



**Validation report form for renewal of crediting period for
CDM project activities
(Version 03.0)**

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

BASIC INFORMATION

Title and UNFCCC reference number of the project activity	CDM Project SHP Santa Carolina UNFCCC Ref #: 6042
Number and duration of the next crediting period	2 nd crediting period 01/05/2020 – 30/04/2027
Version number of the validation report	1
Completion date of the validation report	14/12/2020
Version number of PDD to which this report applies	3
Project participants	Multilagos Geração de Energia Ltda Carolina Geração de Energia Ltda Enerbio Consultoria Ltda-ME
Host Party	Brazil
Applied methodologies and standardized baselines	AMS-I.D – Grid connected renewable electricity generation - Version 18.0
Mandatory sectoral scopes	1 : Energy industries (renewable - / non-renewable sources)
Conditional sectoral scopes, if applicable	N/A
Estimated amount of annual average GHG emission reductions or GHG removals by sinks in the next crediting period	8,980 tCO ₂ e
Name and UNFCCC reference number of the DOE	Earthood Services Private Limited UNFCCC Ref. Number: E-0066
Name, position and signature of the approver of the validation report	 Dr. Kaviraj Singh Managing Director

SECTION A. Executive summary**Brief summary of the project activity**

The project activity consists in generating renewable energy through the construction of a small hydro power plant (SHP) with total installed capacity of 10.56 MW. The SHP also comprehend small reservoirs of 0.093 km².

The project activity reduces the GHG emissions through dispatching GHG-free electricity to the Brazilian National Interconnected System.

The project consists in Type I small scale project activity with installed capacity below 15MW.

The SHP is located in Turvo river, between cities of André da Rocha and Muitos Capões, State of Rio Grande do Sul, Brazil.

The operation start date of the SHP is on 11/03/2016^{/15/}

The main characteristics of the SHP is described below

Turbine

Characteristic	Unit	Turbine
Quantity	Un	2
Serial Numbers	-	PR-0306.T1 PR-0306.T2
Type	-	Francis
Power	kW	5,444
Yield	%	91.85
Rotation	RPM	514.27
Flow	m ³ /s	16.2

Generator

Characteristic	Unit	Generator
Quantity	Un	2
Serial Numbers	-	PR-0306.G1 PR-0306.G2
Type	-	Synchronic
Apparent power	kVA	5,900
Yield	%	97

Geographical Location (SIRGAS 2000)

Characteristic	Unit	value ¹
Latitude	-	-28.619218
Longitude	-	-51.401466

The SHP is connected to the National Interconnected System (SIN).

The lifetime of the main equipment is 30 years as per information provided in the registered PDD.

The estimated ERs of the project activity is 8,980 tCO₂e/y and 62,860 tCO₂e for the entire crediting period.

Scope of validation

Carolina Geração de Energia Ltda has contracted ESPL to conduct the validation of the renewal of the crediting period of the project activity "CDM Project SHP Santa Carolina".

The scope of the validation is to establish that:

- the PA is in accordance with all relevant CDM rules and requirements;

¹ The geographical coordinates have been checked by plotting the geographical coordinates in Google Maps ^{/25/}. Moreover, the site visit has been conducted to confirm the project location and operation.

- the PA is in accordance with conditions of the latest version of applied methodology AMS-I.D: Grid connected renewable electricity generation --- Version 18.0;
- the validation of the renewal of crediting period is in accordance with requirements of CDM methodological tool "TOOL11 – Assessment of the validity of the original / current baseline and update of the baseline at the renewal of the crediting period" – version 03.0.1.

Validation process

The validation process involved the following:

- Contract with Carolina Geração de Energia Ltda for the scope of validation of the renewal of the crediting period of the project activity;
- desk review;
- physical on-site inspection;
- issuance of validation findings;
- reporting, calculation checks, QA/QC and resolution of findings;
- issuance of draft validation report;
- independent technical review of the project documentation;
- issuance of the final validation report;
- submission of the request for renewal, as appropriate.

Conclusion

ESPL has performed the validation of the renewal of the crediting period of the CDM PA "CDM Project SHP Santa Carolina", having UNFCCC Ref. Number 6042 for the 2nd crediting period.

The validation team has confirmed that it is in accordance with all relevant CDM rules and requirements and conditions of the latest version of applied methodology AMS-I.D - Version 18.0. In addition, it was confirmed that the monitoring system is feasible and the estimated emission reductions are conservatively calculated.

The PA is expected to generate an annual average of 8,980 tCO₂e in the second crediting period.

The site visit has been performed in accordance to VVS for PA, version 02.0.

Therefore, the request for renewal of the crediting period of the PA is being submitted in accordance with the CDM procedures.

SECTION B. Validation team, technical reviewer and approver

B.1. Validation team member

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)	Involvement in			
						Desk/document review	On-site inspection	Interview(s)	Validation findings
1.	Team Leader	OR	Sebben	Marcelo	Verifit	Y	Y	Y	Y
2.	Local Expert	OR	Sebben	Marcelo	Verifit	Y	Y	Y	Y
3.	Methodological Expert	OR	Sebben	Marcelo	Verifit	Y	Y	Y	Y
4.	Technical Expert	OR	Sebben	Marcelo	Verifit	Y	Y	Y	Y

B.2. Technical reviewer and approver of the validation report for RCP

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)
1.	Technical reviewer	IR	Garg	Shreya	Central Office
2.	Technical Expert	IR	Garg	Shreya	Central Office
3.	Approver	IR	Singh	Kaviraj	Central Office

SECTION C. Means of validation**C.1. Desk/document review**

A desk review was conducted by the validation team that included:

- a review of the data and information presented to assess its completeness;
- a review of the registered project activity, the applied methodology including applicable tool(s) and, where applicable, the applied standardized baseline;
- a review of supporting documents.

A complete list of documents/evidences reviewed is included as Appendix 3.

C.2. On-site inspection

Duration of on-site inspection: 24/11/2020				
No.	Activity performed on-site	Site location	Date	Team member
1.	Opening Meeting: Introduction, scope and objective of work, roles and responsibilities of audit team, resources required, and timetable of the onsite audit including venue for closing meeting and any concerns from PP.	André da Rocha/RS	24/11/2020	Marcelo Sebben
2.	Implementation and operation of project activity (project boundary, technology, project equipment, monitoring and metering equipment) as per registered PDD/previous verification.	André da Rocha/RS	24/11/2020	Marcelo Sebben
3.	Physical inspection of the project activity: <ul style="list-style-type: none"> - Site visit to the SHP (turbines and generators) - Site visit to Electricity Substation (Check electricity meters Serial Number) 	André da Rocha/RS	24/11/2020	Marcelo Sebben
4.	Revalidation checklist: compliance applicable Legislation and changes to the 2nd CP	André da Rocha/RS	24/11/2020	Marcelo Sebben
5.	Management and monitoring procedures followed at project site.	André da Rocha/RS	24/11/2020	Marcelo Sebben
6.	End of verification site visit.	André da Rocha/RS	24/11/2020	Marcelo Sebben

C.3. Interviews

No.	Interviewee			Date	Subject	Team member
	Last name	First name	Affiliation			
1.	Baltar	Eduardo	Ecofinance	23/11/2020 (virtual)	MR and ER calculations	Marcelo Sebben
2.	Chertios	Diego	Creral	24/11/2020 (Physical site visit)	- Description of project activity. Physical	Marcelo Sebben

					Inspection of site. - Meter diagram, Electricity measurement	
3.	Silva	Gelson	PCH Santa Carolina	24/11/2020 (Physical site visit)	- Operation and maintenance of SHP	Marcelo Sebben

C.4. Sampling approach

Not applicable as no sampling has been used during the validation.

C.5. Clarification requests (CLs), corrective action requests (CARs) and forward action requests (FARs) raised

Area of validation findings	No. of CL	No. of CAR	No. of FAR
Compliance with PDD form	CL 01	-	-
Application and selection of methodologies and standardized baselines	CL 02	-	-
Validity of original baseline or its update	-	-	-
Estimated emission reductions or net anthropogenic removals	-	CAR 01	-
Validity of monitoring plan	-	CAR 02 CAR 03	-
Crediting period	-	-	-
Project participants	-	-	-
Post-registration changes	-	-	-
Others (please specify) – Project location	-	-	-
Total	2	3	-

SECTION D. Validation findings

D.1. Compliance with PDD form

Means of validation	The PDD was crosschecked with the CDM-PDD-FORM template available at the UNFCCC website and with the instructions for filling it out. Nevertheless some issues were found and a CL has been raised
Findings	<p>CL 01</p> <p><i>The following information is not provided in the PDD unlike required by instructions for completing the PDD form:</i></p> <ul style="list-style-type: none"> - Section A.1 <ul style="list-style-type: none"> o <i>Indicate the small-scale project type (Type I, Type II and/or Type III) applicable to the project activity in accordance with the project standard</i> - Section B.2: <i>Demonstrate that the project activity qualifies as Type I, Type II, and/or Type III in accordance with applicable provisions on small-scale project type and eligibility in the project standard</i> - B.6.1: <i>demonstration of PE calculations are not carried out unlike required by PS.</i> - Appendix 7: <i>information of all PRCs since the PA's registration is not provided</i>
Conclusion	The latest version of the PDD template (CDM-PDD-FORM – version 11.0) available at the UNFCCC website has been used. It has been filled out in accordance with the instructions for completing the PDD.

D.2. Application and selection of methodologies and standardized baselines

Means of validation	The PA applies approved methodology AMS-I.D – Grid connected renewable electricity generation - Version 18.0, which is latest one available at UNFCCC website.
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All applicability conditions of the applied methodology and applied tools are met:

Applicability Criteria – AMS-I.D – v. 18.0	Assessment
Small scale threshold (Type I - Renewable energy project activities with a maximum output capacity of 15 MW)	This project corresponds to the installation of one Small Hydro Power plant with installed capacity equal to 10.56 MW ^{/20/} , thus below the threshold of 15MW for small scale PAs. Therefore the small-scale methodologies are applicable.
The methodology AMS I.D, version 18.0 is applicable to project activities that <ul style="list-style-type: none"> a) Install a Greenfield power plant; b) Involve a capacity addition to (an) existing plant(s); c) Involve a retrofit of (an) existing operating plants/units; d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or e) Involve a replacement of (an) existing plant(s)/unit(s). 	The PA complies with the condition (a) as it was a greenfield power plant
Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: <ul style="list-style-type: none"> a) The project activity is implemented in an existing reservoir with no change in the volume of reservoir; b) The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the project emissions section, is greater than 4 W/m² ; c) The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m² 	Option C is applicable as the project was implemented in new reservoir.
If the new unit has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	This project corresponds to the installation of a Small Hydro Power plant with added installed capacity equal to 10.56 MW, thus below the threshold of 15MW for small scale PAs. Therefore, it does not correspond to units that has both renewable and non-renewable components and this condition is not applicable.
Combined heat and power (co-generation) systems are not eligible under this category	This project corresponds to the installation of a Small Hydro Power plant. Therefore, this condition is not applicable.

In the case of project activities that involve the capacity addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct ¹ from the existing units	This project corresponds to the installation of a Small Hydro Power plant. Therefore, this condition is not applicable.
In the case of retrofit, rehabilitation or replacement, to qualify as a small-scale project, the total output of the retrofitted, rehabilitated or replacement power plant/unit shall not exceed the limit of 15 MW.	This project corresponds to the installation of a greenfield Small Hydro Power plant and there is no retrofit, rehabilitation or replacement. Therefore, this condition is not applicable.
In the case of landfill gas, waste gas, wastewater treatment and agro-industries projects, recovered methane emissions are eligible under a relevant Type III category	This project corresponds to the installation of a greenfield Small Hydro Power plants and therefore Type I small scale project are applicable. The PA does not correspond to landfill gas, wastewater treatment and agro-industries projects. Thus, this condition is not applicable.
In case biomass is sourced from dedicated plantations, the applicability criteria in the tool "Project emissions from cultivation of biomass" shall apply	Not applicable as this project corresponds to the installation of one greenfield Small Hydro Power plant.

The applicability conditions of all tools are also met as follows:

Applicability Criteria – TOOL 07	Assessment
This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity that is where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid (e.g. demand-side energy efficiency projects).	The project claims baseline emission by substituting the grid electricity by renewable electricity. Thus, this tool is applicable
Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off-grid power plants.	The Grid emission factor is directly calculated by the Brazilian DNA, based on this TOOL.. Therefore, this condition is met.
In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country	The electricity system is not located partially or totally in the Annex I country.
Under this tool, the value applied to the CO ₂ emission factor of biofuels is zero	The Grid emission factor is directly calculate by the Brazilian DNA, based on this TOOL. Therefore, this condition is met.

However not all eligibility criteria of applied methodology and tools have been taken into account in the revised PDD. Therefore a CL has been raised.

Findings	CL 02 <i>Section B.2: Not all applicability criteria from applied methodology have been taken into account</i>
Conclusion	<p>The correct version of all methodology and tools have been referenced in the PDD. All applicability conditions of the applied methodology and applied tools are met. This project corresponds to the installation of two Small Hydro Power plants with added installed capacity equal to 10.56 MW, thus below the threshold of 15MW for small scale PAs. Therefore the small-scale methodologies are applicable. The latest versions of applied tools have been used:</p> <ul style="list-style-type: none"> a. TOOL07: Tool to calculate the emission factor for an electricity system (version 7.0); b. TOOL11 – Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period – version 03.0.1. <p>The methodology and tools are from UNFCCC CDM website.</p>

D.3. Validity of original baseline or its update

Means of validation	<p>The baseline scenario is given by applied methodology AMS I.D – version 18.0: “The baseline scenario is that the 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 into the grid”. In addition, in accordance with the directives for the renewal of the crediting period of a registered CDM project activity, the validity of the current baseline shall be reassessed using the latest version of the TOOL11 “Tool to assess the validity of the original/ current baseline and to update the baseline at the renewal of a crediting period” (version 03.0.1).</p> <p>The assessment of TOOL11 is made as follows:</p> <p><u>Step 1: Assess the validity of the current baseline for the next crediting period</u></p> <p><i>Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies:</i></p> <p>The current baseline scenario complies with all relevant mandatory national/sectoral legislation. The Operational Licenses^{/17/} are found up to date and were provided to the validation team, which means that the project is duly following all applicable legislation.</p> <p><i>Step 1.2: Assess the impact of circumstances:</i></p> <p>As the baseline scenario identified at the validation of the project activity was the continuation of the current practice without any investment, it is agreed by Validation team that there were no changes in the Market characteristics that affect the Project activity.</p> <p>The conditions used to determine the baseline emissions in the previous crediting period are still valid. The baseline scenario determined by the methodology was the electricity being generated by all plants connected to the grid, which remains unaltered. Comparing to the moment which this project was validated, there is no further incentive to specific source of electricity generation. Therefore, there is no significant variation of prices in the power generation, neither availability of new fuels or raw materials in the power plants connected to the grid. The electricity prices in Brazil are not regulated by government. The rules for generation and commercialization of electricity in Brazil are determined by National Law of Electric Sector^{/24/}, issued on 2004, which is still the ruling law on this matter.</p> <p><i>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:</i></p> <p>The baseline scenario is not the continuation of use of current baseline equipment. The PA consists in the installation of greenfield hydro power plants where no power plant was installed before. Thus, this step is not applied.</p>
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	<p><i>Step 1.4: Assessment of the validity of the data and parameters:</i></p> <p>The fixed parameters remained the same and are:</p> <ul style="list-style-type: none"> - Cap_{BL} (Installed capacity of the hydro power plant before the implementation of the project activity. For new hydro power plants, this value is zero) - A_{BL} (Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m²). For new reservoirs, this value is zero.) <p>Moreover, there is the inclusion of the parameter EF_{BM} (build margin emission factor) which will be kept fixed ex-ante for this 2nd CP in accordance with requirements of TOOL07.</p> <ul style="list-style-type: none"> - EF_{grid,BM}: CO₂ Build Margin emission factor of the grid, in an year y (determined ex-ante and remained fixed for the whole CP as per TOOL07). The values are directly calculated by Brazilian DNA^{/19/}. The value applied for the whole CP will be equal to 0.1020 tCO₂/MWh and it is equivalent to the year 2019 (latest value available to date)^{/19/}. <p>The ex-ante estimation of parameters (EF_{CM} and EF_{OM}) was also updated to the latest values available (from 2019) as required by TOOL07. EF_{OM} is directly calculated by Brazilian DNA^{/19/} and EF_{CM} is calculated as per TOOL07 by project participants, which will be monitored along the crediting period. EF_{BM} will be determined ex-ante and will remain fixed for the next CP as per TOOL07. Thus, the baseline emissions were updated for the 2nd crediting period and the Step 2 is assessed below:</p> <p><u>Step 2: Update the current baseline and the data and parameters</u></p> <p><i>Step 2.1: Update the current baseline:</i></p> <p>Although the baseline remains valid for second CP, the baseline emissions were updated in accordance using the latest information available for Grid Emission Factor (parameters EF_{CM}, EF_{OM} and EF_{BM})^{/19/}.</p> <p><i>Step 2.2: Update the data and parameters:</i></p> <p>The fixed parameter EF_{BM} as well as weighted OM and weighted BM were updated as required by TOOL11. The calculations were updated for this second crediting period as in accordance with the new version of applied methodology and tools.</p>
Findings	N/A
Conclusion	<p>It has been observed that the baseline scenario remains valid for the new crediting period.</p> <p>The baseline scenario is the one given by the applied methodology AMS-I.D – v. 18.0</p> <p>The baseline emissions were updated taking into account the latest available values of EF provided by the Brazilian DNA and the parameter EG_{facility,y} which was based on most reliable evidence (long term hydrological studies called assured energy², discounting the estimated losses^{/14/}), which remained unaltered from the validation phase.</p> <p>The calculations are in accordance with CDM rules and requirements.</p>

D.4. Estimated emission reductions or net anthropogenic removals

Means of validation	<p>All equations, formulas and assumptions were correctly applied as per the applied methodology (AMD-I.D) and tools.</p> <p>The baseline emissions are calculated by the multiplication of the electricity supplied by the project activity to the grid by the combined margin of CO₂ emission factor as follows:</p> $BE_y = EF_{grid,CM,y} \times EG_{facility,y}$ <p>Where:</p>
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² Average electricity to be generated based on long term hydrological studies and approved by National Agency of Electricity – ANEEL^{/26/}

	<p> BE_y = Baseline emissions in the year y $EF_{grid,CM,y}$ = Combined Margin Emission factor of the grid in the year y $EG_{Facility,y}$ = Net electricity of the SHP delivered to grid in the year y (continuously measured, hourly and yearly aggregated) </p> <p>The Combined margin emission factor of the grid ($EF_{grid,CM,y}$) was calculated as follows:</p> $EF_{grid,CM,y} = EF_{OM} \times w_{OM} + EF_{BM} \times w_{BM}$ <p>For this period, the parameter EF_{OM} will be determined ex-post and the parameter EF_{BM} will be determined ex-ante as required by TOOL07. The parameters w_{OM} and w_{BM} will be used in accordance with the same TOOL07 and equal to 0.25 and 0.75 respectively for the second CP (TOOL07 paragraph 86)b).</p> <p>Considering that the plant consists in hydro power plant with reservoir, the project emissions are to be taken into account. According to the applied methodology project emissions are to be calculated if Power Density of the reservoir is greater than 4W/m² and less or equal than 10W/m². The power density is calculated as following:</p> $PD = \frac{Cap_{pj} - Cap_{bl}}{Apj - Abl}$ <p>Where PD = power density Cap_{pj} = Installed Capacity of the hydro power plant after the implementation of the project activity Cap_{bl} = Installed Capacity of the hydro power plant before the implementation of the project activity Apj: area of full reservoir after the implementation of project activity Abl: area of reservoir before the project activity implementation.</p> <p>In the case of this project activity the calculated PD is between 4w/m² and 10 W/m² the Project Emissions for reservoir shall be determined using the following equation:</p> $PE_{HPy} = \frac{EF_{res} \times TEG_y}{1000}$ <p>Where: PE_{HP,y}: Power emissions from water reservoirs EF_{res}: Default emission factor for emissions from reservoirs of hydro power plants in year y TEG_y: Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year y. In case of this project activity, PD was above 10w/m² and therefore project emissions due to reservoir emissions are equal to zero.</p>
Findings	<p>CAR 01</p> <p><i>The applied value for Apj used in the PD estimation is not in accordance with evidence provided.</i></p>
Conclusion	<p>The methodology and tools were correctly applied in order to calculate the estimates of emission reductions, with reliable and conservative parameters.</p> <p>The EF_{OM} will be monitored ex-post. This parameter is annually calculated by the Brazilian DNA, in accordance with requirements of TOOL07. The EF_{BM} used was calculated based on most recent data available (2019) in accordance with applied TOOL07 and will be fixed ex-ante for this 2nd CP as required by TOOL07. The parameters Apj and Cap_{PJ} for both SHPs were determined at the beginning of the CP as per applied methodology and will remain fixed for the whole CP.</p> <p>The parameters used to calculate the emission reductions are conservative, traceable and from official, public and reliable sources.</p>

D.5. Validity of monitoring plan

Means of validation	<p>The PDD sets a monitoring plan, which is feasible and in accordance with the applied methodology and tools.</p> <p>The management structure and roles and responsibilities are established for data collection, calibration frequency of meters, data report and data archiving.</p> <p>Moreover, there are procedures set for crosschecking the monitored data.</p> <p>However there was some inconsistencies when describing the monitored parameters. Thus a CAR has been raised.</p>
Findings	<p>CAR 02</p> <p><i>PDD section B.7.1: The monitoring frequency of the parameters A_{PJ}, CAP_{PJ} and EF_{grid} (especially related to EF_{BM} specified in the "source of data") is not in accordance with applied methodology and TOOLS.</i></p> <p>CAR 03</p> <p><i>PDD, section B.7.1: it is not clear how the monitoring plan is in compliance with applied methodologies and tools considering that the PP opted by monitoring the parameter EF_{om-DD}, but it is not listed in this section of the PDD. Moreover, the parameter CAP_{PJ} is also not included in the monitoring plan unlike required by applied methodology.</i></p>
Conclusion	<p>The monitoring plan of the PA is in accordance with the approved monitoring methodology and the means of monitoring of the parameters contained in the monitoring plan are feasible.</p> <p>The management structure and roles and responsibilities are set for data collection, calibration frequency of monitoring equipment, data report and data archiving. In addition, procedures for quality assurance and quality control are be set, as well as specific training for involved personnel.</p> <p>There is no sampling plan set to monitor the parameters.</p> <p>The parameters fixed are listed in section above and the ones to be monitored necessary for the project activity are listed at the PDD section B.7.1, in accordance with the applied methodology and tools.</p> <p>The parameters required for monitoring are contained in the monitoring plan:</p> <ul style="list-style-type: none"> - $EG_{PJ, Facility, y}$: Quantity of net electricity supplied by the project plant/unit to the grid in year y; (monitored continuously). Value estimated ex-ante remain unaltered from valid version of PDD from 1st CP and equal to 43,590 MWh/year. - A_{PJ}: Area of the single or multiple reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (determined once at the beginning of CP). The applied value is presented in the environmental licence and is equal to 93,000 m². Value was updated as per most recent environmental license^{/17/} - CAP_{PJ} : Installed capacity of the hydro power plant after the implementation of the project activity (determined at the start of CP). The applied value is based on the calculated installed capacity of the PA and is equal to 10,560,000 W. - $EF_{grid, OM-DD}$: CO₂ Operating Margin emission factor of the grid, in an year y (monitored hourly). Estimated value for this PDD was based on average value for 2019, equal to 0.51809 tCO₂/MWh - $EF_{grid, CM}$: Combined Margin CO₂ emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system (monitored yearly)". The applied value for estimated calculations ex-ante was based on latest available data which refers to the year 2019^{/19/} which is equal to 0.20602 tCO₂/MWh <p>The PP determined the parameter A_{PJ} as the flooded area of the water intake in order to be able to determine the PD and consequently, estimate Project emission (equal to zero). It is confirmed that no PE due to CH₄ emissions from reservoir are applied to this project activity. The parameter A_{PJ} was determined through topographical measurements and are part of the current environmental license^{/17/}</p>

D.6. Crediting period

Means of validation	The crediting period is 7 years renewable. This is the 2 nd crediting period and its start date is 01/05/2020, which is the first date after the end of the 1 st crediting period and it ends on 30/04/2027.
Findings	N/A
Conclusion	The 2 nd crediting period is from 01/05/2020 to 30/04/2027– the request for renewal of the crediting period is being done in accordance with PCP version 02, para 270 to 279. Therefore, the project activity is in accordance with CDM requirements and EB directives.

D.7. Project participants

Means of validation	The project participants are Multilagos Geração de Energia Ltda, Carolina Geração de Energia Ltda and Enerbio Consultoria Ltda-ME. The information provided in the PDD is in accordance with UNFCCC website
Findings	N/A
Conclusion	The name of the project participant included in the revised PDD were assessed in accordance with the applicable validation requirements related to the renewal of crediting period. All information is in accordance with UNFCCC website.

D.8. Post-registration changes

Type of post-registration changes (PRCs)	Confirmation (Y/N)	Validation report for PRCs	
		Version	Completion date
Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents ³	N	-	-
Corrections	N	-	-
Change to the start date of the crediting period	N	-	-
Inclusion of a monitoring plan	N	-	-
Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents	N	-	-
Changes to the project design	N	-	-
Changes specific to afforestation and reforestation project activities	N	-	-

SECTION E. Internal quality control

The draft validation report that is prepared by validation team is reviewed by an independent technical review team (one or more members) to confirm if the internal procedures established and implemented by ESPL were duly complied with and such opinion/conclusion is reached in an objective manner that complies with the applicable CDM rules/requirements.

The technical review team is collectively required to possess the technical expertise of all the technical area/sectoral scope to which the project activity is related. All members of technical review team are independent of the validation team.

During the technical review process, additional findings may be identified or the closed-out findings may be opened, which needs to be satisfactorily resolved before the request for the renewal of the crediting period is submitted to UNFCCC. The independent technical reviewer may either approve the report as such or reject/return the same, in such case, providing the comments/findings/issues that needs to be resolved by the validation team. The decision taken by the technical reviewer is final and is authorized on behalf of ESPL.

³ Other standards, methodologies, methodological tools and guidelines (to be) applied in accordance with the applied(selected) methodologies are collectively referred to as the other (applied) methodological regulatory documents).

SECTION F. Validation opinion

Earthood Services Private Limited, contracted by Carolina Geração de Energia Ltda, has performed the independent validation of the renewal of crediting period of the project “CDM Project SHP Santa Carolina” – Ref.: 6042 – in Brazil.

ESPL commenced the validation based on the baseline and monitoring methodology AMS-I.D. ver. 18.0, the registered PDD (from previous crediting period) and draft PDD (for the 2nd crediting period).

ESPL’s validation approach is based on the understanding of the risks associated with reporting the project activity, estimates of GHG emission data and the controls to be implemented to mitigate these. ESPL planned and performed the validation by obtaining evidence, other information and explanations that ESPL considered necessary to give reasonable assurance that the estimated GHG emission reductions are fairly to be achieved.

The validation team confirms, based on final version of revised PDD for the 2nd crediting period, that:

- the original baseline is still valid as it is given by the applied methodology;
- the project additionality is valid for the renewal of the crediting period. No regulatory surplus has been identified. The project is in accordance with all applicable regulations and legislations;
- the project description is in accordance with the characteristics identified on site;
- the monitoring plan is adequate to the project activity and it is in accordance with the applied methodology;

At this 2nd crediting period, the project activity is likely to achieve the estimated of 8,980 tCO₂e per year.

Appendix 1. Abbreviations

Abbreviations	Full texts
ACM	Approved Consolidated Methodology
BE	Baseline Emission
BM	Build Margin
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CL	Clarification Request
CM	Combined Margin
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
CP	Crediting Period
DNA	Designated National Authority
DOE	Designated Operational Entity
EB	Executive Board
EIA	Environmental Impact Assessment
ESPL	Earthood Services Private Limited
FAR	Forward Action Request
GHG	Green House Gas
GSC/GSP	Global Stakeholder Consultation Process
IPCC	Intergovernmental Panel on Climate Change
KP	Kyoto Protocol
kW	kilo Watt
kWh	kilo Watt hour
LoA	Letter of Approval/Authorization
MoC	Modalities of Communication
MP	Monitoring Plan
MW	Mega Watt
MWh	Mega Watt hour
OM	Operating Margin
PA	Project Activity
PCP	Project Cycle Procedure
PDD	Project Design Document
PE	Project Emission
PLF	Plant Load Factor
PP	Project Participant
PS	Project Standard
tCO ₂ e	Tonnes of Carbon dioxide equivalent
UNFCCC	United Nations Framework Convention on Climate Change
VT	Validation Team
VVS	Validation and Verification Standard

Appendix 2. Competence of team members and technical reviewers

Competence Statement			
Name	Marcelo Sebben		
Country	Brazil		
Education	M.Sc. (Sustainable Energy System) B. Eng. (Chemical Engineering)		
Experience	+12.5 Years		
Field	Chemical process industry, CDM, Energy, Climate Change		
Approved Roles			
Team Leader	Yes		
Validator	Yes		
Verifier	Yes		
Methodology Expert	Yes (ACM0001, ACM0002, ACM0006, AM0065, AMS ID, AMS-I.E, AMS-I.C, AM0026, AMS-I.A, AMS-I.F, AMS-III.E, AMS-III.H, AMS-III.I, AMS-III.J, GS: Ecologically Sound Fuel Switch to Biomass with Reduced Energy Requirement, GS: Technologies and Practices to Displace Decentralized Thermal Energy Consumption)		
Local expert	Brazil, Chile, Honduras, Colombia		
Financial Expert	Yes		
Technical Reviewer	No		
TA Expert	Yes (TA 1.1, 1.2, 4.1, 5.1, 9.1, 13.1)		
Reviewed by	Shreya Garg	Date	29/07/2020
Approved by	Anshika Gupta	Date	29/07/2020

Competence Statement			
Name	Shreya Garg		
Country	India		
Education	M.Sc. (Climate Science & Policy), TERI University		
Experience	6 Years +		
Field	Climate Change		
Approved Roles			
Team Leader	YES		
Validator	YES		
Verifier	YES		
Methodology Expert	AMS.I.A., AMS.I.C., AMS.I.D., AMS.I.F., AMS.II.D., AMS.II.G., AMS.II.J., AMS.III.AV., ACM0002, ACM0012		
Local expert	YES (India)		
Financial Expert	NO		
Technical Reviewer	YES		
TA Expert	YES (TA 1.2, TA 3.1)		
Reviewed by	Abhishek Mahawar	Date	01/03/2018
Approved by	Ashok Gautam	Date	01/03/2018

Appendix 3. Documents reviewed or referenced

No.	Author	Title	References to the document	Provider
1.	UNFCCC	Standard: CDM PS for PA	version 02.0	Other
2.	UNFCCC	Standard: CDM PCP for PA	version 02.0	Other
3.	UNFCCC	Standard: CDM VVS for PA	version 02.0	Other
4.	UNFCCC	Form: CDM-PDD-FORM	version 11	Other
5.	UNFCCC	1. Current Valid PDD (revised after PRC (PRC-6042-001) approved on 15/10/2020 2. Assessment on Post registration changes, issued by ESPL	version 8 – 21/08/2020 version 1 – 21/08/2020	PP
6.	Bureau Veritas	Validation report “CDM Project SHP Santa Carolina” issued by Bureau Veritas, report # BRAZIL-Val/02613/2009-POA	Revision 04.2 – 13/04/2012	Other
7.	PP	Project design document (draft)	version 1 – 20/10/2020	PP
8.	PP	Project design document (revised/final)	version 2 – 01/12/2020 Version 3 – 11/12/2020	PP
9.	PP	ER Spreadsheet (draft)	version 1	PP
10.	PP	ER calculation Spreadsheet (revised/final)	Version 2 (final)	PP
11.	UNFCCC	<u>Methodology:</u> 1. AMS-I.D.: Grid connected renewable electricity generation – 2. ACM0002: Grid-connected electricity generation from renewable sources	1. version 18.0 2. version 20.0	Other
12.	UNFCCC	<u>Methodological tools:</u> • TOOL07 – Tool to calculate the emission factor for an electricity system • TOOL 11 – Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period	version 7.0 version 03.0.1	Other
13.	PP	Project Lifetime: 30 years as per registered PDD	https://cdm.unfccc.int/Projects/DB/BVQI1334253365.85/view http://www2.aneel.gov.br/aplicacoes/audiencia/a	PP

		ANEEL guidelines Study of economics useful life time and depreciation (from the Portuguese “Estudo de Vida Útil Econômica e Taxa de Depreciação” dated on November/2000	rquivo/2006/012/documento/relatorio_vida_util_volume_2.pdf	
14.	ANEEL	<u>Estimated EG_{facility,y}</u> Based on assured energy MWh (average) obtained from official source (ANEEL Ordinance # 29) which is equal to 5.13 MWaverage minus 3% of projected transmission losses, which will be equal to 4.98 MWaverage. This value multiplied by 8,760 hours per year will be equal to the applied estimated EG _{facility} .	22/10/2013	Other
15.	ANEEL	<u>Operation start date</u> • ANEEL Dispatch # 609 stating that the operation start date of the 1 st generation unit of the SHP started on 11/03/2016	10/03/2016	Other
16.	Alamo PP	<u>Technical description of SHP:</u> - Operation and Maintenance Manual of Turbine and generators from SHP - Pictures from equipment plates	13/12/2018 11/2020	PP
17.	FEPAM	<u>Operational permit and Reservoir Area</u> Operational Permit of the SHP Santa Carolina # 7921/2015-DL issued by FEPAM (State Environment Secretariat) Operational license Renewal protocol: process # 0101700567199,	The reservoir area is yearly monitored through the Operational permit monitoring reports	Other
18.	ONS (National Electric System Operator)	1. Procedure 12.2 from ONS (National Electric System Operator) regulating the accuracy class of the electricity meters 2. Regulation (ONS Grid Procedure, submodule 12.3) issued on 01/01/2017 revision 2016/12 stating that 5 years calibration frequency is to be applied to electricity meters	-	Others
19.	MCTIC	- Data provided by the Brazilian DNA website regarding the EF _{OM-DD,h} and EF _{BM,y} (last assessed on 08/12/2020)	http://antigo.mctic.gov.br/mctic/opencms/ciencia/SEPED/clima/textogeral/emissao_despacho.html	Other

20.	ANEEL	<u>Calculation of installed capacity of a Hydro power plant</u> - Normative Resolution ANEEL #583 calculated as follows: $Pg = Pt \times \eta_g$ <i>where</i> <i>Pg = Generation power (kW)</i> <i>Pt = Turbine power (kW)</i> <i>η_g = Generator yield (%)</i> $Pg = 5,444 \times 0.97$ $Pg = 5,280.68 \quad \text{each turbo-generator set}$ For 2 turbo generators' set: $2 \times 5,280.68 = 10.56 \text{ MW}$	22/10/2013	ANEEL
21.	PP	<u>Trainings and Duties of Personnel:</u> SHP operation course – Gelson da Silva	17/05/2019	PP
22.	MCTIC	DNA of Brazil	http://www.mct.gov.br	Other
23.	ANEEL	ANEEL – National Agency of Electric Energy	www.aneel.gov.br	Other
24.	Brazilian Government	Law 10,848 issued on 15/03/2004 – which establish the rules for generation, commercialization and transmission of electricity in Brazil.	http://www.planalto.gov.br/ccivil_03/_Ato2004-2006/2004/Lei/L10.848.htm#:~:text=%C2%A7%202%C2%BA%20Submeter%2Dse%2D%C3%A3o,el%C3%A9trica%20para%20o%20mercado%20regulado.	Other
25.	Google Maps	<u>Geographical coordinates</u> - Google maps plot carried out in order to check the correct location of the SHP	https://www.google.com.br/maps/place/28%C2%B037'09.2%22S+51%C2%B024'05.3%22W/@-28.6189502,-51.4016635,442m/data=!3m1!1e3!4m5!3m4!1s0x0:0x0!8m2!3d-28.619218!4d-51.401466	Other
26.	ANEEL	Definition of Assured Energy – Cadernos temáticos ANEEL – issued on 04/2005	https://www.aneel.gov.br/documents/656835/16505063/2005_CardenosTematicosANEEL3.pdf/c09636a7-c356-c427-ac3b-3eea464ca906	Other
27.	-	IPCC publications	www.ipcc-nggip.iges.or.jp	Other
28.	-	UNFCCC	http://cdm.unfccc.int	Other

Appendix 4. Clarification requests, corrective action requests and forward action requests

Table 1. CL from this validation

CL ID	01	Section no.	E.1	Date : 25/11/2020
Description of CL				
<p>The following information is not provided in the PDD unlike required by instructions for completing the PDD form:</p> <ul style="list-style-type: none"> - Section A.1 <ul style="list-style-type: none"> o Indicate the small-scale project type (Type I, Type II and/or Type III) applicable to the project activity in accordance with the project standard - Section B.2: Demonstrate that the project activity qualifies as Type I, Type II, and/or Type III in accordance with applicable provisions on small-scale project type and eligibility in the project standard - B.6.1: demonstration of PE calculations are not carried out unlike required by PS. - Appendix 7: information of all PRCs since the PA's registration is not provided 				
Project participant response				Date : 01/12/2020
Section A.1., B.2., B.6.1 and Appendix 7 were changed and PDD Version 02 provides information required.				
Documentation provided by project participant				
PDD Version 02.				
DOE assessment				Date : 08/12/2020
All information were corrected in the PDD in accordance with instructions for completing the PDD and Project standard.				
CL is closed				

CL ID	02	Section no.	E.1	Date : 25/11/2020
Description of CL				
Section B.2: Not all applicability criteria from applied methodology have been taken into account.				
Project participant response				Date : 01/12/2020
PDD Version 02 considers all applicability criteria from applied methodology.				
Documentation provided by project participant				
PDD Version 02.				
DOE assessment				Date : 08/12/2020
All eligibility criteria of applied methodology has been taken into account as required by Project Standard. The PA complies with all applicability conditions of applied methodology.				
CL is closed				

Table 2. CAR from this validation

CAR ID	01	Section no.	E.6.2	Date : 25/11/2020
Description of CAR				
PDD, section B.7.1: The applied value for Apj used in the PD estimation is not in accordance with evidence provided.				
Project participant response				Date : 01/12/2020
The value for Apj was corrected.				
Documentation provided by project participant				
PDD Version 02.				

DOE assessment	Date: 08/12/2020
The values are in accordance with currently valid environmental license ^{/xx/} of the SHP. This value will remain fixed for the whole CP. Therefore, no PE due to reservoir emission will be applicable to this project activity.	
CAR is closed	

CAR ID	02	Section no.	E.6.2	Date : 25/11/2020
Description of CAR				
<i>PDD section B.7.1: The monitoring frequency of the parameters Ap_j, CAP_{PJ} and EF_{grid} (especially related to EF_{BM} specified in the "source of data") is not in accordance with applied methodology and TOOLS.</i>				
Project participant response				Date : 01/12/2020
<i>Monitoring frequency of the parameters Ap_j, CAP_{PJ} and EF_{grid} were corrected.</i>				
Documentation provided by project participant				
<i>PDD Version 02.</i>				
DOE assessment				Date: 08/12/2020
The monitoring frequency of the mentioned parameters are now in accordance with applied methodologies and tools				
CAR is closed				

CAR ID	03	Section no.	E.6.2	Date : 25/11/2020
Description of CAR				
<i>PDD, section B.7.1: it is not clear how the monitoring plan is in compliance with applied methodologies and tools considering that the PP opted by monitoring the parameter EF_{om-DD}, but it is not listed in this section of the PDD. Moreover, the parameter $CAPPJ$ is also not included in the monitoring plan unlike required by applied methodology.</i>				
Project participant response				Date : 01/12/2020
<i>Parameters CAP_{PJ} and EF_{om-DD} were included at section B.7.1.</i>				
Documentation provided by project participant				
<i>PDD Version 02.</i>				
DOE assessment				Date: 08/12/2020
It is now clear to the validation team that the parameter $EF_{grid,OM-DD}$ will be monitored yearly based on information published by Brazilian DNA. Moreover, all parameters required by applied methodology and tools which are applicable to the project activity are now included in the monitoring plan as required by Project Standard,				
CAR is closed				

Table 3. FAR from previous validation

FAR ID	0x	Section no.	x	Date : xx
Description of CAR				
<i>Not applied</i>				
Project participant response				Date : DD/MM/YYYY
Documentation provided by project participant				
DOE assessment				Date: DD/MM/YYYY

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Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
03.0	31 May 2019	Revision to: <ul style="list-style-type: none">• Ensure consistency with version 02.0 of the “CDM validation and verification standard for project activities” (CDM-EB93-A05-STAN) and version 02.0 of the “CDM project cycle procedure for project activities” (CDM-EB93-A06-PROC);• Make editorial improvements.
02.0	31 October 2017	Revision to align with the requirements of the “CDM validation and verification standard for project activities” (version 01.0).
01.0	23 March 2015	Initial publication.
Decision Class: Regulatory Document Type: Form Business Function: Renewal of crediting period Keywords: crediting period, project activities, validation report		