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

CONTENTS

Annexes

SECTION A. General description of project activity

A.1. Title of the project activity:

CDM Project Activity: "Río Luis"
PDD version 03.2[1]
24/10/2012

A.2. Description of the project activity:

Río Luis is a 15.48 MW run-of-river hydro project in the Province of El Oro, located in Southern Ecuador on the river known as Río Luis. The project will generate electricity for the Ecuadorian national grid.

The hydro resource for the project is taken from the river at an elevation of approximately 1,085 meters above sea level. An ecological stream flow assures protection of flora and fauna in the river bed and its surroundings. The project's hydro resource, after pre-treatment, is conducted through enclosed piping (3.2 km) and a tunnel (2.2 km), then a short section of high-pressure piping to the power house, located at an elevation of 791 meters above sea level. The power house contains two Pelton-type water turbines connected to generators, rated at 7.74 MW each. The authorized hydro resource is 6.1 m^3/s, and is subject to respecting the required ecological stream flow (819 l/s). The project also includes a 9.8 km tie-in at 69 kV to connect the project to the national grid's nearest transmission substation.[2]

The project includes a small reservoir with a dam height of 10m. The purpose of the dam is to create hydraulic pressure to divert the hydro resource to the pre-treatment units. This dam height (10m) is minimal compared to the hydraulic height of the project (294 metres of elevation difference between the capture of the hydro resource and the downstream power house). For this reason, the project has a very high power density, being approximately 1,000 W/m^2 of reservoir area.

The purpose of this project activity is to generate renewable energy in the form of electricity with minimal social and environmental impacts. By maintaining an ecological stream flow and a fish ladder at the 10m dam, flora or fauna impacts are mitigated. No land-use or social impacts are expected from flooding less than two hectares from the dam associated with this project activity.

This is a Greenfield project activity. No existing installations are located on the project site.

In the absence of this project activity, grid power would be provided by other generators. Fossil fuel generators and imports account for nearly 50% of the power handled by the Ecuadorian national grid.

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[1] Version 3 dated 30/01/2012 of this PDD was submitted to the DOE for validation and published for global stakeholder consultation, since version 2 dated 01/07/2010 was presented to the Ecuadorian DNA for host country approval.

[2] The project description is summarized from the detailed engineering design prepared by the firm ICA Ingenieros Consultores Asociados Cía. Ltda. dated July 2009.

Furthermore, over 70% of the power units that have been connected to the Ecuadorian national grid since December 2006 are fired with fossil fuels.

This project activity will reduce greenhouse gas emission by avoiding generation at other plants connected to the national grid, especially those fired with fossil fuels

This project activity will contribute to sustainable development in the following ways:

Environmental

- Utilize a renewable energy resource in an environmentally friendly manner.
- Avoid greenhouse gas and other emissions at more contaminating power units connected to the national grid.
- Maintain environmental values throughout the entire river bed through the ecological stream flow and fish ladder at the small (10m) dam.

Social

- Create jobs in a rural area during both the construction and operational phases.
- Avoid land-use, population dislocation, arqueological and other social impacts associated with some hydro projects via run-of-river technology instead of a large reservoir.

Economic

- Generate an economic good (electricity) with nearly no environmental or social impact.
- Create a new economic activity in a rural area.

A.3. Project participants:

Please list project participants and Party(ies) involved and provide contact information in Annex 1. Information shall be indicated using the following tabular format.

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Ecuador (host)	• ENERGYHDINE C.A. (Private Company)[3]	No

(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.

[3] The voluntary participation of ENERGYHDINE C.A. in this Project activity is authorized by the Letter of Approval issued by the Ecuadorian DNA on 02/08/2010

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Ecuador

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

El Oro

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

Cantons of Portovelo and Zaruma

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

The Project is located on and near the river Río Luis in the Province of El Oro within the municipal territories of Portovelo and Zaruma. Water flow in the river is diverted to the Project at an elevation of 1,085 meters above sea level. The power house is located adjacent to the river at an elevation of 790 meters above sea level.

The geo-coordinates in decimal degree format of this project are:

Power house: Lat: -3.7102°; Lon: -79.5543°
Water capture point: Lat: -3.6965°; Lon: -79.5168°

This project activity also includes the piping and a tunnel from the point of capture to the power house.

The adjacent maps show the location of El Oro province within Ecuador and the municipalities of Portovelo and Zaruma within El Oro.

El Oro Province Within Ecuador

Project Location Within El Oro Province

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

The project activity is a Greenfield run-of-river hydro power plant. The project activity falls in sectoral scope number 1: energy industries (renewable - /non-renewable sources).

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

The Río Luis Project employs run-of-river hydro generation technology to generate electricity from a renewable energy source with minimal environmental and social impacts. The project configuration is depicted in the following diagram:

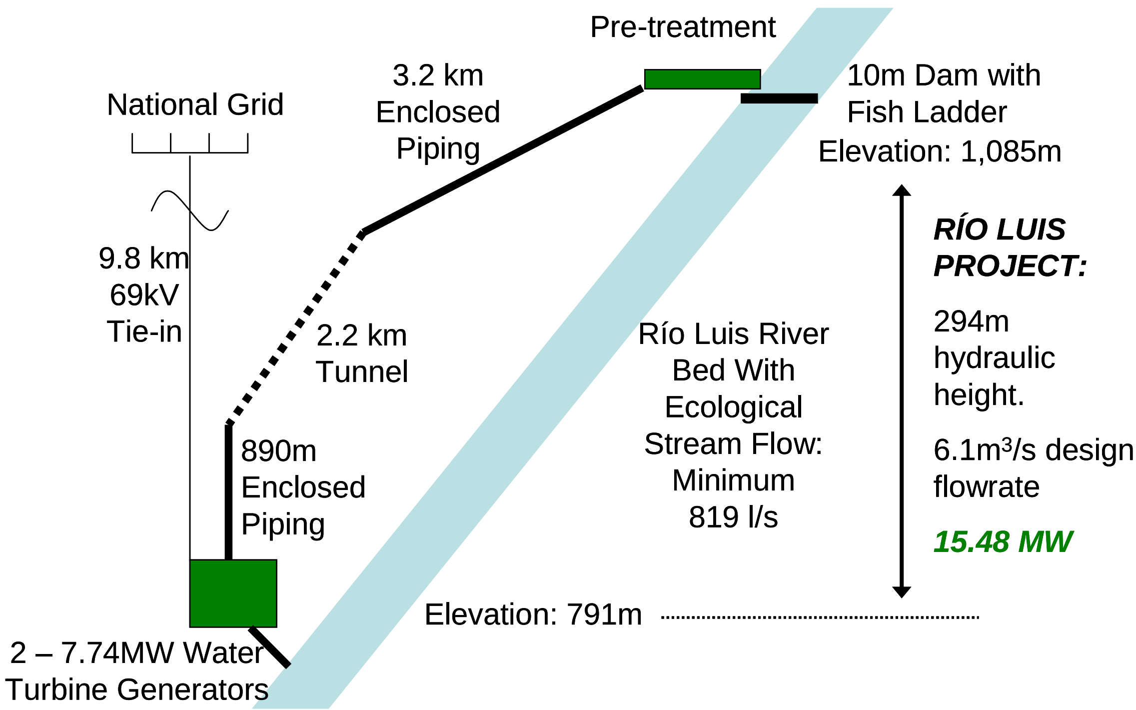

Figure 1: Schematic Diagram of Río Luis Project

The renewable energy resource for the Río Luis Project is a maximum of 6.1 m^3/s, diverted from the river at an elevation of 1,085 m and then conducted through over 6 km of piping and a tunnel to the powerhouse at an elevation of 791 m, thus offering a hydraulic pressure head of 294 m. The amount of water diverted from the river is controlled to assure an ecological stream flow that preserves the environmental values (especially flora and fauna) of the river and its surroundings. A small dam at the point of water capture provides hydraulic head to divert the water flow to the project, although its height is insignificant (10 m) compared to the hydraulic height of the project (294 m). The powerhouse contains 2 identical trains of water turbines and generators, each with a rated capacity of 7.74 MW[4]. The project also includes an electrical tie-in to the closest substation of 9.8 km in length at voltage of 69 kV.

The project components are further described below[5]:

> _Water Capture:_ The water resource will be captured by installing a dam at the 1,085m elevation of the river. The dam has a height of 15m, five of which are foundations below the level of the river bed. The width is 20m, and the dam's geometric profile is "Wes" type. The dam is designed for a maximum flow rate through the river of 145 m^3/s. On the left bank of the river adjacent to the dam is a fish ladder, designed to allow bidirectional travel. To the right of the dam are the gates to regulate the ecological stream flow. The gates are radial type, with dimensions of 2.80m x 2.80m. On the right margin of the river is the capture point, 2.74m length by 2.00m height. The design capacity of the capture point is 6.1 m^3/s.

> _Pre-Treatment:_ Water pre-treatment consists of three steps: Fish protection at the capture point, debris screening and sand screening. The length of the debris screen is 16.5m. It is designed to remove branches, leaves and other debris. A channel of 79.5m follows the debris screen. The length of the sand screen is 54m. It is designed to remove particles with diameters greater than 0.2mm. The particles that are recovered are reintroduced into the river Río Luis. The treated water then enters a 978m^3 surge tank.

> _Water Conduction:_ The first stage of water conduction is at low pressure within enclosed piping, 1.75m in diameter and 8mm wall thickness. The length of this first stage is 3,200m. The second stage of water conduction, also at low pressure, is within an underground tunnel. The cross-section of the tunnel is arched with a width of 2.80m and a height of 2.90m. The length of the tunnel is 2,166m. The elevation at the end of the tunnel is 1,066m. The final stage of conduction is at high pressure, since the elevation drops 272m over a length of 893m. This stage is carried out within enclosed piping en sections with diameters of 1.40m and 1.50m. Due to the length of the water conduction, a pressure vent, 3m in diameter and 33m in height, is located between the tunnel exit and the entrance to the high-pressure, third-stage piping.

> _Powerhouse:_ The powerhouse hosts a valve room on the upper floor and the two trains of turbines and generators on the lower floor. The turbines are Pelton type with three injectors. The turbines have a rated capacity of 7.98 MW each; the generators are each rated at 9.68 MVA and 7.74 MW. The powerhouse includes an overhead crane for installation and maintenance, as well as a control room. The power plant can be operated locally or remotely. Outside the powerhouse is a transformer that steps up voltage from 13.8 kV to 69 kV. A 48m channel directs the waterflow from the powerhouse back to the river Río Luis.

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[4] 15.48 MW (2 units of 7.74MW each) is used as the nominal capacity of this project activity based on the nameplate capacity of the generators (9.68 MVA) and their power factor (0.80), resulting in a capacity per unit of 7.74MW. This is also consistent with the capacity of the turbines (7.98 MW) and the generator efficiency (97%).

[5] The project description is based on the detailed engineering design carried out by the firm ICA Ingenieros Consultores Asociados Cía. Ltda. The start date for this project activity is scheduled for December, 2012 (please see section C.1.1). Minor variations en specifications could occur during construction and when ordering key equipment items.

Tie-In: The powerhouse is located some 7km east of the town of Portovelo. The nearest substation, known as El Pache, owned by the power distributor CNEL Regional El Oro, is 1km west of Portovelo. A 9.8 km, 69kV tie-in line connects the project to the power grid.

Monitoring Equipment: The sole parameter to be monitored for this project activity (please see Section B.7) is net energy generation delivered to the grid. This parameter is regulated in Ecuador[6]. Two meters will be installed for redundancy. The meters will be selected from the list of those certified by CENACE. They will be calibrated by an independent laboratory accredited by CENACE and sealed prior to installation. The meters will be recalibrated as required by CENACE regulations, at least every two years. The precision of the meters will be at least ±0.2% for both active and reactive energy. Readings are taken continuously and stored on a quarter hourly basis.

This is a Greenfield project. No equipment or installations exist prior to this project activity.

No Annex-1 country is involved for technology transfer or the know-how of technology for this project activity.

The baseline scenario for the Project, as described in Section B.4, is the continuing operation of the existing and future power plants connected to the Ecuadorian national grid, necessary to meet the system electricity demand, without the Río Luis Project electricity generation. In the project scenario, the same electricity demand is met with the Río Luis Project electricity generation despatched in the base load, displacing generation from existing power plants and future power developments. Because the project uses renewable sources to produce electricity, there are no additional emissions from the project activity and the emissions reductions are generated by the displaced generation.

The key material and energy flows for this project activity depend on the flow of water through the river Río Luis. The ecological stream flow of 819 l/s will always be maintained.

The estimated generation from the project is based on a detailed analysis of monthly flows through the river over the period from 1964 to 2005. The available water resource is estimated through statistical analysis to be:

Percentile	River Flow, m^3/s
30%	9.16
50%	4.78
70%	2.91
80%	2.33
90%	1.84
95%	1.39

Engineering calculations, based on this resource average availability and the efficiencies of the project design, produce an expected annual generation of 83,065 MWh/y. Actual generation is expected to vary

[6] The power sector regulator in Ecuador is CONELEC, the National Electricity Council. The system operator is CENACE, the National Electricity Control Centre.

on a yearly basis due to rainfall variation, especially due to Niño and Niña conditions, as well as plant availability.

The plant load factor, discounting two weeks of downtime annually, is expected to be 63.7%. The annual average resource availability factor, based on statistical analysis of river flow since 1964, is 62.74%. The former figure is slightly higher than the latter, since scheduled downtime would coincide with the dry season. The standard deviation of the annual resource availability factor is 8.48%, thus demonstrating an expected year to year variation in plant load factor. The highest annual average in the historical data set was 79.9% in 1972; the lowest was 46.7% in 1968. No annual average above 70% has been observed since 1982.

The above expected generation and plant load factor was calculated based on the historical dataset from 1964 to 2005 as part of the detailed engineering design carried out by the firm ICA Ingenieros Consultores Asociados Cía. Ltda. It is therefore compliant with subpart (b) of part 3 of the "Guidelines for the reporting and validation of plant load factors" v01.

Construction activities for the project are scheduled over 31 months, as summarized in the following diagram:

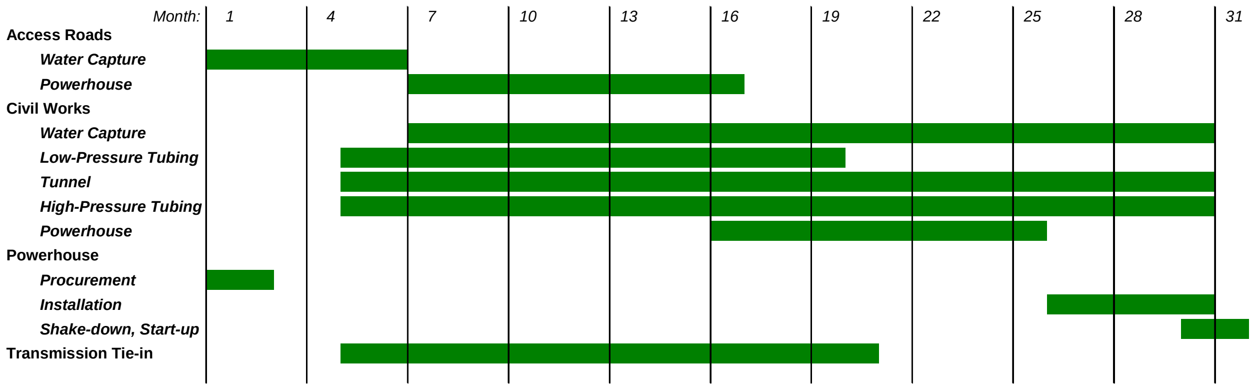


Figure 2: Río Luis Project Implementation Schedule

The participant considers this project to be environmentally safe and sound, based on the following:

- In general terms, this project's technology, run-of-river hydro, is considered more environmentally friendly than reservoir hydro.
- The ecological stream flow is respected during all conditions, even drought. Therefore, the original environmental values of the river Río Luis, especially flora and fauna, will be maintained.
- The small dam includes a fish ladder that works in both directions so that the project does not affect fish species either upstream or downstream.
- Due to its reduced dimensions, any methane emissions from the small run-of-river reservoir will be minimal.
- No social impacts are foreseen (dislocation of dwellings or economic activities, flooding of archaeological sites, etc.)

- The project has carried out an environmental impact analysis and has an approved environmental management plan (please see Section D.2). The environmental management plan will assure that any remain environmental impacts are minimized. The environmental license requires that this management plan be audited every two years.
- Additionally, the project is sponsoring a reforestation venture upstream within the area influenced by the river Río Luis.

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

Year	Estimation of annual emission reductions in tonnes of CO_2 e
2015 (1 July to 31 December)	25,738
2016	51,475
2017	51,475
2018	51,475
2019	51,475
2020	51,475
2021	51,475
2022	51,475
2023	51,475
2024	51,475
2025 (1 January to 30 June)	25,738
Total estimated reductions (tonnes of CO_2 e)	**514,751**
Total number of crediting years	10
Annual average of the estimated Reductions over the crediting period	51,475

A.4.5. Public funding of the project activity:

This project activity involves no public funding[7].

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:

[7] Version 2 of the PDD for this project activity contemplated public funding, since the project participant is a wholly owned subsidiary of vehicle that invests in long-term productive assets in Ecuador to fund pensions for retired military personnel. According to paragraph 8.63 of the System of National Accounts, jointly published by the UN, IMF, OECD, European Commission and World Bank, both the project participant and its parent holding company are considered private.

This project activity uses approved methodology ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" v13.0.0. This methodology requires the use of the "Tool for the demonstration and assessment of additionality" v06.1.0 and the "Tool to calculate the emission factor for an electricity system" v 02.2.1.

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

The project activity meets all of the relevant applicability criteria of ACM0002 v13.0.0:

ACM0002 v13.0.0 Applicability Criteria	***This Project Activity***
This methodology is applicable to grid-connected renewable power generation project activities that (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).	This is a run-of-river hydroelectric greenfield plant (option a), since no renewable plant exists prior to this project. The project activity includes a connection to the Ecuadorian national grid at the El Pache substations, near the town of Portovelo.
The methodology is applicable under the following conditions:	- -
• The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit;	This project activity is the installation of a new run-of-river hydro power plant.

ACM0002 v13.0.0 Applicability Criteria	*This Project Activity*
• In the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition projects which use Option 2: on page 10 to calculate the parameter $EG_{PJ,y}$): the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity;	Not applicable to Greenfield plants (this project activity)
In case of hydro power plants: • One of the following conditions must apply: o The project activity is implemented in an existing single or multiple reservoirs, with no change in the volume of any of reservoirs; or o The project activity is implemented in an existing single or multiple reservoirs, where the volume of any of reservoirs is increased and the power density of each reservoir, as per the definitions given in the project emissions section, is greater than 4 W/m^2; or o The project activity results in new single or multiple reservoirs and the power density of each reservoir, as per the definitions given in the project emissions section, is greater than 4 W/m^2.	The third option applies to this project activity. It includes the construction of one small dam (10m height above river bottom) to allow water flow to be diverted to the project activity. The power density of this single run-of-river pondage is about 1,000 W/m^2, several orders of magnitude greater than the minimum applicability threshold.[8]

[8] The area of the reservoir is determined by the topographical maps of the project area at 1,097 meters above sea level (10 meter dam height above the water capture point at 1,085 meter elevation plus 2 meters of maximum operating height). The reservoir has an upstream length of 474 meters and a variable width, based on the land contours, of up to 70 meters. The surface area of the reservoir is 15,483 square meters. The power density, based on the nameplate capacity of 15.48 MW, is 1,000 W/m^2.

ACM0002 v13.0.0 Applicability Criteria	*This Project Activity*
In case of hydro power plants using multiple reservoirs where the power density of any of the reservoirs is lower than 4 W/m^2 all the following conditions must apply: • The power density calculated for the entire project activity using equation 5 is greater than 4 W/m^2; • Multiple reservoirs and hydro power plants located at the same river and where are designed together to function as an integrated project that collectively constitute the generation capacity of the combined power plant; • Water flow between multiple reservoirs is not used by any other hydropower unit which is not a part of the project activity; • Total installed capacity of the power units, which are driven using water from the reservoirs with power density lower than 4 W/m^2, is lower than 15 MW; • Total installed capacity of the power units, which are driven using water from reservoirs with power density lower than 4 W/m^2, is less than 10% of the total installed capacity of the project activity from multiple reservoirs.	Not applicable to hydro power plants using a single reservoir (this project activity).
The methodology is not applicable to the following: • Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; • Biomass fired power plants; • A hydro power plant that results in the creation of a new single reservoir or in the increase in an existing single reservoir where the power density of the power plant is less than 4 W/m^2.	This project does not involve fuel switching or biomass. The power density of the new single run-of-river reservoir is about 1,000 W/m^2, considerably greater than the applicability threshold.
In the case of retrofits, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, i.e. to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance".	Not applicable to Greenfield plants (this project activity)

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

As per ACM0002 v13.0.0, the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to. This electricity system is the Ecuadorian national grid as defined and further explained in section B.6.1. The project boundary is depicted in the following flow diagram:

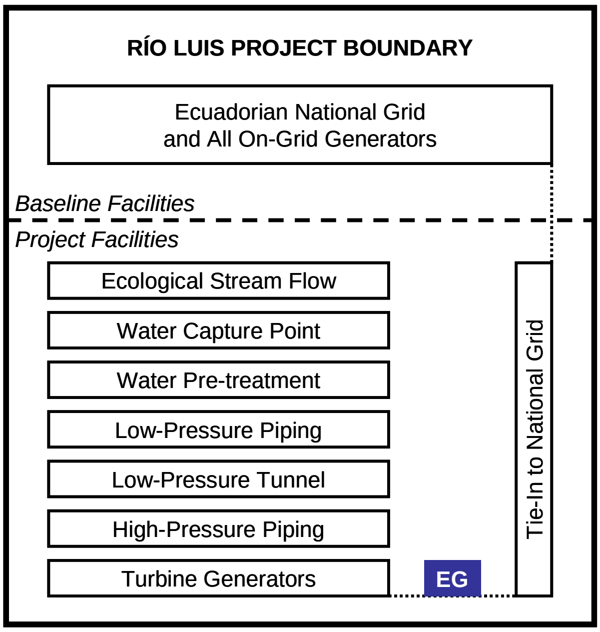


Figure 3: Río Luis Project Boundary

The sources of emissions within the project boundary and its baseline are prescribed by ACM0002 v13.0.0 and thus described in the following table:

Source		Gas	Included?	Justification / Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
Project activity	For hydro power plants, emissions of CH_4 from the reservoir	CO_2	No	Minor emission source
		CH_4	No	Excluded by ACM0002 v13.0.0 for hydro plants with power densities greater that 10 W/m^2
		N_2O	No	Minor emission source

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

Since this project activity is the installation of a new grid-connected renewable power plant/unit, ACM0002 v13.0.0 defines the baseline scenario as 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".*

The approved methodology ACM0002 v13.0.0 does not require the identification and evaluation of alternative baseline scenarios for new grid-connected renewable power plants.

The calculation of the CM as per the cited tool is described in section B.6.1.

Description of the Identified Baseline Scenario

The baseline scenario for the Project is the continuing operation of the existing and future power plants, necessary to meet the actual electricity demand, without the Río Luis Project electricity generation. In the project scenario, the same electricity demand is met with the Río Luis Project electricity generation despatched in the base load, displacing generation from existing power plants and future power developments. Because the project uses renewable sources to produce electricity, there are no additional emissions from the project activity and the emissions reductions are generated by the displaced generation.

The relevant spatial extent of this project activity is the Ecuadorian National Grid System. Therefore, the baseline scenario is one where the electricity that could be supplied by the project to the network would have to be generated by other plants currently connected to the network and by new plants that would be added to the System, based on a mix of primary energy sources. The current generation mix and new plant additions to the system are fully represented in the calculation of the CM that is provided in section B.6.1.

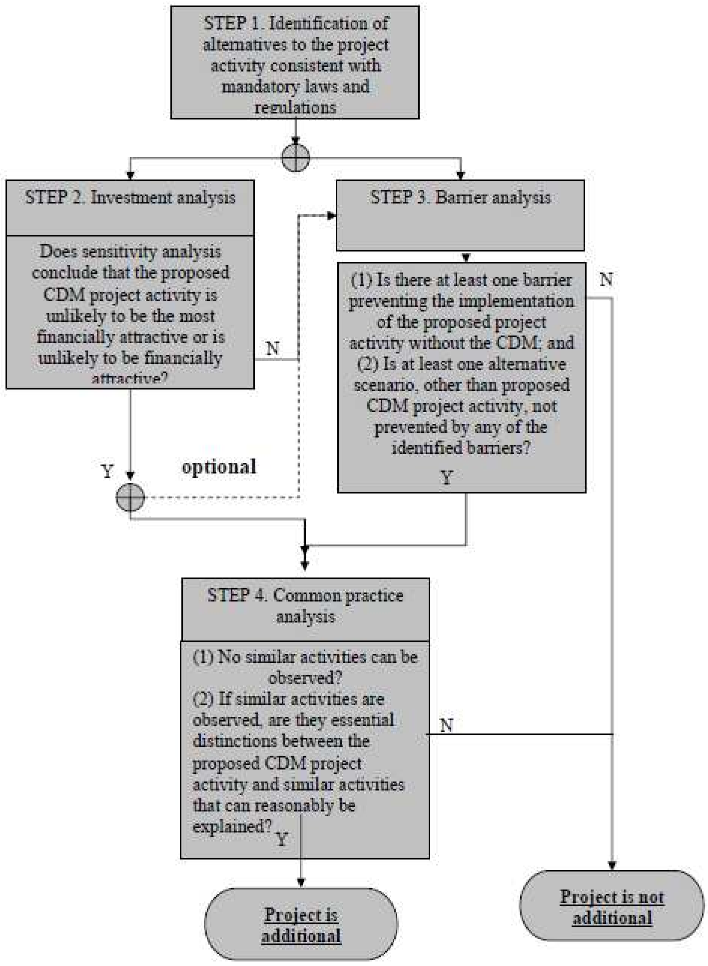
B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

Prior Consideration

The starting date of this project activity is after the Global Stakeholder Consultation undertaken at validation. Therefore, evidence that the incentive from the CDM was seriously considered in the decision to proceed with the project activity is not required as per EB41 Annex 12. Neither is prior notification to the UNFCCC required as per EB63 Annex 13. Nevertheless, this project activity has notified its intention to seek CDM status through the prior consideration form on 6 September 2011 and has communicated said intention with the Ecuadorian DNA as evidenced through the Letter of Approval dated 2 August 2010.

Demonstration and Assessment of Additionality

As indicated in ACM0002 v13.0.0, the demonstration and assessment of additionality for this project activity is carried out using the “Tool for the demonstration and assessment of additionality” v6.1.0. The tool requires a step-wise approach shown in the following diagram:



Step 1: Identification of alternatives to the project activity consistent with current laws and regulations

Define realistic and credible alternatives6 to the project activity(s) through the following Sub-steps:

Sub-step 1a: Define alternatives to the project activity:

Identify realistic and credible alternative(s) available to the project participants or similar project developers that provide outputs or services comparable with the proposed CDM project activity.

The following alternatives are considered realistic and credible:

1. The proposed project activity is undertaken without being registered as a CDM project activity;

2. The Ecuadorian power system would continue to operate and expand without the Río Luis project; that is the electricity will be supplied by a grid produced from a mix of fossil-fuel and renewable generation units as well as imports. This mix is quantified below in section B.6.1.

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

Both alternatives from sub-step 1a are consistent with mandatory laws and regulations. Therefore, this sub-step does not modify either of the available alternatives.

Step 2: Investment analysis

Determine whether the proposed project activity is not:

(a) The most economically or financially attractive; or

(b) Economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs).

This project activity chooses option b, demonstrating that the project activity is not economically or financially feasible without CER revenue.

Sub-step 2a: Determine appropriate analysis method

Determine whether to apply simple cost analysis, investment comparison analysis or benchmark analysis.

According to the "Tool for the Demonstration and Assessment of Additionality" v6.1.0, Option I (simple cost analysis) cannot be used as the project involves revenue generation apart from the revenue from sale of carbon credits. As the alternative to the project activity is the supply of electricity from the grid which is not to be considered an investment, option III (Benchmark analysis) is selected as per paragraph 19 of the "Guidelines on the Assessment of Investment Analysis" v05.

Sub-step 2b: Option III. Apply benchmark analysis

Identify the financial/economic indicator, such as IRR, most suitable for the project type and decision context.

The decision context is whether or not to invest in this project. The project participant uses IRR in its own investment decisions and thus considers it to be suitable for this decision context. For this project type, the decision is to put forth the equity portion of the investment, not the whole amount, since the final investment decision depends on securing leverage for the project. As a result, the financial indicator selected for this benchmark analysis is equity IRR. This project selects equity IRR in real terms instead of nominal terms to avoid distortion from price indexation and escalators.

As per paragraph 29 of the "Tool for the Demonstration and Assessment of Additionality" v6.1.0, the value of the benchmark should be standard in the market. This is deemed suitable for this project activity, since it could be developed by others through offering equity shares in the project or arranging equity finance through a BOT scheme.

The value of the equity IRR benchmark is identified based on the cost of equity. According to Appendix A of the "Guidelines on the Assessment of Investment Analysis" v05, the default value of the cost of equity for sectoral scope 1 (energy industries) projects in Ecuador is 17.0%.

Sub-step 2c: Calculation and comparison of financial indicators

Calculate the suitable financial indicator for the proposed CDM project activity

The basis of the cash flow analysis to determine the equity IRR for this project activity is:

Paragraph[9]	***Concept***	***Value / Method Applied***
3	Period of Assessment	10 years is chosen as the period of assessment since it coincides with the accounting lifetime of the major equipment items in the project activity[10]. This falls within the 10 to 20 year period of the guidelines. This choice of period of assessment is completely independent of the choice of the crediting period. Since the project's operational lifetime is greater, a generous residual value is assigned as explained below.
4	Residual Value	Since the technical lifetime of hydro plants can be long, especially if prolonged through overhauls and/or repowering, a generous residual value is assigned at the end of the period of assessment, calculated using the perpetuity-growth method, assigning zero growth (a conservative assumption since the project's lifetime is finite) to the last year's, after tax operational cash flow and applying the benchmark equity IRR as a discount rate.

[9] Refers to the paragraph of "Guidelines on the Assessment of Investment Analysis" v05

[10] As per references for depreciation periods that follow

Paragraph[9]	*Concept*	*Value / Method Applied*
5	Depreciation and Taxation	Depreciation is included to calculate taxes but not considered as a cash flow. Taxation is included, since the basis of the benchmark is post-tax.
6	Input Values	All input values are listed below and sourced or referenced
7	Interruption	Has not occurred in this project activity
8	Spreadsheet	Attached to this PDD
9,11	Project IRR	Not applicable since the indicator is equity IRR
10	Equity IRR	All financing cash flows are included in the analysis so that only the equity investment is considered
12-18	Benchmark	The identification and justification of the chosen benchmark method and its value are described under sub-step 2b
19	Benchmark vs. Investment Comparison	The selection and justification of benchmark analysis instead of investment comparison is described under sub-step 2a
20	Sensitivity Analysis	A complete sensitivity analysis is provided under sub-step 2d and documented in the attached spreadsheet

Input Values

All of the following input values are valid at the time of committing to the investment, which coincides with the validation of this project activity.

The detailed engineering design for the project is dated July, 2009. Since that time, EHD has advanced towards financial closure on various fronts:

- Towards negotiating a PPA, then opting for a regulated tariff in 2011.
- Towards an EPC contract, then opting for a modified BOT scheme in 2012.
- Towards arranging project finance, then opting for a modified BOT scheme in 2012.
- Towards CDM registration.

The final investment decision was taken by EHD in July, 2012[11]. The input values shown below are valid for this investment decision.

[11] EHD Board meeting 23 July 2012.

The following input values for construction costs are derived from the detailed engineering design[12] for this project activity:

Construction Costs, USD 000	***Year -2***	***Year -1***	***Year 0***	***Total***
Site preparation, civil works, and buildings	6,908.5	6,753.4	3,957.2	17,619.1
Fixed Equipment and Installations	4,975.4	4,863.7	2,850.0	12,689.1
Project Management, QA/QC	992.6	970.4	568.6	2,531.6
Total	12,876.5	12,487.4	7,375.8	32,839.8

To be conservative, land cost is ignored. Costs incurred prior to the investment decision (engineering design and permitting) are also excluded. The cost basis is March, 2009. To be conservative, the investment figures have not been indexed upwards to the moment of the investment decision.

The operating and maintenance costs are estimated in the detailed engineering design studies for the project to be 542,778 USD annually[13].

Average electricity generation is estimated to be 83,065 MWh annually[14].

Electricity sales will receive a net selling price of 6.88 cents (of USD) per kWh according to applicable regulations[15].

The following input values are accounting variables specified in Ecuadorian regulations:

Data Item		***Value***
Depreciation Periods in Years[16]		
	Land	- -
	Site preparation, civil works, and buildings	20
	Fixed Equipment and Installations	10
	Intangibles	5
Corporate income tax[17]		33.7%

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[12] ICA, 2009, Detailed engineering design for Rio Luis. The investment cost estimate is based on the sum individual line items, each having been calculated through engineering methods and costed from vendor quotes or cost engineering methods.

[13] ICA, 2009, Detailed engineering design for Rio Luis as updated through EHD's own financial projections. The annual costs estimate is based on the sum of individual line items that comprise the operating requirements for the project.

[14] ICA, 2009, Detailed engineering design for Rio Luis. The estimated generation (and the plant load factor) is calculated based on hydro resource availability for the project, using statistical analysis of stream flows since 1964.

[15] CONELEC Regulation 004/2011

[16] Specified in Executive Decree 1051 of 2008

[17] Includes the 22% tax on corporate profits specified in Executive Decree 1051 of 2008 as modified by the Production Code plus the 15% mandatory sharing of pre-tax profits with workers as per the Worker's Code. This

The following input values are sourced from indicative project finance offers as received by ENERGYHDINE[18]:

Data Item	***Value***
Fraction Financed	70%
Loan Duration in years	10
Real Interest Rate (APR)[19]	9.0%

The cash flow analysis is carried out on a real basis. Therefore, input values for inflation and price indices are not required.

The equity IRR of this project activity, utilizing the above input values and shown in the attached spreadsheet, is 13.62%. This value is lower than the benchmark value of 17%.

Sub-step 2d: Sensitivity analysis

Include a sensitivity analysis that shows whether the conclusion regarding the financial/economic attractiveness is robust to reasonable variations in the critical assumptions

As per the guidance in paragraph 21 of the "Guidelines on the Assessment of Investment Analysis" v05, a sensitivity analysis has been carried out to study the impact of ±10% variation on the following key variables:

- Investment cost
- Operating and maintenance cost
- Revenues

The sensitivity analysis to the revenues covers variation in either power generation or the regulated tariff. This sensitivity analysis covers all parameters that account for at least 20% of the project's cost or revenues. The sensitivity analysis is included in the attached spreadsheet and summarized in the following table:

Analysis Case	***Equity IRR***
Base Case	13.62%
Sensitivity +10% investment	11.09%
Sensitivity -10% investment	16.50%
Sensitivity +10% cost	13.33%
Sensitivity -10% cost	13.90%

latter is deductible against the former, thus the effective tax rate on pre-tax profits is 15% plus 22% of 85% equals 33.7%

[18] Non-binding finance proposal to EHD

[19] The nominal interest rate in USD offered in the non-binding proposal has been adjusted down by 2% into real terms, according to the long-term inflation target adopted by the Federal Reserve Bank.

Sensitivity +10% revenue	16.48%
Sensitivity -10% revenue	10.52%

In all cases, the equity IRR is lower than the benchmark value of 17.0%.

Breakeven Assessment

Investment: The sensitivity analysis identified that the investment cost would need to be reduced at least 11.6% to achieve a return of 17%. Considering the number of conservative items within the investment cost estimate (not being updated by inflation since March 2009, a small contingency of only 3%, excluding the land cost, etc.) it is considered highly unlikely that the project construction could be delivered at a discount of over 11.6%.

Operating Costs: Even if operating costs were zero, the equity return would only be 16.3%. Therefore, no breakeven is possible by adjusting the operating costs.

Revenues: The sensitivity analysis identified that revenues would need to be increased at least 11.9% to achieve a return of 17%. Since the tariff is fixed via regulation for 15 years, this is not considered possible from the pricing side. From the generation side, a statistical analysis of probability is possible, using the dataset of river flow from 1964 that was used to calculate the plant load factor. This data set results in an average annual load factor of 62.74% with a standard deviation of 8.48%. An 11.9% increase in the load factor would imply a value of 70.21%. The probability of this load factor being exceeded in any given year is 18.9% (one-tail, normal, $z>0.88$). This coincides with historical values, showing this occurrence during 1971-1975 and in 1982; in all other years, the load factor would have been lower. The probability of exceeding this load factor consistently over the period of assessment (10 years) is calculated by dividing the standard deviation of the annual average load factor by the square root of 10 (resulting in 2.68%) and is found to be 0.2% (one-tail, normal, $z>2.79$). Therefore, there is a probability of 99.8% that the revenues would not be increased by at least 11.9% due to variations in the load factor.

Conclusions

The results of the sensitivity analysis demonstrate that an investment in the project activity, in the absence of CER revenues, is unattractive. Therefore, according to the "Tool for the Demonstration and Assessment of Additionality" v6.1.0, the following procedure is step 4.

Step 4: Common practice analysis

This project activity (renewable energy) is listed under paragraph 6 of the "Tool for the Demonstration and Assessment of Additionality" v6.1.0. Therefore, a common practice analysis is carried out.

Two different common practice analyses are shown below, in according to the four-step procedure within paragraph 47 of the "Tool for the Demonstration and Assessment of Additionality" v6.1.0 and the five-step procedures within the "Guidelines on Common Practice" v02.0. Both procedures demonstrate that this project activity is not common practice.

Common Practice Analysis as per the "Tool for the Demonstration and Assessment of Additionality" v6.1.0

Step 1: Calculate applicable output range as +/-50% of the design output or capacity of the proposed project activity.

This project activity comprises one power plant with two identical power units of 7.74 MW each for a total capacity of 15.48MW. The applicable output range is thus 7.74MW to 23.22MW.

Step 2: In the applicable geographical area, identify all plants that deliver the same output or capacity, within the applicable output range calculated in Step 1, as the proposed project activity and have started commercial operation before the start date of the project. Note their number N_{all}. Registered CDM project activities and projects activities undergoing validation shall not be included in this step;

The geographical area is defined as Ecuador, the host country by default. The following plants have been inventoried from the dataset of generation power plants in Ecuador provided to the project activity by CONELEC, being the most recent data available at validation, applying the output range from the previous step:

Power Plant	***Type***	***Capacity, MW***
Miraflores	Gas Turbine	22.800
Guangopolo	Hydro	20.920
El Descanso	Internal Combustion Engine	19.200
REPSOL YPF-SPF-2	Internal Combustion Engine	18.768
Yuralpa	Internal Combustion Engine	17.697
Guangopolo	Internal Combustion Engine	17.520
CPF	Internal Combustion Engine	15.295
Recuperadora	Hydro	14.700
Limoncocha	Internal Combustion Engine	14.569
Saymirín	Hydro	14.432
Catamayo	Internal Combustion Engine	13.910
Shushufindi	Internal Combustion Engine	12.750
Oso	Internal Combustion Engine	12.680
PGE	Steam Cycle	12.000
Secoya	Internal Combustion Engine	11.000

Alao	Hydro (Reservoir)[20]	10.400
Hormiguero C	Internal Combustion Engine	10.005
Celso Castellanos	Internal Combustion Engine	10.000
Yamanunka	Internal Combustion Engine	9.943
Payamino	Internal Combustion Engine	9.350
Luluncoto	Internal Combustion Engine	9.074
Agip Oil - Sarayacu	Internal Combustion Engine	9.000
REPSOL YPF-SSFD	Internal Combustion Engine	8.635
El Carmen	Hydro	8.400
Laguna	Internal Combustion Engine	8.285
Ambi	Hydro	8.000

Registered CDM projects 0142 and 0580 are not included in this list

There are a total of 26 power plants in this group. N_{all} is thus equal to 26.

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}.

Of the 26 power plants in the group of N_{all}, 21 are of other types as defined by CONELEC. These other types are internal combustion engine, gas turbine, and reservoir hydro. These are clearly different energy sources as defined by paragraph 9(a) of the "Tool for the Demonstration and Assessment of Additionality" v6.1.0

Of the remaining 5 power plants, 4 have capacities not more than 15MW, and thus should be considered as different technologies in application of paragraph 9(c)(ii) of the "Tool for the Demonstration and Assessment of Additionality" v6.1.0

Therefore, the number of plants with different technologies, N_{diff}, is equal to 25.

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.*

The factor, F, is calculated as 1-25/26 = 0.038

According to the "Tool for the Demonstration and Assessment of Additionality" v6.1.0:

The proposed project activity is a "common practice" within a sector in the applicable geographical area if both the following conditions are fulfilled:

(a) the factor F is greater than 0.2, and

[20] CONELEC, Reservoirs in the Ecuadorian Electricity System

(b) N_{all}-N_{diff} is greater than 3.

For this project activity, the factor F is 0.038 and is clearly not greater than 0.2; as a result criteria (a) is not met. The difference N_{all}-N_{diff} (26 – 25 = 1) is less than 3, thus not satisfying criteria (b). Since neither criteria (a) nor (b) is satisfied, then the proposed project activity is not a "common practice".

Common Practice Analysis as per the "Guidelines on Common Practice" v02.0

Step 1: Calculate applicable output range as +/-50% of the total design capacity or output of the proposed project activity.

As above, the applicable output range is thus 7.74MW to 23.22MW.

Step 2: identify similar projects (both CDM and non-CDM) which fulfil all of the following conditions:

(a) The projects are located in the applicable geographical area;
(b) The projects apply the same measure as the proposed project activity;
(c) The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity;
(d) The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g. clinker) as the proposed project plant;
(e) The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1;
(f) The projects started commercial operation before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity.

The list from above is modified as follows:

- CDM projects 0142 and 0580 are added to the list
- The measure for this project is power generation based on renewable energy. All fossil fuel fired power plants are excluded from the list

Power Plant	***Type***	***Capacity, MW***
Guangopolo	Hydro	20.920
Calope (CDM 0580)	Hydro	16.600
Sibimbe (CDM (0142)	Hydro	16.000
Recuperadora	Hydro	14.700
Saymirín	Hydro	14.432
Alao	Hydro (Reservoir)	10.400
El Carmen	Hydro	8.400
Ambi	Hydro	8.000

Step 3: within the projects identified in Step 2, identify those that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation. Note their number N_{all}.

Of the 8 projects above, 2 are registered CDM projects, and are thus excluded from the calculation of N_{all}.

$N_{all} = 6$

Step 4: within similar projects identified in Step 3, identify those that apply technologies that are different to the technology applied in the proposed project activity. Note their number N_{diff}.

Part 4 (c) (ii) of the "Guidelines for Common Practice" v02.0 defines different technologies based on scale, referring to the definition of paragraph 28 of decision 1/CMP.2. Said decision establishes that *renewable energy project activities shall have a maximum output capacity of 15 MW*. Therefore, the plants with an output capacity of 15MW or less are considered different technologies.

$N_{diff} = 5$

Step 5: calculate factor F=1-Ndiff/Nall representing the share of similar projects (penetration rate of the measure/technology) using a measure/technology similar to the measure/technology used in the proposed project activity that deliver the same output or capacity as the proposed project activity.

F = 1 – 5/6 = 0.167

The proposed project activity is a "common practice" with a sector in the applicable geographical area if the factor F is great than 0.2 and N_{all}-N_{diff} is greater than 3.

For this project activity, the factor F is 0.167 and is clearly not greater than 0.2; as a result the first criteria is not met. The difference N_{all}-N_{diff} (6 – 5 = 1) is less than 3, thus not satisfying the second criteria. Since neither of the two criteria is satisfied, then the proposed project activity is not a "common practice".

As a result of the above analysis, this proposed project activity is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Project Emissions

ACM0002 v13.0.0 defines project emissions as follows:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y}$$

Where:

PE_y	=	Project emissions in year *y* (tCO_2e/yr)
$PE_{FF,y}$	=	Project emissions from fossil fuel consumption in year *y* (tCO_2/yr)
$PE_{GP,y}$	=	Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year *y* (tCO_2e/yr)
$PE_{HP,y}$	=	Project emissions from water reservoirs of hydro power plants in year *y* (tCO_2e/yr)

The term $PE_{FF,y}$ only applies to geothermal and solar project activities that also combust fossil fuels. Therefore, for this project activity, $PE_{FF,y} = 0$.

The term $PE_{GP,y}$ only applies to geothermal project activities. Therefore, for this project activity, $PE_{GP,y} = 0$.

If the power density of the project activity (*PD*) is greater than 10 W/m^2

$$PE_{HP,y} = 0$$ **(Equation 1)**

The power density of the project activity (*PD*) is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}}$$ **(Equation 2)**

Where:

PD	=	Power density of the project activity (W/m^2)
Cap_{PJ}	=	Installed capacity of the hydro power plant after the implementation of the project activity (W)
Cap_{BL}	=	Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants, this value is zero
A_{PJ}	=	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 (m^2)
A_{BL}	=	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 (m^2). For new reservoirs, this value is zero

The power density of this project activity is about 1,000 W/m^2.

Therefore, for this project activity, $PE_{HP,y} = 0$.

As a result, $PE_y = 0$.

Baseline Emissions

ACM0002 v13.0.0 defines baseline emissions as follows:

$$BE_y = EG_{PJ,y} * EF_{grid,CM,y}$$ **(Equation 3)**

Where:

BE_y	=	Baseline emissions in year *y* (tCO_2/yr)
$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)
$EF_{grid,CM,y}$	=	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" (tCO_2/MWh)

This project activity is a Greenfield facility. The parameter $EG_{PJ,y}$ is calculated according to case (a) of AMC0002 v13.0.0:

$$EG_{PJ,y} = EG_{facility,y}$$

Where:

$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)
$EG_{facility,y}$	=	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh/yr)

The term $EF_{gridCM,y}$ is calculated using the "Tool to calculate the emission factor for an electricity system" v2.2.1 as follows:

STEP 1. Identify the relevant electricity systems

The "Tool to calculate the emission factor for an electricity system" v2.2.1 indicates that the default relevant electricity system for the project is the national grid. The Ecuadorian national grid is thus selected as the relevant electricity system:

- It is operated as a national grid, known as the SNI[21].
- The Ecuadorian national grid is connected to neighbouring national grids (Peru and Colombia) although imports from these other grids are less than 10% of national power demand[22].

The geographical extent of this system covers the entire Ecuadorian continental territory. The power plants in this system are listed in Annex 3[23].

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[21] Acronym in Spanish for National Interconnected System

[22] CONELEC, Ecuadorian Power Sector Statistical Bulletin, 2010

[23] The power plants considered are all those owned by power sector agents (generators and distributors), including those under 1 MW that are self-despatched (as per the regulations governing despatch and operation of the SNI, published in Executive Decree Number 591, 11 February 1999). The list of power plants excludes self-generators that are not grid connected, since they do not comply with the definition of off-grid power units. The list also excludes generation units on the Galapagos Islands since they are not physically connected to the mainland grid.

The Ecuadorian power system includes connections to both the Peruvian and Colombian national grids. As per step 1 of the “Tool to calculate the emission factor for an electricity system” v2.2.1, the consideration of these connections is as follows:

Build margin: Transmission capacity to a connected electricity system may be considered as a build margin source where recent or likely future additions enable significant increases in imported electricity. The connection to the Peruvian grid has not been modified in the past 5 years (the timeframe for analyzing the build margin, please see step 5). Therefore, it is not considered. A second circuit was added to the connection to the Colombian grid at the end of 2008, thus doubling its capacity.[24] Imports from Colombia in 2009, once the upgrade was operational, more than doubled those from 2008[25]. The upgrade to this international connection can therefore be considered significant and hence is included in the build margin.

Operating margin: A simple adjusted operating margin emission rate of the Colombian grid is calculated and used for 2010 and in the build margin. This calculation is shown in Annex 3. For other vintages of imports from the Colombian grid and for all vintages of imports from the Peruvian grid, this project activity assumes the conservative emission factor of 0 tCO_2/MWh.

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

This project activity chooses Option I, to not include off-grid power plants.

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

This project activity chooses method (b), simple adjusted OM. The ex-ante option is chosen, applying data of vintages 2008-2010, being the three most recent years of complete data available at validation.

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

As per the “Tool to calculate the emission factor for an electricity system” v2.2.1, the simple adjusted OM is calculated as follows:

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

The list does include the Ecuadorian continental region of Sucumbios since it is physically interconnected (CONELEC, Electricity Master Plan 2009-2020), although not entirely despatched by the grid operator CENACE. It also includes the interconnections with Colombia and Peru.

24 CONELEC, Electricity Master Plan 2009-2020

25 Imports from Colombia were 1,058.2 GWh in 2009, compared to 500.2 GWh in 2008, according to CONELEC, Ecuadorian Power Sector Statistical Bulletin, 2010

Where

$EF_{grid,OM\text{-}adj,y}$	=	Simple adjusted operating margin CO_2 emission factor in year *y* (tCO_2/MWh)
λ_y	=	Factor expressing the percentage of time when low-cost/must-run power units are on the margin in year *y*
$EG_{m,y}$	=	Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)
$EG_{k,y}$	=	Net quantity of electricity generated and delivered to the grid by power unit *k* in year *y* (MWh)
$EF_{EL,m,y}$	=	CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh)
$EF_{EL,k,y}$	=	CO_2 emission factor of power unit *k* in year *y* (tCO_2/MWh)
m	=	All grid power units serving the grid in year *y* except low-cost/must-run power units
k	=	All low-cost/must-run power units serving the grid in year *y*
y	=	The relevant year as per the data vintage chosen in Step 3

Since fuel consumption and electricity generation is available for each power unit in the system, $EF_{EL,m,y}$, and $EF_{EL,k,y}$, are calculated based on Option A1 of the simple OM method as follows:

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

Where

$EF_{EL,m/k,y}$	=	CO_2 emission factor of power unit *m* or *k* in year *y* (tCO_2/MWh)
$FC_{i,m/k,y}$	=	Amount of fossil fuel type *i* consumed by power unit *m* or *k* in year *y* (Mass or volume unit)
$NCV_{i,y}$	=	Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ/mass or volume unit)
$EF_{CO2,i,y}$	=	CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ)
$EG_{m/k,y}$	=	Net quantity of electricity generated and delivered to the grid by power unit *m* or *k* in year *y* (MWh)
m	=	All grid power units serving the grid in year *y* except low-cost/must-run power units
k	=	All low-cost/must-run power units serving the grid in year *y*
i	=	All fossil fuel types combusted in power unit *m* or *k* in year *y*
y	=	The relevant year as per the data vintage chosen in Step 3

The following data sources are used to calculation the emission factors:

$EG_{m/k,y}$	Annual generation 2008 to 2010 for each power unit as supplied to the project activity in a dataset prepared from the database of CONELEC and shown in Annex 3.
$FC_{i,m/k,y}$	Annual fuel consumption by type 2008 to 2010 for each power unit as supplied to the project activity in a dataset prepared from the database of

	CONELEC and shown in Annex 3.
$NCV_{i,y}$	Values published by CONELEC and sourced from PETROECUADOR for commercial liquid fuels. For other fuels, IPCC default values at the lower limit of the uncertainty at a 95% confidence interval and shown in section B.6.2.
$EF_{CO2,i,y}$	IPCC default values at the lower limit of the uncertainty at a 95% confidence interval and shown in section B.6.2.

Liquid and gaseous fuel consumptions are published in volumetric units. Net calorific values are published in mass units. To be consistent, density values and unit conversions are applied. National density values are used when available. Otherwise, values published by the International Energy Agency are applied. These values are also shown in section B.6.2.

Fossil fuel generators are classified as *m*. Ecuador has no coal-fired generators. Hydro and other renewable generators as well as imports are classified as *k*.

Lambda (λ_y) is calculated in the attached emission factor spreadsheet according to the 4-step procedure, commented as follows:

step (i)	Hourly system load data for 2008-2010 are sorted in descending order. These data were provided to the project by CONELEC and sourced from the grid operator, CENACE.
step (ii)	The annual generation from all low-cost/must-run units was summed from the dataset provided by CONELEC. This dataset includes those on-grid generators that are not despatched by CENACE. Therefore, it is conservative, compared to the hourly load dataset.
step (iii)	The attached emission factor spreadsheet postulates a horizontal line at each of the 8,760 points along the ordered load curve. The area under the postulated horizontal line is then compared to the annual generation from low-cost/must-run units identified in step (ii)
step (iv)	The number of hours is identified by summing the number of hours where the area under the postulated horizontal line is less than the sum of the low-cost/must-run generation.

The results of the Lambda calculation are shown in section B.6.2.

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

This project activity chooses Option 1, ex-ante calculation of the build margin applying data of vintage 2010, being the most recent published data available at validation.

The sample group *m* of power units to calculate the build margin is identified as follows:

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 ($SET_{5-units}$) and determine their annual electricity generation ($AEG_{SET-5-units}$, in MWh);

According to the dataset provided by CONELEC, five units started to supply grid power in 2010:

Power Unit	*Capacity, kW*	*2010 Net Generation, MWh*
Electrocórdova Michael Banki	200	52
Mazar Unit1	91,830	232.518
Mazar Unit2	91,830	29.770
Santa Elena	75,000	244.333
Quevedo	130,000	456.934
Total 5 units	388,860	963,607

b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, 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 ($AEG_{SET-\geq 20\%}$, in MWh);

The net generation of the project electricity system in 2010 was 17,642,869 MWh, including imports. Of this amount, 603,568 MWh correspond to 6 registered CDM projects[26]. The parameter AEG_{total} is thus equal to 17,039,301 MWh and the 20% threshold for this step is therefore equal to 3,407,860 MWh.

The set of most recent power units that supplied this threshold generation value in 2010 is:

Power Plant	*Type*	*Power Unit*	*Start*	*Capacity (kW)*	*2010 Generation (MWh)*	*Cumulative MWh*
Electrocórdova	Hydro	Michael Banki	Jul-10	200	52	52
Mazar	Hydro	U1	Jul-10	91,830	232.518	232.570
Mazar	Hydro	U2	Jul-10	91,830	29.770	262.341
Santa Elena	ICE	Santa Elena	Feb-10	75,000	244.333	506.673
Quevedo	ICE	Quevedo	Ene-10	130,000	456.934	963.607
Pascuales II	GT	TM1	Dec-09	22,800	98.410	1.062.017
Pascuales II	GT	TM2	Dec-09	22,800	108.048	1.170.065
Pascuales II	GT	TM3	Dec-09	22,800	105.523	1.275.588
Pascuales II	GT	TM4	Dec-09	22,800	100.484	1.376.072
Pascuales II	GT	TM5	Dec-09	22,800	98.020	1.474.092
Pascuales II	GT	TM6	Dec-09	22,800	81.775	1.555.867
Power Barge II	ICE	PB-1	Nov-09	12,500	12.230	1.568.097
Power Barge II	ICE	PB-2	Nov-09	12,500	16.280	1.584.378
Power Barge II	ICE	PB-3	Nov-09	12,500	8.897	1.593.275
Power Barge II	ICE	PB-4	Nov-09	12,500	10.818	1.604.093

[26] Registered CDM Projects 0141, 0142, 0210, 0580, 0614, and 4654

Cauchiche	ICE	C6	May-09	45	26	1.604.119
Cauchiche	ICE	C7	May-09	35	29	1.604.148
Puná Viejo	ICE	U1	May-09	35	4	1.604.152
Puná Viejo	ICE	U2	May-09	35	4	1.604.156
Tiliví	Hydro	U1	May-09	120	326	1.604.482
Uravia	Hydro	U1	Feb-09	1,000	7.594	1.612.076
Colombia	Import	50%	Oct-08	270,000	397.255	2.009.331
Jivino	ICE	MAN 1	Jul-07	5,800	26.956	2.036.288
Jivino	ICE	MAN2	Jul-07	5,800	14.342	2.050.629
San Francisco	Hydro	U1	May-07	115,000	418.806	2.469.435
San Francisco	Hydro	U2	May-07	115,000	622.975	3.092.410
Termoguayas	ICE	U1	Dec-06	20,000	175.046	3.267.456
Termoguayas	ICE	U2&3	Dec-06	80,000	417.916	3.685.373

Units 2 and 3 of Termoguayas (considered a single power unit as defined in the "Tool to calculate the emission factor for an electricity system" v2.2.1, since they belong to the same plant and have identical vintages, capacity, and technology) is the marginal unit for this set and thus fully included.

The 230kV connection with Colombia was installed in 2003 and upgraded by adding a second circuit in 2008, thus doubling its capacity. Therefore, only 50% of the import through this connection is considered in the build margin.

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}); Identify the date when the power units in SET_{sample} started to supply electricity to the grid. If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin. In this case ignore steps (d), (e) and (f).

SET_{sample} is identified as $SET_{\geq 20\%}$. The earliest date in the set is December 2006, clearly less than 10 years ago. SET_{sample} is thus used to calculate the build margin and steps (d) - (f) are ignored.

The build margin is calculated as follows:

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

Where

$EF_{grid,BM,y}$	=	Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EG_{m,y}$	=	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$	=	CO_2 emission factor of power unit m in year y (tCO_2/MWh)
m	=	Power units included in the build margin

y = Most recent historical year for which electricity generation data is available

Since this project activity selects Option 1, ex-ante calculation of BM, the parameter y corresponds to vintage 2010, being the most recent data available.

The CO_2 emission factor for all power units in the system is calculated as per the guidance in Step 4 (a) for the simple OM using option A1, as described above and shown in the attached spreadsheet. The calculation of the emission factor for imports from Colombia is shown in Annex 3.

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

This project activity selects method (a) for determining CM, being the preferred option. The combined margin emission factor is thus calculated as follows:

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

Where

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{grid,BM,y}$ = Operating margin CO_2 emission factor in year y (tCO_2/MWh)
w_{OM} = Weight of operating margin emissions factor (%)
w_{BM} = Weight of build margin emissions factor (%)

The default values of w_{OM} = 0.5 and w_{BM} = 0.5 are applied to this project activity.

Leakage

No leakage emissions are considered by ACM0002 v13.0.0.

Emission Reductions

Emission reductions are calculated as follow:

$$ER_y = BE_y - PE_y - L_y$$

Where

ER_y = Emission reductions in year y (tCO_2/y)
BE_y = Baseline emissions in year y (tCO_2/y)
PE_y = Project emissions in year y (tCO_2/y)
L_y = Leakage emissions in year y (tCO_2/y)

Project emissions and leakage are zero, as described above. These two terms can thus be ignored. The formula for baseline emissions (equation 3) is substituted into the above formula to yield:

$$ER_y = EG_{PJ,y} * EF_{grid,CM}$$ **(Equation 4)**

The subscript *y* for the grid emission factor from equation 3 has been omitted to reflect the choice of an ex-ante calculation of the combined margin grid emission factor.

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

(Copy this table for each data and parameter)

Data / Parameter:	**$FC_{i,m,y}$ $FC_{i,k,y}$**
Data unit:	mass or volume units, depending on fuel type (please see Annex 3)
Description:	Fuel consumption of fuel type *i* for power unit *m* or *k* in year *y*
Source of data used:	Dataset provided to the project activity by CONELEC
Value applied:	Please see Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The dataset provided by CONELEC, the electricity regulator, is the official source for power sector statistics in the host country.
Any comment:	The original dataset has been screened to include only those power units that comply with the definition of *Grid power plant/unit* as per the “Tool to calculate the emission factor for an electricity system” v02.2.1 Liquid and gaseous fuels are reported in volumetric units. They are converted to SI through conversion factors and density.

Data / Parameter:	**$NCV_{i,y}$**		
Data unit:	GJ/t		
Description:	Net calorific value of fuel type *i* in year *y*		
Source of data used:	1) Dataset provided to the project activity by CONELEC, referencing the NCVs for commercial liquid fuels to values published by PETROECUADOR 2) 2006 IPPC default values at the lower end of the 95% confidence interval		
Value applied:	Fuel	Source	Value
	Crude	2	40.1
	Natural Gas	2	46.5
	LPG	2	44.8
	Naphtha	2	41.8
	Residual Oil	1	39.7
	Bagasse	2	7.62
	Fuel Oil	1	40.9
	Diesel	1	41.3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Two of the three NCV values published by CONELEC fall below the lower limit of the 95% confidence interval in the IPCC 2006 guidelines. The remaining value is lower than the IPCC default value. They are considered reliable and conservative.		

Any comment:	These values apply to all three vintages: 2008-2010

Data / Parameter:	**ρ_i**		
Data unit:	t/m^3		
Description:	Density (or specific gravity) of fuel type *i*		
Source of data used:	1) Dataset provided to the project activity by CONELEC 2) International Energy Agency. Density of Oil Products. 2004		
Value applied:	Fuel	Source	Value
	Crude	2	0.8505
	Natural Gas	1	0.00074
	LPG	2	0.5625
	Naphtha	1	0.74
	Residual Oil	1	0.86
	Fuel Oil	1	0.96
	Diesel	1	0.88
Justification of the choice of data or description of measurement methods and procedures actually applied :			
Any comment:	Density is required to convert volumetric fuel consumption data for gaseous and liquid fuels into mass units to be consistent with the net calorific values		

Data / Parameter:	**$EF_{CO2,i,y}$**			
Data unit:	Shown below			
Description:	CO2 emission factor for fuel type *i* in year *y*			
Source of data used:	1) 2006 IPPC default values at the lower end of the 95% confidence interval 2) EB23 Annex05			
Value applied:	Fuel	Units	Source	Value
	Crude	tCO_2/TJ	1	71.1
	Natural Gas	tCO_2/TJ	1	54.3
	LPG	tCO_2/TJ	1	61.6
	Naphtha	tCO_2/TJ	1	69.3
	Residual Oil	tCO_2/TJ	1	75.5
	Bagasse	tCO_2/TJ	see below	0
	Fuel Oil	tCO_2/TJ	1	75.5
	Diesel	tCO_2/TJ	1	72.6
	Reservoir Hydro	tCO_2/MWh	2	0.09
Justification of the choice of data or description of measurement methods and procedures actually applied :				
Any comment:	Bagasse is assigned an emission factor of 0 as a biomass fuel			

Data / Parameter:	$EG_{m,y}$ $EG_{k,y}$
Data unit:	kWh/y
Description:	Net electricity generated by power plant *m* or *k* in year *y*
Source of data used:	Dataset provided to the project activity by CONELEC
Value applied:	Please see Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The dataset provided by CONELEC, the electricity regulator, is the official source for power sector statistics in the host country.
Any comment:	The original dataset has been screened to include only those power units that comply with the definition of *Grid power plant/unit* as per the "Tool to calculate the emission factor for an electricity system" v02.2.1

Data / Parameter:	λ_y	
Data unit:	- -	
Description:	Factor expressing the percentage of time when low-cost/must-run power units are on the margin in year *y*	
Source of data used:	Calculation based on the hourly system loads within the dataset provided to the project activity by CONELEC	
Value applied:	Year	Value
	2008	3.8138%
	2009	0.0571%
	2010	0.0000%
Justification of the choice of data or description of measurement methods and procedures actually applied :		
Any comment:	The calculation of Lambda is transparently shown in the attached spreadsheet that calculates EF_{grid}	

Data / Parameter:	w_{OM} w_{BM}	
Data unit:	- -	
Description:	Weighting of operating and build margin emission factors	
Source of data used:	"Tool to calculate the emission factor for an electricity system" v02.2.1	
Value applied:	w_{OM}	0.5
	w_{BM}	0.5
Justification of the choice of data or description of measurement methods and procedures	Default values from the Tool	

actually applied :	
Any comment:	

Data / Parameter:	$EF_{grid.OM,y}$	
Data unit:	tCO_2/MWh	
Description:	Operating margin emission factor in year *y*	
Source of data used:	Calculation shown in the attached spreadsheet based on data cited above	
Value applied:	2008	0.7279
	2009	0.7524
	2010	0.7655
	Average	0.7491
Justification of the choice of data or description of measurement methods and procedures actually applied :	Please see section B.6.1	
Any comment:	The average shown is the generation-weighted average as specified by the "Tool to calculate the emission factor for an electricity system" v02.2.1	

Data / Parameter:	$EF_{grid,BM}$
Data unit:	tCO_2/MWh
Description:	Build margin emission factor for 2010
Source of data used:	Calculation shown in the attached spreadsheet based on data cited above
Value applied:	0.4904
Justification of the choice of data or description of measurement methods and procedures actually applied :	Please see section B.6.1
Any comment:	

Data / Parameter:	$EF_{grid,CM}$
Data unit:	tCO_2/MWh
Description:	Combined margin emission factor
Source of data used:	Calculation shown in the attached spreadsheet based on data cited above
Value applied:	0.6197
Justification of the choice of data or description of measurement methods and procedures actually applied :	Please see section B.6.1
Any comment:	

Data / Parameter:	**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 used:	ACM0002 v13.0.0
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	This is a new, run-of-river hydro power plant

Data / Parameter:	**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 (m^2). For new reservoirs, this value is zero
Source of data used:	ACM0002 v13.0.0
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	This is a new, run-of-river hydro power plant

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

The ex-ante calculation of emission reductions is based on equation 4, reproduced below:

$$ER_y = EG_{PJ,y} * EF_{gridCM}$$ **(Equation 4)**

The follow values are used in the ex-ante calculation of emission reductions:

Parameter	***Value***	***Unit***	***Explanation***
$EG_{PJ,y}$	83,065	MWh/y	Expected typical annual net generation from the project based on statistical analysis of the river flow dataset from 1964 and explained in Section A.4.3.
EF_{gridCM}	0.6197	tCO_2/MWh	Ex-ante emission factor derived in Section B.6.2

Introducing these values in the above formula yields a calculation of emission reductions estimated ex-ante to be:

BE = 51,475 tCO_2/y

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

Year	Estimation of project activity emissions (tCO_2 e)	Estimation of baseline emissions (tCO_2 e)	Estimation of leakage (tCO_2 e)	Estimation of overall emission reductions (tCO_2 e)
2015 (1/07 to 31/12)	0	25,738	0	25,738
2016	0	51,475	0	51,475
2017	0	51,475	0	51,475
2018	0	51,475	0	51,475
2019	0	51,475	0	51,475
2020	0	51,475	0	51,475
2021	0	51,475	0	51,475
2022	0	51,475	0	51,475
2023	0	51,475	0	51,475
2024		51,475		51,475
2025 (1/01 to 30/06)	0	25,738	0	25,738
Total (Tonnes of CO_2 e)	**0**	**514,751**	**0**	**514,751**

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:	**$EG_{PJ,y}$**	
Data unit:	MWh	
Description:	Net electricity generation by the project delivered to the grid in year *y*	
Source of data to be used:	Continuous monitoring	
Value of data applied for the purpose of calculating expected emission reductions in section B.5	83,065 (estimated at validation)	
Description of measurement methods and procedures to be applied:	Method	Continuous, instantaneous electronic monitoring
	Frequency	Continuous monitoring with recording of average instantaneous values every 15 minutes
	Equipment	Meters accredited by the grid operator CENACE
	Calibration	Prior to installation and calibration every two years by an independent laboratory accredited by the grid operator, CENACE
	Accuracy	Precision of ±0.2% or better

	Responsibility	Chief control engineer
QA/QC procedures to be applied:	This measurement is regulated under CONELEC Regulation 005/06, System for Commercial Measurement in the Wholesale Power Market. This system requires redundancy, verification, use of only accredited equipment, sealing of verified meters, and other provisions to ensure accuracy. The data provided by the project participant for this parameter can be cross-checked against two data sources: 1) internal accounting records for electricity sales; and 2) external records of CENACE, the grid operator, for net generation supplied to the national grid.	
Any comment:	The ex-ante estimate of this parameter is based on the statistical analysis of river flow since 1964. This analysis, described in Section A.4.3, shows an annual average resource availability of 62.74% with a standard deviation of 8.48%, thus demonstrating an expected year to year variation due to weather conditions.	

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:	Turbine and generators specifications for the project site
Measurement procedures (if any):	Determine the installed capacity based on recognized standards
Monitoring frequency:	Yearly
QA/QC procedures:	-
Any comment:	At validation, based on the detailed engineering design (ICA, 2009), the value of this parameter is 15,480,000 W.

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:	At validation, based on the topographical survey maps at an elevation of 1097 (2 meters above the dam level), the value of this parameter is calculated to be 15,483 m^2.

B.7.2. Description of the monitoring plan:

Scope of the Monitoring Plan

Only one parameter is monitored continuously in this project activity, net generation supplied to the grid ($EG_{PJ,y}$). This parameter is regulated in Ecuador under CONELEC Regulation 005/06, System for Commercial Measurement in the Wholesale Power Market. This regulation covers:

- Minimum technical characteristics for the System for Commercial Measurement in the Wholesale Power Market.
- Responsibilities of the system agents (generators, distributors, suppliers, etc.) and the grid operator CENACE for meter reading, registering, recording, and exchanging information at measurement points.
- Procedures for validating, estimating and substituting information from measurement points to be applied by the grid operator CENACE.
- Procedures for verification, intervention, operation and maintenance of measurement equipment.

Following are some of the specific requirements of the regulation that will ensure accurate and precise measurement of this parameter.

Para	***Concept***	***Requirement***
5	Measurement Point	Bi-directional measurement equipment is to be installed at the point of connection to the grid
9	Calibration Entities	Calibration of measurement equipment must be carried out by independent entities accredited by the grid operator, CENACE
10	Initial Authorization	Prior to commencing commercial activity, a generator requires authorization from CENACE that demonstrates full compliance with the regulation. The initial equipment will be calibrated and sealed.
11, An4	Calibration	Planned calibration is carried out by an accredited entity every two years. CENACE can carry out calibration spot checks at any point in time
13-15	Recording and Information Exchange	Measurements are to be recorded every 15 minutes. Daily data sets are sent to CENACE prior to 9am the following day. Information exchange is carried out according to detailed protocols.
16, An5	Erroneous or Missing Data	Detailed, conservative procedures are published for handling erroneous or missing data
An3	Specifications	Detailed technical specifications for all measurement equipments items
An4	Intervention	Any intervention in measurement equipment that involves breaking the seal requires prior authorization from CENACE. Following the intervention, the measurement equipment must be recalibrated.

The project participant understands that compliance with this detailed regulation (29 pages, including annexes, plus technical norms referenced therein) constitutes good monitoring practice appropriate to the type of project activity.

Implementation of the Monitoring Plan

The selection, procurement, and installation of measurement equipment, as well as the first calibration and obtaining the initial authorization, will be undertaken during construction.

Once operational, the monitoring plan will be supervised by the Chief Control Engineer. Specific responsibilities will be assigned to operators and maintenance personnel as appropriate. Responsibilities for data archiving will be duplicated between the project activity and the grid operator, CENACE.

Data will be kept for a minimum of two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Río Luis is a Greenfield facility. Thus all workers will be newly hired and management systems will be newly implemented. Specific training is planned for all personnel. Training required for CDM monitoring will be integrated within the training for quality control.

Annual monitoring of the CDM variables, Cap_{PJ} and A_{PJ}, will be carried out by the CDM coordinator.

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):

16/01/2012, completed by

CO2 Spain Innovaciones y Soluciones, S.A.
Costanilla de los Angeles, 13
28013 Madrid SPAIN

Supervised by:

Laurence W. (Larry) Philp
Managing Director

larry.philp@co2spain.com

This entity is not 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:

The starting date of this project activity is expected to be on or about 15 December 2012, when the construction contract for the project is signed. This starting date is after the global stakeholder consultation.

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

The operation lifetime of this project activity is expected to be at least 25 years and 0 months[27].

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

This project activity selects a fixed crediting period.

C.2.1. Renewable crediting period:

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

N/A, left blank on purpose

C.2.1.2. Length of the first crediting period:

N/A, left blank on purpose

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

01/07/2015

C.2.2.2. Length:

10 years, 0 months.

SECTION D. Environmental impacts

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

The design of the Río Luis project minimizes environmental impacts from the generation of electricity from hydro power:

- Run-of-river technology avoids a large dam and its associated environmental and social impacts.

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[27] 25 years is a typical design life for the turbines and generators (as cited by renewable energy specialists such as First Renewables [UK] and CEATI [Canada]). At that point in time, the operating life of the project could be extended through overhaul or repowering, if such a decision is taken. The expected operating schedule is 8,424 hours yearly (two weeks of downtime). Over 25 years, the turbines and generators would operate some 210,600 hours. This estimated lifetime is conservative compared to the 150,000 hour default lifetime for hydro turbines cited in the “Tool to determine remaining equipment lifetime” v1.

- An ecological stream flow maintains the environmental values, especially flora and fauna within the river Río Luis.
- A fish ladder adjacent to the small (10m high dam) allows bidirectional fish flow through the project area.

Furthermore, the operation of the project will displace other generation supplying the national grid – especially fossil fuel-fired, thermal plants. Therefore, the project participant believes that the net environmental impacts from this project activity are positive, and not insignificantly so.

Nevertheless, some residual environmental impacts will or might be produced by the project activity. These residual environmental impacts are identified in an Environmental Impact Assessment (EIA, referenced below in section D.2).

The EIA documents 22 environmental impacts associated with the project activity. Of these 22 impacts, 18 are associated with the construction phase and thus temporary. The remaining 4 environmental impacts are associated with the operational phase and thus permanent during the lifetime of the project activity. Of the 22 environmental impacts, 20 are considered minor. The two environmental impacts that are considered significant are:

- Visual impact during construction. These impacts occur at the capture point, along the conduction, and at the powerhouse. This same visual impact is considered minor during the operational phase, since natural vegetation growth within the affected areas will mitigate this impact quickly due to the climatologic conditions at the project site that promote rapid growth of native species.
- Flora and fauna impact within the Río Luis riverbed. This is a significant impact that is inherent to the project activity. It is mitigated through the ecological stream flow and the fish ladder at the small dam. It is also compensated through a reforestation program for the upper Río Luis river basin. The project participant believes that the residual impact, after mitigation measures and compensation through reforestation, is minor.

No transboundary environmental impacts were identified during the EIA process. The two environmental impacts described above as significant are located entirely within Ecuador.

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:

The Río Luis Project has obtained an environmental licence according to Ecuadorian requirements.[28] Prior to issuing the license, and as a legal prerequisite, the Final Environmental Impact Assessment for Río Luis was approved.[29]

The legal basis for issuing the environmental license is based on the following Ecuadorian Laws and Regulations:

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[28] CONELEC, Environmental Licence 006/09, issued through Resolution DE-09-026, 16 June 2009

[29] CONELEC, Communication DE-09-0488, 7 March 2009

- Articles 19 and 20 of the Law for Environmental Management require that public or private sector projects with environmental impacts require an environmental licence issued by the Ministry for Environment.
- Article 3 of the Law for Governing the Power Sector authorizes CONELEC to approve the sector's Environmental Impact Assessments.
- Resolution 0173 of the Ministry of Environment transfers the authority to issue environmental licenses for power sector projects to CONELEC, except those in protected areas.

The principal conclusions of the environmental impact assessment are summarized above in section D.1.

A summary of the environmental impact assessment for the Río Luis project is published online by CONELEC for permanent public consultation[30].

The environmental impact assessment was also required by the concession to water rights in the river Río Luis[31]. Additionally, this concession requires the reforestation using native species of the area affected by the project.

The environmental impact assessment includes an environmental management plan. According to the requirements of the environmental license, the environmental management plan will be audited by a duly accredited entity every two years.

SECTION E. Stakeholders' comments

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

Local stakeholders were invited to a public meeting on December 10, 2008 in Portovelo. An information centre on the project was set up prior to the public meeting and operative from December 3 to 9, 2008. Following the public meeting, the information centre remained open to receive public comments regarding the project from December 11 to 17, 2008. The draft Environmental Impact Assessment was published via internet for local stakeholder consultation on December 3, 2008. All of these means to inform and seek comments from local stakeholders were published in a newspaper advertisement. A total of 21 persons attended the public meeting

The local stakeholder consultation process has been done as per applicable host country regulations and laws.

E.2. Summary of the comments received:

Nine participants in the meeting offered a total of 14 comments or questions regarding the project. The 9 participants that commented on the project were:

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[30] http://www.conelec.gob.ec/documentos.php?cd=3055&l=1 accessed on 21 January 2012

[31] Concession for Water Rights, issued to the Río Luis Project by the National Council for Water Resources, Machala Agency, 19 November 2007.

Name	***Representing***
Jorge Torres Matamoros	PREDESUR, El Oro Region
Jaime Armijos	Township of Arca
Araldo Borja	Township of Curtincapac
Fernando Romero	Municipality of Zaruma
Arturo Sanchez	Regional Government of El Oro
José Ochoa	Municipality of Zaruma
Rubén Aguilar	Union of Drivers of Portovelo
Alonso Espinosa	Township of Morales
Walter González	Township of Güizhagüiña

The 14 comments and questions can be summarized as follows:

4 questions and comments	Regarding water uses in the river Río Luis
3 questions	Regarding the participation of local municipalities in the profits from the project
2 questions	Regarding other economic benefits for local municipalities from the project
2 comments	Regarding the participation in the meeting
1 comment	Regarding water rights in the river Río Luis
1 comment	Regarding water flow in the river Río Luis
1 comment	Regarding other regional water issues

No comments or observations were received in the information centre following the public meeting.

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

All comments and questions were fully resolved by ENERGYHDINE and CONELEC during the public meeting. No negative comments were received and hence, there was no need to take due account of the comments.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding was or will be used in this project activity

Annex 3

BASELINE INFORMATION

Annex 3.1: 2008 Net Generation and Fuel Consumption of Power Units, in the dataset provided by CONELEC

Power Plant	Type	Unit	Capacity	Net Generation	Crude	Natural Gas	LPG	Naphtha	Residual Oil	Bagasse	Fuel Oil	Diesel
			kW	MWh	m^3	km^3	m^3	m^3	m^3	t	m^3	m^3
Sillunchi I	Hydro	U-100	100	487.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sillunchi II	Hydro	U-304	304	1,925.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Enrique García	Gas Turbine	TG-5	102,000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gonzalo Zevallos (Gas)	Gas Turbine	TG-4	26,265	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gonzalo Zevallos (Vapor)	Steam Turbine	TV-2	73,000	306,440.4	0.0	0.0	0.0	0.0	0.0	0.0	95,158.4	119.5
Gonzalo Zevallos (Vapor)	Steam Turbine	TV-3	73,000	385,675.5	0.0	0.0	0.0	0.0	0.0	0.0	112,088.0	63.6
Trinitaria	Steam Turbine	TV1	133,000	750,571.3	0.0	0.0	0.0	0.0	0.0	0.0	191,201.3	104.6
Agoyán	Hydro	U1	80,000	572,495.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Agoyán	Hydro	U2	80,000	581,495.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pucará	Hydro	U1	36,500	130,968.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pucará	Hydro	U2	36,500	128,092.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paute	Hydro	U1	100,000	577,012.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paute	Hydro	U10	115,000	625,288.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paute	Hydro	U2	100,000	604,608.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paute	Hydro	U3	100,000	597,066.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paute	Hydro	U4	100,000	363,333.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paute	Hydro	U5	100,000	614,239.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paute	Hydro	U6	115,000	726,597.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paute	Hydro	U7	115,000	707,017.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paute	Hydro	U8	115,000	699,103.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paute	Hydro	U9	115,000	704,487.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Power Plant	Type	Unit	Capacity kW	Net Generation MWh	Crude m^3	Natural Gas km^3	LPG m^3	Naphtha m^3	Residual Oil m^3	Bagasse t	Fuel Oil m^3	Diesel m^3
Termoesmeraldas	Steam Turbine	CTE	132,500	626,001.7	0.0	0.0	0.0	0.0	0.0	0.0	160,677.8	220.8
Campo Alegre	IC Engine	CA4	100	51.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.9
Guangopolo	IC Engine	U1	5,200	28,637.1	0.0	0.0	0.0	0.0	6,008.0	0.0	0.0	558.6
Guangopolo	IC Engine	U2	5,200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Guangopolo	IC Engine	U3	5,200	26,172.7	0.0	0.0	0.0	0.0	5,546.9	0.0	0.0	497.0
Guangopolo	IC Engine	U4	5,200	25,446.9	0.0	0.0	0.0	0.0	5,487.4	0.0	0.0	509.4
Guangopolo	IC Engine	U5	5,200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Guangopolo	IC Engine	U6	5,200	28,653.9	0.0	0.0	0.0	0.0	6,063.6	0.0	0.0	546.0
Guangopolo	IC Engine	U7	1,920	6,183.8	0.0	0.0	0.0	0.0	1,682.4	0.0	0.0	214.0
La Propicia	IC Engine	U1	4,416	171.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	305.9
La Propicia	IC Engine	U3	4,416	13,571.5	0.0	0.0	0.0	0.0	3,364.9	0.0	0.0	563.8
Miraflores	IC Engine	1	2,500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Miraflores	IC Engine	10	2,500	104.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.4
Miraflores	IC Engine	11	6,000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Miraflores	IC Engine	12	6,000	154.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.5
Miraflores	IC Engine	13	2,500	57.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5
Miraflores	IC Engine	14	2,500	57.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5
Miraflores	IC Engine	16	2,500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Miraflores	IC Engine	18	2,500	286.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	95.2
Miraflores	IC Engine	22	2,500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Miraflores	IC Engine	7	2,500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Miraflores	IC Engine	8	2,500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Miraflores	IC Engine	9	2,500	104.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.4
Miraflores	IC Engine	K	2,500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Miraflores	Gas Turbine	TG1	3,400	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Puná Nueva	IC Engine	Cummins No.2	700	298.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	69.3
Puná Nueva	IC Engine	Perkins	350	837.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	194.7
Puná Nueva	IC Engine	PN2	500	121.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	48.5
Santa Rosa	Gas Turbine	TG1	17,100	6,856.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2,798.5
Santa Rosa	Gas Turbine	TG2	17,100	8,937.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3,614.9
Santa Rosa	Gas Turbine	TG3	17,100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Power Plant	Type	Unit	Capacity kW	Net Generation MWh	Crude m^3	Natural Gas km^3	LPG m^3	Naphtha m^3	Residual Oil m^3	Bagasse t	Fuel Oil m^3	Diesel m^3
Chimbo	Hydro	U1	563	556.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chimbo	Hydro	U2	1,100	3,673.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chimbo	Hydro	U3	235	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Guaranda	IC Engine	U2	2,541	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bellavista	IC Engine	Deutz BF4L2011	105	24.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.2
Collin Lockett	IC Engine	Crossley #4	10,900	1,490.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	442.7
Costa Rica	IC Engine	Perkins 1104A-44TG2	53	62.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.8
Jambelí	IC Engine	Cummins #2	300	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Machala	IC Engine	G. M. #5	5,000	2,135.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	641.1
Pongalillo	IC Engine	Deutz	35	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Lorenzo	IC Engine	1	1,100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Centro Industrial	IC Engine	4	11,460	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Milagro	IC Engine	8	15,000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
La Libertad	IC Engine	9	27,300	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Playas	IC Engine	4	1,802	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Posorja	IC Engine	5	2,840	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Celso Castellanos	IC Engine	GM 1	2,500	1,286.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	419.9
Celso Castellanos	IC Engine	GM 2	2,500	604.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	198.7
Celso Castellanos	IC Engine	GM 3	2,500	2,473.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	803.7
Celso Castellanos	IC Engine	GM 4	2,500	2,187.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	709.2
Dayuma	IC Engine	U2	192	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jivino	IC Engine	ALCO 1	2,500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jivino	IC Engine	ALCO 2	2,500	1,806.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	568.9
Jivino	IC Engine	ALCO 3	2,500	1,171.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	406.4
Jivino	IC Engine	ALCO 4	2,500	111.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	43.6
Jivino	IC Engine	GM 5	2,500	921.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	377.7
Jivino	IC Engine	GM 6	2,500	437.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	172.2
Loreto	IC Engine	Caterpil.	520	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lumbaqui	Hydro	TURBINA 1	200	655.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lumbaqui	Hydro	TURBINA 2	200	336.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nvo. Rocafuerte	IC Engine	JD 1	250	299.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	124.2

Power Plant	Type	Unit	Capacity	Net Generation	Crude	Natural Gas	LPG	Naphtha	Residual Oil	Bagasse	Fuel Oil	Diesel
			kW	MWh	m^3	km^3	m^3	m^3	m^3	t	m^3	m^3
Palma Roja	IC Engine	U2	220	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Payamino	IC Engine	Caterpillar 1	650	11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.2
Payamino	IC Engine	Caterpillar 2	650	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Payamino	IC Engine	GM 1	1,575	100.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	39.2
Payamino	IC Engine	GM 2	2,500	1,020.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	353.5
Pto. El Carmen	IC Engine	CAT 1	450	2,345.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	960.3
Pto. El Carmen	IC Engine	U2	420	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pto. El Carmen	IC Engine	U3	185	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pto. El Carmen	IC Engine	U4	275	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sansahuari	IC Engine	G-1002	600	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Taracoa	IC Engine	G-1002	208	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tiputini	IC Engine	U1	113	461.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	203.3
Tiputini	IC Engine	U3	50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Interconexión Colombia	Ex/Import	Interconexión Colombia	540,000	500,162.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Batán	IC Engine	G4	5,418	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lligua	IC Engine	G1	2,500	1,033.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	303.3
Lligua	IC Engine	G2	2,500	109.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.0
Península	Hydro	G1	500	3,480.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Península	Hydro	G2	500	2,899.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Península	Hydro	G3	500	3,237.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Península	Hydro	G4	1,500	7,669.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Macas	IC Engine	GENERAL (2500kW)	4,780	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Santiago	Hydro	U1	380	374.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Angamarca	Hydro	Grupo 1	150	620.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Angamarca	Hydro	Grupo 2	150	164.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Catazacón	Hydro	Grupo 1	400	2,093.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Catazacón	Hydro	Grupo 2	400	2,263.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
El Estado	Hydro	Grupo 1	850	5,387.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
El Estado	Hydro	Grupo 2	850	4,389.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Illuchi No.1	Hydro	Grupo 1	698	2,908.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Illuchi No.1	Hydro	Grupo 2	698	3,652.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Power Plant	Type	Unit	Capacity	Net Generation	Crude	Natural Gas	LPG	Naphtha	Residual Oil	Bagasse	Fuel Oil	Diesel
			kW	MWh	m^3	km^3	m^3	m^3	m^3	t	m^3	m^3
Illuchi No.1	Hydro	Grupo 3	1,400	2,349.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Illuchi No.1	Hydro	Grupo 4	1,400	10,661.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Illuchi No.2	Hydro	Grupo 1	2,120	12,554.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Illuchi No.2	Hydro	Grupo 2	2,120	12,377.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ambi	Hydro	G1	4,000	10,819.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ambi	Hydro	G2	4,000	18,938.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
La Playa	Hydro	G1	440	2,078.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
La Playa	Hydro	G2	440	2,078.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
La Playa	Hydro	G3	440	2,078.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Francisco Norte	IC Engine	G1	2,500	1,274.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	394.2
San Gabriel	Hydro	G1	230	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Miguel de Car	Hydro	G1	2,950	22,228.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cumbayá	Hydro	U1	10,000	41,918.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cumbayá	Hydro	U2	10,000	55,527.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cumbayá	Hydro	U3	10,000	59,853.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cumbayá	Hydro	U4	10,000	32,691.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
G. Hernández	IC Engine	U1	5,720	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
G. Hernández	IC Engine	U2	5,720	26,873.6	0.0	0.0	0.0	0.0	0.0	0.0	6,189.3	153.9
G. Hernández	IC Engine	U3	5,720	24,891.1	0.0	0.0	0.0	0.0	0.0	0.0	5,736.9	135.6
G. Hernández	IC Engine	U4	5,720	27,881.0	0.0	0.0	0.0	0.0	0.0	0.0	6,432.6	143.4
G. Hernández	IC Engine	U5	5,720	22,535.1	0.0	0.0	0.0	0.0	0.0	0.0	5,182.0	134.4
G. Hernández	IC Engine	U6	5,720	27,680.2	0.0	0.0	0.0	0.0	0.0	0.0	6,377.7	154.2
GuangopoloH	Hydro	U1	2,000	1,327.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GuangopoloH	Hydro	U2	2,000	3,889.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GuangopoloH	Hydro	U3	1,700	4,082.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GuangopoloH	Hydro	U4	1,700	3,323.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GuangopoloH	Hydro	U5	2,000	4,911.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GuangopoloH	Hydro	U6	11,520	80,845.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Los Chillos	Hydro	U1	880	7,774.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Los Chillos	Hydro	U2	880	5,154.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Luluncoto	IC Engine	U1	3,025	9,246.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2,781.7
Luluncoto	IC Engine	U2	3,025	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Power Plant	Type	Unit	Capacity	Net Generation	Crude	Natural Gas	LPG	Naphtha	Residual Oil	Bagasse	Fuel Oil	Diesel
			kW	MWh	m³	km³	m³	m³	m³	t	m³	m³
Luluncoto	IC Engine	U3	3,025	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Luluncoto	IC Engine	U4	3,025	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nayón	Hydro	U1	14,850	77,659.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nayón	Hydro	U2	14,850	84,176.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oyacachi 1	Hydro	U1	70	124.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pasochoa	Hydro	U1	2,250	12,927.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pasochoa	Hydro	U2	2,250	12,513.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alao	Hydro	Grupo 1	2,600	21,639.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alao	Hydro	Grupo 2	2,600	22,073.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alao	Hydro	Grupo 3	2,600	19,238.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alao	Hydro	Grupo 4	2,600	20,380.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nizag	Hydro	Única	312	323.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Río Blanco	Hydro	Única	3,125	7,939.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Riobamba	IC Engine	Única	2,500	339.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	109.7
Carlos Mora	Hydro	U1	600	3,785.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Carlos Mora	Hydro	U2	600	3,888.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Carlos Mora	Hydro	U3	1,200	6,799.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Catamayo	IC Engine	U1	1,800	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Catamayo	IC Engine	U10	2,500	2,008.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	638.3
Catamayo	IC Engine	U2	1,280	1,203.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	320.4
Catamayo	IC Engine	U3	766	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Catamayo	IC Engine	U4	1,575	267.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	77.8
Catamayo	IC Engine	U5	1,575	175.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	58.8
Catamayo	IC Engine	U6	2,880	2,293.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	594.2
Catamayo	IC Engine	U7	2,880	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Catamayo	IC Engine	U8	2,500	1,919.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	606.8
Catamayo	IC Engine	U9	2,500	1,867.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	559.8
ECOELECTRIC	Steam Turbine	TURBO # 5	3,000	33,186.4	0.0	0.0	0.0	0.0	0.0	181,819.7	0.0	0.0
ECOELECTRIC	Steam Turbine	TURBO # 6	6,000	33,186.4	0.0	0.0	0.0	0.0	0.0	181,819.7	0.0	0.0

Power Plant	Type	Unit	Capacity kW	Net Generation MWh	Crude m3	Natural Gas km3	LPG m3	Naphtha m3	Residual Oil m3	Bagasse t	Fuel Oil m3	Diesel m3
ECOELECTRIC	Steam Turbine	TURBO # 7	27,500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Loreto	Hydro	Loreto	2,300	14,830.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Papallacta	Hydro	G1	2,190	729.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Papallacta	Hydro	G2	4,444	26,238.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ecudos A-G	Steam Turbine	TGE-1	3,000	4,312.3	0.0	0.0	0.0	0.0	0.0	23,957.1	0.0	0.0
Ecudos A-G	Steam Turbine	TGE-2	3,000	7,874.3	0.0	0.0	0.0	0.0	0.0	43,746.0	0.0	0.0
Ecudos A-G	Steam Turbine	TGE-3	12,500	17,076.6	0.0	0.0	0.0	0.0	0.0	79,425.9	0.0	0.0
Ecudos A-G	Steam Turbine	TGE-4	16,800	45,743.5	0.0	0.0	0.0	0.0	0.0	152,478.2	0.0	0.0
El Descanso	IC Engine	G1	4,800	25,270.7	0.0	0.0	0.0	0.0	5,519.0	0.0	0.0	533.1
El Descanso	IC Engine	G2	4,800	18,951.9	0.0	0.0	0.0	0.0	4,133.7	0.0	0.0	391.7
El Descanso	IC Engine	G3	4,800	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
El Descanso	IC Engine	G4	4,800	19,304.2	0.0	0.0	0.0	0.0	4,251.1	0.0	0.0	376.6
Monay	IC Engine	G6	11,625	319.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	103.0
Saucay	Hydro	G1	4,000	15,239.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saucay	Hydro	G2	4,000	15,093.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saucay	Hydro	G3	8,000	63,658.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saucay	Hydro	G4	8,000	63,485.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saymirín	Hydro	G1	1,256	6,756.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saymirín	Hydro	G2	1,256	7,254.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saymirín	Hydro	G3	1,960	12,663.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saymirín	Hydro	G4	1,960	12,704.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saymirín	Hydro	G5	4,000	34,775.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saymirín	Hydro	G6	4,000	35,100.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Álvaro Tinajero	Gas Turbine	G1-CAT	54,000	104,185.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30,717.9
Álvaro Tinajero	Gas Turbine	G2-CAT	40,800	32,133.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12,551.9
Aníbal Santos (Gas)	Gas Turbine	G1-CAS	22,650	7,971.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3,322.7
Aníbal Santos (Gas)	Gas Turbine	G2-CAS	22,300	3,729.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,503.3
Aníbal Santos (Gas)	Gas Turbine	G3-CAS	15,000	5,648.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2,433.0

Power Plant	Type	Unit	Capacity	Net Generation	Crude	Natural Gas	LPG	Naphtha	Residual Oil	Bagasse	Fuel Oil	Diesel
			kW	MWh	m^3	km^3	m^3	m^3	m^3	t	m^3	m^3
Aníbal Santos (Gas)	Gas Turbine	G5-CAS	23,700	5,818.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2,691.4
Aníbal Santos (Gas)	Gas Turbine	G6-CAS	23,120	2,835.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,296.7
Aníbal Santos (Vapor)	Steam Turbine	V1-CAS	34,500	68,875.6	0.0	0.0	0.0	0.0	0.0	0.0	23,030.8	0.0
Espejo	Hydro	U1	300	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Espejo	Hydro	U2	200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Otavalo	Hydro	U1	400	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Electroquil	Gas Turbine	U1	45,000	61,035.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16,978.4
Electroquil	Gas Turbine	U2	46,000	68,933.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19,913.8
Electroquil	Gas Turbine	U3	45,000	62,391.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17,888.8
Electroquil	Gas Turbine	U4	45,000	67,067.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19,083.2
El Carmen	Hydro	U1	8,400	39,130.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Noroccidente	Hydro	N.1	240	840.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Recuperadora	Hydro	N.1	14,700	96,345.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Calope	Hydro	U1	8,581	95,091.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Calope	Hydro	U2	8,581	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lasso	IC Engine	U1	3,750	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Machala	Gas Turbine	FA1	70,000	431,644.3	0.0	140,961.9	0.0	0.0	0.0	0.0	0.0	0.0
Machala	Gas Turbine	FA2	70,000	323,475.6	0.0	108,057.8	0.0	0.0	0.0	0.0	0.0	0.0
Generoca	IC Engine	U1	4,700	18,693.2	0.0	0.0	0.0	0.0	4,552.8	0.0	0.0	348.3
Generoca	IC Engine	U2	4,700	20,418.1	0.0	0.0	0.0	0.0	4,980.6	0.0	0.0	391.6
Generoca	IC Engine	U3	4,700	20,188.8	0.0	0.0	0.0	0.0	4,917.8	0.0	0.0	368.3
Generoca	IC Engine	U4	4,700	21,488.9	0.0	0.0	0.0	0.0	5,228.8	0.0	0.0	407.7
Generoca	IC Engine	U5	4,700	21,427.1	0.0	0.0	0.0	0.0	5,220.4	0.0	0.0	406.6
Generoca	IC Engine	U6	4,700	20,387.4	0.0	0.0	0.0	0.0	4,978.7	0.0	0.0	388.8
Generoca	IC Engine	U7	4,700	7,412.5	0.0	0.0	0.0	0.0	1,848.0	0.0	0.0	152.8
Generoca	IC Engine	U8	4,700	21,924.2	0.0	0.0	0.0	0.0	5,349.6	0.0	0.0	419.1
Hidroabanico	Hydro	U1	7,690	63,908.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hidroabanico	Hydro	U2	7,690	63,908.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hidroabanico	Hydro	U3	7,690	63,908.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hidroabanico	Hydro	U4	7,690	63,908.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hidroabanico	Hydro	U5	7,690	63,908.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Power Plant	Type	Unit	Capacity	Net Generation	Crude	Natural Gas	LPG	Naphtha	Residual Oil	Bagasse	Fuel Oil	Diesel
			kW	MWh	m^3	km^3	m^3	m^3	m^3	t	m^3	m^3
Marcel Laniado	Hydro	U1	71,000	206,411.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Marcel Laniado	Hydro	U2	71,000	324,777.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Marcel Laniado	Hydro	U3	71,000	265,635.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Francisco	Hydro	U1	115,000	511,857.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Francisco	Hydro	U2	115,000	460,527.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sibimbe	Hydro	U1	8,000	85,170.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sibimbe	Hydro	U2	8,000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
La Calera	Hydro	Corazón	500	4,711.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
La Calera	Hydro	Cotopaxi	1,000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
La Calera	Hydro	Rumiñahui	500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Victoria II	Gas Turbine	Victoria II	105,000	135,234.4	0.0	0.0	0.0	30,040.2	0.0	0.0	0.0	18,153.4
Vindobona	Hydro	U1	1,500	10,494.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Vindobona	Hydro	U2	1,500	5,499.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Selva Alegre	IC Engine	U1	4,170	79,532.2	0.0	0.0	0.0	0.0	18,805.6	0.0	0.0	2,354.7
Selva Alegre	IC Engine	U2	4,170	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Selva Alegre	IC Engine	U3	4,170	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Selva Alegre	IC Engine	U4	3,968	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
La Esperanza	Hydro	U1	3,000	14,105.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
La Esperanza	Hydro	U2	3,000	14,105.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Poza Honda	Hydro	U1	1,500	3,615.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Poza Honda	Hydro	U2	1,500	3,421.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Geppert	Hydro	Geppert	1,572	10,073.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Kohler	IC Engine	KOHLER	1,600	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Atuntaqui	Hydro	U1	200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Atuntaqui	Hydro	U2	200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cotacachi	Hydro	U2	440	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perlabí	Hydro	U1	2,700	15,983.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Interconexión Perú	Ex/Import	Interconexión Perú	110,000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Carlos	Steam Turbine	Turbo 1	3,000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Carlos	Steam Turbine	Turbo 2	4,000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Power Plant	Type	Unit	Capacity kW	Net Generation MWh	Crude m^3	Natural Gas km^3	LPG m^3	Naphtha m^3	Residual Oil m^3	Bagasse t	Fuel Oil m^3	Diesel m^3
San Carlos	Steam Turbine	Turbo 3	16,000	29,213.2	0.0	0.0	0.0	0.0	0.0	324,590.7	0.0	0.0
San Carlos	Steam Turbine	Turbo 4	12,000	29,213.2	0.0	0.0	0.0	0.0	0.0	324,590.7	0.0	0.0
Termoguayas	IC Engine	U1	20,000	157,859.2	0.0	0.0	0.0	0.0	0.0	0.0	39,939.2	0.0
Termoguayas	IC Engine	U2	40,000	232,943.0	0.0	0.0	0.0	0.0	0.0	0.0	59,186.9	0.0
Termoguayas	IC Engine	U3	40,000	59,188.8	0.0	0.0	0.0	0.0	0.0	0.0	15,224.5	0.0
Termoguayas	IC Engine	U4	50,000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Power Barge I	IC Engine	PB1	30,000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Annex 3.2: 2009 Net Generation and Fuel Consumption of Power Units, in the dataset provided by CONELEC

Power Plant	Type	Unit	Capacity kW	Net Generation MWh	Crude m^3	Natural Gas km^3	LPG m^3	Naphtha m^3	Residual Oil m^3	Bagasse t	Fuel Oil m^3	Diesel m^3
Sillunchi I	Hydro	U-100	100	566.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sillunchi II	Hydro	U-304	304	1,963.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Enrique García	Gas Turbine	TG-5	102,000	275,883.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	92,788.8
Gonzalo Zevallos (Gas)	Gas Turbine	TG-4	26,265	5,031.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2,203.6
Gonzalo Zevallos (Vapor)	Steam Turbine	TV-2	73,000	468,793.7	0.0	0.0	0.0	0.0	0.0	0.0	136,297.6	69.1
Gonzalo Zevallos (Vapor)	Steam Turbine	TV-3	73,000	464,660.6	0.0	0.0	0.0	0.0	0.0	0.0	134,887.6	105.4
Pascuales II	Gas Turbine	TM1	22,800	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pascuales II	Gas Turbine	TM2	22,800	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pascuales II	Gas Turbine	TM3	22,800	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pascuales II	Gas Turbine	TM4	22,800	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pascuales II	Gas Turbine	TM5	22,800	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pascuales II	Gas Turbine	TM6	22,800	136.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	43.6
Trinitaria	Steam Turbine	TV1	133,000	698,198.3	0.0	0.0	0.0	0.0	0.0	0.0	175,091.6	138.0
Agoyán	Hydro	U1	80,000	526,262.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Agoyán	Hydro	U2	80,000	419,117.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pucará	Hydro	U1	36,500	110,442.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pucará	Hydro	U2	36,500	140,130.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paute	Hydro	U1	100,000	416,126.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paute	Hydro	U10	115,000	509,271.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paute	Hydro	U2	100,000	414,263.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paute	Hydro	U3	100,000	427,856.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paute	Hydro	U4	100,000	460,433.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paute	Hydro	U5	100,000	429,045.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paute	Hydro	U6	115,000	519,559.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paute	Hydro	U7	115,000	521,453.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paute	Hydro	U8	115,000	531,972.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paute	Hydro	U9	115,000	524,365.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Termoesmeraldas	Steam Turbine	CTE	132,500	943,529.0	0.0	0.0	0.0	0.0	0.0	0.0	240,906.2	215.7
Campo Alegre	IC Engine	CA4	150	58.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.7
Campo Alegre	IC Engine	CA5	150	52.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.9
Campo Alegre	IC Engine	CA6	100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cauchiche	IC Engine	C6	45	18.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.7

Power Plant	Type	Unit	Capacity kW	Net Generation MWh	Crude m^3	Natural Gas km^3	LPG m^3	Naphtha m^3	Residual Oil m^3	Bagasse t	Fuel Oil m^3	Diesel m^3
Cauchiche	IC Engine	C7	35	19.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.1
Guangopolo	IC Engine	U1	5,200	31,020.0	0.0	0.0	0.0	0.0	6,366.9	0.0	0.0	716.7
Guangopolo	IC Engine	U2	5,200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Guangopolo	IC Engine	U3	5,200	37,132.7	0.0	0.0	0.0	0.0	7,893.6	0.0	0.0	654.0
Guangopolo	IC Engine	U4	5,200	33,225.0	0.0	0.0	0.0	0.0	7,069.8	0.0	0.0	668.5
Guangopolo	IC Engine	U5	5,200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Guangopolo	IC Engine	U6	5,200	23,238.8	0.0	0.0	0.0	0.0	4,836.6	0.0	0.0	528.8
Guangopolo	IC Engine	U7	1,920	3,812.6	0.0	0.0	0.0	0.0	1,259.7	0.0	0.0	122.2
La Propicia	IC Engine	U1	4,416	18,722.2	0.0	0.0	0.0	0.0	3,610.5	0.0	0.0	1,746.4
La Propicia	IC Engine	U3	4,416	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Miraflores	IC Engine	1	3,400	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Miraflores	IC Engine	10	2,500	4,524.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,077.0
Miraflores	IC Engine	11	6,000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Miraflores	IC Engine	12	6,000	13,756.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3,255.2
Miraflores	IC Engine	13	2,500	2,615.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	565.1
Miraflores	IC Engine	14	2,500	1,560.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	304.6
Miraflores	IC Engine	16	2,500	394.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	105.6
Miraflores	IC Engine	18	2,500	3,719.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	939.3
Miraflores	IC Engine	2	3,400	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Miraflores	IC Engine	22	2,500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Miraflores	IC Engine	3	3,400	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Miraflores	IC Engine	4	3,400	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Miraflores	IC Engine	7	2,500	2,669.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	653.9
Miraflores	IC Engine	8	2,500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Miraflores	IC Engine	9	2,500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Miraflores	Gas Turbine	TG1	22,800	2,961.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	792.7
Pedernales	IC Engine	P-U1	2,500	3,680.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,103.4
Power Barge II	IC Engine	PB-1	12,500	6,936.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,657.5
Power Barge II	IC Engine	PB-2	12,500	4,936.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,241.0
Power Barge II	IC Engine	PB-3	12,500	5,248.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,228.4
Power Barge II	IC Engine	PB-4	12,500	5,120.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,183.3
Puná Nueva	IC Engine	Cummins No.2	700	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Puná Nueva	IC Engine	Perkins	350	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Puná Nueva	IC Engine	PN1	500	492.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	150.5

Power Plant	Type	Unit	Capacity kW	Net Generation MWh	Crude m^3	Natural Gas km^3	LPG m^3	Naphtha m^3	Residual Oil m^3	Bagasse t	Fuel Oil m^3	Diesel m^3
Puná Nueva	IC Engine	PN2	500	464.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	145.0
Puná Nueva	IC Engine	PN3	1,000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Santa Rosa	Gas Turbine	TG1	17,100	29,942.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11,561.0
Santa Rosa	Gas Turbine	TG2	17,100	38,833.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15,155.1
Santa Rosa	Gas Turbine	TG3	17,100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chimbo	Hydro	U1	563	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chimbo	Hydro	U2	1,100	3,274.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chimbo	Hydro	U3	235	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chimbo	Hydro	U4	1,100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chimbo	Hydro	U5	235	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Guaranda	IC Engine	U2	2,541	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bellavista	IC Engine	Deutz BF4L2011	105	31.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.4
Collin Lockett	IC Engine	Crossley #4	10,900	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Costa Rica	IC Engine	Perkins 1104A-44TG2	53	63.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.2
Jambelí	IC Engine	Cummins #2	300	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Machala	IC Engine	G. M. #5	5,000	396.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	120.5
Pongalillo	IC Engine	Deutz	35	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Lorenzo	IC Engine	1	1,100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Centro Industrial	IC Engine	4	11,460	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Milagro	IC Engine	8	15,000	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
La Libertad	IC Engine	9	27,300	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Playas	IC Engine	4	1,802	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Posorja	IC Engine	5	2,840	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Celso Castellanos	IC Engine	GM 1	2,500	692.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	226.9
Celso Castellanos	IC Engine	GM 2	2,500	667.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	223.3
Celso Castellanos	IC Engine	GM 3	2,500	2,872.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	919.7
Celso Castellanos	IC Engine	GM 4	2,500	2,578.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	822.9
Dayuma	IC Engine	U2	192	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jivino	IC Engine	ALCO 1	2,500	40.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.1
Jivino	IC Engine	ALCO 2	2,500	2,052.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	637.2
Jivino	IC Engine	ALCO 3	2,500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jivino	IC Engine	ALCO 4	2,500	163.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	47.3
Jivino	IC Engine	GM 5	2,500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Power Plant	Type	Unit	Capacity kW	Net Generation MWh	Crude m^3	Natural Gas km^3	LPG m^3	Naphtha m^3	Residual Oil m^3	Bagasse t	Fuel Oil m^3	Diesel m^3
Jivino	IC Engine	GM 6	2,500	649.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	204.6
Jivino	IC Engine	MAN 1	5,800	18,740.1	3,704.8	0.0	0.0	0.0	0.0	0.0	0.0	255.6
Jivino	IC Engine	MAN2	5,800	19,995.6	4,798.8	0.0	0.0	0.0	0.0	0.0	0.0	429.5
Loreto	IC Engine	Caterpil.	520	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lumbaqui	Hydro	TURBINA 1	200	539.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lumbaqui	Hydro	TURBINA 2	200	371.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nvo. Rocafuerte	IC Engine	Detroit	280	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nvo. Rocafuerte	IC Engine	JD 1	170	348.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	137.9
Palma Roja	IC Engine	U2	80	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Payamino	IC Engine	Caterpillar 1	1,575	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Payamino	IC Engine	Caterpillar 2	2,500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pto. El Carmen	IC Engine	CAT 1	650	2,618.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,100.0
Sansahuari	IC Engine	G-1002	600	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Taracoa	IC Engine	G-1002	208	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tiputini	IC Engine	U1	440	702.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	272.1
Interconexión Colombia	Ex/Import	Interconexión Colombia	540,000	1,058,204.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tiliví	Hydro	U1	120	335.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Batán	IC Engine	G4	5,418	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lligua	IC Engine	G1	2,500	190.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	54.5
Lligua	IC Engine	G2	2,500	471.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	143.2
Península	Hydro	G1	500	480.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Península	Hydro	G2	500	1,333.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Península	Hydro	G3	500	2,179.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Península	Hydro	G4	1,500	7,006.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Macas	IC Engine	GENERAL (2500kW)	4,780	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Santiago	Hydro	U1	380	551.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Angamarca	Hydro	Grupo 1	150	436.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Angamarca	Hydro	Grupo 2	150	257.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Catazacón	Hydro	Grupo 1	400	1,934.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Catazacón	Hydro	Grupo 2	400	1,802.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
El Estado	Hydro	Grupo 1	850	3,469.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
El Estado	Hydro	Grupo 2	850	4,002.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Power Plant	Type	Unit	Capacity kW	Net Generation MWh	Crude m^3	Natural Gas km^3	LPG m^3	Naphtha m^3	Residual Oil m^3	Bagasse t	Fuel Oil m^3	Diesel m^3
Illuchi No.1	Hydro	Grupo 1	697	1,016.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Illuchi No.1	Hydro	Grupo 2	697	1,674.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Illuchi No.1	Hydro	Grupo 3	1,400	7,960.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Illuchi No.1	Hydro	Grupo 4	1,400	8,440.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Illuchi No.2	Hydro	Grupo 1	2,600	11,132.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Illuchi No.2	Hydro	Grupo 2	2,600	11,757.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ambi	Hydro	G1	4,000	5,409.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ambi	Hydro	G2	4,000	18,887.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
La Playa	Hydro	G1	440	4,917.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
La Playa	Hydro	G2	440	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
La Playa	Hydro	G3	440	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Francisco Norte	IC Engine	G1	2,500	4,287.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,277.6
San Gabriel	Hydro	G1	230	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Miguel de Car	Hydro	G1	2,950	17,612.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cumbayá	Hydro	U1	10,000	41,127.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cumbayá	Hydro	U2	10,000	37,218.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cumbayá	Hydro	U3	10,000	45,351.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cumbayá	Hydro	U4	10,000	36,493.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
G. Hernández	IC Engine	U1	5,720	21,519.9	0.0	0.0	0.0	0.0	0.0	0.0	63.3	4,957.0
G. Hernández	IC Engine	U2	5,720	34,253.3	0.0	0.0	0.0	0.0	0.0	0.0	58.6	8,116.2
G. Hernández	IC Engine	U3	5,720	31,218.5	0.0	0.0	0.0	0.0	0.0	0.0	72.2	7,287.3
G. Hernández	IC Engine	U4	5,720	32,227.8	0.0	0.0	0.0	0.0	0.0	0.0	90.9	7,523.4
G. Hernández	IC Engine	U5	5,720	28,917.0	0.0	0.0	0.0	0.0	0.0	0.0	75.7	6,813.4
G. Hernández	IC Engine	U6	5,720	32,654.3	0.0	0.0	0.0	0.0	0.0	0.0	66.2	7,698.2
GuangopoloH	Hydro	U1	2,000	76,807.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GuangopoloH	Hydro	U2	2,000	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GuangopoloH	Hydro	U3	1,700	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GuangopoloH	Hydro	U4	1,700	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GuangopoloH	Hydro	U5	2,000	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GuangopoloH	Hydro	U6	11,520	4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Los Chillos	Hydro	U1	880	13,156.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Los Chillos	Hydro	U2	880	5.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Luluncoto	IC Engine	U1	3,025	2,300.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Luluncoto	IC Engine	U2	3,025	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Power Plant	Type	Unit	Capacity kW	Net Generation MWh	Crude m^3	Natural Gas km^3	LPG m^3	Naphtha m^3	Residual Oil m^3	Bagasse t	Fuel Oil m^3	Diesel m^3
Luluncoto	IC Engine	U3	3,025	3,130.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nayón	Hydro	U1	14,850	63,369.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nayón	Hydro	U2	14,850	67,866.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oyacachi 1	Hydro	U1	70	141.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pasochoa	Hydro	U1	2,250	23,331.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pasochoa	Hydro	U2	2,250	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alao	Hydro	Grupo 1	2,600	20,188.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alao	Hydro	Grupo 2	2,600	20,839.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alao	Hydro	Grupo 3	2,600	17,914.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alao	Hydro	Grupo 4	2,600	20,125.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nizag	Hydro	Única	312	904.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Río Blanco	Hydro	Única	3,125	16,192.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Riobamba	IC Engine	Única	2,500	2,738.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	853.4
Carlos Mora	Hydro	U1	600	4,249.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Carlos Mora	Hydro	U2	600	4,187.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Carlos Mora	Hydro	U3	1,200	7,923.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Catamayo	IC Engine	U1	1,800	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Catamayo	IC Engine	U10	2,500	1,991.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	630.3
Catamayo	IC Engine	U2	1,280	2,492.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	665.2
Catamayo	IC Engine	U3	766	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Catamayo	IC Engine	U4	1,575	3,349.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	979.5
Catamayo	IC Engine	U5	1,575	3,351.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,083.0
Catamayo	IC Engine	U6	2,880	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Catamayo	IC Engine	U7	2,880	7,459.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,696.4
Catamayo	IC Engine	U8	2,500	6,318.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,925.5
Catamayo	IC Engine	U9	2,500	7,573.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2,214.0
ECOELECTRIC	Steam Turbine	TURBO # 5	3,000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ECOELECTRIC	Steam Turbine	TURBO # 6	6,000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ECOELECTRIC	Steam Turbine	TURBO # 7	27,500	69,374.8	0.0	0.0	0.0	0.0	0.0	333,138.9	0.0	0.0
Loreto	Hydro	Loreto	2,300	14,368.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Papallacta	Hydro	G1	2,190	837.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Papallacta	Hydro	G2	4,444	24,428.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ecudos A-G	Steam Turbine	TGE-1	3,000	8,414.1	0.0	0.0	0.0	0.0	0.0	46,744.9	0.0	0.0
Ecudos A-G	Steam Turbine	TGE-2	3,000	9,238.9	0.0	0.0	0.0	0.0	0.0	51,327.2	0.0	0.0

Power Plant	Type	Unit	Capacity kW	Net Generation MWh	Crude m^3	Natural Gas km^3	LPG m^3	Naphtha m^3	Residual Oil m^3	Bagasse t	Fuel Oil m^3	Diesel m^3
Ecudos A-G	Steam Turbine	TGE-3	12,500	19,565.1	0.0	0.0	0.0	0.0	0.0	91,000.4	0.0	0.0
Ecudos A-G	Steam Turbine	TGE-4	16,800	32,054.1	0.0	0.0	0.0	0.0	0.0	106,847.1	0.0	0.0
El Descanso	IC Engine	G1	4,800	12,908.4	0.0	0.0	0.0	0.0	2,803.0	0.0	0.0	274.0
El Descanso	IC Engine	G2	4,800	31,153.0	0.0	0.0	0.0	0.0	6,050.3	0.0	0.0	567.9
El Descanso	IC Engine	G3	4,800	8,595.2	0.0	0.0	0.0	0.0	1,249.9	0.0	0.0	179.9
El Descanso	IC Engine	G4	4,800	31,051.4	0.0	0.0	0.0	0.0	6,122.2	0.0	0.0	559.2
Monay	IC Engine	G6	11,625	124.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.6
Saucay	Hydro	G1	4,000	9,360.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saucay	Hydro	G2	4,000	9,709.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saucay	Hydro	G3	8,000	49,972.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saucay	Hydro	G4	8,000	49,896.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saymirín	Hydro	G1	1,256	3,192.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saymirín	Hydro	G2	1,256	3,550.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saymirín	Hydro	G3	1,960	7,515.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saymirín	Hydro	G4	1,960	7,439.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saymirín	Hydro	G5	4,000	31,779.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saymirín	Hydro	G6	4,000	32,222.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Álvaro Tinajero	Gas Turbine	G1-CAT	54,000	167,511.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	48,264.7
Álvaro Tinajero	Gas Turbine	G2-CAT	40,800	56,895.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20,593.8
Aníbal Santos (Gas)	Gas Turbine	G1-CAS	22,650	9,289.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3,845.0
Aníbal Santos (Gas)	Gas Turbine	G2-CAS	22,300	7,510.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3,022.1
Aníbal Santos (Gas)	Gas Turbine	G3-CAS	15,000	15,991.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6,733.3
Aníbal Santos (Gas)	Gas Turbine	G5-CAS	23,700	48,219.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20,312.3
Aníbal Santos (Gas)	Gas Turbine	G6-CAS	23,120	43,786.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19,782.3
Aníbal Santos (Vapor)	Steam Turbine	V1-CAS	34,500	46,772.1	0.0	0.0	0.0	0.0	0.0	0.0	15,945.2	0.0
Espejo	Hydro	U1	300	19.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Espejo	Hydro	U2	200	19.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Otavalo	Hydro	U1	400	19.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Electroquil	Gas Turbine	U1	45,000	143,211.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40,518.4
Electroquil	Gas Turbine	U2	46,000	146,183.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	41,355.3
Electroquil	Gas Turbine	U3	45,000	107,630.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29,285.0
Electroquil	Gas Turbine	U4	45,000	130,558.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	37,909.8
El Carmen	Hydro	U1	8,400	45,895.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Noroccidente	Hydro	N.1	240	404.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Power Plant	Type	Unit	Capacity kW	Net Generation MWh	Crude m^3	Natural Gas km^3	LPG m^3	Naphtha m^3	Residual Oil m^3	Bagasse t	Fuel Oil m^3	Diesel m^3
Recuperadora	Hydro	N.1	14,700	99,457.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Calope	Hydro	U1	8,581	40,581.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Calope	Hydro	U2	8,581	40,581.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lasso	IC Engine	U1	3,750	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Machala	Gas Turbine	FA1	70,000	511,696.4	0.0	165,011.6	0.0	0.0	0.0	0.0	0.0	0.0
Machala	Gas Turbine	FA2	70,000	395,504.3	0.0	130,857.0	0.0	0.0	0.0	0.0	0.0	0.0
Generoca	IC Engine	U1	4,700	25,773.9	0.0	0.0	0.0	0.0	6,265.9	0.0	0.0	422.8
Generoca	IC Engine	U2	4,700	20,341.2	0.0	0.0	0.0	0.0	4,741.2	0.0	0.0	327.8
Generoca	IC Engine	U3	4,700	25,446.7	0.0	0.0	0.0	0.0	6,260.9	0.0	0.0	423.4
Generoca	IC Engine	U4	4,700	19,696.7	0.0	0.0	0.0	0.0	4,760.0	0.0	0.0	314.4
Generoca	IC Engine	U5	4,700	26,348.6	0.0	0.0	0.0	0.0	6,260.2	0.0	0.0	423.9
Generoca	IC Engine	U6	4,700	25,684.6	0.0	0.0	0.0	0.0	6,268.0	0.0	0.0	420.2
Generoca	IC Engine	U7	4,700	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Generoca	IC Engine	U8	4,700	24,929.2	0.0	0.0	0.0	0.0	6,084.6	0.0	0.0	405.1
Hidroabanico	Hydro	U1	7,690	63,698.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hidroabanico	Hydro	U2	7,690	63,698.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hidroabanico	Hydro	U3	7,690	63,698.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hidroabanico	Hydro	U4	7,690	63,698.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hidroabanico	Hydro	U5	7,690	63,698.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Marcel Laniado	Hydro	U1	71,000	87,174.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Marcel Laniado	Hydro	U2	71,000	271,298.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Marcel Laniado	Hydro	U3	71,000	230,914.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Francisco	Hydro	U1	115,000	284,946.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Francisco	Hydro	U2	115,000	777,629.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sibimbe	Hydro	U1	8,000	40,334.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sibimbe	Hydro	U2	8,000	40,334.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uravia	Hydro	U1	500	5,523.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
La Calera	Hydro	Corazón	500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
La Calera	Hydro	Cotopaxi	1,000	5,630.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
La Calera	Hydro	Rumiñahui	500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Victoria II	Gas Turbine	Victoria II	5,000	136,529.1	0.0	0.0	0.0	37,676.9	0.0	0.0	0.0	8,187.5
Vindobona	Hydro	U1	1,500	9,563.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Vindobona	Hydro	U2	1,500	9,807.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Selva Alegre	IC Engine	U1	4,170	19,030.0	0.0	0.0	0.0	0.0	4,156.7	0.0	0.0	643.9

Power Plant	Type	Unit	Capacity kW	Net Generation MWh	Crude m^3	Natural Gas km^3	LPG m^3	Naphtha m^3	Residual Oil m^3	Bagasse t	Fuel Oil m^3	Diesel m^3
Selva Alegre	IC Engine	U2	4,170	21,837.9	0.0	0.0	0.0	0.0	4,793.2	0.0	0.0	727.3
Selva Alegre	IC Engine	U3	4,170	17,136.1	0.0	0.0	0.0	0.0	3,725.1	0.0	0.0	616.9
Selva Alegre	IC Engine	U4	3,848	4,329.8	0.0	0.0	0.0	0.0	972.1	0.0	0.0	127.0
Selva Alegre	IC Engine	U5	5,562	5,476.4	0.0	0.0	0.0	0.0	1,148.8	0.0	0.0	206.9
Selva Alegre	IC Engine	U6	5,562	25,686.3	0.0	0.0	0.0	0.0	5,582.6	0.0	0.0	935.1
Selva Alegre	IC Engine	U7	5,562	22,939.0	0.0	0.0	0.0	0.0	5,083.4	0.0	0.0	730.4
La Esperanza	Hydro	U1	3,000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
La Esperanza	Hydro	U2	3,000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Poza Honda	Hydro	U1	1,500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Poza Honda	Hydro	U2	1,500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Geppert	Hydro	Geppert	1,572	4,696.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Kohler	IC Engine	KOHLER	1,600	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Atuntaqui	Hydro	U1	200	785.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Atuntaqui	Hydro	U2	200	785.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cotacachi	Hydro	U2	440	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perlabí	Hydro	U1	2,700	13,900.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Interconexión Perú	Ex/Import	Interconexión Perú	110,000	62,548.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Carlos	Steam Turbine	Turbo 1	3,000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Carlos	Steam Turbine	Turbo 2	4,000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Carlos	Steam Turbine	Turbo 3	16,000	44,826.8	0.0	0.0	0.0	0.0	0.0	153,469.5	0.0	0.0
San Carlos	Steam Turbine	Turbo 4	12,000	22,209.7	0.0	0.0	0.0	0.0	0.0	80,232.1	0.0	0.0
Termoguayas	IC Engine	U1	20,000	174,252.8	0.0	0.0	0.0	0.0	0.0	0.0	44,508.7	0.0
Termoguayas	IC Engine	U2	40,000	311,313.7	0.0	0.0	0.0	0.0	0.0	0.0	79,840.8	0.0
Termoguayas	IC Engine	U3	40,000	92,360.9	0.0	0.0	0.0	0.0	0.0	0.0	23,848.9	0.0
Termoguayas	IC Engine	U4	50,000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Power Barge I	IC Engine	PB1	30,000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Annex 3.3: 2010 Net Generation and Fuel Consumption of Power Units, in the dataset provided by CONELEC

Power Plant	Type	Unit	Capacity kW	Net Generation MWh	Crude m^3	Natural Gas km^3	LPG m^3	Naphtha m^3	Residual Oil m^3	Bagasse t	Fuel Oil m^3	Diesel m^3
Sillunchi I	Hydro	U-100	100	681.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sillunchi II	Hydro	U-304	304	2,140.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Enrique García	Gas Turbine	TG-5	102,000	310,740.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	104,482.9
Gonzalo Zevallos (Gas)	Gas Turbine	TG-4	26,265	3,684.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,639.8
Gonzalo Zevallos (Vapor)	Steam Turbine	TV-2	73,000	497,789.4	0.0	0.0	0.0	0.0	0.0	0.0	145,557.1	105.3
Gonzalo Zevallos (Vapor)	Steam Turbine	TV-3	73,000	490,926.2	0.0	0.0	0.0	0.0	0.0	0.0	142,337.7	72.4
Pascuales II	Gas Turbine	TM1	22,800	98,410.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28,953.7
Pascuales II	Gas Turbine	TM2	22,800	108,048.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31,533.2
Pascuales II	Gas Turbine	TM3	22,800	105,523.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31,035.3
Pascuales II	Gas Turbine	TM4	22,800	100,484.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29,430.9
Pascuales II	Gas Turbine	TM5	22,800	98,019.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29,892.4
Pascuales II	Gas Turbine	TM6	22,800	81,775.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24,497.0
Trinitaria	Steam Turbine	TV1	133,000	861,412.9	0.0	0.0	0.0	0.0	0.0	0.0	214,517.5	60.2
Agoyán	Hydro	U1	80,000	427,732.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Agoyán	Hydro	U2	80,000	485,903.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pucará	Hydro	U1	36,500	81,608.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pucará	Hydro	U2	36,500	59,913.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mazar	Hydro	U1	91,830	232,518.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mazar	Hydro	U2	91,830	29,770.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paute	Hydro	U1	100,000	342,617.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paute	Hydro	U10	115,000	411,709.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paute	Hydro	U2	100,000	355,163.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paute	Hydro	U3	100,000	347,803.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paute	Hydro	U4	100,000	360,033.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paute	Hydro	U5	100,000	409,598.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paute	Hydro	U6	115,000	422,644.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paute	Hydro	U7	115,000	397,881.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paute	Hydro	U8	115,000	426,944.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Power Plant	Type	Unit	Capacity kW	Net Generation MWh	Crude m^3	Natural Gas km^3	LPG m^3	Naphtha m^3	Residual Oil m^3	Bagasse t	Fuel Oil m^3	Diesel m^3
Paute	Hydro	U9	115,000	573,134.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Termoesmeraldas	Steam Turbine	CTE	132,500	449,543.1	0.0	0.0	0.0	0.0	0.0	0.0	116,333.4	332.3
Campo Alegre	IC Engine	CA4	150	88.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	48.8
Campo Alegre	IC Engine	CA5	150	170.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	74.8
Campo Alegre	IC Engine	CA6	100	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Cauchiche	IC Engine	C6	45	26.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.5
Cauchiche	IC Engine	C7	35	29.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.0
Guangopolo	IC Engine	U1	5,200	34,083.5	0.0	0.0	0.0	0.0	7,218.7	0.0	0.0	740.9
Guangopolo	IC Engine	U3	5,200	31,629.3	0.0	0.0	0.0	0.0	6,728.9	0.0	0.0	610.0
Guangopolo	IC Engine	U4	5,200	19,580.8	0.0	0.0	0.0	0.0	4,211.4	0.0	0.0	377.1
Guangopolo	IC Engine	U7	1,920	4,354.2	0.0	0.0	0.0	0.0	1,135.2	0.0	0.0	136.6
La Propicia	IC Engine	U1	4,000	13,637.2	0.0	0.0	0.0	0.0	3,121.2	0.0	0.0	719.0
La Propicia	IC Engine	U3	2,500	1,543.0	0.0	0.0	0.0	0.0	204.5	0.0	0.0	490.7
Miraflores	IC Engine	10	2,500	3,544.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	931.7
Miraflores	IC Engine	11	6,000	1,983.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	487.4
Miraflores	IC Engine	12	6,000	21,062.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5,411.8
Miraflores	IC Engine	13	2,500	973.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	240.1
Miraflores	IC Engine	14	2,500	2,204.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	609.2
Miraflores	IC Engine	16	2,500	4,630.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,225.9
Miraflores	IC Engine	18	2,500	4,701.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,241.6
Miraflores	IC Engine	22	2,500	187.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	46.1
Miraflores	IC Engine	7	2,500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Miraflores	IC Engine	8	2,500	1,550.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	376.5
Miraflores	IC Engine	9	2,500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Miraflores	Gas Turbine	TG1	22,800	103,216.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30,135.3
Pedernales	IC Engine	P-U1	2,500	3,228.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,007.5
Power Barge II	IC Engine	PB-1	12,500	12,229.7	0.0	0.0	0.0	0.0	0.0	0.0	1,979.8	1,370.5
Power Barge II	IC Engine	PB-2	12,500	16,280.3	0.0	0.0	0.0	0.0	0.0	0.0	2,608.2	1,883.3
Power Barge II	IC Engine	PB-3	12,500	8,897.3	0.0	0.0	0.0	0.0	0.0	0.0	1,435.0	1,026.1
Power Barge II	IC Engine	PB-4	12,500	10,818.4	0.0	0.0	0.0	0.0	0.0	0.0	1,736.8	1,256.2
Puná Nueva	IC Engine	Cummins No.2	560	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Puná Nueva	IC Engine	Perkins	560	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Power Plant	Type	Unit	Capacity	Net Generation	Crude	Natural Gas	LPG	Naphtha	Residual Oil	Bagasse	Fuel Oil	Diesel
			kW	MWh	m^3	km^3	m^3	m^3	m^3	t	m^3	m^3
Puná Nueva	IC Engine	PN1	500	824.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	265.3
Puná Nueva	IC Engine	PN2	750	433.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	144.6
Puná Nueva	IC Engine	PN3	1,000	489.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	164.4
Puná Viejo	IC Engine	U1	35	3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.4
Puná Viejo	IC Engine	U2	35	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.8
Quevedo	IC Engine	Quevedo	130,000	456,933.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	138,694.0
Santa Elena	IC Engine	Santa Elena	75,000	244,332.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	67,907.2
Santa Rosa	Gas Turbine	TG1	17,100	26,550.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10,302.0
Santa Rosa	Gas Turbine	TG2	17,100	32,768.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12,937.9
Santa Rosa	Gas Turbine	TG3	17,100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chimbo	Hydro	U1	563	150.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chimbo	Hydro	U2	1,100	4,343.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bellavista	IC Engine	Deutz BF4L2011	45	8.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.2
Bellavista	IC Engine	FG WILSON P44E5	45	21.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.6
Costa Rica	IC Engine	FG WILSON P88E1	96	34.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.5
Costa Rica	IC Engine	Perkins 1104A-44TG2	80	23.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.2
San Lorenzo	IC Engine	1	1,100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Celso Castellanos	IC Engine	GM 1	2,500	250.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.8
Celso Castellanos	IC Engine	GM 2	2,500	1,347.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	425.4
Celso Castellanos	IC Engine	GM 3	2,500	3,871.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,219.0
Celso Castellanos	IC Engine	GM 4	2,500	2,235.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	706.4
Jivino	IC Engine	ALCO 1	2,500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jivino	IC Engine	ALCO 2	2,500	2,182.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	676.6
Jivino	IC Engine	ALCO 3	2,500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jivino	IC Engine	ALCO 4	2,500	1,557.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	480.1
Jivino	IC Engine	GM 5	2,500	1,719.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	545.1
Jivino	IC Engine	GM 6	2,500	77.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.5
Jivino	IC Engine	MAN 1	5,800	26,956.5	6,079.9	0.0	0.0	0.0	0.0	0.0	0.0	318.7
Jivino	IC Engine	MAN2	5,800	14,341.7	3,280.2	0.0	0.0	0.0	0.0	0.0	0.0	165.0
Lumbaqui	Hydro	TURBINA 1	200	702.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Power Plant	Type	Unit	Capacity kW	Net Generation MWh	Crude m^3	Natural Gas km^3	LPG m^3	Naphtha m^3	Residual Oil m^3	Bagasse t	Fuel Oil m^3	Diesel m^3
Lumbaqui	Hydro	TURBINA 2	200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nvo. Rocafuerte	IC Engine	Detroit	280	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nvo. Rocafuerte	IC Engine	JD 1	170	334.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	144.6
Payamino	IC Engine	Caterpillar 1	650	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Payamino	IC Engine	Caterpillar 2	650	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Payamino	IC Engine	GM 1	1,575	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Payamino	IC Engine	GM 2	2,500	365.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	115.8
Pto. El Carmen	IC Engine	CAT 1	650	3,263.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,277.1
Tiputini	IC Engine	U1	160	648.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	237.2
Interconexión Colombia	Ex/Import	Interconexión Colombia	540,000	794,510.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tiliví	Hydro	U1	120	325.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lligua	IC Engine	G1	2,500	69.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.6
Lligua	IC Engine	G2	2,500	133.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	65.1
Península	Hydro	G1	500	1,965.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Península	Hydro	G2	500	1,588.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Península	Hydro	G3	500	601.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Península	Hydro	G4	1,500	5,841.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Santiago	Hydro	U1	500	390.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Angamarca	Hydro	Grupo 1	150	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Angamarca	Hydro	Grupo 2	150	572.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Catazacón	Hydro	Grupo 1	400	2,149.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Catazacón	Hydro	Grupo 2	400	2,822.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
El Estado	Hydro	Grupo 1	850	1,949.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
El Estado	Hydro	Grupo 2	850	5,269.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Illuchi No.1	Hydro	Grupo 1	697	1,258.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Illuchi No.1	Hydro	Grupo 2	697	1,654.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Illuchi No.1	Hydro	Grupo 3	1,400	6,509.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Illuchi No.1	Hydro	Grupo 4	1,400	8,491.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Illuchi No.2	Hydro	Grupo 1	2,600	11,562.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Illuchi No.2	Hydro	Grupo 2	2,600	9,258.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ambi	Hydro	G1	4,000	13,810.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ambi	Hydro	G2	4,000	12,586.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Power Plant	Type	Unit	Capacity kW	Net Generation MWh	Crude m^3	Natural Gas km^3	LPG m^3	Naphtha m^3	Residual Oil m^3	Bagasse t	Fuel Oil m^3	Diesel m^3
La Playa	Hydro	G1	440	2,033.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
La Playa	Hydro	G2	440	2,033.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
La Playa	Hydro	G3	440	2,033.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Francisco Norte	IC Engine	G1	2,500	2,418.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	740.5
San Miguel de Car	Hydro	G1	2,950	17,744.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cumbayá	Hydro	U1	10,000	35,637.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cumbayá	Hydro	U2	10,000	33,644.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cumbayá	Hydro	U3	10,000	36,884.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cumbayá	Hydro	U4	10,000	34,240.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
G. Hernández	IC Engine	U1	5,720	29,699.4	0.0	0.0	0.0	0.0	0.0	0.0	6,897.9	70.2
G. Hernández	IC Engine	U2	5,720	31,060.9	0.0	0.0	0.0	0.0	0.0	0.0	7,320.0	48.2
G. Hernández	IC Engine	U3	5,720	34,410.3	0.0	0.0	0.0	0.0	0.0	0.0	8,160.2	49.3
G. Hernández	IC Engine	U4	5,720	32,665.1	0.0	0.0	0.0	0.0	0.0	0.0	7,789.1	44.0
G. Hernández	IC Engine	U5	5,720	32,953.4	0.0	0.0	0.0	0.0	0.0	0.0	7,852.6	65.9
G. Hernández	IC Engine	U6	5,720	31,563.5	0.0	0.0	0.0	0.0	0.0	0.0	7,585.8	41.6
GuangopoloH	Hydro	U1	2,000	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GuangopoloH	Hydro	U2	2,000	6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GuangopoloH	Hydro	U3	1,700	28.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GuangopoloH	Hydro	U4	1,700	1,735.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GuangopoloH	Hydro	U5	2,000	6.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GuangopoloH	Hydro	U6	11,520	63,447.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Los Chillos	Hydro	U1	880	5,980.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Los Chillos	Hydro	U2	880	6,508.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Luluncoto	IC Engine	U1	3,025	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Luluncoto	IC Engine	U2	3,025	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Luluncoto	IC Engine	U3	3,025	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nayón	Hydro	U1	14,850	72,466.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nayón	Hydro	U2	14,850	42,869.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oyacachi 1	Hydro	U1	100	129.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pasochoa	Hydro	U1	2,250	11,730.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pasochoa	Hydro	U2	2,250	12,130.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alao	Hydro	Grupo 1	2,600	20,286.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alao	Hydro	Grupo 2	2,600	20,687.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Power Plant	Type	Unit	Capacity	Net Generation	Crude	Natural Gas	LPG	Naphtha	Residual Oil	Bagasse	Fuel Oil	Diesel
			kW	MWh	m^3	km^3	m^3	m^3	m^3	t	m^3	m^3
Alao	Hydro	Grupo 3	2,600	18,354.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alao	Hydro	Grupo 4	2,600	20,889.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nizag	Hydro	Única	312	2,909.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Río Blanco	Hydro	Única	3,125	20,827.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Riobamba	IC Engine	Única	2,500	1,612.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	499.7
Carlos Mora	Hydro	U1	600	3,808.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Carlos Mora	Hydro	U2	600	3,922.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Carlos Mora	Hydro	U3	1,200	7,694.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Catamayo	IC Engine	U10	2,500	4,425.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,401.2
Catamayo	IC Engine	U4	1,575	2,680.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	808.4
Catamayo	IC Engine	U5	1,575	2,439.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	793.0
Catamayo	IC Engine	U6	2,880	2,601.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	690.5
Catamayo	IC Engine	U7	2,880	9,820.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2,759.3
Catamayo	IC Engine	U9	2,500	985.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	295.8
ECOELECTRIC	Steam Turbine	TURBO # 5	3,000	866.1	0.0	0.0	0.0	0.0	0.0	5,122.1	0.0	0.0
ECOELECTRIC	Steam Turbine	TURBO # 6	6,000	4,477.1	0.0	0.0	0.0	0.0	0.0	30,584.6	0.0	0.0
ECOELECTRIC	Steam Turbine	TURBO # 7	27,500	57,945.2	0.0	0.0	0.0	0.0	0.0	266,663.4	0.0	0.0
Loreto	Hydro	Loreto	2,300	10,817.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Papallacta	Hydro	G1	2,190	757.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Papallacta	Hydro	G2	4,444	18,975.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ecudos A-G	Steam Turbine	TGE-1	3,000	8,534.0	0.0	0.0	0.0	0.0	0.0	47,391.6	0.0	0.0
Ecudos A-G	Steam Turbine	TGE-2	3,000	8,218.7	0.0	0.0	0.0	0.0	0.0	45,659.3	0.0	0.0
Ecudos A-G	Steam Turbine	TGE-3	7,000	20,021.0	0.0	0.0	0.0	0.0	0.0	93,120.9	0.0	0.0
Ecudos A-G	Steam Turbine	TGE-4	16,800	59,706.5	0.0	0.0	0.0	0.0	0.0	199,021.5	0.0	0.0
El Descanso	IC Engine	G1	4,800	18,789.9	0.0	0.0	0.0	0.0	4,183.4	0.0	0.0	340.6
El Descanso	IC Engine	G2	4,800	13,199.5	0.0	0.0	0.0	0.0	2,945.5	0.0	0.0	224.5
El Descanso	IC Engine	G3	4,800	21,367.4	0.0	0.0	0.0	0.0	4,840.6	0.0	0.0	349.5

Power Plant	Type	Unit	Capacity kW	Net Generation MWh	Crude m^3	Natural Gas km^3	LPG m^3	Naphtha m^3	Residual Oil m^3	Bagasse t	Fuel Oil m^3	Diesel m^3
El Descanso	IC Engine	G4	4,800	4,523.2	0.0	0.0	0.0	0.0	1,014.8	0.0	0.0	70.6
Saucay	Hydro	G1	4,000	9,305.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saucay	Hydro	G2	4,000	9,154.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saucay	Hydro	G3	8,000	41,040.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saucay	Hydro	G4	8,000	42,126.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saymirín	Hydro	G1	1,256	3,424.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saymirín	Hydro	G2	1,256	3,432.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saymirín	Hydro	G3	1,960	7,208.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saymirín	Hydro	G4	1,960	6,959.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saymirín	Hydro	G5	4,000	25,092.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saymirín	Hydro	G6	4,000	25,391.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Álvaro Tinajero	Gas Turbine	G1-CAT	54,000	218,727.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	59,366.5
Álvaro Tinajero	Gas Turbine	G2-CAT	40,800	80,041.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29,015.8
Aníbal Santos (Gas)	Gas Turbine	G1-CAS	22,650	16,022.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6,407.0
Aníbal Santos (Gas)	Gas Turbine	G2-CAS	22,300	16,795.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6,837.4
Aníbal Santos (Gas)	Gas Turbine	G3-CAS	15,000	5,800.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2,687.0
Aníbal Santos (Gas)	Gas Turbine	G5-CAS	23,700	33,849.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14,695.1
Aníbal Santos (Gas)	Gas Turbine	G6-CAS	23,120	14,121.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6,541.2
Aníbal Santos (Vapor)	Steam Turbine	V1-CAS	34,500	210,339.8	0.0	0.0	0.0	0.0	0.0	0.0	65,383.6	0.0
Espejo	Hydro	U2	200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Otavalo	Hydro	U1	400	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Electrocórdova	Hydro	Michael Banki	200	52.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Electroquil	Gas Turbine	U1	45,000	158,833.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45,997.2
Electroquil	Gas Turbine	U2	46,000	143,145.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	39,518.6
Electroquil	Gas Turbine	U3	45,000	91,649.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25,185.0
Electroquil	Gas Turbine	U4	45,000	104,527.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31,032.7
El Carmen	Hydro	U1	8,400	35,464.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Noroccidente	Hydro	N.1	261	1,637.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Recuperadora	Hydro	N.1	14,700	97,129.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Calope	Hydro	U1	8,300	44,166.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Calope	Hydro	U2	8,300	44,166.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Machala	Gas Turbine	A	70,000	517,193.4	0.0	167,100.8	0.0	0.0	0.0	0.0	0.0	0.0

Power Plant	Type	Unit	Capacity	Net Generation	Crude	Natural Gas	LPG	Naphtha	Residual Oil	Bagasse	Fuel Oil	Diesel
			kW	MWh	m^3	km^3	m^3	m^3	m^3	t	m^3	m^3
Machala	Gas Turbine	B	70,000	497,603.0	0.0	163,871.2	0.0	0.0	0.0	0.0	0.0	0.0
Generoca	IC Engine	U1	4,765	25,093.3	0.0	0.0	0.0	0.0	6,498.3	0.0	0.0	432.0
Generoca	IC Engine	U2	4,765	28,543.4	0.0	0.0	0.0	0.0	7,358.7	0.0	0.0	489.5
Generoca	IC Engine	U3	4,765	28,295.1	0.0	0.0	0.0	0.0	7,295.5	0.0	0.0	487.9
Generoca	IC Engine	U4	4,765	1,208.5	0.0	0.0	0.0	0.0	343.8	0.0	0.0	28.2
Generoca	IC Engine	U5	4,765	27,648.4	0.0	0.0	0.0	0.0	7,122.1	0.0	0.0	474.3
Generoca	IC Engine	U6	4,765	28,526.6	0.0	0.0	0.0	0.0	7,338.4	0.0	0.0	485.1
Generoca	IC Engine	U7	4,765	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Generoca	IC Engine	U8	4,765	26,855.2	0.0	0.0	0.0	0.0	6,944.4	0.0	0.0	455.8
Hidroabanico	Hydro	U1	7,690	59,924.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hidroabanico	Hydro	U2	7,690	59,924.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hidroabanico	Hydro	U3	7,690	59,924.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hidroabanico	Hydro	U4	7,690	59,924.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hidroabanico	Hydro	U5	7,690	59,924.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hidrocarolina	Hydro	Hidrocarolina 1	292	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hidrocarolina	Hydro	Hidrocarolina 2	308	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Marcel Laniado	Hydro	U1	71,000	189,288.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Marcel Laniado	Hydro	U2	71,000	308,461.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Marcel Laniado	Hydro	U3	71,000	265,109.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Francisco	Hydro	U1	115,000	418,805.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Francisco	Hydro	U2	115,000	622,975.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Industrial Algondonera Atuntaqui	Hydro	U2	240	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Industrial Algondonera Atuntaqui	Hydro	U3	320	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sibimbe	Hydro	U1	8,000	40,179.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sibimbe	Hydro	U2	8,000	40,179.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uravia	Hydro	U1	1,000	7,594.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
La Calera	Hydro	Corazón	625	218.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
La Calera	Hydro	Cotopaxi	1,250	7,181.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
La Calera	Hydro	Rumiñahui	625	200.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Victoria II	Gas Turbine	Victoria II	115,000	327,942.7	0.0	0.0	0.0	55,417.2	0.0	0.0	0.0	52,719.3
Vindobona	Hydro	U1	1,500	10,482.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Power Plant	Type	Unit	Capacity kW	Net Generation MWh	Crude m^3	Natural Gas km^3	LPG m^3	Naphtha m^3	Residual Oil m^3	Bagasse t	Fuel Oil m^3	Diesel m^3
Vindobona	Hydro	U2	1,500	6,823.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Selva Alegre	IC Engine	U1	4,170	22,778.1	0.0	0.0	0.0	0.0	5,979.7	0.0	0.0	888.0
Selva Alegre	IC Engine	U2	4,170	22,898.5	0.0	0.0	0.0	0.0	6,001.2	0.0	0.0	884.7
Selva Alegre	IC Engine	U3	4,170	18,297.1	0.0	0.0	0.0	0.0	5,468.4	0.0	0.0	801.6
Selva Alegre	IC Engine	U4	3,968	6,209.7	0.0	0.0	0.0	0.0	1,718.1	0.0	0.0	278.0
Selva Alegre	IC Engine	U5	5,562	20,918.9	0.0	0.0	0.0	0.0	3,938.6	0.0	0.0	606.1
Selva Alegre	IC Engine	U6	5,562	16,959.8	0.0	0.0	0.0	0.0	3,229.5	0.0	0.0	426.5
Selva Alegre	IC Engine	U7	5,562	16,832.1	0.0	0.0	0.0	0.0	3,141.3	0.0	0.0	414.9
La Esperanza	Hydro	U1	3,000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
La Esperanza	Hydro	U2	3,000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Poza Honda	Hydro	U1	1,500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Poza Honda	Hydro	U2	1,500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Geppert	Hydro	Geppert	1,650	1,696.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Kohler	IC Engine	KOHLER	1,600	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Atuntaqui	Hydro	U1	200	667.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Atuntaqui	Hydro	U2	200	667.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perlabí	Hydro	U1	2,700	7,102.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Interconexión Perú	Ex/Import	Interconexión Perú	110,000	78,390.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Carlos	Steam Turbine	Turbo 1	3,000	104.4	0.0	0.0	0.0	0.0	0.0	389.3	0.0	0.0
San Carlos	Steam Turbine	Turbo 2	4,000	3,050.4	0.0	0.0	0.0	0.0	0.0	10,451.7	0.0	0.0
San Carlos	Steam Turbine	Turbo 3	16,000	40,158.9	0.0	0.0	0.0	0.0	0.0	136,381.2	0.0	0.0
San Carlos	Steam Turbine	Turbo 4	12,000	21,548.2	0.0	0.0	0.0	0.0	0.0	77,516.0	0.0	0.0
Termoguayas	IC Engine	U1	20,000	175,046.1	0.0	0.0	0.0	0.0	0.0	0.0	44,947.1	0.0
Termoguayas	IC Engine	U2	40,000	324,810.6	0.0	0.0	0.0	0.0	0.0	0.0	83,788.4	0.0
Termoguayas	IC Engine	U3	40,000	93,105.8	0.0	0.0	0.0	0.0	0.0	0.0	24,184.7	0.0
Termoguayas	IC Engine	U4	50,000	2,823.8	0.0	0.0	0.0	0.0	0.0	0.0	733.6	0.0

Annex 3.4: Simple Adjusted OM for the Colombian Grid

As per the "Tool to calculate the emission factor for an electricity system" v2.2.1, the simple adjusted OM is calculated as follows:

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

Where

$EF_{grid,OM-adj,y}$	=	Simple adjusted operating margin CO_2 emission factor in year *y* (tCO_2/MWh)
λ_y	=	Factor expressing the percentage of time when low-cost/must-run power units are on the margin in year *y*
$EG_{m,y}$	=	Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)
$EG_{k,y}$	=	Net quantity of electricity generated and delivered to the grid by power unit *k* in year *y* (MWh)
$EF_{EL,m,y}$	=	CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh)
$EF_{EL,k,y}$	=	CO_2 emission factor of power unit *k* in year *y* (tCO_2/MWh)
m	=	All grid power units serving the grid in year *y* except low-cost/must-run power units
k	=	All low-cost/must-run power units serving the grid in year *y*
y	=	The relevant year as per the data vintage chosen in Step 3

Since fuel consumption and electricity generation is available for each power unit in the system, $EF_{EL,m,y}$, *and* $EF_{EL,k,y}$, are calculated based on Option A1 of the simple OM method as follows:

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

Where

$EF_{EL,m/k,y}$	=	CO_2 emission factor of power unit *m* or *k* in year *y* (tCO_2/MWh)
$FC_{i,m/k,y}$	=	Amount of fossil fuel type *i* consumed by power unit *m* or *k* in year *y* (Mass or volume unit)
$NCV_{i,y}$	=	Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ/mass or volume unit)
$EF_{CO2,i,y}$	=	CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ)
$EG_{m/k,y}$	=	Net quantity of electricity generated and delivered to the grid by power unit *m* or *k* in year *y* (MWh)
m	=	All grid power units serving the grid in year *y* except low-cost/must-run power units
k	=	All low-cost/must-run power units serving the grid in year *y*
i	=	All fossil fuel types combusted in power unit *m* or *k* in year *y*

y = The relevant year as per the data vintage chosen in Step 3

The following data sources are used to calculation the emission factors:

$EG_{m/k,y}$ = Annual generation 2010 for each power unit from the NEON[32] database as shown below.
$FC_{i,m/k,y}$ = Annual fuel consumption by type 2010 for each power unit from the NEON database as shown below.
$NCV_{i,y}$ = Official values published by the system operator and used in the NEON database, since fuel consumption is reported in energy units.
$EF_{CO2,i,y}$ = Official values published in the FECOC database.

Fossil fuel generators are classified as *m*. Hydro and other renewable generators are classified as *k*.

Lambda (λ_y) is calculated in the attached emission factor spreadsheet according to the 4-step procedure, commented as follows:

step (i) Hourly system load data for 2010 are sorted in descending order. These data were sourced from the NEON database.
step (ii) The annual generation from all low-cost/must-run units was summed from the NEON database.
step (iii) The attached emission factor spreadsheet postulates a horizontal line at each of the 8,760 points along the ordered load curve. The area under the postulated horizontal line is then compared to the annual generation from step (ii)
step (iv) The number of hours is identified by summing the number of hours where the area under the postulated horizontal line is less than the sum of the low-cost/must-run generation.

The following data are available at validation:

Data / Parameter:	**$FC_{i,m,y}$ $FC_{i,k,y}$**
Data unit:	TJ/y
Description:	Fuel consumption of fuel type *i* for power unit *m* or *k* in year *y*
Source of data used:	NEON Database
Value applied:	Please see below
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	Fuel consumption is reported by the system operator in energy units. The

[32] The NEON database is maintained and provided by the Colombian power market operator, XM. It includes detailed hourly information for all generation units. It was accessed by this project activity to identify real, hourly system generation (to calculate Lambda) and monthly generation and fuel consumption for all on-grid generators. The monthly data was summed to arrive at annual totals for 2010 for both net generation and fuel consumption.

	parameter NCV is not required.

Data / Parameter:	**$EF_{CO2,i,y}$**			
Data unit:	Shown below			
Description:	CO_2 emission factor for fuel type *i* in year *y*			
Source of data used:	1) FECOC Database 2) EB23 Annex05			
Value applied:	Fuel	Units	Source	Value
	Natural Gas	tCO_2/TJ	1	55.101
	Coal	tCO_2/TJ	1	97.257
	Fuel Oil	tCO_2/TJ	1	80.570
	Diesel	tCO_2/TJ	1	74.869
	Reservoir Hydro	tCO_2/MWh	2	0.09
Justification of the choice of data or description of measurement methods and procedures actually applied :	All of the values from the FECOC database fall within the ranges of the IPCC 2006 guidelines. They are therefore considered reasonable. Since they have been used in other registered CDM project activities in Colombia, they are considered reliable as well.			
Any comment:				

Data / Parameter:	**$EG_{m,y}$ $EG_{k,y}$**
Data unit:	MWh/y
Description:	Net electricity generated by power plant *m* or *k* in year *y*
Source of data used:	NEON Database
Value applied:	Please see below
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	Only grid generators that are despatched by the system operator are included in this database

Data / Parameter:	**λ_{2010}**
Data unit:	- -
Description:	Factor expressing the percentage of time when low-cost/must-run power units are on the margin in year *y*
Source of data used:	Calculation based on the hourly system loads the NEON database
Value applied:	2.6826%
Justification of the choice of data or description of measurement methods and procedures	

actually applied :	
Any comment:	The calculation of Lambda is transparently shown in the attached spreadsheet that calculates EF_{grid} for Colombia

Data / Parameter:	**$EF_{grid.OM,2010}$**
Data unit:	tCO_2/MWh
Description:	Operating margin emission factor in year *2010*
Source of data used:	Calculation shown in the attached spreadsheet based on data cited above
Value applied:	0.6581
Justification of the choice of data or description of measurement methods and procedures actually applied :	Please see above and attached spreadsheet
Any comment:	For imports to Ecuador from Colombia

2010 Net Generation and Fuel Consumption of Power Units in Colombia, from the NEON database

Power Unit	Generation MWh	Subtype	Diesel TJ	Coal TJ	Fuel Oil TJ	Natural Gas TJ
MENOR LA CASCADA-ABEJORRAL	4.182		0	0	0	0
MENOR AGUA FRESCA	51.505		0	0	0	0
ALBAN	1.865.081	Reservoir	0	0	0	0
GENERADOR PLANTA MENOR AMAIME	4.915		0	0	0	0
MENOR AMALFI	3.669		0	0	0	0
MENOR AMERICA	191		0	0	0	0
MENOR ASNAZU	4.174		0	0	0	0
MENOR AYURA	104.089		0	0	0	0
MENOR BELLO	1.877		0	0	0	0
MENOR BELMONTE	24.139		0	0	0	0
MENOR EL BOSQUE	14.754		0	0	0	0
MENOR BAYONA	2.086		0	0	0	0
COGEN. CENTRAL CASTILLA	2.414		0	0	0	0
MENOR COCONUCO	19.667		0	0	0	0
COGEN. INGENIO MAYAGUEZ	61.609		0	0	0	0
BETANIA	1.725.672	Reservoir	0	0	0	0
MENOR CALICHAL	498		0	0	0	0
CHIVOR	3.305.175	Reservoir	0	0	0	0
MENOR CIMARRON	94.861		0	0	0	0
COGEN. INGENIO PROVIDENCIA	97.078		0	0	0	0
MENOR CALDERAS	90.350		0	0	0	0
CALIMA	195.083	Reservoir	0	0	0	0
COGEN. COLTEJER	12.838		0	0	0	0

Power Unit	Generation MWh	Subtype	Diesel TJ	Coal TJ	Fuel Oil TJ	Natural Gas TJ
MENOR CEMENTOS DEL NARE	38.685		0	0	0	0
MENOR CAMPESTRE (EPM)	3.228		0	0	0	0
MENOR CAMPESTRE (CALARCA)	5.015		0	0	0	0
MENOR CHARQUITO	93.060		0	0	0	0
MENOR CARACOLI	15.867		0	0	0	0
COROZO - SAN MATEO 2 230 KV	0		0	0	0	0
MENOR CASCADA	20.674		0	0	0	0
TERMOCARTAGENA 1	59.999		0	0	234	634
TERMOCARTAGENA 2	112.612		0	0	994	555
TERMOCARTAGENA 3	68.472		0	0	0	1.073
MENOR EL MORRO 1	171.560		0	0	0	0
MENOR EL MORRO 2	62.925		0	0	0	0
COGEN. TUMACO	765		0	0	0	0
GENERADOR HIDRAULICO LOS CURRUCUCUES	286		0	0	0	0
MENOR DOLORES EPM	53.428		0	0	0	0
ECUADOR-TULCÁN (ENLACE)	0		0	0	0	0
ECUADOR-POMASQUI (ENLACE)	9.745		0	0	0	0
ESMERALDA	225.738		0	0	0	0
MENOR FLORIDA	80.031		0	0	0	0
MENOR CARUQUIA	52.509		0	0	0	0
MENOR GUACAICA	2.018		0	0	0	0
MENOR GUANAQUITAS	41.560		0	0	0	0
GUATAPE	3.008.573	Reservoir	0	0	0	0
GUATRON	2.748.692	Reservoir	0	0	0	0
GUAVIO	4.306.377	Reservoir	0	0	0	0
MIEL	1.720.075	Reservoir	0	0	0	0
MENOR LA HERRADURA	116.683		0	0	0	0
COGEN. INGENIO LA CARMELITA	835		0	0	0	0
COGEN. INCAUCA	21.236		0	0	0	0
MENOR INSULA	115.545		0	0	0	0
MENOR INTERMEDIA	7.078		0	0	0	0
MENOR INZA	3.924		0	0	0	0
MENOR IQUIRA 1	12.289		0	0	0	0
MENOR IQUIRA 2	5.554		0	0	0	0
COGEN. INGENIO RISARALDA	6.119		0	0	0	0
JAGUAS	813.753	Reservoir	0	0	0	0
MENOR JULIO BRAVO	5.045		0	0	0	0
MENOR LA JUNCA	129.318		0	0	0	0
PARQUE EOLICO JEPIRACHI	38.570		0	0	0	0
MENOR NUEVO LIBARE	6.211		0	0	0	0
MENOR LA CASCADA	14.650		0	0	0	0
MENOR EL LIMONAR	96.222		0	0	0	0
MENOR EL PALO	4.228		0	0	0	0
LA TASAJERA	1.594.443	Reservoir	0	0	0	0
MENOR MIROLINDO	15.603		0	0	0	0

Power Unit	Generation MWh	Subtype	Diesel TJ	Coal TJ	Fuel Oil TJ	Natural Gas TJ
MENOR MUNICIPAL	7.472		0	0	0	0
MENOR MONDOMO	3.732		0	0	0	0
MENOR MANANTIALES	12.260		0	0	0	0
MERILECTRICA 1	20.266		0	0	0	268
MENOR NIMA	30.214		0	0	0	0
MENOR NIQUIA	99.471		0	0	0	0
MENOR NUTIBARA	2.158		0	0	0	0
MENOR OVEJAS	4.854		0	0	0	0
MENOR PIEDRAS BLANCAS	5.977		0	0	0	0
PARAISO GUACA	3.724.156	Reservoir	0	0	0	0
COGEN. INGENIO PICHICHI	4.199		0	0	0	0
MENOR PAJARITO	25.589		0	0	0	0
MENOR PALMAS SAN GIL	66.532		0	0	0	0
PALENQUE 3	1.633		0	0	0	31
MENOR URRAO	5.380		0	0	0	0
PLAYAS	1.266.991	Reservoir	0	0	0	0
MENOR REMEDIOS	2.646		0	0	0	0
COGEN. PROENCA	5.723		0	0	0	0
PAIPA 1	158.787		0	2.261	0	0
PAIPA 2	288.345		0	3.878	0	0
PAIPA 3	409.257		0	5.396	0	0
PAIPA 4	999.534		0	10.017	0	0
COGEN. PAPELES NACIONALES	2.625		0	0	0	0
PORCE II	2.002.715	Reservoir	0	0	0	0
PORCE 3 GENERADOR	264	Reservoir	0	0	0	0
MENOR PRADO 4	42.371		0	0	0	0
PRADO	196.955	Reservoir	0	0	0	0
PROELECTRICA 1	156.014		0	0	0	2.547
PROELECTRICA 2	93.765		0	0	0	0
MENOR PASTALES 1	4.287		0	0	0	0
MENOR LA PITA	4.662		0	0	0	0
MENOR PATICO - LA CABRERA	5.257		0	0	0	0
MENOR PUENTE GUILLERMO	2.416		0	0	0	0
MENOR PTAR	0		0	0	0	0
MENOR PROVIDENCIA	0		0	0	0	0
MENOR RIO BOBO	14.595		0	0	0	0
MENOR RIO ABAJO	639		0	0	0	0
MENOR RIO RECIO	2.556		0	0	0	0
MENOR RIO CALI	14.023		0	0	0	0
MENOR RIO FRIO I	8.458		0	0	0	0
MENOR RIO FRIO II	50.485		0	0	0	0
MENOR RIOGRANDE I	1.734		0	0	0	0
RIOGRANDE	1.478		0	0	0	0
MENOR RIO INGENIO	41		0	0	0	0
MENOR RUMOR	14.366		0	0	0	0
MENOR RIO MAYO	110.130		0	0	0	0

Power Unit	Generation MWh	Subtype	Diesel TJ	Coal TJ	Fuel Oil TJ	Natural Gas TJ
MENOR RIONEGRO	57.135		0	0	0	0
MENOR RIO PIEDRAS	148.292		0	0	0	0
COGEN. INGENIO RIOPAILA	7.296		0	0	0	0
MENOR SAN ANTONIO	82.051		0	0	0	0
MENOR SAN JOSE DE LA MONTAÑA	1.937		0	0	0	0
MENOR SAJANDI	18.669		0	0	0	0
MENOR SAN JOSE	2.260		0	0	0	0
MENOR SILVIA	1.959		0	0	0	0
SALVAJINA	1.135.290	Reservoir	0	0	0	0
MENOR SAN CANCIO	5.750		0	0	0	0
SAN CARLOS	6.448.811	Reservoir	0	0	0	0
SAN FRANCISCO	322.537		0	0	0	0
MENOR SONSON	45.352		0	0	0	0
MENOR SANTA ANA	34.064		0	0	0	0
MENOR RIO SAPUYES	8.978		0	0	0	0
GENERADOR HIDRAULICO SANTA RITA	1.690		0	0	0	0
MENOR SERVITA	2.241		0	0	0	0
MENOR SUEVA 2	30.022		0	0	0	0
TERMOBARRANQUILLA 3	146.066		0	0	517	1.562
TERMOBARRANQUILLA 4	122.322		0	0	333	1.466
TEBSA TOTAL	5.132.259		0	0	0	47.358
TERMOCANDELARIA 1	405.398		0	0	19	4.802
TERMOCANDELARIA 2	354.993		0	0	26	4.174
TERMODORADA 1	15.632		0	0	0	184
TERMOEMCALI 1	265.026		2.203	0	0	52
TERMOFLORES 1	993.797		0	0	0	9.049
TERMOFLORES 2	235.157		28	0	0	3.041
TERMOFLORES 3	463.002		0	0	0	5.584
TERMO FLORES 4	1.183		0	0	0	83
GUAJIRA 1	607.975		0	4.698	0	3.256
GUAJIRA 2	548.943		0	4.411	0	2.507
MENOR LA TINTA	0		0	0	0	0
MENOR RIOFRIO (TAMESIS)	6.934		0	0	0	0
MENOR TERMOPIEDRAS	124		0	0	0	0
MENOR TEQUENDAMA	116.375		0	0	0	0
TERMOCENTRO 1 CICLO COMBINADO	485.591		0	0	0	4.830
TASAJERO 1	817.338		0	2.943	0	0
TERMOSIERRAB	1.020.938		0	0	0	8.368
TERMOVALLE 1	593.508		1.713	0	0	3.165
TERMOYOPAL 1	148.678		0	0	0	0
TERMOYOPAL 2	221.520		0	0	0	3.218
MENOR UNION	4.200		0	0	0	0
URRA	1.482.193	Reservoir	0	0	0	0

Power Unit	Generation MWh	Subtype	Diesel TJ	Coal TJ	Fuel Oil TJ	Natural Gas TJ
MENOR LA VUELTA	64.642		0	0	0	0
MENOR VENTANA A	11.581		0	0	0	0
MENOR VENTANA B	14.341		0	0	0	0
CUESTECITAS - CUATRICENTENARIO 1 230 KV	0		0	0	0	0
ZIPAEMG 2	73.756		0	1.035	0	0
ZIPAEMG 3	219.669		0	2.238	0	0
ZIPAEMG 4	214.961		0	2.052	0	0
ZIPAEMG 5	282.954		0	2.601	0	0
MENOR ZARAGOZA	1.622		0	0	0	0

Annex 4

MONITORING INFORMATION

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