Monitoring report form for CDM project activity
(Version 08.0)

Complete this form in accordance with the instructions attached at the end of this form.

MONITORING REPORT

Title of the project activity	Hydro Electric Plant - Hidro Pantasma		
UNFCCC reference number of the project activity	9118		
Version number of the PDD applicable to this monitoring report	05		
Version number of this monitoring report	2.0		
Completion date of this monitoring report	07/07/2021		
Monitoring period number	1st		
Duration of this monitoring period	07/10/2013 – 06/10/2020 (first and last days included)		
Monitoring report number for this monitoring period	01		
Project participants	Hidropantasma S.A. (Private Company)		
Host Party	Nicaragua		
Applied methodologies and standardized baselines	AMS-I.D. Version 17.0 - Grid connected renewable electricity generation. There is not standardized baseline applicable to this project.		
Sectoral scopes	1: Energy industries (renewable - / non-renewable sources)		
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by the project activity in this monitoring period	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013 until 31 December 2020	Amount achieved from 1 January 2021
	0 t CO2e	229,478 t CO_2e	0 t CO2e
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	250,075 t CO_2e[1]		

[1] The amount of GHG emission reductions estimated ex ante for this monitoring period was calculated by multiplying the expected daily emission reduction by 2,555 days, the equivalent days to the 07/10/2013 - 06/10/2020 period.

SECTION A. Description of project activity

A.1. General description of project activity

The Hydro Electric Plant - Hidro Pantasma project is a small run-of-river renewable hydroelectric plant with a total installed capacity of 14.4 MW (rated capacity of generators). The energy generated is sold and thereafter distributed through the National Interconnected System of Nicaragua.

The project activity contemplates the production of clean hydroelectric power using a flow of water. The project collects the waters of the Pantasma River at a point 843 meters above sea level, driving the water flow through a Creager-free spillway diversion dam to an underground low-pressure steel pipeline network. Through this, the water flow runs down river until it reaches the project powerhouse which holds two Pelton turbines with their respective generators and valves. The electricity generated in the powerhouse is driven through a 11 km transmission line to the Asturias Substation where it enters the National Interconnected System of Nicaragua, and ultimately distributed to end consumers.

During the current reporting period from 07/10/2013 to 06/10/2020, the project has generated 300,993 MWh and reduced 229,478tons of CO2e.

The project was implemented by Hidropantasma S.A., a private electric services company that is in charge of electric energy generation, transmission, and maintenance functions. The engineering design was developed by the engineering company Carbon Ingenieria, S.A. from Costa Rica, while the construction and installation was by Grupo Corporativo Saret.

A.2. Location of project activity

The project activity was implemented on the left bank of the Pantasma River, in the department of Jinotega, Nicaragua. The project site, where the works have been developed, is located at 250 km from Managua (Nicaragua's capital) and 22 km north of the city of Jinotega.

The coordinates for the project location (Cartesian coordinate system) are:

- Water intake (Lat: 13.2867°, Long: -86.0069°) (UTM: E 607,570 ; N 1,469,059.54)
- Power house (Lat: 13.3005°, Long: -85.9700°) (UTM: E 611,556 ; N 1,470,600.47)

The geographical project location is showed in the following figure:

Figure 1: Location of the Hydro Electric Plant - Hidro Pantasma

A.3. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Nicaragua (host)	Hidropantasma S.A. (private company)	No

A.4. References to applied methodologies and standardized baselines

The following approved baseline and monitoring methodology is applicable to the project activity:

- Type I.D. (Reference AMS-I.D.) – *"Grid connected renewable electricity generation"* – Version 17. For power generation using renewable sources that supply electricity to and/or displace electricity from an electricity distribution system.

As well, the following tools are applicable to the project activity:

- TOOL07: *"Tool to calculate the emission factor for an electricity system"* - for the calculation of emissions factor – Version 07.0.

- TOOL03: *"Tool to calculate project or leakage CO2 emissions from fossil fuel combustion"* – for the calculation of project emissions from fossil fuel combustion – Version 3.0.

A.5. Crediting period type and duration

07/10/2013 – 06/10/2020 (Renewable)

SECTION B. Implementation of project activity

B.1. Description of implemented project activity

The operation starting date of the Hidropantasma hydroelectric power plant was on 07 October 2013. The project uses a deviation of a percentage of the total Pantasma river water flow between the ground elevation lines 843 and 444 above sea level, in order to take advantage of approximately 374 meter net head and a water flow of 4m^3/s. With these resources, the project obtained an effective capacity of 13.7 MW (rated capacity of turbines) with an annual power supply estimated around 62,415 MW/h.

The project has the following characteristics:

Water capture (Intake): the water is obtained by a concrete diversion dam with a Creager-type uncontrolled spillway (with a lateral intake). The dam was constructed 19 meters high and 37.5 meters long, in order to contain a reservoir with a capacity of approximately 250,000 cubic meters of water. The design flow considered for discharge is 4.00 m^3/s, while the median river flow is 2.56 m^3/s. The dam also has a bottom discharge gate of 2.5 m x 2.5 m in order to periodically clean the reservoir and maintain relatively low sediment levels. The 131 m long embankment dam was installed to complete the closure on the right bank.

Water conduction (from upstream to downstream): the water conduction was completed by a low-pressure pipe made of steel with a length of 2,329 m and a diameter of 1.5 m. The pipeline was buried, but a 460 m length fraction is used as a siphon to save a depression of 66 m; in addition, it has two steel aerial passages that are 25 m and 29 m in length. The water is then conducted through a horseshoe tunnel section 818 m long and 2.1 m wide. A surge tank of 34.15 m high and 5 m of internal diameter is located at the end of the flow. Finally, a penstock welded steel pipe 840 m long with a width of 1.25 m, followed by two welded steel strands that are 12.2 m by 0.85m conduct water to the turbines intake valves.

Power generation: the powerhouse is located at the end of the penstock and is above the inundation levels of the stream (safe from flooding).

The powerhouse has two horizontal axis Pelton-type turbines (hydraulic reaction turbine in which the flow exits the turbine blades in an axial direction) connected to respective synchronous generators. The discharge is conducted by independent reinforced concrete channels for each unit that is 2 m wide and 26.5 m long. A dissipation structure to return the water to the stream channel was also constructed. The technical characteristics of the major equipment are presented in the following table:

Table 1: Technical specifications of the major equipment

Turbines	Parameter
Manufacturer	KOSSLER GESELLSCHAFT m.b.H
Type	Pelton – PH2I - 1300/390
Number of turbines	2
Axis	Horizontal
Design Flow	2.00 m^3/s (each one)
Rated Output	6,860 kW (each one)
Speed	600 rpm
Impeller diameter	1,300 mm
Design head	374 m
Turbine efficiency (at design flow)	89.9%
Generators	**Parameter**
Manufacturer	Voith
Number of generators	2
Rated Output	7,200 kW (each one)
Voltage	13,800 V +/- 5%
Power factor	0.90
Frequency	60 Hz
Speed	600 rpm
Connection	Star – Neutral grounded
Efficiency 100% of rated output	97.13%

The capacity of the power plant is based on data from technical specifications provided by the manufacturer; the energy generation is confirmed by means of the Ministerial Agreement No. 2-DGERR-02-2010 emitted by the Ministry of Energy and Mining in which the effective capacity is limited to a maximum of 12,500 kW[2]. As such, the project developer obtains the Electric Energy Generation License only for this capacity.

Power transmission: The electrical substation is located close to the powerhouse in an area of about 10 m by 10 m. The transformers and the switching equipment required for the connection to the electrical network are located in the courtyard. Given the characteristics of the net, two generators are used in a synchronous continuous operation, which allow the line voltage to be regulated and supply the required reactive power. The equipment is geared with a static excitation system brushless (which requires less maintenance). The synchronization of the two units with the National Interconnected System of Nicaragua is manual and/or automatic as a function of voltage, frequency, and phase sequence. The connection of the stator of each generator star type with neutral grounded.

[2] Value determined considering a generating capacity of 13.7 MW (rated capacity of turbines which is smaller than the generators capacity), taking into account a reduction due to the parasitic load of electricity consumption needed by the plant to operate, reducing the output to approximately 12.5 MW (this is conservative).

A 11 km transmission line with a voltage of 69 kV was connected the project via the Asturias substation. The National Dispatch Center (a division of Enatrel) confirmed the quantity of energy to be delivered by the project activity. Enatrel is in charge of the central control point of the meter readings.

B.2. Post-registration changes

B.2.1. Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents

Parameter FCi.j,y:

During the entire monitoring period this parameter was not properly monitored, and the volume meter was not calibrated as defined in the registered PDD. Therefore, as a conservative approach, the maximum diesel consumption of the backup electricity system during the entire monitoring period was estimated to calculate the project's emissions according to its fuel efficiency and maximum operating capacity or load factor defined in the manufacturer's specifications (see ER spreadsheet).

B.2.2. Corrections

Changes that are being submitted with this monitoring report as part of the request for issuance (post-registration change - issuance track) were made in the revised PDD (completion date 07/07/2021, version 5.1)

- **Turbine type:** the registered PDD states as turbine type “Pelton – PH2/1300/390” which was determined during the plant design stage based on the “Technical proposal – Mechanical equipment – Final offer No. 020824-30B_Kossler”. However, the turbine type was updated to “Pelton – PH2I - 1300/390” according to the installed turbine nameplates.
- **Rated output capacity:** the registered PDD states as turbine rated output capacity “6,547 kW (each one)” which was determined during the plant design stage based on the “Technical proposal – Mechanical equipment – Final offer No. 020824-30B_Kossler”. However, the turbine rated output capacity was updated to “6,860 kW (each one)” according to the installed turbine nameplates.

B.2.3. Changes to the start date of the crediting period

There have not been any changes to the start date of the crediting period fixed at the registration of the project activity.

B.2.4. Inclusion of monitoring plan

There have not been any post-registration changes to include a monitoring plan in the PDD.

B.2.5. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents

The PDD under operating margin calculation it is stated that “the emission factor should be updated for the year in which the power plant displaces electricity from the grid (applicable over the crediting period)”, however, data for calculating emission factor from official sources is usually only available 18 months after the end of year y, therefore the emission factor of the year proceeding the previous year y-2 was used and the same data vintage (y, y-1 or y-2) was used throughout all crediting periods, i.e., 2011-2018, then the PDD was updated in accordance with Tool 07 allowing the applicability of such option.

B.2.6. Changes to project design

There have not been any changes to the project design of the project activity.

B.2.7. Changes specific to afforestation or reforestation project activity

Not applicable.

SECTION C. Description of monitoring system

The monitoring plan was implemented to ensure that the approved monitoring methodology AMS.I.D, Version 17 is correctly applied in order to enable the accurate and transparent determination of avoided emissions. The plan incorporated the QA/QC procedures and is described in Section D below. The overall management structure responsible for project monitoring is as follows:

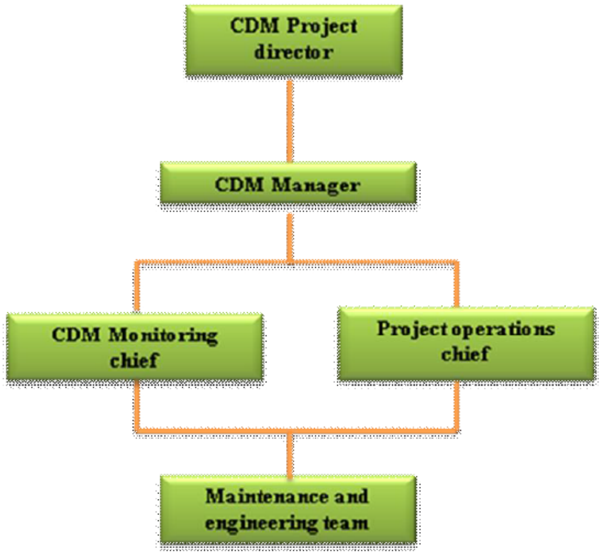

Figure 2: Metering scheme of the Hydro Electric Plant - Hidro Pantasma

Responsibility and CDM management: it is the maximum authority in the project. The executive board of the company is in charge of attending to this responsibility. The CDM manager is appointed at the company and whose responsibility is monitoring all CDM project related activities and organizing specific training.

The CDM Project Manager is responsible for overseeing the implementation of this procedure and provides information to the board related to the performance of the entire system. Competency requirements for the position of CDM Manager were defined and applied to ensure that the project manager is able to implement this procedure.

The CDM monitoring chief has day-to-day responsibilities for checking instrumentation, record keeping, data handling and data processing, filing, reporting, organizing repair and maintenance of monitoring equipment, and ensuring the monitoring plan is adhered to as indicated in the approved PDD. All calculations were checked and signed by the CDM monitoring chief who is also responsible for preparing and checking documents required for verification.

The Maintenance and Engineering team reports directly to the CDM monitoring chief (only activities related with CDM monitoring matters).

The monitoring staff received technical training and safety training to minimize exposure to workplace hazards. At least one fully trained technical member of the monitoring team was present during every shift.

Operational staff with existing responsibilities to monitor energy generation at the power plant received additional training and collaborated with the monitoring staff. A management level link was established to ensure effective co-operation between operational staff and CDM monitoring staff. All relevant information, notes of meetings, data files, maintenance records, defect reports, hard copy and computerized records of monitoring were kept at a designated location and arranged in an orderly and transparent manner to facilitate auditing when required. Responsibilities, procedures, methods, equipment types, and specifications are to be described in detail in a specific CDM document.

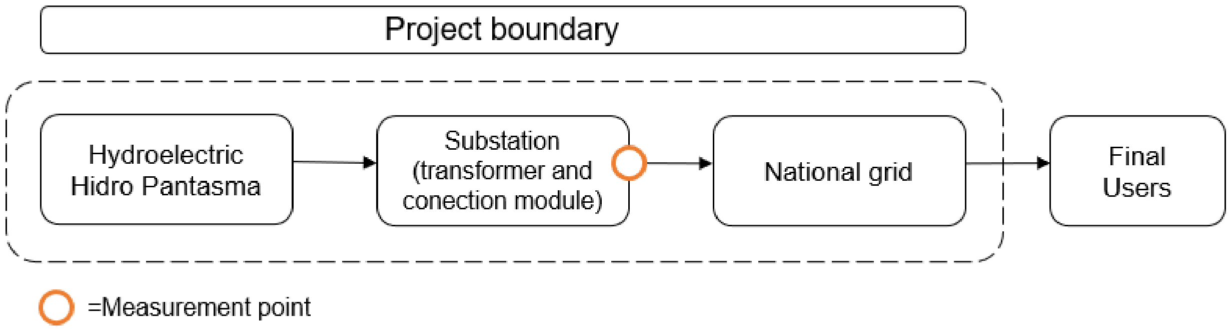

Figure 3: relevant monitoring point.

On-line monitoring system: All key meters required to determine GHG emissions and emission reductions were monitored from a central control point which record meter readings at a pre-determined interval as specified in the project documents. These data points were used to continually update total emission reductions as long as the generating plant was in operation. Key meters measured the parameters listed in Section D below. The data collected has low uncertainty levels and, to guarantee its accuracy, was cross-checked with the electricity sales receipts obtained from the grid trader/generator. (Where applicable, the lowest value was used for emission reductions calculation. This is conservative.)

Calculation of emissions reductions: The data required for calculation baseline was fed into a processor (spreadsheet application) that calculated the emission reductions according to the formulae described below, using the defined default values. Access to the spreadsheet is controlled for security purposes. The process includes various checks, such as a comparison of total energy generated in the plant against the energy supplied to the grid indicated in the electricity sales receipts obtained from the grid operator. The data and documents were regularly audited to ensure it is operating correctly.

Non-essential data: The online monitoring system also recorded “non-essential” data. Such data is deemed non-essential because it is not directly listed in the monitoring methodology, but it was constituted a means of corroborating the online system. Non-essential data included measurements of net and gross output from the generator, certificated conversion efficiency, fed water and any other data considered relevant to the project activity.

Accuracy and calibration of instruments: All meters were operated and maintained as specified in the manufacturer specifications. All key meters were subject to a quality control regime that includes regular maintenance and calibration. A record was maintained showing the location and unique identification number of each meter, the calibration status of that meter (date of the last calibration and date of the next calibration), and who performed the calibration service. Calibration certificates were retained for all meters up to two years after the end of the crediting period.

Archiving data: The online system archived data automatically in a secure and retrievable storage format on a periodic basis (e.g. weekly basis). Calibration records were archived in an accessible electronic format. This data was stored for up to two years after the end of the crediting period.

Document control: The CDM Manager implemented a document control system to ensure that the current versions of necessary documents are available at the point of use. The CDM Monitoring manual was made to guarantee the best practice and results in the monitoring implementation.

Preparation of monitoring report: The archived/live data was used to prepare the periodic monitoring report which is submitted to the CDM EB for verification and issuance of CERs. A standard format for the monitoring report was prepared prior to the submission of the first monitoring report.

Treatment of missing or corrupted data: Where data in the online system is corrupted or missing whilst the generator is operating (as shown, for example, by monitoring equipment failure), the missing data can be estimated by using the lowest value for the parameter in question in the hour before the error or the hour immediately after the system came on-line again. If there is evidence to suggest that both of these values are un-representative, the average from the previous 24 hours will be used. The error will be recorded in the daily log sheet and the occurrence of the error will be investigated and rectified as soon as possible. If the online system is compromised for more than 24 hours, data will be manually recorded. Any deficiencies in energy generated monitoring data will be rectified by back calculation from the power sold.

Audit function and management review: The CDM Manager arranged for an audit of the management system at least twice per year. The auditor must not be involved in the daily operation of the plant and if necessary, may be sourced from a third party. The auditor assessed the implementation of the monitoring procedure and the preparation of the monitoring report. Audit findings, and steps taken to address findings, were recorded and reviewed in a management review meeting (convened at least annually) at which time the effectiveness of these procedures was reviewed and necessary changes implemented. The variable to be monitored was listed and described in Section D.2.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante

Data/Parameter	$EG_{m,y}$
Unit	MWh
Description	Net electricity generated by power units m in year *y*.
Source of data	Government records from Nicaraguan Energy Institute (Instituto Nicaragüense de la Energía).
Value(s) applied	Please refer ER spreadsheet.
Choice of data or measurement methods and procedures	The net electricity generated by power units is used to calculate the CO_2 emission coefficients of the power plants in the grid, according to “Tool to calculate the emission factor for an electricity system” version 07.0. All information regarding the national interconnected system is handled and stored by Nicaraguan Energy Institute, it is checked at the web site: https://www.ine.gob.ni/index.php/electricidad/serie-historica/
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	No comments

Data/Parameter	$FC_{i,m,y}$
Unit	Mass or volume unit/y.
Description	Amount of fossil fuel type i consumed by power plant/unit m in year y.

Source of data	Government records from Nicaraguan Energy Institute (Instituto Nicaragüense de la Energía).
Value(s) applied	Please refer ER spreadsheet
Choice of data or measurement methods and procedures	The amount of fossil fuels consumed by power plants/units is used to calculate the CO_2 emission coefficients of the power plants in the grid, according to "Tool to calculate the emission factor for an electricity system" version 07.0. All information regarding the national interconnected system is handled and stored by Nicaraguan Energy Institute, it is checked at the web site: https://www.ine.gob.ni/index.php/electricidad/serie-historica/
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	No comments.

Data/Parameter	$NCV_{i,y}$
Unit	*GJ/t*
Description	Net calorific value (energy content) of fossil fuel type i in year y / Weighted average net calorific value of fuel type i in year y.
Source of data	IPCC 2006 Guidelines for National Greenhouse Gas Inventories, Table 1.2 of Chapter 1 of Vol. 2 (Energy) (Default values at the lower limits of the 95% confidence intervals).
Value(s) applied	41.4 (Diesel oil) 39.8 (Fuel oil)
Choice of data or measurement methods and procedures	The net calorific value of fossil fuels consumed by power plants/units is used to calculate the CO_2 emission coefficients of the power plants in the grid, according to "Tool to calculate the emission factor for an electricity system" version 07.0. According to the tools the IPCC default values are used. This is conservative.
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	No comments.

Data/Parameter	$EF_{CO2,i,y}$ / $EF_{CO2,m,i,y}$
Unit	tCO_2/ *GJ*
Description	CO_2 emission factor of fossil fuel type i used in power unit m in year y / Weighted average CO_2 emission factor of fuel type i in year y.
Source of data	IPCC 2006 Guidelines for National Greenhouse Gas Inventories, Table 1.4 of Chapter 1 of Vol. 2 (Energy) (Default values at the lower limits of the 95% confidence intervals).
Value(s) applied	0.0726 (Diesel oil) 0.0755 (Fuel oil)
Choice of data or measurement methods and procedures	The CO_2 emission factor of fossil fuels consumed by power plants/units is used to calculate the CO_2 emission coefficients of the power plants in the grid, according to "Tool to calculate the emission factor for an electricity system" version 07.0. According to the tools the IPCC default values are used. This is conservative.
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	Any future revision of the IPCC Guidelines would be taken into account.

D.2. Data and parameters monitored

Data/Parameter	$EG_{facility,y}$ ($EG_{BL,y}$)
Unit	MWh/year
Description	Net electricity generated and supplied to the grid by the project activity in the year *y*

<table>
<tr><td>Measured/calculated/
default</td><td>Measured</td></tr>
<tr><td>Source of data</td><td>Measurement by project participant.</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>
<table>
<tr><th>Year</th><th>Fossil fuel (l)</th></tr>
<tr><td>2013</td><td>21,796.89</td></tr>
<tr><td>2014</td><td>49,238.72</td></tr>
<tr><td>2015</td><td>46,818.99</td></tr>
<tr><td>2016</td><td>53,909.15</td></tr>
<tr><td>2017</td><td>67,912.71</td></tr>
<tr><td>2018</td><td>61,316.83</td></tr>
<tr><td>2019</td><td>32,018.10</td></tr>
<tr><td>2020</td><td>36,177.14</td></tr>
</table>
</td></tr>
<tr><td>Monitoring equipment</td><td>
Meters
<table>
<tr><th></th><th>Serial</th><th>Model</th><th>Brand</th><th>Calibration and validity date</th><th>Accuracy</th></tr>
<tr><td>Main</td><td>SJ – 1111A176 - 02</td><td>ION-9610</td><td>SIEMENS</td><td>2013/08/16 – 2015/08/15
2015/08/14 – 2017/08/13
2017/08/25 – 2019/08/24
2019/08/29 – 2021/08/28</td><td>0.2%</td></tr>
<tr><td>Backup</td><td>SJ – 1111A179 - 02</td><td>ION-9610</td><td>SIEMENS</td><td>2013/08/16 – 2015/08/15
2015/08/14 – 2017/08/13
2017/08/25 – 2019/08/24
2019/08/29 – 2021/08/28</td><td>0.2%</td></tr>
</table>
Calibration frequency: once every two years.
Calibration gaps: 14/08/2017 - 25/08/2017 and 25/08/2019 - 29/08/2019
</td></tr>
<tr><td>Measuring/reading/recording frequency</td><td>Measured continuously and periodically recorded (every 15 minutes). The records of any energy generated was recorded since the start of project. Bidirectional power meters were installed in the project installations. The net electricity supplied to the grid was determined as the measured quantities of the grid electricity delivered to the grid minus the auxiliary electricity consumption, technical losses and electricity imports from the grid to the project power plant (determined in the commercial border or point used for billing purposes). The values were recorded monthly and stored in a spreadsheet.</td></tr>
<tr><td>Calculation method
(if applicable)</td><td>-</td></tr>
<tr><td>QA/QC procedures</td><td>Power meters are quite accurate. Moreover, the meters were calibrated by ENATREL[3] periodically according to national standards (once every two years in accordance with the operating regulations of the Commercial Annex: Commercial Measurement System) or IEC standards and recalibrated at appropriate intervals according to manufacturer’s specifications (at least once in three years). Data collected has low uncertainty levels and to guarantee its accuracy, it was cross-checked with the electricity sales receipts obtained from the grid trader/generator (where applicable, the lowest value was used for emission reductions calculation. This is conservative). For each power plant connected to the grid at the same point, the grid trader/generator delivered sales receipt separately (for each power plant). The accuracy of the meters as +/- % of the readings of kWh (measurement) is 0.2% (applicable to meters class 0.2).

In accordance with the operating regulations of the Commercial Annex: Commercial Measurement System when the CNDC detects that the main meter is failing, it will take as official the reading of the backup meter. The CNDC compares both measurements monthly and if the maximum total percentage error at cosine fi = 0.9, introduced in the measurement by the voltage drop in the secondary circuit cables of the voltage transformers exceeds 0.1%, the backup measurement must be taken.</td></tr>
</table>

[3] Empresa Nacional de Transmisión de Energía of Nicaragua.

Purpose of data/parameter	Calculation of baseline emissions
Additional comments	Since there are calibration gaps from 14/08/2017 to 25/08/2017 and 25/08/2019 to 29/08/2019, a correction factor of 0.2% is applied (major factor between found deviation and maximum deviation permissible) for these two full months. During the last meter test in 2019, power data meter readings between the Main and Backup meters were validated and showed satisfactory readings below the maximum deviation permissible (0.00256 % error). In the data cross-checked it was found that the main meter data tends to be higher than the invoicing data, this difference is due to the technical losses that are discounted in each invoice. However, approximately between the months of April and June there was a clear pattern where the invoiced value is higher than the net measured data, this is since during these months there was a period of dry season where it was necessary to consume energy from the grid (SIN), so the energy received increases, decreasing even more the net dispatch value tending to be lower than the invoiced value. Conservative values were used in the ER calculation.

Data/Parameter	$FC_{i,j,y}$
Unit	Mass or volume unit/y.
Description	Quantity of fuel type i combusted in process j during the year y.
Measured/calculated/ default	Measured
Source of data	Measurement by project participant.
Value(s) of monitored parameter	Estimated maximum diesel consumption: **Year** – **Fossil fuel (l)** 2013 – 2,342 2014 – 9,940 2015 – 9,940 2016 – 9,940 2017 – 9,940 2018 – 9,940 2019 – 9,940 2020 – 2,342
Monitoring equipment	Volume meter (buoy/float type)
Measuring/reading/recording frequency	Continuous measurement of all fossil fuel fed into the process using volume meters. Each filling of the backup electricity system was manually recorded by project participant.
Calculation method (if applicable)	-
QA/QC procedures	Results were recorded in a data log file (.xlsx). The meter is subject to regular maintenance and calibration as per the manufacturer's specifications (once every year). The uncertainty level of the data is low. The quantity is cross-checked with purchased quantities and stock changes. Where the purchased fuel invoices can be identified specifically for the CDM project, the metered fuel consumption quantities are also cross-checked with available purchase invoices from the financial records.
Purpose of data/parameter	Calculation of project emissions

Additional comments	The backup electricity system was not used during this monitoring period, only control and maintenance ignitions were performed, however, during the entire monitoring period this parameter was not properly monitored, and the volume meter was not calibrated as defined in the registered PDD. Therefore, as a conservative approach, the maximum diesel consumption of the backup electricity system during the entire monitoring period was estimated to calculate the project's emissions according to its fuel efficiency and maximum operating capacity or load factor as indicated in the manufacturer's specifications (see ER spreadsheet).

Data/Parameter	$EG_{m,y}$
Unit	MWh
Description	Net electricity generated by power units m in year y.
Measured/calculated/ default	Measured
Source of data	Government records from Nicaraguan Energy Institute (Instituto Nicaragüense de la Energía).
Value(s) of monitored parameter	Please refer ER spreadsheet
Monitoring equipment	-
Measuring/reading/recording frequency	Determined annually according to “Tool to calculate the emission factor for an electricity system” version 07.0. The national dispatch center of Nicaragua is responsible for issuing plans and ensuring a reliable performance of the national grid. All information regarding the national interconnected system (included information of the net electricity generated by power units) which is handled and stored by Nicaraguan Energy Institute is checked at the website: https://www.ine.gob.ni/index.php/electricidad/serie-historica/
Calculation method (if applicable)	-
QA/QC procedures	-
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	No comments.

Data/Parameter	$FC_{i.m,y}$
Unit	Mass or volume unit/y.
Description	Amount of fossil fuel type i consumed by power plant/unit m in year y.
Measured/calculated/ default	Measured
Source of data	Government records from Nicaraguan Energy Institute (Instituto Nicaragüense de la Energía).
Value(s) of monitored parameter	Please refer ER spreadsheet
Monitoring equipment	-
Measuring/reading/recording frequency	Determined annually according to “Tool to calculate the emission factor for an electricity system” version 07.0. The national dispatch center of Nicaragua is responsible for issuing plans and ensuring a reliable performance of the national grid. All information regarding the national interconnected system (included information of the amount of fossil fuels consumed by power units) which is handled and stored by Nicaraguan Energy Institute, it is checked at the web site: https://www.ine.gob.ni/index.php/electricidad/serie-historica/
Calculation method (if applicable)	-
QA/QC procedures	-
Purpose of data/parameter	Calculation of baseline emissions

Additional comments	No comments.

Data/Parameter	*$NCV_{i,y}$*
Unit	GJ/t.
Description	Net calorific value (energy content) of fossil fuel type i in year y / Weighted average net calorific value of fuel type i in year y.
Measured/calculated/ default	Default
Source of data	IPCC 2006 Guidelines for National Greenhouse Gas Inventories, Table 1.2 of Chapter 1 of Vol. 2 (Energy) (Default values at the lower limits of the 95% confidence intervals).
Value(s) of monitored parameter	41.4 (Diesel oil) 39.8 (Fuel oil)
Monitoring equipment	-
Measuring/reading/recording frequency	Determined annually according to “Tool to calculate the emission factor for an electricity system” version 07.0 and “Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion” version 3.0. Although the values provided by the fuel suppliers are preferred, the thermal power plants use several fuel suppliers which have not characterized under standard methods the net calorific values of the fuels; therefore, according to the tools, the IPCC default values are used. This is conservative.
Calculation method (if applicable)	-
QA/QC procedures	-
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	Any future revision of the IPCC Guidelines would be taken into account.

Data/Parameter	*$EF_{CO2,i,y}$ / $EF_{CO2,m,i,y}$*
Unit	*tCO_2 / GJ*
Description	CO_2 emission factor of fossil fuel type i used in power unit m in year y / Weighted average CO_2 emission factor of fuel type i in year y.
Measured/calculated/ default	Default
Source of data	IPCC 2006 Guidelines for National Greenhouse Gas Inventories, Table 1.4 of Chapter 1 of Vol. 2 (Energy) (Default values at the lower limits of the 95% confidence intervals).
Value(s) of monitored parameter	0.0726 (Diesel oil) 0.0755 (Fuel oil)
Monitoring equipment	-
Measuring/reading/recording frequency	Determined annually according to “Tool to calculate the emission factor for an electricity system” version 07.0 and “Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion” version 3.0. Although the values provided by the fuel suppliers are preferred, the thermal power plants use several fuel suppliers which have not characterized under standard methods the emission factors of the fuels; therefore, according to the tools, the IPCC default values are used. This is conservative.
Calculation method (if applicable)	-
QA/QC procedures	-
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	Any future revision of the IPCC Guidelines would be taken into account.

Data/Parameter	η_m
Unit	-
Description	Average net energy conversion efficiency of power unit m or k in year y.
Measured/calculated/ default	Default
Source of data	Nicaraguan Energy Institute (Instituto Nicaragüense de la Energía).
Value(s) of monitored parameter	0. Default values provided in the TOOL09: ”Determining the baseline efficiency of thermal or electric energy generation systems".
Monitoring equipment	-
Measuring/reading/recording frequency	Determined annually according to “Tool to calculate the emission factor for an electricity system” version 07.0 for each year calculation where option A2 for the OM simple calculation applies.
Calculation method (if applicable)	-
QA/QC procedures	If the data obtained from the manufacturer, the utility, the dispatch center of official records is significantly lower than the default value provided in Table 2, Appendix of TOOL09: ”Determining the baseline efficiency of thermal or electric energy generation systems" for the applicable technology, project proponents should assess the reliability of the values, and provide appropriate justification if deemed reliable. Otherwise, the default values provided in Appendix of TOOL09 shall be used
Purpose of data/parameter	Calculation of baseline emissions.
Additional comments	During this monitoring period, option A2 was not applied for the OM simple calculation therefore this parameter was not monitored.

D.3. Implementation of sampling plan

N/A

SECTION E. Calculation of emission reductions or net anthropogenic removals

E.1. Calculation of baseline emissions or baseline net removals

For AMS.I.D Version 17, the baseline is the MWh produced by the renewable generating unit and delivered to the national grid multiplied by an emission factor (measured in tCO_2e/MWh) as follows:

$$BE_y = EG_{BL,y}\ x\ EF_{CO_2,grid,y}$$ **Equation (1)**

Summary:

BE	
y	**tCO_2**
2013	14,346
2014	32,906
2015	31,179
2016	35,885
2017	45,559
2018	33,353
2019	17,093
2020	19,335

Where:

BE_y	Baseline emissions in the year y (tCO_2e).
$EF_{C02,grid,y}$	CO_2 emission factor of the grid in year y (tCO_2e/MWh)
$EG_{BL,y}$	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh).

Calculation of $EF_{CO2,grid,y}$.

The emission factor must be calculated in a transparent and conservative manner as a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the "Tool to calculate the emission factor for an electricity system" version 07.0 The calculation was based on data from an official source (where available) and made publicly available. According to the tool, the calculation of the emission factor is developed through the following six steps:

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

Step 1: Identifying the relevant electric power system.

The Nicaraguan electricity distribution network is composed by energy generators, transmission operators, net operators and traders. The net capacity of the national interconnected system in 2011 was 1,072.59 MW the hydraulic generation represents 9.82 %, the thermal generation represents 64.8%, and the geothermal generation 8.16%, the wind generation 5.87% and the biomass 11.36%[4]. The national dispatch centre of charge (CNDC) of Nicaragua is responsible for issuing plans and assuring a reliable performance of the national grid. The following figure shows the distribution of the National Interconnected System of Nicaragua.

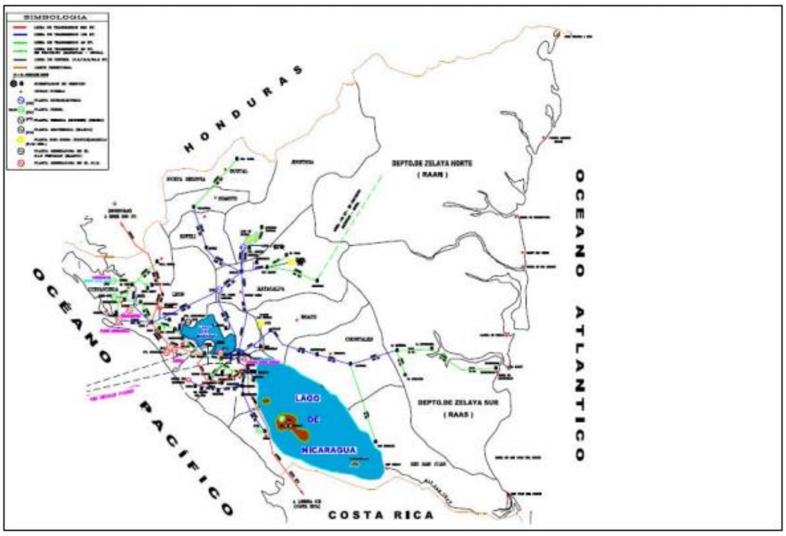

Figure 4: National Interconnected System of Nicaragua.

[4] Private and public enterprises of the SIN, 2010- Nicaraguan Energy Institute (Instituto Nicaragüense de la Energía).

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

For this project, the Option I of the tool has been chosen, and therefore only grid power plants are included in the emission factor calculation.

Step 3 - 4: Select a method and calculate the operating margin (OM).

Based on long-term averages for Low-cost/must-run production (minimum time frame of 15 years) it is determined that these constitute less than 50 per cent of total grid generation (excluding electricity generated by off-grid power plants)[5], therefore, the Operating Margin was calculated using the simple method and the ex-post value was chosen.

As such, the emission factor was updated for the year in which the power plant displaces electricity from the grid (applicable over the crediting period). The option chosen requires the monitoring and recalculation of the emission factor every year during the crediting period, using public information from official sources. Since the data from official sources is usually only available 18 months after the end of year y, the emission factor of the year proceeding the previous year y-2 was used. The same data vintage (y, y-1 or y-2) was used throughout all crediting periods, i.e., 2011-2018.

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

- Option A: based on the net electricity generation and the CO_2 emission factor of each power unit,
- Option B: based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project's electricity system.

For the calculation, the information to determine the simple OM emission factor was available from official sources (public information), thus option A has been chosen.

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

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

Equation (2)

Summary:

$EF_{grid,OMsimple,y}$	
y	**tCO_2/MWh**
2013	0.6636
2014	0.6843
2015	0.6772
2016	0.6757
2017	0.6823
2018	0.6875
2019	0.6673
2020	0.6685

Where:

[5] See ER spreadsheet – tap "OM method_LCMR-Analysis"

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

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

The option selected for the calculation of the emission factor for each plant is based on the fuel consumption (option A1) of the different plants of the grid. According to this option, for power unit m, only data on electricity generation and the fuel types used is available:

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

Equation (3)

Example: $EF_{EL,\ Planta\ Nicaragua,2013} = \frac{71.23\ Gg \cdot 41\frac{TJ}{Gg} \cdot 75.5\frac{tCO2}{TJ}}{258{,}431.47\ MWh} = 0.8615\frac{tCO_2}{MWh}$

Where:

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

Determination of $EG_{m,y}$

For grid power plants, $EG_{m,y}$ was determined as per the provisions in the monitoring tables. For this approach (simple OM), to calculate the operating margin, the subscript m refers to the power plants/units delivering electricity to the grid, not including low-cost/must-run power plants/units. Electricity import data was not included as no information was available.

The information needed to calculate the operating margin emission factor is available from official sources such as CNDC and the Nicaraguan Energy Institute (Instituto Nicaragüense de la Energía). The data used corresponds to the last available information necessary to calculate the update of the national emission factor by official sources.

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

For the project, the BM emission factor is calculated based on the vintage of data under option 2 (updated annually, ex-post approach). This option was chosen in order to use recent and public information from official sources up to the year of registration of the project activity.

For the build margin calculation, the group of available generating plants m were selected and the five most recently built power stations were identified. It was determined that the most recent additions represent 20% of total generation. The option that comprises the larger annual generation was chosen. Power plants registered as CDM/VCS project activities were excluded from the sample group m as long as the power plants in the sample group were no more than 10 years old. The option that corresponds to the highest annual generation was chosen. The energy produced by the 5 most modern power stations in Nicaragua or the most recent power stations generating the 20% of the electricity. The build margin emission factor was therefore calculated based on 20% of the electricity generated.

The build margin emission factor is the generated-weighted average emission factor (tCO_2/MWh) of power units in sample group m during the most recent year y for which power generation data is available. The following formula was used to calculate the build margin emission factor:

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

Equation (4)

Summary:

$EF_{grid,BM,y}$	
y	**tCO_2/MWh**
2013	0.6527
2014	0.6523
2015	0.6547
2016	0.6556
2017	0.6594
2018	0.4004
2019	0.4004
2020	0.4004

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 the year y (MWh).
$EF_{EL,m,y}$	CO_2 emission factor for power unit m in the year y (tCO_2/ MWh).
m	Power units included in the build margin.
y	Most recent historical year for which power generation data is available.

The emission factor for each of the power stations selected for calculating the build margin $FE_{EL,m,y}$ is produced in the same way as in the previous steps.

Step 6: Calculate the combined margin (CM) emission factor.

The calculation of the combined margin (CM) emission factor is based on one of the following methods:

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

The weighted average CM method (option a) should be used as the preferred option. The simplified CM method (option b) can only be used if:

- The project activity is located in a Least Developed Country (LDC) or in a country with less than 10 registered projects at the starting date of validation; and

- The data requirements for the application of step 5 above cannot be met.

For the CM calculation, option a has been chosen, thus the combined margin emission factor is calculated as a weighted average of the operating margin (EF_{OM}) and build margin (EF_{BM}) emission factors.

$$EF_{grid,CM,y} = w_{OM}\ x\ EF_{grid,OM,y} + w_{BM}\ x\ EF_{grid,BM,y}$$ **Equation (5)**

Summary:

$EF_{grid,CM,y}$	
y	**tCO_2/MWh**
2013	0.6582
2014	0.6683
2015	0.6660
2016	0.6657
2017	0.6709
2018	0.5440
2019	0.5339
2020	0.5345

Where:

$EF_{grid,BM,y}$	Build margin CO_2 emission factor in year y (tCO_2/MWh).
$EF_{grid,OM,y}$	Operating margin CO_2 emission factor in one year y (tCO2/MWh).
ωOM	Weighting of operating margin emissions factor (%).
ωBM	Weighting of build margin emissions factor (%).

E.2. Calculation of project emissions or actual net removals

The methodology AMS.I.D version 17 states for most renewable energy project activities, project emissions are zero (PEy = 0). However, since the project has a reservoir, the project emissions from water reservoirs of hydro power plants were considered, following the procedures described in the ACM0002. In addition, CO_2 emissions from on-site consumption of fossil fuels due to project activity were also considered using the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" version 3.0.

According to ACM0002 version 13.0.0, project emissions must be calculated using the following equation:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y}$$ **Equation (6)**

Where:

PE_y	Project emissions in year y (tCO_2/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 project does not consider geothermal power plants, therefore $PE_{GP,y}$ is not considered.

Project emissions from fossil fuel consumption in year y ($PE_{FF,y}$).

For the project activity, the use of a backup electricity system only for emergencies has been considered (fossil fuel based), therefore the project emissions were considered. According to AMS.I.D version 17, CO_2 emissions from on-site consumption of fossil fuels due to project activity shall be calculated using the latest version of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" version 3.0.

According to the tool the CO_2 emissions from fossil fuel combustion in process are calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels, as follows:

$$PE_{FC,j,y} = \sum_i FC_{i,j,y} \; x \; COEF_{i,y} \qquad \textbf{Equation (7)}$$

Summary:

PE$_{FC,j,y}$	
y	**tCO_2**
2013	5.98
2014	25.39
2015	25.39
2016	25.39
2017	25.39
2018	25.39
2019	25.39
2020	19.41

Where:

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

The CO_2 emission coefficient $COEF_{i,y}$ can be calculated using one of the following two Options, depending on the availability of data on the fossil fuel type i, as follows:

- Option A: The CO_2 emission coefficient COEF is calculated based on the chemical composition of the fossil fuel type i.
- Option B: The CO_2 emission coefficient COEF is calculated based on net calorific value and CO_2 emission factor of the fuel type i.

Tough option A is preferred, the information of the weighted average mass fraction of carbon in fuel type and the weighted average density are not available from official sources or from the fuel suppliers, then for this project the option B has been chosen. The CO2 emission coefficient COEF is calculated as follows:

$$COEF_{i,y} = NCV_{i,y} \; x \; EF_{CO2,i,y} \qquad \textbf{Equation (8)}$$

Example: $COEF_{i,y} = 41.4 \frac{GJ}{t} \; x \; 0.0726 \frac{tCO2}{GJ} = 3.005 \; \frac{tCO2}{t}$

Where:

$COEF_{i,y}$	CO_2 emission coefficient of fuel type i in year y (tCO_2/mass or volume unit).

$NCV_{i,y}$	Is the weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit).
i	Are the fuel types combusted in process j during the year y.

Project emissions from water reservoirs of hydro power plants in year y (*$PE_{HP,y}$*)

According to ACM0002 version 13.0.0, the power density (PD) is calculated as follows:

$$PD = \frac{Cap_{pj} - Cap_{BL}}{A_{pj} - A_{BL}}$$ **Equation (9)**

Example: $PD = \frac{14{,}400{,}000\ W - 0}{247{,}449\ m^2 - 0} = 58.19\ \frac{W}{m^2}$

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 at 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 at 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.

After the plant was built, the reservoir area was determined by means of a topographic map at the maximum water level (247,449 m^2), updating the preliminary area reported in the PDD.

The power density value is 58.19 W/m^2; therefore, according to the option b, as the power density of the project activity (PD) is greater than 10 W/m^2, project emission from reservoir is zero, *$PE_{HP,y}$* = 0.

E.3. Calculation of leakage emissions

In accordance to the applicable methodology, leakages are to be considered “if the energy generating equipment is transferred from another activity or if the existing equipment is transferred to another activity”. Since there is no transfer of equipment from or to the project activity, leakages are zero.

E.4. Calculation of emission reductions or net anthropogenic removals

	Baseline GHG emissions or baseline net GHG removals (t CO_2e)	Project GHG emissions or actual net GHG removals (t CO_2e)	Leakage GHG emissions (t CO_2e)	GHG emission reductions or net anthropogenic GHG removals (t CO_2e)			
				Before 01/01/ 2013	From 01/01/ 2013 until 31/12/ 2020	From 01/01/ 2021	Total amount
Total	229,656	178	0	0	229,478	0	229,478

E.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the registered PDD

Amount achieved during this monitoring period ($t\ CO_2e$)	Amount estimated ex ante for this monitoring period in the PDD ($t\ CO_2e$)
229,478	250,075

E.5.1. Explanation of calculation of "amount estimated ex ante for this monitoring period in the PDD"

The amount of GHG emission reductions estimated ex ante for this monitoring period was calculated by multiplying the expected daily emission reduction by 2,555 days, the equivalent days to the 07/10/2013 – 06/10/2020 period. Thus, amount estimated ex ante is 35,725/365*2,555 = 250,075 t CO2e.

E.6. Remarks on increase in achieved emission reductions

There is no increase in emissions achieved.

E.7. Remarks on scale of small-scale project activity

According to TOOL20: Assessment of debundling for small-scale project activities (v4.0), debundling is defined as the fragmentation of a large project activity into smaller parts. A smallscale project activity that is part of a large project activity is not eligible to use the simplified modalities and procedures for small-scale CDM project activities. The full project activity or any component of the full project activity shall follow the regular CDM modalities and procedures.

A proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

- With the same project participants.
- In the same project category and technology/measure; and
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point. The same small-scale project type remained under the limit of that type every year during the crediting period.

Considering there are no CDM project registered within 1km from Hidro Pantasma, the project activity shall not be considered as a part of a larger project activity.

In addition, the following eligibility criteria shall be met for Type I SSC according to §119 of CDM PS (v2.0):

> *"Type I: Renewable energy project activities with a maximum output capacity of 15 MW (or an appropriate equivalent). In this context:*
> *(i) "Output" is the installed/rated capacity as indicated by the manufacturer of the equipment or plant, irrespective of the actual load factor of the plant. The installed/rated capacity of renewable electricity generating units that involve turbine generator systems shall be based on the installed/rated capacity of the generator".*

According to the generator tags, the power capacity of generators is 8,000 kVA. Considering 0.90 power factor:

2 generators x 8,000 kVA capacity x 0.90 power factor = 14,400 kW

It is important mentioning that installed capacity presented in the registered PDD was based on generators rate capacity, however the project is also limited by the turbines rate capacity (2 x 6.860 kW = 13.7 MW). Independently of both approaches, the installed capacity of the project does not surpass the eligibility criteria of SCC project activities under type I (15 MW). Moreover, the energy generation is confirmed by means of the Ministerial Agreement No. 2-DGERR-02-2010 emitted by the Ministry of Energy and Mining in which the effective capacity is limited to a maximum of 12,500 kW. As such, the project developer obtains the Electric Energy Generation License only for this capacity.

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Document information

Version	Date	Description
08.0	6 April 2021	Revision to: • Reflect the “Clarification: Regulatory requirements under temporary measures for post-2020 cases” (CDM-EB109-A01-CLAR).
07.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the “CDM project standard for project activities” (CDM-EB93-A04-STAN); • Add a section on remarks on the observance of the scale limit of small-scale project activity during the crediting period; • Add "changes specific to afforestation or reforestation project activity" as a possible post-registration changes; • Clarify the reporting of net anthropogenic GHG removals for A/R project activities between two commitment periods; • Make editorial improvements.
06.0	7 June 2017	Revision to: • Ensure consistency with version 01.0 of the “CDM project standard for project activities” (CDM-EB93-A04-STAN); • Make editorial improvements.
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: • Include provisions related to delayed submission of a monitoring plan; • Provisions related to the Host Party; • Remove reference to programme of activities; • Overall editorial improvement.
04.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from *F-CDM-MR* to *CDM-MR-FORM*; • Editorial improvement.
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB 70, Annex 11).

Version	*Date*	*Description*
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01.0	28 May 2010	EB 54, Annex 34. Initial adoption.

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