**CLEAN DEVELOPMENT MECHANISM**
**PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)**
**Version 03 - in effect as of: 22 December 2006**

**CONTENTS**



**Annexes**

**Revision history of this document**

| Version Number | Date | Description and reason of revision |
|---|---|---|
| 01 | 21 January 2003 | Initial adoption |
| 02 | 8 July 2005 | • The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document.<br>• As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>. |
| 03 | 22 December 2006 | • The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM. |

## SECTION A. General description of small-scale project activity

### A.1 Title of the small-scale project activity:

Cote small-scale hydropower plant ("the project"), Renewal of the Crediting Period
21 August, 2012
Version 07 PDD

### A.2. Description of the small-scale project activity:

The proposed project is a small hydropower plant located in Costa Rica, over the limit of the county of Tilarán and Guatuso in the province of Guanacaste and Alajuela, respectively; within the Arenal Conservation Area ("ACA"). The purpose of the project is renewable electricity generation to be supplied to Costa Rica's national electric grid named National Interconnected System ("*NIS")*. The project's installed capacity and projected yearly average generation are 6.786 Megawatts ("MW") and 13.2[1] Gigawatts hours ("GWh"), respectively.

The project is expected to displace 20,088 tons of carbon dioxide equivalent ("$tCO_{2e}$") in the second 7-year crediting period, generating an equivalent amount of certified emission reductions ("CERs"). The project takes advantage of the infrastructure already installed to divert water from the Cote Lake [2] to the Rugama Creek which flows into the *Instituto Costarricense de Electricidad*[3] ("*ICE*") Arenal Reservoir [4]. In particular the project uses the existing water intake structure (a tunnel of 389 meter-length and a damn). The project takes the water from the Cote River and transports it by way of a conducting tunnel and underground pressure pipe until the power house, where the water is turbinated and delivered in unaltered conditions to the Rugama Creek which flows into the Arenal Reservoir [5]. The project has an 87.79 meters ("m") net head; with a nominal water flow of 8.4 $m^3$/s.

The project will supply electricity to the *NIS* through its own 200 meters ("m") - 34.5 Kilovolts ("KV")[6] transmission line which will connect to the closest distribution line that belongs to *ICE*. *ICE* is the distributor of the closest-to-the-project distribution system named Tilarán-Guatuso distribution circuit. Such distribution line owned by *ICE* will transport the electricity generated by the project until the Substation Arenal[7], which belongs to *NIS*. Substation Arenal will transform the energy from 34.5 KV to 120KV and 240KV.

[1] Taken from the project's feasibility study

[2] Costa Rica's largest natural lake.

[3] A stated owned vertically integrated utility that manages the power sector being the only power purchaser in the country.

[4] Built in 1982. This infrastructure purpose was to convert the Cote Lake into a hydropower plant regulating reservoir, which would be used for the Arenal hydroelectric project.

[5] As the structure built in 1982 did as well.

[6] The project counts with its own substation that transform the project's electricity generated up to 34.5 KV.

[7] Owned by *ICE*.

The stated owned energy distributor *Compañía Nacional de Fuerza y Luz* ("*CNFL*")[8] is the project's sponsor ("the sponsor"). The project is in compliance with all Costa Rican regulations for hydropower plants generation activities[9].

The project contributes to sustainable development by:

a) Assisting the *NIS* to keep thermal plants shut and use them only as stand-by power generation, therefore, displacing heavy fuel and diesel-fired generation; and at the same time reducing $CO_2$ emissions to the atmosphere by generating energy without greenhouse gases ("GHGs") emissions.
b) Employing local labor in construction and in operation.
c) Facilitating electricity access by serving demand that otherwise would suffer blackouts in the zone, due to failures in already existing *ICE's* distribution line. For this purpose, the sponsor made technical improvements in the distribution line to which the project's transmission line connects.
d) Serving as a small demonstrative project for clean renewable electricity generation in the country, which could also function as an independent power producer ("IPP") if developed by a private company.
e) Contributing to Costa Rica's fiscal accounts through the payment of taxes.
f) Helping the country improve the hydrocarbons trade balance through reduction of oil imports to be used for electricity generation – Costa Rica imports all of its oil[10].
g) The sponsor agreed to develop local environmental[11] and social[12] positive impacts which will be monitored through a Sustainable Development Monitoring Plan ("SDMP")[13].

**A.3. Project participants:**

| **Name of Party involved (*) ((host) indicates a host Party):** | **Private and/or public entity(ies) project participants(*) (as applicable)** | **Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)** |
|---|---|---|
| Costa Rica (host) | Compañía Nacional de Fuerza y Luz ("*CNFL*") | No |
| Canada | Government of Canada – Ministry of Foreign Affairs & International Trade | Yes |

[8] Largest electricity distributor in Costa Rica and which also has the distribution in San José (the capital), the largest local market. The sponsor has been in operation since 1941.

[9] The project would be primarily operating under Law 7554 (Environmental Organic Law of 1995), Law 449 that legally allocates to *ICE* (98.6% shareholder of the sponsor) the responsibility of the development of electricity generation projects and regulated under Law 7593, which created the regulatory entity named *Autoridad Reguladora de Servicios Públicos* ("*ARESEP"*). The sponsor does not require water concessions, generation permits, etc. required by private projects, as it is a stated owned company.

[10] The steep increase in oil prices since 1999 has hampered the task of reducing inflation.

[11] Related to forest cover and vegetation, water flow, water quality, biodiversity, and ecosystem protection.

[12] Local job creation and improve and help maintaining local access ways and roads.

[13] The SDMP can be seen in the annex section of the project's Monitoring Plan ("MP").

| | | |
|---|---|---|
| Finland | Fortum Corporation;<br>Government of Finland -<br>Ministry of Foreign Affairs of Finland | Yes |
| France | GDF SUEZ | No |
| Germany | RWE Power AG | No |
| Japan | Chubu Electric Power Co., Inc;<br>The Chugoku Electric Power Co., Inc;<br>Kyushu Electric Power Co., Inc;<br>Mitsubishi Corporation;<br><br>Mitsui & Co. Ltd.;<br>Shikoku Electric Power Co., Inc;<br>Tohoku Electric Power Co., Inc;<br>The Tokyo Electric Power Co., Inc;<br>Japan International Cooperation Agency (JICA) | No |
| Netherlands | International Bank for Reconstruction and Development as Trustee of the Prototype Carbon Fund (PCF);<br>Electrabel S.A.;<br>Netherlands' Ministry of Infrastructure and the Environment (IenM)<br>Netherlands' Ministry of Economic Affairs, Agriculture and Innovation (EL&I) | Yes |
| Norway | Norsk Hydro ASA;<br>Government of Norway -<br>Ministry of Foreign Affairs<br>Statoil ASA | Yes |
| United Kingdom of Great Britain and Northern Ireland | BP Alternative Energy International Ltd;<br>Deutsche Bank AG | No |
| Sweden | Government of Sweden -<br>Swedish Energy Agency | Yes |
| (*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required. | | |
| Note: *When the PDD is filled in support of a proposed new methodology (forms CDM-NBM and CDMNMM),* at least the host Party (ies) and any known project participants (e.g. those proposing a new | | |

methodology) shall be identified.

The Official Contact Person for the Clean Development Mechanism ("CDM") project activity:
Joëlle Chassard
Manager
Carbon Finance Unit IBRD as the Trustee of the PCF
Washington DC. USA.

Contact information is listed in Annex 1.

### A.4. Technical description of the small-scale project activity:

#### A.4.1. Location of the small-scale project activity:

Costa Rica, Central America

##### A.4.1.1. Host Party(ies):

Costa Rica

##### A.4.1.2. Region/State/Province etc.:

Guanacuaste and Alajuela Provinces

##### A.4.1.3. City/Town/Community etc:

Tilarán (in Guanacaste) and Guatuso (in Alajuela) Counties.
Nuevo Arenal (in Tilarán) and Cote (in Guatuso) Districts.

##### A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :

The project is located over the Guanacaste and Alajuela Provinces, over the Tilarán (in Guanacaste) and the Guatuso (in Alajuela) Counties, over the Nuevo Arenal (in Tilarán) and Cote (in Guatuso) Districts. The transmission line is located in Tilarán County. The project is approximately 3-km away from the closest population composed by the Nuevo Arenal District. The project is located approximately 4.5 hours driving from San José. The water intake is at 647.4 masl, the load chamber at 637.2 masl. and the discharge channel to the Rugama Creek at 539 masl.

The plant is located between the following coordinates:

- 10º34'29,26" North – 84º54'58,30" West.
- 10º32'51,62" North – 84º54'58,12" West.
- 10º32'51,74" North – 84º53'52,33" West.
- 10º34'29,38" North – 84º53'52,51" West.

**The Project Site**


Source: The sponsor.

### A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

The project falls into:
-Type I: Renewable Energy Projects. -Category D Version 17: Renewable electricity generation for a grid. The project conforms with this category because it is a hydropower plant that will supply electricity to a grid. The project installed capacity is 6.786 MW and will not increase its capacity beyond 15 MW; complying with the limits for small-scale project activities every year over the 14-year crediting period remaining.

That the small-scale project activity is not a debundled component of a larger project activity is further analyzed under A.4.5. Aside from using the already built water intake constructed for the Arenal hydroelectric project in 1982 the project's technology contains an open channel, an additional conducting tunnel, an underground 789.35m-1.8m diameter pressure pipe, a fore-bay, a powerhouse containing a 6.786 MW Francis Turbine (of horizontal axis and located at 547 masl), a substation located next to the power house and a sluice leading to the Rugama Creek. The powerhouse and substation will occupy an area of 18.5 ha. on land already highly disturbed and altered as a result of the construction of the Arenal hydroelectric project. The power house is 9.4m wide, 15.4m length, and 7m height. The net head is 87.79m, nominal capacity losses are 3.66m, and the water flow is 8.4$m^3$/s. All turbinated water is discharged back to the existing Rugama Creek in unaltered conditions.

The project transfers environmentally safe and sound technology and know-how to Costa Rica by:
-Serving as a small demonstrative project for clean renewable electricity generation in the country, which could also function as an IPP if developed by a private owner - this is possible under

Costa Rica's Law 7200[14] and Decree 7508[15], which support limited private ownership of renewable energy sources.

-Hiring local labor in all of its implementation phases, including the design and execution of civil works. During operation, almost all staff working in the project site is local people, previously trained when necessary[16].

### A.4.3 Estimated amount of emission reductions over the chosen crediting period:

The first crediting period is of 7 years: from 1April 2003 until 31March 2010 with the option of renewing the crediting period twice. The second crediting period goes from 1 April 2010 until 31 March 2017 with the option of renewing the crediting period one more time.

Following baseline methodology AMS-ID, the project is estimated to reduce 20,088 ERs for the duration of the second 7-year crediting period and 2,869.7 estimated ERs every year thereafter until the 14 year[17].

| Year | Annual Estimation of Emissions Reductions in tonnes of $CO_{2e}$ |
|---|---|
| 01/04/2010 – 31/12/2010 | **2,162.1** |
| 01/01/2011 – 31/12/2011 | **2,869.7** |
| 01/01/2012 – 31/12/2012 | **2,869.7** |
| 01/01/2013 – 31/12/2013 | **2,869.7** |
| 01/01/2014 – 31/12/2014 | **2,869.7** |
| 01/01/2015 – 31/12/2015 | **2,869.7** |
| 01/01/2016 – 31/12/2016 | **2,869.7** |
| 01/01/2017 – 31/03/2017 | **707.6** |
| Total Estimated Reductions (tonnes of $CO_{2e}$) 2nd crediting period | **20,088** |
| Total number of crediting years | **7** |
| Annual average over the crediting period of estimated reductions (tonnes of $CO_{2e}$) | **2,869.7** |

Source: The World Bank based on "El Cote" estimated annual generation.

14 Which promotes small-scale exploitation of hydraulic potential and other renewable energy sources to sell energy to the public electricity system: *ICE*. This Law limited the size of the unit to less than 20 MW, the aggregated installed capacity owned by private generators to less than 15% and local ownership to at least 65% of the project's capital structure.

15 Which modifies Law 7200 by raising the limits for size to less than 50 MW, the aggregated installed capacity owned by private generators to less than 30% and local ownership to at least 35% of the project's capital structure. This decree also required that the concessions for new capacity would be awarded under competitive bidding procedures; and authorized *ICE* to enter into international agreements for electricity transactions with other regional or state-owned utilities.

16 As of today, 15 people work permanently onsite, 14 out of them are local.

17 These are estimates. For each crediting period, the baseline and emission reductions will be recalculated each time.

### A.4.4. Public funding of the small-scale project activity:

No public funding is involved in this project. The project was developed by a Costa Rican public company. Initially a loan was taken from the Central American Bank for Economic Integration ("CABEI"), but the loan has been paid in full and El Cote is now 100% state owned.

### A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

Following Annex C, the project is not deemed to be a debundled component of a large project activity because there is not a registered small-scale CDM project activity or an application to register another small-scale CDM project:
-With the same project participants
-In the same project category and technology/measure;
-Registered within the previous 2 years; and -Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point. The project is the only CDM application for hydropower plant generation to which the sponsor has applied, as of today.

Hence, the project is eligible as a small-scale CDM project and can use the simplified modalities and procedures for small-scale CDM project activities.

## SECTION B. Application of a baseline and monitoring methodology

### B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:

The type and category of the project activity for the project is as follows:
-Type I: Renewable Energy Project
-Category D: Renewable electricity generation for a grid

The project falls into project category I.D. because it is a hydropower plant that will supply renewable electricity to a grid. Hence, the applicable baseline and monitoring methodology for the project is AMS-ID version 17.

### B.2 Justification of the choice of the project category:

The project falls into project category I.D. because it is a hydropower plant that will supply renewable electricity to a grid. Hence, the applicable baseline methodology for the project is AMS-ID, which is provided in Appendix B. The chosen baseline calculation following AMS-ID is the average of the "approximate operating margin" and the "build margin". The baseline calculation chosen was deemed to be superior on its compliance with the Marrakech Accords ("MA")'s baseline definition[18], than the weighted average emissions of the current generation mix for two reasons:

[18] The definition for baseline of the Marrakech Accords ("MA"), is: "The baseline for a CDM project activity is the scenario that reasonably represents the anthropogenic emissions by sources of greenhouse gases that would occur in the absence of the proposed project activity".

a) The project is more likely to mitigate fossil fuel-based electricity generation than hydro electricity generation given the *NIS* dispatch characteristics[19]; this operational fact of the *NIS*, would have been completely ignored if the weighted average emissions (in $KgCO_2$/KWh) of the current generation mix had been considered the project's baseline. However, it is taken into account (with a weight of 25%)[20] in the baseline chosen as the approximate operating margin excludes renewable energy sources[21];

b) The build margin is a more dynamic component for the baseline than the weighted average emissions (in $KgCO_2$/KWh) of the current generation mix, since the build margin focuses on the emission from the most recently-built plants[22]. At the same time, the build margin is also conservative as it is based on emissions (in $KgCO_2$/KWh) of a generation mix that do not exclude any type of electricity generation technology. In summary, it was deemed that .25OM +.75 BM combination of both margins (approximate operating margin and build margin) following AMS-ID explained better what would happen in the absence of the project activity than the weighted average emissions (in $KgCO_2$/KWh) of the current generation mix.

## B.3. Description of the project boundary:

According to methodology AMS-ID, the project boundary encompasses the physical, geographical site of the renewable electricity generation source. Hence, the project boundary is the 18.5-hectare area where the powerhouse, substation and transmission line is placed; and as the transmission line reaches the *NIS*, when connecting to *ICE*'s distribution line, the *NIS* will also be included in the project's boundary.

## B.4. Description of baseline and its development:

The project falls into project category I.D. because it is a hydropower plant that will supply renewable electricity to a grid. Hence, the applicable baseline methodology for the project is AMS-ID version 17.

According to the "Procedures for renewal of the crediting period of a registered CDM project activity" (version 06.0, EB 63), project participants shall update the sections of the PDD relating to the baseline, estimated emission reductions and the monitoring plan using an approved baseline and monitoring methodology.

***Baseline Update***

The "*Tool to assess the validity of the original/current baseline and to update the baseline at the renewal of a crediting period*" version 03.0.1 EB66, Annex 47 was used and includes the following steps:

***Step 1: Assess the validity of the current baseline for the next crediting period***

[19] Which assigns less dispatch merit order to fossil fuel-based generation than to renewable generating technologies – Merit order of NIS provided by *ICE*- can be seen in Annex 3.

[20] Given the Annex 12 "Tool to calculate the emission factor for an electricity system" (Ver 02.2.1) where it is recommended to use Wom=0.25 and WBm=0.75 for the second and third crediting period

[21] Except for LFGTE which is not excluded in the approximate operating margin for the baseline calculation, following AMS-ID ver 17.

[22] The latest capacity addition's generation up to 20% of the *NIS* generation takes new units added from 2003.

As per the methodology, if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the electricity delivered to the grid by the project activity that otherwise would have been generated by the operation of grid-connected power plants and by the addition of new generation sources. As the project is the grid connected renewable power plant, the above mentioned baseline is applicable.

The "Procedures for the renewal of the crediting period of a registered CDM project activity" approved by the CDM Executive Board require assessing the impact of new relevant national and/or sectoral policies and circumstances on the current applied baseline.

***Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies***

The V National Energy Plan 2008-2021 (PNE)[23] provides the energy legal framework for Costa Rica and information on the energy mix and perspectives for electricity generation as well as its status. Even though Costa Rica has great hydroelectric and geothermal potential, currently it has been decreasing due to the restriction to generate electricity in National parks and protected areas and the lack of updated legislation in terms of hydro resources.

The main challenge of the electricity sector is the feasibility and sustainability of its National Energy Plan together with the associated finance. If legislation is not amended to provide a proper framework for private investment in sensitive areas such as power generation, the risk could be rationing between 2008 and 2010. There are two main weaknesses identified: first, there is no previous experience in terms of market competition in the sector and second, the judicial inequity between enterprises in the sector without counting the legal gaps resulting from the lag in the design of new norms.

From its analysis it is concluded that the current baseline complies with all relevant mandatory national and/or sectoral policies which have come into effect after the submission of the project activity for validation or the submission of the previous request for renewal of the crediting period and are applicable at the time of requesting renewal of the crediting period.

***Step 1.2: Assess the impact of circumstances***

Assess the impact of circumstances existing at the time of requesting renewal of the crediting period on the current baseline emissions, without reassessing the baseline scenario.

The new circumstances related to electricity generation are similar to when the PDD was first submitted for registration. A restrictive, fragmented and disperse legal and regulatory framework persists and as such limits the development of electricity generation. The development model of the country has been successful but has also been affected by the delicate fiscal situation inhibiting the availability of finance for the development of pre-feasibility studies for project development.

The perspective of a scenario where the status quo remains implies a greater thermoelectric power generation instead of renewable generation in the medium and long run, as well as an inefficient use of energy and strong peak demand and vulnerability due to a greater consumption of hydrocarbons for power generation.

[23] V National Energy Plan 2008-2021, Energy and Environment Ministry (MINAE), 7March, 2008.

Due that the same circumstances prevail as when the last PDD was submitted, the continued validity of the current baseline is plausible.

***Step 1.3: Assess whether the continuation of the use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested.***

As the project activity involves a grid connected hydro power plant where in the absence of the project activity, the project participants would not have constructed the plant but where the electricity would have been generated by the operation of grid-connected power plants and by the addition of new generation sources. It is assessed that the remaining technical lifetime of the equipment that would have continued to be used in the absence of the project activity, exceeds the crediting period for which renewal is requested.

***Step 1.4: Assessment of the validity of the data and parameters***

The data and parameters have been verified and some of them need to be updated. That is the case of the emission factor for the electricity grid and the corresponding IPCC default values for fuel type, therefore the baseline needs to be updated for the subsequent crediting period and we go to step 2.

***Step 2: Update the current baseline and the data and parameters***
As step 1.4 showed that the current baseline needs to be updated, we go to the next step:

***Step 2.1: Update the current baseline***

Given that the application of Steps 1.1, 1.2, 1.3 and 1.4 confirmed that the current baseline is still valid for the subsequent crediting period, then this baseline can be used for the renewed crediting period.

***Step 2.2: Update the data and parameters***
If the application of Step 1.4 showed that the data and/or parameter(s) that were only determined at the start of the crediting period and not monitored during the crediting period are not valid anymore, project participants should update all applicable data and parameters, following the guidance in Step 1.4. Accordingly, this step has been implemented and updated the relevant parameters in the emission factor calculations.

To look at the baseline update in terms of data and parameters estimates go to section B.6.3

**B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:**

The project generates electricity without emitting GHGs and supplies it to the *NIS;* thereby it displaces expensive fossil-fuel based electricity generation that otherwise would be supplied to the *NIS*[24]. Also, the project would displace future generation facilities in the *NIS*, given that the *NIS* Expansion Plan considers a raise in the participation of fossil fuel-fired power plants across future years due to their shorter

[24] The project generates electricity mostly during hours of high demand, when it is more likely that otherwise fossil fuel-based electricity would have been dispatched. This is due to the environmental limit in the level of Cote Lakes' water monitored by *SETENA* (the minimum and maximum heights of the Cote Lake's water level must be 647.44 masl and 648.50 masl, respectively), which restraints the project's number of hours of operation. This fact allows the project to choose in which hours it operates.

construction time, lower construction risks, lower turnkey cost and greater reliability to satisfy the growing annual demand, as shown in the table below.

**Expected Average Generation in the Recommended Latest Expansion Plan of *ICE* (2005-2015)**

| Year | Fossil Fuel (%) | Renewable (%) | Total (GWh) |
|---|---|---|---|
| **2005** | 6% | 94% | 8,319 |
| **2006** | 7% | 93% | 8,766 |
| **2007** | 9% | 91% | 9,233 |
| **2008** | 10% | 90% | 9,720 |
| **2009** | 9% | 91% | 10,235 |
| **2010** | 11% | 89% | 10,776 |
| **2011** | 13% | 87% | 11,350 |
| **2012** | 11% | 89% | 11,953 |
| **2013** | 14% | 86% | 12,580 |
| **2014** | 17% | 83% | 13,226 |
| **2015** | 19% | 81% | 13,916 |

Source: The World Bank based on table 5.2 *ICE*'s Latest Expansion Plan

The table above shows that the participation of fossil fuel–based generation in the total country's generation will grow from 6% in 2005 to 19% in 2015.

The formulae used to estimate the anthropogenic emissions by sources of GHG's in the baseline, which can be seen under B.6.3, is based on the project's baseline emissions calculation described in methodology AMS-ID, for a system where **not** all generators use exclusively fuel oil and/or diesel fuel. Following baseline methodology AMS-ID, the project is estimated to reduce 20,088 $tCO_{2e}$ for the duration of the second 7-year crediting period. The baseline emissions are deemed to represent emissions that would occur in the absence of the project, and therefore emissions that will be mitigated by the project; given the project additionality detailed under Attachment A of Appendix B of the Simplified Modalities and Procedures for small-scale CDM Project Activities ("Appendix B").

The project is additional because it would not have occurred anyway due to three out of the four barriers listed in Attachment A to Appendix B.

**(a) Investment Barrier:** The investment barriers identified were two, the high turnkey cost and the low load factor.

-The much higher up-front investment cost need for hydropower plants than for fossil fuel-fired power plants makes fossil fuel power plants a more financially viable alternative than hydropower plants for generation. The table below shows the turnkey cost[25] per MW of different technologies.

**<u>Technology Diesel Engine Simple Cycle River Comparison Gas Turbine Hydro</u>**

| Technology Comparison | Diesel Engine | Simple Cycle Gas Turbine | River Hydro |
|---|---|---|---|
| Size Range (MW) | 0.02 – 25 | 0.5 - 450 | .02 - 1 |

[25] Turnkey meaning the investment needed to put a power plant in operation.

| | | | |
|---|---|---|---|
| Efficiency (%) | 36% - 43% | 21% - 45% | 60-70% |
| Gen Set Cost ($/MW) | 125,000 to 300,000 | 300,000 to 600,000 | NA |
| Turnkey Cost-No Heat Recovery ($/MW) | 200,000 to 500,000 | 300,000 to 650,000 | 750,000 to 1,200,000 |

Source: Meherwan P. Boyce, Ph.D, P.E (2002); "Gas Turbine Engineering Handbook", p.8

The following table shows the final turnkey cost for the project:

| | |
|---|---|
| Total Cost of The Project ($) | $15,740,590.80 |
| Installed Capacity (MW) | 6.786 |
| **Turnkey Cost ($/MW)** | **$2,319,568** |

Source: The sponsor - Financial Department

With such high initial investment cost per MW, the sponsor needed to raise debt to solve its need of capital as well as its need of sharing the risk involved. However, at present the debt has been paid in full.

-The project's load factor of 22% was very low. Load factors of renewable energy[26] latest capacity addition added to the *NIS* are much higher, as shows the table below.

| Years | Technology | Added Inst.Cap (MW) | Annual Generation(MWh) | Load Factor(%) |
|---|---|---|---|---|
| **1999** | | | | |
| MOVASA (eólico) | Wind | 19 | 71,396 | 42% |
| **2000** | | | | |
| ANGOSTURA | Hydro | 172 | 746,616 | 49% |
| MIRAVALLES III | Geothermal | 30 | 219,203 | 85% |
| LA ESPERANZA | Hydro | 6 | 26,789 | 56% |
| **2001** | | | | |
| **2002** | | | | |
| GARITA 5 | Hydro | 7 | 34,364 | 53% |
| TEJONA | Wind | 20 | 79,386 | 46% |
| PEÑAS BLANCAS | Hydro | 38 | 190,716 | 58% |
| **2003** | | | | |
| PEÑAS BLANCAS | Hydro | 0.4 | 2,183 | 58% |
| COOPELESCA-CHOCOSUELA | Hydro | 17 | 68,481 | 45% |
| CNFL | Hydro | 7 | 32,207 | 50% |
| **2004** | | | | |
| MIRAVALLES V | Geothermal | 21 | 144,410 | 79% |
| CACHI | Hydro | 8 | 34,213 | 49% |

Source: The World Bank based on *ICE -Centro Nacional de Control de Energía* (*NIS* Dispatch Center) data.

The lowest load factor of the list above is almost double than that of the project. Consequently the debt and equity raised for the project would take longer to be repaid than other renewable energy investments in Costa Rica would. In this scenario, only the prospects of carbon finance revenue are capable of lower the investments barriers faced by the project.

**(b) Technological barrier:** The project's technological barriers were the two listed below.

[26] Excluding biomass and landfill-gas-to energy generating activities, whose generation depends on factors other than the renewable energy source availability.

-The project is located in an area with high seismic activity that could generate problems associated with landslides for the project slopes around the infrastructure (*taludes*) as well as damages to the infrastructure.

-Superficial water could increase the weight of the slopes around the infrastructure (*taludes*) and reduce the angle of soil friction increasing the probability of landslides.
These conditions increased the likelihood of potential technical inconveniences and cost increases. In fact, due to construction contingencies the turnkey cost of the project went from an initially forecasted conservative estimate of $1,719,640/MW[27] to $2,319,568/MW[28], all the extra-cost was assumed by the sponsor. These land-instability contingencies not only increased costs (5.6 times the originally planned contingencies, going from $500,000 to $3,285,000), but also extended the project construction period in 1-year; the total project construction period took 3 years and 3 months to be built: From December 2000 to March 2003. The works to reinforce the land stability were performed between October 19 2001 (date of an unexpected landslide) and November 2002. Regardless of size, fossil fuel-fired plants are a less technologically advanced option[29]as well as a less technologically risky option[30].

**d) Other barriers:** Costa Rican fiscal deficit, can seriously affect hydropower-plant development. At the start of the project's construction phase (22 December, 2000), Costa Rica's fiscal deficit[31] and the deceleration of the economy[32] started to limit stated-owned enterprises' levels of investment and financial leverage. As the fastest way to decrease fiscal deficit (and thus avoid triggering inflation) is to cut expenses including investments in infrastructure, and as government is still the main investor in energy in Costa Rica[33], energy investments have plunged in recent years as the following table shows:

| Years | Technology | Added Inst.Cap (MW) | Additional Annual Clean Energy Capacity (MW) |
|---|---|---|---|
| **2000** | | | |
| ANGOSTURA | Hydro | 172 | |
| MIRAVALLES III | Geothermal | 30 | |
| LA ESPERANZA | Hydro | 6 | 207 |
| **2001** | | | 0 |
| **2002** | | | |
| GARITA 5 | Hydro | 7 | |
| TEJONA | Wind | 20 | |
| PEÑAS BLANCAS | Hydro | 38 | 65 |
| **2003** | | | |
| PEÑAS BLANCAS | Hydro | 0.4 | |
| MOIN GAS - C.N.F.L.2 | Diesel | 90 | |
| COOPELESCA-CHOCOSUELA | Hydro | 17 | |
| CNFL | Hydro | 7 | |
| INGENIO TABOGA S.A. 10 | Biomass | 17 | 42 |

[27] $11,669,479/6.786MW.

[28] $15,740,591/6.786MW.

[29] Hydropower plants constitute a much more challenging investment than fossil fuel-fired power plants, in terms of technology.

[30] Given that the particular hydrological and geological conditions and possible design failures can only be fully known ex-post - hydropower plants' are more vulnerable to natural events including earthquakes and droughts, which increase probabilities of technical inconveniences.

[31] Taken from Yahoo Finance "Costa Rica's Background": "Over the past four years the consolidated deficit has been equivalent to 3.5% to 4% of GDP; interest rates in the country are high both in nominal and in real terms and that adds significantly to the deficit problem, as public debt is now 50% of GDP, high interest payments on debt make closing the budget gap doubly difficult".

[32] Taken from Yahoo Finance "Costa Rica's Background": "In particular, the year 2000 saw a dramatic deceleration of the economy with GDP growth down to 1.7% in 2000 from 8.4% in the year 1999. The slowdown continued in 2001 when the economy grew just one percent.

[33] Stated owned enterprises are the main electricity generation investors in the country -*ICE* and *CNFL* were responsible for 77% and 5% of the generation in the country, respectively, during 2004.

| | | | |
|---|---|---|---|
| **2004** | | | |
| MIRAVALLES V | Geothermal | 21 | |
| RIO AZUL | LFGTE | 4 | |
| CACHI | Hydro | 8 | 33 |

Source: The World Bank

Renewable energy developments are an extremely sensitive source to long-term capital sources availability[34] due to their greater turnkey cost per MW installed and capital cost. Since opting for more viable alternatives than the project would have led to higher emissions, the project is additional under Attachment A to Appendix B.

## B.6. Emission reductions:

### B.6.1. Explanation of methodological choices:

The project complies with all the requirements that qualify it for the use of the simplified baseline and simplified monitoring for small-scale project activities. In particular the project:

a) Falls into project category I.D, listed in Appendix B, and uses the baseline methodology calculation AMS-ID, the parameters and emission factors have been updated as per the "*Tool to assess the validity of the original/current baseline and to update the baseline at the renewal of a crediting period*" Version 03.0.1 (EB 66, Annex 47).

b) Would otherwise not be implemented due to the existence of one or more of the barriers listed in Attachment A of Appendix B.

c) Is a renewable energy project activity with 6.786MW of installed capacity[35]

d) Is not a debundled component of a larger project activity, as determined by Annex C.

### B.6.2. Data and parameters that are available at validation:

| **Data / Parameter:** | **$EF_{CO2,grid,y}$** |
|---|---|
| Data unit: | $tCO_2/MWh$ |
| Description: | Emission factor of the grid, Combined Margin |
| Source of data used: | Calculated. Official statistics from ICE for electricity generation clustered by technology 2004, 2005, 2006, 2007, 2008 |
| Value applied: | **0.2022** $tCO_2/MWh$ |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | This value was calculated according to "Tool to calculate the emission factor for an electricity system (version 02.2.1)." Applied value was calculated by referring to Official NIS Statistics for electricity generation (2004, 2005, 2006, 2007, 2008) |
| Any comment: | This value will be calculated ex-ante and fixed for the entire crediting period. |

[34] And also sensitive to macroeconomic factors that shows volatility in the economy - such as high interest rates level and inflation risks .

[35] 15 MW is the limit stipulated in paragraphs 6(c) of decision 17/CP.7 – which clears the use of Appendix B for baseline and monitoring.

| | |
|---|---|
| **Data / Parameter:** | EFOM, y |
| Data unit: | tCO2/MWh |
| Description: | Operating Margin emission factor |
| Source of data used: | Calculated |
| Value applied: | **0.0602** $tCO_2$/MWh |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | This value was calculated according to “Tool to calculate the emission factor for an electricity system (version 02.2.1).” Applied value was calculated by referring Official ICE Statistics for electricity generation (2004, 2005, 2006, 2007, 2008). |
| Any comment: | -This data will be calculated at the time of PDD submission and will not be changed during the second crediting period. |

| | |
|---|---|
| **Data / Parameter:** | **EFBM, y** |
| Data unit: | $tCO_2$/MWh |
| Description: | Build Margin emission factor |
| Source of data used: | Calculated |
| Value applied: | 0.2495 $tCO_2$/MWh |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | This value was calculated according to “Tool to calculate the emission factor for an electricity system (version 02.2.1).” Applied value was calculated by referring Official ICE Statistics for electricity generation (2004, 2005, 2006, 2007, 2008). |
| Any comment: | This data will be calculated at the time of PDD submission and will not be changed during the second crediting period. |

| | |
|---|---|
| **Data / Parameter:** | **FCi,m,y** |
| Data unit: | mass or volume unit |
| Description: | Amount of fossil fuel type i consumed by power plant / unit m in year y |
| Source of data used: | Official statistics from ICE for electricity generation clustered by technology 2004, 2005, 2006, 2007, 2008 |
| Value applied: | See the <Table Annex-3> |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Applied value was calculated by referring to Official NIS Statistics for electricity generation (2004, 2005, 2006, 2007, 2008). |
| Any comment: | The same value will be applied during the second crediting period without updating. |

| | |
|---|---|
| **Data / Parameter:** | $\mathbf{NCV_{i,y}}$ |
| Data unit: | GJ/mass or volume unit |
| Description: | Net calorific value (energy content) of fossil fuel type *i* in year *y* |
| Source of data used: | IPCC default values at the lower limit of the uncertainty at a 95% confidence |

| | |
|---|---|
| | interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories. |
| Value applied: | Default values |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | By means of the net calorific values is calculated the apparent fuel consumed during each year by the generating units. |
| Any comment: | |

| **Data / Parameter:** | **$EFCO_2$,i,y** |
|---|---|
| Data unit: | $tCO_2$/TJ |
| Description: | $CO_2$ emission factor of fossil fuel type i in year y |
| Source of data used: | 2006 IPCC Guidelines on National GHG Inventories |
| Value applied: | See the < Annex-3> |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | IPCC default values at the lower limit of the uncertainty at 95% confidence interval as provided in table 1.4 of Chapter1 of Vol.2 (Energy) |
| Any comment: | The same value will be applied during the second crediting period without updating. |

| **Data / Parameter:** | **$EG_{m,y}$** |
|---|---|
| Data unit: | MWh |
| Description: | Net electricity generated and delivered to the grid by power plant / unit *m* in year *y* |
| Source of data used: | Official statistics from ICE for electricity generation clustered by technology 2006, 2007, 2008 |
| Value applied: | See the < Annex-3> |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Official statistics from ICE for electricity generation clustered by technology for years 2006, 2007, 2008 is used.<br><br>Electricity generated by the plants data is used to calculate the apparent fuel consumed per plant and Operating Margin and Build Margin. Electricity is measured through equipment measurement installed in each plant. |
| Any comment: | |

| **Data / Parameter:** | **$\eta_{m,y}$** |
|---|---|
| Data unit: | |
| Description: | Average net energy conversion efficiency of power unit *m* in year *y* |
| Source of data used: | Data from the dispatch center |
| Value applied: | See the < Annex-3> |
| Justification of the | |

| | |
|---|---|
| choice of data or description of measurement methods and procedures actually applied : | |
| Any comment: | |

The calculation of the OM and BM emission factors were submitted to DOE as an excel file. It Includes the following information:

• Information to clearly identify the plant
• The date of commissioning
• The fuel type(s) used
• The quantity of net electricity generation in the relevant year(s)
• The fuel consumption of each fuel type in the relevant year(s)

**B.6.3 Ex-ante calculation of emission reductions:**

According to AMS I.D version 17, Emission reductions are calculated as follows:

$ER_y = BE_y - PE_y - LE_y$

Where:
$ER_y$ Emission reductions in year *y* (t $CO_{2e}$/y).
$BE_y$ Baseline Emissions in year *y* (t $CO_{2e}$/y).
$PE_y$ Project emissions in year *y* (t $CO_2$/y).
$LE_y$ Leakage emissions in year *y* (t $CO_2$/y).

<u>Baseline Emissions</u>
The formulae used to estimate the anthropogenic emissions by sources of GHG's in the baseline is based on the project's baseline calculation described in methodology AMS I.D. Baseline emissions include only $CO_2$ emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants.

The baseline emissions are the product of electrical energy baseline $EG_{BL,\ y}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by an emission factor.

$BEy = EG_{BL,y} * EF_{CO2,grid,y}$

Where:

BEy Baseline Emissions in year y; t $CO_2$
$EG_{BL,y}$ Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year *y* (MWh)
$EF_{CO2,grid,y}$ $CO_2$ Emission Factor in year y; t $CO_{2e}$/MWh

The Emission Factor can be calculated in a transparent and conservative manner as follows:

(a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the 'Tool to calculate the Emission Factor for an electricity system's version 02.2.1 EB 63.

**$CO_2$ EMISSION FACTOR CALCULATION PROCEDURE**

As per the 'Tool to calculate the Emission Factor for an electricity system' version 02.2.1 EB 63, Project participants shall apply the following six steps to calculate the $CO_2$ emission factor of the electricity system connected:

STEP 1. Identify the relevant electricity systems.
STEP 2. Choose whether to include off-grid power plants in the project electricity system (optional).
STEP 3. Select a method to determine the operating margin (OM).
STEP 4. Calculate the operating margin emission factor according to the selected method.
STEP 5. Calculate the build margin (BM) emission factor.
STEP 6. Calculate the combined margin (CM) emissions factor.

***Step 1. Identify the relevant electric power system***

Costa Rica's National grid (National Interconnected System NIS) is identified as the relevant electricity system. It is the grid which serves the whole country.

For determining the electricity emission factors, the project electricity system is the spatial extent of the power plants connected to the National Interconnected system and dispatched without significant transmission constraints. The spatial extent of the project boundary includes the project site and all power plants connected physically to the electricity system.

**STEP 2. Choose whether to include off-grid power plants in the project electricity system (optional).**

PE has chosen Option I: not to include off-grid power plants in project electricity system

**STEP 3. Select a method to determine the operating margin (OM).**

The calculation of the operating margin emission factor ($EFgrid,OM,y$) is based on one of the following methods:

(a) Simple OM, or

(b) Simple adjusted OM, or

(c) Dispatch data analysis OM, or

(d) Average OM.

The simple OM method (option a) can only be used if low-cost/must-run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.

Based on data on the Costa Rica's grid's total generation from 2004 to 2008, low-cost must-run facilities

make up more than 50% of the generation during the last five years, and therefore the choice of option (a) is not appropriate for this project activity (see Table 1A).

**Table 1A. Composition of the Total Plants Generation during the five most recent years (2004-2008) in %**

| | 2004 Gen. Elect. | 2005 Gen. Elect. | 2006 Gen. Elect. | 2007 Gen. Elect. | 2008 Gen. Elect. | Average Gen. Elect. | Low Cost Must Run. |
|---|---|---|---|---|---|---|---|
| **Thermal** | 0.98% | 3.45% | 6.31% | 8.18% | 7.43% | 5.27% | **5.27%** |
| **Hydro** | 80.81% | 79.95% | 76.39% | 75.32% | 78.44% | 78.18% | **94.73%** |
| **Geothermal** | 14.95% | 13.98% | 14.06% | 13.78% | 12.01% | 13.76% | |
| **Wind** | 3.19% | 2.48% | 3.16% | 2.68% | 2.11% | 2.73% | |
| **Biomass** | 0.06% | 0.15% | 0.08% | 0.05% | 0.01% | 0.07% | |

Source: World Bank's own estimate based on Table 1 (see Annex 3).

As there is not enough data available for calculating the OM using options (b) and (c) in Costa-Rica, these options are eliminated and finally, Option (d) – Average OM is chosen for the project activity.

For the average OM, the emissions factor was calculated using the following data vintage:

- Ex ante option: A 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period,

***Step 4. Calculate the operating margin emission factor according to the selected method***

The average OM emission factor ($EF_{grid,OM-ave,y}$) is calculated as the average emission rate of all power plants serving the grid, using the methodological guidance as described under (a) above for the simple OM, but also including the low-cost/must-run power plants in all equations.

Therefore, the average OM can be calculated using the following options:

Option A: Based on the net electricity generation and a $CO_2$ emission factor of each power unit; or

Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

Accordingly, Option A is used to calculate the OM emission factor based on the electricity generation of each power unit and an emission factor for each power unit, as follows:

*Option A - Calculation based on average efficiency and electricity generation of each plant*
Under this option, the simple OM emission factor is calculated based on the net electricity generation of each power unit and an emission factor for each power unit, as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_{m} EG_{m,y} \cdot EF_{EL,m,y}}{\sum_{m} EG_{m,y}}$$

Where:
$EF_{grid,OMsimple,y}$ = Simple operating margin $CO_2$ emission factor in year *y* ($tCO_2$/MWh)
$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)
$EF_{EL,m,y}$ = $CO_2$ emission factor of power unit *m* in year *y* ($tCO_2$/MWh)
m = All power units serving the grid in year *y* including low-cost / must-run power units
y = The relevant year as per the data vintage chosen in Step 3

*Determination of $EF_{EL,m,y}$*

The emission factor of each power unit *m* is determined using Option A1 as follows:

Option A1. If for a power unit *m* data on fuel consumption and electricity generation is available, the emission factor $EF_{EL,m,y}$ should be determined as follows:

$$EF_{EL,m,y} = \frac{\sum_{i} FC_{i,m,y} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{EG_{m,y}}$$

Where:
$EF_{EL,m,y}$ = CO2 emission factor of power unit *m* in year *y* (tCO2 /MWh)
FCi,m,y = Amount of fossil fuel type *i* consumed by power unit *m* in year *y* (Mass or volume unit); this has been calculated based on the specific fuel consumption data (kWh/l) available
NCVi,y = Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ/mass or volume unit)
EFCO2,i,y = CO2 emission factor of fossil fuel type *i* in year *y* (tCO2/GJ)
EG m,y = Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)
m = All power units serving the grid in year *y* except low-cost/must-run power
i = All fossil fuel types combusted in power unit *m* in year *y*
y = The relevant year as per the data vintage chosen in Step 3

EGm,y is sourced from the official data sources available in the country. As ex-ante option is used for this, the most recent three historical years (i.e. 2006, 2007 and 2008) for which data is available at the time of submission of the CDM-PDD to the DOE for validation is used.

## OPERATING MARGIN:

| Operating Margin | A | B | C | D |
|---|---|---|---|---|
| | Total Emissions | Total Generation, EG m,y | OM by year; $EF_{EL,m,y}$: | OM Weighted Average |
| | (tCO2) | (MWh) | (tCO2 / MWh) | (tCO2 / MWh) |
| **2006** | **463,971.0** | **8,730,272.41** | **0.0531** | **0.0602** |
| **2007** | **629,104.6** | **9,153,201** | **0.0687** | |
| **2008** | **549,882.5** | **9,413,089.68** | **0.0584** | |

Source: World Bank´s estimates based on Instituto Costarricense de Electricidad (ICE) Annual Summary 2006-2008

Considering the above factors, assumptions, and the operation of the Costa Rica power system from 2006 to 2008, and applying the Average OM method, the result is:

$$EF_{grid,OMsimple,y} = \frac{\sum_m EG_{m,y} \cdot EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

$EF_{grid,OMsimple,y}$ = (8,730,271.41 x 0.0531 + 9,153,201 x 0.0687 + 9,413,089.68 x 0.0584) / ((8,730,271.41 + 9,153,201 + 9,413,089.68)

$EF_{grid,OMsimple,y}$ = 0.0602 $tCO_2$ / MWh

***(Annex 3 includes the OM estimates)***

***Step 5. Calculate the build margin (BM) emission factor***

In terms of vintage of data Option 1 is chosen:

*Option 1*. For the first crediting period, calculate the build margin emission factor *ex-ante* based on the most recent information available on units already built for sample group *m* at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

The sample group of power units m used to calculate the build margin is determined as per the following procedures :

(a) The set of five power units that started to supply electricity to the grid most recently ($SET_{5\text{-units}}$) and their annual electricity generation ($AEG_{SET\text{-}5\text{-units}}$) are listed in the table below (excluding power units registered as CDM project activities).

The 5 most recently built capacity addition up to 2008 were Arrendamiento San Antonio, Arrendamiento Barranca, El Viejo, Taboga and Canalete with a total generation of 291 GWh in 2008.

| $SET_{5\text{-units}}$ | $AEG_{SET\text{-}5\text{-units}}$ (MWh) |
|---|---|
| Arrendamiento San Antonio | 144.00 |
| Arrendamiento Barranca | 60.00 |
| El Viejo | 7.00 |
| Taboga | 15.00 |
| Canalete | 65.00 |
| **Total** | **291.00** (equivalent to **3.09** % of the $AEG_{total}$) |

(b) The annual electricity generation in 2008 of the project electricity system, excluding power units registered as CDM project activities is: $AEG_{total}$ = 9114.72 MWh. The set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of $AEG_{total}$ are identified in table below as $SET_{\geq 20\%}$ along with their annual electricity generation ($AEG_{SET\text{-}\geq 20\%}$, in MWh).

The following table shows the list of plants from the electricity system that comprise 20% of the system generation and that have been built most recently:

**Build Margin Emission factor for 20% of System Generation**

| A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|
| **Power Plant** | **Technology** | **Start** | **GEN. 2008 (GWh)** | **GEN. 2008 excluding generation from CDM projects** | **Accum GEN. 2008** | **Share out of total generation** |
| | | | | **(GWh)** | **(GWh)** | **(%)** |
| **Arrendamiento Barranca** | **Thermal** | **2008** | **60** | **60.00** | **60.00** | 0.64% |
| **Arrendamiento San Antonio** | **Thermal** | **2008** | **144** | **144.00** | **204.00** | 2.17% |
| **El Viejo** | **Bagasse** | **2008** | **7** | **7.00** | **211.00** | 2.24% |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Taboga** | **Bagasse** | **2008** | **15** | **15.00** | **226.00** | 2.40% |
| **Canalete** | **Hydro** | **2007** | **65** | **65.00** | **291.00** | **3.09%** |
| **Cariblanco** | **Hydro** | **2007** | **299** | **299.00** | **590.00** | **6.27%** |
| **General** | **Hydro** | **2006** | **198** | **198.00** | **788.00** | **8.37%** |
| **La Joya (*)** | **Hydro** | **2006** | **281** | | **788.00** | **8.37%** |
| **Puhol –Guápiles** | **Thermal** | **2006** | **52** | **52.00** | **840.00** | **8.93%** |
| **Puhol** | **Thermal** | **2006** | **36** | **36.00** | **876.00** | **9.31%** |
| **Rio Azul (*)** | **Bagase** | **2004** | **1** | | **876.00** | **9.31%** |
| **CNFL(**)** | **Hydro** | **2003** | **408** | **393.72** | **1,269.72** | **13.49%** |
| **Coopelesca** | **Hydro** | **2003** | **100** | **100.00** | **1,369.72** | **14.55%** |
| **Moin Gas** | **Thermal** | **2003** | **324** | **324.00** | **1,693.72** | **18.00%** |
| **Miravalles 5** | **Geothermal** | **2003** | **108** | **108.00** | **1,801.72** | **19.14%** |
| **Penas Blancas** | **Hydro** | **2002** | **162** | **162** | **1,963.72** | **20.87%** |
| | | | **2260** | | **1,963.72** | **20.87%** |

(*) MDL: La Joya , Rio Azul and El Cote
(**) CNFL excluding EL Cote (6.3 MW, 13.96 GWh)

Source: World Bank´s own estimates based on the table 4 (see Annex 3).

The plant built in 2002 that enters the latest 20% added installed capacity (in generation) sample for the BM is Penas Blancas hydro.

(c) From $SET_{5\text{-units}}$ and $SET_{\geq 20\%}$, the set of power units that comprises the larger annual electricity generation ($SET_{sample}$) is identified as $\mathbf{SET_{\geq 20\%}}$. Dates when the power unit in $SET_{sample}$ started to supply electricity are identified the table above (all less than 10 years ago) and found that none of the power plants have started supplying electricity to the grid more than 10 years ago.

The 5 most recently built capacity addition up to 2008 were Arrendamiento San Antonio, Arrendamiento Barranca, El Viejo, Taboga and Canalete with a total generation of 291 GWh in 2008. The 20% most recently built capacity addition, in generation, comprise the plants listed above from year 2002 and this sample comprises a total generation of 1,964.04 GWh in 2008. Hence, the selected sample for the BM was composed by the latter group, as its generation output was greater.

Sub-steps d) to f) do not apply since power units listed are all less than 10 years ago.

The build margin emissions factor is the generation-weighted average emission factor ($tCO_2/MWh$) of all power units *m* during the most recent year *y* for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

Where:
$EF_{grid,BM,y}$ = Build margin $CO_2$ emission factor in year *y* ($tCO_2$ /MWh)
$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)
$EF_{EL,m,y}$ = $CO_2$ emission factor of power unit *m* in year *y* ($tCO_2$/MWh)
m = Power units included in the build margin
y = Most recent historical year for which power generation data is available

The $CO_2$ emission factor of each power unit *m* (EFEL,m,y) should be determined as per the guidance in Step 4 (a) for the simple OM, using options A1, A2 or A3, using for *y* the most recent historical year for which power generation data is available, and using for *m* the power units included in the build margin. Accordingly, Option A1 is used just similar to the one used for OM calculations under Step 4.

The table below shows the weighted average emissions of the most recent 20% of power plants built in generation (selected sample for the BM):

**BUILD MARGIN:**

| **Build Margin 2008** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Plant** | **Start** | **Technology** | **GEN. 2008 (GWh)** | **GEN. excluding CDM projects generation 2008 (GWh)** | **Acum. Gen. 2008 (GWh)** | **Share (%)** | **Emission ($tCO_2$)** |
| Arrend. Barranca | 2008 | Thermal | 60 | 60 | 60 | **0.64%** | 42,192.88 |
| Arrend. San Antonio | 2008 | Thermal | 144 | 144 | 204 | **2.17%** | 101,034.07 |
| El Viejo | 2008 | Bagasse | 7 | 7 | 211 | **2.24%** | 0 |
| Taboga | 2008 | Bagasse | 15 | 15 | 226 | **2.40%** | 0 |
| Canalete | 2007 | Hydro | 65 | 65 | 291 | **3.09%** | 0 |
| Cariblanco | 2007 | Hydro | 299 | 299 | 590 | **6.27%** | 0 |
| General | 2006 | Hydro | 198 | 198 | 788 | **8.37%** | 0 |
| La Joya (*) | 2006 | Hydro | 281 | 0 | 788 | **8.37%** | 0 |
| Puhol - Guápiles | 2006 | Thermal | 52 | 52 | 840 | **8.93%** | 33,185.09 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Pujol | 2006 | Thermal | 36 | 36 | 876 | **9.31%** | 22,805.86 |
| Río Azul (*) | 2004 | Bagasse | 1 | 0 | 876 | **9.31%** | 0 |
| CNFL (*) | 2003 | Hydro | 408 | 393.72 | 1,269.72 | 13.49% | 0 |
| COOPELESCA | 2003 | Hydro | 100 | 100 | 1,369.72 | 14.55% | 0 |
| Moín Gas | 2003 | Thermal | 324 | 324 | 1,693.72 | 18.00% | 290,747.54 |
| Miravalles V | 2003 | Geothermal | 108 | 108 | 1,801.72 | 19.14% | 0 |
| Peñas Blancas | 2002 | Hydro | 162 | 162 | 1,963.72 | 20.87% | 0 |
| | | | **2,260** | **1,963.72** | | | **489,965.45** |

Source: The World Bank, with *ICE -Centro Nacional de Control de Energía* (*NIS* Dispatch Center) data.

| **2008** | | |
|---|---|---|
| **Emissions:** | **489,965.45** | **( $tCO_2$ )** |
| **Generation:** | **1,963,718** | **( MWh )** |
| **BM** | 0.2495 | **($tCO_2$ / MWh)** |

***Step 6. Calculate the combined margin (CM) emissions factor***

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on one of the following methods:

(a) Weighted average CM; or
(b) Simplified CM.

In this case (a) the weighted average CM is used.

***(a) Weighted average CM***

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times W_{OM} + EF_{grid,BM,y} \times W_{BM}$$

Where:
$EF_{grid,BM,y}$ = Build margin $CO_2$ emission factor in year *y* ($tCO_2$/MWh)
$EF_{grid,CM,y}$ = Operating margin $CO_2$ emission factor in year *y* ($tCO_2$/MWh)

$w_{OM}$ = Weighting of operating margin emissions factor (%)
$w_{BM}$ = Weighting of build margin emissions factor (%)

The following default values should be used for $w_{OM}$ and $w_{BM}$:

Hydro projects: $w_{OM}$ = 0.25 and $w_{BM}$ = 0.75 for the second and third crediting period, unless otherwise specified in the approved methodology which refers to this tool.

The CM was calculated as the simple average of both the resulting OM and the resulting BM. All margins expressed in $KgCO_2$/KWh. The formula used for the CM was:
CM = 0.25 x OM + 0.75 x BM[36]

The CM obtained was:

| 0.25 | OM | 0.75 | BM | CM |
|---|---|---|---|---|
| | (Ton $CO_2$/MWh) | | (Ton $CO_2$/MWh) | ( Ton$CO_2$ /MWh) |
| **0.25** | **0.0602** | **0.75** | **0.2495** | **0.2022** |

| | | |
|---|---|---|
| **CM =** | **0.2022** | **(Ton$CO_2$ /MWh)** |

**Step 4 – Ex-ante calculation of the project ERs**

The estimated ERs per year for the project are equal to the baseline emissions, obtained from the following formula:

Estimated ERs per year = CM x (Estimated EGy).

**Estimated ERs per year = 0. 2022 t$CO_2$/MWh x 14,194 KWh = 2,869.7 t$CO_{2e}$ ERs.**

The ERs estimated for the second crediting period add up to **20,088 t$CO_{2e}$**. This calculation can be seen in the table below:

| A | B | C | D | E |
|---|---|---|---|---|
| **SECOND CREDITING PERIOD (2010 - 2017)** | | | | |
| | Year | CM | Annual Generation | Emission Reduction |
| | | | | E=( D * C ) |
| DATES OF CERS DELIVERY | | (Ton$CO_2$ /MWh) | ( Thousand KWH ) | (Thousand Kg $CO_2$) |
| | | **0.2022** | **14,194** | **2,162.1** |

36 As per Meth AMS I.D suggestion of percentages for OM and BM for the 2nd crediting period.

| | | | |
|---|---|---|---|
| **01/04/2010 - 31/12/2010** | **0.2022** | **14,194** | **2,869.7** |
| **01/01/2011 - 31/12/2011** | **0.2022** | **14,194** | **2,869.7** |
| **01/01/2012 - 31/12/2012** | **0.2022** | **14,194** | **2,869.7** |
| **01/01/2013 - 31/12/2013** | **0.2022** | **14,194** | **2,869.7** |
| **01/01/2014 - 31/12/2014** | **0.2022** | **14,194** | **2,869.7** |
| **01/01/2015 - 31/12/2015** | **0.2022** | **14,194** | **2,869.7** |
| **01/01/2016 - 31/12/2016** | **0.2022** | | |
| **01/01/2017 - 31/12/2017** | | **14,194** | **707.6** |
| | | | **20,088** |

Source: The World Bank – single parameter of generation was taken from ICE electricity meter..

As the plant is hydro electric plant, no other fuel will be used to generate the electricity (as it is technically not possible). Hence, there is no need to adjust the electricity generation by deducting the electricity generation from fossil fuels using the specific fuel consumption and the quantity of fossil fuel consumed.

**Project emissions**

As per the methodology, the project emissions for hydro electric projects like this with no water reservoirs construction are zero. Hence *PEy* = 0. However, if there is any fossil fuel of any type is consumed during the emergency in the diesel sets in the plant, the consumption of the same will be monitored and emissions will be calculated as per the procedure defined as per the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion ".

$$PE_{FC,j,y} = \sum_{i} FC_{i,j,y} \times COEF_{i,y}$$

| | |
|---|---|
| Where: $PE_{FC,j,y}$ | $CO_2$ emissions from fossil fuel combustion in process j during the year y ($tCO_2$/yr); |
| $FC_{i,j,y}$ | the quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr); |
| $COEF_{i,y}$ | $CO_2$ emission coefficient of fuel type i in year y ($tCO_2$/mass or volume unit) |
| i | Are the fuel types combusted in process j during the year y |

The $CO_2$ emission coefficient $COEF_{i,y}$ can be calculated using one of the following Option B:

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y}$$

| | |
|---|---|
| Where: $COEF_{i,y}$ | $CO_2$ emission coefficient of fuel type i in year y ($tCO_2$/mass or volume unit) |
| $NCV_{i,y}$ | weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit) - uses IPCC default value |
| $EF_{CO2,i,y}$ | weighted average $CO_2$ emission factor of fuel type i in year y ($tCO_2$/GJ) - uses IPCC default value |
| i | fuel types combusted in process j during the year y |

Option B is selected as the weighted average mass fraction of carbon in fuel type needed under Option A is not available in the plant as this information is neither supplied by suppliers in the invoices nor there is a facility to measure this at the site. Moreover, the consumption of fossil fuel in the plant is very minimal and hence the emissions are negligible in comparison to total emission reductions.

Leakage

As there is no transfer of the energy generating equipment from another activity, no leakage is required to be considered. Hence *LEy* = 0.

### B.6.4 Summary of the ex-ante estimation of emission reductions:

The project's ERs are equal to the baseline emissions. The project does not have any emissions or leakages. The ERs estimated for the second crediting period add up to 20,088 $tCO_{2e}$.

| Year at Annual CERs delivery | Estimation of Project Activity Emissions ($tCO_{2e}$) | Total baseline emissions ($tCO_{2}e$) | Estimation of Leakage ($tCO_{2e}$) | Estimation of Overall Emission Reductions ($tCO_{2e}$) |
|---|---|---|---|---|
| 01/04/2010 – 31/12/2010 | 0 | 2,162.1 | 0 | 2,162.1 |
| 01/01/2011 – 31/12/2011 | 0 | 2,869.7 | 0 | 2,869.7 |
| 01/01/2012 – 31/12/2012 | 0 | 2,869.7 | 0 | 2,869.7 |
| 01/01/2013 – 31/12/2013 | 0 | 2,869.7 | 0 | 2,869.7 |
| 01/01/2014 – 31/12/20114 | 0 | 2,869.7 | 0 | 2,869.7 |
| 01/01/2015 – 31/12/2015 | 0 | 2,869.7 | 0 | 2,869.7 |
| 01/01/2016 – 31/12/2016 | 0 | 2,869.7 | 0 | 2,869.7 |

| | | | | |
|---|---|---|---|---|
| **01/01/2017 – 31/12/2017** | **0** | **707.6** | **0** | **707.6** |
| Total | 0 | **20,088** | 0 | **20,088** |

Source: The World Bank based on the estimated annual generation provided by ICE.

## B.7 Application of a monitoring methodology and description of the monitoring plan:

The monitoring methodology and plan for the project ("the MP") follows the methodology AMS-ID definition, which states that: "The monitoring shall consist of metering the electricity generated by the renewable energy technology". The project's baseline calculation follows methodology AMS-ID baseline definition for a system where **not** all generators use exclusively fuel oil and/or diesel fuel, also the data parameters and emission factors have been updated as per "*Tool to assess the validity of the original/current baseline and to update the baseline at the renewal of a crediting period*" Version 03.0.1 (EB 66, Annex 47).

The project credit renewal includes a MP, which will be implemented. Verification and certification of the ERs achieved will cover all of the bundled project activities.

### B.7.1 Data and parameters monitored:

| **Data / Parameter:** | $EG_{BL,y}$ |
|---|---|
| Data unit: | MWh |
| Description: | Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year *y* (MWh) |
| Source of data to be used: | Measured; ICE's electricity meter readings; the value corresponds to the measured net energy supplied to the grid on year 2008. |
| Value of data | 14,194 MWh |
| Description of measurement methods and procedures to be applied: | Read from watt-hour meter. Details are as below:<br><br>ICE's MAIN METER:<br>• Meter Type: bi-directional<br>• Accuracy class: 0.2<br>• Calibration frequency: As there are no specific regulations in the country that specify calibration frequency for meters, ICE calibrates meters only if the client brings its notice any discrepancy with meter readings.<br>•<br><br>ICE's BACK-UP METER:<br>• Meter Type: bi-directional<br>• Accuracy class: 0.2<br>• Calibration frequency: As there are no specific regulations in the country that specify calibration frequency for meters, ICE calibrates meters only if the client brings its notice any discrepancy with meter readings.<br><br>CNFL's MAIN METER:<br>• Meter Type: bi-directional |

| | |
|---|---|
| | • Accuracy class: 0.2<br>• Calibration frequency: at least once in three years<br><br>CNFL's BACKUP METER:<br>• Meter Type: bi-directional<br>• Accuracy class: 0.2<br>• Calibration frequency: at least once in three years |
| QA/QC procedures to be applied: | ICE's electricity meter will be used to account for ERs and project's own meter will be used to double check accuracy of the project electricity generation registered by ICE's meter. The calibration of the ICE's meter follows standard procedures established for all of ICE's meters across the Costa Rican national territory. This is to conduct the calibration when the client brings any inconsistency with the meter readings. The calibration of the project's own meters follows CNFL standard procedures (calibration at least once every three years). However, CNFL calibrates its meters at least once within this time period and recently started calibrating once in 2 years. Calibrating this way (once in 2 years) ensures more accuracy to readings in comparison to once in 3 years as per the EB requirements). The calibration of ICE's meters is not within the control of CNFL.<br><br>The project's generation registered by ICE's meter will be checked monthly against the project generation registered by the project's own meter in order to prevent any discrepancies in ICE's meter – this procedure will be performed by the ERCP Manager as directed in the ERCP Quality Control Procedure36. If deviation is higher than ±0.5% from one meter to another or higher than ±0.2% cumulatively, the ERCP manager will inform ICE to check its meter and rectify – after checking that the project's own meter is in good standing. If failure is confirmed by ICE, then during the failure period the project's own meter registered generation will be taken to account for ERs until ICE's meter is repaired. Evidence that ICE's meter underwent repairance should be made available to the verifier (if this case happens).<br><br>Every month, the ERCP manager will receive the project's registered generation from two sources: ICE's meter and the project's own meter, and double check accuracy. Furthermore, power generation records will be double-checked against sales receipts. The ERCP Manager should perform monthly calculation of accounted ERs to be ready for the verifier visit in any time of the year. |
| Any comment: | - Data will be measured hourly and recorded monthly.<br>- Data will be kept for two years after the last issuance of CERs for this project activity.<br>- Data will be aggregated weekly, monthly and yearly<br>- Measured data will be double checked against receipt of sales<br>- This data is electricity generated except electricity consumed in the plant and electricity imported for the project activity. |

| **Data / Parameter:** | *FCi,j,y* |
|---|---|
| Data unit: | Mass or volume unit per year (e.g. ton/yr or $m^3$/yr) |
| Description: | Quantity of fuel type i combusted in process j during the year y |
| Source of data to be used: | The plant records |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 0 |
| Description of measurement methods and procedures to be applied: | This data is recorded in a log book during emergency period.<br>The amount of diesel consumption is calculated by multiplying the actual hours of operation, which is recorded in a plant log book, by the hourly consumption of the generator according to manufacturer's specifications. |
| QA/QC procedures to be applied: | This will be cross checked with the purchase receipts of diesel fuel and the value that is higher among two is used for calculation of project emissions. |
| Any comment: | Expected to be zero as the amount of diesel consumed in the plant during emergency and observed during first crediting period is negligible and is expected to be the same during current crediting period as well. Considering this low volumes, the above method has been proposed to calculate the amount of diesel consumed. |

| **Data / Parameter:** | **$NCV_{i,y}$** |
|---|---|
| Data unit: | TJ/Gg |
| Description: | Weighted average net calorific value of fuel type i in year y |
| Source of data to be used: | PCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories. |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 43.3 |
| Description of measurement methods and procedures to be applied: | Not applicable as the source of the data is IPCC default values. |
| QA/QC procedures to be applied: | |
| Any comment: | |

| Data / Parameter: | $EFCO_2$,i,y |
|---|---|
| Data unit: | $tCO_2$/TJ |

| | |
|---|---|
| Description: | Weighted average $CO_2$ emission factor of fuel type i in year y |
| Source of data to be used: | IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories. |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 74.8 |
| Description of measurement methods and procedures to be applied: | Not applicable as the source of the data is IPCC default values. |
| QA/QC procedures to be applied: | - |
| Any comment: | - |

### B.7.2 Description of the monitoring plan:

The MP created for the project can be found in Annex 4 of this document.

The monitoring methodology and plan for the project ("the MP") follows the methodology AMS-ID version 17.

ICE's electricity meter will be used to account for ERs and project's own meter will be used to double check accuracy of the project electricity generation registered by ICE's meter. The calibration of this ICE's meter follows standard procedures established for all of ICE's meters across the Costa Rican national territory. This is to calibrate meters only if the client brings its notice any discrepancy with meter readings. The calibration of the project own meter follows CNFL standard procedures, as well.

CNFL's Energy Administration Department is responsible for detailing the rules and procedures for the revision of CNFL's and ICE's power generation data. The Energy Administration Department's personnel is, at various levels, involved in the reading individual meters, assembling data and preparing the monthly generation reports, checking data consistency between CNFL's and ICE's meters, authorizing and distributing the monthly generation reports within the relevant departments in CNFL.

In details, the special meters technician ("tecnico de medidores especiales") is responsible for CNFL's remotely meters reading; receiving data from manual meters reading and from the internal data management system RIME & ION Enterprise[37]; preparing the monthly report with all individual data; checking data consistency between CNFL's and ICE's meters; delivering the draft monthly report to the manager of the Energy Administration Department. The manager of the Energy Administration

37 RIME & ION Enterprise is a multi-system and multi-network data management system, designed and developed for remote interrogation of power electronic meters of different makes and models. Along with the collection of information, the RIME allows processing and automatic generation of reports and analysis of information. Operates in Windows XP environment and supports SQL server databases and Oracle. It performs tasks such as time synchronization of meters. It also allows on-site meter reading by portable terminals.

Department is in turn responsible for revising the monthly report, and receiving its clearance and authorization from the manager of the Technical Services Department.

The project generation registered by ICE's meter will be checked monthly against the project generation registered by the project's own meter in order to prevent failures in ICE's meter – this procedure will be performed by the ERCP manager as directed in the ERCP Quality Control Procedure and the document "Procedimiemto: Revision de la Factura por la Compra de Energia al ICE" (4320 P 2). If deviation is more than ±0.5% from one meter to another or ±0.2% collectively, the ERCP manager will inform ICE to repair its meter – after checking that the project's own meter is in good standing. If failure is confirmed by ICE then during the failure period, the project's own meter registered generation will be taken to account for ERs, until ICE's meter is repaired. Evidence that ICE's meter underwent repairance should be made available to the verifier (if this case happens).

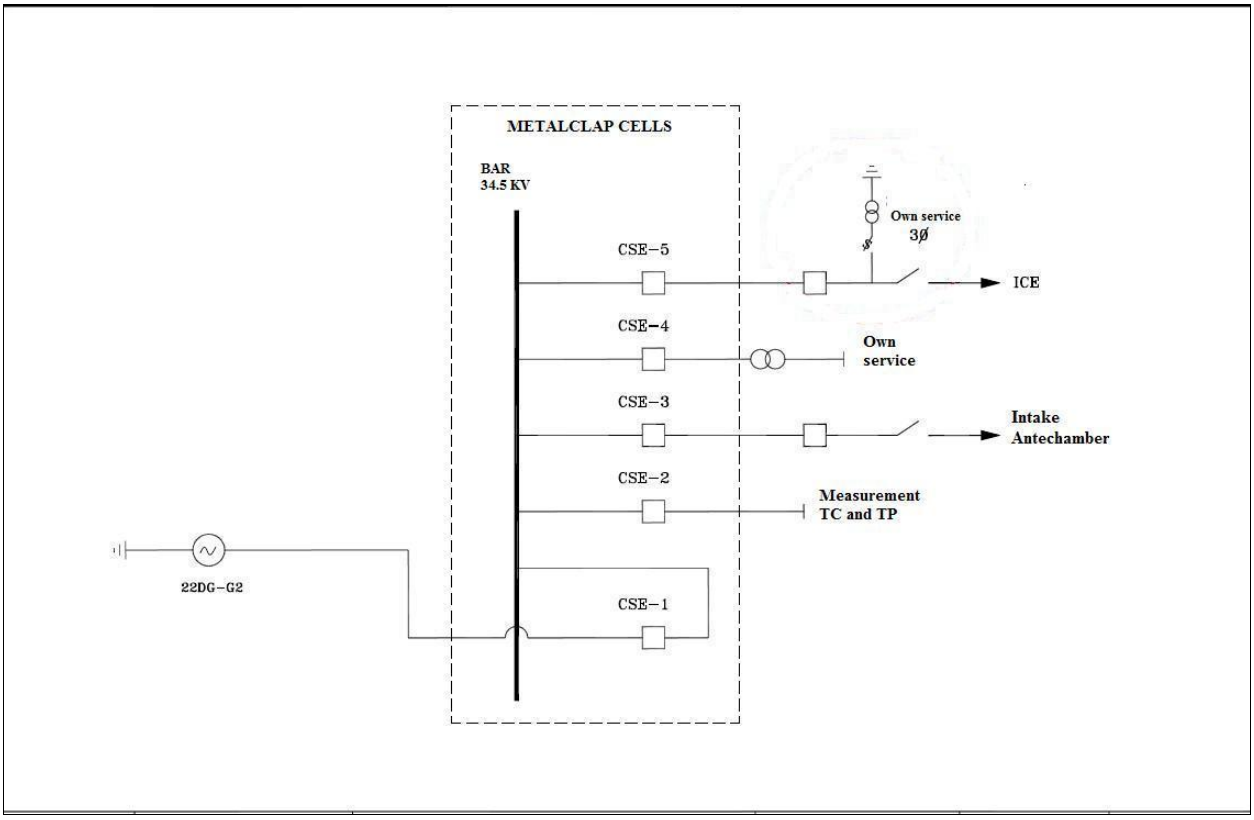
The ERCP Manager should perform monthly calculation of accounted ERs to be ready for the verifier visit in any time of the year.

Responsibilities in the ERCP have been established in an ERCP Organizational Structure, were a hierarchy is also established. The ERCP Quality Control Procedure establishes steps to be taken in order to minimize errors in the ERCP.

In addition, the plant consumes very negligible volume of diesel during emergency situations. The amount of diesel consumed is calculated based on the number of hours the diesel plant operates and its hurly consumption rate based on manufacturer specifications. This value is compared with the diesel purchase receipts and the one which is higher among two is considered for the calculation of project emissions due to diesel consumption. The plant operator in the diesel plant will record the number of daily operating hours and the accounts department will compile the diesel purchase records on monthly basis.

**Metering location**

The following diagram shows the meters located in the plant and are used to monitor the electricity generation and delivery to ICE:



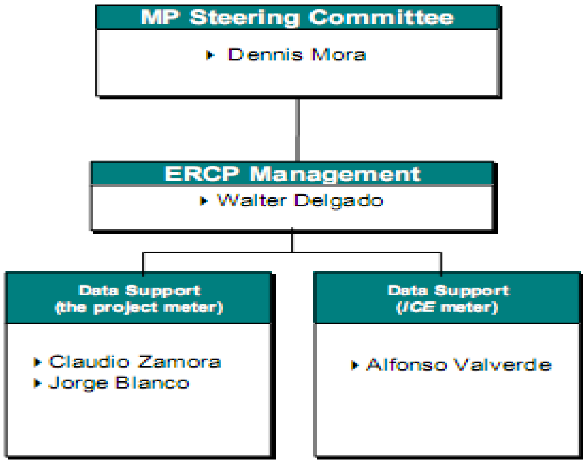

Source: CNFL

**Operational and Management Structure**

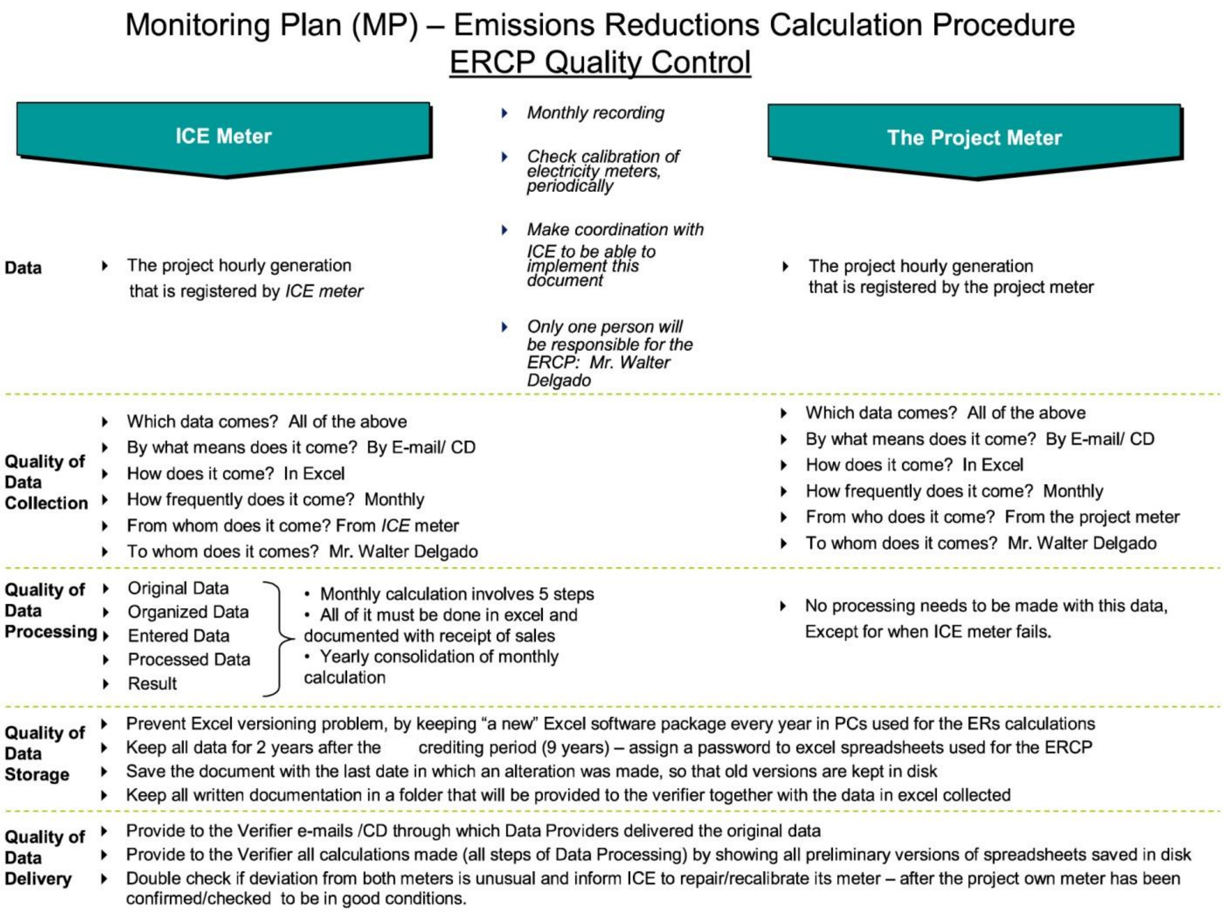
The Organizational, Operational and Monitoring Obligations are detailed in Annex 4 and the structure is as shown below.

Monitoring Plan (MP) – Emission Reductions Calculation Procedures

**ERCP Organizational Structure**




The following diagram indicates the responsibilities for and institutional arrangements for data collection and archiving:




Source: CNFL

**B.8 Date of completion of the application of the baseline and monitoring methodology and the name of the responsible person(s)/entity(ies)**

The Monitoring Methodology and Monitoring Plan were completed on 20/08/2009 on behalf of The Prototype Carbon Fund by:
World Bank Carbon Finance Business Unit.
Ms. Paola Del Rio
Consultant

## SECTION C. Duration of the project activity / crediting period

### C.1 Duration of the project activity:

#### C.1.1. Starting date of the project activity:

22/12/2000

#### C.1.2. Expected operational lifetime of the project activity:

40 y

### C.2 Choice of the crediting period and related information:

#### C.2.1. Renewable crediting period

##### C.2.1.1. Starting date of the second crediting period:

01/04/2010

##### C.2.1.2. Length of the second crediting period:

7y-0m

#### C.2.2. Fixed crediting period:

N/A

##### C.2.2.1. Starting date:

N/A

##### C.2.2.2. Length:

N/A

## SECTION D. Environmental impacts

### D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

The project's Environmental Impact Assessment ("EIA") was approved by the National Environmental

Technical Secretariat ("*SETENA*") in May 2000, as required by Law. Water rights approvals are not required for a stated-owned enterprise as the sponsor is[38].

Existing environmental and social conditions found in the EIA can be summarized as follow:

-Geology: The stratigraphic base of the project's area is volcanic rock. The dominant tectonic structures have a northeast-southeast alignment.

-Hydrology: The average rainfall for the area is 4,500 mm/year. Many tributaries feed into the Cote lake, the most important being the Pierna de la Laguna river. The flow at the project site has an average annual from of 1.97 $m^3$/s, ranging from 0.4 $m^3$/s in April to 3.13 $m^3$/s in August. The water from the existing project drains into the Rugama, a tributary to the Arenal lagoon. The Rugama has an average annual flow of 0.21 $m^3$/s, ranging from 0.04 m3/s in April to 0.34 m3/s in August. Maximum flow in the Rugama was calculated through Gumbel distribution, assuming a design flow with a return period of 500 years, the flood flow is 39.0 $m^3$/s.

-Natural Disasters: Aside from flooding (see above), the natural disaster risks in this area are limited to seismic and volcanic activity. These were both considered in the design of the project, again based on a return period of 1 in 500 years.

-Land Use: The Cote watershed (15.3 $km^2$) mostly consists of forests important for the protection of the flora and fauna, aquifer recharge, genetic reserves and aesthetic beauty. The soil of the watershed Rugama (1.8 $km^2$) has good drainage, is very steep and has low fertility; its importance is mainly as forest cover. Economic activities in the region are tourism (upper watershed) and agriculture (lower watershed).

-Water Rights: The only river effected by the project, the Rugama, has no known water uses save serving as the major inflow into the Arenal lagoon.

-Terrestrial Flora and Fauna: Intense deforestation in the past altered the weather conditions in the area, increasing the temperature and the wind speed, changing soil humidity, evaporation and the runoff from rivers. Based on Holdridge's classification system, the area is humid and highly humid pre-montane tropical forest. In the areas where the facilities already exist, there is a significant amount of underbrush and aquatic plants at the shore of the lagoon, near the intake. Pines were planted along the tunnel, and ipil-ipil was planted around the lagoon. Above the canal, there is a secondary forest which is highly mixed and intervened. In the area which the project will intervene, between the tunnel exit and the first canal intake, a high quality forest exists (some primary). The tunnel extension crosses some forested area, but mostly pastureland. The second channel, the antechamber and the beginning of the pressure pipe are in an area with primary forest. This area also suffers from landslides. The majority of the pressure pipe crosses fairly polluted (trash) pastureland. Finally, the machine house and the tailrace canal are in a very intervened zone. Spotted cavies, red coatis, foxes, and squirrels are all common. Monkeys frequent the area, as are birds. Many of the 284 species of birds that have been reported in the area are protected by law to some degree.

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[38] Once approved, *SETENA*, has legal powers in the case of unresolved community conflicts or non-compliance with the terms of the EIA and the Environmental Management Plan ("EMP") that include being able to stop the project (other resources are also available). In addition, the *SETENA* designs one "*Regente Ambiental*" during construction and another during operation. The *Regentes Ambientales* act as watch-guards of what is committed in the EIA and EMP; the *Regentes Ambientales* have civil and judicial responsibility to the validity of what they inform to *SETENA*. In addition to an EIA, the project required forestry permits to be granted by *MINAE*, these were granted on April 2001.

-Aquatic Flora and Fauna: The aquatic environment associated with the project is the Cote Lake, the Rugama creek and the Cote River. With the construction of this project, the Rugama creek will return to its natural state (prior to the *ICE* dam built in 1982). The Cote River will remain at its current, diverted (and almost dry) state. The Cote lake water is dark, with low light penetration. There is no evidence of endemic fish in the lake, nor in surrounding rivers. Many frogs and other amphibians are common. Otters have been spotted. The lake is surrounded by some wetlands.

-Local Communities: Two communities are located in the project area of influence, the village of Arenal de Tilarán and the village San Rafael de Guatuso. San Rafael has a population of 6,694, whose main economic activities include grain, vegetable, fruit and dairy production. Arenal has a population of 2,180, and its main economic activity is tourism. The communities have access to education, health services, drinking water, public transportation and electricity. A social assessment was completed during project preparation, and these communities were targeted during project public consultation.

-Cultural Property: Based on information from the National Museum of Costa Rica, no known archeological sites exist in the project area.

The Environmental Management Plan derived from the EIA can be summarized as follows:

| **Project Activity** | **Potential Impacts** | **Corrective Measures taken** |
|---|---|---|
| Modification of the water intake over the Cote River. | • Removal of the forest. | • Reforestation program for affected area. |
| | • Noise | • Transportation performed over the Cote Lake<br>• Training to personnel. |
| | • Hunting risk | • Establishment of limits for walkers.<br>• Allocation of preventive advertisement. |
| Conducting-tunnel Construction | • Removal of the forest | • Reforestation program for affected area |
| | • Noise<br>• Habitat fragmentation<br>• Personnel security. | • Stability reinforcement of the channels and access roads.<br>• Water control.<br>• Reforestation with species that favor land stability.<br>• Change from an open channel to an underground channel structure.<br>• Control of hours of labor and rest.<br>• Allocation of advertisement in risky zones. |
| Excavation of new tunnel and new structures | • Change in humidity.<br>• Debris generation.<br>• Archeological impact. | • Control of excavation.<br>• Elaboration of an archeological evaluation. |
| Construction of the load chamber | • Removal of forest. | • Reforestation program for affected area. |
| Construction of Pressure Pipe | • Removal of forest. | • Reforestation program for affected |

| | | |
|---|---|---|
| | • Reproductive barrier.<br>• Visual impact. | area.<br>• Monitoring of the biodiversity.<br>• Reforestation by using native species. |
| Construction of power house and turbo-generator. | • Removal of forest<br>• Noise | • Reforestation by using native species. |
| Final phase of construction | • Noise.<br>• $CO_2$ emissions.<br>• Contamination risk for<br>• oil spills.<br>• Traffic.<br>• Debris emissions. | • Training.<br>• Ears protection equipment made available.<br>• Machinery inspection.<br>• Careful management of oil by using deposits.<br>• Distribution of hours of work |
| Camping and offices | • Interaction with the community.<br>• Contamination risk for solid residues. | • Environmental training.<br>• Drainage structures for chemicals to avoid spills.<br>• Medical services made available.<br>• Vehicle speed regulation established.<br>• Transportation of solid residues to a landfill.<br>• Allocation of advertisement regarding solid residues management. |

**D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:**

N/A

## SECTION E. Stakeholders' comments

**E.1. Brief description how comments by local stakeholders have been invited and compiled:**

The two affected populations, San Rafael de Guatuso and Nuevo Arenal have been involved in extensive consultations with project proponents (i.e. The Arenal Municipality conferred construction permissions to the project on April 2001 after a public presentation of the project). These populations have been invited to participate in several Public Consultation meetings through oral notification and notes posted on churches and schools which indicated the place, time and date of the meetings[39].

The objectives of the Public Consultations have been as follow: a) to present the project and its environmental impacts as analyzed in the EIA and solve any doubt raised by the community, b) to improve the relationship with the neighboring population, c) to become familiarized with the comments of the local stakeholders regarding the project, and, finally, d) to initiate a communication process between enterprise and neighboring community. No downstream water users will be affected, since there

[39] Neither newspaper nor any other means of mass communication is available in the area.

are no water users along the stretch of Rugama creek with future reduced flow. Local landowners who are affected by the project have also signed agreements to sell the required land to the project. The process of land purchase from private owners was completed on March 2001. Similarly, the permission conferred by *ICE* to used *ICE*-owned lands for project was granted on April 2001.

### E.2. Summary of the comments received:

Comments, concerns and/or observations from the Public Consultation have been positive and negative. The positive have been focused on:

-Source of work.
-Better electricity access.
-Improvement in roads.
-Economic benefits for the local population

The negative were focused on:

-Negative effects on the ecology.
-Negative effects on the lake level.
-Negative effect on downstream aquatic vegetation.

No other major comments have been received.

### E.3. Report on how due account was taken of any comments received:

The very mission of the sponsor, which is to contribute to the social and economic development of the country, is interpreted internally to include social support to the communities surrounding its projects. The sponsor has well-developed community participation programs, which they have also applied in the case of the project. In part at least due to these programs, the sponsor is perceived as a responsible "good guy" by the greater Costa Rican society, including those segments of the society that live in the areas of influence of its electrical generation projects. As a result of the public consultations meetings performed and also at the sponsor's own initiative, the sponsor agreed to the following:

-Hire local labor[40].
-Build small infrastructure improvements (i.e. performed improvements in the illumination of Sports Park of Nuevo Arenal, performed a slight road improvement).
-Establishment of a community feedback mechanism[41]
- 16 persons of Nuevo Arenal and 12 persons of Guatuso volunteer to be part of this mechanism, these persons would kept aware of the project advancement, and would be given the responsibility to spread any information given by the sponsor in the community. This mechanism was to be in existence during the whole pre-operative period.
-Improve local electricity access and electricity quality (constant blackouts) by improving *ICE*'s distribution line to which the project connects.
-Teach educational classes at local schools regarding the importance of protecting the environment and local natural resources.

[40] Information about available local labor was raised through polls performed as of December 12, 2000. During construction the project hired 435 neighbors.

[41] As of the end of 2003 there have been 16 meetings carried out with this feedback mechanism.

-The plant committed to acquired certification A of Ecological Flag, provided by MINAE, and the project's actual target is achieving AA in the short term[42].

[42] These certifications would take due account on the negative comments received listed under G.2.

## Annex 1

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## Annex 2

### INFORMATION REGARDING PUBLIC FUNDING

No Public Funding is involved in this project.

## Annex 3

## BASELINE INFORMATION

**Table 1. Composition of the Total Plants Generation during the five most recent years (2004-2008)**

| | 2004 (GWh) | 2005 (GWh) | 2006 (GWh) | 2007 (GWh) | 2008 (GWh) |
|---|---|---|---|---|---|
| Thermal | 79,307.7 | 283,410.1 | 545,387.9 | 735,156.0 | 699,362.4 |
| Hydro | 6,514,501.2 | 6,565,403.4 | 6,600,896.2 | 6,770,629.8 | 7,383,549.8 |
| Geothermal | 1,205,609.7 | 1,147,712.2 | 1,214,888.3 | 1,238,528.4 | 1,130,863.7 |
| Wind | 257,537.8 | 203,571.9 | 273,496.7 | 241,058.1 | 198,164.5 |
| Biomass | 4,891.0 | 12,061.3 | 6,765.5 | 4,160.2 | 1,149.3 |
| **Total** | **8,061,847.4** | **8,212,158.9** | **8,641,434.6** | **8,989,532.4** | **9,413,089.7** |

Source: ICE Annual Summary (dispatch center), Gross Generation per year (Annex: Gen 2004 to Gen 2008 )

**Table 1A. Composition of the Total Plants Generation during the five most recent years (2004-2008) in %**

| | 2004 Gen. Elect. | 2005 Gen. Elect. | 2006 Gen. Elect. | 2007 Gen. Elect. | 2008 Gen. Elect. | Average Gen. Elect. | Low Cost Must Run. |
|---|---|---|---|---|---|---|---|
| Thermal | 0.98% | 3.45% | 6.31% | 8.18% | 7.43% | 5.27% | 5.27% |
| Hydro | 80.81% | 79.95% | 76.39% | 75.32% | 78.44% | 78.18% | 94.73% |
| Geothermal | 14.95% | 13.98% | 14.06% | 13.78% | 12.01% | 13.76% | |
| Wind | 3.19% | 2.48% | 3.16% | 2.68% | 2.11% | 2.73% | |
| Biomass | 0.06% | 0.15% | 0.08% | 0.05% | 0.01% | 0.07% | |

Source: World Bank's own estimate based on Table 1 above.

## Calculations for Operating Margin (OM)

| General Values according to Fuel Type | | | | | | |
|---|---|---|---|---|---|---|
| Fuel Type | Unit. | Net Calorifc Value | $CO_2$ Emission Factor * | Net Calorifc Value ** | Density | Density*** |
| | | (MJ / L) | ($tCO_2$/ TJ) | (MJ/kg) | (kg/L) | (L/kg) |
| **Diesel** | liter | 34.91 | 72.6 | **41.40** | **0.8432** | 1.1860 |
| **Bunker** | liter | 37.58 | 75.5 | **39.8** | **0.9442** | 1.0590 |

* 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Table 1.4 Chapter 1, Volume 2: Energy, http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf
** 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Table 1.2 Chapter 1, Volume 2: Energy, http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf
*** Good practice guidance and uncertainty management in National Greenhouse Gas Inventories, Fuel Density Values, http://www.ipcc-nggip.iges.or.jp/public/gp/bgp/2_4_Water-borne_Navigation.pdf

| OM 2008 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| A | B | C | D | F | G | H | i | J | K |
| Plant | Start | Tech | Fuel | GEN. 2008* (MWh) | Consum. (kWh/L.)** | Cons. Fuel (L.) | Net Calorifc Value (MJ / L.) | Emission Factor ($tCO_2$/ TJ) | Emissions $tCO_2$ (tCO2) |
| | | | | | | H=((F*1000)/G) | | | =(J*(i*H)/1000000) |
| Colima (*) | 1956 | Motors | (*) Mix 92% búnker | 11,407.4 | 3.19 | 3,575,974 | 37.58 | 75.50 | **10,146.8** |
| Colima (*) | 1956 | Motors | (*)8% Diesel | 991.9 | 3.19 | 310,954 | 34.91 | 72.60 | **788.0** |
| San Antonio Gas | 1973 | Turbine | Diesel | 23,349.6 | 2.50 | 9,339,855 | 34.91 | 72.60 | **23669.7** |
| Barranca | 1974 | Turbine | Diesel | 17,517.8 | 2.30 | 7,616,443 | 34.91 | 72.60 | **19302.1** |
| Moín Pistón (**) | 1977 | Motors | (*) 5 % Diesel | 415.3 | 3.90 | 106,480 | 34.91 | 72.60 | **269.8** |
| Moín Pistón (**) | 1977 | Motors | (*) Mix 95% búnker | 7,890.2 | 3.90 | 2,023,120 | 37.58 | 75.50 | **5,740.6** |
| Moín Gas | N/D | Turbine | Diesel | 187,937.2 | 2.82 | 66,644,390 | 34.91 | 72.60 | **168,894.6** |
| Moín Gas - CNFL | N/D | Turbine | Diesel | 135,591.6 | 2.82 | 48,082,121 | 34.91 | 72.60 | **121,852.9** |
| Pujol Orotina | N/D | Motors | Bunker | 36,007.3 | 4.48 | 8,037,342 | 37.58 | 75.50 | **22,805.9** |
| Pujol-Guápiles | N/D | Motors | Bunker | 52,394.7 | 4.48 | 11,695,236 | 37.58 | 75.50 | **33,185.1** |
| TEIC San Antonio | 2008 | Motors | Diesel | 143,521.9 | 3.60 | 39,867,184 | 34.91 | 72.60 | **101,034.1** |
| Arrend. Barranca | 2008 | Motors | Diesel | 59,936.2 | 3.60 | 16,648,952 | 34.91 | 72.60 | **42,192.9** |
| **Thermoelectric** | | | | **676,961.0** | | | | | **549,882.48** |

| | | | |
|---|---|---|---|
| **Parallel Thermal** | **22,401.4** | | |
| **Hydroelectric** | **7,383,549.8** | | |
| **Geothermal** | **1,130,863.7** | | |
| **Wind** | **198,164.5** | | |
| **Biomass** | **1,149.3** | | |
| | **9,413,089.7** | | **549,882.48** |

*Source: ICE Annual Summary (dispatch center), Gross Generation 2008
** Source : Power Generation Expansion Plan 2009 ICE p.63 "Characteristics of the electric system power plants " Table 11.1
http://www.grupoice.com/esp/ele/planinf/docum/plan_expansion_generacion_09.pdf
(*) Colima : http://www.grupoice.com/esp/ele/infraest/electric/instalac1f2.htm#1
(**) Moin Piston : http://www.grupoice.com/esp/ele/infraest/electric/instalac1g.htm#3

**OM 2007**

| A | B | C | D | F | G | H | i | J | K |
|---|---|---|---|---|---|---|---|---|---|
| **Plant** | **Start** | **Tech** | **Fuel** | **GEN. 2007*** (MWh) | **Consum.** (kWh/L.)** | **Cons. Fuel** (L.) | **Net Calorifc Value** (MJ / L.) | **Emission Factor** ($tCO_2$/ TJ) | **Emission $tCO_2$** ($tCO_2$) |
| | | | | | | H=((F*1000)/G) | | | K=(J*(i*H)/1000000) |
| Colima (*) | 1956 | Motors | (*) Mix 92% búnker | 17,254.9 | 3.19 | 5,409,052 | 37.58 | 75.50 | 15,348.1 |
| Colima (*) | 1956 | Motors | (*) 8 % Diesel | 1,500.4 | 3.19 | 470,352 | 34.91 | 72.60 | 1,192.0 |
| San Antonio Gas | 1973 | Turbine | Diesel | 77,306.1 | 2.50 | 30,922,428 | 34.91 | 72.60 | 78,365.7 |
| Barranca | 1974 | Turbine | Diesel | 55,470.6 | 2.30 | 24,117,635 | 34.91 | 72.60 | 611,20.5 |
| Moín Pistón (**) | 1977 | Motors | (*) 5 % Diesel | 1,006.4 | 3.90 | 258,058 | 34.91 | 72.60 | 654.0 |
| Moín Pistón (**) | 1977 | Motors | (*) Mix 95% búnker | 19,122.1 | 3.90 | 4,903,097 | 37.58 | 75.50 | 13,912.5 |
| Moín Gas | N/D | Turbine | Diesel | 294,165.9 | 2.82 | 104,314,163 | 34.91 | 72.60 | 264,359.9 |
| Moín Gas - CNFL | N/D | Turbine | Diesel | 119,653.2 | 2.82 | 42,430,202 | 34.91 | 72.60 | 107,529.4 |
| Pujol Orotina | N/D | Motors | Bunker | 56,272.0 | 4.48 | 12,560,708 | 37.58 | 75.50 | 35,640.9 |
| Pujol-Guápiles | N/D | Motors | Bunker | 80,493.0 | 4.48 | 17,967,192 | 37.58 | 75.50 | 50,981.7 |
| **Thermoelectric** | | | | **722,244.5** | | | | | **629,104.65** |
| **Parallel Thermal** | | | | 12,911.4 | | | | | |
| **Hydroelectric** | | | | 6,770,630 | | | | | |
| **Geothermal** | | | | 1,238,528 | | | | | |
| **Wind** | | | | 241,058 | | | | | |
| **Biomass** | | | | 4,160 | | | | | |
| **Imports** | | | | 163,668.6 | | | | | |

| | | | |
|---|---|---|---|
| | 9,153,201 | | 629,104.65 |

*Source: ICE Annual Summary (dispatch center), Gross Generation 2007
** Source : Power Generation Expansion Plan 2009 ICE p.63 "Characteristics of the electric system power plants " Table 11.1 http://www.grupoice.com/esp/ele/planinf/docum/plan_expansion_generacion_09.pdf
(*) Colima : http://www.grupoice.com/esp/ele/infraest/electric/instalac1f2.htm#1
(**) Moin Piston : http://www.grupoice.com/esp/ele/infraest/electric/instalac1g.htm#3

**OM 2006**

| A | B | C | D | F | G | H | i | J | K |
|---|---|---|---|---|---|---|---|---|---|
| **Plant** | **Start** | **Tech** | **Fuel** | **GEN. 2006*** (MWh) | **Consum.** (kWh/L.)** | **Cons. Fuel** (L.) | **Net Calorifc Value** (MJ / L.) | **Emission Factor** ($tCO_2$/ TJ) | **Emission $tCO_2$** ($tCO_2$) |
| | | | | | | H=((F*1000)/G) | | | K=(J*(i*H) /1000000) |
| Colima (*) | 1956 | Motores | (*) Mix 92% búnker | 11,691.0 | 3.19 | 3,664,887 | 37.58 | 75.50 | 10,399.1 |
| Colima (*) | 1956 | Motores | (*) 8 % Diesel | 1,016.6 | 3.19 | 318,686 | 34.91 | 72.60 | 807.6 |
| San Antonio Gas | 1973 | Turbina | Diesel | 52,521.2 | 2.50 | 21,008,488 | 34.91 | 72.60 | 53,241.1 |
| Barranca | 1974 | Turbina | Diesel | 35,447.8 | 2.30 | 15,412,072 | 34.91 | 72.60 | 39,058.3 |
| Moín Pistón (**) | 1977 | Turbina | (*) 5 % Diesel | 776.7 | 3.90 | 199,158 | 34.91 | 72.60 | 504.7 |
| Moín Pistón (**) | 1977 | Turbina | (*) Mix 95% búnker | 14,757.6 | 3.90 | 3,783,995 | 37.58 | 75.50 | 10,737.0 |
| Moín Gas | N/D | Turbina | Diesel | 187,832.7 | 2.82 | 66,607,340 | 34.91 | 72.60 | 168800.7 |
| Moín Gas - CNFL | N/D | Turbina | Diesel | 133,109.4 | 2.82 | 47,201,919 | 34.91 | 72.60 | 119622.2 |
| Pujol Orotina | N/D | Motores | Bunker | 34,112.0 | 4.48 | 7,614,276 | 37.58 | 75.50 | 21,605.4 |
| Pujol-Guápiles | N/D | Motores | Bunker | 61,883.1 | 4.48 | 13,813,188 | 37.58 | 75.50 | 39,194.8 |
| **Thermoelectric** | | | | **533,148.0** | | | | | **463,971.04** |
| **Parallel Thermal** | | | | **12,239.8** | | | | | |
| **Hydroelectric** | | | | **6,600,896.2** | | | | | |
| **Geothermal** | | | | **1,214,888.3** | | | | | |
| **Wind** | | | | **273,496.7** | | | | | |
| **Biomass** | | | | **6,765.5** | | | | | |
| **Imports** | | | | **88,837.8** | | | | | |
| | | | | **8,730,272.4** | | | | | **463,971.04** |

*Source: ICE Annual Summary (dispatch center), Gross Generation 2006
** Source : Power Generation Expansion Plan 2009 ICE p.63 "Characteristics of the electric system power plants " Table 11.1
http://www.grupoice.com/esp/ele/planinf/docum/plan_expansion_generacion_09.pdf

(*) Colima : http://www.grupoice.com/esp/ele/infraest/electric/instalac1f2.htm#1

(**) Moin Piston : http://www.grupoice.com/esp/ele/infraest/electric/instalac1g.htm#3

## Calculation of the Build Margin:

| A | B | C | D | E | E | F | G |
|---|---|---|---|---|---|---|---|
| POWER PLANT | TYPE | START | Effective Power (MW) | Generation 2008 (GWh) | Generation 2008 (GWh) | Cum. Gen. 2008 (GWh) | Share (%) |
| **Arrendami. Barranca** | **Thermal** | **2008** | **90** | **60** | **60** | **60.00** | **0.64%** |
| **Arrendami. San Antonio** | **Thermal** | **2008** | **110** | **144** | **144** | **204.00** | **2.17%** |
| **El Viejo** | **Bagase** | **2008** | **14** | **7** | **7** | **211.00** | **2.24%** |
| **Taboga** | **Bagase** | **2008** | **17** | **15** | **15** | **226.00** | **2.40%** |
| **Canalete** | **Hydro** | **2007** | **18** | **65** | **65** | **291.00** | **3.09%** |
| **Cariblanco** | **Hydro** | **2007** | **84** | **299** | **299** | **590.00** | **6.27%** |
| **General** | **Hydro** | **2006** | **39** | **198** | **198** | **788.00** | **8.37%** |
| **La Joya (*)** | **Hydro** | **2006** | **50** | **281** | | **788.00** | **8.37%** |
| **Puhol - Guápiles** | **Thermal** | **2006** | **14** | **52** | **52** | **840.00** | **8.93%** |
| **Pujol** | **Thermal** | **2006** | **10** | **36** | **36** | **876.00** | **9.31%** |
| **Río Azul (*)** | **Bagase** | **2004** | **2** | **1** | | **876.00** | **9.31%** |
| **CNFL (**)** | **Hydro** | **2003** | **71** | **408** | **393.72** | **1269.72** | **13.49%** |
| **COOPELESCA** | **Hydro** | **2003** | **28** | **100** | **100** | **1369.72** | **14.55%** |
| **Moín Gas - CNFL** | **Thermal** | **2003** | **209** | **324** | **324** | **1693.72** | **18.00%** |
| **Miravalles V** | **Geothermal** | **2003** | **18** | **108** | **108** | **1801.72** | **19.14%** |
| **Peñas Blancas** | **Hydro** | **2002** | **37** | **162** | **162** | **1963.72** | **20.87%** |
| Tejona | Wind | 2002 | 20 | 53 | 53 | **2016.72** | |
| Angostura | Hydro | 2000 | 180 | 903 | 903 | **2919.72** | |
| Miravalles III | Geothermal | 2000 | 26 | 220 | 220 | **3139.72** | |
| Tierras Morenas | Wind | 1999 | 20 | 48 | 48 | **3187.72** | |
| Aeroenergía | Wind | 1998 | 6 | 25 | 25 | **3212.72** | |
| Miravalles II | Geothermal | 1998 | 55 | 329 | 329 | **3541.72** | |
| Toro II | Hydro | 1997 | 66 | 284 | 284 | **3825.72** | |
| Tilarán | Wind | 1996 | 20 | 72 | 72 | **3897.72** | |
| Toro I | Hydro | 1996 | 27 | 108 | 108 | **4005.72** | |
| Boca de Pozo | Geothermal | 1995 | 5 | 42 | 42 | **4047.72** | |
| Miravalles I | Geothermal | 1994 | 55 | 432 | 432 | **4479.72** | |
| Sandillal | Hydro | 1993 | 32 | 151 | 151 | **4630.72** | |
| Ventanas Garita | Hydro | 1988 | 100 | 508 | 508 | **5138.72** | |
| Corobicí-Dengo | Hydro | 1982 | 174 | 847 | 847 | **5985.72** | |
| Arenal | Hydro | 1979 | 157 | 789 | 789 | **6774.72** | |
| Moín Pistón | Thermal | 1977 | 26 | 8 | 8 | **6782.72** | |
| Barranca | Thermal | 1974 | 36 | 18 | 18 | **6800.72** | |
| S.A. Gas | Thermal | 1973 | 37 | 23 | 23 | **6823.72** | |
| Cachí | Hydro | 1967 | 103 | 643 | 643 | **7466.72** | |
| Río Macho | Hydro | 1963 | 134 | 539 | 539 | **8005.72** | |
| Garita | Hydro | 1958 | 40 | 112 | 112 | **8117.72** | |
| Colima | Thermal | 1956 | 14 | 12 | 12 | **8129.72** | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ESPH | Hydro | varios | 19 | 100 | 100 | **8229.72** | |
| Generación Privada | Hydro | varios | 127 | 702 | 702 | **8931.72** | |
| JASEC | Hydro | varios | 19 | 140 | 140 | **9071.72** | |
| Menores ICE | Hydro | varios | 6 | 43 | 43 | **9114.72** | |
| **TOTAL SIN :** | | | | **9,411.00** | **9,114.72** | | |

Source: Power Generation Expansion Plan 2009 ICE pag.63 "Characteristics of the electric system power plants "
Instituto Costarricense de Electricidad (ICE) GENERATION 2008
Note: There may exist a difference between the OM and BM results for each plant given that "ICE" uses different levels of accuracy in the documents (Generation 2008 / Expansion and Generation Plan). For OM the figures are in MWh whereas for BM information is only available in GWh (rounded) therefore creating a difference.
(*): La Joya and Rio Azul power plants were excluded because they are CDM projects
(**): CNFL is integrated by Brasil (24 MW) + Daniel Gutierrez (19,3 MW) + Belen (9 MW) + Electriona N. and Amo R. Segundo (12 MW) + El Cote (6,3 MW). Only El Cote is excluded for being a CDM Project.
Only El Cote is excluded for being a CDM project. ( "El Cote" electricity generation 2008 is 13,95 GWh )

**Table 4A. Build Margin Emission factor for 20% of System Generation**

| **Build Margin 2008** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **A** | **B** | **C** | **D** | **E** | **F** | **G** | **H** |
| **Plant** | **Start** | **Tech** | **GEN. 2008** | **GEN. 2008** | **Acum. Gen. 2008** | **Share** | **Emission** |
| | | | **(GWh)** | **(GWh)** | **(GWh)** | **(%)** | **($tCO_2$)** |
| Arrendami. Barranca | 2008 | Thermal | 60.00 | 60.00 | 60.00 | 0.64% | 42,192.88 |
| Arrendami. San Antonio | 2008 | Thermal | 144.00 | 144.00 | 204.00 | 2.17% | 101,034.07 |
| El Viejo | 2008 | Bagase | 7.00 | 7.00 | 211.00 | 2.24% | |
| Taboga | 2008 | Bagase | 15.00 | 15.00 | 226.00 | 2.40% | |
| Canalete | 2007 | Hydro | 65.00 | 65.00 | 291.00 | 3.09% | |
| Cariblanco | 2007 | Hydro | 299.00 | 299.00 | 590.00 | 6.27% | |
| General | 2006 | Hydro | 198.00 | 198.00 | 788.00 | 8.37% | |
| La Joya (*) | 2006 | Hydro | 281.00 | | 788.00 | 8.37% | |
| Puhol - Guápiles | 2006 | Thermal | 52.00 | 52.00 | 840.00 | 8.93% | 33,185.09 |
| Pujol | 2006 | Thermal | 36.00 | 36.00 | 876.00 | 9.31% | 22,805.86 |
| Río Azul (*) | 2004 | Bagase | 1.00 | | 876.00 | 9.31% | |
| CNFL (**) | 2003 | Hydro | 408.00 | 393.72 | 1269.72 | 13.49% | |
| COOPELESCA | 2003 | Hydro | 100.00 | 100.00 | 1,369.72 | 14.55% | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Moín Gas | 2003 | Thermal | 324 | 324.00 | 1,693.72 | 18.00% | 209,747.54 |
| Miravalles V | 2003 | Geothermal | 108 | 108.00 | 1,801.72 | 19.14% | |
| Peñas Blancas | 2002 | Hydro | 162 | 162.00 | 1,963.72 | 20.87% | |
| | | | **2,260.0** | **1,963.72** | | | **489,965.45** |

(*): La Joya and Rio Azul power plants were excluded because they are CDM projects
(**): CNFL is integrated by Brasil (24 MW) + Daniel Gutierrez (19,3 MW) + Belen (9 MW) + Electriona N. and Amo R. Segundo (12 MW) + El Cote (6,3 MW). Only El Cote is excluded for being a CDM Project. Only El Cote is excluded for being a CDM project. ( "El Cote" electricity generation 2008 is 13,96 GWh )

| 2008 | | |
|---|---|---|
| **Emissions:** | **489,965.45** | **( $tCO_2$ )** |
| **Generation:** | **1,963,718** | **( MWh )** |
| **BM** | **0.2495** | **($tCO_2$ / MWh)** |

## Annex 4

## MONITORING INFORMATION

**The Monitoring Plan**

**TABLE OF CONTENTS**



- - - - -

## I. Background Information

The baseline methodology and monitoring methodology for the project are in accordance with the approved small-scale methodology AMS-I.D, which is applicable to renewable electricity generation for a grid.

The project installed capacity and estimated yearly average generation is as follows:

| Project name | Installed capacity (MW) | Expected Annual Generation (MWh/year) |
|---|---|---|
| Cote | 6.786 | 13,169 |

Source: The project's feasibility study

The proposed project is a small hydropower plant located in Costa Rica, over the limit of the county of Tilarán and Guatuso in the province of Guanacaste and Alajuela, respectively; within the Arenal Conservation Area ("ACA"). The purpose of the project is renewable electricity generation to be supplied to Costa Rica's national electric grid named National Interconnected System ("*NIS").* The project's installed capacity and projected yearly average generation are 6.786 Megawatts ("MW") and 13.2 Gigawatts hours ("GWh"), respectively.

The project is expected to displace 20,088 tons of carbon dioxide equivalent ("$tCO_{2e}$") in the second 7-year crediting period, generating an equivalent amount of certified emission reductions ("CERs"). The project takes advantage of the infrastructure already installed to divert water from the Cote Lake[43] to the Rugama Creek which flows into the *Instituto Costarricense de Electricidad*[44] ("*ICE*") Arenal Reservoir[45]. In particular the project uses the existing water intake structure (a tunnel of 389 meter-length and a dam.The project takes the water from the Cote River and transports it by way of a conducting tunnel and underground pressure pipe until the power house, where the water is turbinated and delivered in unaltered conditions to the Rugama Creek which flows into the Arenal Reservoir[46]. The project has an 87.79 meters ("m") net head; with a nominal water flow of 8.4$m^3$/s. The project will supply electricity to the *NIS* through its own 200 meters ("m") - 34.5 Kilovolts ("KV")[47] transmission line which will connect to the closest distribution line that belongs to *ICE*. *ICE* is the distributor of the closest-to-the-project distribution system named Tilarán-Guatuso distribution circuit. Such distribution line owned by *ICE* will transport the electricity generated by the project until the Substation Arenal[48], which belongs to *NIS*. Substation Arenal will transform the energy from 34.5 KV to 120KV and 240KV.

The stated owned energy distributor *Compañía Nacional de Fuerza y Luz* ("*CNFL*")[49] is the project's sponsor ("the sponsor"). The project is in compliance with all Costa Rican regulations for hydropower plants generation activities[50].

---

43 Costa Rica's largest natural lake.

44 A stated owned vertically integrated utility that manages the power sector being the only power purchaser in the country

45 Built in 1982. This infrastructure purpose was to convert the Cote Late into a hydropower plant regulating reservoir, which would be used for the Arenal hydroelectric project.

46 As the structure built in 1982 did as well..

47 The project counts with its own substation that transform the project's electricity generated up to 34.5 KV.

48 Owned by *ICE*

49 Largest electricity distributor in Costa Rica and which also has the distribution in San José (the capital), the largest local market. The sponsor has been in operation since 1941.

**II. Purpose of the Monitoring Plan**

This report presents the Monitoring Plan ("the MP") for the project, which has been considered by The Prototype Carbon Fund ("PCF") for ERs purchases in Costa Rica. The MP defines a standard against which the performance in terms of the project's ERs will be monitored and verified, in conformance with all relevant requirements of the CDM of The Kyoto Protocol. The MP is part of the Emissions Reductions Purchase Agreement (ERPA) document and, after its validation, will be an integral part of the contractual agreement between the PCF, and the project' sponsor ("the sponsor"). For the MP, the sponsor will be treated as it were the project's operator ("the operator"), and solely responsible for the ERs delivery. Both the project's baseline and the MP are subject to verification procedures.

**III. Use of the Monitoring Plan by the Operator**

This report, the MP, identifies key performance indicators of the project and sets out the procedures for metering, monitoring, calculating and verifying the ERs generated by the project, annually. Adherence to the instructions in the MP is necessary for the operator to successfully measure and track the impact of the project on the environment and prepare all data required for the periodic audit and verification process that must be undertaken to confirm the achievement of the corresponding ERs. The MP is thus the basis for the production of ERs and delivery of ERs to the PCF.

The MP assists the operator in establishing a credible, transparent, and adequate data measurement, collection, recording and management system to successfully develop and maintain the proper information; required for an audit and for the verification and certification of the achieved ERs and other Project outcomes. Specifically, the MP provides the requirements and instructions for: (i) establishing and maintaining the appropriate monitoring system including spreadsheets for the calculation of ERs, (ii) checking whether the project meets key sustainable development indicators, (iii) implementing the necessary measurement and management operations, and (iv) preparing for the requirements of independent third party verifications and audits.

The MP ensures environmental integrity and accuracy of crediting ERs by only allowing actual ERs to be accounted for after they have been achieved. The MP must therefore be used throughout the period in which the project has committed to or desires to sell/track ERs. It must be adopted as a key input into the detailed planning of the project, and included as one of the operational manuals of the project. The MP can be updated and adjusted to meet operational requirements. The verifier approves such modifications during the process of initial or periodic verification. In particular, any shifts in the baseline scenario may lead to such amendments, which may be mandated by the verifier. Amendments may also be necessary as a consequence of new circumstances that affect the ability to monitor ERs as described here or to accommodate new or modified CDM rules.

**I.V. Organizational, Operational and Monitoring Obligations**

**A. Obligations of The Operator**

[50] The project would be primarily operating under Law 7554 (Environmental Organic Law of 1995), Law 449 that legally allocates to *ICE* (98.6% shareholder of the sponsor) the responsibility of the development of electricity generation projects and regulated under Law 7593, which created the regulatory entity named *Autoridad Reguladora de Servicios Públicos* ("*ARESEP"*). The sponsor does not require water concessions, generation permits, etc. required by private projects, as it is a stated owned company.

Monitoring the project's performance in terms of ERs achievement requires the fulfillment of operational data collection and processing obligations from the operator. The operator has the primary obligation to calculate the project ERs based on the most recent available information, following the ERs Calculation Procedure ("ERCP") presented in this MP and to abide to the ERCP Organizational Structure and the ERCP Quality Control Procedure presented in the annex section of this MP. Both the ERCP Organizational Structure and the ERCP Quality Control can be seen in annex. The ERCP Organizational Structure aims at showing that the ERCP Manager will be responsible for performing the ERCP (monthly), and the MP Steering Committee will be responsible for supervising the ERCP Manager monitoring work (monthly). The ERCP Manager will report to the MP Steering Committee (monthly); and both the ERCP Manager and MP Steering Committee co-ordinately will report to the verifier (when the verification takes place), allowing for a successful verification of the project's accounted ERs.

The ERCP Quality Control aims at providing guidance on how to handle monitoring data as to ensure that sufficient and accurate information is made available to the verifier, allowing for a successful verification of accounted ERs. It is responsibility of the operator to enter into agreements with both sorts of data sources (*NIS*) to ensure that data is made available monthly to the ERCP Manager. To avoid conflict of interests, all data required for the MP will come from *ICE* through e-mail or CD.

It is believed that the MP approach presented here will result in an accurate, yet conservative calculation of ERs. However some uncertainties may lead to a deviation between monitored and verified ERs, especially errors in the data monitoring and processing system. The operator is expected to prevent such errors and the verification audits are expected to uncover any possible errors. The Certified Emissions Reductions ("CERs") would be granted post-verification.

**Monthly Data Collection – parties involved and monitoring responsibilities**

| | |
|---|---|
| I. ICE – (Data Provider) | - Shall provide the operator with written proof of the project's monthly generation registered by ICE's meter (through e-mail)<br>Frequency: Monthly |
| II. The operator (Data Processor) | - Shall keep receipt of sales.<br>- Shall perform monthly calculation of ERs following the ERCP.<br>- Shall perform the annual report of ERs achieved to the verifier.<br>- Shall establish the necessary agreements with *ICE* to assure that ICE provides (monthly) the project's hourly generation registered by its meter |

Source: CNFL

**B. Emissions Reductions Calculation Procedure and Required Spreadsheets**

The ERCP is the basic instrument for gathering, recording and processing information that will result in the measured ERs. The operator shall consider the project's ERCP as a manual. The ERCP should contain: i) data gathered from *ICE* meter, and ii) data processed by the operator. All data processing should be done in Excel. The ERCP is designed for monthly and yearly calculation, based on final monthly ICE *meter* reports. Filling data monthly in the required spreadsheets will provide time to review formulas, minimize errors and have data readily available for the verifier in any period of the year. There will be in only 1 spreadsheet to be reviewed by the verifier. The file is named Cote ERs at "yearly period in question".xls**.** However, as the verifier could require preliminary calculations, The ERCP responsible ("ERCP manager") should keep the name of the file and follow by the date at which the latest adjustment

is made, every time he works on the file. This will allow saving old versions on disk and keeping them as a record to show to the verifier, if required.

When the ERs calculation for the month is completed, the file should be named Cote ERs at "month in question".xls, to allow differentiating scratch versions from the final monthly calculation. Likewise, after the calculation of the ERS of the last month of the year, the file should change its name to Cote ERs at "yearly period in question".xls.

The year for the MP will run from April 1st to March 31st. This monthly-filled file will be composed by 2 worksheets:

-Worksheet # 1: Original Data from ICE -(ICE's meter)
-Worksheet # 2: Organized Data, Processed Data and Result

1. **Worksheet #1**: Should contain data as it was handed in, by *ICE*, through email or CD, regardless of how it comes i.e. arranged in hours or every 15 minutes or the final monthly project's generation figure. The ERCP manager should not manipulate this data other than copy and paste it from the file it was handed in. The e-mail/CD through which data comes from provider should be kept as proof for the verifier.

2. **Worksheet # 2:** The ERCP manager should put in one column, the hourly generation or quarterof-hour generation of the month of the project and sum it up to obtain the monthly project generation. In this same Worksheet, the ERCP manager should calculate monthly ERs (measured in $tCO_2$) by multiplying the generation in KWh (or MWh) times 0.2022 in $KgCO_2$/KWh (or $tCO_2$/MWh), which is the baseline emission factor for the project and will be used for the second crediting period (7 years). No rounding needs to be made per month when calculating monthly ERs -as this is only done to measure progress. However, resulting yearly ERs must be rounded down to the nearest integer. At the end of the year[51], the ERCP manager should sum the resulting yearly ERs of the project to obtain the yearly project' ERs ready for verification. Once the yearly ERs calculation is completed in the Cote ERs at March.xls, this file should become Cote ERs at "yearly period in question".xls. Worksheet # 2 also allows the ERCP manager to calculate the cumulative generation and cumulative ERs along the year and be aware of the project's environmental benefits progresses regarding ERs.

Worksheet # 2 also allows the ERCP manager to calculate the cumulative generation and cumulative ERs along the year and be aware of the project's environmental benefits progresses regarding ERs.

*The ERCP Quality Control and Organizational Structure can be seen in the annex section of this MP.*

**V. Sustainable Development Monitoring Plan ("SDMP"):** Being a CDM activity, the project must meet the requirements of The Kyoto Protocol Article 12 for CDM Projects, which states that the CDM activity must assist the host country in achieving sustainable development. The Government of Costa Rica has endorsed the project as a CDM-eligible activity. It can be taken for granted that the project will contribute to environmental sustainability as well as development in Costa Rica over its lifetime. The sustainable development objective applies also to projects, where not only positive but also negative environmental and social effects are conceivable. The MP for the project specifies sustainable

[51] For MP purposes: March 31st

development indicators and targets, which must be monitored and met by the operator and the area to which these indicators and targets will be applied.

*The specific SDMP built for the project can be seen in the annex section of this MP***.**

**A. Environmental Sustainability: Impact on Local Pollution**

In addition to mitigate emission of $CO_2$, the project will reduce emissions of local pollutants (particularly$SO_2$, $NO_x$ and particulates).

The stratigraphic base of the project's area is volcanic rock. The Cote River will remain at its current, diverted (and almost dry) state. The Cote lake water is dark, with low light penetration. There is no evidence of endemic fish in the lake, nor in surrounding rivers. Many frogs and other amphibians are common. Otters have been spotted. The lake is surrounded by some wetlands.

The project contribution to environmental sustainability is contemplated in the SDMP, shown in the annex section of this MP.

**B. Socio-Economic Sustainability**

No negative social impacts are predicted as a consequence of the project, two communities are located in the project area of influence, the village of Arenal de Tilarán and the village San Rafael de Guatuso. A social assessment was completed during project preparation, and these communities were targeted during project public consultation[52].

Based on information from the National Museum of Costa Rica, no known archeological sites exist in the project area.

The project contribution to socio-economic sustainability is contemplated in the SDMP, shown in the annex section of this MP.

[52] San Rafael has a population of 6,694 habitants, whose main economic activities include grain, vegetable, fruit and dairy production. Arenal has a population of 2,180 habitants, and its main economic activity is tourism. The communities have access to education, health services, drinking water, public transportation and electricity.

## VI. Annexes

### Sustainable Development Monitoring Plan (“SDMP”)

The SDMP will cover the project’s direct and indirect area of influence[53] and their habitants. The following sustainable development indicators and targets framework will facilitate the measurement of progress towards sustainability. The indicators will be revised annually[54] by the verifier to check compliance with targets. The targets will be progresses[55] registered by the indicators. The following indicators have been established:

**SDMP Indicators and Targets Framework**

| **Goal 1: Environmental Sustainability** | | |
|---|---|---|
| **Initiative** | **Indicator[56]** | **Target** |
| Land Quality | Reforested area as % of the total area de-forested | The same or improved[57] |
| Land Quality | Minimum ecological flow | The same or improved[58] |
| Water Quality | Water Quality | The same or improved[59] |
| Biodiversity | Number of key bioindicator species, frequency of sightings | The same or improved[60] |
| Biodiversity | Payment for environmental services to protect watershed forests | $36,000[61] |
| New Initiative | In case the sponsor desires to incorporate a new initiative to this environmental-sustainability-initiative list, it will have to be approved by the verifier | N/A[62] |

[53] Defined in the EIA.

[54] The year for the MP runs from April 1st to March 31st

[55] Progresses meaning positive results of the indicators

[56] Yearly flow or yearly change.

[57] During the first 4 years of operation

[58] During the project’s operating life.

[59] During the project’s operating life.

[60] During the project’s operating life.

[61] During the first 10 years of operation.

[62] Target will be set when indicator is created and also needs to be approved by the verifier

| Goal 1: Socio-Economic Sustainability | | |
|---|---|---|
| **Initiative** | **Indicator**[63] | **Target** |
| Economic standards | Number of permanent jobs created by the project | Positive[64] |
| | Quality of access ways and roads maintained – $m^2$ improved | Positive[65] |
| New Initiative | In case the sponsor desires to incorporate a new initiative to this socio-economic-sustainability-initiative list, it will have to be approved by the verifier | N/A[66] |

To provide evidence of listed indicators' progresses, the project should provide the verifier the following:

(a) Receipts of expenses incurred for the socially and environmentally responsible action.
(b) Documents related to socially and environmentally responsible action.
(c) The compliance form signed annually by all members of the compliance committee (described below).

**The Compliance Committee:** The compliance committee will be formed to enforce further the SDMP. The compliance committee will be composed by the project's "*Regente Ambiental*" during the project operation: Ms. Ángela González[67].

The compliance committee will meet annually to:

- After reviewing evidence [(a) and (b) described above], reviewing a written summary of the environmentally and socially responsible actions taken in the year - to be prepared by the sponsor (*CNFL*) - and being left convinced by this evidence about the indicators' progresses' accuracy claimed by the project, sign the attached form annexed below ("compliance form"); and

- Review progresses, identify stoppages and suggest solutions regarding listed indicators, to *CNFL*, represented by Mr. Dennis Mora, who will be present at the meeting.

[63] Yearly flow or yearly change.

[64] During the project's operating life.

[65] During the project's operating life

[66] Target will be set when indicator is created and also needs to be approved by the verifier.

[67] Professional biologist.

**Annual Compliance Committee Meeting - Compliance Form**

| Goal 1: Environmental Sustainability | | |
|---|---|---|
| **Initiative** | **Indicator**[68] | **Target** |
| Land Quality | Reforestated area as % of the total area deforested[69] | As of March 31= |
| Land Quality | Minimum ecological flow[70] | As of March 31= |
| Water Quality | Water Quality[71] | As of March 31= |
| Biodiversity | Number of key bioindicator species, frequency of sightings[72] | As of March 31= |
| Biodiversity | Payment for environmental services to protect watershed forests[73] | As of March 31= |
| New Initiative | In case the sponsor desires to incorporate a new initiative to this environmental-sustainability-initiative list, it will have to be approved by the verifier | N/A[74] |

| Goal 1: Socio-Economic Sustainability | | |
|---|---|---|
| **Initiative** | **Indicator**[75] | **Target** |
| Economic standards | Number of permanent jobs created by the project[76] | As of March 31= |
| | Quality of access ways and roads maintained – $m^2$ improved[77] | As of March 31= |
| New Initiative | In case the sponsor desires to incorporate a new initiative to this socio-economic-sustainability-initiative list, it will have to be approved by the verifier | N/A[78] |

Identified stoppages, suggested solutions and other observations brought up in the meeting: ___________

______________________________________________________________________

[68] Yearly flow or yearly change.

[69] During the first 4 years of operation.

[70] During the project's operating life

[71] During the project's operating life

[72] During the project's operating life

[73] During the first 10 years of operation

[74] Target will be set when indicator is created and also needs to be approved by the verifier

[75] Yearly flow or yearly change.

[76] During the project's operating life.

[77] During the project's operating life.

[78] Target will be set when indicator is created and also needs to be approved by the verifier.

(Annex extra-paper if necessary).

Direct area of influence representative    Indirect area of influence representative

The sponsor

Date of the Compliance Committee Meeting:    Period of the year monitored: