Biomass	0,0	63,0	0,0	63,0	3000	3000	3000	0,0	189,0	0,0	$189	11,2%
Waste	0,0	65,0	0,0	65,0	5900	5250	5250	0,0	341,3	0,0	$341	20,2%
Total				758,8							$1.690	100

The total estimated investment on the proposed renewable energy capacity additions is in the order of 1,690 Million US$ for the 758 MW needed from RE sources; accounting for a 70/30 percent relationship for the debt to equity ratio normal in these kinds of projects, the total debt component of the package is nearly a 1,183 Million US$ and the equity component is on the order of approximately 507 million US$.

The **estimated indicative full cost for implementation of the NAMA** is presented below.

NAMA Cost Component	Details	Private Investors (M US$)	ICAs/CC related Agencies (M US$)	MDBs (M US$)	Commercial Banks (M US$)	GoJ (M US$)	Estimated Total NAMA Budget (M US$)
Preparation/Design of the NAMA	Includes actions related to NAMA concept detail development, conduct initial institutional convergence and buy-in, initial readiness activities	-	$0,50	-	-	-	**$0,50**
RE Project Pre-Investment Equity	Includes the estimated project equity leverage for financial arrangements of the NAMA portfolio of RE project	$506,90	-	-	-	-	**$506,90**
Risk/Guarantee Financial Facility for RE projects	Estimated on leverage required for early start up of risk mitigation for RE projects (based on risk managing facilities commonly design for RE scaling up programs across similar contexts)	-	$5,00	$15,00	-	$30,00	**$50,00**
RE Project Debt	Estimated on available benchmarks for CAPEX of RE projects internationally	-	-	$354,83	-$827,94	-	**1.182,78**
Grid Infrastructure Investment to support RE Project Uptake	Reinforcement of grid, estimated from the MSTEM grid analysis for VRE additions to the Jamaica grid, investment at the utility level	$10,35	-	$15,52	-	-	**$25,87**
Studies/consultancies	Grid capacity, dispatch cost, vulnerability cost assessment, land cost, design of financial mechanisms, permit process,	-	$2,00	-	-	-	**$2,00**
Capacity Building for RE Network / Partnership Development	Support to RE Associations, development of public-public and public-private partnerships	-	$1,40	-	-	-	**$1,40**
Regulatory Support for RE Project Action Enhancement	indicative level of the potential incentives (Fiscal),and savings related to improved permitting processes related to RE project development estimated to be 12% of the investor project expected return	-	-	-	-	$13,00	**$13,00**
NAMA Operation Expenses During Implementation	Includes coordination teams, any secretariat, integrators required for the implementation of the NAMA	-	$1,60	-	-	$0,32	**$1,92**
MRV	Includes costs associated and supportive structures for relevant monitoring, reporting and verification	-	$0,75	-	-	$0,30	**$1,05**
Total		**$517,25**	**$11,25**	**$385,36**	**$827,94**	**$43,32**	**$1.785,12**

The total implementation cost for the NAMA is in the order of US$ 1,785 Million with a degree of participation of:

a. 46.38% leveraged through commercial bank lending (local or international),
b. 28.97% through private sector equity placing,
c. 21.58% leveraged through Multilateral Development Banks involvement,
d. 2.42% from GoJ contributions in kind, labour and allocation of incentives, and
e. 0.63% through leverage from International Cooperation Agencies and Climate Financing for NAMA development.

Annex I.

Details of Proposed NAMA Coordinating Entity and NAMA Approving Entity

	NAMA Coordinating Entity	**NAMA Approving Entity**
Name of Institution:	Ministry of Science, Technology, Energy and Mines (MSTEM)	Ministry of Land, Water, Environment and Climate Change (MWLECC)
Contact Person:		Mr. Gerald Lindo Senior Technical Officer Mitigation. Ministry of Water, Land, Environment and Climate Change (MWLECC)
Address:		16A Half Way Tree Road Kingston 5, Jamaica
E-mail:		gerald.lindo@mwlecc.gov.jm Skype: gerry.lindo
Tel:		Office: +1-876-633-7352 Mobile: +1-876-579-8280

Annex

Simulations of Baseline and NAMA Scenario GHG Emissions

Baseline Scenario Simulation

	2014		2015		2016		2017		2018		2019		2020		2021	
EnergySource	Power Capacity in use (MW)	PowerGeneration (GWh/Year)	Power Capacity in use (MW)	PowerGeneration (GWh/Year)	Power Capacity in use (MW)	PowerGeneration (GWh/Year)	Power Capacity in use (MW)	PowerGeneration (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)
Petroleum	688,9	4.546,8	712,9	4.704,8	314,9	2.078,2	336,8	2.223,2	218,2	1.527,1	206,5	1.486,7	113,3	815,7	109,1	785,3
Natural Gas	0,0	0,0	0,0	0,0	360,0	2.838,2	360,0	2.838,2	480,0	3.784,3	520,0	4.099,7	640,0	5.045,8	680,0	5.361,1
Hydro	37,6	197,3	37,6	197,3	37,6	197,3	57,6	302,3	57,6	302,3	57,6	302,3	57,6	302,3	57,6	302,3
Wind	75,7	205,9	105,7	297,9	105,7	297,9	105,7	297,9	105,7	297,9	105,7	297,9	105,7	297,9	105,7	297,9
PV	0,0	0,0	0,0	0,0	20,0	38,4	20,0	38,4	20,0	38,4	20,0	38,4	20,0	38,4	20,0	38,4
Biomass	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Waste	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total renewable	113,3	403,2	143,3	495,2	163,3	533,6	183,3	638,6	183,3	638,6	183,3	638,6	183,3	638,6	183,3	638,6
Total	802,2	4.950,0	856,2	5.200,0	838,2	5.450,0	880,1	5.700,0	881,5	5.950,0	909,8	6.225,0	936,6	6.500,0	972,4	6.785,0
Renewable participation (%)	**14,1%**	**8,1%**	**16,7%**	**9,5%**	**19,5%**	**9,8%**	**20,8%**	**11,2%**	**20,8%**	**10,7%**	**20,1%**	**10,3%**	**19,6%**	**9,8%**	**18,9%**	**9,4%**

	2022		2023		2024		2025		2026		2027		2028	
Energy Source	Power Capacity in use (MW)	Power Generation (GWh/ Year)	Power Capacity in use (MW)	Power Generation (GWh/ Year)	Power Capacity in use (MW)	Power Generation (GWh/ Year)	Power Capacity in use (MW)	Power Generation (GWh/ Year)	Power Capacity in use (MW)	Power Generation (GWh/ Year)	Power Capacity in use (MW)	Power Generation (GWh/ Year)	Power Capacity in use (MW)	Power Generation (GWh/ Year)
Petroleum	17,9	129,2	58,9	424,2	5,4	38,6	11,5	83,1	0,0	0,0	5,4	38,7	5,2	37,5
Natural Gas	800,0	6.307,2	800,0	6.307,2	920,0	6.992,8	920,0	7.253,3	1.040,0	7.661,4	1.080,0	7.922,8	1.200,0	8.273,9
Hydro	57,6	302,3	57,6	302,3	57,6	302,3	57,6	302,3	57,6	302,3	57,6	302,3	57,6	302,3
Wind	105,7	297,9	105,7	297,9	105,7	297,9	105,7	297,9	105,7	297,9	105,7	297,9	105,7	297,9
PV	20,0	38,4	20,0	38,4	20,0	38,4	20,0	38,4	20,0	38,4	20,0	38,4	20,0	38,4
Biomass	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Waste	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total renewable	183,3	638,6	183,3	638,6	183,3	638,6	183,3	638,6	183,3	638,6	183,3	638,6	183,3	638,6
Total	1.001,2	7.075,0	1.042,2	7.370,0	1.108,7	7.670,0	1.114,8	7.975,0	1.223,3	8.300,0	1.268,7	8.600,0	1.388,5	8.950,0
Renewable participation (%)	**18,3%**	**9,0%**	**17,6%**	**8,7%**	**16,5%**	**8,3%**	**16,4%**	**8,0%**	**15,0%**	**7,7%**	**14,4%**	**7,4%**	**13,2%**	**7,1%**

	2029		2030	
Energy Source	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)
Petroleum	5,5	39,7	5,2	37,5
Natural Gas	1.200,0	8.586,7	1.240,0	8.588,9
Hydro	57,6	302,3	57,6	302,3

Wind	105,7	297,9	105,7	297,9
PV	20,0	38,4	20,0	38,4
Biomass	0,0	0,0	0,0	0,0
Waste	0,0	0,0	0,0	0,0
Total renewable	183,3	638,6	183,3	638,6
Total	1.388,8	9.265,0	1.428,5	9.265,0
Renewable participation (%)	**13,2%**	**6,9%**	**12,8%**	**6,9%**

NAMA Scenario Simulation

Energy Source	2014		2015		2016		2017		2018		2019		2020		2021	
	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)
Petroleum	688,9	4.546,8	712,9	4.704,8	314,9	2.078,2	336,8	2.223,2	211,3	1.479,4	146,5	1.055,1	0,0	0,0	0,0	0,0
Natural Gas	0,0	0,0	0,0	0,0	360,0	2.838,2	360,0	2.838,2	480,0	3.784,3	520,0	4.099,7	640,0	5.307,2	680,0	5.523,9
Hydro	37,6	197,3	37,6	197,3	37,6	197,3	57,6	302,3	72,5	350,0	79,9	388,8	82,4	401,9	82,4	401,9
Wind	75,7	205,9	105,7	297,9	105,7	297,9	105,7	297,9	105,7	297,9	204,2	643,0	204,2	643,0	204,2	643,0
PV	0,0	0,0	0,0	0,0	20,0	38,4	20,0	38,4	20,0	38,4	20,0	38,4	20,0	38,4	20,0	38,4
Biomass	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	20,5	109,5	35,5	177,8
Waste	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total renewable	113,3	403,2	143,3	495,2	163,3	533,6	183,3	638,6	198,2	686,3	304,1	1.070,2	327,1	1.192,8	342,1	1.261,1
Total	802,2	4.950,0	856,2	5.200,0	838,2	5.450,0	880,1	5.700,0	889,5	5.950,0	970,6	6.225,0	967,1	6.500,0	1.022,1	6.785,0
Renewable participation (%)	**14,1%**	**8,1%**	**16,7%**	**9,5%**	**19,5%**	**9,8%**	**20,8%**	**11,2%**	**22,3%**	**11,5%**	**31,3%**	**17,2%**	**33,8%**	**18,4%**	**33,5%**	**18,6%**

Energy Source	2022		2023		2024		2025		2026		2027		2028	
	Power Capacity in use (MW)	Power Generation (GWh/ Year)	Power Capacity in use (MW)	Power Generation (GWh/ Year)	Power Capacity in use (MW)	Power Generation (GWh/ Year)	Power Capacity in use (MW)	Power Generation (GWh/ Year)	Power Capacity in use (MW)	Power Generation (GWh/ Year)	Power Capacity in use (MW)	Power Generation (GWh/ Year)	Power Capacity in use (MW)	Power Generation (GWh/ Year)
Petroleum	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Natural Gas	800,0	5.536,5	800,0	5.474,2	920,0	5.513,8	920,0	5.726,4	1.040,0	5.957,9	1.080,0	6.145,8	1.200,0	6.402,3
Hydro	82,4	401,9	82,4	401,9	82,4	401,9	82,4	401,9	82,4	401,9	82,4	401,9	82,4	401,9
Wind	204,2	643,0	204,2	643,0	204,2	643,0	204,2	643,0	204,2	643,0	204,2	643,0	204,2	643,0
PV	99,5	188,1	129,5	243,8	197,5	370,2	247,5	462,7	297,5	556,1	357,5	668,3	407,5	761,7
Biomass	63,0	305,5	63,0	305,5	63,0	305,5	63,0	305,5	63,0	305,5	63,0	305,5	63,0	305,5
Waste	0,0	0,0	45,0	301,6	65,0	435,6	65,0	435,6	65,0	435,6	65,0	435,6	65,0	435,6
Total renewable	449,1	1.538,5	524,1	1.895,8	612,1	2.156,2	662,1	2.248,6	712,1	2.342,1	772,1	2.454,2	822,1	2.547,7
Total	1.249,1	7.075,0	1.324,1	7.370,0	1.532,1	7.670,0	1.582,1	7.975,0	1.752,1	8.300,0	1.852,1	8.600,0	2.022,1	8.950,0
Renewable participation (%)	**36,0%**	**21,7%**	**39,6%**	**25,7%**	**40,0%**	**28,1%**	**41,8%**	**28,2%**	**40,6%**	**28,2%**	**41,7%**	**28,5%**	**40,7%**	**28,5%**

Energy Source	2029		2030	
	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)
Petroleum	0,0	0,0	0,0	0,0
Natural Gas	1.200,0	6.623,8	1.240,0	6.493,0
Hydro	82,4	401,9	82,4	401,9
Wind	204,2	643,0	204,2	643,0
PV	457,5	855,2	527,5	986,1
Biomass	63,0	305,5	63,0	305,5
Waste	65,0	435,6	65,0	435,6
Total renewable	872,1	2.641,2	942,1	2.772,0
Total	2.072,1	9.265,0	2.182,1	9.265,0
Renewable participation (%)	**42,1%**	**28,5%**	**43,2%**	**29,9%**