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. • 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:

Project Title: Chamelecón 280 Hydroelectric project
PDD Version: 02.1
Date: 11/ 03 / 2011

PDD development history:

1st PDD: (25/05/2010)	Version 01	First Global Stakeholder Process
2nd PDD: 23/12/2010	Version 02	Updated version after comments from audit team
3rd PDD: 11/3/2011	Version 02.1	Update after requests from the audit team.

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

The project consists of renewable electricity generation from a run-of-river small hydro power plant utilizing the Chamelecón River near the community of Macuelizo, Honduras. The small hydro power plant consists of 2 turbines of 5.56 MW capacity each, and has a total installed capacity of 11.12 MW.

Projects such as Chamelecón 280 who sell all their output to ENEE supply the national grid with an economical KWh but also encourage sustainable development in the surrounding rural regions through rural electrification, job creation, and the afforestation/reforestation programs implemented.

The Project contributes to sustainable development by:

a) Helping SIN to displace expensive generation fired by heavy fuel, diesel, and coal and reduces GHG emissions;

b) Generating direct and indirect jobs, businesses and local services;

d) Increasing the national power generation capacity, and contribute to the overall development of the country;

e) Supporting the development of the project’s neighboring Municipality of Macuelizo through workshops with main local stakeholders, social organizations and institutions regarding environmental protection of the river basin and afforestation.

f) Improvement of the roads that can be used by the local citizens.

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)
Honduras (host)	Generación de Energía Renovable S.A. de C.V. (GERSA)	No

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

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

A.4.1.1. Host Party (ies):

Honduras

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

Santa Bárbara Department

A.4.1.3. City/Town/Community etc:

Municipality of Macuelizo, Villages of Laguna Seca and La Playa

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

The Chamelecón 280 hydroelectric project is located in the municipality of Macuelizo, Santa Barbara Department, Honduras. It is near to the Laguna Seca and La Playa villages.

Geographic Coordinates:

Diversion Dam: 1680,700 N; 326,531 E

Power Plant: 1681,739 N; 329,664 E


Belize
Macuellizo
Guatemala
Honduras
El Salvador
Nicaragua


LA PLAYA
LAGUNA SECA
Power House
Subterranean Water Conduction Tunnel
(3,130 m Long.)
Diversion Dam

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

According to the Appendix B to the simplified modalities and procedures for small-scale CDM project activities, the proposed project activity falls under the following type and category.

Project Type: I **-** Renewable energy projects
Category: I.D **-** Grid connected renewable electricity generation
Reference: AMS.I.D, version 16, EB 54 valid from June 11, 2010

The project consists of renewable electricity generation from a run-of-river small hydro power plant utilizing the Chamelecón River in Macuelizo, Honduras. The small hydro power plant consists of 2 turbines of 5.56MW capacity each, and has a total installed capacity of 11.12 MW, i.e., below the eligibility threshold of 15 MW for small scale projects. Further turbine design characteristics can be found in the following table.

Number of turbines	2
Turbine type	Francis Horizontal Shaft
Nominal turbine power	5.560 kW
Number of generators	2
Nominal generator power	6.8 MVA
Generator Frequency	60 Hz
Generator Voltage	13.8 kV
Plant load factor	57%
Average yearly generation	55.7 GWh
Design water flow	8 m^3/s
Net head	76.5 m

The plant conforms to the NREL definition of run-of-the-river because it does not have a reservoir to store water and thus relies on the natural water flow of the Chamelecón River, greatly reducing the environmental impact of the site.

The plant load factor has been calculated using the average yearly water flow from the years 1971-1997 and 2000-2006 (32 years). Using the average monthly water flow measured, the flow duration curve has been prepared. With such data and including the efficiencies (from turbine, generator, transformer, transport), the power has been calculated. The energy generated can be calculated with the power by a period of time (1 year). The plant load factor has been calculated comparing the ratio of the actual output of the power plant over a period of time (8760 hours per year) and its output if it had operated a full capacity of that time period.

The Chamelecón Hydroelectric Power Plant utilizes Francis Horizontal Shaft turbines.

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

Year	**Annual estimation of emission reductions in tons of CO_2-eq**
Y1	35,352
Y2	35,352
Y3	35,352
Y4	35,352
Y5	35,352
Y6	35,352
Y7	35,352
Total emission reductions (tons of CO_2e-eq)	**247,464**
Total number of crediting years	**7 years**
Annual average over the crediting period estimated reductions (of tons of CO_2e)	35,352

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

There is no public funding from Annex I countries available for the project.

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

According to appendix C of simplified modalities and procedures for the small-scale CDM project activities, a proposed small-scale project activity shall be deemed to be a de-bundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

· With the same project participants
· In the same project category and technology/measure; and
· Registered within the previous 2 years; and
· Where the project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

This project does not meet any of the above mentioned requirements. Therefore it is not a debundled component of a large-scale project activity.

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:

AMS I.D. Grid connected renewable electricity generation (Version 16, EB 54, June 11, 2010).

As electricity dispatched to the Honduran grid does not exclusively depend on fuel oil and/or diesel fuel based generation paragraph 12. of AMS I.D. V16 applies:
"12. 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'.

OR

(b) The weighted average emissions (in kg CO_2e/kWh) of the current generation mix. The data of the year in which project generation occurs must be used.

Calculations must be based on data from an official source (where available) and made publicly available."

For this project option (a) will be used for calculating the baseline.

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

The project activity meets all the applicability conditions of the AMS I.D. as described below:

The applicability conditions for simplified baseline methodology category AMS I.D are:

- This category comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass that supply electricity to a national or a regional grid.

The project is a hydroelectric power plant and as such fulfils this criterion.

- This methodology is applicable to project activities that (a) install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).

The project installs a new power plant at a site where there was no renewable energy power plant operating and thus fulfils this criterion.

- Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology:
    - The project activity is implemented in an existing reservoir with no change in the volume of reservoir;
    - The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m2;
    - The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m2.

The project is a run-of-the-river power plant and as such uses no reservoir, thus this criterion is not applicable.

- In the case of biomass power plants, no other biomass types than renewable biomass is to be used in the project plant.

The project is not a biomass power plant, this criterion is not applicable.

- If the new unit has both renewable and non-renewable components (e.g., a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable

component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.

The project does not have a non-renewable component, this criterion is not applicable.

- Combined heat and power (co-generation) systems are not eligible under this category.

The project is not combined heat and power, this criterion is not applicable.

- In the case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.

The project does not involve the addition of renewable energy generation units at an existing facility, this criterion is not applicable.

- In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.

The project is not a retrofit or replacement, this criterion is not applicable.

For the proposed project:
The proposed project activity is an 11.12 MW hydropower project delivering electricity to the Honduran National Interconnected System (SIN, from its Spanish acronym). Therefore, the proposed project activity satisfies the requirements of (1) the capacity of a project should be less than 15 MW; (2) the project should concern renewable power generation; and (3) the electricity generated from the proposed project supply to a grid (SIN), which is predominantly non renewable.

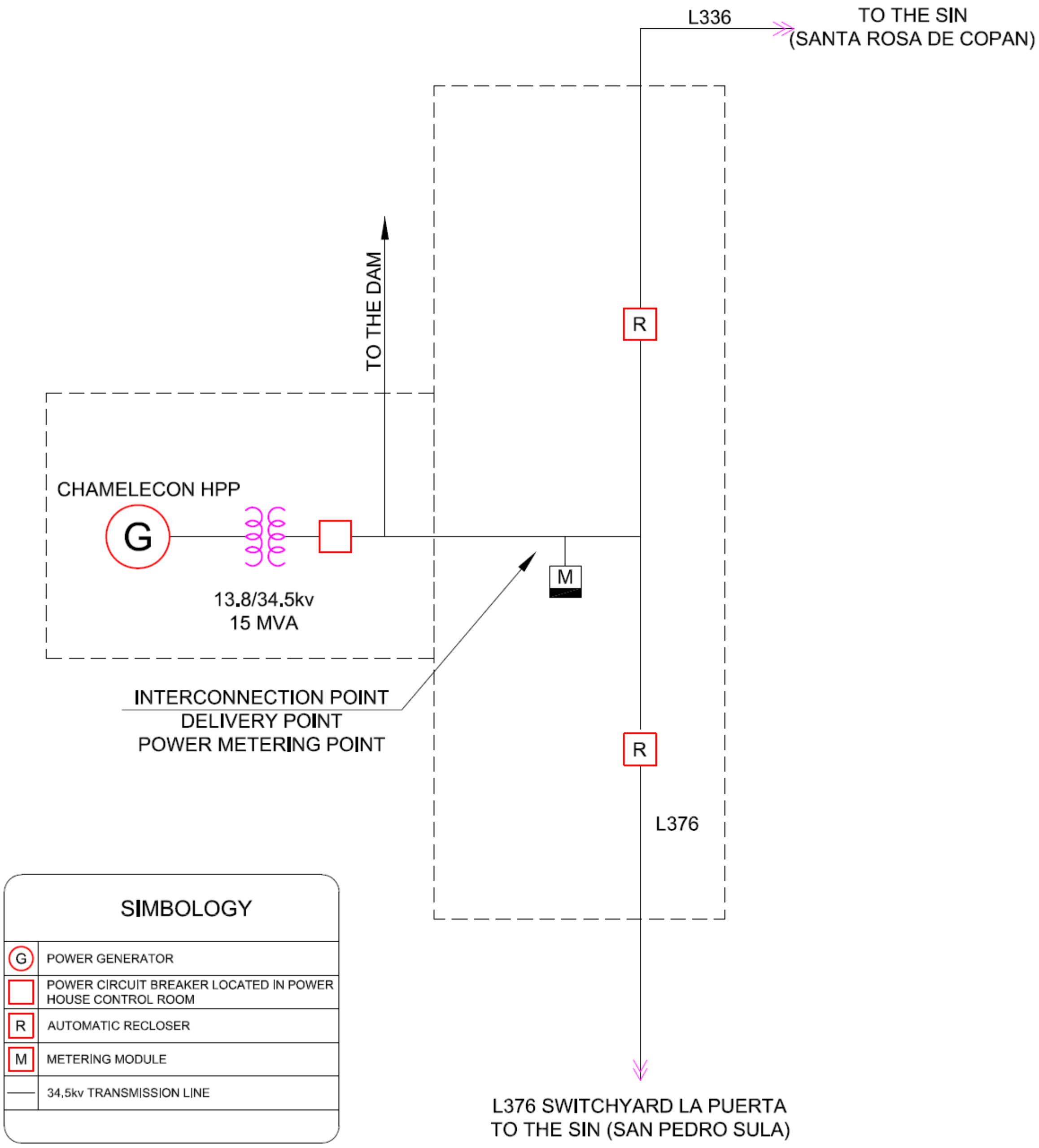
Thus, all applicability conditions for the use of simplified baseline methodology category I.D have been satisfied.

B.3. Description of the project boundary:

According to methodology AMS I.D, the project boundary encompasses the physical and geographical site of the renewable electricity generation source. For that reason, the project boundary is the area of where Chamelecón 280 hydroelectric power plant, diversion dam and transmission lines are located. This would be near the Macuelizo Municipality in Santa Barbara Department, Honduras. As the transmission line will reach the SIN by interconnecting to the L-336 distribution line, the SIN will also be included in the project's boundary. The power generated from the project would be metered and accurately quantified.

The connection to the national grid is described in the sketch in the next page.

INTERCONNECTION TO THE NATIONAL INTERCONNECTED SYSTEM AND ENERGY METERING POINT OF THE CHAMELECON 280 HYDROELECTRIC PROJECT



B.4. Description of baseline and its development:

The baseline has been calculated on the basis of the latest information provided by ENEE (Empresa Nacional de Energía Eléctrica, the Honduran National utility). This information includes data up to 2008. See Annex 3 for details on existing power plants, energy production and fuel use.

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:

Because the start date of project activity precedes the publication of the CDM-PDD for global stakeholder consultation the following describes serious previous consideration of CDM benefits:

- The importance of CDM is mentioned in the first draft of the project profile "Borrador del Perfil del Proyecto Hidroelectrico Chamelecon 280" written in October 2005. CDM income is considered in the financial analysis at this stage, as it is throughout the rest of the development process.
- Anaconda Carbon was contracted as a CDM consultant to develop the CDM component of Chamelecon 280 on January 20, 2009 after more than 6 months of proposals and negotiations, as evidenced by emails and draft proposals starting in August 2008.

Summary of the current situation

As of the end of 2008, energy in Honduras was generated 37.8% by renewable energy and 62.2% fuel oil and diesel. Hydroelectric projects made up over 90% of total generation in 1993, dropping to 32.7% in 2008; a negligible amount of hydroelectric capacity has been added to the grid in the last 15 years; most of which came from large hydroelectric projects. Thus, small scale hydroelectric projects (below 15 MW, as defined by the UNFCCC) account for less than 2% of current hydroelectric capacity. ENEE estimates that an increase in installed capacity of 892 MW from 2002 levels will be necessary to meet demand by the year 2015; 475 MW of these have already been assigned to thermal production.

Table 1 provides a summary of energy generation within Honduras and illustrates the increasing shift away from hydroelectric power to thermal generation.

Table 1: Total Energy Output in the National Grid
Source: ENEE Statistical Bulletin April 2009 (www.enee.hn)

Plant	Cumulative 1993		Cumulative 2002		Cumulative 2007		Cumulative 2008	
	GWh	%	GWh	%	GWh	%	GWh	%
Hydroelectric	2,277.7	90.68	1,609	35.82	2,212.9	35.5	2,290.4	35.1
Thermal	234.1	9.32	2,464.35	54.85	3,936.7	62.8	4,015.5	61.5
Biomass	0	0	4.15	0.09	109.4	1.7	184.8	2.8
Imported	0	0	415.15	9.24	11.8	0.2	42.6	0.7
Total	2,511.8	100	4,493.29	100	6,270.8	100	6,533.3	100

Less than 34% of the projects included in the "Indicative Plan for Generation Expansion" (Plan Indicativo de Expansión de Generación) for 2007 - 2020, which is essentially ENEE's blueprint for electricity generation in Honduras, are hydroelectric. The vast majority of hydroelectric projects are large scale, including Tornillito (160 MW), Piedras Amarillas (100 MW), Llanitos (98 MW), Jicatuyo (173 MW), La

Terrosa (150 MW) and Valencia (270 MW). This document clearly identifies further reliance on fossil fuels by the Honduran grid, along with the construction of a handful of large hydroelectric projects, as the likeliest of scenarios in the absence of CDM incentives for small-scale renewable energy.

The Chamelecón 280 Hydroelectric Project reduces anthropogenic emissions of GHG that would have occurred in the absence of the project as per the attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities requiring the project proponent to demonstrate that the project activity would not have occurred anyway due to *at least one* of the following barriers:

- Investment barrier
- Technological barrier
- Barrier due to prevailing practices / common practice
- Other barriers (including institutional barriers)

The most significant barriers faced by the Chamelecón 280 Hydroelectric Project are investment and institutional barriers as described below.

(a) Institutional Barriers

Issues regarding unclear processes, political reluctance to modernize the regulatory framework to incentivize renewable energy and prolonged, unreliable timeframes to complete permits and licenses are amongst the key institutional barriers which deter developers from undertaking small-scale energy projects; those developers who do undertake them are faced with financial institutions who are reluctant to fund their projects because the institutional barriers generate large, or at least hard-to-quantify risks.

Details regarding the specific institutional barriers faced by Chamelecón 280 are provided below; these must be analyzed in the context of the current political climate which is reticent to support renewable energy despite the clear need for legal incentives. The latest amendments to Decree 070-2007 “Law for the promotion of electrical energy from renewable sources” are still being discussed by the Legislature, which had approved the amendments requested by the renewable energy project developers, but was forced to review them after a partial veto from the President of Honduras.

Legal documentation for small-scale hydro projects can take over 3 years to acquire, while the same documentation can be procured within a year in the case of some thermal projects.

Chamelecón 280 Hydroelectric Project faces three especially complicated institutional barriers which have placed undue legal and regulatory risk on the project, delaying its progress.

- Interconnection of the project with ENEE’s Interconnected National System
    - On February 14 2008, after several months of conversations, GERSA officially requested authorization to interconnect the project to the SIN (the National Interconnected System). Such authorization is a requirement for ENEE’s approval and authorization of a PPA which would allow the project financing, and thus, the starting of the construction of Chamelecón 280 Hydroelectric Project.
    - Thirteen month later, specifically on April 27 2009, ENEE approves GERSA’s request.
    - On April 29 2009, ENEE informs GERSA that PPA negotiations will be suspending pending resolution of issues with another private Developer who requested interconnection on March 2009.
    - ENEE promised to have a final answer for GERSA by May 15, 2009.

  - A short, medium and long term solutions were given by ENEE on July 03, 2009.
  - On December 01 2009, ENEE suspended the short term solution and decide to approve the medium and long term solution as the final decision.

The Interconnection authorization to the National Grid is a key document in the development of an energy project. Delays by ENEE in granting it postponed PPA negotiations, which in turn, kept project financing formalization (the PPA is required by all local banks as future loan payment guarantee). Further delays with this process would mean GERSA would be unable to fulfill contractual obligations with suppliers and civil work company.

- Environmental Permit (Licencia Ambiental)
  - On June 4, 2007 GERSA introduces an Environmental Permit Request to SERNA for Chamelecón 280 Hydroelectric Project, including the Qualitative Environmental Diagnostic (Spanish Diagnóstico Ambiental Cualitativo – DAC)
  - On July 26, 2007 SERNA carries out a project inspection.
  - SERNA, finding no objection to the project, sends a signed Environmental Mitigation and Control Contract to GERSA on July 8 2008; this contract was to be signed by GERSA, in order for SERNA to issue the required Environmental Permit.
  - GERSA requested clarification and modification of clauses which could be subject to confusion and misinterpretation; a counterproposal to the contract was presented by GERSA to SERNA during the second semester of 2008.
  - On August 2008 GERSA presents technical studies relating to Ecological flow to support its counterproposal.
  - On May 13 2009 SERNA requested an additional study about the biodiversity downstream the future dam, in order to assess the counterproposal presented by GERSA
  - On July 24, 2009 GERSA presented the required additional study to SERNA.
  - The Environmental Permit, No.126-2009, was finally issued by SERNA November 9, 2009.

As with the interconnection authorization from ENEE, the delays in finalizing the Environmental Permit generated delays and costs for the project developer. If the Environmental License is not granted the project cannot be executed, causing further losses for the developer.

- Power Purchase Agreement Negotiations
  - Due to the previously described delays, especially the one dealing with the interconnection authorization, negotiations to secure a PPA were stalled for over two years. This situation was compounded by delays and uncertainty regarding issues dealing with a Special Renewable Law modification, which has not yet been approved by Honduras Government. Even so, GERSA decided to proceed with PPA negotiations regardless of the outcome of this law, thus taking on further financial hardships and risks.
  - PPA negotiations were finally concluded on April 24, 2010 when 49 companies were adjudicated contracts totally about 250MW of renewable energy generation.

The final approval of the PPA by the Honduran congress is the final institutional hurdle that a project needs to overcome in order to be developed. It is here, where the CDM process supports the project activity to be developed. The congress made the final decision to approve the project from a political point of view, which means taking into account the social and environmental aspects of the project more than the importance for the national development. CDM development gives the decision makers the

assurance that the project is being developed taking into account international social and environmental requirements, therefore, it supports the final approval step of the project activity.

Institutional barriers, which have been accepted as the main barriers faced by previously registered small-hydro projects in Honduras including La Esperanza, Cuyamapa, Cuyamel, La Gloria, Cortecito, San Carlos, Cececapa and Yojoa hydroelectric projects have been some of the main hurdles which Chamelecón 280 Hydroelectric Project has faced. These barriers have forced the project developer to incur delays which would, in the absence of CDM, render the project unattractive for development.

(b) Investment Barriers

A major investment barrier that GERSA has faced with Chamelecón 280 is in the difficulty to obtain project finance from banks and other financial institutions. This obstacle is linked to the difficulties that GERSA has experienced in attaining a power purchasing agreement (PPA) with ENEE. ENEE did not grant GERSA the right to sell the power output from the project activity to the Honduran National Utility until April 24, 2010 after sizeable delays and additional costs. This situation and how it affects the financing of the project activity represents another serious investment barrier. This situation was further explained in the “Institutional Barrier” section.

GERSA will be the developer of the first hydroelectric power project with direct investment of the ELCOSA group. ELCOSA has one investment of a 80MW fossil fuel (fuel oil) based energy generation unit. The investment was financed by three international banks; IFC, DEG from Germany and FMO from Netherlands. The financing of fossil fuel electricity generation cannot be compared with the problemas faced securing financing for hydropower projects, mainly because the technical equipment of thermal energy production can be easily sold in case of bankrupt and secondly, because the construction process of a hydro power plant (with tunnels, terrain) represents a much higher risk. This statement was confirmed by the local bank that is syndicating the financing of the project activity. CDM helps to overcome the investment barrier by assuring that the project will be developed under international standards and therefore helping the decision makers of the banks to approve this financing with higher risks.

Conclusion

“Attachment “A” of Appendix B” of the simplified modalities and procedures for small-scale CDM project activities recognizes investment and institutional barriers as legitimate obstacles, which, if evidenced and supported by the project developer, render the proposed project activity as additional.

The current and expected practice of predominantly relying on thermal sources in expanding the generation capacity in Honduras, as well as the combination of investment, prevailing practice and institutional barriers described demonstrate that Chamelecón 280 Hydroelectric Project is additional and therefore not part of the baseline scenario. The prohibitive nature of the barriers prevalent in Honduras are confirmed by the recent trend in capacity addition and small hydro-plants’ small share of total electricity generation in the country.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

This section explains the CO_2 emission factor *(EFgrid,CM,y)* for the displacement of electricity generated by power plants in an electricity system, by calculating the "operating margin" (OM) and "build margin" (BM) as well as the "combined margin" (CM).

- *EFgrid,CM,y* refers to Combined margin CO_2 emission factor for grid connected power generation in year y;
- *EFgrid,BM,y* refers to Build margin CO_2 emission factor for grid connected power generation in year y;
- *EFgrid,OM,y* refers to Operating margin CO_2 emission factor for grid connected power generation in year y.

The emission factors are determined according to the procedures prescribed in the "**Tool to calculate the emission factor for an electricity system**" (version 02) as following seven steps:

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 theoperating margin (OM).
STEP 4. Calculate the operating margin emission factor according to the selected method.
STEP 5. Identify the group of power units to be included in the build margin (BM).
STEP 6. Calculate the build margin emission factor.
STEP 7. Calculate the combined margin (CM) emissions factor.

Step 1. Identify the relevant electricity systems

The project will supply electricity to the national grid (SIN) by connecting to the L - 336 distribution line that belongs to ENEE. The Project will use its own transmission line to interconnect with the National Grid.

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

Off-Grid power plants are not included in the emission factor calculations

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

The "**Tool to calculate the emission factor for an electricity system**" (version 2) – referred to further as the "Tool" – allows four methods to calculate the operating margin emission factor $EF_{grid,OM,y}$. Of these four, the 'Simple OM' can be used only if low-cost/must-run resources constitute less than 50% of total grid generation on average over the last 5 years. This condition is fulfilled in Honduras, where the share of low-cost/must-run resources has been below 50% since 2001.
Hence, the 'Simple OM' method will be used.[1]

[1] Calculations made for this report show percentages of low cost / must run (LC/MR) generation plants as: 33.4% (2006), 32.4% (2007) and 30.7% (2008). Calculations made for 2004 and 2005 show similar results.

The second choice is between the ex ante and the ex post option.

The ex ante option will be selected.

This requires the calculation of a 3 year generation-weighted average, based on the most recent data available. Data will be used for the years 2006, 2007 and 2008.

Power plants registered, as CDM projects should be included in the sample group to calculate the OM, if the criteria related to the power source allow for their inclusion.

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

This PDD adopts the (a) Simple OM. The simple OM emission factor is calculated as the generation weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units. It may be calculated:

- Based on the net electricity generation and a CO_2 emission factor of each power unit (**Option A**), or
- 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.(**Option B**)

Option A is the preferred option to calculate the operating margin emission factor. The conditions to use option B are not met.
Option A has been selected to be used in this PDD document

The $EF_{OM\ simple,2006\text{-}8}$ (in tCO_2/MWh) have been calculated as:

Emissions (tCO_2) 2006-2008 / Generation15 (MWh) 2006-2008 =7.626.719 / 11.711.371 =0.6512

The formula to be used for the calculation of the simple OM emission factor $EF_{OM\ simple,y}$ under Option A is:

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

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* except low-cost / must-run power units
y = The relevant year as per the data vintage chosen in Step 3

The formula used for the calculation of $EF_{EL,m,y}$ under Option A1 is:

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

$EF_{EL,m,y}$	= CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh)
$FC_{i,m,y}$	= Amount of fossil fuel type *i* consumed by power plant unit m in year *y* (mass or volume unit)
$NCV_{i,y}$	= Net Calorific value (energy content) of fossil fuel type I in year y (GJ / mass or volume unit)
$EF_{co2,i,y}$	= CO_2 emission factor of fossil fuel type I in year y (tCO_2/GJ)
EGm,y	= Net electricity generated and delivered to the grid by the power plant/unit m in year y (MWh)
M	= All power units serving the grid in the year y with except low-cost/must-run power units
i	= All fossil fuel types combusted in power plant/unit m in year y
y	= Three most recent years for which data is available at the time of submission of the project (Chosen in step 3)

Step 5. Identify the group of power units to be included in the build margin (BM)

To calculate the build margin (BM), the tool allows to use either the five most recently built power units – not retrofits - or the most recent capacity additions that comprise 20% of the system generation. Preference should be given to the set of power plants that comprises the larger annual generation.

The calculation model, as developed, includes the calculation of the BM on the basis of the 20% option, but if the five most recently built power units exceed the 20%, that option will be used. CDM projects are to be excluded from the sample group. [2]

Since 2005 at least 15 mainly smaller plants have been commissioned of which less than half are CDM projects, but the production of these recent non CDM projects comprises less than 20% of the electricity generated in 2008 and hence the **BM has been calculated on the basis of the 20% option** and not on the basis of the five most recently built non CDM power units. The oldest of the most power plants included to reach the 20% is Lufassa III, commissioned in August 2004.

The tool allows for two options with respect to the vintage of data; ex ante or ex post. **The ex ante option has been selected.** The ex ante result can be used for the full first crediting period and implies that the emission factor does not have to be monitored during this period.

Step 6.Calculate the build margin emission factor

[2] The tool describes specific situations in which CDM projects should be included in the sample group for BM, related to the dispatching authority to the electricity system. This information is to be provided by the host country.

The calculation of the BM emission factor is to be based only on the most recent year for which data are available, i.e. 2008. The procedure and formulae are similar to the ones for the OM emission factor.
The EF_{BM} has been calculated as 0.6181 (tCO_2/MWh).

The formula to be used for the calculation of the BM is:

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

$EF_{grid,BM,y}$ = 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

Step 7.Calculate the combined margin (CM) emissions factor

The combined margin EF_{CM} will be the simple average of the EF_{OM} and the EF_{BM}
The tool has indicated that the default weights for OM and BM for all projects other than wind and solar will be equal for the first crediting period. The tool does allow for alternative weights to be proposed for specific circumstances, but for the concerned project the suggested default values will be applied.
In formula:

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

Where:

$EF_{grid,CM,y}$ = Combined Margin emission factor in a year (tCO_2/ MWh)

$EF_{grid,OM,y}$ = Operating Margin CO_2 emission factor in year y (tCO_2/MWh)

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

w_{OM} = Weighting of operating margin emission factor (%)

w_{BM} = Weighting of build margin emission factor (%)

And both values for the weights are the default ones as suggested;
W_{OM}= 0.5 and W_{BM}= 0.5

The $EF_{grid,CM,y}$ has been calculated as = 0.6347.

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

Data / Parameter:	**ID.1 / $EF_{grid,CM,y}$**
Data unit:	tCO_2/GWh
Description:	CO_2 emission factor for electricity displaced in the grid
Source of data used:	Own calculations based on data provided by the national electricity company ENEE for 2006-8 and best practice assumptions as shown in Annex 3
Value applied:	0.6347
Justification of the choice of data or description of measurement methods and procedures actually applied :	The parameter is calculated as the combined margin (CM) according to the "Tool to calculate the emission factor for an electricity system (version 02)". For operating margin (OM) and built margin (BM) the respective ex-ante approaches are chosen. For the OM data from the years 2006, 2007 and 2008 is used. For the BM data from the year 2008 is used.
Any comment:	Calculations correspond to the official estimate from SERNA. See http://www.serna.gob.hn/noticias/Documents/Reporte%20Calculo%20del%20EF%202008%20INGLES.pdf

Data / Parameter:	**ID.2- $EF_{grid,OM,y}$**
Data unit:	tCO_2/MWh
Description:	Operating Margin emission factor in year y
Source of data used:	Calculations by SERNA based on data provided by the national electricity company ENEE for 2006-8 and best practice assumptions as shown in Annex 3.
Value applied:	0.6512
Justification of the choice of data or description of measurement methods and procedures actually applied :	Emissions (tCO_2) 2006-2008 / Generation[15] (MWh) 2006-2008 according to the "Tool to calculate the emission factor for an electricity system (version 02)"
Any comment:	All relevant data and parameters are taken from the official SERNA estimate : http://www.serna.gob.hn/noticias/Documents/Reporte%20Calculo%20del%20EF%202008%20INGLES.pdf

Data / Parameter:	**ID.3- $EF_{grid,BM,y}$**
Data unit:	tCO_2/MWh
Description:	Build Margin emission factor in year y
Source of data used:	Calculations by SERNA based on data provided by the national electricity company ENEE for 2006-8 and best practice

	assumptions as shown in Annex 3.
Value applied:	0.6181
Justification of the choice of data or description of measurement methods and procedures actually applied :	Emissions (tCO_2) 2008 / Generation (MWh) 2008 according to the "Tool to calculate the emission factor for an electricity system (version 02)"
Any comment:	All relevant data and parameters are taken from the official SERNA estimate : http://www.serna.gob.hn/noticias/Documents/Reporte%20Calculo%20del%20EF%202008%20INGLES.pdf

Data / Parameter:	**ID.4-** $NCV_{i,y}$
Data unit:	TJ/Gg
Description:	Net calorific value (energy content) per mass unit of fuel *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:	Fuel Oil: 39.8 TJ/Gg Diesel: 41.4 TJ/Gg
Justification of the choice of data or description of measurement methods and procedures actually applied :	No other data is publicly available. IPCC guidelines have been used in a conservative manner.
Any comment:	Notice that the original fuel consumption data provided by the facilities is expressed in gals. These are converted to mass units (by means of a coefficient *Di*)

Data / Parameter:	**ID.5-** $EF_{CO2,i,y}$
Data unit:	tCO_2/TJ
Description:	CO_2 emission factor of fossil fuel *i* in year *y*.
Source of data used:	IPCC default values at the lower limit if 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 Greenhouse Gas Inventories
Value applied:	Fuel Oil: 75.5 tCO_2/TJ Diesel: 72.6 tCO_2/TJ

Justification of the choice of data or description of measurement methods and procedures actually applied :	No other data is publicly available. IPCC guidelines have been used in a conservative manner.
Any comment:	All relevant data and parameters are taken from the official SERNA estimate : http://www.serna.gob.hn/noticias/Documents/Reporte%20Calculo%20del%20EF%202008%20INGLES.pdf

Data / Parameter:	**ID.6 *Di*,**
Data unit:	Gr/cm^3
Description:	Density of fuel *i* in year *y*.
Source of data used:	Table A.4 "Emissions of Greenhouse Gases in the United States" - Energy Information Administration (US Department of Energy). Available at http://www.eia.doe.gov/oiaf/1605/archive/87-92rpt/appa.html
Value applied:	Fuel Oil: 11.2 API(= 0.993 gr/cm^3) Diesel: 34 API (= 0.8473 gr/cm^3)
Justification of the choice of data or description of measurement methods and procedures actually applied :	No regional or national data is publicly available. IPCC Guidelines (2006) do not provide information on density so another source had to be sought
Any comment:	

Data / Parameter:	**ID.7** $EG_{m,y}$
Data unit:	MWh
Description:	Net electricity generated and delivered to the grid by power plant/unit *m* in year *y*.
Source of data used:	ENEE – Empresa Nacional de Energía Eléctrica de Honduras
Value applied:	Data for the 2006-2008 period is available in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data is obtained from official sources
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

The total emission reductions of the project are calculated on the basis of the equations and parameters presented and explained in section B.6.1 of this document. Baseline information for the combined margin emission factor is presented in Annex 3 of this document.

Taking into account November 2011 as a starting date of a 7 year crediting period, emission reductions calculations for year 2011 and 2018 refer to the fraction of the respective year that is covered by the crediting period.

Baseline emissions
Grid connected renewable electricity generation
1. Calculation of the baseline emissions from electricity generation

Input data

$$EG_y = (P_y . LF_y\ 24 . 365)/1000$$

Where
EG_y = Net electricity generation of the project (GWh/year).
P_y = Power capacity installed (MW)
LF_y = Load factor
24 = Hours / day
365 = Operational days of the project / year

For Chamelecón 280
EG_y = 55.7 (GWh/year)
P_y = 11.12 (MW)
LF_y = 0.57

Table 5. Net electricity generation of the project

Year	2011	2012	2013	2014	2015	2016	2017	2018
EG_y GWh/year	6.9	55.7	55.7	55.7	55.7	55.7	55.7	48.7

$$EF_{grid,CM,y} = 0.6347\ tCO_2eq/MWh$$

Equation:

$$BE_{y\ power} = EG_y\ EF_{grid\ CM\ y}$$

Result:

Table 6. Baseline emissions from electricity generation

Year	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
$BE_{y,power}$[tCO_2eq/year]	**4,442**	**35,352**	**35,352**	**35,352**	**35,352**	**35,352**	**35,352**	**30,910**

Emission reductions
2. Calculation of emission reduction from electricity generation

Input data:
$BE_{y\ power}$, = Table 3. Baseline emissions from electricity generation
$PE_{y\ power}$, = 0
$Leakage_{y\ power}$, = 0

Equation:
$ER_{y\ power} = BE_{y,power} - PE_{y\ power,}$
Result:

Table7. Emission reduction from electricity generation

Year	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
$BE_{y,power}$[tCO_2eq/year]	**4,442**	**35,352**	**35,352**	**35,352**	**35,352**	**35,352**	**35,352**	**30,910**

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

Year	**Project Emissions**	**Baseline Emissions**	**Leakage**	**Emission reductions**
Year 1	0	35,352	0	35,352
Year 2	0	35,352	0	35,352
Year 3	0	35,352	0	35,352
Year 4	0	35,352	0	35,352
Year 5	0	35,352	0	35,352
Year 6	0	35,352	0	35,352
Year 7	0	35,352	0	35,352
Subtotal	**0**	**247,464**	**0**	**247,464**
Average	0	35,352	0	35,352

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

As per AMS I.D, version 16, June 11 2010, and because the project generates electricity from a renewable source without using biomass or fossil fuels, "Monitoring shall consist of metering the electricity generated by the renewable technology".

B.7.1 Data and parameters monitored:

Data / Parameter:	**EGy**
Data unit:	MWh/year
Description:	Annual net electricity supplied.
Source of data to be used:	Measured by both the project developer and ENEE.
Value of data	55,700 MWh/year
Description of measurement methods and procedures to be applied:	In order to monitor the electricity generated by the renewable technology, the data collected will be the hourly reading from the meter at the plant and the reading from the utility electricity meter used for issuing the energy sale invoice (This document will show the amount of energy supplied to the grid).
QA/QC procedures to be applied:	Meters will be calibrated according to the manufacturer manual or ENEE request. Data collected has low uncertainty levels and to guarantee its accuracy it will be cross checked with the electricity sales receipts obtained from the grid operator.

Any comment:	Data will be archived at least for two years after crediting period.

B.7.2 Description of the monitoring plan:

The monitoring of this type of project consists of metering and verifying the electricity generated by the renewable energy technology. Below it is described the monitoring procedures for data measurement, quality assurance and quality control.

The main electricity meters for determining the electricity delivered to the GRID will be installed at the interconnection point in a switching substation to be located in Chiquila; Santa Bárbara, approximately two kilometres away from the project site. Measurements will begin at 00:00 hours of the first day of every calendar month and will conclude at 24:00 hours of the last day of the month. Said substation will be built by the project OWNER and will be delivered to ENEE. The amount of electricity delivered to the substation will be monitored by two electricity meters in order to double check the measurements. Such meters will keep track of both incoming and outgoing electricity. The meters' accuracy 0.15 is according to the ANSI as required by the PPA with ENEE standards. The official measurement will be the average of two measurements whenever the difference is not greater than one percent (1%). If this difference is greater than one percent (1%) or one of the meters is damaged or presents inaccuracy the more accurate one, determined by immediate tests, will be accepted as the official meter, and the Party with the failure shall solve the problem according to the methods and procedures determined by the Contract Operation Committee which members represent both parties: ENEE (2 permanent members + 1 substitute or backup), GERSA (2 permanent members + 1 substitute or backup). One of the procedures could be to contact an independent third party (conveniently the manufacturer) to test the faulty meter with the presence of a representative of both GERSA and ENEE. All meter verification will be carried out by the Contract Operation Committee which could be assisted by additional experts. Once the measurement to be used has been identified and agreed upon, a written statement will be produced and signed by representatives of the Contract Operation Committee; this statement will include the net results in kilowatts (kW) and kilowatt-hour (kWh). GERSA will then generate and invoice for the generated electricity which will be delivered to ENEE for payment.

Information from the meters will be accessible through two systems:

- A GSM modem which will be accessible by any computer with its operating software and a cellular data connection. This system will be used by ENEE to download the necessary data to process the payment for energy delivered to the GRID.
- A dedicated Optical Ground Wire (OPGW) installed within one of the interconnection lines which will be linked to the Supervisory Control and Data Acquisition (SCADA) system at the project site. The OPGW will enable the continuous monitoring of all values registered by both meters; said data will be integrated into the SCADA database at the project site. This database can also be accessed from a remote location through an Internet-based Virtual Private Network (VPN).

The meters that will be used in the Chamelecón HPP are factory-calibrated as proven by the calibration guarantee sheet provided by the manufacturer.

The meter has an accu-measure digital sensing technology which provides unmatched accuracy, autocalibration, temperature compensation, among others and a diagnostic mode.

In the unlikely event that the verification uncovers any sort of inconsistency, the manufacturer will immediately be contacted to calibrate the meters and any suspect data will be reviewed by the Contract Operating Committee under the Quality Control and Quality Assurance guidelines outlined below.

Beyond that, the electricity meters will be calibrated at least once every three years.

Data will be measured continuously and at the end of each month the monitoring data will be filed in both electronic (frozen data) and hard copy. Records of the meter (type, manufacturer, model and verification documentation) will be retained by both GERSA and ENEE.

Quality Control and Quality Assurance

Quality control and quality assurance procedures will guarantee the quality of the data collected.

Meters will be verified as follows:

- As previously described, all verification will be carried out by the Contract Operation Committee.
- Additionally, either of the parties may, at any time, request that a Third party perform a precision verification of any of the meters.
- During any verification or testing, the seals on the meters shall only be cut in the presence of both parties.

To guarantee the consistency and accuracy of the data collected from the meter(s), data will be cross-checked with the sale invoices which will show the amount of energy supplied to ENEE.

GERSA's personnel participation in the metering process is described in Annex 4: Metering Information.

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 PDD, including monitoring methodology was developed by:

Anaconda Carbon S.A.

San José, Costa Rica
info@anacondacarbon.com

www.anacondacarbon.com

Contact Person: J. Felipe De León (E-mail: jfelipe.deleon@anacondacarbon.com)

The Honduras Natural Resources and Environment Agency (SERNA) contracted the following company to establish the official baseline for Honduras:

GEOINGENIERIA Ingenieros Consultores

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:

Project activity start date is defined as "the earliest of the date(s) on which the implementation or construction or real action of a project activity begins/has begun (EB33, Para 76/CDM Glossary of terms/EB41, Para 67)"; which in this case is the signing of the main equipment supply contract, i.e. turbine, generator, inlet valve, etc.

Starting date of project activity: December 17, 2009

CDM consideration is demonstrated by the fact that the global stakeholder process has been started on June 04, 2010, which is less than 6 months after the starting date of the project activity. CDM prior consideration requirements as for EB49 annex 22 have been met.

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

30 years

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

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

14 November 2011

C.2.1.2. Length of the first crediting period:

7 years 0 months

C.2.2. Fixed crediting period:

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:

Run-of-river small scale hydroelectric projects are generally considered amongst the most environmentally friendly energy sources currently available in the developing world. The absence of a reservoir, although adding some degree of risk to output stability, eliminates the most controversial aspect of hydroelectric power; there is no flooding and thus very little impact at the project site. Chamelecón 280 has gone even further in its environmental responsibility by building the longest conduction tunnel in the country to avoid the construction of above-ground conduction closed channel which would have a notable environmental impact.

The key elements of the Chamelecón 280 Environmental Impact Assessment are outlined below and they satisfy the requirements contained in the Environmental Mitigation Contract signed with SERNA.

Waste Management

The waste that is generated during the construction period will be disposed of on a daily basis by COPRECA, the civil works contractor. The waste will be transported to the municipal dump located in Macuelizo as required by SERNA and will be verified by the environmental unit of the said municipality.

Any solid waste that is contaminated with oil or chemicals that come from cleaning processes will be temporarily stored in closed containers until their final disposal and will ultimately be transported to San Pedro Sula for final disposal. Because the project site is located far from sanitary facilities, septic tanks were installed with a capacity to serve approximately 250 people at a ratio of one septic tank per 10 people at a distance of 15 meters from the river as required by SERNA. Once the construction has finished, the number of people at the site will be reduced to 10; the residual waters from this staff will continue to utilize the septic tank.

Any other type of liquid waste will be treated according to its nature: Water with suspended particles generated during the construction activities will be captured and allowed to rest in order for the particles to settle before releasing the water back into the river. Residues from oils, grease and fuel will be collected in tanks via grease and oil traps and placed on a concrete slab in order to reduce the impact if the residues accidentally spill before it is collected and disposed of properly by COPRECA which is currently searching for a buyer for the burnt oil.

Waste will never be burnt or disposed of into the river.

Noise and Vibrations

Considering that the construction activities will be held far from a residential area, noise mitigation measures other than those that are required by the personnel will not be necessary. Wildlife will temporarily flee due to noise and vibration but will return once the construction phase is over.

Once the project enters commercial operation, the only noise generated will be from the hydraulic generators. This noise will be generated inside the power house, which will be completely isolated (walls and ceiling). Personnel will use audio protection equipment inside the power house at all time.

Water Quality

No untreated waste water will be released back into the river or the ground in order to prevent subterranean or surface water contamination. Water quality is monitored, in accordance with Environmental Mitigation and Control Contract issued by SERNA, up river from the diversion dam and down river from the final discharge. Amongst the parameters that are to be measured are: pH, temperature, conductivity, turbulence, dissolved oxygen, total dissolved solids, total suspended solids, phosphates, nitrates, alkalinity and CO_2. The results of this analysis must meet or exceed the standards that were at that site prior to the commencement of construction.

Air Quality

During the construction of the Project heavy machinery will be utilized. This equipment will be kept in good conditions in order to minimize their combustion emissions.

The dust that is produced in the construction phase is the greatest air contaminant and will be minimized to the greatest extent by several mitigation techniques including moistening of the roads. Since power output from hydroelectricity does not involve any combustion process, the project activity will prevent pollution that would have risen from the thermal power projects that would have been in place in the absence of Chamelecón 280.

Soil Erosion

In order to prevent soil erosion during construction of roads and paths, slopes will be stabilized using Vetiver and ivy plants which will be grown in the project greenhouse and canals will be built for water evacuation.

Fish population and Diversity

The fish species found at the project site are not of economic or recreational importance as evaluated through the ichthyofauna study. However, the installation of protective barriers will keep these fish from entering the power plant intake. With the intention of mitigating any possible loss of wildlife refuge that may result from the project activity, the river banks will be covered with trees and other types of local vegetation.

The summary of the environmental information provided above, combined with the use of run-of-river technology clearly demonstrate there is a negligible negative impact from Chamelecón 280, while there are numerous local and global benefits.

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 Empresa Generación de Energía Renovable S.A (GERSA) carried out the Stakeholder Consultation for the Chamelecon 280 project on November 20, 2009 with a strong attendance of 104 individuals. The Consultation was developed as an open caucus (cabildo abierto) and which was announced by the Macuelizo Municipality in Santa Barbara. The objective of the consultation was to review the project and determine the mechanisms for the management of the Chamelecon 280 watershed natural resources.

In order to describe the most relevant components of the project to the inhabitants of all the local communities the event itself was planned and executed with the local municipalities which are very supportive of the project as a source of employment, electrification and road improvement which will improve the quality of life of the local population. The methodology, programs and strategy which will be carried out in the Chamelecon 280 watershed to revert the pressures exerted by the project on the natural surroundings as well as recover the areas which have been degraded by human intervention in the area.

After the consultation was concluded Mr. German Altamirano, representative from the Municipal Environmental Unit signed an official certification of the successful completion of the stakeholder consultation for Chamelecon 280 which, with the signed attendance sheets, constitutes the official record of the event.

E.2. Summary of the comments received:

1. Municipal Representatives Guevara and Juan Carlos López:
   Is there any way to integrate the Chiquila Microbasin in the Management Plan?
2. What will happen with the lands that are going to be reforested on both sides of the river, 3km from the dam?

3. Will you be carrying out environmental projects?
4. Isaac of the Health Secretariat of Macuelizo:
   What degree of coordination do you expect to have with the Health Secretariat?
5. Will the communities located outside the Chamelecon 280 Watershed be considered (Buenos Aires, Ojos de Agua)?
6. Victor Sierra of the Azacualpa community:
   We have problems due to power blackouts. When does the project come online? Will the electricity in the area improve?
7. Comunidad de La Sierra:
   We have no light or water. We would like your help.

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

The following are the responses made by GERSA to each question:

1. GERSA reply: The Chiquila micro-basin is outside of the boundaries of the Chamelecon 280 Watershed, however we can work on finding ways we can help.

2. GERSA reply: There will be no activities in detriment of the community. You will not be dispossessed of your lands. We will reach an agreement with the communities. Everything will be discussed and a consensus developed with the inhabitants.

3. GERSA reply: Yes, we have planned reforestation activities, cleanup campaigns and watershed protection, amongst others.

4. GERSA reply: We want you to feel as if you are part of the initiative. You will help guide us on how to proceed.

5. GERSA reply: We will see how the benefits expand beyond the limits of the sub-basin.

6. GERSA reply: I can’t make any promises to you. The Mayor is the one responsible for carrying out the necessary requests to the Government. The solution depends on the Mayors lobbying ability, in which GERSA can help. We hope to begin operations within 2 years, which means strong work opportunities for the next 2 years.

7. GERSA reply: La Sierra is outside the limits of the sub-basin. Petition the Mayor to have him make the necessary requests of the government. GERSA can help the Mayor in his lobbying of the government.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Generación de Energía Renovable S.A. de C.V. (GERSA)
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<u>Annex 2</u>

INFORMATION REGARDING PUBLIC FUNDING

NO PUBLIC FUNDING IS PROVIDED FOR THE CHAMELECÓN - 280 HYDROELECTRIC PROJECT.

Annex 3

BASELINE INFORMATION

Plant Name	Capacity 2008 (MW)	Entry Date	Fuel Type	Output (MWh) Year 1 (2006)	Year 2 (2007)	Año 3 (2008)	Qty of fuel (thousands of gallons or tonnes) Year 1 (2006)	Year 2 (2007)	Year 3 (2008)
Envasa	8	2008	Coal			6,882			7,048
Celsur	14	2008	Biomasa			78,257			
San Carlos	2.263	2008	Agua (CDM)			15,828			
Green Valley	10	2007	Fuel Oil		30,724	25,043		1,811	1,502
Chumbagua	7	2007	Biomasa		3,822	8,302			
Cortecito	3.195	2007	Agua (CDM)		1,631	21,768			
Cuyamel	7.8	2007	Agua (CDM)		17,594	38,915			
Ecopalsa	1	2007	Biomasa (CDM)		2,482	2,859			
La Glorias	5.8	2007	Agua (CDM)		2,831	20,600			
Cuyamapa	12.2	2006	Agua (CDM)	14,009	50,306	52,517			
Azunosa (Inv, Hondureñas)	4	2005	Biomasa (CDM)	10,136	12,233	13,399			
Cahsa	25.751	2005	Biomasa	27,107	42,517	39,443			
Cececapa (Congelsa)	2.9	2005	Agua (CDM)	18,936	14,558	16,425			
Yojoa	0.63	2005	Agua (CDM)	1,347	1,866	2,246			
Enersa	259	2004	Fuel Oil	1,379,228	1,375,723	1,507,156	81,165	82,233	88,994
Enersa (Cont.)		2004	Diesel				183	260	379
Elcatex	21.8	2004	Fuel Oil	13,281	6,378	5,192	770	370	301
Lufussa III	267,4	2004	Fuel Oil	1,805,260	1,822,010	1,783,726	98,927	99,974	97,013
Lufussa III (Cont.)		2004	Diesel				44	19	23
Babilonia (Energisa)	4	2004	Agua	30,606	30,212	32,673			
La Esperanza	12.761	2004	Agua (CDM)	23,828	34,952	44,645			
Laeisz NACO	13.5	2004	Diesel	30,902	6,556	0	2,315	489	0
Río Blanco	5	2004	Agua (CDM)	38,372	34,421	35,045			
Tres Valles	7.8	2004	Biomasa (CDM)	26,506	21,473	22,261			
Nac de Ingenieros CTE.	20	2002	Diesel	309	3,749	11,719	0	301	883,7
La Grecia	12	2002	Biomasa	35,942	30,276	20,668			
Las Nieves	0.48	2002	Agua	1,514	996	1,312			
Nacaome	30	2002	Agua	32,405	42,674	41,788			
Lufussa Valle	80	1999	Fuel Oil	154,630	219,407	271,396	9,379	13,186	16,682
Lufussa Valle (Cont.)		1999	Diesel				20	31	3
Emce Choloma	55	1999	Fuel Oil	145,909	169,649	210,587.1	8,503	10,275	12,562
Emce Choloma (Cont.)		1999	Diesel				402	316	342
Aysa	8	1998	Biomasa	269	1,171				
Emce I / La Ceiba		1997	Fuel Oil	63,149	51,183	33,502	4,283	3,432	2,205
Emce I / La Ceiba (Cont.)		1997	Diesel				193	205	181
Lufussa I	39.5	1995	Diesel	8311	3,834	13,311	630	193	1,075
La puerta(Gen_Elec + Hitachi)	33	1994	Diesel	1,105	330	2,860	176	61.4	368.4

Plant Name	Capacity 2008 (MW)	Entry Date	Fuel Type	Output (MWh)			Qty of fuel (thousands of gallons or tonnes)		
				Year 1 (2006)	Year 2 (2007)	Year 3 (2008)	Year 1 (2006)	Year 2 (2007)	Year 3 (2008)
Santa Fe	5	1994	Fuel Oil	0	-60	245	0	1,27	22,7
Elcosa	80	1994	Fuel Oil	168,276	244,137	142,620	10,256	14,903	8,724
Ampac	10.1	1994	Fuel Oil		35	0			
Zacapa II (Cenit)	0.5	1994	Agua (CDM)	3,004	2,400	3,075			
Santa María del Real	1.2	1986	Agua	3,766	2,590	5,119			
El Cajón	300	1985	Agua	1,038,558	1,236,291	1,298,632			
El Níspero	22.5	1982	Agua	91,291	55,652	34,156			
Río Lindo	80	1971	Agua	586,313	520,644	474,543			
Cañaveral	29	1964	Agua	185,906	164,475	152,025			
Sub Total	1,502.08			5,940,175	6,261,722	6,490,739			
Imports				7,282	12,639	45,307			
Total Inc. Imports				5,947,457	6,274,361	6,536,046			

Sources[3]

Data on annual generation by the respective units was obtained from ENEE publications, which are available on its website. Fuel consumptions were obtained from ENEE for public facilities, the latter of which are available in the same bulletin. The only exception to this is the station "EMCE La Ceiba", since official statistics show zero consumption despite the fact that the unit provided positive generation in the same period. Data provided by the plant was used instead.

Fuel consumption by private generators was obtained directly by the respective facilities. For those plants selling surplus energy, average efficiency (in gallons per MWh) was used in order to accurately estimate fuel consumption corresponding to the energy that was effectively delivered to the grid. This was the case for Green Valley, Elcosa and Elcatex. In all these cases, total fuel consumption was divided in total generation (grid + internal use) in order to obtain the efficiencies. This quotient was then multiplied by the energy delivered to the grid. For the specific case of Elcatex, the assumption of 58 gallons per MWh was used since at the time of making this report, the plant had not provided its total generation information. The source for this assumption is http://www.energyinternationalinc.com/spanish/pdfs/proyectoelcatex.pdf

Other important issues worth mentioning include:

- ENEE buys a part of Lufussa's generation, and reports the latter as independent generation in public statistics under the name "LUFUSSA convenio ENEE". This generation was attributed to the plant Lufussa III (Pavana III), since according to the station's OWNER, almost 98% of the generation sold to ENEE comes from this plant. This does not affect the EF estimations.

- In 2006, ENEE statistics indicate zero fuel consumption for the unit "Nacional de Ingenieros"

[3] Baseline calculations and information sourced from official SERNA emissions factor. http://www.serna.gob.hn/noticias/Documents/Reporte%20Calculo%20del%20EF%202008%20INGLES.pdf

although the plant generated energy, as reported by the same official statistical source.

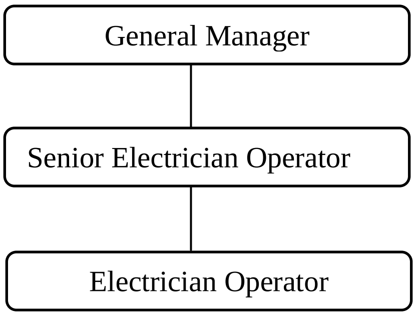
- 63.9 MW must be added to total system capacity reported in Table 10 in order to obtain the same result displayed in table 3 of the 2008 annual statistical report (ENEE). This capacity corresponds to the plants El Coyolar, Puerto Cortés I y II, Eda, Lean y Aguan, excluded from our sample because they remained idle during the entire period under study (2006-2008).

- "Ampac" only provided energy to the grid in 2007. Since this generation was very close to zero, the consumption was assumed for the latter.

Annex 4

METERING INFORMATION

GERSA's personnel will participate in the metering process as follows:



General Manager

1. Representative of the Contract Operation Committee.
2. Signs off on the monthly invoice.
3. Designates the representative for precision verification.
4. Designates the appropriate person to presence the cutting and attachment of the meters' seals and to carry out hourly reading from meters.

Senior Electrician Operator

1. Drafts and signs off, jointly with the representative of ENEE,, the written statement of the official measurement of the meters for each month to be delivered to the General Manager for signature.
2. Verifies the readings carried out by the Electrician Operator.
3. Maintains communication with the Dispatch National Center.

Electrician Operator

1. Carries out readings from meters.
2. Stores readings in electronic database.
3. Sends meter readings to the Dispatch National Center and to Senior Electrician Operator for the monthly written statement.
4. Fills in the daily metering reports.

Emergency system consists on the following measures:

- The design of the power plant and their equipment includes a fire control system.
- Mitigation Plan for fire, medical emergencies, hurricanes and other accidents is included in the emergency system.
- Training of the personnel on emergency situations.
- Fire extinguisher installation.
- Communication equipment for the employees (Radios and cell phones).
- First aid boxes and personal protection equipment (gloves, shoes, etc.)
- General management system for acting in case of emergency.

Data Saving and storage:

1) Weekly backup in an external hard disk from all monitored data of the Chamelecon project.
2) Weekly back up of the hard disk data in the company server.
3) The hard disk will be stored in the company´s fire and water resistant safe.
4) The data management and energy monitoring personnel will be trained at the moment of joining the company. Further trainings will be held every 6 months.