CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

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ANNEXES

SECTION A. General description of project activity

A.1. Title of the project activity:

OCAÑA Hydropower Project
Version 01.4, <November 14, 2012>

A.2. Description of the project activity:

The purpose of the OCAÑA Hydropower Project is to generate zero-emission power and deliver it to the Ecuadorian grid. This proposed CDM Project Activity is being developed by the power generation company called Electro Generadora del Austro S.A. (ELECAUSTRO), which generates the equivalent of 203.10 GWh of energy per year.

Electricity generated by this Project Activity will be supplied to the Ecuadorian Electrical Grid (SNI for its initials in Spanish, *Sistema Nacional Interconectado*) and will displace the electricity generated by fossil fuels (the majority produced using diesel, fuel oil and oil residue and to a lesser extent naphtha and natural gas) and electricity imports, mainly from Colombia. Likewise, the Project Activity will achieve Greenhouse Gas (GHG) emission reductions by avoiding CO_2 emissions generated by grid-connected fossil fuel-fired power plants that have a meaningful share in the SNI.

In order to define the scenario, which existed before implementation of the OCAÑA Project Activity, it is important to cite the 2009-2020 Electrification Master Plan, which refers to the fact that during the 1997-2008, the proportion of effective power being generated from hydropower plants had decreased with respect to the total electricity supply. In 1997, hydropower sources accounted for 54.82% of the supply to the SNI, a figure that had decreased to 48.13% by December 2008. In view of these figures, without the OCAÑA Project Activity, electricity supplied to the grid would be come from hydropower (over 100MW) and fossil fuel sources; as indicated by the trend, the increased proportion of power generation by fossil fuel sources would continue in order to cover the ever increasing demand.

The scenario with the Project Activity includes the construction and the operation of the OCAÑA Hydropower Plant with an installed capacity of 26MW. OCAÑA is a run-of-the-river plant that will use water from the Cañar River to drive two 13MW Pelton type vertical turbines. Other important components of the plant include:

(i) Water collection and grit chamber works,
(ii) Sand traps,
(iii) Headrace tunnel,
(iv) Regulation reservoir,
(v) Surge tank,
(vi) Penstock,
(vii) Power house,
(viii) Elevated Substation; and,
(ix) Transmission line.

The baseline scenario is the same as that which existed at the start of the implementation of the OCAÑA Project Activity. In section B.4, more details on the baseline scenario are presented.

ELECAUSTRO considers that implementing the OCAÑA Hydropower Project will contribute to the sustainable development of Ecuador in the following aspects:

- Provide renewable energy to the SNI, which will displace thermal electricity generation that is mainly produced using fossil fuels (diesel, fuel oil and waste crude). As consequence, the OCAÑA Hydropower Project will achieve CO_2 emission reductions in the Ecuadorian Electrical Grid.
- Increase electricity supply using cheaper alternatives and diversifying the SNI´s electricity sources.
- Reduce the generation of SOx and NOx emissions that contaminate the air and damage health.
- Reduce the need to import diesel used for power generation. It is important to note with respect to this issue that even though Ecuador is an exporter of crude oil, currently its refinement capacity is not sufficient to meet demand for refined oil. To demonstrate this issue, according to the Ecuadorian Central Bank, the volume of sales of petroleum derived goods increased by 37% during the first 10 months of 2010.
- Generate jobs, particularly during the construction and operation phases.

A.3. Project participants:

Name of party involved	Private and/or public entity(ies)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Republic of Ecuador (host)	Electro Generadora del Austro S.A.	No
The Netherlands	Vattenfall Energy Trading Netherlands N.V.	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Republic of Ecuador.

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

South America/Ecuador/Cañar Province.

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

Ducur Parish/Javín Precinct.

A.4.1.4. Details of physical location, including information allowing the unique identification of this project activity (maximum one page):

The site where the water is captured for the OCAÑA Hydropower Project is located on the Cañar River 150 m. downriver from where it is joined by the Corazón River joins, and 25km from the village of Cochancay in the Province of Cañar, in the southwestern part of Ecuador. The powerhouse is located on the right side of the Cañar River 50m before the confluence of the Ocaña Stream with the Cañar River.

Access to the Project Activity is by the highway that connects the Cities of Cuenca and Guayaquil, following the El Zhud – Cochancay road. The Project´s socio-economic area of influence covers the Cañar River drainage basin and in administrative terms, the influence area is in the cantons of Cañar, El Tambo and Suscal.

The Project´s area of influence, corresponding to the watershed and conduction and hydropower generation areas, crosses two rural parishes: Ducur and San Antonio de Pahuancay. The water catchment is located at these geographical coordinates: 2^0 29´ 22” S, 79^0 10´ 50” W; and the discharge at these coordinates: 2^0 29´ 50” S, 79^0 14´ 39” W.

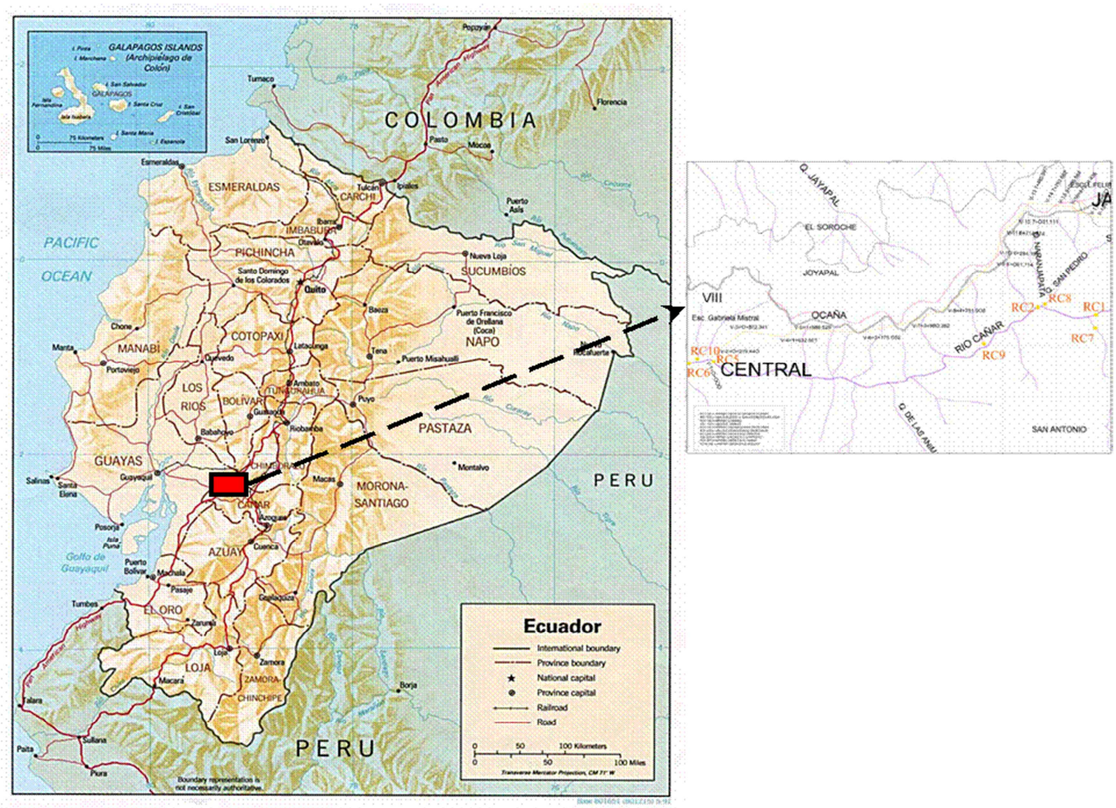

Figure No. 1: Location of the Project´s area of influence

A.4.2. Category(ies) of project activity:

Sectoral Scope No. 1: Energy Industries (renewable / no renewable)

A.4.3. Technology to be employed by the project activity:

The scenario that existed before implementation of the OCAÑA Project Activity shows that some 730 MW of new power generation was incorporated into the SNI during 2006, 2007, and 2008 (see Table No.1). However, this increase in generation has not been sufficient to supply energy demand. In addition, 35 % of the new electricity generated uses fuel oil, which is not in line with a sustainable energy policy.

Plant	Type	Fuel	Effective Capacity (MW)
Abanico	Hydropower	-	15
Sibimbe	Hydropower	-	16
Lafarge – Cementos	Thermal	Fuel Oil	13
Calope	Hydropower	-	15
La Esperanza	Hydropower	-	7
Generoca	Thermal	Fuel Oil	34
Termoguayas	Thermal	Fuel Oil	150
San Francisco	Hydropower	-	230
Colombia	Interconnection	-	250
Total			**730**

Table No. 1: New Generation within the National Grid 2006, 2007 & 2008
Source: The 2009 – 2020 Electrification Master Plan, CONELEC.

In 2008, the electrical energy produced and imported that was delivered into the SNI, surpassed 19,000 GWh per year, 38% of which was produced by thermal power plants that operate using fossil fuels. The 2009 – 2020 Electrification Master Plan demonstrated that this form of generating electricity produced more than 4 million tons of CO_2 in 2008. Chart No.1, below, shows the changes in CO_2 emissions resulting from electricity generation in the period between 1999 and 2008.

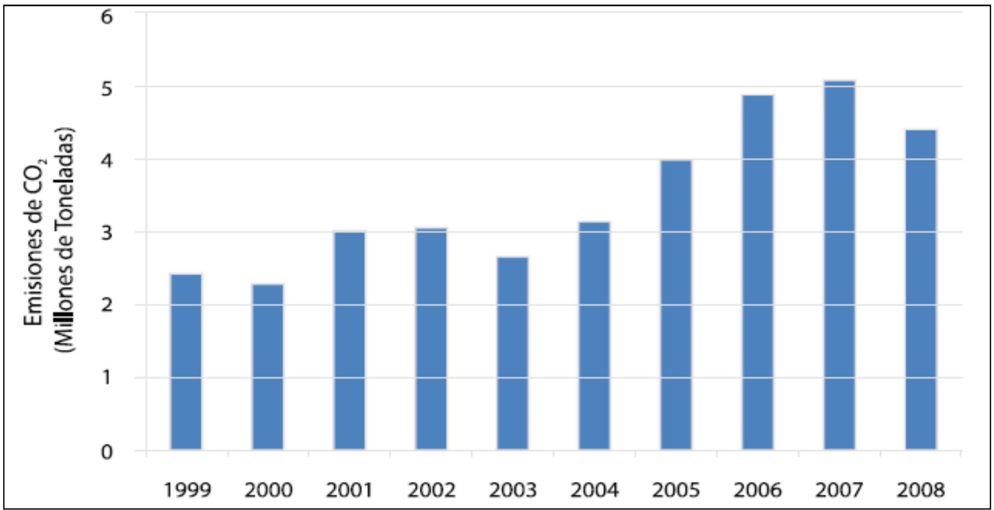

Chart No. 1: Changes in CO2 emission produced by the electricity sector from 1999 to 2008
Updated to July 2008
Source: The 2009 – 2020 Electrification Master Plan, CONELEC.

Implementing the OCAÑA Project Activity will reduce emissions generated by the SNI, as it will result in a reduction in the need for electricity generated by thermal power plants, which use fossil fuels. The

grid operates in a manner that prioritizes the use of energy from renewable sources and those with lower production costs as opposed to those with higher environmental and economic costs (i.e plants powered by diesel, naphtha, fuel oil, and waste oil).

The technology used for the OCAÑA Project Activity uses the typical hydropower process known as "run-of- river", in which the water collected passes through a sedimentation process before being delivered to a 42,370 m^3 useful working volume regulation reservoir, which is designed to guarantee that the power plant can function at full capacity for three hours of maximum demand. The water flows from the reservoir through metal pipeline to the start of the tunnel that has a cross-section of 8.26m^2. The tunnel is 6.39km long and carries the water in a 1.085km long high-pressure pipeline with a design drop in altitude of 373m, after which it is discharged into the turbines, which are driven by the force of gravity. Once the process of generating electricity is complete, the water is returned to the river without altering its quality or quantity.

The principal components of the Project Activity are: [1]

1. **Closure:** Located in the Cañar River where a concrete weir is built 5m over the riverbed, with a 37.20 m. long crown plus a radial gate with a maximum evacuation capacity of 476 m^3/s.
2. **Intake:** Design flow of 8.2 m^3/s through a grid of 2 separate modules, each module 6.3m x 3.00 m, plus two radial 4m x 4m and 2m x 2m purge gates, to evacuate water in the event of extraordinary rises over the design flow.
3. **Sand trap:** Two chambers, 50m long, 8.4m wide and 2.65m average height.
4. **Pressure tank:** structure measuring 18.60m width x 15.05m height x 10.6m length (where the free flow becomes pressurized flow).
5. **Regulation reservoir:** To guarantee the design flow for three hours, a reservoir with a capacity of 42,370 m^3 will be installed; whose water mirror has a surface area of 11,000 m^2 approximately (Power density = 2,364 W/m^2).
6. **Conduction:** 8.2 m^3/s will be conducted from the water intake to the reservoir, then from there via a tunnel and then through a steel pipe of 1.9 m in diameter (internal). Interconnection of the catchment works with the portal of the trunk tunnel (right bank) of 6.39 km long.
7. **Surge tank:** Underground structure with a restricted opening, made of structural concrete, 3.8 m diameter, 75 meters long and total height, 44.58 m.
8. **Penstock:** On the surface, with a length of 1,085 km to the splitter. The interior diameter varies from 1.9 m to 1.6 m to conduct 8.2 m^3/s.
9. **Powerhouse and recovery channel:** This is built on the surface and has three levels: the valve floor, the main floor and the command and control floor, with an area of 600 m^2. It houses two turbine-generator groups. Dimensions: 32.5 m long (main floor) x 18.5 m wide long (main floor) x 16.2 m tall.
10. **Mechanical equipment:** Two Pelton vertical axis turbines with a nominal power of 13,000 kW. Rotation speed 600 rpm, with 4 injectors and a spherical valve of 0.80 m.
11. **Electrical equipment:** Each turbine couples with a 13 MW synchronous generator, giving the plant a total power of 26 MW, at 13.8 kV.

[1] Please refer to document: "Informe final de Fiscalización" section 5.4 "Componentes principales de la Central" pages 5, 6, 7 and 8; and section 5.5 "Resumen de las características técnicas del proyecto" pages 8, 9 and 10. Document attached as Reference N°2A.

12. **Transmission line:** Double 69 kV three-phase line, ACAR 500 MCM conductor, 41 km long to reach the Cañar substation of the Central South Regional Electric Company, located in the city of Cañar.
13. **Control and Telecommunications System:** SCADA supervision, control and data acquisition system on hydraulic, electromechanical, electrical and load dispatch parameters, with two operational levels, one manual, and the other automatic, with both local and remote control.

The following table shows the estimated energy production of the Project Activity:

Max. Energy	(MWh/year)	224,373
Average Energy	(MWh/year)	203,099
Minimum Energy	(MWh/year)	176,773
Firm Energy	(MWh/year)	181,609
Plant Factor		90 %

The energy scenarios indicated: maximum, medium and minimum were calculated based on the monthly average flow rates obtained in the intake site of the hydroelectric project Ocaña. These water flows are in the hydrology report which is part of the Feasibility Studies and Definitive Designs developed by Caminosca Company. The estimation of the electric energy is present in the documents accompanying the request for funding from FEISEH.

As indicated, the proposed CDM Project Activity is a typical hydropower technology known as “run-of-the-river” hence the technology transfer is particularly limited to capacity building through training activities for the operation of the electromechanical, substations, transformer equipment, as well as SCADA system. In particular, this equipment (hardware and software) has been provided by international suppliers that have contributed to developing capacity in ELECAUSTRO.

The Final Environmental Impact Study for the project and line transmission was accomplished considering a specific technology and conventional methods to construct the project. Based o it, the Final Environmental Impact Study established measures to prevent, mitigate and remediate negative environmental impacts, which are part of the Environmental management Plan. The execution on the Plan guarantees the environmental safety the project, and allowed ELECAUSTRO to obtain an environmental license.

Furthermore, a section related to specific environmental measures to be fulfilled by the constructors was incorporated as part of the contract signed.

Also in 2008, a process to updating the final designs of the project was executed, thus allowing the optimization of resources and reducing environmental risks, ensuring that the project is environmentally safe. The main changes were:

- Relocation of the regulation reservoir, due to geological hazards and high environmental sensitivity of area assigned for its construction. The update of the designs established that the final location of the

reservoir should be next to the sand traps, considering that this area is intervened and composed solely of sugar cane crops.

- The originally road design to the powerhouse crossed primary forest; however, in the updating a new path for the road was identified, based on a footpath made by the zone's inhabitants. This new road to the powerhouse, avoided crossing the primary forest, decreasing the negative environmental impacts.

A.4.4. Estimated amount of emission reductions over the chosen crediting period:

The chosen accreditation period is 7 years, this period is renewable, during which time it is expected that the Project Activity will reduce an **equivalent of 786,338 tons of CO_2**.

Years	Estimation of annual emissions reduction (tons of CO_2 e)
2013	112,334
2014	112,334
2015	112,334
2016	112,334
2017	112,334
2018	112,334
2019	112,334
Total Emissions Reductions Estimate (tons of CO_2 e)	**786,338**
Total number of years for crediting	**7**
Average annual emissions reduction (tons of CO_2 e) during the crediting period	112,334

A.4.5. Public funding of the project activity:

There are no plans to use funds declared as Official Development Assistance (ODA) from the countries in Annex 1.

SECTION B. Application of a baseline and monitoring methodology

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

The Project Activity will use the following methodology and tools:

1. Approved consolidated baseline and monitoring methodology ACM0002 Version 12.3.0 - "Consolidated baseline methodology for grid-connected electricity generation from renewable sources."
2. Methodological tool "Tool to calculate the emission factor for an electricity system" (Version 02.2.1).
3. Methodological tool "Tool for the demonstration and assessment of Additionality" (Version 06.0.0).

B.2. Justification of the choice of the methodology and why it is applicable to the project activity:

The methodology is applicable to the OCAÑA Project Activity, as this is a Project Activity that will generate renewable energy for the Ecuadorian National Grid, which is known as the National Interconnected System (SNI). Moreover, the Project Activity complies with other requirement of the methodology:

- OCAÑA will be implemented in an area where there are no other renewable Energy projects which means it is thus considered as a new or "Greenfield" Project.
- OCAÑA is a run-of-the-river hydropower energy plant that utilizes two 13MW generation units.

The geographical limits of the Ecuadorian Grid, within which the Project Activity is located, are clearly identified and this information is available from the institutions that regulate the Electricity Sector in Ecuador.

Considering the specific case for hydropower projects:

- OCAÑA has a small regulation reservoir, which has a power density of 2,364 W/m^2 (greater than 4 W/m^2).

The Project Activity does not fulfill any of the conditions that make the methodology non-applicable:

- OCAÑA does not involve a switch from using fossil fuel to renewable energy at the Project Activity site.
- OCAÑA is not a biomass-burning power generation plant.
- OCAÑA does not have a reservoir with a power density lower than 4 W/m^2.

Given the indicated conditions, the OCAÑA Project Activity meets the applicability conditions of the methodology ACM0002 Version 12.3.0.

B.3. Description of the sources and gases included in the project boundary:

The scope of the Project Activity includes the OCAÑA Hydropower Project and all the power plants that are connected to the SNI grid (Hydropower, Thermal). The following data shows a map of the SNI to which the CDM Project Activity will be connected, it is important to note that the SNI is the only electricity transmission system on mainland Ecuador:

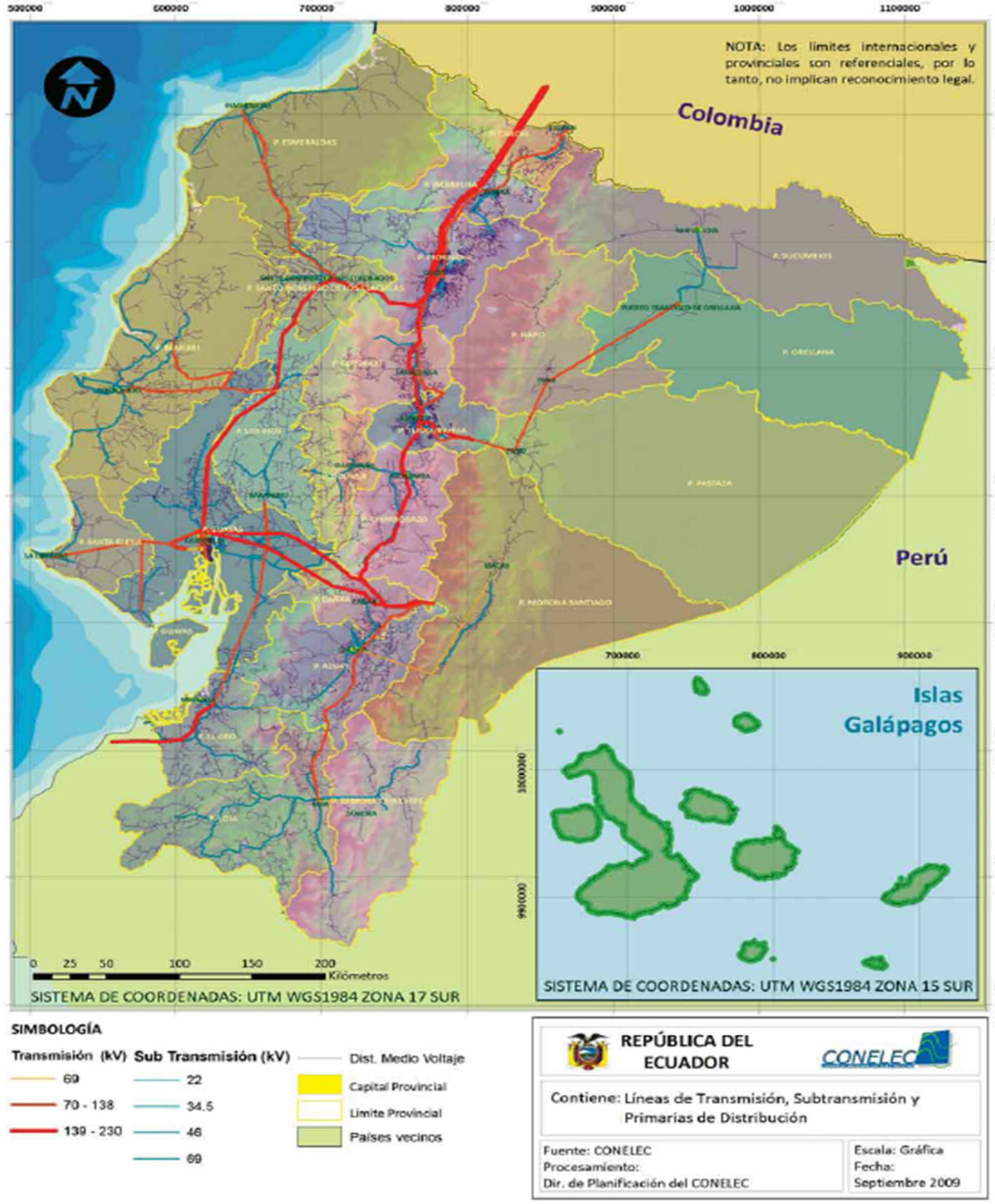

Figure No. 2: The Ecuadorian National Interconnected Grid (SNI)
Source: Statistical Report on the Ecuadorian Electricity Sector 2009, CONELEC.

Figure number 2 Spanish language terminology	English translation
Nota: los límites internacionales y provinciales son sólo referenciales, por lo tanto no implican reconocimiento legal	Note: international and provincial boundaries are only indicative, therefore do not imply legal recognition
Islas Galápagos	Galapagos Islands
Sistema de coordenadas: UTM WGS 1984 Zona 15 Sur	Coordinates: UTM WGS 1984 Zone 15 South
Simbología: transmisión (kv) sub transmisión (kv)	Legend: transmission (kv) sub transmission (kv)
Dist. Medio voltaje	Medium Voltage Distribution
Capital provincial	Province Capital
Límite provincial	Province boundary
Países vecinos	Neighbouring countries
República del Ecuador	Republic of Ecuador
Contiene: Líneas de transmisión, sub transmisión y primarias de distribución	Contains: transmission lines, sub transmission lines and primary distribution lines
Fuente: CONELEC	Source: CONELEC
Procesamiento: Dir. de Planificación de CONELEC	Processing: Planning Department, CONELEC
Escala: Gráfica	Scale: Graphic
Fecha: Septiembre 2009	Date: September 2009
Kilómetros	Kilometers

The following table shows the GHG emissions that are included and excluded from the scope of the Project Activity:

Source		Gas	Included?	Justification / Explanation
Base Line	CO_2 emissions produced by thermal power generation plants (fossil fuels) that will be displaced by the OCAÑA Project Activity in the SNI.	CO_2	Included	Emissions generated by the burning of diesel, fuel oil and waste crude to generate electricity at the Thermal Power plants connected to the SNI.
		CH_4	Excluded	Assumed to be negligible.
		N_2O	Excluded	Assumed to be negligible.
oje	CH_4 emissions produced by the OCAÑA Project Activity reservoir.	CO_2	Excluded	Assumed to be negligible.
		CH_4	Excluded	The Power Density of the Project

				Activity is equal to 2,364 W/m^2 (greater than 4 W/m^2), hence these emissions are considered to be negligible
		N_2O	Excluded	Assumed to be negligible.

The spatial extent of the Project boundary includes the site where is located the Ocaña Power Plant and all power plants connected physically to the Ecuadorian electrical grid known as the National Interconnected System (SNI) (see Figure No. 2).

The flow diagram of the Project Activity boundary is illustrated as follows:

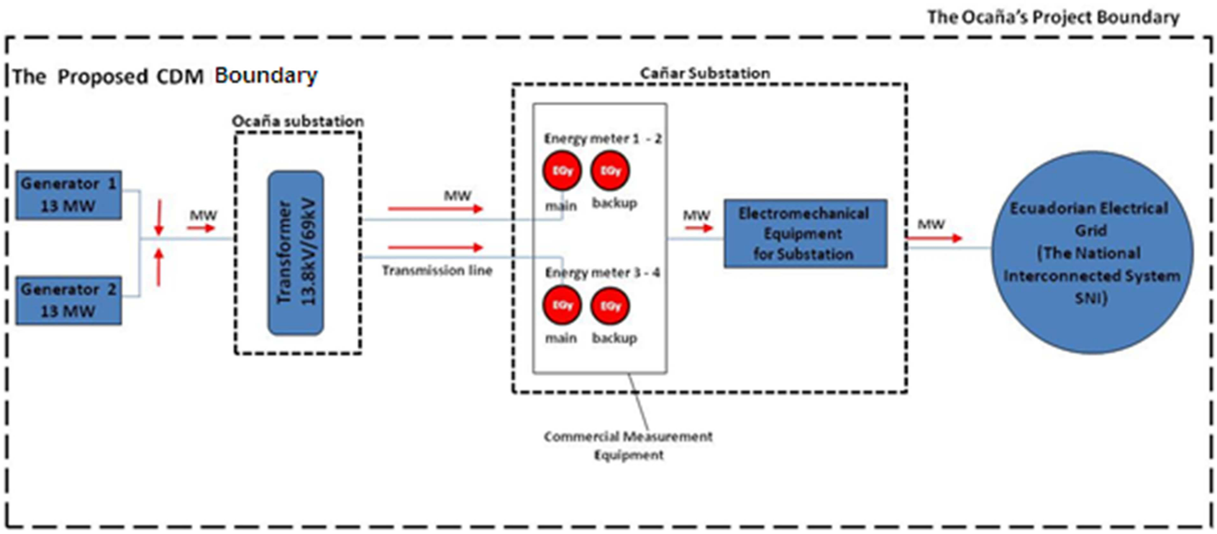

Figure No. 3: Project Boundary for the Ocaña Hydropower Plant.

In Figure N ° 3, the arrows represent the flow of electricity from the project Ocaña to the National Interconnected System of Ecuador.

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

Identification of the Baseline scenario

The baseline scenario is identified through the procedure detailed in the ACM0002, Version 12.3.0 which states that if the Project Activity involves installing a new renewable energy plant connected to a grid, then the baseline scenario is the following:

> *"Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the 'Tool to calculate the emission factor for an electricity system'".*

Description of the baseline scenario

The baseline scenario describes the situation that existed prior to implementing the OCAÑA Project Activity. This is to say, the power that the OCAÑA Project Activity would supply to the Grid, which would otherwise be produced by the existing plants connected to the SNI and new sources of power generation, mainly thermal and interconnected sources (international). Since 1997, the growth of power generation has had equally unfavorable characteristics with respect to the availability of supply, as there have not been enough energy reserves to cope with dry periods. To cover this lack in the system, the government has had to resort to programmed power cuts during the last quarters of 2005 and 2006, as well as technical-operational solutions such as reducing the voltage in the system. These actions have been taken to avoid more significant supply problems.

The power generation plants and international connections that have been installed during the period from 1997 to 2008, total 1,653 MW of additional supply for the SNI, the table below presents the main additions:

Plant/Interconnection	Type	Fuel	Power (MW)	Observations
Marcel Laniado	Hydropower	-	213	It came into operation in 1999.
Victoria II	Gas Turbine	Naphtha	102	It was reincorporated in 2000.
Bajo Alto 1	Natural Gas Turbine	Natural Gas	130	Began operating in October 2002.
Colombia	Interconnection	-	250	It has been operating since March, 2003
Termoguayas	Internal Combustion Motors	Fuel Oil	150	It was incorporated since 2006
San Francisco	Hydropower	-	250	It entered in operation in June 2007.
Peru	Interconnection	-	110	In operation since January 2005. Operates in emergencies (dry periods).
Ecudos	Biomass	Waste pulp	29.8	It was incorporated during 2005 and 2006
San Carlos			35	
Ecoelectric			36.5	
Colombia	Interconnection (Second Line)	-	250	Available since October, 2008.

Table No. 2: New power generation made available to the SNI in the period from 1997 to 2008 (Greater than 100 MW)
Source: The 2009 – 2020 Electrification Master Plan, CONELEC.

In addition, during this period around 180 MW was withdrawn from the Grid, mainly because of generation reductions implemented by the Ecuapower company plants and the Guayaquil Steam Plant (Thermal Plants). The information presented in Table No. 2 shows that from 1997 to 2008 only two large hydropower projects have been incorporated into the SNI (Marcel Laniado and San Francisco). Other

small/medium scale projects have been implemented such as Abanico, Sibimbe, and Calope, which have already been registered under the CDM and are included in Table No. 1 in Section A.4.3.

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 CDM project activity (assessment and demonstration of additionality):

Prior consideration of the CDM

On the **April 3 2008**, ELECAUSTRO signed the contract for the construction, equipment and commissioning of the OCAÑA Hydropower Project. Therefore, following the "Guidelines on the Demonstration and Assessment of Prior Consideration of the CDM – Version 04", this date is considered as the starting date of the proposed CDM Project Activity. .

A timeline with the chronology of events/milestones of the Project Activity is shown in the Table No.3 below:

Date	Event/Milestone	Reference/Document
04/07/2003	ELECAUSTRO attended to the event "Ecuador frente al Mercado de Carbono" (Ecuador facing the Carbon Market) that is organized by the Ministry of the Environment/The National CDM Promotion Office (CORDELIM).	▪ Invitation sent by CORDELIM via email.
09/07/2003	A draft PIN was submitted to the Prototype Carbon Fund (PCF) of the World Bank.	▪ Communications via email.
22/07/2003	A draft of PIN was submitted to the Latin America Carbon Program (PLAC) of the Andean Development Bank (CAF).	▪ Communications via email.
17/09/2003	The Prototype Carbon Fund (PCF) of the World Bank request to ELECAUSTRO the Project Concept Note (PCN) of the OCAÑA Project Activity.	▪ Communications via email.
06/2004	The Project Activity was included in the Indicative CDM Project Portfolio that was supported/promoted by CORDELIM in the Carbon Expo 2004.	▪ Call sent by CORDELIM via email to project developers. ▪ Project brief in English.
15/09/2005	ELECAUSTRO asked to CORDELIM to support in order to update PIN.	▪ Communications via email.
11/2005	PIN updated to that date.	▪ PIN updated in English.
26/12/2005	An internal memo to the General Manager concluded that carbon finance is a key issue within the financial structure of the Ocaña Project Activity.	▪ Reference Memorandum DIPLAM 2005 No. 0162 (Memorando Referencia DIPLAM 2005 No. 0162)
25/09/2007	ELECAUSTRO updated the PIN. Internet communications were maintained with PLAC/CAF.	▪ Communications via email. ▪ PIN updated in English.

31/10/2007	ELECAUSTRO had contacts with Carbon Asset Management AB (Sweden) who proposed a terms sheet to sale and purchase CERs.	▪ Terms and conditions for the forward Sale and Purchase of Certified Emission Reductions
25/02/2008	ELECAUSTRO'S General Manager reported to the Executive Board that the benefits of the CDM are decisive in the decision to proceed with the Project. This Memorandum stated that carbon finance is a key element to implement the Project Activity.	▪ Memorandum GG-2008 0071 (February 25th 2008) (Memorando GG-2008 0071 (25 de Febrero de 2008)).
26/02/2008	ELECAUSTRO'S Executive Board stated that General Manager shall continue actions to secure CDM status. Board declares CDM for the Ocaña Hydropower Project as a strategic priority.	▪ Summary of Board Meeting Resolutions 154 (February 26th 2008) (Resumen de Resoluciones de la Sesión de Directorio No. 154 (Febrero 26 de 2008)).
03/04/2008	ELECAUSTRO signed the contract for the construction, equipment and commissioning/construction started.	▪ Contract for the construction, equipment and operation of the Ocaña hydroelectric project of 26 MW (03/04/2008). (Contrato para la Construcción, Equipamiento y Puesta en Operación del Proyecto Hidroeléctrico Ocaña de 26 MW (03/04/2008)).
04/04/2008	Construction started.	▪ Report "ELECAUSTRO Gestión 2000 – 2008".
28/04/2008	PIN updated to that date.	▪ Communications via email. ▪ PIN updated in English.
09/2009	Preliminary actions to hire a national PDD consultant.	▪ Communications via email.
16/06/2010	A PDD consultant was hired.	▪ Consultancy Contract No. 2010 – 0030.
10/03/2011	LoA was issued by the DNA (Ministry for the Environment)	▪ LoA issued.
27/10/2011	PDD is published at UNFCCC website for the Global Stakeholder Consultation Process.	▪ See UNFCCC/CDM website

Table No. 3: Timeline of events to secure CDM status of the OCAÑA Hydropower Project
Source: ELECAUSTRO.

As shown in the above timeline, the development procedure shows real actions to secure CDM status of the OCAÑA Hydropower Project.

On the other hand, in order to demonstrate and assess the Additionality of the Project Activity, the Project Participants will apply the most recent versions of the following documents:

1. "Tool for demonstration and assessment of Additionality – Version 06.0.0".
2. "Guidelines for objective demonstration and assessment of barriers – Version 01".

STEP 1: IDENTIFICATION OF ALTERNATIVES TO THE PROJECT ACTIVITY THAT ARE CONSISTENT WITH CURRENT LAWS AND REGULATIONS

Sub-step 1a. Define alternatives to the Project Activity:

The following alternatives to the Project Activity have been identified; these options are realistic and feasible for ELECAUSTRO:

Alternative 1: Status quo – SNI supplies the required Power

This alternative implies that the current situation continues and the proposed CDM Project Activity is not implemented and electricity is therefore supplied by the SNI. For ELECAUSTRO, this alternative involves no additional investment or cost; also, it will result in no reduction in GHG emissions in the SNI. Moreover, by not incorporating in the short term, renewable energy power plants, GHG emissions will actually increase due to the increased use of the thermal power plants to meet increasing demand.

Alternative 2: Implement the OCAÑA Hydropower Project without registering it under the CDM

Another alternative available to ELECAUSTRO is to carry out the OCAÑA Hydropower Project (26 MW) without taking into account the additional incentives offered by the CDM. This Project Activity has however faced barriers in terms of access to financing, which resulted in early actions being taken to enable the project to benefit from the incentives provided by the CDM.

In this analysis, other alternatives were not considered like: (i) the implementation of a thermal power plant or (ii) the development of renewable wind, solar or biomass energy projects; with power generation from non-renewable or renewable energy sources that would be equivalent to that produced by the Project Activity. The thermal power plant is not a realistic option given that ELECAUSTRO seeks to reduce its fossil fuel power generation and diversify generation mainly using renewable sources. The Executive Board of ELECAUSTRO by the resolution No. 155-0767 dated March 31 2008 decided to suspend permanently commercial operations of the Monay Thermal Power Plant from April 1 2008. This action was taken in accordance with the company's objectives of replacing fossil fuels with renewable energy sources and reducing the company's dependence on fossil fuels, especially those derived from crude oil, which are imported and used to produce power.

Likewise, the second option is also not a realistic alternative for ELECAUSTRO because the company does not have built capacity to develop and operate wind farms, solar photovoltaic systems, thermal generation plants using biomass, or geothermal generation plants with a capacity equivalent to the OCAÑA Project. It is important to mention that ELECAUSTRO is a company that supplies power to the SNI through two hydropower plants; Saucay (24MW) and Saymirin (14.4MW) and El Descanso thermal power plant (19.20MW) – as previously mentioned the company suspended operations at the Monay Thermal Power plant (11MW) in April, 2008.

In December 2009, CONELEC updated the Ecuadorian Inventory of Electricity Generating Energy Resources, which presents the geographic location of those sites that are apt for exploiting renewable sources. This document does not identify the area where the OCAÑA Project Activity is located as a potential location for developing renewable energy sources like wind, solar, biomass or geothermal.

Sub-step 1b. Consistency with mandatory laws and regulations

The alternatives presented in Sub-step 1a are consistent with and comply with the laws and regulations established for the electricity sector in Ecuador. Therefore, there is no restriction that could prevent the status quo (Alternative 1) or construction/operation of the OCAÑA Hydropower Project without consider carbon finance (Alternative 2)

STEP 3: BARRIERS ANALYSIS

Sub-step 3a. Identify barriers that would prevent the implementation of the proposed CDM project activity:

In order to identify barriers that would prevent the implementation of the Ocaña Hydropower Project is necessary to introduce a brief analysis of the Ecuadorian electricity sector. Thus, last 15 years, the regulatory framework of the electricity sector has undergone a series of profound changes, passing from a free market system – in which was expected an active participation of the private sector to invest in generation projects – to the current system that is a centralized model in which the State is the principal investor in the sector. As highlighted in the 2009-2020 Electrification Master Plan, the legislation and regulations that were in place prior to the reforms ordered by Mandate No.15 (July 23, 2008), incorporated a range of incentives for investment in hydropower generation projects, which were not however sufficient to attract private investment (see below Table No. 5).

Likewise, the lack of timely payments to the public and private electricity generators who invested in the country, added significantly to this problem. This lack of compliance on the part of the electricity distributors (utilities) gave the wrong signals to investors who had showed interest in developing power-generating projects in Ecuador, and in light of these unfortunate circumstances demanded sovereign guarantees from the State, which were not granted because they are expressly prohibited by law. Very few privately funded hydropower generation initiatives (only three between 10 and 100 MW in twelve years), which were mainly focused on small and medium scale projects, faced investment barriers[2] (see below Table No. 5a).

As remarked in the 2009 – 2020 Electrification Master Plan, the lack of investment in expanding generation capacity resulted in a situation characterized by:

- Low reserve levels
- High energy prices
- High dependency on fuel imports
- High dependency on energy imports
- Increased public spending on fuel imports and subsidies
- Increased public spend on electricity consumer subsidies
- Risk of supply shortage

Given this situation, the sector underwent a series of reforms, which were established in Mandate No. 15. This mandate set up those resources needed to cover the required investments in generation; transmission

[2] Regarding to these issues, it is important to review sectoral studies prepared by CENACE (a technical entity of the electrical sector): (1) “Deudas del sector eléctrico y cierre de cuentas” (2005) and (2) “Soluciones a la problemática del sector eléctrico ecuatoriano” (2004). Documents can be downloaded at: http://www.cenace.org.ec/index.php?option=com_phocadownload&view=category&id=2:phocatmem&Itemid=50

and distribution would be provided by the State whereby power generation infrastructure would obligatorily become part of the General State Budget.

The Electrification Plan states that, despite the superior hierarchy of this legal instrument, and the willingness of the authorities to comply with it, the financing of power generation by the State has been limited by the scarce availability of resources in the treasury. One of the factors influencing the deficit is related to the economic conditions at the global level, which had an effect on the economy of Ecuador, which is highly dependent on the international price of crude oil.

In compliance with the Mandate and thanks to the availability of the funds coming from the surplus revenue generated by oil sales, which had in part been used to increase the Ecuadorian Fund for Investment in the Energy and Hydrocarbon sector (FEISEH) the development of hydropower generation projects was given a significant boost[3]. However, the global economic crisis at the end of 2008 and the subsequent fall in the price of oil resulted in a reduction in funds allocated toward investment in electricity generation; this motivated the country to search for and identify new sources for financing.

Despite the fact that in Ecuador there are a significant potential for hydropower projects and the State promotes their implementation, the lack of financing sources and the Sector´s Structural problems has led to a reduction in the proportion of effective power being supplied by hydropower sources. In 1997, hydropower power generation accounted for 54.82% of the total effective power in the system but, in 2008, this figure had fallen to 48.13%[4].

It is worth mentioning that ELECAUSTRO has undergone changes in its structure as a Company. Even though ELECAUSTRO was formed as an anonymous society, with State capital, and its shareholders are public entities (like Provincial and Local Governments from the south of Ecuador), it is currently making the transition to become a state owned company. Likewise, the conditions for developing the proposed CDM Project Activity have changed profoundly since its conception in 2000 – 2001 until 2007 – 2008, at which time the aforementioned changes to Ecuadorian electricity sector began to take place (changes that among others, have been fomented since early 2007).

As mentioned, Elecaustro was formed as a anonymous society, with shareholders (owners) all from the public sector. In December 2007, the share capital was $ 80,235,000 dollars of United States of America with the shareholding indicated in the following table:

SHAREHOLDER	2007	%
FONDO DE SOLIDARIDAD	34.896.000	43,492
CONSEJO PROVINCIAL DEL AZUAY	19.801.000	24,679
FIM - FEISEH	14.000.000	17,449
I. MUNICIPALIDAD DE CUENCA	7.055.000	8,793
CONSEJO PROVINCIAL DEL CAÑAR	2.456.000	3,061
CREA	887.000	1,106

[3] The FEISEH later was integrated into the General State Budget managed by the Ministry of Economy and Finance.

[4] CONELEC, the 2009-2020 Electrification Master Plan, November 2009. This report can be downloaded at www.conelec.gob.ec

H. CONSEJO PROVINCIAL DE M. SANTIAGO	704.000	0,877
I. MUNICIPALIDAD DE SIGSIG	175.000	0,218
I. MUNICIPALIDAD DE SANTA ISABEL	158.000	0,197
I. MUNICIPALIDAD DE BIBLIAN	101.000	0,126
I. MUNICIPALIDAD DE MORONA	2.000	0,002
Total	**80.235.000**	**100,000**

Table No. 4a: ELECAUSTRO Shareholder, December 2007

The organization is structured as follows: the General Meeting of Shareholders, Board of Directors composed by representatives of the shareholders (ten members including a representative of the employees of the Company), General Management and the following areas: Production, Environment and Civil Engineering, Administrative, Planning and Marketing, and Legal.

Total assets to December 2007 were USD 100,759,406.39; total liabilities were $ 12,579,401.32 and 88,180,005.07 USD of patrimony. It is important to mention that within the assets there is a value of $ 19,220,738.12 corresponding to accounts receivable from distribution electricity companies. This value is greater than one year of billing. Total revenues of the Company were USD 16,003,091.22, while costs were $ 11,999,565.26. The earnings before taxes were $ 4,003,525.96, while after taxes were $ 2,066,979.73. Such dividends were reinvested in the Ocaña Hydropower Project.

Investment Barrier

The legal and structural changes that the electricity sector has undergone affected the OCAÑA Hydropower Project; its development was primarily delayed due to the investment barrier. Notwithstanding, once all efforts had been made to obtain funding for the Project Activity, after 8 years of work on the part of ELECAUSTRO, CDM potential revenues were fundamental to overcome the barrier. As indicated in Table No. 3, since 2003 efforts to include the Project Activity under the CDM had been unceasing.

A first step in seeking financing for the OCAÑA Project Activity took place in March 2001 when the General Shareholders Board of ELECAUSTRO approved the report presented by the OCAÑA Commission to analyze and propose financing alternatives for the Project Activity. Consequently, the Shareholder´s Board authorized the General Manager to execute the necessary steps to obtain financing.

Table No.4b summarizes all of the actions intended to obtain financing for the OCAÑA Hydropower Project. Although, it is known that anecdotal evidence per-se is not sufficient proof of barrier, it can be used to support the analysis as stated in Para 42 of the "Tool for demonstration and assessment of Additionality – Version 06.0.0."

DATE	ACTIONS CARRIED OUT	RESULTS
March-2001	The ELECAUSTRO S.A. General Shareholders Board approved the report presented by the Ocaña Commission to analyze and propose alternatives for financing the Project Activity.	

DATE	ACTIONS CARRIED OUT	RESULTS
April-2001	To execute the above resolution, the General Manager contacted the main private banks in the country, the Inter-American Development Bank (IADB), and visited the embassies of various countries, to promote the Project Activity and generate interest among potential lenders.	The Private banks showed no interest. The IADB, to that date, has only been interested in financing privatization processes, and the embassies responded by saying that at that time there were no financing lines for Ecuador.
October-2001	ELECAUSTRO launched the first international public tendering process (in various Ecuadorian newspapers), for the construction and financing of the Project Activity. A visit was made to the Latin American Energy Organization (OLADE), which subsequently presented the Project Activity, in Argentina, at a Congress in October. New visits were made to various embassies to generate interest in the bidding process.	In the same year, the Executive Board of ELECAUSTRO decided to declare the tendering process void.
First Quarter, 2002	The Executive Board of ELECAUSTRO, after abandoning the bidding process, authorized the General Manager (GM) and the OCAÑA Commission to continue seeking financing. The GM took up bilateral negotiations with ALSTOM Brazil.	ALSTOM Brazil proposed signing a cooperation agreement for constructing and financing the Project Activity.
First Quarter, 2002	With the authorization of the ELECAUSTRO Executive Board, the cooperation agreement was signed – without an exclusivity clause –, and as a result of the agreement, meetings were held with the Brazilian Development Bank (BNDES), a visit to Brazil was made and at the same time a detailed Business Plan was presented. Meanwhile, contacts were made with the Ecuadorian State Bank (BEDE) regarding the granting of an endorsement/guarantee for financing the Project Activity.	The responses of ALSTOM and BNDES were not satisfactory.
May-2002	A working meeting was planned in which the BEDE participated, and during which the Business Plan was	

DATE	ACTIONS CARRIED OUT	RESULTS
	presented, and different financing variables were determined, also the scope of the guarantee or endorsement requested from the BEDE was analyzed.	
June-2002	In the meeting referred to in May 2002, the BEDE agreed to issue a letter of intention for UNION TECH INC. (representing to Chinese companies), and ELECAUSTRO, which allowed the financing process to progress.	The response was not positive, since the Companies (represented by UNION TECH ENGINEERING INC.) demanded guarantees with a bank that has triple A rating and a correspondent bank abroad.
June-2002	Contact was made with INTERVED from Canada.	Despite the efforts made by ELECAUSTRO, INTERVED did not show any serious interest in the Project Activity, and thus a formal proposal was never made.
November-2002	ELECAUSTRO S.A. signed with CONELEC the construction and operation permission contract for the OCAÑA Hydropower Project, with a 50-year term.	On the same date, a letter of intention was signed with the BEDE to provide the guarantee for the Project financing.
Third Quarter of 2002	A cooperation agreement with the Spanish Consortium, led by the company EXPANSION EXTERIOR S.A. and including ARG (Brazil) and ALSTOM (Spain) was negotiated. This led to the signing of said agreement that included obtaining financing and consolidation of an offer to construct the Project Activity.	The technical and economic proposal presented by the Consortium faced a series of difficulties, particularly related to building the tunnel, and, in the financial section, problems resulting from the economic conditions within the country at that time.
August-2003	The Consortium led by EXPANSION EXTERIOR S.A. and including at this time ALSTOM POWER S.A. and OBRASCON HUARTE LAIN (OHL) formally presented a technical, commercial, and financial offer that estimated the Project´s construction costs at US$ 48,238,038.63. With the financing and tax costs also accounted for the cost of the project for ELECAUSTRO, totaled US$ 68,472,515.	The Commission designated to evaluate the offer concluded that it was not acceptable. The Executive Board requested an adjusted offer.
Final quarter 2003	As EXPANSION EXTERIOR S. A. did not have exclusivity, the General Manager of ELECAUSTRO	EXPANSION EXTERIOR S. A. presented an incomplete unofficial offer, and no progress was made on the issue.

DATE	ACTIONS CARRIED OUT	RESULTS
	continued to seek alternative financing sources. Working meetings including a visit to the OCAÑA Project Activity site were held with representatives from Companies of the China National Electric Equipment Corporation (CNEEC) and SIDRI also from the republic of China. These companies were interested in financing and constructing the OCAÑA hydropower project.	
January - 2004	CNEEC sent a financial proposal, prepared by the financial consultancy firm China Commerce & Investment Advisory & Consultancy Center PTE LTD. (CCIAC). To date the adjusted offer presented by the Spanish Consortium EXPANSION EXTERIOR-OHL-ALSTOM POWER was available.	Upon evaluating the adjusted offer that was presented by the Spanish Consortium EXPANSION EXTERIOR-OHL-ALSTOM POWER, the ELECAUSTRO Executive Board reported to the General Shareholders Meeting that: ▪ This offer would not be in the Company´s interests; and, ▪ It would not be convenient to award the project to this Consortium. Additionally, the BEDE rejected to request to issue the guarantee given that the Project would not be financially feasible with the Spanish offer.
September - 2004	In order to identify new sources of financing in September 2004 an initial contact was made with Canadian company AIMACON FS.	In November 2004, ELECAUSTRO received a proposal of AIMACON FS that contemplated a US$ 45 million loan, at a fixed annual rate of 5.5%, with repayments over 15 years and a 2-year grace period.
Last Quarter of 2004	ELECAUSTRO presented the Project directly to the Andean development Corporation (CAF), for obtaining a loan.	The interest rates and the payments periods proposed by the CAF were considered disadvantageous.
November-2004	ELECAUSTRO prepared a “Report on the alternatives for financing the OCAÑA Hydropower Project”	This Report concluded that the cost of the Project Activity amounts to USD 50.4 million and the most suitable proposal to develop the Project comes from CNEEC.

DATE	ACTIONS CARRIED OUT	RESULTS
December-2004	The General Shareholders Board decided to:	1. Accept the recommendations of the Executive Board and terminate negotiations with the Spanish Consortium; 2. Suspend negotiations with CNEEC from China and AIMACON FS from Canada (Information on AIMACON FS is presented in the following point 14); 3. Order that all the information relating to the Project be sent to the BEDE in order to receive the Guarantee required to facilitate future lending, regardless of the origin of the loan; and 4. When the Guarantee was obtained, issue a call for bids, which would also include the condition of financing.
Last Quarter - 2004	Invited by CONELEC, ELECAUSTRO and representatives from other electricity generating companies, held a working meeting with officials from the World Bank. The alternatives for financing the Project Activity were presented.	Officials from the World Bank acknowledged the importance of the progress and made a commitment to inform higher authorities from this multi-lateral institution of the Project Activity. Meanwhile, ELECAUSTRO requested that the BEDE, in Cuenca, ratify the intention to guarantee the Project Activity. The BEDE answered positively but conditional on the Project´s viability and ELECAUSTRO´s financial capacity, factors which the BEDE would subsequently evaluate.
June-July-2005	ELECAUSTRO decided to redefine the negotiations and summon another international tendering process for the Project´s financing and construction.	This process began in January 2006, 6 companies expressed interest in the process. Ultimately, no offers were presented, as no guarantee for the credit required to financially closing the Project Activity and the consequent construction contract was available.

Table No. 4b: Anecdotal evidence to support the analysis of the investment barrier
Source: ELECAUSTRO.

Given the barrier that the Project Activity faced up until 2006, ELECAUSTRO decided to start other efforts to strengthen its search for financing, this time though capital contributions and loans, applying new legal provisions that favored these types of investments in the electricity sector. Thus, the announcement, in October 2006 by the National Congress, of the Organic Law to create the Ecuadorian Investment Fund for the Energy and Hydrocarbon Sectors (FEISEH) and its Regulations (April/2007), made it possible for ELECAUSTRO to make progress in obtaining financing.

After the request to the FEISEH, presented in May 2007, the Project Activity finally was granted financing by the FEISEH in August/September 2007, which involved an initial capital contribution of USD 14 million and a loan of USD 22.7 million. ELECAUSTRO contributed USD 7.5 million of financing by reinvesting profits; the Shareholders approved this investment. The availability of the funds from FIMFEISEH (capital and loan) allowed ELECAUSTRO to launch a call for bids for the "Construction, Equipment and Commissioning" of the OCAÑA Project Activity in May 2007. Almost a year after, in March 2008, the trustee of FIMFEISEH approved an additional capital contribution of US$15.5 million.

To proceed with the disbursement of the capital and credit funds from FIMFEISEH (at that date managed by the National Central Bank – BCE), ELECAUSTRO formed an Administration and Guarantee Business Trust, which has the role of administering the funds for carrying out the Project Activity and paying the financial commitments made by ELECAUSTRO with the National Central Bank.

At the same time, in February 2008, the Executive Board of ELECAUSTRO issued the *"ELECAUSTRO's Executive Board Resolution No. 154-0753:4"* which indicate awareness of the CDM prior to the Project Activity start date and state the CDM as a strategic procedure within its environmental policy. This Resolution was made based on a key report prepared by the General Manager (Memorandum GG-2008 0071, February 25, 2008) who clearly stated that the benefits of the CDM are a decisive factor in the decision to proceed with the Project Activity.

It is important to highlight that the additional capital contribution of USD 15.5 million was approved based on the actions undertaken by ELECAUSTRO to get CDM status of the Project Activity. In other words, carbon finance were a decisive factor to secure additional capital contribution to cover the financial gap raised by increasing of costs and terms due to an increased demand of electromechanical equipment and perceived country risks and uncertainties.

Given the fact that the additional income from carbon credits are economic rights that are negotiable in the international market, those futures revenues were considered by the lender as a guarantee to fulfill ELECAUSTRO´s financial obligations for executing the proposed CDM Project Activity. Therefore, the lender accepted the Administration and Guarantee Business Trust (Fideicomiso OCAÑA) formed by ELECAUSTRO, as a significant financing decision to proceed with the loan. Following the "Guidelines for objective demonstration and assessment of barriers – Version 01," the Trust included the benefit of the CDM in the following references:

> *"Content right or set of contents rights which are tradable on the national and international stock exchanges, including among others; shares, bonds, warrants, investment funds, futures contracts, or term contracts…"*

> *"…The Trust is comprised of public and private capital that may be contains tangible and no-tangible assets that the Constituent (Elecaustro) transfer, as well as other assets and rights that being integrated as a result of developing and complying of this Contract…".*

It is important to point that at the time when the decision to proceed with the Project Activity was made (September 2007), the lender was not able to explicit the CDM benefits into the Trust due to internal policies, which are currently in effect.

(Outcome of Step 3a): Therefore, given the fact that the identified barrier prevented Alternative 2 at the time when decision to proceed was made, this Alternative (the Project Activity) is additional.

Sub-step 3b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity):

The aforementioned barrier is specific to the OCAÑA Hydropower Project (Alternative No. 2) which means they do not affect Alternative No. 1 (Status quo – Power supply from existing sources to the SNI) because this option does not represents additional investment by ELECAUSTRO.

Outcome of Step 3: The sub-steps 3a and 3b have been met for the proposed CDM Project Activity (the identified barrier prevented project implementation); hence, analysis continues towards Step 4.

Step 4. COMMON PRACTICE ANALYSIS

Sub-step 4a. Analyze other activities similar to the proposed project activity:

Sub-step 4a. is not necessary for this analysis.

Sub-step 4b. Discuss any similar options that are occurring

Sub-step 4b. is not necessary for this analysis.

For measures that are listed in paragraph 6:

Step 1: Calculate applicable output range as +/- 50% of the design out or capacity of the proposed Project Activity

To identify similar activities, the output range of +/- 50% of the design output or capacity of the Project Activity is taken into account. According to the design nominal capacity of the project (26 MW), the applicable range is from 13 MW to 39 MW for hydropower plants within the SNI.

Step 2: Identify all plants that deliver the same output or capacity, within the applicable output range calculated in Step 1 (exclude registered CDM projects and projects activities undergoing validation)

Table No. 5 shows the plants that fall within the applicable output range calculated in Step 1 (from 13 MW to 39 MW). Following the Tool, this Table does not include registered CDM and projects activities undergoing validation:

Plant	Technology	Year (Start Commercial Operation)	Nominal Capacity (MW)
Recuperadora	Hydropower Run of River	1990	14.50

Saucay	Hydropower Run of River	1978	24.00
Nayón	Hydropower Run of River	1974	29.70
Saymirín	Hydropower Run of River	1957	14.43
Guangopolo	Hydropower Run of River	1937	20.92

Table No. 5: List of power plants (in operation) that delivers the same capacity than the Project Activity
Source: Statistical Report on the Ecuadorian Electricity Sector 2009, CONELEC.

Therefore,

$N_{all} = 5$

Step 3: Within plants identified in Step 2, identify those that apply technologies different that the technology applied in the proposed project activity. Note their number N_{diff}

Para. 44 of the "Tool for demonstration and assessment of Additionality – Version 06.0.0" states that:

> *"….Projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of the similar scale, and take place in **a comparable environment with respect to regulatory framework, investment climate,** access to technology, access to financing, etc…."*

It is important to point out that in 1996, the Electrification Law was modified to liberalize the electricity market in order to promote/spread out private investment in the electric sector; particularly, in the generation side of the business. Hence, all the projects implemented before 1996 had a very different investment scenario, which is NOT a comparable environment with respect to the regulatory framework followed by the proposed Project Activity.

Therefore, the projects listed in Table No. 5b are not similar to the Project Activity.

As consequence:

$N_{diff} = 5$

Step 4: Calculate factor F= 1 - N_{diff} / N_{all} *representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity*

Therefore,

F = 0, and;

$N_{all} - N_{diff} = 0$

Given the proposed Project Activity do not fulfill conditions to be "common practice"[5]; this additional analysis confirms that the Project Activity is not common practice.

Therefore the Proposed Project Activity is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The following methodological choices have been chosen in order to estimate emission reductions:

1. Calculate Project Emissions (PE_y)
2. Calculate Baseline Emission (BE_y)
3. Calculate Leakage
4. Calculate Emission Reductions (ER_y)

1) Project emissions

Given the Power Density of the OCAÑA Hydropower Project is 2,364 W/m^2, CH_4 emissions from the reservoir shall not be accounted whereby PE_y is zero.

$$PE_y = 0$$

2) Baseline emissions

The baseline emissions include the CO_2 emissions produced to generate electricity in the plants that use fossil fuels, as their power source and that would be displaced because of the electricity generated by the OCAÑA Project Activity. The emissions for the baseline are calculated using the following formula:

$$BE_y = EG_{PJ,y} \cdot EF_{grid,CM,y}$$

Where:

BE_y	=	Baseline emissions for year y (tCO_2)
$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of implementing the CDM Project Activity in the year y (MWh)
$EF_{grid,CM,y}$	=	Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system".

According to the *"Tool to calculate the emission factor for an electricity system" (Version 02.2.1)* to calculate the combined margin emissions factor ($EF_{grid,CM,y}$) one should follow these 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 the operating margin (OM);
STEP 4. Calculate the operating margin emission factor according to the selected method;

[5] A project is considered "common practice", if both the following conditions are fulfilled: (a) the factor F is greater than 0.2; and, (b) N_{all} - N_{diff} is greater than 3.

STEP 5. Calculate the build margin (BM) emission factor.
STEP 6. Calculate the combined margin (CM) emission factor.

1) Identify the relevant electricity systems

When determining the emission factor, a project electricity system is defined in the Tool as the spatial extent of the power plants that are physically connected through transmission and distribution lines to a CDM project activity and can be dispatched without significant transmission constraints. As mentioned previously, the OCAÑA Hydropower Project will supply power to the SNI, which in this case is the relevant electricity system, the operative information of which will be used to calculate the estimated emissions reductions generated by the Project Activity.

The SNI (see Figure No. 2) is made up of generators, distributors, self-generating companies and the international interconnection (Colombia and Peru). The interconnection with Colombia is made using the following transmission lines: Tulcán-Ipiales up to 138 kV and Pomasqui-Jamondino up to 230 kV and the interconnection with Peru is made using Machala- Zorritos transmission line. However it is important to note that the interconnection with Peru is not in operation permanently but delivers power to the SNI only in emergencies (for example, when there is a deficit due to a low water season, which results in reduced hydropower production.)

Therefore, the list of plants and units considered in order to calculate the emission factor only includes plants connected to the SNI that feed power to the system. The National Electricity Board (CONELEC) and the National Center for Power Control (CENACE) provided the operative information required for calculations.

It is important to point out that the Ministry of Environment, DNA of Ecuador, has published a delineation of the System (SNI) in the report named as "Factor de emisión de CO2 del Sistema Nacional Interconectado del Ecuador al Año 2011, Informe 2011, Ministerio de Electricidad y Energía Renovable (MEER), Ministerio del Ambiente (MAE), Concejo Nacional de Electricidad (CONELEC) y Centro Nacional de Control de Energía (Corporación CENACE), 2011".

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

Given that the OCAÑA Hydropower Project will be connected to the SNI, to calculate the emission factor, only those plants that are connected to the grid will be included.

3) Select a method 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: (a) average of the five most recent years, or (b) based on long-term

averages for hydroelectricity production. In the case of the SNI in Ecuador, option (a) is chosen whereby Table No. 6 lists the average electricity generated in the five most recent years and shows that the Simple OM method is not applicable to the grid in Ecuador, given that power generation from low-cost/must-run sources is greater than 50% (actually equivalent to 63%).

Generation (GWh)	2006	2007	2008	2009	2010	Average	Percentage
Low – cost/ must run	8,581.51	9,785.30	11,677.15	10,199.31	9,571.56	9,962.97	63.2%
No low – cost/ must run	5,478.73	5,220.53	4,409.64	6,156.23	7,758.48	5,804.72	36.8%
Total	**14,060.25**	**15,005.83**	**16,086.79**	**16,355.54**	**17,330.04**	**15,767.69**	**100%**

Table No. 6: Total grid generation in the SNI between 2006 and 2010

Source: Factor de emisión de CO2 del Sistema Nacional Interconectado del Ecuador al Año 2011, Informe 2011, Ministerio de Electricidad y Energía Renovable (MEER), Ministerio del Ambiente (MAE), Concejo Nacional de Electricidad (CONELEC) y Centro Nacional de Control de Energía (Corporación CENACE), 2011.

Likewise, the Dispatch Data Analysis OM (option c) cannot be applied as the information required to make the calculations is not available to the public. In the case of the Average OM method (option d), this could be applied, however it has been decided to use the Simple Adjusted method (option b) as it is more precise and it allows one to obtain a more exact emission factor with a result that is more adapted to the SNI´s operating format. In the case of the OCAÑA Hydropower Project the ex-ante option was chosen, which means that the weighted calculation over the last 3 years (most recent) will be applied; this is to say, for 2010, 2009 and 2008.

According to the Tool, when the simple Adjusted OM method is applied, the power generating units in the system are divided into two categories these are: low-cost/must-run sources and the no low-cost/must-run sources. For the SNI the low-cost/ must-run sources include the plants powered by renewable energy such as hydropower, and turbo steam plants using waste biomass, and the power imported into the grid from Colombia. On the other hand, the no low-cost/must-run sources are represented by thermal generation plants connected to the SNI, which are powered by fossil fuels.

4) Calculate the operating margin according to the selected method

The simple adjusted OM emission factor is a variation of the simple OM method, where the power plants / units (including imports) are separated in low-cost/must-run power sources (k) and other power sources (m). The simple adjusted OM can be calculated, based on data on fuel consumption and net electricity generation of each power plant / unit and an emission factor for each plant / unit. The following formula is used:

$$EF_{grid,OM\text{-}adj,y} = (1-\lambda_y)\cdot\frac{\sum_m EG_{m,y}\times EF_{EL,m,y}}{\sum_m EG_{m,y}} + \lambda_y\cdot\frac{\sum_k EG_{k,y}\times EF_{EL,k,y}}{\sum_k EG_{k,y}}$$

Where:

$EF_{grid,OM\text{-}dj,y}$	=	Simple adjusted operating margin emission factor in year y (tCO2/MWh).
λ_y	=	Number of hours low-cost /must-run sources are on the margin in year *y*.
$EG_{m,y}$	=	Net quantity of electricity generated and dispatched to the grid by power unit m in year y (MWh).
$EG_{k,y}$	=	Net quantity of electricity generated and dispatched to the Grid by power unit *k* in year

		y (MWh).
$EF_{EL,m,y}$	=	CO_2 emission factor of Power unit / plant m in year y (tCO_2e/MWh)
$EF_{EL,k,y}$	=	CO_2 emission factor for the Power unit / plant *k* in year *y* (tCO_2e/MWh)
m	=	All the units / plants that supply Power to the Grid in year *y*, except the low-cost/must-run.
k	=	All the low-cost/must-run units / plants that supply Power to the grid in year *y*.
y	=	Year corresponding to the period chosen in Step 3 (2010, 2009 and 2008).

$EF_{EL,m,y}$, $EF_{EL,k,y}$, $EG_{m,y}$ and $EG_{k,y}$ are determined using the same procedures as those for the parameters $EF_{EL,m,y}$ and $EG_{m,y}$ in Option A of the simple method.

$EF_{EL,m,y}$ is calculated applying the following Options:

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

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

Where:

$EF_{EL,m,y}$	=	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 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)
EFCO2,i,y	=	CO_2 emission factor of fossil fuel type i in year y (tCO_2/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 units.
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.

Option A2. If for a power unit m only data on electricity generation and the fuel types used is available, the emission factor is determined based on the CO_2 emission factor of the fuel type used and the efficiency of the power unit, as follows:

$$EF_{EL,m,y} = \frac{EF_{CO2,m,i,y} \times 3.6}{\eta_{m,y}}$$

Where:

$EF_{EL,m,y}$	=	CO_2 emission factor of Power unit m in year y (tCO_2/MWh)
$EF_{CO2,m,i,y}$	=	Average CO_2 emission factor of fossil fuel type i used in power unit m in year y (tCO_2/GJ)

$\eta_{m,y}$	=	Average net energy conversion efficiency of power unit m in year y (ratio)
m	=	All power units serving the grid in year *y*, except low-cost/must-run power units.
y	=	Year corresponding to the period chosen in Step 3 (2010, 2009 and 2008).

$EG_{m,y}$, is calculated according to provisions for grid power plants.
The parameter λ_y is calculated using the following formula:

$$\lambda_y\ (\%) = \frac{\text{Number of hours low-cost /must-run sources are on the margin in year } y}{\text{8760 hours per year}}$$

Lambda (λ_y) should be calculated as follows (see figure below):

Step i) Plot a load duration curve. Collect chronological load data (typically in MW) for each hour of the years 2010, 2009 and 2008, and sort the load data from the highest to the lowest MW level. Plot MW against 8760 hours in the year, in descending order.

Step ii) Collect power generation data from each power plant / unit. Calculate the total annual generation (in MWh) from low-cost/must-run power plants / units (Hydropower Plants, turbo steam plants using residual pulp and electricity imports).

Step iii) Fill out the load duration curve. Plot a horizontal line across the load duration curve such that the area under the curve (MW times hours) equals the total generation (in MWh) from low-cost/must-run power plants / units (i.e. $\Sigma_k EG_{k,y}$).

Step iv) Determine the "Number of hours for which low-cost/must-run sources are on the margin in years 2010, 2009, and 2008". First, locate the intersection of the horizontal line plotted in step (iii) and the load duration curve plotted in step (i). The number of hours (out of the total of 8760 hours) to the right of the intersection is the number of hours for which low-cost/must-run sources are on the margin.

5) Calculate the build margin (BM) emission factor

In terms of vintage data, the project participants have chosen the Option 1. Likewise, the sample group of power units m used to calculate the build margin emission factor has been determined through the following procedure:

a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-units}}$) and determine their annual electricity generation ($AEG_{SET\text{-}5\text{-units}}$, in MWh);
b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEGtotal, in MWh). Identify 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} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET \geq 20\%$) and determine their annual electricity generation ($AEG_{SET\text{-}\geq 20\%}$, in MWh);

c) From $SET_{5\text{-units}}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample});

The "*Factor de emisión de CO2 del Sistema Nacional Interconectado del Ecuador al Año 2011, Informe 2011*" indicates that, due to operative characteristics of the SNI, the $SET_{\geq 20\%}$ will be selected for the calculation. Additionally, the following issues were taken into consideration:

- The power units in SET_{sample} started to supply electricity to the grid at the day when this power unit goes into operation at the SNI.
- The project activities registered under CDM have been excluded from the SET_{sample}.
- The power units, which started to supply electricity to the grid more than 10 year, also have been excluded from the SET_{sample}.

Therefore, 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 (2010), this factor is calculated using the following formula:

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

Where:

$EF_{grid,BM,y}$	=	Build margin CO_2 emission factor for the project electricity system 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 for the Power unit / plant *m* in the year *y* (tCO_2e/MWh)
m	=	Power Generation units / plants included in the build margin.
y	=	The most recent year for which generation data is available (2009).

The CO_2 emission factor used for each power generation unit / plant *m* ($EF_{EL,m,y}$) is the same as that determined in Step 4 (the same formulas and information sources).

6) Calculate the Combined Margin (CM) Emissions Factor

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:

EFgrid,BM,y	=	Build margin CO2 emission factor in year *y* (tCO2/MWh)
EFgrid,OM,y	=	Operating margin CO2 emission factor in year *y* (tCO2/MWh)
W_{OM}	=	Weighting of operating margin emissions factor (%)
W_{BM}	=	Weighting of build margin emissions factor (%)

As the OCAÑA Project Activity is a hydropower one, for this calculation the following weighting factors will be used: $w_{OM} = 0.5$ y $w_{BM} = 0.5$.

3) Leakage

According to ACM0002/V. 12.3.0, one should not consider leakages for emission reductions calculation.

4) Emission reductions (ER_y)

Therefore, the emission reductions are calculated using the following formula:

$$ER_y = BE_y - PE_y$$

Where:

ER_y = Emissions reductions in the year y (tCO_2).
BE_y = Baseline emissions in year y (tCO_2).
PE_y = Emissions resulting from the project (are considered to be equivalent to zero).
LE_y = Leakages (are considered to be equivalent to zero).

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

(Copy this table for each data and parameter)

Data / Parameter:	$\mathbf{EF_{grid, CM, y}}$
Data unit:	tCO2/MWh
Description:	Combined marginal CO_2 emission factor for power generation, connected to the grid in the year *y*.
Source of data used:	Consolidated Information from CONELEC and CENACE.
Value applied:	For the first crediting period of the Proposed Project, the value calculated for the period 2008 – 2010 will apply (**0.5531** tCO_2/MWh)
Justification of the choice of data or description of measurement methods and procedures actually applied :	To calculate the emission factor has been used the "Tool to calculate the emission factor for an electricity system – Version 02.2.1". Please refer to the document "*Factor de emisión de CO2 del Sistema Nacional Interconectado del Ecuador al Año 2011, Informe 2011*".
Any comment:	-

Data / Parameter:	$\mathbf{GWP_{CH4}}$
Data unit:	t CO_2 e / t CH_4
Description:	Global Warming Potential of the CH_4
Source of data used:	IPCC
Value applied:	21.
Justification of the choice of data or description of measurement methods	Established for the first commitment period: 21 t CO_2 e / t CH_4

and procedures actually applied :	
Any comment:	-

Data / Parameter:	**$FC_{i,m,y}$**
Data unit:	Mass or Volume Unit
Description:	Quantity of fossil fuel consumed by each generation unit / plant.
Source of data used:	Consolidated Information from CONELEC and CENACE.
Value applied:	See calculation sheet
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official data supplied by institutions from the sector.
Any comment:	-

Data / Parameter:	**$EG_{m,y}$, $EG_{k,y}$**
Data unit:	MWh
Description:	Net electricity generated by each unit of m, k in the year y.
Source of data used:	Consolidated Information from CONELEC and CENACE.
Value applied:	See calculation sheet
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official data provided by official institutions from the sector.
Any comment:	-

Data / Parameter:	**$NCV_{i,y}$**
Data unit:	$TJ/10^3$ ton
Description:	Net calorific value (energy content) for each fossil fuel.
Source of data used:	2006 IPCC guidelines for National Greenhouse Gas Inventories, Chapter 1, Table 1.2
Value applied:	Fuel Oil: 39.8 Diesel: 41.4 Naphtha: 41.8 Gas Natural: 46.5 Fuel Oil 6: 40.2 Bunker: 20.3
Justification of the choice of data or description of measurement methods	Applying the methodology, the lower bound of the 95% confidence intervals is used.

and procedures actually applied :	
Any comment:	-

Data / Parameter:	$D_{i,y}$
Data unit:	ton/m^3
Description:	Density of each fossil fuel.
Source of data used:	The World Bank, Working Paper Series, "Greenhouse Gas Assessment Handbook – A practical guidance document for the assessment of project-level greenhouse gas emissions", Annex 5.
Value applied:	Fuel Oil: 0.96 Diesel: 0.88 Naphtha: 0.74 Gas Natural: 0.00074 Waste crude: 0.86
Justification of the choice of data or description of measurement methods and procedures actually applied :	For the Fuel Oil (FO Nº6) the value corresponding to Residual Fuel Oil/heavy was used, for the Diesel the value corresponding to distillate Fuel Oil/heavy Diesel, for the Naphtha the value corresponding to gasoline, for Natural Gas the value corresponding to Natural Gas and for Waste crude the value corresponding to crude oil.
Any comment:	-

Data / Parameter:	$EF_{CO2,i,y}$
Data unit:	kg CO_2/TJ
Description:	Emission Factor for each fossil fuel.
Source of data used:	2006 IPCC guidelines for National Greenhouse Gas Inventories, Chapter 1, Table 1.4
Value applied:	Fuel Oil: 75,500 Diesel: 72,600 Naphtha: 69,300 Gas Natural: 54,300 Fuel Oil 6: 76,300 Bunker: 73,300
Justification of the choice of data or description of measurement methods and procedures actually applied :	Applying the methodology, the lower bound of the 95% confidence intervals is used.
Any comment:	-

Data / Parameter:	EF_{Res}
Data unit:	kgCO2e/MWh
Description:	Default emission factor for emissions from reservoirs of hydro power plants

Source of data:	Decision by EB23
Value to be applied	90 kgCO2e/MWh
Any comment:	-

Data / Parameter:	$\mathbf{Cap_{BL}}$
Data unit:	W
Description:	Installed capacity of the hydro power plant before the implementation of the project activity. For new hydro power plants, this value is zero
Source of data:	Project site
Measurement procedures (if any):	For new hydro power plants, this value is zero.
Any comment:	-

Data / Parameter:	$\mathbf{A_{BL}}$
Data unit:	m^2
Description:	Area of the single or multiple reservoirs measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m2). For new reservoirs, this value is zero.
Source of data:	Project site
Value applied:	To be specified for each CPA; For new reservoirs, this value is zero
Measurement procedures (if any):	For new reservoirs, this value is zero.
Any comment:	-

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

The following numbers are taken from the Official Report: "*Factor de emisión de CO2 del Sistema Nacional Interconectado del Ecuador al Año 2011, Informe 2011*". The DOE can validate hypothesis and calculations of these numbers going through this Official Report, which is attached to the PDD.

1) Project emissions

According to ACM0002 (version 12.3.0), for most renewable power generation project activities, PEy = zero. This is applicable to the Proposed CDM Project.

2) Baseline emissions

EF OM (t CO_2/MWh) =	2008	2009	2010
	0.7013	0.7310	0.7588

	2008	2009	2010	Total
Annual Electricity Generation (MWh)	16,086.79	16,355.54	17,330.54	49,772.38
%	32.3%	32.9%	34.8%	

$EF_{grid,OM,y}$ = 0.7311 tCO_2/ MWh

All the plants that are used to estimate the Build Margin Emission Factor for the year 2010 are included in Annex 3 (see number 4) Build Margin Emission Factor (Year 2010): Power units used for calculation. The number applied for calculation is the following:

$EF_{grid,BM,2010}$ = 0.3751 tCO_2/ MWh

The combined margin emissions factor is calculated applying the following formula:

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

As the OCAÑA Project Activity is a hydropower one, for this calculation the following weighting factors will be used: w_{OM} = 0.5 y w_{BM} = 0.5.

Where:

$EF_{grid,CM,\ 2010}$ = 0.7311 × 0.5 + 0.3751 × 0.5 = 0.5531 tCO2/MWh; for the first crediting period.

Hence,

Estimating the value of annual average energy generation of the Project as 203,099 (MWh/year)

B_{Ey} = 203,099× 0.5531 = 112,334 tCO2e

The ex-ante baseline emission factor: 0.5531 tCO2/ MWh (see details in Annex 3)
Annual baseline emissions: 112,334 tCO_{2e}

3) Leakage

According to ACM0002 (version 12.3.0), no leakage is considered. The main emissions potentially giving rise to leakage are neglected.

4) Emission Reductions

ERy = BEy - PEy

The total annual baseline emissions are 112,334 tCO_{2e}.
The total annual project emissions are zero tCO_{2e}.

Hence,

E_{Ry} = B_{Ey} - P_{Ey} = 112,334 – 0 = 112,334 tCO_{2e}

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

Year	Project emissions estimates (tons of CO2)	Baseline emissions estimate (tons of CO2)	Estimates of leaks (tons of CO2)	Estimated emissions reductions (tons of CO2)
2013	-	112,334	-	112,334
2014	-	112,334	-	112,334
2015	-	112,334	-	112,334
2016	-	112,334	-	112,334
2017	-	112,334	-	112,334
2018	-	112,334	-	112,334
2019	-	112,334	-	112,334
Total (tons of CO2)		**786, 338**		**786, 338**

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

B.7.1 Data and parameters monitored:

(Copy this table for each data and parameter)

Data / Parameter:	**EG_y**
Data unit:	MWh
Description:	Net quantity of electricity generated by the project in the year ***y***
Source of data to be used:	ELECAUSTRO will measure this parameter at the project site according their internal procedure *"Manual de Procedimientos Electro Generadora del Austro: Procedimiento para Monitorear y Registrar la Energía Neta producida por la Central Hidroeléctrica Ocaña"*[6].
Value of data applied for the purpose of calculating expected emission reductions in section B.5	203,099
Description of measurement methods and procedures to be applied:	This parameter will be measured by the Commercial Measurement Equipment, which includes energy meters, communication system and the software namely Terminal Portátil de Lectura or TPL. Measurement procedure will follow the *"Commercial Measurement System of the Electric Whole Market – MEM"* established in the Regulation CONELEC 005/06[7]. The readings of the electricity meter will be continuously measured on a dailyly basis. Data will be archived for 2 years following the end of the last crediting period by means of electronic and paper backup.

[6] This document can be requested to ELECAUSTRO/Dirección de Planificación y Mercadeo.

[7] Regulation 005/06 can be downloaded at: http://www.conelec.gob.ec/normativa_detalle.php?cd_norm=186

QA/QC procedures to be applied:	Four energy meters will be installed at project site (two operative/two backup). These meters will be calibrated following manufacturer's directives, however, ELECAUSTRO, on a daily basis; will check measurement records in order to detect potential failures in the equipment. The electricity generation from the plant will be monitored and recorded at the central control room. The SCADA's project operator is responsible for recording such data. Receipts for electricity sales will be kept for cross check, when necessary.
Any comment:	-

Data / Parameter:	**Cap_{PJ}**
Data unit:	W
Description:	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data:	Project site
Measurement procedures (if any)	Determine the installed capacity based on recognized standards
Monitoring frequency:	Yearly
QA/QC procedures:	-
Any comment:	-

Data / Parameter:	**A_{PJ}**
Data unit:	m^2
Description:	Area of the single or multiple reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full
Source of data:	Project site
Measurement procedures (if any)	Measured from topographical surveys, maps, satellite pictures, etc
Monitoring frequency:	Yearly
QA/QC procedures:	-
Any comment:	-

B.7.2. Description of the monitoring plan:

The Monitoring Plan includes the procedures for collecting the data identified in Section B.7.1. and is intended to determine and verify the emission reductions achieved by the OCAÑA Hydropower Project. For this purpose, ELECAUSTRO, following the Regulation CONELEC 005/06, installed the Commercial Measurement Equipment (energy meters, communication system, and TPL).

On a daily basis, the SCADA operator will download information from the energy meters by means of the TPL software of CENACE; later, this information will be uploaded to the Commercial Measurement System for the Electricity Market (SMEC) managed by CENACE. Once CENACE validates the daily measured net energy, this information will be presented through the website of the Information System of the Electricity Market (SIMEM) in accordance to the Annex 5 of the Regulation 005/06.

In order to crosscheck information, an official of the Planning and Trading Direction of ELECAUSTRO will verify the information published by CENACE. In case of differences on data were found, ELECAUSTRO will request to CENACE corresponding adjustments; revised and agreed information will be published as monthly net energy.

As required by the ACM0002/V.12.3.0 methodology, the net quantity of electricity generated by the project data will be filed electronically and will be available for at least 2 years after the end of the final crediting period. It should be noted that these data will be monitored continuously and all of the measuring equipment (power meters) will be properly calibrated following the directives of the Regulation 005/06.

The net quantity of electricity generated by the Project Activity, $\mathbf{EG_y}$, will be monitored continuously, which will make it possible to estimate the emissions reduction.

Annex 4 shows a flowchart that describes the monitoring process of $\mathbf{EG_y}$ (see Flowchart No. 1).

QA/QC Procedures

Four energy meters will be installed at the CDM Project Site from which two will be in operation and two will be in stand-by as backup. These meters will be calibrated following the manufacturer's instructions as well as directives of the Regulation CONELEC 005/06. However, ELECAUSTRO, on a daily basis; will check measurement records in order to detect potential failures in the equipment.

Receipts for electricity sales will be kept for cross check, when necessary.

Annex 4 shows a flowchart that present the QA/QC procedures (procedures see Flowchart No. 2).

Managerial and operational structure

The execution of the Monitoring Plan demands the active participation of both operational and managerial entities; therefore, ELECAUSTRO has proposed the following management structure:

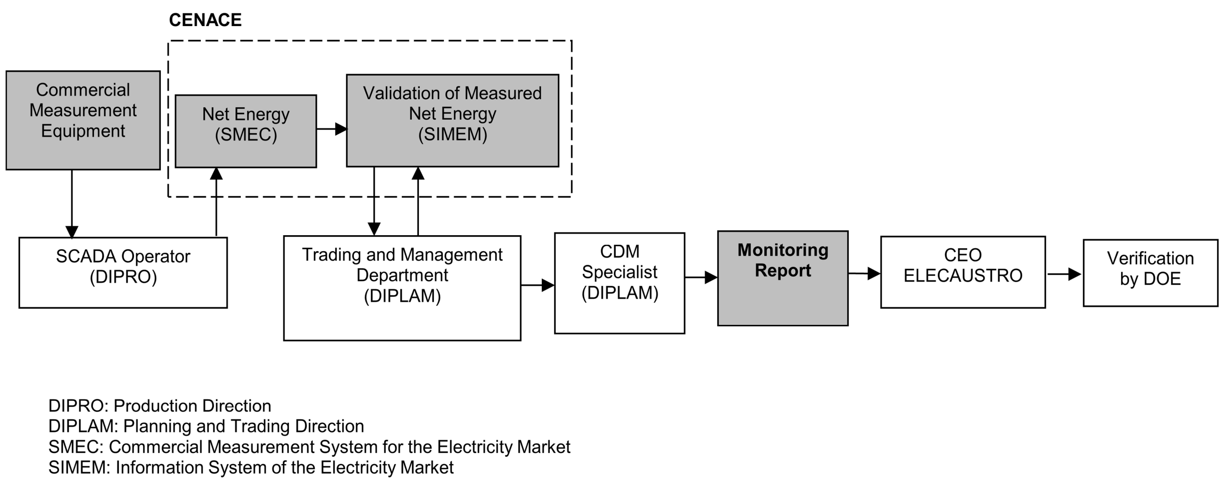

Figure No.4: Operational structure for the implementation of the Monitoring Plan.

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

Date of completion of baseline study and monitoring methodology: 15/12/2010

Name of person/entity determining the baseline:

Mr. Jaime Sánchez
Electro Generadora del Austro S.A.
Address: Av. 12 de Abril y José Peralta, Edificio Paseo del Puente, Cuenca
Phone: +593 7 4103073 x 207
Mobile: +593 9 9590875
E-mail: jsanchez@elecaustro.com.ec
WWW: elecaustro.com.ec

ELECAUSTRO is a Project Participant.

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:

April 3, 2008 (Signing of the contract for construction, equipment and commissioning of the proposed CDM Project Activity)**.**

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

50 years 0 months

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

The Ocaña Hydropower Project will use a renewable crediting period

C.2.1. Renewable crediting period:

Each crediting period shall be at most 7 years and may be renewed at most two times.

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

01/01/2013 (estimated date)

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:

Not applicable

C.2.2.2. Length:

Not applicable

SECTION D. Environmental impacts

D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

The construction and operation permission contract for the OCAÑA Hydropower Project was signed between ELECAUSTRO and CONELEC (the electricity sector regulator and the only entity authorized to grant construction and/or concession permits) on November 3, 2002. This contract has been updated on various occasions, both prior to the construction and during different stages of the construction. ELECAUSTRO presented the Final Technical and Environmental studies, the Definitive Environmental Impact Study (DEIS) and the Environmental Management Plan (EMP) which were both approved by CONELEC and enabled the Environmental License No. 005/07 for the construction of the Project Activity; this License has been published in the Official Registry No. 210 of November 13, 2007.

However, during the construction of the Project Activity raised some changes from the original designs whereby, in April 2010, CONELEC requested an updated version of the Definitive Environmental Impact Study. In November 2011, CONELEC approved the *Updated Definitive Ex-Post Environmental Impact Study for the Variants of the Ocaña Hydropower Project*, which ratified the Environmental License No, 005/07 got by ELECAUSTRO in 2007. Additionally, it is important to highlight that ELECAUSTRO performed an environmental audit in 2010 and, currently, the 2011 environmental audit currently is ongoing.

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:

As indicated in the Final Environmental Impact Study (2003), the OCAÑA Hydropower Project generates some significant impacts, but the overall effect does not affect greatly the Project's area. In any case, mitigation measures and actions designed and laid out in the approved Environmental Management Plan (EMP) will reduce identified significant environmental impacts. The main characteristics of these actions are presented in Table No. 7.

Policies 1. Ensure compliance with existing laws and regulations. 2. Comply with to the construction timetable through a demanding supervision process, which ensures compliance with specifications, especially regarding environmental protection. 3. Establish, consolidate, and strengthen sustainable relationships with the community. 4. Efficiency and effectiveness in solving the problems caused by improper land use.
Objectives 1. Guarantee that the construction work is properly designed, in order to reduce potential problems derived from the lack of foresight. 2. Prevent and minimize those problems and damages caused to the environment that are inevitable during project execution, by striving to reduce their intensity, scope, duration, and risk of occurrence. 3. Pay proper and timely attention to the population that will be affected by the execution of the project, especially those people located in the areas of intervention, in order to reduce the

magnitude of inconveniences caused, thus facilitating the relationships between ELECAUSTRO and the community, in order to achieve greater levels of understanding and collaboration. 4. Improve environmental conditions, paying special attention to those aspects related to landscape and land use, whose effects are currently portrayed as one of the main causes of environmental degradation in this area.
Goals a) Plan and monitor the progress of project execution, so that it is compatible with the potential of the land and the economic development of the area. b) Maintain and promote plant cover in sensitive areas. c) Coordinate as much as possible with the community, in order to minimize environmental problems, avoid an increase in the economic resources required to develop the project, and to maintain its benefits over the long-term. d) Reduce environmental impacts during the construction phase to a minimum, through an adequate system of environmental monitoring and oversight by the construction supervisor. e) Adequately dispose of the construction waste in the sites established (debris pits), and encourage the recycling of waste in order to prolong the useful life of the area assigned for the disposal of solid wastes. f) Prevent the collateral project activities from becoming sources of environmental pollution due to noise and the emission of solid, liquid, and gaseous contaminants. g) Contribute to the sustainable development of the project area. h) Control and reduce the occurrence of soil erosion and landslides. i) Take actions needed to ensure the availability of the water flow required for hydropower power generation.
Components 1. Program to prevent and mitigate impacts during project construction, operation and withdrawal. 2. Program of compensatory measures. 3. Waste management program. 4. Environmental training program. 5. Environmental oversight and monitoring program. 6. Citizen participation program. 7. Industrial safety and occupational health program. 8. Contingency plan.

Table No. 7: Targets of Environmental Management Plan (EMP)

Source: Final Environmental Impact Studies of the OCAÑA Hydropower Plant, 2003.

The goals also include specific elements related to the proper management of construction waste and the recycling of leftover debris, reducing pollution derived from generating solid wastes, effluents, atmospheric emissions, and noises.

The criteria used to formulate the EMP that is summarized in Table No. 7 have been presented here so that they can serve as the fundamental guidelines of the proposal for the new activities that could be incorporated into the EMP. For each component of this Plan, a series of concrete actions were designed, which are described both in the EIS prepared in 2003 as well as in the updated Study done in 2008, before beginning with project construction.

SECTION E. Stakeholders' comments

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

In the development of the OCAÑA Hydropower Project, various stakeholders have been identified both at the national and local level. In fact, the prolonged search for financing for the Project Activity has made it possible to share information about this initiative with different national stakeholders. For example: the Ministry of Energy and Mines (now the Ministry of Electricity and Renewable Energy), the Ministry of Finance, the National Secretariat of Planning and Development (SENPLADES), the Bank of the State (Banco del Estado, BEDE), the National Financial Corporation (CFN), among others. Given the Project's contribution to diversifying Ecuador's electricity grid, it has received support from these institutions, all of whom helped in acquiring project financing.

Since April 2008, the Supervision Unit of the OCAÑA Project Activity has prepared and distributed, on a monthly basis, the informative newsletter of the Project Activity, which reports on the Project's technical characteristics, and primarily the main advances in terms of both physical construction as well as contractual and financial updates. The newsletter is disseminated among the main national and local stakeholders, who are thus kept informed about the progress of the Project Activity, and above all have a tool through which they can incorporate their comments, observations, and suggestions.

Locally, the stakeholders located in the Project's area of influence (the rural parishes of Ducur and San Antonio de Pahuancay and the communities of Ocaña, Javín, Las Delicias (Siglo XX), San Marcos y Las Copas) have had various channels of participation available through which they can express their concerns and comments regarding the Project Activity. A number of activities were organized with the participation of the communities. Among others, we can mention the following activities:

- Direct interviews with representatives or leaders of the communities, in order to define the current organizational profile and its trends, the factors which will help to improve understanding about the use, development and distribution of natural resources in the study area, in order to in turn identify possible conflicts that could arise in the operation of the Project Activity.
- Application of "Rapid Survey Forms" in order to obtain specific information required for the area of interest.
- Bibliographical review of secondary information published by entities that carry out activities in the areas (government, non-governmental organizations (NGOs) and religious institutions).
- Public presentations about the Project Activity to which local and provincial authorities, ELECAUSTRO and the communities involved were invited.
- The existing information was regularly updated, while the same structure and formatting was maintained.
- The study was expanded in those communities with greater involvement and impact; for example, emphasis was placed on working with the communities of the Ducur parish, since in the EIS prepared in 2003, the activities were more focused on the communities of the San Antonio de Pahuancay parish.

Additionally, at an earlier stage of the Project, the stakeholders in the project's area of influence were invited to make comments about the proposed CDM project through channels such as:

- Calls to participate in public hearings through local radio such as Radio Ingapirca (Cañar) and Radio Morena and Sucre (Guayas), newspapers such as El Espectador (see Figure No. 5), and direct invitations to the stakeholders.
- Public hearings
- Visits to the project site (the hydropower plant as well as the route of the transmission line).

INVITACION

ElecAustro

La Empresa Electro Generadora del Austro S.A.

Invita a participar de una Audiencia Pública para conocer cuál es la concepción del "Proyecto Hidroeléctrico Ocaña", la misma que se realizará en la Casa Comunal de la población de Ocaña, el día sábado 18 de mayo del 2002 a las 15:00.

Ing. Francisco Zamora Zamora
GERENTE GENERAL

Figure No. 5: Sample of a public invitation to stakeholders through a newspaper
Source: CAMINOSCA, Annex 5.2. (Documentation of environmental impact studies, volume 5) of the Feasibility and Final Design Studies of the Ocaña Hydropower Project, June 2002.

Note that all of the comments received by the stakeholders have been compiled in reports such as annex 5.2: Documentation of environmental impact studies (volume 5) which is part of the Feasibility and Final Design Studies of the Ocaña Hydropower Project, (CAMINOSCA, June 2002) and the report of the socialization for the construction of the project (INELAP, 2009)[8].

- On 11th March 2012, ELECAUSTRO held a meeting with local stakeholders to present and invite comments on the Ocaña CDM project. Invitations were sent directly to the identified local stakeholders and they were also called to participate in public hearings through advertisements in the newspapers: "El Spectator" and "La Portada" and local radio: "Ondas Cañaris" y "La Voz de Ingapirca". In this meeting, ELECAUSTRO presented the CDM project to the stakeholders in the form of a presentation and question / answer session. No further issues were raised over and above those outlined in Section E.2 of the PDD below. A meeting report is available.

E.2. Summary of the comments received:

As mentioned, both nationally and locally, different stakeholders were informed about the status and progress of the Ocaña Project Activity; in general, there is a good level of knowledge about the execution of the Project Activity, which, as with any undertaking of a significant magnitude, generates different reactions among those involved during the development, implementation, and operational stages. It is particularly important to summarize below the observations of the communities located in the Project's area of influence.

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[8] These documents can be requested to ELECAUSTRO/Dirección de Planificación y Mercadeo.

- In terms of positive aspects, communities commented that roads have been upgraded; for instance, the Javin-Rio Cañar road. In addition, respondents say that the Project Activity will positively enhance the stability of power generation in the country, and will provide jobs for the residents of local communities. One point that the communities highlighted is being able to make visits to other hydropower projects located in other parts of the country.
- ELECAUSTRO is always committed to support development of the local communities; however, there were some comments and concerns that have been expressed by local stakeholders, which ELECAUSTRO has not been able to satisfy. For example:
    - There are expectations that there will be new jobs for local residents, who are hoping that labor is not brought in from outside the project area. However, ELECAUSTRO only hired workers from outside when local workers were not available i.e. trained workers.
    - The communities also asked that the working hours be adjusted, because they believe that they are too long. However, it is important to highlight that working hours are established by the Official Working Code of Ecuador.
- Regarding the construction of the transmission line between the Project Site and the Substation Cañar, the communities affected by this important component of the Project Activity expressed their comments and concerns, which were collected through some public hearings as well as visits to the route of the transmission line. Minutes of these activities can be reviewed in the Report of the socialization for the construction of the prepared by INELAP, 2009.
- It is important to mention other comments and concerns related to the following issues:

Comments	Actions undertaken by ELECAUSTRO
▪ Avoid blocking passage through horseshoe roads, since going by other roads takes much longer in the areas near to the Project Activity.	▪ No horseshoe or main road had been blocked, and facilities were provided for the passage of local goods.
▪ Continually broadcast information about the project, its progress, and to know about the mitigation work done about the environmental facts associated with water quantity and quality, and slope stability problems.	▪ There always has been broadcast of information about the Project progress, and monitoring about water quantity and quality, also about slope stability; showing non involvement of this aspects.
▪ Promote reforestation programs to avoid erosion and vegetation degradation.	▪ ELECAUSTRO have implemented the following programs: o Forestry inventory in the surrounding area of the Project Activity i. e. La Delicia Town, Province of Cañar. o Cooperation Agreement between ELECAUSTRO and the Local Government of the Province of Cañar to support a Soil Conservation Project through Agroforestry and Production Strategies in the area of influence of the Ocaña Hydropower Project.

▪ Improve the access road to Rosario community.	▪ Although this is not ELECAUSTRO´s responsibility, however ELECAUSTRO signed an agreement with the Local Government of the Province of Cañar in order to support the maintenance of roads in the surrounding areas of the Ocaña Project.
▪ Jobs for the stakeholders (people affected by the project activity.	▪ Along the construction period of the Project Activity, ELECAUSTRO´S contractors have hired workers from the area influenced by the Project Activity (See table No. 11).
▪ Persons that do not have a high school bachelor degree cannot work in the project.	▪ Was intended to promote basic education within the area residents, but this condition was not accomplished, area residents worked with or without any bachelor degree.
▪ There is a breach for the offerings of job sources.	▪ Due to reasons explained above, i.e. trained local workers were not available at the Project area; it was not possible to meet all the demand.
▪ The cost of labor has increased.	▪ Consequence of higher wages than what is common to pay in the area, required by the Ecuador´s Work Law.
▪ There is no support for execution of projects and social projects in the area.	▪ ELECAUSTRO has supported the following projects: o Preparation of a technical report regarding to the biological relevance of the Hacienda Huatacón, Javin, Province of Cañar, Ecuador. o Preparation of the diagnosis and management plan for the ichthyofauna of the Cañar Revier on the surrounding area of the Ocaña Hydropower Project. o Agreement between the Mayoralty of Cañar and ELECAUSTRO for the construction of sidewalks and curbs close to the Rigoberto Navas Elementary School as well as in the surrounding area of the Dr. Justiniano Crespo Playground in the city of Cañar. o Development of environmental training programs for the population located in the surrounding area of the Project Activity. o Under an agreement with de the Ladies Foundation CIEELA (Fundación de Damas CIEELA), sponsorship of medical teams to children of the communities located close to the Ocaña Project.

Table No. 8: Summary of comments received and actions undertaken by ELECAUSTRO
Source: "Final Environmental Impact Studies of the OCAÑA Hydropower Plant", 2003 and Barragán, Antonio et. al., "Updated Definitive Ex-Post Environmental Impact Study for the Variants of the Ocaña Hydropower Project", 2011.

Tables No. 9.1 and 9.2 show a list of the stakeholders who made some comments during the direct interviews, surveys, meetings and public hearings organized by ELECAUSTRO in order to inform about the Proposed CDM Project Activity:

Community	Stakeholder
Javin	Elvia Jacome
Javin	Blanca Lema
Javin	Tenorio Lema
Javin	Rosa Ester Pomabilla
San Marcos	Maria Rosa Dutan
Ocaña	Victor Ortiz
Ocaña	Rosaura Solis
Ocaña	Marco Guaman
Las Delicias	Maria Perez
Las Delicias	Zoila Tamayo

Table No. 9.1: Stakeholders that have made comments to the Project Activity
Source: Barragán, Antonio et. al., "Updated Definitive Ex-Post Environmental Impact Study for the Variants of the Ocaña Hydropower Project", 2011.

Community/Rural Parish/Entity	Stakeholder
Ducur	Martín Bermeo/ President of the Rural Parish
Ducur	Gerardo Martínez/Member of the Rural Parish
Ducur	Manuel Ortega
Chuya Mikuna (NGO)	Franklin Bermeo
NGO	Victor Idrovo
Javín	Segundo Montesdeoca / President of the Community
Javín	AurelioMontero / Director of the Education Network in Javín
Javín	Italo Vásquez
Quilloac	Antonia Solano / President of the Community
Tucaita (NGO)	José Manuel Chimbo

Table No. 9.2: Stakeholders that have made comments to the Project Activity
Source: INELAP, "Report of the Public Hearings about the Construction of the Transmission Line", 2009.

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

In response to the comments received from stakeholders, ELECAUSTRO has incorporated new activities within the Environmental Management Plan. Table No. 10 summarizes the activities, which have been included in the following programs: Impact Prevention and Mitigation, Waste Prevention and Management, Environmental Control and Monitoring and Occupational Health and Safety.

Program and Measure	Specifications
Impact prevention and mitigation program → Slope protection measures	→ The cut made at the right bank of the Cañar River prior to the construction of the overflow dam must be protected, because the material

	(agglomerate) exposed there is very erodible. (Coordinate 702,202 – 9,724,702)
Waste management program → Design and construction of units to treat the effluents from the installations for the operational phase.	→ Effluent treatment plants which comply with environmental regulations in terms of the quality of the water to be discharged into the receiving bodies.
Environmental control and monitoring program → Water quality analysis → Bio-monitoring → Plan for managing the natural forests within the project's areas of influence.	→ Sampling points: 8 (The same one used for biomonitoring). Frequency: quarterly, for four years (one for construction and three for operation) Parameters to analyze: the same ones used for calculating the WQI, plus the nitrates, due to the use of explosives. Final report with an integrated evaluation related to water flow volumes. → Study points: 8 (The same ones used previously) Frequency: quarterly, for four years (one for construction and three for operation) Final report with an integrated evaluation associated with the analysis of the water quality and flow volumes. → Environmental management plan for the natural forests within the project's area of influence.

Table No. 10: New actions proposed for the Environmental Management Plan (EMP) following the comments received by the stakeholders

Source: Barragán, Antonio et. al., "Updated Definitive Ex-Post Environmental Impact Study for the Variants of the Ocaña Hydropower Project", 2011.

Additionally, the following actions may be considered as main executions:

a) During the construction phase of the Project Activity, ELECAUSTRO´S contractors hired workers from the area influenced by the Project Activity. For example, Table No. 11 shows the number of local workers hired:

Monthly Report	Direct local labor (number of hired workers)	Indirect local labor (i.e. local suppliers)
October 2009	81	30
February 2010	134	24
October 2010	154	27

Table No. 11: Sample of local labor contracted for the construction phase of the Project Activity

Source: CAMINOSCA, "Monthly Control Report of the Construction of the Ocaña Hydropower Project", October 2009, February 2010, and October 2010.

b) A fish ladder has been constructed on the right side of the diversion to preserve the ichthyologic habitat and guarantee the minimum ecological water flow.

c) Training for approximately 1700 people from the project zone in two aspects: i) environmental, care of water, soil and air; and ii) solid waste management, to prevent the misuse of water streams as garbage dumps and contamination itself.
d) Slope treatment has been done to prevent erosion through reforestation.
e) The Environmental Management Plan (EMP) has been accomplished, according to the correct soil dumps vegetal reposition and reforestation.
f) Eight medical brigades have been done, especially in schools of economically poor areas, where more than 800 children have been treated.
g) Biotic monitoring, water quality tests, ichthyologic species, flora and fauna verifications are been made in the project area to verify possible affections caused during construction of the project.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

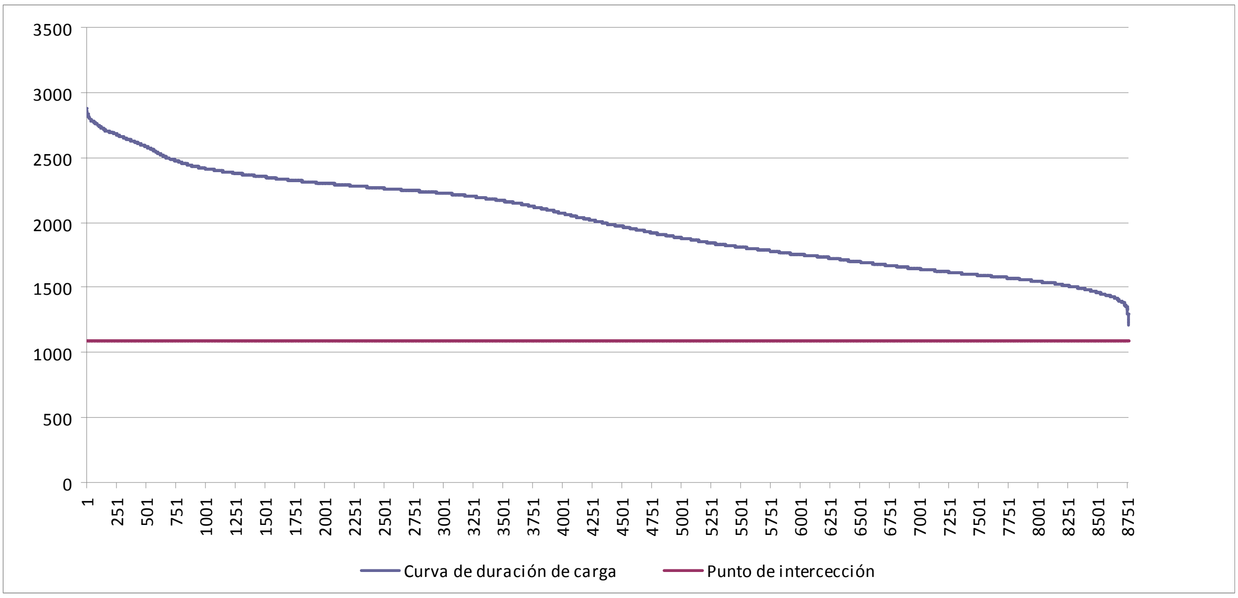
For the financing of the OCAÑA Project Activity, there are no plans to use funds declared to be Official Development Assistance (ODA) from the countries listed in Annex I.

ANNEX 3

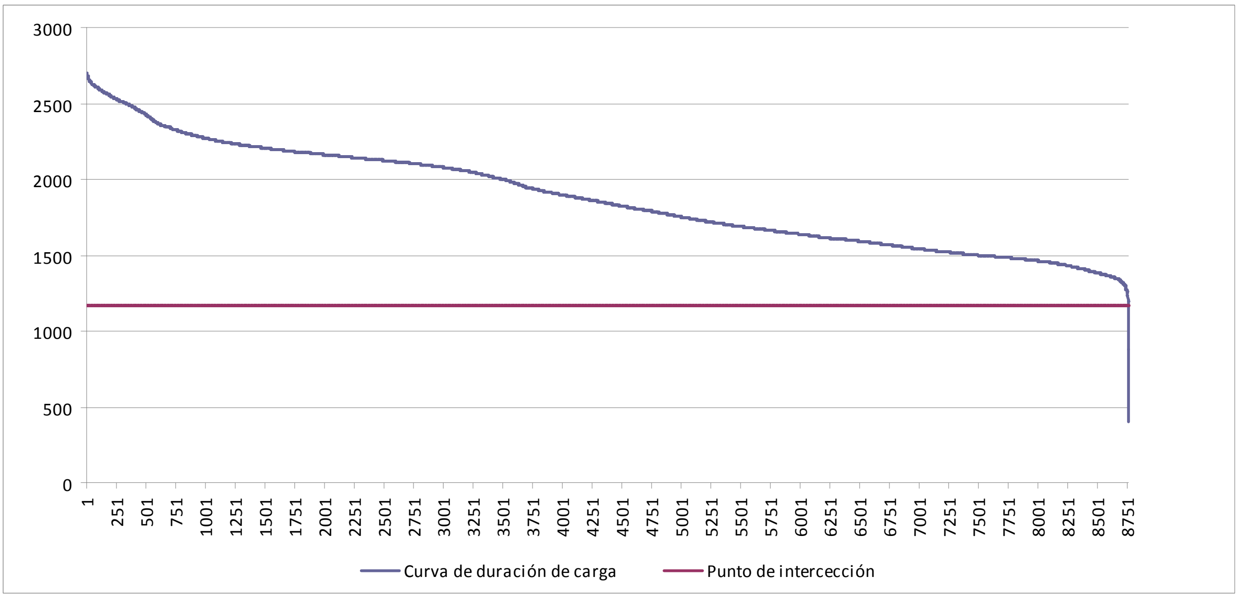
BASELINE INFORMATION

Information used to estimate Baseline Emissions

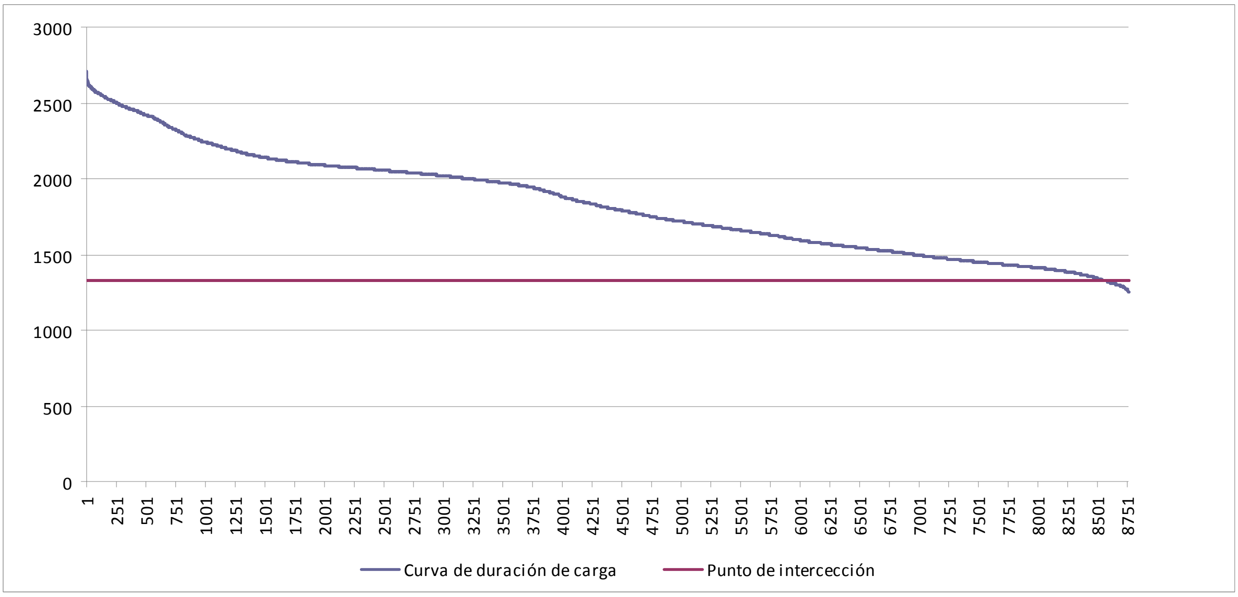
1) Operating Margin Emission Factor (Year 2010): Lambda 2010



2) Operating Margin Emission Factor (Year 2009): Lambda 2009



3) Operating Margin Emission Factor (Year 2008): Lambda 2008



4) Build Margin Emission Factor (Year 2010): Power units used for calculation

Central Eléctrica	Inicio de Operación	Tecnología	Tipo de Combustible	Unidad	Generación Neta
Mazar	noviembre/2010	Hidráulica embalse		U2	29404,60
Mazar	mayo/2010	Hidráulica embalse		U1	230087,37
Santa Elena APR	febrero/2010	Térmica MCI	Diesel	U1	245024,34
Quevedo Energía Internacional	enero/2011	Térmica MCI	Diesel	U1	475795,30
Pascuales II	febrero/2010	Térmica Turbo vapor	Diesel	TM1	98404,25
Pascuales II	febrero/2010	Térmica Turbo vapor	Diesel	TM2	108035,94
Pascuales II	enero/2010	Térmica Turbo vapor	Diesel	TM3	105516,62
Pascuales II	enero/2010	Térmica Turbo vapor	Diesel	TM4	100481,35
Pascuales II	enero/2010	Térmica Turbo vapor	Diesel	TM5	98015,67
Miraflores	diciembre/2009	Térmica Turbo gas	Diesel	TG1	103200,15
Pascuales II	diciembre/2009	Térmica Turbo vapor	Diesel	TM6	81772,25
Generoca	enero/2007	Térmica Turbo vapor	Diesel - Residuos de Petróleo	U1	24600,97
Generoca	enero/2007	Térmica Turbo vapor	Diesel - Residuos de Petróleo	U2	27980,98
Generoca	enero/2007	Térmica Turbo vapor	Diesel - Residuos de Petróleo	U3	27724,59
Generoca	enero/2007	Térmica Turbo vapor	Diesel - Residuos de Petróleo	U4	1187,68
Generoca	enero/2007	Térmica Turbo vapor	Diesel - Residuos de Petróleo	U5	27104,23
Generoca	enero/2007	Térmica Turbo vapor	Diesel - Residuos de Petróleo	U6	27957,45
Generoca	enero/2007	Térmica Turbo vapor	Diesel - Residuos de Petróleo	U7	0,17
Generoca	enero/2007	Térmica Turbo vapor	Diesel - Residuos de Petróleo	U8	26319,71
Hidroabanico	julio/2007	Hidráulica pasada		U3	
Hidroabanico	julio/2007	Hidráulica pasada		U4	
Hidroabanico	julio/2007	Hidráulica pasada		U5	
San Francisco	junio/2007	Hidráulica pasada		U1	445056,00
San Francisco	mayo/2007	Hidráulica pasada		U2	585969,51
POZA HONDA	mayo/2007	Hidráulica pasada		U1	
POZA HONDA	mayo/2007	Hidráulica pasada		U2	
Calope	diciembre/2006	Hidráulica pasada		1	
Calope	diciembre/2006	Hidráulica pasada		2	
La Esperanza	diciembre/2006	Hidráulica pasada		U1	
La Esperanza	diciembre/2006	Hidráulica pasada		U2	
Termoguayas	diciembre/2006	Térmica MCI	Fuel Oil	1	175046,15
Termoguayas	diciembre/2006	Térmica MCI	Fuel Oil	2	324810,62
Termoguayas	diciembre/2006	Térmica MCI	Fuel Oil	3	93105,82
Termoguayas	diciembre/2006	Térmica MCI	Fuel Oil	4	2823,78
				TOTAL	3.465.425,47

Central Eléctrica	Inicio de Operación	Tecnología	Tipo de Combustible	Unidad	Generación Neta	Fuel Oil (ton)	Diesel 2 (ton)	Nafta (ton)	Gas Natural (ton)	Residuo (ton)	$EF_{EL,m,y}$ (tCO_2/MWh)	EG x EF_{EL}	%	% acumulado
Mazar	noviembre/2010	Hidráulica embalse		U2	230087,37						-	0	1,3%	1,33%
Mazar	mayo/2010	Hidráulica embalse		U1	29404,60						-	0	0,2%	1,50%
Santa Elena APR	febrero/2010	Térmica MCI	Diesel	U1	245024,34	-	59.830,76	-	-	-	0,73	179829,7229	1,4%	2,91%
Quevedo Energía Internacional	enero/2011	Térmica MCI	Diesel	U1	475795,30	-	122.198,64	-	-	-	0,77	367285,1349	2,7%	5,66%
Pascuales II	febrero/2010	Térmica Turbo vapor	Diesel	TM1	98404,25	-	25.510,10	-	-	-	0,78	76674,17995	0,6%	6,23%
Pascuales II	febrero/2010	Térmica Turbo vapor	Diesel	TM2	108035,94	-	27.782,88	-	-	-	0,77	83505,33456	0,6%	6,85%
Pascuales II	enero/2010	Térmica Turbo vapor	Diesel	TM3	105516,62	-	27.344,16	-	-	-	0,78	82186,71357	0,6%	7,46%
Pascuales II	enero/2010	Térmica Turbo vapor	Diesel	TM4	100481,35	-	25.930,59	-	-	-	0,78	77938,01753	0,6%	8,04%
Pascuales II	enero/2010	Térmica Turbo vapor	Diesel	TM5	98015,67	-	26.337,23	-	-	-	0,81	79160,23376	0,6%	8,60%
Miraflores	diciembre/2009	Térmica Turbo gas	Diesel	TG1	103200,15	-	27.952,59	-	-	-	0,81	84015,42669	0,6%	9,20%
Pascuales II	diciembre/2009	Térmica Turbo vapor	Diesel	TM6	81772,25	-	21.583,46	-	-	-	0,79	64872,10562	0,5%	9,67%
JAM230POM 3	enero/2008	Importación			294165,24						-	0	1,7%	11,37%
JAM230POM 4	enero/2008	Importación			238424,90						-	0	1,4%	12,75%
Generoca	enero/2007	Térmica Turbo vapor	Diesel - Residuos de Petróleo	U1	24600,97	-	380,59	-	-	5.595,34	0,72	17631,46592	0,1%	12,89%
Generoca	enero/2007	Térmica Turbo vapor	Diesel - Residuos de Petróleo	U2	27980,98	-	431,32	-	-	6.336,13	0,71	19966,81048	0,2%	13,05%
Generoca	enero/2007	Térmica Turbo vapor	Diesel - Residuos de Petróleo	U3	27724,59	-	429,85	-	-	6.281,75	0,71	19802,14093	0,2%	13,21%
Generoca	enero/2007	Térmica Turbo vapor	Diesel - Residuos de Petróleo	U4	1187,68	-	24,85	-	-	296,00	0,80	946,9164165	0,0%	13,22%
Generoca	enero/2007	Térmica Turbo vapor	Diesel - Residuos de Petróleo	U5	27104,23	-	417,85	-	-	6.132,45	0,71	19326,1466	0,2%	13,37%
Generoca	enero/2007	Térmica Turbo vapor	Diesel - Residuos de Petróleo	U6	27957,45	-	427,43	-	-	6.318,67	0,71	19903,67291	0,2%	13,53%
Generoca	enero/2007	Térmica Turbo vapor	Diesel - Residuos de Petróleo	U7	0,00	-	-	-	-	-	-	0	0,0%	13,53%
Generoca	enero/2007	Térmica Turbo vapor	Diesel - Residuos de Petróleo	U8	26319,71	-	401,56	-	-	5.979,38	0,72	18826,14843	0,2%	13,69%
Hidroabanico	julio/2007	Hidráulica pasada		U3							-	0	0,0%	13,69%
Hidroabanico	julio/2007	Hidráulica pasada		U4							-	0	0,0%	13,69%
Hidroabanico	julio/2007	Hidráulica pasada		U5							-	0	0,0%	13,69%
San Francisco	junio/2007	Hidráulica pasada		U1	445056,00						-	0	2,6%	16,25%
San Francisco	mayo/2007	Hidráulica pasada		U2	585969,51						-	0	3,4%	19,64%
POZA HONDA	mayo/2007	Hidráulica pasada		U1							-	0	0,0%	19,64%
POZA HONDA	mayo/2007	Hidráulica pasada		U2							-	0	0,0%	19,64%
Calope	diciembre/2006	Hidráulica pasada		1							-	0	0,0%	19,64%
Calope	diciembre/2006	Hidráulica pasada		2							-	0	0,0%	19,64%
La Esperanza	diciembre/2006	Hidráulica pasada		U1							-	0	0,0%	19,64%
La Esperanza	diciembre/2006	Hidráulica pasada		U2							-	0	0,0%	19,64%
Termoguayas	diciembre/2006	Térmica MCI	Fuel Oil	1	175046,15	43.201,53	-	-	-	-	0,74	129816,284	1,0%	20,65%
				TOTAL	3.577.275,23	43.201,53	366.983,87	-	-	36.939,72		1.341.686,46		

Proyectos de Mecanismo de Desarrollo Limpio registrados

Spanish language terminology	English translation[9]:
Central eléctrica	Power facility
Inicio de operación	Operation start date
Noviembre/2010	November/2010
Mayo/2010	May/2010
Febrero/2010	February/2010
Enero/2010	January/2010
Diciembre/2010	December/2010
Julio/2010	July/2010
Tecnología	Technology
Hidráulica embalse	Hydro (dam)
Térmica	Thermal
Térmica turbo vapor	Thermal steam turbine
Hidráulica pasada	Hydro (run of river)
Importación	Importation
Tipo de combustible	Type of fuel
Diesel	Diesel
Diesel- residuos petróleo	Diesel-waste oil
Fuel oil	Fuel oil
Gas Natural	Natural gas
NAFTA	NAFTA
Residuo	Waste
Unidad	Unit
Generación Neta	Net Electricity Generation
% acumulado	% accumulated

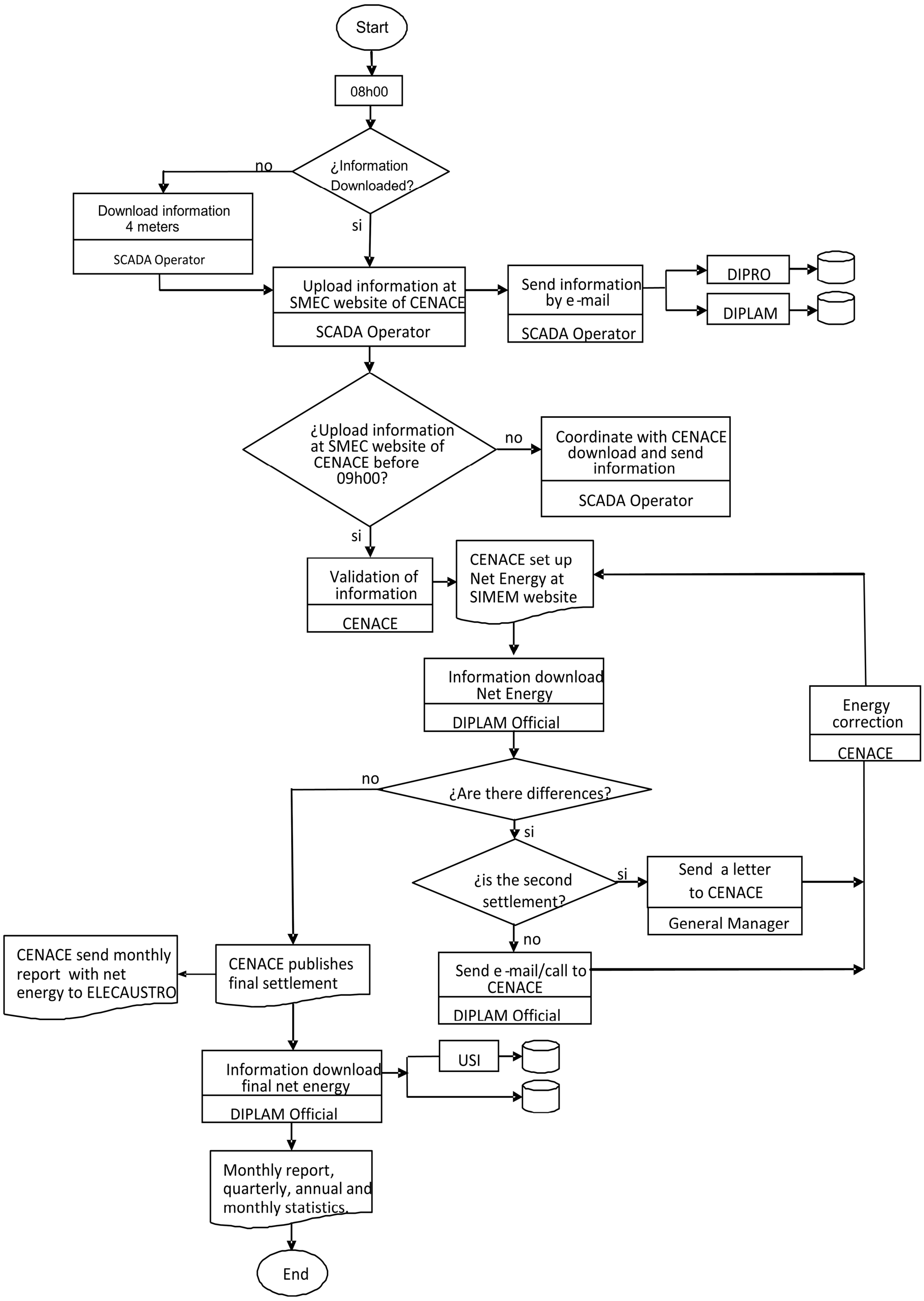
[9] Translation of the EF spreadsheet has been provided to the DOE. Please see “RefN5A-Factor Emission CO2-english.pdf”

Proyectos de Mecanismo de Desarrollo Limpio registrados	Clean Development Mechanism Projects registered

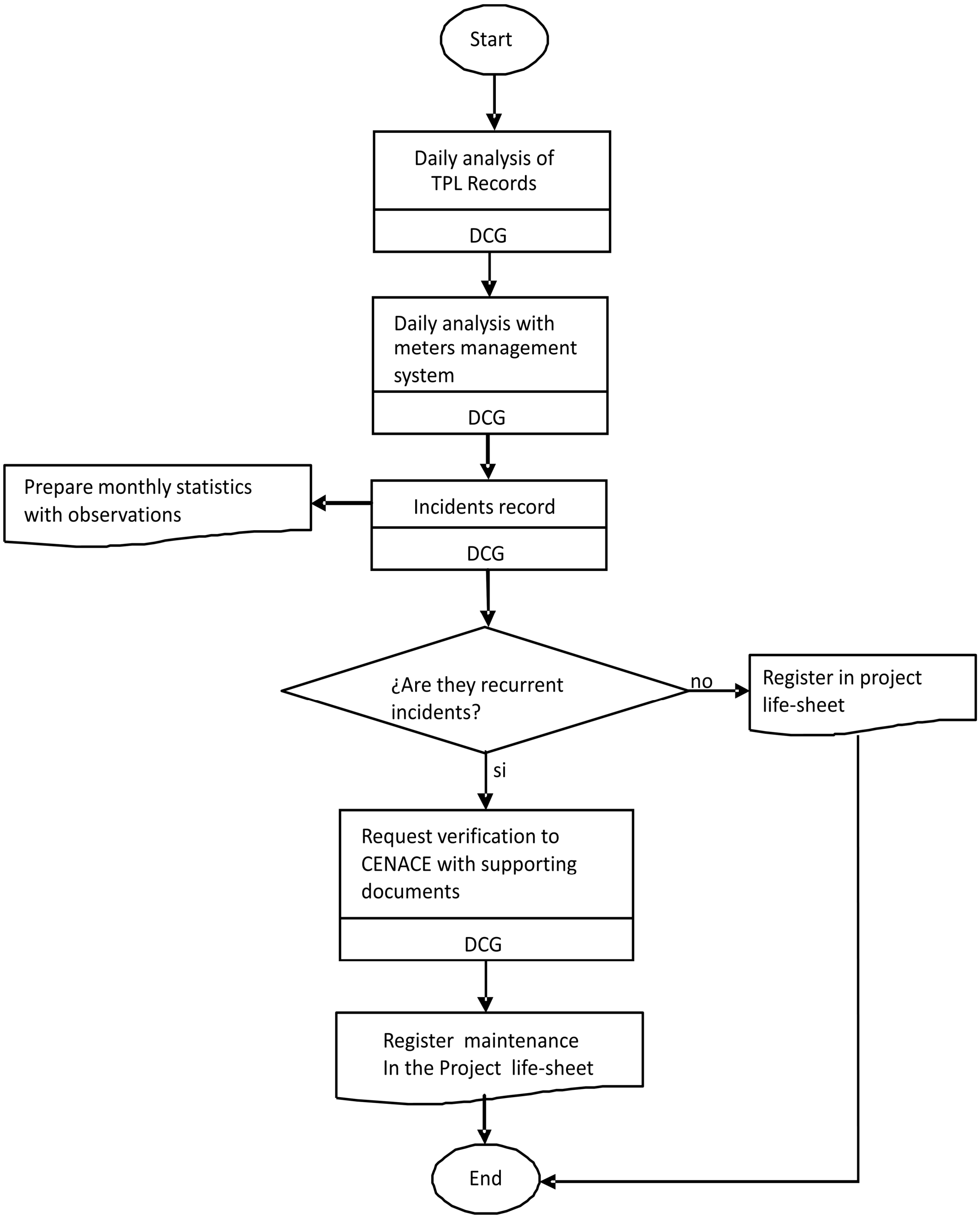
ANNEX 4

MONITORING INFORMATION

Flowchart No.1: The monitoring process of EG_y;



Flowchart No.2: QA/QC Procedures;



Acronyms used in the flowcharts:

DIPLAM	Planning and Trading Direction – ELECAUSTRO
DIPRO	Production Direction – ELECAUSTRO
USO	Ocaña Management Unit – ELECAUSTRO
USI	Information System Unit – ELECAUSTRO
DCG	Generation Control Department – ELECAUSTRO