Project design document form
(Version 11.0)

BASIC INFORMATION	
Title of the project activity	Votorantim's Hydropower Plant with existing reservoir "Pedra do Cavalo" CDM Project
Scale of the project activity	☒ Large-scale ☐ Small-scale
Version number of the PDD	3.0
Completion date of the PDD	05/08/2019
Project participants	Votorantim Cimentos Ltda. Ecopart Assessoria em Negocios Empresariais Ltda. J. Aron & Company CM Capital Market Holding S.A.
Host Party	Brazil
Applied methodologies and standardized baselines	Grid-connected electricity generation from renewable sources --- Version 19.0
Sectoral scopes	Sectoral Scope 1: Energy industries (renewable - / non-renewable sources)
Estimated amount of annual average GHG emission reductions	101,417 tCO_2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

The project activity is a hydropower plant with existing reservoir built since 1985, which neither volume nor flooded area of the reservoir was increased. The project included construction of electric sub-stations, fabrication and installation of turbines and generators. The plant has an installed capacity of 162MW[1], located in the city of Governador Mangabeira, São Félix and Cachoeira, state of Bahia, Northeastern of Brazil. *UHE*[2] *Pedra do Cavalo* (hereinafter referred to as UHEPC) is owned by VOTORANTIM CIMENTOS LTDA. and administered by VOTORANTIM ENERGIA LTDA., both are subsidiaries of GRUPO VOTORANTIM.

The project activity reduces greenhouse gases emissions that would have occurred in the absence of the project by avoiding electricity generation by fossil fuel sources in the operating margin and build margin of the system. The power plant was built in an existing reservoir that was built with the purpose of supplying water to the city of Salvador. The use of the reservoir for electricity generation added a new function to the reservoir without resulting in additional environmental impacts due to increase in flooded area. During the third crediting period of the project, it is expected to reduce 709,920 tCO_2e, *i.e.* 101,417 tCO_2e/year.

The primary objective of the UHEPC is to help meet Brazil's rising demand for energy due to economic growth and to improve the supply of electricity, while contributing to the environmental (utilization of an existing reservoir to generate electricity), social (job creation about 500 workers in the construction phase, and infra-structure enhancements in surrounded municipalities), and economic sustainability (4% of state of Bahia's electricity generation) by increasing renewable energy's share of the total Brazilian (and the Latin America and the Caribbean region's) electricity consumption.

The UHEPC improves the supply of electricity with clean, renewable energy while contributing to the regional/local economic development. This indigenous and cleaner source of electricity has been providing local distributed generation and has been providing site-specific reliability and transmission and distribution benefits including:

- Increased reliability, shorter and less extensive outages;
- Lower reserve margin requirements;
- Improved power quality;
- Reduced lines losses;
- Reactive power control;
- Mitigation of transmission and distribution congestion, and;
- Increased system capacity with reduced T&D investment.

It is important to highlight that in 1999, cement industry worldwide launched the Cement Sustainability Initiative. Among other reasons, the Initiative was launched in response to international concerns about the role of the cement industry in Climate Change. The objective of the Initiative was to develop studies and to propose an agenda towards the sustainability of the cement industry. In the Climate Change chapter, the agenda proposed some important actions including: innovation in improving the energy efficiency of processes and equipment; switching to lower carbon fuels and energy sources; using alternative raw materials to reduce limestone use; developing CO_2 capture and sequestration techniques; and taking advantage of market mechanisms such as emissions trading and voluntary initiatives. Votorantim Cimentos is signatory of the Cement Industry Initiative and started to define strategies in order to meet the Initiative agenda.

[1] Considering the capacity of the generators, that is the equipment with the minor installed capacity at the plant, which limits the electricity generation by the plant.

[2]. UHE from the Portuguese "*Usina Hidrelétrica"* – Hydropower plant

A.2. Location of project activity

The project activity is located in the cities of Governador Mangabeira, Cachoeira and São Félix under the following geographic coordinates:

Latitude: 12º36'00'' South

Longitude: 38º59'00'' West

A.3. Technologies/measures

The facility description follows:

- 105 m waterfall for 162 MW1 total installed capacity (2 x 81 MW generators and 2 × 82.65 MW Francis turbines – Figure 1), and yearly firm average energy output capacity of 55.1 MW.
- The flooded area of the reservoir (186 km²), which is in place since 1985 (Figure 2), did not increase.

Figure 1 – Pedra do Cavalo's Francis turbine (S*ource: Wilson Besnosik*).

Figure 2 – Pedra do Cavalo's reservoir since 1985.

It is important to mention that the hydropower plant of the project activity operates in accordance with the installed capacity authorized by the environmental agency (which can be confirmed by the operation license) and as per the authorization issued by the Brazilian Electricity Regulatory Agency (from the Portuguese *Agência Nacional de Energia Elétrica – ANEEL*)[3].

A.4. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Brazil (Host Party)	Votorantim Cimentos Ltda. (private entity)	No
	Ecopart Assessoria em Negocios Empresariais Ltda. (private entity)	
Switzerland	J. Aron & Company (private entity)	
	CM Capital Market Holding S.A. (private entity)	

A.5. Public funding of project activity

No public funding, including official development assistance, was or will be used in Votorantim's Hydropower Plant with existing reservoir "Pedra do Cavalo" CDM Project Activity.

A.6. History of project activity

The project activity is registered under CDM since 31/12/2006 and it is currently renewing the crediting period.

The Project Participants confirm that:

(a) The proposed CDM project activity is not included as a component project activity (CPA) in a registered CDM programme of activities (PoA);

(b) The proposed CDM project activity is not a project activity that has been deregistered;

(c) The proposed CDM project activity is not a CPA that has been excluded from a registered CDM PoA;

(d) The proposed CDM project activity is not a registered CDM project activity or a CPA under a registered CDM PoA whose crediting period has or has not expired (hereinafter referred to as former project) exists in the same geographical location as the proposed CDM project activity.

A.7. Debundling

Not applicable. The project is a large scale project type.

[3] As per ANEEL Ordinance #1 061, dated 15/12/2004 (http://www.aneel.gov.br/cedoc/dsp20041061.pdf) and ANEEL Ordinance #139, dated 28/01/2005 (http://www.aneel.gov.br/cedoc/dsp2005139.pdf).

SECTION B. Application of methodologies and standardized baselines

B.1. References to methodologies and standardized baselines

ACM0002: "Grid-connected electricity generation from renewable sources" (version 19.0).

ACM0002 refers to the latest approved versions of the following tools:

- TOOL01: Tool for the demonstration and assessment of additionality (Version 7.0);
- TOOL02: Combined tool to identify the baseline scenario and demonstrate additionality (version 7.0);
- TOOL03: Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion (version 3.0);
- TOOL05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (version 3.0);
- TOOL07: Tool to calculate the emission factor for an electricity system (Version 7.0);
- TOOL10: Tool to determine the remaining lifetime of equipment (version 1.0);
- TOOL11: Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period (version 3.0.1).

Since this PDD refers to the third crediting period of the project, the "Tool for the demonstration and assessment of additionality" (TOOL01) and the "Combined tool to identify the baseline scenario and demonstrate additionality" (TOOL02) are not applicable.

The "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (TOOL03) is also not applied to the project, since there are no GHG emissions from fossil fuel combustion in the project boundary.

B.2. Applicability of methodologies and standardized baselines

ACM0002 is applicable to project activities that:

(a) Install a greenfield power plant;

(b) Involve a capacity addition to an existing plant(s);

(c) Involve a retrofitting of (an) existing operating plant(s)/unit(s);

(d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or

(e) Involve a replacement of (an) existing plant(s)/unit(s).

In the case of the proposed project activity, option (a) is applicable.

Furthermore, the methodology is applicable under the following conditions:

(a) The project activity may include renewable energy power plant/unit of the following types: hydro power plant/unit with or without reservoir, wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit.

The project activity consists of a hydropower plant.

(b) In the case of capacity additions, retrofits, rehabilitations or replacements (except for wind, solar, wave or tidal power capacity addition projects): 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, retrofit, or rehabilitation of the plant/unit has been undertaken between the start of this minimum historical reference period and the implementation of the project activity.

Not applicable, since only new project/unit(s) is considered in the proposed project activity.

In case of hydro power plants, one of the following conditions shall apply:

(a) The project activity is implemented in an existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or

(b) The project activity is implemented in an existing single or multiple reservoirs, where the volume of any of the reservoirs is increased and the power density calculated using equation (3) is greater than 4 W/m^2; or

(c) The project activity results in new single or multiple reservoirs and the power density calculated using equation (3) is greater than 4 W/m^2; or

(d) The project activity is an integrated hydro power project involving multiple reservoirs, where the power density for any of the reservoirs, calculated using equation (3), is lower than or equal to 4 W/m^2 , all of the following conditions shall apply:

(i) The power density calculated using the total installed capacity of the integrated project, as per equation (4), is greater than 4 W/m2 ;

(ii) Water flow between reservoirs is not used by any other hydropower unit which is not a part of the project activity;

(iii) Installed capacity of the power plant(s) with power density lower than or equal to 4 W/m2 shall be:

a. Lower than or equal to 15 MW; and

b. Less than 10 per cent of the total installed capacity of integrated hydro power project.

In the case of the project activity, option (a) is applied. Previously to the implementation of the UHEPC, EMBASA (EMPRESA BAIANA DE SANEAMENTO) operated the reservoir for almost 20 years (from 1985 up to 2004). EMBASA is the company responsible for providing the services of water supply and sanitation to Salvador and some cities in the countryside of the state.

In the case of integrated hydro power projects, project proponent shall:

(a) Demonstrate that water flow from upstream power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or

(b) Provide an analysis of the water balance covering the water fed to power units, with all possible combinations of reservoirs and without the construction of reservoirs. The purpose of water balance is to demonstrate the requirement of specific combination of reservoirs constructed under CDM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability in different seasons to optimize the water flow at the inlet of power units. Therefore this water balance will take into account seasonal flows from river, tributaries (if any), and rainfall for minimum five years prior to implementation of CDM project activity.

Not applicable, since the project activity is not an integrated project type.

Additionally, the methodology is not applicable to the following:

(a) 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

Not applicable, since the hydropower plant is a grid-connected power project.

(b) Biomass fired power plants;

Not applicable, since the project activity is a hydropower project type.

Considering explanations above, the project activity follows the applicability conditions established in ACM0002.

B.3. Project boundary, sources and greenhouse gases (GHGs)

	Source	GHG	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 dry or flash steam geothermal power plants, emissions of CH_4 and CO_2 from non-condensable gases contained in geothermal steam	CO_2	No	Not applicable, since the proposed project is based on hydropower source.
		CH_4	No	
		N_2O	No	
	For binary geothermal power plants, fugitive emissions of CH4 and CO2 from noncondensable gases contained in geothermal steam	CO_2	No	
		CH_4	No	
		N_2O	No	
	For binary geothermal power plants, fugitive emissions of hydrocarbons such as n-butane and isopentane (working fluid) contained in the heat exchangers	CO_2	No	
		CH_4	No	
		N_2O	No	
	CO_2 emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants	CO_2	No	
		CH_4	No	
		N_2O	No	
	For hydro power plants, emissions of CH_4 from the reservoir	CO_2	No	Main emission source. However, the project activity was built in an existent reservoir and, then, reservoir is not an emission source.
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source

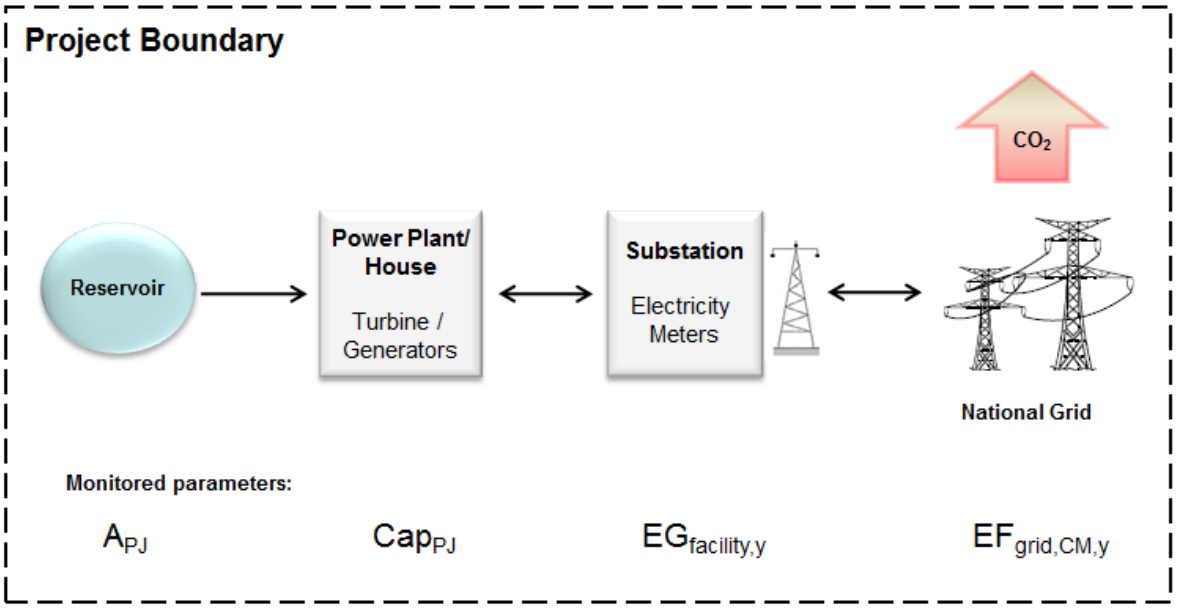

Figure 3 – Flow diagram of the project boundary.

B.4. Establishment and description of baseline scenario

In accordance with the ACM0002, if the project activity consists of the installation of a greenfield power plant, the baseline scenario is:

"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".

Since the project activity consists of the implementation of a greenfield power project, the baseline scenario mentioned above is applicable.

According to §287 and §290 the CDM Project Standard (version 9.0):

"To demonstrate the validity of the original baseline or its update, project participants are not required to re-assess the baseline scenario. Instead, project participants shall assess the GHG emission reductions that would have resulted from that scenario (…)

(…)If data and parameters used for determining the original baseline, that were determined ex ante and not monitored during the crediting period, are no longer valid, the project participants shall update such data and parameters in accordance with the "Methodological tool: Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period".

Steps of the methodological tool "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period" (TOOL11) were applied as follows:

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

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

In the first crediting period, the project electricity system was the North-Northeast and the CO_2 emission factor of the grid was calculated by the project participants, while applying the ex-post option for the simple adjusted OM. For the second crediting period of the project, the CO_2 emission factor of the grid has changed considering the electricity system delineation of grid-connected projects following the Brazilian DNA definition. According to Resolution # 8 issued by the Brazilian DNA on May 26th, 2008, the project electricity system for projects connected to the National Interconnected System ("SIN" from the Portuguese "Sistema Interligado Nacional") shall cover cover all five macro-geographical regions of the country (North, Northeast, South, Southeast and Midwest). The CO_2 emission factor of the grid continued to be calculated by the project participants as the Brazilian DNA presented values using OM dispatch data analysis method only (option (c) of TOOL07).

In this third crediting period, the project participants are applying the grid delineation (SIN) and values published by the Brazilian DNA, while applying the ex-ante data vintage using values published by the Brazilian DNA under the simple adjusted OM (option (b) of TOOL07). Therefore, the current baseline complies with national and sectoral policies which have come into effect after the submission of the project for registration.

Since circumstances related to the calculation of the emission factor of the grid have changed, information related to baseline emission factor calculation was reviewed in this third crediting period (see sections B.6.1 and B.6.3).

Step 1.2: Assess the impact of circumstances

As mentioned above, circumstances related to CO_2 emission factor of the grid have changed and, therefore, it was reviewed in this PDD. The operating, build and combined margin CO_2 emission factor of the grid during the project crediting periods are presented below:

Table 1 – Operating, Build and Combined CO_2 emission factor as presented in the PDD.

Crediting period	**$EF_{OM,y}$ (tCO_2/MWh)**	**$EF_{BM,y}$ (tCO_2/MWh)**	**$EF_{CM,y}$ (tCO_2/MWh)**
First - North-Northeast Grid 09 Apr 05 - 08 Apr 12	0.1840	0.0568	0.1204
Second - National Grid 09 Apr 12 - 08 Apr 19	0.4787	0.1404	0.2250

Crediting period	$EF_{OM,y}$ (tCO_2/MWh)	$EF_{BM,y}$ (tCO_2/MWh)	$EF_{CM,y}$ (tCO_2/MWh)
Third - National Grid 09 Apr 19 – 08 Apr 26	0.4195	0.1404	0.2102

The CO_2 EF of the grid reflects the GHG emissions of existing and the prospective power plants connected to the electricity system. In the case of Brazil, it possesses a large share of hydroelectricity and, for this reason, it presents a low CO_2 emission factor of the grid when comparing to other countries. However, during the years when an atypical short rainy season is observed, the generation of electricity by the thermal power plants fuelled with fossil fuels rises.

While analyzing methods and source of data, the main difference from the 1st and 2nd crediting periods in respect to the CO_2 EF calculation is the delineation of the grid. In the first crediting period, the delineation of the grid was based on the North-Northeast grid system, for which emission factor was calculated by the Project Participants based on data from the Brazilian Electric System Operator ("ONS" from the Portuguese "Operador Nacional do System").

Furthermore, the weights established in the CO_2 EF tool also impacted the $EF_{CM,y}$ results at the time of the 2nd crediting period, since 0.25 for OM and 0.75 for BM shall be considered for the 2nd and subsequent crediting periods (and no more 0.5 for OM and BM as in the 1st crediting period). Detailed description of methods applied for the calculation of emission reductions are presented in sections B.6.1 and B.6.3.

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

In the absence of the project, the electricity would be generated by grid connected power plants. The National Interconnected System (SIN, from the Portuguese "Sistema Interligado Nacional") is composed by 7.125 plants[4] and each one has specific characteristics and equipment. Thus this step does not apply, since the whole system would continue to supply energy independently of the lifetime of individual equipment.

Regarding the project lifetime, the project has more than 35 years lifetime without any new investment required as validated in the registered PDD. Since the project startup occurred in 2004-2005 year, the project is expected to be operational up to 2039-2040 year. Then, the remaining technical lifetime exceeds the end of the last crediting period of the project (2026 year).

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

Considering that emission factor calculation determined on the third crediting period has changed, parameters related to its calculation have been reviewed. Detailed description of data and parameters applied for the calculation of emission reductions are presented in sections B.6.1 and B.6.3.

Step 2: Update the current baseline and the data and parameters

Step 2.1: Update the current baseline

The current scenario still valid, thus there is no need to be updated. Detailed description of data and parameters applied for the calculation of emission reductions are presented in sections B.6.1 and B.6.3.

Step 2.2: Update the data and parameters

Considering changes in the Brazilian grid delineation, the CO_2 emission factor of the grid has to be updated to reflect the current delineation and matrix, following the latest version of TOOL07. Detailed description on how the emission factor was determined is presented in sections B.6.1 and B.6.3 of this PDD.

[4] Source ANEEL, 2018. Available at <http://www2.aneel.gov.br/aplicacoes/capacidadebrasil/capacidadebrasil.cfm>. Accessed on August 22nd, 2018.

B.5. Demonstration of additionality

Not applicable for the renewal of the crediting period.

B.6. Estimation of emission reductions

B.6.1. Explanation of methodological choices

Project Emissions

According to ACM0002, for most renewable energy power generation project activities, $PE_y = 0$. However, some project activities may involve project emissions that can be significant. These emissions shall be accounted for as project emissions by using the following equation:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y} \quad \textbf{Equation 1}$$

Where:

PE_y = Project emissions in year *y* (tCO_2e);

$PE_{FF,y}$ = Project emissions from fossil fuel consumption in year *y* (tCO_2);

$PE_{GP,y}$ = Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year *y* (tCO_2e);

$PE_{HP,y}$ = Project emissions from water reservoirs of hydro power plants in year *y* (tCO_2e).

For all renewable energy power generation project activities, emissions due to the use of fossil fuels for the backup generator can be neglected.

According to ACM0002, project emissions from reservoir depend on the power density of hydropower projects calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} \quad \textbf{Equation 2}$$

Where:

PD = Power density of the project activity, as W/m^2;

Cap_{PJ} = Installed capacity of the hydroelectric plant after implementation of the project activity (W);

Cap_{BL} = Installed capacity of the hydroelectric plant before implementation of the project activity (W). For new hydroelectric power plants, this value is zero;

A_{PJ} = Reservoir area measured at the surface of the water, after implementation of the project activity when the reservoir is full (m^2);

A_{BL} = Reservoir area measured at the surface of the water, before implementation of the project activity when the reservoir is full (m^2). For new reservoirs, this value is zero;

If the power density (PD) of the hydroelectric plant is higher than 4 W/m^2 and lower or equal to 10 W/m^2:

$$PE_y = \frac{EF_{Res} \cdot TEG_y}{1000} \quad \textbf{Equation 3}$$

Where:

PE_y = Reservoir emission as tCO_2e/year;

EF_{Res} = Default emission factor for emissions from reservoirs of hydropower plants and the standard value according to EB23 is 90 $kgCO_2e/MWh$;

TEG_y = Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in the year y (MWh).

If the power density (PD) of the hydroelectric plant is higher than 10 W/m^2, PEy = 0

Baseline emissions

Baseline emissions (BEy, as tCO_2e) are obtained by the product of the emissions factor of baseline (EFy as tCO2e/MWh) by the electricity supplied to the grid by the project activity (EGy, as MWh) as follows:

$$BE_y = EG_{PJ,y} \cdot EF_{grid,CM,y}$$ **Equation 4**

Where:

BE_y = Baseline emissions in the year y (tCO_2/year);

$EG_{PJ,y}$ = Liquid amount of electricity injected in the grid as resulted from the implementation of the CDM project in the year y (MWh/year);

$EF_{grid,CM,y}$ = Emission factor of CO_2 of the combined margin for the generation of energy connected to the grid in the year calculated using the latest version of the "Tool for the calculation of the emission factor for an electrical system" (tCO_2e/MWh).

I. Calculation of the combined margin CO_2 emission factor for grid connected power generation ($EF_{grid,CM,y}$)

According to TOOL07, the following 6 (six) steps shall be applied in order to calculate the baseline emission factor as further detailed below.

STEP 1 - Identify the relevant electricity systems

According to the tool, the following options can be applied:

Option 1. A delineation of the project electricity system and connected electricity systems published by the DNA or the group of the DNAs of the host country(ies), In case a delineation is provided by a group of DNAs, the same delineation should be used by all the project participants applying the tool in these countries;

Option 2. A delineation of the project electricity system defined by the dispatch area of the dispatch centre responsible for scheduling and dispatching electricity generated by the project activity. Where the dispatch area is controlled by more than one dispatch centre, i.e. layered dispatch area, the higher level area shall be used as a delineation of the project electricity system (e.g. where regional dispatch centres are required to comply with dispatch orders of the national dispatch centre then area controlled by the national dispatch centre shall be used);

Option 3. A delineation of the project electricity system defined by more than one independent dispatch areas, e.g. multi-national power pools;

The project activity applies Option 1 above.

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

The tool provides the following 2 (two) options to calculate the operating margin and build margin emission factor:

Option (i): only grid power plants are included in the calculation;

Option (ii): both grid power plants and off-grid power plants are included in the calculation.

The Brazilian DNA made available the emission factor calculation based on Option (i) above.

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

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

(a) Simple OM, or

(b) Simple adjusted OM, or

(c) Dispatch data analysis OM, or

(d) Average OM.

The project activity applies the simple adjusted OM (option b).

For the simple adjusted OM, the emissions factor can be calculated using either of the two following data vintages:

(a) Ex ante option: if the ex ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation. For off-grid power plants, use a single calendar year within the five most recent calendar years prior to the time of submission of the CDM-PDD for validation;

(b) Ex post option: if the ex post option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required to calculate the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year y-1 may be used. If the data is usually only available 18 months after the end of year y, the emission factor of the year proceeding the previous year y-2 may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.

The project activity applies option (a), the ex-ante data vintage.

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

According to the tool "*the simple adjusted OM emission factor ($EF_{grid,OM-adj,y}$) is a variation of the simple OM, where the power plants / units (including imports) are separated in low-cost/must-run power sources (k) and other power sources (m).*"

$$EF_{grid,OM-adj,y} = (1-\lambda_y) \cdot \frac{\sum_m EG_{m.y} \times EF_{EL,m,y}}{\sum_m EG_{m.y}} + \lambda_y \cdot \frac{\sum_k EG_{k,y} \times EF_{EL,k,y}}{\sum_k EG_{k,y}} \qquad \textbf{Equation 5}$$

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 grid power units serving the grid in year *y;*

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

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

The parameter λ_y is defined as follows:

$$\lambda_y(\%) = \frac{number - of\ - low - hours - \cos t / must - run - on - the - m\arg in - in - year - y}{8760 hours - per - year} \quad \textbf{Equation 6}$$

There are two approaches to determine lambda (λ_y):

Approach 1. Use default values of lambda from Table 1 Appendix 3 based on the share of electricity generation from low-cost/must-run in total generation derived using 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production. Approach 1 can only be applied if the LASL is not less than one-third of the HASL in a project electricity/ grid system demonstrated based on the yearly data for the years used to determine the OM emission factor.

Approach 2. Lambda (λ_y) should be calculated determined by applying the step wise procedure provided in Appendix 4 of the tool.

The Brazilian DNA annually publishes the CO_2 OM emission factor under the simple adjusted method as well as the total energy dispatched to SIN.

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

The sample group of power units *m* used to calculate the build margin was determined following the procedure provided by the tool and BM emission factor shall be calculated based on the equation below:

$$EF_{grid,BM,y} = \frac{\sum mEG_{m,y} \times EF_{EL,m,y}}{\sum mEG_{m,y}} \quad \textbf{Equation 7}$$

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

The sample group of power units *m* used to calculate the build margin was identified following the procedure provided by the tool.

The Brazilian DNA annually publishes the CO_2 BM emission following TOOL07.

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.

Since power grid is not located in LDC/SIDs/URC and the weighted average CM method (option A) is the preferred option, this method was considered. The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \cdot w_{OM} + EF_{grid,BM,y} \cdot w_{BM} \quad \textbf{Equation 8}$$

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 year y (tCO_2/MWh);

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

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

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

- Wind and solar power generation project activities: w_{OM} = 0.75 and w_{BM} = 0.25 (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods;
- All other projects: w_{OM} = 0.5 and w_{BM} = 0.5 for the first crediting period, and w_{OM} = 0.25 and w_{BM} = 0.75 for the second and third crediting period, unless otherwise specified in the approved methodology which refers to this tool.

II. Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity ($EG_{PJ,y}$)

According to ACM0002, the calculation of $EG_{PJ,y}$ is different depending on the case of the project. Since the proposed project activity consists of a *greenfield* plant, the following equation shall be used:

$$EG_{PJ,y} = EG_{facility,y} \quad \textbf{Equation 9}$$

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);

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh).

Emission Reductions

The reductions of emissions are calculated as follows:

$$ER_y = BE_y - PE_y \quad \textbf{Equation 10}$$

Where:

ER_y = Reductions of emissions in the year y (tCO_2e/year);

BE_y = Emissions of baseline in the year y (tCO_2/year);

PE_y = Emissions of the project in the year y (tCO_2e/year).

Leakage

In accordance with ACM0002, “no leakage emissions are considered. The emissions potentially arising due to activities such as power plant construction and upstream emissions from fossil fuel use (*e.g.*, extraction, processing and transport) are neglected”. Therefore, LEy = 0 tCO_2e.

B.6.2. Data and parameters fixed ex ante

Data/Parameter	EF_{Res}
Data unit	$kgCO_2e/MWh$
Description	Default emission factor for emissions from reservoirs.
Source of data	Decision at EB 23.
Value(s) applied	90
Choice of data or measurement methods and procedures	Established by ACM0002.
Purpose of data	Calculation of project emissions.
Additional 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	Project site.
Value(s) applied	0
Choice of data or measurement methods and procedures	Determine the installed capacity based on recognized standards.
Purpose of data	Calculation of baseline and project emissions.
Additional comment	-

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	Project site.
Value(s) applied	186×10^6
Choice of data or measurement methods and procedures	Measured from topographical surveys, maps, satellite pictures, etc.
Purpose of data	Calculation of project emissions.
Additional comment	-

"Tool to calculate the emission factor for an electricity system"

Data/Parameter	$EF_{grid,OM-adj,2016-2018}$
Data unit	tCO_2/MWh
Description	Simple adjusted operating margin CO_2 emission factor in year *y*
Source of data	The Brazilian DNA
Value(s) applied	0.4195
Choice of data or measurement methods and procedures	As per the requirements in TOOL07. For the OM EF, option b) of TOOL07 is used using *ex-ante* data vintage. Therefore, the 3-year generation-weighted average is considered based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation.
Purpose of data	Calculation of baseline emissions.
Additional comment	For methodological choices details, please refer to sections B.6.1 and B.6.3

Data/Parameter	$EF_{BM,2010}$
Data unit	tCO_2/MWh
Description	Build Margin CO_2 emission factor in year *y*
Source of data	The Brazilian DNA
Value(s) applied	0.1404
Choice of data or measurement methods and procedures	According to TOOL07, for the third crediting period, the build margin emission factor calculated for the second crediting period should be used.
Purpose of data	Calculation of baseline emissions.
Additional comment	For methodological choices details, please refer to sections B.6.1 and B.6.3

B.6.3. Ex ante calculation of emission reductions

Project emissions

There is no fossil fuel consumption other than the use of the backup generator and the project is not a geothermal power plant. Therefore, $PE_{FF,y} = 0$ and $PE_{GP,y} = 0$.

For determining $PE_{HP,y}$,the power density of the project was calculated following Equation 2:

Table 2 – Power density calculation.

Parameter	Before project implementation	After project implementation
Installed capacity (MW)	0.0	162
Reservoir area (km^2)	186	186
PD (W/m^2)	-	

Source: *The registered PDD and ANEEL-Energia assegurada. Available at* <http://www.aneel.gov.br/aplicacoes/capacidadebrasil/energiaassegurada.asp>*.*

As the project was implemented in an existing reservoir, *i.e.* no new flooded area, $PE_{HP,y} = 0$. Therefore, $PE_y = 0$.

Baseline emissions

Baseline emissions are calculated based on the CO_2 emission factor of the grid and the electricity dispatched to the grid by the project activity as follows.

I. Calculation of the combined margin CO_2 emission factor for grid connected power generation ($EF_{grid,CM,y}$)

The combined margin CO_2 emission factor for grid connected power generation ($EF_{grid,CM,y}$) was determined following the steps established in TOOL07 and methodological choices indicated in section B.6.1 of the PDD:

STEP 1 - Identify the relevant electricity systems

According to Resolution # 8 issued by the Brazilian DNA on May 26th, 2008, the Brazilian Interconnected Grid ("SIN" from the Portuguese Sistema Interligado Nacional) corresponds to the system to be considered. It covers all the five macro-geographical regions of the country (North, Northeast, South, Southeast and Midwest) as presented in the figure below.

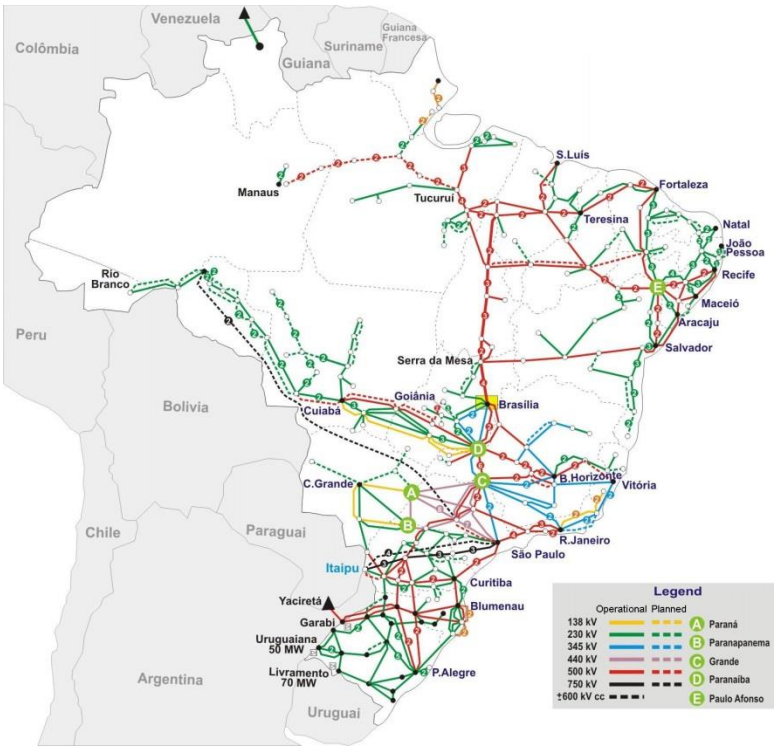

Figure 4 – Brazilian Interconnected System.

Source: *ONS. Mapas do SIN. Information available at: <http://www.ons.org.br/>.*

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

Option (i) was chosen as it is the option used by the Brazilian DNA in order to calculate the emission factor, i.e. only grid power plants are included in the calculation.

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

The simple operating margin can only be used where low-cost/must-run resources[5] constitute less than 50% of total grid generation in: 1) average of 5 most recent years, or 2) based on long-term normalities for hydroelectricity production. The following figure shows that the share of hydroelectricity in the total electricity production for the Brazilian Interconnected System is higher than 50%. Then, the simple operating margin is not applicable to the proposed CDM Project Activity.

[5] Low operating cost and must run resources typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation.

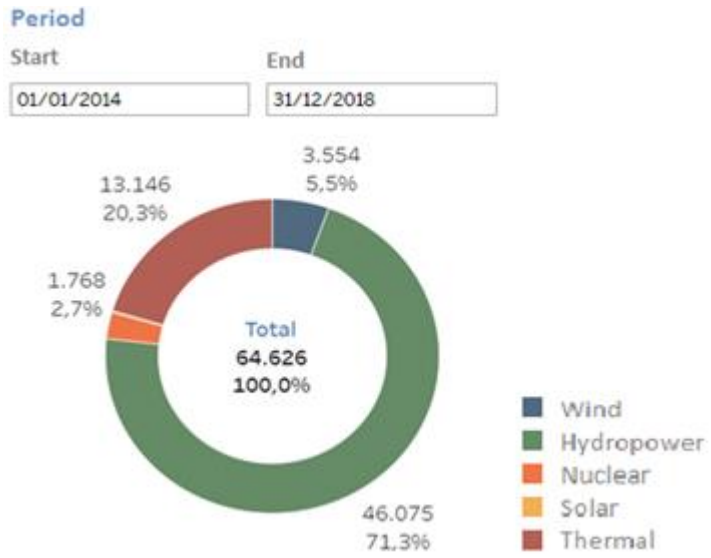

Figure 5 – Hydroelectricity generation in the Brazilian Interconnected System (2014 – 2018).

Source: *ONS: Histórico da Operação. Available at* <http://www.ons.org.br/Paginas/resultados-da-operacao/historico-da-operacao/geracao_energia.aspx>.

The fourth alternative, an average operating margin, is an oversimplification and does not reflect in any way the impact of the project activity on the operating margin. As the Brazilian DNA publishes the CO_2 OM following b) the simple adjusted and c) the dispatch data analysis method, the Project Participants chose option b) while applying the ex-ante data vintage.

In accordance with the explanation provided above in STEP 2, off-grid power plants are not considered in the grid emission factor calculation.

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

As described in section B.6.1, data OM CO_2 emission factor published by the Brazilian DNA using the simple adjusted method is used. As the project applies the ex-ante option, the three-year generation-weighted average based on the most recent data is considered:

Table 3 – Three-year simple adjusted OM and generation.

Year	Simple adjusted OM (tCO_2/MWh)	Total energy dispatched to SIN (MWh)
2016	0.4360	485,310,967
2017	0.4287	475,332,364
2018	0.3932	468,555,516

Source: *The Brazilian DNA (https://www.mctic.gov.br/mctic/opencms/ciencia/SEPED/clima/textogeral/emissao_ajustado.html)*

Therefore, $EF_{grid,OM\text{-}adj,2016\text{-}2018}$ is as follows:

$EF_{grid,OM\text{-}adj,2017}$ = 0.4195 tCO_2e/MWh

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

In terms of vintage, **option 1** was chosen. Following TOOL07, the "*build margin emission factor calculated for the second crediting period should be used*". Therefore, the BM CO_2 emission factor validated in the 2nd crediting period is used as follows:

$EF_{grid,BM,2010}$ = 0.1404 tCO_2e/MWh

STEP 6 – Calculate the combined margin (CM) emissions factor

Applying the results presented above in STEPS 4 and 5 above to the Equation 8 presented in section B.6.1. and considering the weights w_{OM} = 0.25 and w_{BM} = 0.75 for the third crediting period:

$$\mathbf{EF_{grid,CM,y} = 0.25 \times 0.4195 + 0.75 \times 0.1404\ tCO_2e/MWh}$$

$$\mathbf{EF_{grid,CM,y} = 0.2102\ tCO_2e/MWh}$$

II. Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity ($EG_{PJ,y}$)

As mentioned in section B.6.1, $EG_{PJ,y} = EG_{facility,y}$. Estimated quantity of net electricity generation supplied by the project plant/unit to the grid is calculated based on the assured energy as presented in the concession contract of the project # 19/2002.

Table 4 – Plant load factor (PLF) of the project activity.

Installed Capacity (MW)	162 MW
Assured Energy (MW-ave)	55.1 MW-ave
Plant Load Factor [Assured Energy ÷ Installed Capacity]	34.0%
Net electricity generated (MWh/yr)	482,676

Therefore, the project activity applies option (a) of the "Guidelines for the reporting and validation of plant load factors", *i.e.* "the plant load factor provided to banks and/or equity financiers while applying the project activity for project financing, or to the government while applying the project activity for implementation approval".

As referred in ACM0002, TOOL05 shall be considered in order to determine $EG_{facility,y}$. According to TOOL05, $EG_{facility,y}$ shall be determined as difference between (a) the quantity of electricity supplied by the project plant/unit to the grid; and (b) the quantity of electricity the project plant/unit from the grid the quantity of electricity delivered to the project plant/unit from the grid.

As verified during the audit visit, electricity from the grid is also consumed at the plant and it is measured by a separated meter. Electricity consumption is monthly invoiced to UHEPC. For emission reduction estimates, electricity consumed by UHEPC in 2018 year is considered according to invoices issued by COELBA – Companhia de Eletricidade do Estado da Bahia (the local utility). According to 2018 invoices, electricity consumption is around 540MWh/year. Therefore, the net electricity dispatched to the grid by the project is 482,136 MWh/year while discount UHEPC's electricity consumption.

While applying $EG_{PJ,y}$ and $EF_{grid,y}$ presented above, baseline emissions are as follows following Equation 4:

$$BE_y = 482{,}136\ MWh/year \times 0{,}2102\ tCO_2/MWh = 101{,}338\ tCO_2/year$$

Emission Reductions

The emission reductions are calculated through Equation 10 and are summarized in section B.6.4 below.

Leakage

As mentioned in section B.6.1, leakage in the context of the project activity is 0 (zero).

B.6.4. Summary of ex ante estimates of emission reductions

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
2019	74,129	0.00	0.00	74,129
2020	101,616	0.00	0.00	101,616
2021	101,338	0.00	0.00	101,338
2022	101,338	0.00	0.00	101,338
2023	101,338	0.00	0.00	101,338
2024	101,616	0.00	0.00	101,616
2025	101,338	0.00	0.00	101,338
2026	27,208	0.00	0.00	27,208
Total	**709,920**	0.00	0.00	**709,920**
Total number of crediting years	7			
Annual average over the crediting period	101,417	0.00	0.00	101,417

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data/Parameter	$EG_{facility,y}$
Data unit	MWh/yr
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y.
Source of data	Electricity meter(s).
Value(s) applied	482,136
Measurement methods and procedures	This parameter should be either monitored using bi-directional energy meter or calculated as difference between (a) the quantity of electricity supplied by the project plant/unit to the grid; and (b) the quantity of electricity the project plant/unit from the grid. In case it is calculated then the following parameters shall be measured: (a) The quantity of electricity supplied by the project plant/unit to the grid; and (b) The quantity of electricity delivered to the project plant/unit from the grid. In order to determine $EG_{facility}$, parameter (a) will be checked by CCEE data and discounting parameter (b), which will be checked by the local utility invoices. Both references are official source of data.
Monitoring frequency	Continuous measurement and at least monthly recording.
QA/QC procedures	Accuracy of meters: 0.2% (class D) Cross check measurement results with records for sold electricity (if applicable). Calibration of electricity meters will be carried out by an accredited person or institution and it will follow the ONS procedures.
Purpose of data	Calculation of baseline emissions.
Additional comment	$EG_{facility,y}$ used for ex-ante ER calculation is based on assured energy of the project.

Data/Parameter	Cap_{PJ}
Data unit	W
Description	Installed capacity of the hydro power plant after the implementation of the project activity

Source of data	Project site.
Value(s) applied	162 x 10^6
Measurement methods and procedures	Determine the installed capacity based on manufacturer's specifications or commissioning data or recognized standards.
Monitoring frequency	Determined once at the beginning of each crediting period.
QA/QC procedures	-
Purpose of data	Calculation of baseline and project emissions.
Additional comment	-

Data/Parameter	A_{PJ}
Data unit	m^2
Description	Area of the single or multiple reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full.
Source of data	Project site.
Value(s) applied	186 x 10^6
Measurement methods and procedures	Measured from topographical surveys, maps, satellite pictures, etc.
Monitoring frequency	Determined once at the beginning of each crediting period.
QA/QC procedures	-
Purpose of data	Calculation of project emissions.
Additional comment	-

B.7.2. Sampling plan

Not applicable. This section is intentionally left blank.

B.7.3. Other elements of monitoring plan

The monitoring plan of the emission reductions by the project activity is in accordance with the procedures set by the methodology ACM0002.

The Project owner proceeded with the necessary monitoring measures as established in the procedures from the Electric System National Operator (ONS – from the Portuguese *Operador Nacional do Sistema*), Brazilian Electricity Regulatory Agency (ANEEL from the Portuguese *Agência Nacional de Energia Elétrica*) and the Electric Power Commercialization Chamber (CCEE form the Portuguese *Câmara de Comercialização de Energia Elétrica*).

The ONS is the entity responsible for coordinating and controlling the operation of generation and transmission facilities in the National Interconnected Grid (SIN) under supervision and regulation of ANEEL[6] which is the regulatory agency providing favourable conditions for the electric power market to develop a balance between the agents and the benefit of society[7]. CCEE is a not-for-profit, private, civil organization company that is in charge of carrying out the wholesale transactions and commercialization of electric power within the NIPS, for both Regulated and Free Contracting Environments and for the spot market[8].

According to the procedures established by ONS, it is possible to monitor total electricity exported to the grid. Beyond that, energy information is controlled in real time by CCEE. Once the measurement points are physically defined and the invoice measurement system and the communication infrastructure are installed,

[6] Information available at <http://www.ons.org.br/institucional/modelo_setorial.aspx?lang=en>.

[7] Information available at <http://www.aneel.gov.br/>.

[8] Information available at <http://www.ccee.org.br/cceeinterdsm/v/index.jsp?vgnextoid=25afa5c1de88a010VgnVCM100000aa01a8c0RCRD>.

the measurement points will be registered in the SCDE (System of Energy Data collection) managed by CCEE.

There are two energy meters (principal and backup) for which the model and type are specified by ONS. In addition, before the operations start, ONS demands that these meters are calibrated by an entity with *Rede Brasileira de Calibração* (RBC) credential. According to current ONS procedures, they recommend a 5-year calibration frequency[9]. The project sponsor is responsible for ensuring that the calibrations occur within the periodicity determined by ONS. In order to confirm and to give more credibility about the energy generated, it is controlled in real time by the plant and CCEE.

Project sponsor is also responsible for the maintenance of the equipments' monitoring, for dealing with possible monitoring data adjustments and uncertainties, for review of reported results/data, for internal audits of GHG project compliance with operational requirements and for corrective actions. Yet, it is also responsible for the project management, as well as for organising and training of the staff in the appropriate monitoring, measurement and reporting techniques.

It is important to mention that ANEEL can visit the plant to inspect the operation and maintenance of the facilities at any time. Yet, during the periodic verifications, UHEPC will provide all the necessary documents evidencing the amount of net electricity exported to the grid.

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

SECTION C. Start date, crediting period type and duration

C.1. Start date of project activity

23/04/2002

C.2. Expected operational lifetime of project activity

35 years – 0 month

C.3. Crediting period of project activity

C.3.1. Type of crediting period

Renewable crediting period.

C.3.2. Start date of crediting period

09/04/2019

C.3.3. Duration of crediting period

7 years

[9] [9] Sub-módulo 12.3. Metering System Maintenance for Invoincing, in a free translation from the Portuguese *Manutenção do Sistema de Medição para Faturamento*.

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

The growing global concern on sustainable use of resources is driving a requirement for more sensitive environmental management practices. Increasingly this is being reflected in countries' policies and legislation. In Brazil the situation is not different. Environmental rules and licensing policies are very demanding in line with the best international practices.

In Brazil, the sponsor of any project that involves construction, installation, expansion or operation of any polluting or potentially polluting activity or any other capable to cause environmental degradation is obliged to secure a series of permits from the relevant environmental agency (federal and/or local, depending on the project). In the case of the proposed project activity, considering the plant comprises two different states of the country, the federal environmental institute – IBAMA – is the responsible for the environmental licensing process.

Project sponsors have to obtain all licenses required by the Brazilian environmental regulation (Resolution CONAMA - *Conselho Nacional do Meio Ambiente* (National Environmental Council) n° 237/97):

- *The preliminary license (*Licença Prévia *or LP),*
- *The construction license (*Licença de Instalação *or LI); and*
- *The operating license (*Licenca de Operação *or LO).*

The environmental permit process has an administrative nature and was implemented by the National Environmental Policy, established by the Law n. 6938 dated on October 31st, 1981. Additionally, other norms and laws were issued by CONAMA and local state agencies.

In order to obtain all environmental licenses every small hydro projects shall mitigate the following impacts:

- *Inundation of indigenous people lands and historical areas – the authorization for that depends on National Congress decision;*
- *Inundation of environmental preservation areas, legally formed as National Parks and Conservation Units;*
- *Inundation of urban areas or country communities;*
- *Reservoirs where there will be urban expansion in the future;*
- *Elimination of natural patrimony;*
- *Expressive losses for other water uses;*
- *Inundation of protected historic areas; and*
- *Inundation of cemeteries and other sacred places.*

The process starts with a previous analysis (preliminary studies) by the local environmental department. After that, if the project is considered environmentally feasible, the sponsors have to prepare the Environmental Assessment, which is basically composed by the following information:

- *Reasons for project implementation;*
- *Project description, including information regarding the reservoir;*
- *Preliminary Environmental Diagnosis, mentioning main biotic, and anthropic aspects;*
- *Preliminary estimation of project impacts; e*
- *Possible mitigating measures and environmental programs.*

The result of those assessments is the Preliminary License (LP), which reflects the environmental local agency positive understanding about the environmental project concepts.

In order to obtain the Construction License (LI) it is necessary to present (a) additional information about previous assessment; (b) a new simplified assessment; or (c) the Environmental Basic Project, according to the environmental agency decision informed at the LP.

The Operation License (LO) is a result of pre-operational tests during the construction phase to verify if all exigencies made by environmental local agency were completed.

The project activity has the necessary licences issued by the Environmental Agency of the State of Bahia (Secretaria de Meio Ambiente e Recursos Hídricos – SEMARH). Given that, it can be inferred that the project does not imply in negative transboundary environmental impacts, on the contrary, the licenses would not have been issued.

D.2. Environmental impact assessment

The project activity has all necessary environmental and construction licenses. All three environmental licenses (LP, LI and LO) were issued by the Environmental Agency of the State of Bahia (Secretaria de Meio Ambiente e Recursos Hídricos - SEMARH).

In the processes, reports containing investigation of the following aspects were prepared:

- Impacts to climate and air quality.
- Geological and soil impacts.
- Hydrological impacts (surface and groundwater).
- Impacts to the flora and animal life.
- Socioeconomic (necessary infrastructure, legal and institutional, etc.).

SECTION E. Local stakeholder consultation

E.1. Modalities for local stakeholder consultation

According to the federal and local state legislation, the environmental licensing process requests public hearings with the local community. Also, the same legislation requests the announcement of the issuance of the licenses (LP, LI and LO) in the state official journal ("*Diário Oficial do Estado*") and in the local newspapers. UHEPC carried out several public hearings with fishers, NGOs, public institutions, and private companies. UHEPC also organize several visits to the plant when school teachers, students, and other stakeholders are able to understand the project.

Beside of the stakeholders comments requested for the environmental licenses, the Brazilian Designated National Authority, "*Comissão Interministerial de Mudanças Globais de Clima*", requires comments by local stakeholders based on a translated version of the PDD, and the validation report issued by an authorized DOE according to the Resolution no. 1, issued on 11th September 2003, in order to provide the letter of approval. The Resolution determines that copies of the invitations for comments sent by the project proponents at least to the following agents involved in and affected by project activities:

- *Municipal governments and City Councils;*
- *State and Municipal Environmental Agencies;*
- *Brazilian Forum of NGOs and Social Movements for Environment and Development;*
- *Community associations;*
- *State Attorney for the Public Interest;*

Therefore, the following stakeholders were invited in the case of the project activity:

- Prefeitura Municipal de Cachoeira, Governador Mangabeira and São Félix;
- Câmara Municipal de Cachoeira, Governador Mangabeira and São Félix;
- Órgão Ambiental Estadual – SEMARH;
- Secretaria do Meio Ambiente de Cachoeira, Governador Mangabeira and São Félix;

- Ministério Público do Estado da Bahia;
- FBOMS – Fórum Brasileiro de ONGs e Movimentos Sociais para o Desenvolvimento e Meio Ambiente;
- Associação da Faculdade Adventista da Bahia (Cachoeira – BA);
- Pólo Sindical (CATRUFS) (Feira de Santana – BA);
- Colônia de Pescadores Z7 de Maragogipe (Maragogipe – BA);
- Associação das Senhoras de Caridade (São Félix – BA).

Invitation letters were sent to above mentioned stakeholders (copies of the letters and post office confirmation of receipt communication are available upon request) and no comment was received. The PDD of the project is open for comments in the validation stage in the United Nations Framework Convention on Climate Change website (http://www.unfccc.int/), since anyone can have access to the mentioned document from a legitimate source.

E.2. Summary of comments received

No comments were received. The project was developed as planned and following the requests made by the environmental agency and corresponding legislation.

E.3. Consideration of comments received

No comments were received. The project was developed as planned and following the requests made by the environmental agency and corresponding legislation.

SECTION F. Approval and authorization

Parties involved in the project activity is the Host Country (Brazil) and Switzerland. Letters of Approval are available at: <https://cdm.unfccc.int/Projects/DB/DNV-CUK1160397342.29/view?cp=1>.

Appendix 1. Contact information of project participants

Organization name	Votorantim Cimentos Ltda.
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Contact person	Mr. David Canassa

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Appendix 2. Affirmation regarding public funding

No public funding for this project has been obtained.

Appendix 3. Applicability of methodologies and standardized baselines

Not applicable. This section is intentionally left blank.

Appendix 4. Further background information on ex ante calculation of emission reductions

This section is intentionally left blank. Please refer to section B.6 for details regarding the emission factor of the Brazilian Interconnected Grid calculation.

Appendix 5. Further background information on monitoring plan

This section is intentionally left blank. For details, please, refer to section B.7.

Appendix 6. Summary report of comments received from local stakeholders

This section is intentionally left blank. For details, please, refer to section E.

Appendix 7. Summary of post-registration changes

During the second verification – corresponding to the period of 01/01/2007 to 31/12/2010 – of the first crediting period of the project, a Notification of Changes was carried out in order to:

- Revise technical characteristics of equipment including:
  - Revision of turbine capacity from 80MW to 82.65MW each;
  - Inclusion of generators capacity of 81MW each;
- Revise of installed capacity from 160MW to 162MW according to the nameplate of generators

The Notification of Changes was accepted by DOE and submitted to UNFCCC, and CERs were issued on 11/06/2012.

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Document information

Version	*Date*	*Description*
11.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN); • Make editorial improvements.
10.1	28 June 2017	Revision to make editorial improvement.
10.0	7 June 2017	Revision to: • Improve consistency with the "CDM project standard for project activities" and with the PoA-DD and CPA-DD forms; • Make editorial improvement.

Version	*Date*	*Description*
09.0	24 May 2017	Revision to: • Ensure consistency with the "CDM project standard for project activities" (CDM-EB93-A04-STAN) (version 01.0); • Incorporate the "Project design document form for small-scale CDM project activities" (CDM-SSC-PDD-FORM); • Make editorial improvement.
08.0	22 July 2016	EB 90, Annex 1 Revision to include provisions related to automatically additional project activities.
07.0	15 April 2016	Revision to ensure consistency with the "Standard: Applicability of sectoral scopes" (CDM-EB88-A04-STAN) (version 01.0).
06.0	9 March 2015	Revision to: • Include provisions related to statement on erroneous inclusion of a CPA; • Include provisions related to delayed submission of a monitoring plan; • Provisions related to local stakeholder consultation; • Provisions related to the Host Party; • Make editorial improvement.
05.0	25 June 2014	Revision to: • Include the Attachment: Instructions for filling out the project design document form for CDM project activities (these instructions supersede the "Guidelines for completing the project design document form" (Version 01.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for the application of the methodology (ies) to the project activity in B.7.4 and Appendix 1; • Change the reference number from F-CDM-PDD to CDM-PDD-FORM; • Make editorial improvement.
04.1	11 April 2012	Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b.
04.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the project design document form for CDM project activities" (EB 66, Annex 8).
03.0	26 July 2006	EB 25, Annex 15
02.0	14 June 2004	EB 14, Annex 06b
01.0	03 August 2002	EB 05, Paragraph 12 Initial adoption.

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