Document of the Inter-American Development Bank

**Regional**

**Sustainable Energy Facility (SEF) for the Eastern Caribbean Expanded (SEF Expanded)**

**(RG-L1112)**

**And**

**Green Climate Fund (GCF) Grant for the Sustainable Energy Facility for the Eastern Caribbean Expanded (SEF Expanded)**

**(RG-G1013)**

**And**

**Republic of Italy (REI) Grant for the Sustainable Energy facility for the Eastern Caribbean Expanded (SEF Expanded)**

**(RG-T3170)**

**Monitoring and Evaluation Plan (M&E Plan)**

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Abbreviations

CBA Cost Benefit Analysis

CDB Caribbean Development bank

CTF Clean Technology Fund

EA Executing Agency

EC Eastern Caribbean

ECC Eastern Caribbean Countries

EE Energy Efficiency

GE Geothermal Energy

IDB Inter-American Development Bank

JICA Japanese International Cooperation Agency

MW MegaWatt

MWh MegaWatt hour

PCR Project Completion Report

PBL Policy-Based Loan

POD Proposal for Operation Development

RE Renewable Energy

SEF Sustainable Energy Facility

# Introduction

This document presents the Monitoring and Evaluation (M&E) Plan for the Sustainable Energy Facility for the Eastern Caribbean Expanded (‘the SEF-Expanded’). The SEF‑Expanded is a complement to the Sustainable Energy Facility for the Eastern Caribbean (SEF-2015) approved by the Inter‑American Development Bank (IDB) in October 2015. Together the SEF‑Expanded and the SEF-2015 comprise the SEF Program.

The objective of the SEF Program is to radically change the energy matrix of the six Eastern Caribbean Countries (ECC), namely Antigua and Barbuda (A&B), Dominica (DOM), Grenada (GRE), Saint Kitts and Nevis (SKN), Saint Lucia (SL), and Saint Vincent and the Grenadines (SVG) by reducing their dependency on fossil fuels for power generation and the cost of electricity.

The SEF Program places emphasis on developing Geothermal Energy (GE), a RE source for which five ECC have potential (all except A&B) and which has the largest potential for displacing fossil fuels in the region. The SEF-Expanded differs from the SEF-2015 in that its exclusive focus is on GE.

The objective of the SEF-Expanded is to reduce the financial, technical and institutional barriers which GE development encounters in the five (ECC) with GE potential (all ECC except for A&B), and to provide institutional strengthening and capacity building to the governments of these ECC and to the CDB for GE development.

The purpose of this document is to establish the framework, processes, and institutional arrangements that will be used to monitor and evaluate the SEF-Expanded. However, the SEF-Expanded will be monitored together with the SEF-2015 as they comprise one program, the SEF Program.

The SEF-Expanded includes the following components:

**Component 1 – GE project development (US$80.45 million):** will support GE projects as they advance through successive stages of development all the way to plant construction by offering funding under:

**Sub-component 1.1 – Prefeasibility (US$4.45 million).** Financedby US$4.45 million from the non-reimbursable technical cooperation provided by REI (RG-T3170) for the purposes of carrying out pre-feasibility studies required to identify promising exploratory drilling sites.

**Sub-component 1.2 –Exploration Drilling** **(US$16 million).** Financedby US$16 million grant resources provided by GCF (RG-G1013) to be used as risk mitigation for exploratory drilling.

**Sub-component 1.3 – Field and plant development (US$60 million).** Financed by loan resources from GCF (RG-L1112) to provide concessional loans for the drilling of production and reinjection wells, engineering and construction of steam gathering systems and power plants, as well as for the construction of power substations and transmission lines.

**Component 2: Technical Assistance: Regulatory framework, institutional strengthening and capacity building (US$5.16 million).** Financed by a US$4 million grant from GCF (RG-G1013) to provide non-reimbursable technical assistance to the CDB and to the five ECC. Additional funds from REI (RG-T3170) in the amount of US$1.16 million will be used to provide technical assistance to the five ECC. Technical assistance to the CDB includes the following activities: (a) developing staff capacity to evaluate and execute sub-loans; (b) consulting services to provide specific skills and advisory services as and when required for sub-project preparation; (c) drafting of legal documents (i.e. loan contracts for GE sub-loans). Technical assistance to the ECC governments will support ECC ministries responsible for energy and electric utilities to develop an effective legal, policy and regulatory framework for the implementation of GE projects, as well as to make progress in negotiations with private sector actors to develop GE. To this end, resourcesfromGCF or REI will support the following activities: (i) transaction advisory support to structure projects and negotiate with private partners; (ii) training to acquire the necessary skills to enable GE development and project execution; and (iii) capacity building to strengthen governments technical, institutional, environmental and regulatory capacity.

As reference, the SEF-2015 consists of the following components:

* 1. **Component 1: Energy Efficiency (EE)** – Resources from this component will be used for the financing of sub-loans and grants to ECC governments to promote EE measures such as: (i) retrofitting government buildings; (ii) installing new or replacing existing streetlights with more efficient ones; and (iii) increasing power generation efficiency, including transmission and distribution loss reduction programs.
  2. **Component 2: Regulatory framework, institutional strengthening and capacity building –** Resources from this component will be used for the financing of non-reimbursable technical assistance to the CDB, and to the ECC governments[[1]](#footnote-2), including their ministries responsible for energy and electric utilities. Support to the CDB will focus on strengthening its capacity as required to implement the program including: (i) consulting services to provide specific skills and advisory services when required for sub-project preparation; (ii) drafting of legal documents (i.e. loan contracts for GE sub-loans); and (iii) further developing staff capacity to evaluate and execute sub-loans. Support to the ECC governments will include: (i) supporting an effective legal, policy and regulatory framework[[2]](#footnote-3) for the implementation of SE projects; (ii) strengthening their technical, institutional, environmental and regulatory capacity; (iii) transaction advisory support to structure projects and negotiate with private partners; and (iv) providing opportunities for training to acquire the necessary skills to enable EE and RE development and project execution.
  3. **Component 3: Renewable Energy (RE)** – Resources from this component will be provided to both ECC governments and PPP under the following sub‑components: Subcomponent 1: Intermittent RE: includes the financing of projects such as wind power and solar PV; and Subcomponent 2: includes the financing of projects such as GE, hydro and waste to energy projects. Since the risk levels involved in GE projects are inherent to each of the development stages, the program will offer financial instruments tailored for each stage to enable projects to advance to subsequent stages through to plant construction. Funds for GE projects will be made available through a facility proposed by the CDB, called the GeoSmart Facility to address the specific challenges that GE development faces given its risk profile. Under this sub-component, the GeoSmart Facility will provide a range of financial support to public sector actors and/or PPP, customized for each stage of geothermal development to support development of GE projects in each of the ECC with geothermal potential. The activities to be financed are: (i) pre‑investment activities, for which a mix of grants and/or loans are best suited to unlock investments, including: (a) surface studies (geology, geophysics and geochemistry- 3Gs) and ESIA, and studies on the feasibility of power interconnections between neighboring islands; and (b) drilling of early exploration wells (slim holes); (ii) exploration activities, for which risk mitigation instruments such as contingent recovery grants are essential, including: (a) exploration drilling program (full size wells); and (b) feasibility studies for targeted reservoirs, and the ESIA for this phase; and (iii) field and power plant development activities for which loans will be provided for: (a) production drilling (production and reinjection wells); (b) engineering and construction of power plants; and (c) access roads, substations and transmission lines. As shown in Table 3, RE opportunities identified during program preparation would require investments of approximately US$703 million of which US$526 million are required for GE.

For the purpose of consolidating results in SEF Program execution, the following table shows how each program’s components and sub-components are related to the other.

|  |  |  |
| --- | --- | --- |
| **SEF-Expanded Components and sub-components** | | **SEF-2015 Components/Sub-components** |
| Component 1 – GE project development (US$80.45 million) | Sub-component 1.1 – Prefeasibility (US$4.45 million). | Component 3. Renewable Energy |
| Sub-component 1.2 –Exploration Drilling (US$16 million). |
| Sub-component 1.3 – Field and plant development (US$60 million). |
| Component 2: Technical Assistance: Regulatory framework, institutional strengthening, capacity building, and studies (US$5.1075 million) | | Component 2: Regulatory framework, institutional strengthening and capacity building |

This Monitoring and Evaluation (M&E) Plan is organized in two main sections:

* the **Monitoring Plan** (Section 2)—presents the indicators used to monitor the Program’s outputs, assigns the responsibility for collecting data, defines the instruments used to monitor the Program, and establishes the work plan and budget for monitoring the Program
* the **Evaluation Plan** (Section 3)—presents the main questions the Evaluation Plan addresses, mentions the studies that the Evaluation Plan builds upon, identifies the indicators used to evaluate the Program, and describes the methodology and instruments used to evaluate the results of the Program.

# Monitoring

The Program will be monitored by tracking a set of indicators that measure performance. The monitoring plan defines these indicators and establishes the process and institutional arrangements to monitor these indicators. Specifically, the monitoring plan describes the instruments used to track these indicators, defines the tasks, assigns responsibilities, and defines budget necessary for preparing these instruments.

## Output Indicators

Table 2.1 presents the indicators that will be used to measure whether the SEF-Expanded Program’s outputs are fulfilled. The Program’s outputs are not fixed in advance due to the on-demand nature of the SEF program and the fact that this is a Global Credit Loan (a financial intermediary) operation.

As such, the indicators are designed to be flexible enough to allow for this variability in quantity of outputs and focus more on the activities financed with program resources and executed by the CDB (the CDB will be the Executing Agency (‘EA) of the Program and therefore the main party responsible for providing inputs to monitor the Program).

Table 2.1: Output Indicators

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Indicator** | **Description** | **Method of calculating indicator** | **Frequency of Measurement** | **Source of Verification** |
| **Component 1: GE project Development** | | | | |
| Grants provided to geothermal projects with resources from the program for doing pre-feasibility studies. | Measures the number of grants that were provided by CDB using grant resources for doing pre-feasibility studies | \*\*\* | Semi-annually and at completion of the execution period | SAPR and Concept Note for each individual grant approved by CDB |
| CRG provided to geothermal projects to complete exploratory drilling activities. | Measures the number of exploratory drilling projects that were financed by CDB using contingent recovery grants | \*\*\* | Semi-annually and at completion of the execution period | Reports from CDB |
| Loans provided to geothermal projects at any stage of development with resources from the program. | Measures the number of concessional loans provided by CDB to GE projects for field development and plant construction | \*\*\* | Semi-annually and at completion of the execution period | Reports from CDB |
| Loans provided to finance transmission and distribution lines required for bringing GE to market. | Measures the number of concessional loans provided by CDB to ECC for transmission and distribution projects | \*\*\* | Semi-annually and at completion of the execution period | Reports from CDB |
| **Component 2: Technical Assistance: Regulatory framework, institutional strengthening, and capacity building** | | | | |
|  |  |  |  |  |
| Technical assistance grants provided to governments in ECC with resources from the program | Measures the number of technical assistance grants provided to governments in ECC with resources from the program | \*\*\* | Semi-annually and at completion of the execution period | Program report from CDB with information from the projects, the utilities, and the Governments in the EC countries |
| Specialized advisory services  contracts awarded to strengthen CDB’s capacity to  implement the program | Measures the number of specialized advisory services contracts awarded to strengthen CDB’s capacity to implement the program | Add the number of individual contracts awarded by the CDB with specialized advisory services companies | Semi-annually and at completion of the execution period | Reports from CDB and copy of the terms of reference of the contracts awarded |

\*\*\* The output indicators for Component 1 measure the number of individual operations (sub-grants and sub-loans) that the CDB approved and that use resources from the Program. Each indicator refers to the different options the program offers in terms of financial instruments available to fund GE development and their possible use: (i) grants for doing pre-feasibility studies; (ii) contingent recovery grants for exploratory drilling projects; (iii) concessional loans for field development and plant construction; and (iv) concessional loans provided by CDB to ECC for transmission and distribution projects. Each indicator refers to the different options the program offers in terms of financial instruments available to fund GE development and their possible use: (i) grants for doing pre-feasibility studies; (ii) contingent recovery grants for exploratory drilling projects; (iii) concessional loans for field development and plant construction; and (iv) concessional loans provided by CDB to ECC for transmission and distribution projects.

One of the output indicators for Component 2 (Number of technical assistance grants provided to ECC governments) follows the same logic; it measures the number of grants to provide technical assistance to governments in ECC that the CDB approved using resources from the Program.

The method for calculating these output indicators is to add the number of individual operations approved by CDB using Program Resources and for which the CDB will provide the Bank with (in accordance with the Program OM):

* A Non-objection request prior to consideration by its Board of Directors
* Copy of the signed sub-grant or sub-loan agreement after approval by CDB’s Board of Directors

Table 2.2 presents the planned annual disbursements from the SEF Expanded for each of the outputs. The disbursements are based on the indicative pipeline of projects to be financed by the operation and the indicative allocations of operation resources between projects.[[3]](#footnote-4)

The IDB and the CDB will refine these planned financial disbursements at the start of the Program when the project pipeline has been advanced. The IDB will include these planned disbursements as targets in the Project Monitoring Report (PMR) and will track actual disbursements against these targets to monitor the progress of financial disbursements during implementation.

Table 2.2: Annual Costs by Output (US$ millions)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Outputs** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** | **Year 6** | **Year 7** | **Year 8** | **Target** |
| **Component 1 – GE project development** | | | | | | | | | |
| Grants provided to geothermal projects for doing pre-feasibility studies required to identify promising exploratory drilling sites | 0.39 | 2.67 | 1.39 |  |  |  |  |  | 4.45 |
| Grants (in the form of loan guarantees or grants convertible to loans) provided to geothermal projects with resources from the Program | - | 6.00 |  | 10.00 | - | - | - | - | 16.00 |
| Loans provided to geothermal projects at any stage of development with resources from the Program | - | 6.45 | 12.25 | 7.36 | 16.55 | 17.39 | - | - | 60.00 |
| **Sub-total Component 1** | **0.39** | **15.12** | **13.64** | **17.36** | **16.55** | **17.39** | **-** | **-** | **80.45** |
| **Component 2: Technical Assistance: Regulatory framework, institutional strengthening, and capacity building** | | | | | | | | | |
| Technical assistance grants provided to governments in ECC with resources from the program | 0.5 | 0.5 | - | - | - | - | - | - | 1.0 |
| Specialized advisory services contracts awarded to strengthen CDB’s capacity to implement the program | 2.15 | 1.31 | 0.70 | - | - | - | - | - | 4.16 |
| **Sub-total Component 2** | **2.65** | **1.81** | **0.70** | **-** | **-** | **-** | **-** | **-** | **5.16** |
| **Total SEF Expanded** | **3.04** | **16.93** | **14.34** | **17.36** | **16.55** | **17.39** | **-** | **-** | **85.61** |

Additional grant resources from other donors might be added to the SEF and disbursed to projects.

Table 2.3: Annual Targets by Output

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Outputs** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** | **Year 6** | **Year 7** | **Year 8** | **Target** |
| **Component 1 – GE project development** | | | | | | | | | |
| Grants provided to geothermal projects for doing pre-feasibility studies required to identify promising exploratory drilling sites | 1 | 1 | 1 |  |  |  |  |  | 3 |
| Grants (in the form of loan guarantees or grants convertible to loans) provided to geothermal projects with resources from the Program | - | 2 | 1 | - | - | - | - | - | 3 |
| Loans provided to geothermal projects at any stage of development with resources from the Program | - | 2 | 1 | - | - | - | - | - | 3 |
| Loans provided to finance transmission and distribution lines required for bringing GE to market. | - | - | - | - | - | - | - | - | -[[4]](#footnote-5) |
| **Component 2: Technical Assistance: Regulatory framework, institutional strengthening, and capacity building** | | | | | | | | | |
| Technical assistance grants provided to governments in ECC with resources from the program | 0.5 | 0.5 | - | - | - | - | - | - | 1.0 |
| Specialized advisory services contracts awarded to strengthen CDB’s capacity to implement the program | 2.15 | 1.31 | 0.70 | - | - | - | - | - | 4.16 |
| **Sub-total Component 2** | **2.65** | **1.81** | **0.70** | **-** | **-** | **-** | **-** | **-** | **5.16** |
| **Total SEF Expanded** | **3.04** | **16.93** | **14.34** | **17.36** | **16.55** | **17.39** | **-** | **-** | **85.61** |

## Data Collection and Instruments

The EA (the CDB) will be responsible for reporting on the results of the Program, based on information collected from the ECC Governments and private sponsors and on information from its own systems. The EA will be responsible for reporting progress and results to the IDB. The EA will collect, store, and retain all information to assist the IDB in monitoring performance of the Program.

The INE/ENE Division of the IDB will be responsible for overseeing the execution of the M&E Plan for the complete SEF Program, including the funds provided by other donors under SEF-2015 and SEF-Expanded. As such, INE/ENE must report annually to the Clean Technology Fund (CTF) and the Global Environmental facility (GEF) for SEF-2015 and to the Green Climate Fund (GCF) and the Republic of Italy (REI) for SEF-Expanded on progress towards achieving the results of the Program and estimations of results (in case of plants in state of construction and non-operational as of reporting date).

CDB will ensure that, in accordance with IDB’s applicable policies and procedures, records relating to individual projects are to be furnished to the aforementioned donors upon their written request in a timely manner, and records will be maintained adequately to record the progress of individual projects.

The project team composed by specialists from INE/ENE and IFD/CMF, with support from the country office in Barbados, will oversee the execution, monitoring and evaluation of the program. The EA and the IDB have committed to carry out field visits according to a regular schedule to be agreed upon between the two parts (see Table 2.2 Monitoring Work Plan for an indicative schedule).

Sources of information for monitoring the Program include EA semi-annual reports, IDB’s field inspections, and EA administrative records and financial statements. The EA will be responsible for providing administrative records, financial statements, and reports, and will participate in the IDB’s field inspections.

## Reporting Monitoring Results

The IDB will use four instruments to monitor the Program’s progress in completing the expected outputs:

* Semi-annual progress reports (SAPR)
* Annual progress reports (APR)
* Due Diligence and Annual Supervision Missions
* Field Inspections
* Audited and Unaudited Financial Statements.

For each instrument, the remainder of this section describes the instrument, and explains who is responsible for preparing it, when it should be submitted or carried out, its purpose, and its content.

### Semi-Annual Progress Reports (SAPR)

Semi-Annual Progress Reports (SAPR) are designed to monitor the progress in implementing the EE and RE projects and the technical assistance funded by SEF-2015, and the GE projects and technical assistance funded by SEF-Expanded and measure their impact through various indicators. The EA is responsible for preparing them, with input from the Governments, private sponsors, utilities, and projects in the ECC. The IDB is responsible for reviewing the SAPR and giving its non-objection. As their name suggests, these reports are due every six months. The EA will deliver the reports within 60 calendar days after the end of each semester.

Purpose

The purpose of the Semi-Annual Reports is to track the Program’s progress towards the targets established for the output indicator described in Section 2.1 and the results indicators included Section 3.3. The SAPR will serve as inputs to completing the Project Monitoring Report (PMR), which is the IDB’s main tool for monitoring progress towards meeting the indicator targets.

Content

SAPR contain four components:

* **Execution Plans**—present Gantt charts that show the Program’s progress towards completing the tasks for fulfilling outputs. The Gantt charts present updated timelines that show any planned changes in carrying out the tasks within each Component. Two execution plans are presented: the Pluri-annual Execution Plan (PEP) which covers the complete execution period and the Annual Operation Plan (POA) which covers the following twelve-month period. The execution plans should assign costs to each task to track the financial progress of the Program. In addition, the EA should attach a bank statement with the execution plans, which the IDB will use to validate the progress reported in the execution plans against actual disbursements
* **Financial and Procurement Plans**—show the planned disbursements and procurement activities for the following twelve-month period. The Financial Plan presents a financial projection of the planned disbursements that should coincide with the planned tasks included in the execution plans. The Procurement Plan shows procurement activities the EA will carry out directly. Generally, the EA’s procurement activities will take place at the beginning and towards the end of the Program’s execution period. The EA would only need to submit Procurement Plans when there are procurement activities planned for the following year
* **Updated Risk Matrix**—shows the status of risks identified in the Risk Matrix of the Program, as well as proposed actions or mitigation measures. It also identifies any new issues, risks, and events that affect or may potentially affect the future implementation of the Project
* **Updated Results Matrix**—shows the physical and financial progress towards the targets listed for each indicator in the Results Matrix of the Program.
* **Lessons Learned**—presents the lessons learned and any other information required to ensure the successful implementation of the Project.
* **Operation and Maintenance of program** **financed assets** – presents the report on the status of maintenance activities for the works and equipment financed with program resources, in accordance with generally accepted technical standards; the annual maintenance plan for that year as provided by the EA’s sub-borrowers; and the steps to fully correct any deficiencies in case inspections conducted by the Bank, or the reports it receives, show that maintenance is being performed below the agreed-upon levels.
* **Revised indicative pipeline** – presents an update to the indicative pipeline which includes the different GE projects and technical assistance activities that the EA expects to finance during program execution and the expected resource allocation from to these from the different sources of funding available under the SEF Program. Due to the program’s on-demand nature, this pipeline is periodically reviewed by CDB and IDB to reflect the latest market developments in the ECC, the progress in program execution, and any additional resources mobilized either by CDB or IDB in support of program objectives.

### Annual Progress Reports (APR)

Annual Progress Reports (APR) are designed to monitor the progress in implementing the GE projects and technical assistance funded by SEF-Expanded and measure their impact through various indicators. The EA is responsible for preparing them, with input from the Governments, private sponsors, utilities, and projects in the ECC. The IDB is responsible for reviewing the APR and giving its non-objection. As their name suggests, these reports are due annually. The EA will deliver the reports within 40 calendar days after the end of each calendar year during the 8-year disbursement period of the SEF-Expanded. The first APR shall be submitted following the end of the calendar year after the GCF and IDB have entered into the relevant FAA and the last APR within 6 months of the end of the disbursement period. The APR shall set any necessary corrective measure.

**Purpose**

The purpose of the APR is to report back to the GCF regarding the Program’s progress towards the SEF-Expanded targets established for the output indicators described in Section 2.1 and the results indicators included Section 3.3.

**Content**

APRs will include a narrative report on implementation progress based on the logical framework submitted to the GCF in the Funding Proposal and considerations on the ongoing performance of the Funded Activity against the GCF’s investment framework criteria. The report shall be prepared in accordance with GCF requirements, and will include, among others: (i) information on compliance with the financial/economic, fiduciary, GHG emissions reduction as applicable, environmental and social requirements of the program; (ii) information on compliance with the gender aspects of the program; and (iii) information that confirms that the activities of the program have been carried out in accordance with the applicable intellectual property laws.

### Due Diligence and Annual Supervision Missions

There will be due diligence for each Category A proposed GE project financed by the program. There will be one due diligence mission at the beginning of the projects. Following that, there will be annual supervision missions for the following years of the commitment period of the program.

The IDB will be responsible for hiring external consultants to carry out the due diligence and supervisions missions for the RE projects financed through the Program including the GE projects financed with SEF-Expanded resources. The due diligence missions should occur during year 1 of each sub-project, prior to the first disbursements made to the projects. The supervision missions will occur on an annual basis, starting in year two and until program completion.

Purpose

The purpose of the due diligence missions is to provide an independent opinion about the viability of the projects and their progress. Specifically, the due diligence will verify the financial and technical information included in the loan applications and inform the IDB and other donors of the risks. The supervision missions will provide an unbiased technical opinion about the projects’ progress.

Content

The IDB will review the TOR of the due diligence and supervision missions and once completed, the IDB must review and approve the due diligence reports.

### Field Inspections

Field Inspections are designed to monitor the progress in implementing the GE projects and the technical assistances funded with SEF-Expanded resources. Field Inspections provide an opportunity for the IDB to validate in the field the progress reported in the SAPR. The IDB is responsible for coordinating them with support from the EA, ECC Governments and private sponsors. Other donors of the SEF that may want to participate in the field inspections will coordinate it with the IDB. Field inspections are to be carried out semiannually, within a 60-day period after the SAPR are submitted. Field inspections could be carried out within a 60-day period before the SAPR are submitted.

Purpose

The purpose of the Field Inspections is to track and confirm the Program’s progress towards targets listed for each indicator included in the Results Matrix.

Content

Field Inspections include field visits and meetings between the IDB, the EA, and the ECC Governments and/or private sponsors that signed sub-project agreements with the EA.

### Audited and Unaudited Financial Statements

The EA will submit to the IDB:

(a) Annual Audited Financial Statements (AFS) of the CDB. These reports are to be presented to the Bank within 180 days following the end of CDB’s fiscal year end, December 31st;

(b) Annual Audited Financial statements for the Program, including financial information on sub‐loans and sub-grants (considering all sub-projects approved and for which there has been at least one disbursement), within 180 days following the end of CDB’s fiscal year. Audited financial statements will be conducted by an independent audit firm that is eligible to the Bank. The CDB may utilize the services of its auditors, once they are considered eligible to the Bank.

(c) Semi‐annual Unaudited Financial Reports of the project, including financial status reports on sub‐loans. These statements should be submitted within 60 days after the close of each semester. These statements are intended to supplement the information in CDB’s AFS since the AFS does not include project specific information.

Purpose

The purpose of the Audited Financial Statements of the CDB, Annual Audited Financial Statements of the Program and Semi‐annual Unaudited Financial Reports of the project is to assess the financial performance of the Program.

## Monitoring Coordination, Work Plan, and Budget

The IDB will be responsible for overseeing the execution of the Monitoring and Evaluation Plan for the SEF-Expanded but also for the complete SEF Program, including the funds provided by other donors. The IDB will also be responsible for reporting to the other Donors on the execution and results of the Program. The project team at the IDB responsible for carrying out these tasks will be composed by specialists from the INE/ENE and IFD/CMF divisions, with support from the country office in Barbados.

The EA (the CDB) will be responsible for executing the SEF-Expanded and all SEF Program and reporting on the results. The EA will designate a Project Management Unit that will be responsible for carrying out these tasks (see Operating Manual). The Project Management Unit will be responsible for reporting the Program’s progress and results to the IDB and the other donors (CTF, GCF, ROI). The monitoring of SEF-Expanded will be done jointly with the SEF-2015. The funds for these activities will be covered by the budget considered in SEF-2015.

Table 2.4 shows the timing of the tasks for monitoring the Program, including the cost and entity responsible for carrying out each task.

Table 2.4: Monitoring Work Plan

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Activity** | **2016** | | | **2017** | | | **2018** | | | **2019** | | | **2020** | | **2021** | | **2022** | | **2023** | | **2024** | | **2025** | |  | | **Resp.** | **Fund.** | **US$** |
| **S1** | **S2** | | **S1** | **S2** | | **S1** | **S2** | | **S1** | **S2** | | **S1** | **S2** | **S1** | **S2** | **S1** | **S2** | **S1** | **S2** | **S1** | **S2** | **S1** | **S2** | **S1** | **S2** |  |  |  |
| Semi-Annual Reports |  |  | |  |  | |  |  | |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | EA | Prog. | 0 |
| Annual Reports |  |  | |  |  | |  |  | |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | EA | Prog. | 0 |
| Field Inspections |  |  | |  |  | |  |  | |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | IDB & EA | Prog. | 120,000 |
| Annual Audited Financial Statements of the CDB |  |  | |  |  | |  |  | |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | EA | Prog. | 140,000 |
| Annual Audited Financial Statements of the Program |  |  | |  |  | |  |  | |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | EA | Prog. | 195,000 |
| Semi-annual Unaudited Financial Statements of the Program |  |  | |  |  | |  |  | |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | EA | Prog. | 0 |
| ESG Due Diligence and Annual Supervision Missions by External Consultant |  |  | |  |  | |  |  | |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | IDB | Prog. | 250,000 |
| **Total** |  | |  | | |  | | |  | | |  | | | | | | | | | | | | | | | | | **705,000** |
|  |  | |  | | |  | | |  | | |

# Evaluation

The Program will be evaluated by measuring compliance with targets for a set of indicators. The Evaluation Plan first defines what questions the indicators address. Then it mentions the studies that the Evaluation Plan builds upon and describes the indicators that will be used to evaluate the results of the Program. It also explains the before and after evaluation methodology and the instruments that will be used to evaluate the Program. Lastly, it describes the institutional arrangements, work plan, and budget to carry out the Evaluation Plan.

## Main Evaluation Questions

The purpose of the evaluation is to assess the outcomes and impact of the Project. The main evaluation questions are as follows:

* How many geothermal projects financed by the program moved or are projected to move from the current to the next stage of development?
* How did the program contribute to the regional penetration of indigenous renewable energy sources for power generation within the ECC?
* What was the impact of the Program towards decreasing the amount of greenhouse gas emissions, the cost of electricity service, and the amount of fuel oil imports?
* How much additional public and private resources was the Program able to leverage in the development of geothermal projects financed at some stage by the program?
* How many loans, contingent recovery grants and grants were provided to geothermal projects in the different development stages?
* How many countries have legal and regulatory frameworks implemented that enable GE developments?
* How many women were trained in construction, operation and/or maintenance of GE projects and participated in consultation processes?

## Existing Knowledge

An ex-ante Cost Benefit Analysis (CBA) and financial analysis of the geothermal projects that may be funded by the Program have been prepared. The CBA, financial analysis, and a description of the methodology used in their preparation and their main conclusions are explained in further detail in the [Cost Benefit Analysis Report](http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=39683421) which is an Optional Electronic Link of the Proposal for Operation Development (POD). A summary of the methodology, assumptions, and main results of the ex-ante CBA are discussed below.

The CBA is an economic analysis that presents the net economic benefits to the Eastern Caribbean region and to each country from implementing SEF-2015 Components 1 and 3 and SEF-Expanded Component 1. The financial analysis estimates the rate that the geothermal projects would charge to utilities and its impact on the tariff in the countries, as well as the cost of debt of the projects. The financial analysis includes projected financial statements for each of the geothermal projects.

Cost Benefit Analysis

The objective of the CBA methodology is to determine whether GE projects to be financed by the Program are economically viable. While a CBA was carried out for the street light retrofitting and geothermal power projects included in the indicative project pipeline for SEF-2015 approval, the CBA for GE projects has been updated for the SEF-Expanded considering updated values for oil prices which is one of the main variables. Because the revised indicative pipeline is the current forecast of the potential demand for Program funds from the ECC, the CBA is based on it.

The results of the CBA indicate that the projects are economically viable when a 12 percent discount rate is used. Specifically, the results of the CBA show that the present value (PV) of the net economic benefits of each project is positive and their internal rates of return exceed the cost of capital (12 percent). Similarly, the PV of the aggregate net economic benefit of all projects combined is also positive and exceeds the cost of capital. This means that implementing the projects will result in a net economic gain for the Governments in each of the countries and for the region as a whole, and so, the Governments, multilateral institutions, and private sponsors should proceed with implementing them.

To carry out the CBA, a methodology that complies with the IDB Guidelines for Economic Analysis was used. Specifically, the PVs of the projects’ net benefits were estimated. To do so the PV of the projects’ benefits and costs were estimated. For calculating the projects’ benefits, the savings in electricity expenditures and the monetary value of greenhouse gas emissions displaced by the projects were estimated. For calculating the projects’ costs, the full economic costs of implementing the projects were included, including the costs not financed by the Program. Then the difference between these two values was calculated and the present value of that difference was found. That PV is the result of the CBA. If the PV is positive, the project is economically viable.

To determine the projects’ net benefits, the annual economic costs and benefits were estimated for a period of 40 years and a period of 15 years for geothermal projects and energy efficiency projects, respectively. Table 3.1 presents the assumptions used to calculate the economic costs and benefits of the projects.

Table 3.1: Assumptions Used to Determine the Indicative Projects’ Economic Costs and Benefits

| **Variable** | **All Projects** | **Dom.** | **Gren.** | **Nevis** | **SL** | **SVG** |
| --- | --- | --- | --- | --- | --- | --- |
| **General Assumptions** | | | | | | |
| Social Cost of one ton of CO₂ emissions (US$/tCO₂) | 10[[5]](#footnote-6) | | | | | |
| Pounds of CO₂ emissions per kWh of electricity produced from fuel oil (No.2) (tCO₂/MWh) | 0.76[[6]](#footnote-7) | | | | | |
| Discount rate (%) | 0.12 | | | | | |
| **Assumptions for Geothermal Projects** | | | | | | |
| Plant size (MW) | 60 | 10 | 10 | 10 | 20 | 10 |
| Plant availability (%) | 85 | | | | | |
| Total Capex (US$ million) | 531.5 | 68.3 | 102.3 | 96.3 | 168.3 | 96.3 |
| Pre-investment  Exploration  Production Drilling  Power Plant Construction  T&D and Access Roads | 12  56  112  270  81.5 | 0  0  7  45  16.3 | 6  14  21  45  16.3 | 0  14  21  45  16.3 | 6  14  42  90  16.3 | 0  14  21  45  16.3 |
| Operating cost of electricity from geothermal generation (US$/kWh) | 0.02[[7]](#footnote-8) | | | | | |
| Avoided cost of fuel oil generation (US$) |  | 0.174 | 0.205 | 0.192 | 0.20 | 0.189 |
| Avoided cost of electricity expenditures (US$) |  | 0.26[[8]](#footnote-9) |  |  | 0.39[[9]](#footnote-10) |  |
| Average electricity tariff for customers in ECC in 2015 (US$/KWh) | 0.33 | 0.35 | 0.30 | 0.32 | 0.34 | 0.33 |
| Regional penetration of indigenous RE sources for power generation within the ECC (%) | 10% | | | | | |
| Financing from other sources (e.g. commercial banks, private equity) leveraged by this program (US$ millions) |  |  |  |  |  | 15 |

The results of the CBA and the financial analysis were used to establish the targets for measuring the results of the Program. This ensures the targets set in the M&E Plan coincide with the goals established during the design and approval of the Program. The targets for the percentage decrease in cost of electricity service will be based on the projected cost of electricity service calculated in the financial model.

## Outcome Indicators

Table 3.2 presents the indicators that will be used to measure whether the Program achieved its intended outcomes/results. Due to the long maturities associated to these projects, projects financed from early exploration may not be fully operational until past the timeframe of evaluation. Therefore, for those cases, some indicators will be estimated based on expected future outcomes. A note is included signaling the indicators for which this is the case. The basis for estimating indicator values is included in the source description.

Table 3.2: Key Results Indictors

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Results Indicator** | **Unit**  **/Description** | **Frequency of Measurement** | **Source of Verification** | |
| **Component 1: GE project Development** | | | |
| Geothermal power generation capacity installed in projects facilitated or financed at some stage by the program. | MW  Estimations of expected installed capacity based on quality of resource confirmed once exploration wells are drilled in projects facilitated or financed at some stage by the program | Semiannually and at the end of the execution period | Report from CDB with information from ECC and private project sponsors | |
| Geothermal projects financed by the program with a power plant in construction or operation | Number of GE projects financed by the program with a power plant in construction or operation. | Semiannually and at the end of the execution period | Report from CDB with information from ECC and private project sponsors | |
| **Component 2- Technical Assistance: Regulatory framework, institutional strengthening, and capacity building** | | | |
| ECC with legal and regulatory frameworks that enable GE development implemented | Number of countries that have GE legal and regulatory frameworks | Semiannually and at the end of the execution period | EA report based on information from Governments | |
| Specialized advisory services provided to ECC to structure GE sub-projects and reach financial closing for the construction of power plants | Number of countries that received advisory services | Semiannually and at the end of the execution period | CDB report | |
| Public institutions responsible for energy in the ECC trained in GE technical, financial, or regulatory aspects. | Number of institutions that received training | Semiannually and at the end of the execution period | CDB report | |
| Women trained in construction, operation and/or maintenance of RE infrastructure and projects | %  Measures the percentage of women trained, out of the total trainees, in construction, management and/or maintenance of RE infrastructure/project. Measured as an average of individual GE sub projects at the end of the program | At the completion of the execution period | EA report based on information from Governments and private project sponsors | |
| % of women who participated in consultations. | %  Measures the percentage of woman that participated in consultation process for GE projects out of the total of persons that participated in consultations. Measured as an average of individual GE sub projects at the end of the program | At the completion of the execution period | Reports from the CDB based on information from governments and private project sponsors | |

## Evaluation Methodology

The IDB will follow a before-completion and after-completion methodology to evaluate the results of the Program (SEF-Expanded and SEF-2015). Specifically, for a group of indicators, the IDB will compare baseline values against the values after the Program is completed. This is the same methodology that is used for monitoring the Program. The only difference is the point in time when the methodology is applied. For monitoring the Program, the methodology is applied while the Program is being executed. For evaluating the Program, the methodology is used after the Program is completed.

By measuring baseline values in year 0 of the SEF Program (2015), the IDB will simulate a counterfactual of what the performance for these indicators would be if the Program would not be implemented. This methodology assumes that if the Program was not implemented, indicator values would remain at their baseline values.

The CBA variables will be updated with real values through the execution of the project:

* Pounds of CO₂ emissions per kWh of electricity produced from fuel oil: the value will be updated with the actual emission intensity of the fossil fuel plant that will be displaced by GE projects considering the prefeasibility and exploration results or actual plants under construction or operation.
* Plant size: the MW will be updated with the results obtained from the prefeasibility and exploration studies and actual plants under construction or operation.
* Total Capex: will be updated with real capex of the plants that are already constructed or updated estimates for the planned or under construction plants for each specific site.
* Operating cost of electricity from geothermal generation: will be updated with real operational costs of the plants that are already constructed or updated estimates for the planned or under construction plants for each specific site.
* Avoided cost of fuel oil will be calculated for each country and oil cost for the displaced fossil fuel plants.

The main instrument the IDB will use to evaluate the Program will be the Project Completion Report (‘PCR’), which compares the Program results against baseline values. The IDB will base the PCR on mid-term and final evaluations and an ex-post CBA. These instruments are described in more detail in the following section.

Also, in addition to the evaluation described in this section, the IDB Oversight Evaluation Office (OVE) may also separately evaluate the impact of the Program.

## Reporting Results

The EA will be responsible for reporting on the results of the Program, based on information collected from the EC Governments and private sponsors and on information from its own systems. The EA will be responsible for reporting progress and results to the IDB. The EA will collect, store, and retain all information to assist the IDB in monitoring performance of the Program.

The INE/ENE Division of the IDB will be responsible for overseeing the execution of the Monitoring and Evaluation Plan for the complete Program, including the funds provided by other donors. As such, they must report annually to the Clean Technology Fund Trust Fund Committee (CTF TFC) and the Japan International Cooperation Agency (‘JICA’) on progress towards achieving the results of the Program and estimations of results (in case of plants in state of construction and non-operational as of reporting date).

The project team composed by specialists from INE/ENE and IFD/CMF, with support from the country office in Barbados, will be in charge of following up the execution, monitoring and evaluation of the program.

There are five instruments that the IDB will use to evaluate the Program’s results. The instruments are as follows:

* Baseline Values Study
* Mid-Term Evaluation and Final Evaluation – GEF
* Mid-Term Evaluation
* Ex-post Cost Benefit Analysis (‘CBA’)
* Project Completion Report

For each instrument, the remainder of this section describes its purpose, the entities responsible for preparing it, and, when applicable, the methodology used in its preparation.

Baseline Values Study

The Baseline Values Study establish the baseline values of the indicators that will be used to evaluate the Program. This study is a key input of the Evaluation Plan and was done at the beginning of SEF-2015 and therefore measured the status of the indicators at the start of the Program (SEF-2015 and SEF-Expanded). The IDB is responsible for carrying out the Baseline Values Study with support from the EA, and the Governments, utilities, private sponsors, and projects in EC countries.

Midterm and Terminal evaluation - GEF

A mid-term and a terminal evaluation will be conducted according to GEF guidelines to review and evaluate the achievements attained during the implementation of the GEF grant as regards the fulfillment of its objectives, outputs, results framework and work plan.

Mid Term Evaluation / Interim Independent Evaluation Report

The Mid-term Evaluation is designed to assess the performance of the Program, by reviewing whether the Program has met the targets set for the evaluation indicators. Specifically, the evaluation will verify the reported progress of the Program, assess Program’s performance against the planned results, and assess the EA’s performance in coordinating and executing the Program. This evaluation will also identify ways that the Program’s operations could be improved and will identify lessons learned. A Final Evaluation will be completed as part of the Project Completion Report discussed in further detail below and presented in Paragraph 3.16 of the Proposal for Development.

The EA is responsible for hiring the independent consultant that will prepare the Mid Term Evaluations. In addition, the EA is responsible for providing the independent consultant the information needed to complete it. Once completed, the EA must submit the Mid-term Evaluation to the IDB for its review and non-objection. The EA will be responsible of submit two Mid-term Evaluations. One Mid-term Evaluation, done for the whole Program including SEF-Expanded and SEF-2015, is due once 50% of SEF-2015 loan resources are disbursed, or after four years from the date of the first disbursement of the SEF-2015, whichever is earlier. The second Mid-term Evaluation, done for the whole Program including SEF-Expanded and SEF-2015, is due once 50% of SEF-Expanded loan resources are disbursed, or after four years from the date of the first disbursement of the SEF-Expanded, whichever is earlier.

Ex-post Cost Benefit Analysis

The ex-post Cost Benefit Analysis (‘ex-post CBA’) is designed to measure the economic impact of the Program. The ex-post CBA be conducted once 100% of the program is completed, including both SEF-2015 and SEF-Expanded, so no sub-project is left out of the analysis.

The ex-post CBA will measure whether the actual economic benefits of the Program exceeded its actual economic costs and how these compared to estimations made when the Program was designed. It will also assess the financial costs and benefits of the geothermal projects to private investors or PPP. Comparing the ex-post CBA with the ex-ante CBA will identify what factors led to discrepancies between the estimated costs and benefits included in the ex-ante CBA and the actual costs and benefits observed at the Program’s completion. For this reason, the ex-post CBA will follow the same methodology used for preparing the ex-ante CBA presented in Section 3.2 and in the [Cost Benefit Analysis Report](http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=39683421) which is an Optional Electronic Link of the POD.

In assessing the financial costs and benefits of the geothermal projects to the investors, the ex-post CBA will determine the cost of electricity service with the new geothermal capacity. Due to the long maturities associated to these projects, projects financed from early exploration may not be fully operational until past the timeframe of evaluation. As such, indicator values that depend on when power plants are commissioned will be estimated. The ex-post CBA will be the instrument to estimate the estimated decrease in cost of service based on up to date information about resource quality, estimated installed capacity, and the estimated timelines for the geothermal power plants to come on line.

Final Independent Evaluation Report.

A report of the final evaluation of the Program will be presented to the Bank within 5 months after disbursement of 100% of the resources of the SEF-Expanded, according to the terms set forth in the OM.

Project Completion Report for the Program

The Project Completion Report (PCR) is designed to assess and document the performance of the Program. A PCR will be completed for the Program as a whole, including SEF-2015 and SEF-Expanded, including the results of each sub-project financed through the Program. The PCR be conducted once 100% of the program is completed, including both SEF-2015 and SEF-Expanded, so no sub-project is left out of the analysis. The PCR will include the progress in meeting the program results as defined in the Results Matrix, information on the execution of the program and lessons learned.

The PCR evaluates three main areas: whether the Program and sub-projects met their targets for results indicators, whether the results are sustainable, and the issues that affected how successful the Program and sub-projects were in achieving their intended results.

In evaluating whether the Program and sub-projects met the targets for results indicators, the PCR uses a before and after methodology that compares the baseline values of the results indicators against the indicator values after the Program and/or Project is completed. As part of the PCR completed for the Program, an ex-post Cost Benefit Analysis (CBA) will be developed.

The evaluation of the sustainability of the results and the issues that affected the Program’s and/or projects’ implementation is focused on evaluating risks. In evaluating whether the results are sustainable, the PCR identifies the risks that could affect the sustainability of the Program’s and/or projects’ results, and their likelihood and severity. The four main kinds of risks that should be considered include: financial risks, sociopolitical risks, institutional framework and governance risks, and environmental risks. In evaluating issues, the PCR considers the risks that were not properly mitigated against and turned into issues that affected the implementation of the Program and sub-projects. Examples can include poor local implementation capacities and delays and effects thereof on the Program’s and/or projects’ results.

## Methodology and Assumptions to replicate the CBA

To carry out the ex-post CBA, a methodology that complies with the IDB Guidelines for Economic Analysis will be used. Specifically, the PVs of the projects’ net benefits will be estimated based on current information for the EA, Governments, and private project sponsors. To do so the PV of the projects’ benefits and costs will be estimated. For calculating the projects’ benefits, the savings in electricity expenditures and the monetary value of greenhouse gas emissions displaced by the projects will be estimated.

To determine the geothermal project’s net benefits, the annual economic costs and benefits of the geothermal project, for a period of 40 years will be calculated. For calculating the projects’ costs, the full economic costs incurred during the implementation of the projects will be included, including the costs that were not financed by the Program.

The steps to calculate the net benefits of the Program are:

* Estimate the economic costs of geothermal projects (3.6.1)
* Estimate the economic benefits of geothermal projects (3.6.2)
* Estimate the present value of the geothermal projects net economic benefits (3.6.3)

We discuss each of these steps and the assumptions to be used in their calculation in more detail below:

### Economic Costs of Geothermal Projects

The economic costs of the geothermal projects are composed by:

**Capital Expenditures (Capex)**—these are the actual capital investments that were made to complete the project stages of geothermal projects financed at some stage with resources from the program. If there are still stages that are pending, then the remaining Capex costs will be estimated based on the costs for completing the pre-investment stages (first slim hole drillings), the exploration stage (test drilling), and the field development stage (production drilling and power plant construction) presented below. These costs are the same considered in the Ex-ante CBA for geothermal plants of a certain installed capacity expected to be developed in each of the ECC islands. If the actual installed capacity of the plants effectively built or planned is different from the assumption, then the Capex cost per MW of installed capacity that results from the assumptions presented below will be used to estimate total capex costs of pending stages.

Theseassumptions for capital expenditures are based on the estimated average costs for developing each geothermal stage from the IDB and the Energy Sector Management Assistance Program (ESMAP) and the financial model of the SVG project.[[10]](#footnote-11)

| **Variable** | **All Projects** | **DOM** | **GRE** | **Nevis** | **SL** | **SVG** |
| --- | --- | --- | --- | --- | --- | --- |
| Plant size (MW) | 60 | 10 | 10 | 10 | 20 | 10 |
| Total Capex (US$ million) | 517.5 | 67.0 | 102.3 | 92.1 | 159.3 | 96.8 |
| Pre-investment  Exploration  Production Drilling  Power Plant Construction  T&D and Access Roads | 12.0  58.3  115.7  263.1  68.4 | 7  45  15 | 6  14  21  45  16 | 14  21  45  12 | 6  14  42  81  16 | 17  25  47  8 |

### Economic Benefits of Geothermal Projects

The economic benefits of the geothermal projects are composed by:

* **Savings in generation costs**—generating electricity from geothermal resources potentially cost less than generating electricity from liquid fossil fuels such as diesel and/or fuel oil. Therefore, the countries will save in generation costs by replacing fuel oil generation with geothermal generation. Savings to the country will be estimated as the difference between the Total Avoided Cost (‘TAC’) of fuel oil generation and the Total Operating Costs (‘TOC’) of geothermal generation. The TAC is the long run marginal cost of diesel generation. We use the following formulas to calculation the savings in generations costs:

Generation from Geothermal (kWh), Total Energy Sold (kWh), and Operating Costs from Geothermal (US$/kWh) will be reported by the Geothermal power generation company at the time of the ex-post CBA.

Total Fuel Cost (US$) will be estimated based on the Total Energy Sold (kWh), the Amount of oil used per kWh of power generated (Barrels/kWh) assumption presented below, and the price of oil. The price of oil projections used will be the ones published by the U.S. Energy Information Administration at the time when the Ex-Post CBA is conducted.

| **Variable** | **All Projects** | **DOM** | **GRE** | **Nevis** | **SL** | **SVG** |
| --- | --- | --- | --- | --- | --- | --- |
| Amount of oil used per MWh of power generated (Barrels/kWh) | 0.00162[[11]](#footnote-12) | | | | | |

* **Reduction in CO₂ emissions**—the economic benefit of the reduction in CO₂ emissionswill be calculatedas the product of the expected reduction in CO₂ emissions and the social cost of CO₂ emissions. The expected reduction in CO₂ emissions is the product of the CO₂ emissions per unit of electricity produced from fuel oil and the units of electricity produced from geothermal generation. The same assumptions used for these two inputs in the Ex-ante CBA will be used in the Ex-post CBA and are presented below.

| **Variable** | **All Projects** | **DOM** | **GRE** | **Nevis** | **SL** | **SVG** |
| --- | --- | --- | --- | --- | --- | --- |
| Social Cost of one ton of CO₂ emissions (US$/tCO₂) | 10[[12]](#footnote-13) | | | | | |
| Pounds of CO₂ emissions per kWh of electricity produced from fuel oil (No.2) (tCO₂/MWh) | 0.76[[13]](#footnote-14) | | | | | |

### Net Economic Benefits of Geothermal Projects

After estimating the project’s economic costs and benefits, the next step will be to calculate the PV of the project’s net benefits. To do so, the analyst will subtract the PV of the project’s costs from the PV of the project’s benefits. To determine the PV of the projects costs and benefits, a social discount rate of 12 percent (in real terms) shall be used. If the PV of the project’s net benefits is greater than zero, the PV of economic benefits is greater than the PV of economic costs. That means that the geothermal project is economically viable.

### Data collection

In addition to calculating the economic costs and benefits of the geothermal projects, the Ex-post CBA will include data collection for the following variables. Data collection for the ex-post CBA will be conducted once 100% of the program is completed, including both SEF-2015 and SEF-Expanded, so no sub-project is left out of the analysis.

| **Variable** | **All Projects** | **DOM** | **GRE** | **Nevis** | **SL** | **SVG** |
| --- | --- | --- | --- | --- | --- | --- |
| Plant size (MW) | The actual size of the built/planned plant should be used | | | | | |
| Average electricity tariff for customers in ECC in 2015 (US$/KWh) | The actual electricity tariff when conducting the Ex-post CBA shall be collected from local utilities and regulators | | | | | |
| Regional penetration of indigenous RE sources for power generation within the ECC (%) | The composition of the energy matrix in each of the countries must be characterized to estimate the proportion of the mix that is RE | | | | | |
| Financing from other sources (e.g. commercial banks, private equity) leveraged by this program (US$ millions) | The additional sources of funding other than SEF program resources used to finance GE projects must be identified | | | | | |

The CDB is responsible for hiring the independent consultant that will prepare the ex-post CBA and reviewing and approving the final draft of the ex-post CBA. The EA is responsible for providing the independent consultant with the information needed to complete the ex-post CBA. In addition, the EA will coordinate with local authorities in EC countries to obtain any information that the external consultant may require completing the ex-post CBA.

The ex-post CBA will be developed as part of the Project Completion Report completed for the Program.

## Evaluation Coordination, Work Plan, and Budget

The budget for completing the Evaluation Plan is US$160,000 which is contemplated in SEF-2015. The tasks of the Evaluation Plan will be carried out at the start, at the halfway point, and at the completion of the Program. For each evaluation instrument, the remainder of this section describes when it should be prepared, who prepares it, and how it will be funded.

* **Baseline Values Study**— Already executed. Responsibility of the IDB and procured to an external consultant. The Baseline Values Study was prepared before the SEF-2015 Program start.
* **Midterm Evaluation and Terminal evaluation for GEF**—will be procured by the IDB and prepared by an external consultant. The Mid-term and Terminal Evaluation will be financed with Program funds (GEF) that are part of SEF-2015 and will cost an estimated value of US$70,000.
* **Interim and Final Independent Evaluation for GCF** —will be procured by the EA and prepared by an external consultant. Each evaluation will cost an estimated value of US$40,000.
* **Ex post Cost Benefit Analysis**—will be procured by the EA and prepared by an external consultant. The Ex-post CBA will be financed by the CDB and will cost approximately US$40,000. The Ex-post CBA will be prepared as part of the PCR. US$40,000 from CDB counterpart resources under RG-L1071 (SEF-2015) have been allocated for conducting the ex-post CBA. Hence, no additional resources are assigned for this under the SEF-Expanded.
* **Project Completion Report**—will be prepared by the EA and conducted up to 2 years after the final disbursement of SEF resources to the individual projects.

Table 3.3: Evaluation Work Plan

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Activity** | **2015** | **2016** | | **2017** | | **2018** | | **2019** | | **2020** | | **2021** | | **2022** | | **2023** | | **2024** | | **2025** | |  | | **Res.** | **Fund** | **US$** |
| **S2** | **S1** | **S2** | **S1** | **S2** | **S1** | **S2** | **S1** | **S2** | **S1** | **S2** | **S1** | **S2** | **S1** | **S2** | **S1** | **S2** | **S1** | **S2** | **S1** | **S2** | **S1** | **S2** |  |  |  |
| Baseline Values Study |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | IDB | IDB | 10,000 |
| Mid-term and terminal evaluation - GEF |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | IDB | GEF | 70,000 |
| Mid-term and final independent Eval - GCF |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | EA | IDB | 80,000 |
| Ex-post CBA |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | EA | EA | 40,000 |
| PCR |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | EA | IDB | 0 |
| **Total** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 200,000 |

1. The CDB will develop and use grant agreements to provide technical assistance under Component 2 to ECC governments. [↑](#footnote-ref-2)
2. Including a framework for establishing PPP arrangements. [↑](#footnote-ref-3)
3. The projects in the indicative pipeline were identified in the mission to the six EC countries in June 2015 based on conversations with government officials and utilities. The indicative pipeline is included in a separate document. [↑](#footnote-ref-4)
4. According to the latest revision of the Indicative Pipeline, no resources have been indicatively allocated for this output. However, due to the on-demand nature of the program and because this output is considered within the Broader SEF program, it is important to keep it as part of the Results Matrix. [↑](#footnote-ref-5)
5. The Department of Energy assigns a range for the social cost of CO₂ from $0 to $20 per ton of CO₂. We use the median value of this range. See following source:

   Department of Energy. Chapter 9: Emissions Monetization. Pg. 2 <https://www1.eere.energy.gov/buildings/appliance_standards/commercial/pdfs/ch_9_ashrae_nopr_tsd.pdf>. (accessed on 4 December 2014) [↑](#footnote-ref-6)
6. U.S. Energy Information Administration. “Frequently Asked Questions: How much carbon dioxide is produced per kilowatt-hour when generating electricity with fossil fuels?” <http://www.eia.gov/tools/faqs/faq.cfm?id=74&t=11>. Accessed on 4 December 2014. [↑](#footnote-ref-7)
7. Office of Energy Efficiency & Renewable Energy. U.S. Department of Energy. “Geothermal FAQS.” <http://www1.eere.energy.gov/geothermal/faqs.html> (accessed on 9 December 2014). [↑](#footnote-ref-8)
8. 2014 Dominica Street Lighting Tariff (71 cents per unit converted to US dollars). Source: DOMLEC. “DOMLEC Tariff Sheet effective as of September 2007” <http://www.domlec.dm/index.php/our-company/news/24-domlec-tariff-sheet>. Accessed on 28 June 2015. [↑](#footnote-ref-9)
9. 2014 St. Lucia Basic Energy Rate for Street Lighting converted to US Dollar. Source: LUCELEC "Basic Energy Rates" <https://www.lucelec.com/content/energy-rates>. Accessed on 28 June 2015. [↑](#footnote-ref-10)
10. The Energy Sector Management Assistance Program (ESMAP). “Geothermal Handbook: Planning and Financing Power Generation.” June 2012 and West Japan Engineering Consultants, Inc., “Study on Current Status of Geothermal Development in the Eastern Caribbean Islands.” March 2014. [↑](#footnote-ref-11)
11. Based on a heat rate of 10200 Btu per kWh and 5.8 million BTU per barrel of oil [↑](#footnote-ref-12)
12. The Department of Energy assigns a range for the social cost of CO₂ from $0 to $20 per ton of CO₂. We use the median value of this range and perform a sensitivity analysis on it. See following source:

    Department of Energy. Chapter 9: Emissions Monetization. Pg. 2 <https://www1.eere.energy.gov/buildings/appliance_standards/commercial/pdfs/ch_9_ashrae_nopr_tsd.pdf>. (accessed on 4 December 2014) [↑](#footnote-ref-13)
13. U.S. Energy Information Administration. “Frequently Asked Questions: How much carbon dioxide is produced per kilowatt-hour when generating electricity with fossil fuels?” <http://www.eia.gov/tools/faqs/faq.cfm?id=74&t=11>. Accessed on 4 December 2014. [↑](#footnote-ref-14)