




**Verification and certification report form 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	Pesqueiro Energia Small Hydroelectric Project (PESHP) UNFCCC Ref #: 0242
Scale of the project activity	<input type="checkbox"/> Large-scale <input checked="" type="checkbox"/> Small-scale
Version number of the verification and certification report	1
Completion date of the verification and certification report	02/02/2021
Monitoring period number and duration of this monitoring period	2 nd Monitoring period 01/10/2013 to 26/01/2017 (both days included)
Version number of the monitoring report to which this report applies	2.1
Crediting period of the project activity corresponding to this monitoring period	Type: Renewable (2 nd CP) Start date: 27/01/2010, Length: 7 years
Project participants	Pesqueiro Energia S.A. Trading Emissions PLC CM Capital Markets Holding S.A. Ecopart Assessoria em Negocios Empresariais Ltda.
Host Party	Brazil
Applied methodologies and standardized baselines	AMS-I.D. ver. 17 - Grid connected renewable electricity generation
Mandatory sectoral scopes	1 : Energy industries (renewable - / non-renewable sources)
Conditional sectoral scopes, if applicable	N/A
Estimated amount of GHG emission reductions or GHG removals for this monitoring duration in the registered PDD	59,578 tCO ₂ e
Certified amount of GHG emission reductions or GHG removals for this monitoring period	79,006 tCO ₂ e
Name and UNFCCC reference number of the DOE	Earthood Services Private Limited (ESPL) (ref E- 0066)
Name, position and signature of the approver of the verification and certification report	

	 Dr. Kaviraj Singh Managing Director
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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 12.44 MW. The SHP also comprehend small reservoir of 0.33 km².

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

The SHP is located in Jaguariaíva river, city of Jaguariaíva, Paraná State, Brazil.

The operation start date of the SHP is on January 2003.

Scope of verification

Pesqueiro Energia S.A. has contracted Earthood Services Private Limited to conduct the verification and certification of emission reductions reported for the CDM project activity "Pesqueiro Energia Small Hydroelectric Project (PESHP)" for the period from 01/10/2013 to 26/01/2017 (including both days).

The verification is the periodic independent review and ex post determination of the monitored reductions in GHG emissions that have occurred due to the registered CDM project activity during the defined monitoring period.

The scope of the verification is to establish/verify that:

- the project activity has been implemented and operated as per the registered PDD or any approved revised PDD, and that all physical features (technology, project equipment, and monitoring and metering equipment) of the project are in place;
- the monitoring report and other supporting documents provided are complete in accordance with the latest applicable version of the completeness checklist for requests for issuance of CERs, verifiable, and in accordance with applicable CDM requirements;
- the actual monitoring systems and procedures comply with the monitoring systems and procedures described in the monitoring plan, any revised approved monitoring plan, the approved methodology including applicable tool(s) and/or, where applicable, the approved standardized baseline;
- the data recorded and stored as per the monitoring methodology including applicable tool(s) and, where applicable, the standardized baseline.

Verification process

The verification process involved following:

- Contract with Pesqueiro Energia S.A. for the scope of verification;
- publication of monitoring report;
- desk review;
- physical on-site inspection;
- issuance of verification findings;
- reporting, calculation checks, QA/QC and resolution of findings;
- issuance of draft verification report;
- independent technical review of the project documentation;
- issuance of the final verification report;
- submission of the request for issuance, as appropriate.

Conclusion

Earthood Services Private Limited has performed the verification of the CDM PA "Pesqueiro Energia Small Hydroelectric Project (PESHP)", having UNFCCC Ref. Number 0242 for the monitoring period 01/10/2013 to 26/01/2017. The verification team has confirmed the implementation of the project as per description in the revised PDD, the monitoring plan of the PDD and the application of the monitoring methodology (AMS-I.D. ver.

17). In addition, it was confirmed that the monitoring system is in place and the emission reductions are calculated without material misstatements.

The verified emission reductions amount to 79,006 tCO₂e in the above mentioned monitoring period.

The verification team concluded that the registered CDM PA complies with all relevant CDM procedures/standards/guidance and therefore request for issuance is being submitted in accordance with the CDM procedures.

SECTION B. Verification team, technical reviewer and approver

B.1. Verification 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	Interviews	Verification 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 verification and certification report

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. Application of materiality

C.1. Consideration of materiality in planning the verification

No.	Risk that could lead to material errors, omissions or misstatements	Assessment of the risk		Response to the risk in the verification plan and/or sampling plan
		Risk level	Justification	
1.	<i>Not applied as no sampling has been carried out. All data (100%) could be checked during the verification process</i>	-	-	-

C.2. Consideration of materiality in conducting the verification

The concept of materiality has not been applied during this verification as no sampling was conducted. All data (100%) could be checked during the verification process.

SECTION D. Means of verification**D.1. Desk/document review**

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

- a. a review of the data and information presented to verify its completeness;
- b. a review of the registered monitoring plan, the monitoring methodology including applicable tool(s) and, where applicable, the applied standardized baseline, paying particular attention to the frequency of measurements, the quality of metering equipment including calibration requirements, and the quality assurance and quality control procedures;
- c. an evaluation of data management and the quality assurance and quality control system in the context of their influence on the generation and reporting of emission reductions.

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

D.2. On-site inspection

Duration of on-site inspection: 19/11/2020				
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.	SHP Pesqueiro, Jaguariaíva/PR	19/11/2020	Marcelo Sebben
2.	Implementation and operation of project activity (project boundary, technology, project equipment, monitoring and metering equipment) as per registered PDD/previous verification.	SHP Pesqueiro, Jaguariaíva/PR	19/11/2020	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 (Jaguariaíva SUBSTATION – Check electricity meters Serial Number) 	SHP Pesqueiro, Jaguariaíva/PR	19/11/2020	Marcelo Sebben
4.	Download of raw data from e-meter (Vetorlog)	SHP Pesqueiro, Jaguariaíva/PR	19/11/2020	Marcelo Sebben
5.	Management and monitoring procedures followed at project site.	SHP Pesqueiro, Jaguariaíva/PR	19/11/2020	Marcelo Sebben
6.	Management and operational system: Documentation, allocation of responsibilities, qualification and training, data recording & archiving, internal audit and management review and emergency procedures	SHP Pesqueiro, Jaguariaíva/PR	19/11/2020	Marcelo Sebben
7.	Verification checklist: compliance of monitoring procedures followed at project site with registered PDD and monitoring methodology.	SHP Pesqueiro, Jaguariaíva/PR	19/11/2020	Marcelo Sebben
8.	End of verification site visit.	SHP Pesqueiro, Jaguariaíva/PR	19/11/2020	Marcelo Sebben

D.3. Interviews

No.	Interviewee			Date	Subject	Team member
	Last name	First name	Affiliation			
1.	Lima	Eder	Pesqueiro Energia	19/11/2020	- Description of project activity. Physical Inspection of site. Meter diagram, Electricity measurement	Marcelo Sebben
3.	Santos	Antonio	Pesqueiro Energia	19/11/2020	Operation and maintenance of SHP Pesqueiro,	Marcelo Sebben
5.	Nagai	Karen	Eqao	19/11/2020	MR and ER calculations	Marcelo Sebben

D.4. Sampling approach

Not applicable as no sampling has been used during the verification

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

Areas of verification findings	No. of CL	No. of CAR	No. of FAR
Compliance of the monitoring report with the monitoring report form	-	-	-
Compliance of the project implementation and operation with the registered PDD	-	-	-
Post-registration changes	-	-	-
Compliance of the registered monitoring plan with the methodologies including applicable tools and standardized baselines	-	-	-
Compliance of monitoring activities with the registered monitoring plan	CL 01	CAR 01 CAR 02	-
Compliance with the calibration frequency requirements for measuring instruments	-	CAR 03	-
Assessment of data and calculation of emission reductions or net removals	-	-	-
Assessment of reported sustainable development co-benefits	-	-	-
Global stakeholder consultation	-	-	-
Others (please specify)	-	-	-
Total	1	3	-

SECTION E. Verification findings**E.1. Compliance of the monitoring report with the monitoring report form**

Means of verification	The MR was crosschecked with the CDM-MR-FORM template available at the UNFCCC website and with the instructions for filling it out. No inconsistencies were found.
Findings	N/A
Conclusion	A valid version of the verification template (CDM-MR-FORM – version 07.0) available at the UNFCCC website has been used. It has been filled out in accordance with the “Instructions for filling out the monitoring report form”.

E.2. Remaining forward action requests from validation and/or previous verifications

Means of verification	The latest verification report ^{/14/} has been reviewed and it was observed that no FAR has been opened during the previous verification.
Findings	N/A
Conclusion	No remaining FAR is kept open during this verification process. No issues remained from previous verification. All evidences were duly provided to the verification team.

E.3. Compliance of the project implementation and operation with the registered project design document

Means of verification	During the on-site visit, the verification team checked the implementation status of the project activity as well as the monitoring equipment. In addition, interviews with personnel and PP's representatives were also performed.		
	The project activity consists in generating renewable energy through the construction of a small hydro power plant (SHP Pesqueiro), reducing the GHG emissions through dispatching GHG-free electricity to the Brazilian Interconnected System.		
	The total installed capacity of the Project activity is 12.44 MW ¹ . All physical features are in accordance with registered PDD.		
	The main characteristics of the SHP is described below		
	Generators		
	Characteristic	Unit	value
	Manufacturer/model		WEG/SPA1250
	Quantity	-	2
	Serial Numbers	-	100 802 / 100 803
			-
	Type		Synchronic
	Apparent power	kVA	6,800
	Cos ϕ	-	0.92
	Frequency	Hz	60
	Turbines		
Characteristic	Unit	value	
Manufacturer		Möller (Alstom)	
Quantity	-	2	
Serial Numbers	-	#1	
		#2	
Type		Francis Horizontal	
Power	kW	6,220	
Flow	m³/s	8.05	
Rotation	rpm	514.3	
Head	m	86	
Technical information			
Characteristic	Unit	value	
Operation Start Date	date	January 2003	
Geographical Location			
Characteristic	Unit	value²	
Latitude	-	24°07'58" S	

¹ The rated power is based on the Turbine's installed capacity which is also the official data approved by ANEEL^{/27/}.

² The geographical coordinates have been checked in the PDD^{/9/} and MR^{/6/} provided. Moreover, the site visit has been conducted to confirm the project location and operation. In order to check the correctness of the information, conference in google maps^{/15/} has been carried out. It has been observed that the location observed in Google Maps is close to the SHP. Small differences may be related to difference in equipment accuracy. Therefore, the location is confirmed.

	Longitude	-	49°38'09" W
Findings	N/A		
Conclusion	<p>It was confirmed through on-site inspection and document review that all physical features (technology, project equipment, and monitoring and metering equipment) of the SHP Pesqueiro were in place and are in accordance with the registered PDD.</p> <p>It is confirmed by verification team that the small-scale project activity is not a debundling from a large scale PA. Moreover, it remains within the Type I small-scale threshold as defined by PS para 119 where the installed capacity given by generators shall be less than 15 MW³.</p> <p>The SHP was operated as per as the registered PDD. The information presented in the MR is accurate and in accordance with actual situation and registered PDD.</p>		

E.4. Post-registration changes

E.4.1. Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents⁴

Means of verification	Not applied
Findings	-
Conclusion	-

E.4.2. Corrections

c	Not applied
Findings	-
Conclusion	-

E.4.3. Changes to the start date of the crediting period

Means of verification	Not applied
Findings	-
Conclusion	-

E.4.4. Inclusion of a monitoring plan

Means of verification	Not applied
Findings	-
Conclusion	-

E.4.5. Permanent changes from registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines or other methodological regulatory documents

Means of verification	Not applied
Findings	-
Conclusion	-

E.4.6. Changes to the project design

Means of verification	Not applied
Findings	-

³ Although, in this PA the capacity is officially given by the turbines capacity (official value approved by ANEEL⁽²⁷⁾), as per PS para 119, the output given by generator shall be smaller than 15MW. The output given by generator is equal to $2 \times 6,800 \text{ KVa} \times 0.92 (\cos\phi) = 12,512 \text{ kW}$ which is below the threshold.

⁴ 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).

Conclusion	-
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E.4.7. Changes specific to afforestation and reforestation project activities

Means of verification	Not applied
Findings	-
Conclusion	-

E.5. Compliance of the registered monitoring plan with applied methodologies, applied standardized baselines, and other applied methodological regulatory documents

Means of verification	The MP of the registered PDD was reviewed against the monitoring requirements of the applied methodology and applicable tools.
Findings	-
Conclusion	The MP of the project activity is totally in accordance with the applied methodology (AMS-I.D. ver. 17 - Grid connected renewable electricity generation).

E.6. Compliance of monitoring activities with the registered monitoring plan

E.6.1. Data and parameters fixed ex ante or at renewal of crediting period

Means of verification	According to the registered PDD, the following parameters are fixed for the crediting period: <ul style="list-style-type: none"> - $EF_{grid,BM}$ – Build Margin emission CO₂ emission factor in year y. This value was fixed ex-ante. The value is equal to 0.1458 tCO₂/MWh, which is in accordance with monitoring plan presented in the PDD. - 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. - ABL - 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
Findings	N/A
Conclusion	All fixed parameters were duly included in the MR section D.1 and are in accordance with registered PDD. The values applied in the ER calculations are accurate.

E.6.2. Data and parameters monitored

Means of verification	All monitored parameters listed in MR used to calculate baseline GHG emissions of the PA were checked against the registered PDD. No project or leakage emissions are due as per applied methodology and registered PDD. The parameters of the registered PDD were verified in order to check its consistency with CDM tools and guidance to ER calculations.	
	1. <i>$EG_{BL,y}$: Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y</i>	
	Criteria/Requirements	Assessment Observation
	Measuring / Reading / Recording frequency	The parameter is continuously read, measured and recorded every one hour automatically by two meters (main and backup) in the Jaguariáiva Substation. The raw data was available for download in the Company's system. The final value of this parameter refers to the yearly aggregated data.
	Is the measuring and reporting frequency in accordance with the	Yes

	monitoring plan and monitoring methodology?	
	Monitoring equipment	<p>Information is not provided in the MR. Therefore a CL has been raised Refer to CL 01.</p> <p>After findings resolution the information regarding the electricity meter has been duly referenced in this parameter and presented in the parameter EG_{PJ,h}</p> <p>It has been observed that correct information regarding installed electricity meters were included in the MR as follows:</p> <p>02 (two) bi-directional electricity meters (main and backup). Type/model Landis+Gyr/SAGA1000 1- Main - S/N: 226378. 2- Backup - S/N: 226377</p>
	Is the accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification?	The accuracy of the equipment is 0.2 as required by Brazilian Regulations ^{/16/}
	Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges?	Accuracy class is valid for the entire range.
	Calibration frequency / interval	Calibration taken as per National resolution ^{/16-2/}
	Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications?	The calibration interval is in line with the monitoring plan as it is set as per national regulations ^{/16-2/} .
	Is the calibration of measuring equipment carried out by an accredited person or institution?	An accredited institution has carried out calibration of equipment ^{/20/} .
	Is(are) the calibration(s) valid for the entire reporting period?	No. Gaps were observed. Refer to details in section 7 below.
	Is the calibration carried out for a measuring range comparable with the range for which measurements have been carried out?	Yes.
	How were the values in the monitoring report verified?	The values of the MR were verified through the comparison between the raw data ^{/17/} and values applied in the Excel spreadsheets.

	If applicable, has the reported data been crosschecked with other available data?	<p>The monitored values are to be reviewed by crosschecking 100% of the data with reports from CCEE which is the Government Chamber of Electricity Commercialization (Official Source)^{18/}. However this comparison has not being made. Thus a CAR has been raised. Refer to CAR 02 below.</p> <p>After findings resolution it has been observed that all data has been cross-checked in accordance with registered monitoring plan. The conservative values were used in the ER Calculations spreadsheet.</p>							
	Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	<p>It has been observed that the data used in the ER calculations was not taken from the dispatch electricity meter. Therefore, a CAR has been raised. Refer to CAR 01 below</p> <p>After findings resolution it has been observed that all data is now in accordance with evidences provided.</p>							
	In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by paragraph 231 b) the CDM Project Standard for PA-version 02.0?	Not applied							
	<p>2. $EG_{PJ,h}$: Electricity displaced by the project activity in hour h of the year y</p> <table border="1"> <thead> <tr> <th>Criteria/Requirements</th><th>Assessment Observation</th></tr> </thead> <tbody> <tr> <td>Measuring / Reading / Recording frequency</td><td>The parameter is continuously read, measured and recorded every one hour automatically by two meters (main and backup) in the Jaguariaíva Substation. The raw data was available for download in the Company's system. The value is aggregated hourly and it is used for calculation of the EF_{OM-DD}. This parameter is the same as the parameter $EG_{BL,y}$ above. However this parameter is hourly determined whereas the parameter EG_{BL} above is yearly.</td></tr> <tr> <td>Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology?</td><td>Yes</td></tr> <tr> <td>Monitoring equipment</td><td> <p>Information is not provided in the MR. Therefore a CL has been raised Refer to CL 01</p> <p>After findings resolution, information has been duly included in the MR as follows:</p> </td></tr> </tbody> </table>		Criteria/Requirements	Assessment Observation	Measuring / Reading / Recording frequency	The parameter is continuously read, measured and recorded every one hour automatically by two meters (main and backup) in the Jaguariaíva Substation. The raw data was available for download in the Company's system. The value is aggregated hourly and it is used for calculation of the EF_{OM-DD} . This parameter is the same as the parameter $EG_{BL,y}$ above. However this parameter is hourly determined whereas the parameter EG_{BL} above is yearly.	Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology?	Yes	Monitoring equipment
Criteria/Requirements	Assessment Observation								
Measuring / Reading / Recording frequency	The parameter is continuously read, measured and recorded every one hour automatically by two meters (main and backup) in the Jaguariaíva Substation. The raw data was available for download in the Company's system. The value is aggregated hourly and it is used for calculation of the EF_{OM-DD} . This parameter is the same as the parameter $EG_{BL,y}$ above. However this parameter is hourly determined whereas the parameter EG_{BL} above is yearly.								
Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology?	Yes								
Monitoring equipment	<p>Information is not provided in the MR. Therefore a CL has been raised Refer to CL 01</p> <p>After findings resolution, information has been duly included in the MR as follows:</p>								

		02 (two) bi-directional electricity meters (main and backup). Type/model Landis+Gyr/SAGA1000 3- Main - S/N: 226378. 4- Backup - S/N: 226377
	Is the accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification?	The accuracy of the equipment is 0.2 as required by Brazilian Regulations ^{/16/}
	Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges?	Accuracy class is valid for the entire range.
	Calibration frequency / interval	Calibration taken as per National resolution ^{/16-2/}
	Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications?	The calibration interval is in line with the monitoring plan as it is set as per national regulations ^{/16/} .
	Is the calibration of measuring equipment carried out by an accredited person or institution?	An accredited institution has carried out calibration of equipment ^{/20/} .
	Is(are) the calibration(s) valid for the entire reporting period?	No. Gaps were observed. Refer to details in section 7 below.
	Is the calibration carried out for a measuring range comparable with the range for which measurements have been carried out?	Yes.
	How were the values in the monitoring report verified?	The values of the MR were verified through the comparison between the raw data ^{/17/} and values applied in the Excel spreadsheets.
	If applicable, has the reported data been crosschecked with other available data?	The monitored values are to be reviewed by crosschecking 100% of the data with reports from CCEE which is the Government Chamber of Electricity Commercialization (Official Source) ^{/18/} . However this comparison has not being made. Thus a CAR has been raised. Refer to CAR 02 below. After findings resolution it has been observed that all data has been cross-checked in accordance with registered monitoring plan. The conservative values were used in the ER Calculations spreadsheet.

	Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	<p>It has been observed that the data used in the ER calculations was not taken from the dispatch electricity meter. Therefore, a CAR has been raised. Refer to CAR 01 below</p> <p>After findings resolution it has been observed that all data is now in accordance with evidences provided.</p>
	In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by paragraph 231 b) the CDM Project Standard for PA-version 02.0?	Not applied
	3. $EF_{EL,DD,h}$: CO2 emission factor for power units in the top of the dispatch order in hour h in year y	
	Criteria/Requirements	Assessment Observation
	Measuring / Reading / Recording frequency	<p>According to the applied tool for calculating emission factor for an electricity system, "For the dispatch data analysis OM, use the year in which the project activity displaces grid electricity and update the emission factor annually during monitoring". The parameter was determined for all monitoring period as per applied tool. The parameter was calculated hourly by the Brazilian DNA, and represents the hourly emission factor of the National Interconnected System (SIN). The parameter is then multiplied by hourly generation (parameter $EG_{PJ,h}$ above) and then aggregated yearly in order to determine the Operating Margin Emission factor of this project. This is used to determine the Combined Margin Emission Factor, in accordance with TOOL07. The calculation was carried out by the Project Participants as can be seen in the ER calculations spreadsheet^{t/08/}.</p>
	Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology?	Yes
	Monitoring equipment	N/A
	Is the accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification?	N/A

	Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges?	N/A
	Calibration frequency / interval	N/A
	Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications?	N/A
	Is the calibration of measuring equipment carried out by an accredited person or institution?	N/A
	Is(are) the calibration(s) valid for the entire reporting period?	N/A
	Is the calibration carried out for a measuring range comparable with the range for which measurements have been carried out?	N/A
	How were the values in the monitoring report verified?	The data was directly checked in the DNA website ^{/19/} and compared to the data used in the ER calculations.
	If applicable, has the reported data been crosschecked with other available data?	Not applied as no cross-check is done in this parameter. It is determined based on public available parameters and electricity generated by the project activity.
	Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	The data management ensure the correct transfer of the data to the emission reductions calculation spreadsheet.
	In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by paragraph 231 b) the CDM Project Standard for PA-version 02.0?	N/A
4. CAP_{PJ}: Installed Capacity of the hydro power plant after the implementation of the project activity		
Criteria/Requirements	Assessment Observation	
Measuring / Reading / Recording frequency	Corresponds to the installed capacity of the SHP observed in the equipment plates. The values presented in the MR are in accordance with observed on site ^{/23/} .	
Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology?	Yes	

	Monitoring equipment	N/A
	Is the accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification?	N/A
	Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges?	N/A
	Calibration frequency / interval	N/A
	Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications?	N/A
	Is the calibration of measuring equipment carried out by an accredited person or institution?	N/A
	Is(are) the calibration(s) valid for the entire reporting period?	N/A
	Is the calibration carried out for a measuring range comparable with the range for which measurements have been carried out?	N/A
	How were the values in the monitoring report verified?	The data was checked directly at the equipment tags and provided evidences during site visit ^{23/} .
	If applicable, has the reported data been crosschecked with other available data?	The installed capacity has been checked with observations carried out during site visit.
	Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Data management system was found to be reliable and appropriate. It has been cross-checked with official information (ANEEL's Dispatch) ^{27/}
	In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by paragraph 231 b) the CDM Project Standard for PA-version 02.0?	N/A

5. A_{PJ} : Area of Reservoir measured in the water surface after the implementation of the project activity when the reservoir is full	
Criteria/Requirements	Assessment Observation
Measuring / Reading / Recording frequency	The maximum area is monitored and controlled continuously by surface height

		and by topographical survey processing. This parameter is monitored annually. It could be observed that the value applied was obtained from topographical measurements obtained by ANEEL's Geo-referenced Information Systems which is the official information. ^{/22-1/} .
	Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology?	yes
	Monitoring equipment	N/A
	Is the accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification?	N/A
	Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges?	N/A
	Calibration frequency / interval	N/A
	Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications?	N/A
	Is the calibration of measuring equipment carried out by an accredited person or institution?	N/A
	Is(are) the calibration(s) valid for the entire reporting period?	N/A
	Is the calibration carried out for a measuring range comparable with the range for which measurements have been carried out?	N/A
	How were the values in the monitoring report verified?	The data was checked directly at the evidence provided.
	If applicable, has the reported data been crosschecked with other available data?	Data cross-checked with operational licenses ^{/22-2/} which contain information from topographical study of reservoir area.
	Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	yes
	In case project participants have temporarily not monitored the parameter, has either i) a deviation	N/A

	<p>been approved by the CDM EB or ii) has the parameter been estimated as stipulated by paragraph 231 b) the CDM Project Standard for PA–version 02.0?</p>	
Findings	<p>CL 01 <i>Section D.2: parameter EG_{Pj,h} information regarding type, accuracy class, serial number, calibration frequency, date of last calibration and validity of monitoring equipment were not provided as required by instructions for completing MR.</i></p> <p>CAR 01 <i>The values applied for the parameter EG_{Pj} did not take into account the net electricity dispatched to the SIN (generated minus consumption) measured by the dispatched meters (SN 226377 and 226378).</i></p> <p>CAR 02 <i>Cross check of parameter EG_{PJ,y} has not been demonstrated (reports issued by CCEE)</i></p>	
Conclusion	<p>After the findings resolutions all parameters were determined in a conservative manner and in accordance with requirements of applied tools, methodology and monitoring plan.</p> <p>The data used for the parameters EG_{PJ} was the one measured by meters installed in the grid connection point (COPEL Substation) and cross-checked with values from CCEE (official source). The smaller values from each month were applied, which is a conservative measure as less ERs were achieved with it.</p> <p>Parameter EF_{EL,DD,h} is directly provided by Brazilian DNA^{/19/} and it is used for calculation of EF_{OM,y} ex post. Correct data has been used in the calculations and the calculations are accurate.</p> <p>Regarding the parameter Cap_{PJ}, the verification team confirmed it during site visit by checking the equipment plates. Therefore, the parameter is correct.</p> <p>Regarding parameter A_{PJ}, ANEEL Geo-referenced Information^{/22/} has been provided to the verification team stating the area of the reservoir which was cross-checked with environmental license^{/22-2/}. This last document is the current valid license and therefore, it confirms the correct reservoir area. Yearly reports are to be sent as part of the environmental licensing and no change in the reservoir area is allowed unless change in the environmental permit is requested. Correct data was used in the power density calculation.</p> <p>All parameters were determined at correct frequency and as per monitoring plan.</p>	

E.6.3. Implementation of sampling plan

Means of verification	The project participants have not applied sampling approach in the monitoring period. All parameters were fully checked as described in the monitoring plan during the operational period of the SHP. Documents were checked and interviews with PP's representatives and personnel were performed in order check this information.
Findings	No findings.
Conclusion	No sampling plan was used.

E.7. Compliance with the calibration frequency requirements for measuring instruments

Means of verification	<p>Manuals of equipment, national regulations registered monitoring plan and calibration certificates were checked in order to verify the compliance and frequency of the calibrations/inspections requirements of measuring equipment.</p> <p>In this project activity, the only equipment used are electricity meters that measure the parameters EG_{BL,y} and EG_{PJ,h}. These equipment comprehend the following electricity meters: one main and one backup:</p>
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	Parameter	Electricity meter S/N	Calibration dates (frequency required 2 years ^{/16-2/}) ⁵	Delays
	EG_{BL,y} and EG_{PJ,h}	Main (226378)	15/05/2012 30/07/2014 19/10/2017	15/05/2014 until 29/07/2014 And 30/07/2016 until 18/10/2017 ⁶
		Backup (226377)	15/05/2012 30/07/2014 19/10/2017	15/05/2014 until 29/07/2014 And 30/07/2016 until 18/10/2017 ⁷
As gaps in calibration were observed, a finding has been raised.				
Findings	CAR 03 <i>As per monitoring plan (PDD section B.7.2), the calibration frequency shall be conducted every two years. Nevertheless, this frequency has not been followed.</i>			
Conclusion	Gaps in calibration have been observed as stated above. Nevertheless, the PP applied the most conservative value between maximum permissible error of the equipment and the error obtained during the calibration as it could be observed in the ER calculations spreadsheet and as required by VVS for PA, para 366 a). The maximum equipment error has been applied as the error monitored during calibration was smaller. Therefore, it is concluded that conservative measures were taken when calibration delays were observed. It is also important to point out that another calibration has been carried out after the end of the MP ^{/20/} on 19/10/2017 for both electricity meters and it was observed that the equipment error is smaller than the maximum permissible error, thus, complying with VVS para 368.			

E.8. Assessment of data and calculation of emission reductions or net removals

E.8.1. Calculation of baseline GHG emissions or baseline net GHG removals by sinks

Means of verification	<p>The calculations of baseline emission have been done in accordance with registered monitoring plan and applied methodology. The equation used is the follow:</p> $BE_y = EG_{BL,y} \times EF_{CO_2,grid,y}$ <p>Where: BE_y = Baseline emissions in the year y $EF_{grid,CM,y}$ = Combined Margin Emission factor of the grid in the year y EG_{y} = Net electricity of the SHP delivered to grid in the year y (hourly value aggregated for each year)</p>
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⁵ It worth mentioning that from electricity meters calibrated from 01/01/2017 onwards^{/16-3/} the national regulation has changed and calibration frequency is to be carried out every 5 years. Nevertheless, this change does not affect the current MP.

⁶ This is the end date of the calibration delay based on the calibration frequency valid for this meter. Nevertheless, the end of MP is on 26/01/2017 and therefore, the correction factor has been applied until this date.

⁷ This is the end date of the calibration delay based on the calibration frequency valid for this meter. Nevertheless, the end of MP is on 26/01/2017 and therefore, the correction factor has been applied until this date.

	<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>Where w_{OM} and w_{BM} are the Operating margin weight and the build margin weight and both are fixed as 0.25 and 0.75 respectively as per applied tool for calculating emission factor for an electricity system.</p> <p>For the determination of $EF_{OM-DD,y}$ the PP applied the parameters provided by the Brazilian DNA. The $EF_{OM-DD,y}$ was calculated with the hourly dispatch emission factor of the grid and with the hourly electricity generation of the project activity as follows:/</p> $EF_{grid,OM-DD,y} = \frac{\sum EG_{PJ,h} \times EF_{EL-DD,h}}{EG_{PJ,y}}$ <p>Where:</p> <p>$EF_{grid,OM-DD,y}$ = Dispatch data analysis operating margin CO2 emission factor in year y</p> <p>$EF_{EL-DD,h}$ = hourly dispatch emission factor of the grid</p> <p>$EG_{PJ,y}$ = Net electricity of the SHP delivered to grid hourly and aggregated for each year.</p> <p>$EF_{BM,y}$ was fixed for the crediting period and therefore the value presented in the PDD was applied in the calculations.</p> <p>As there is an issue regarding the parameter EG_y and an issue regarding the calibration certificates, CARs have been raised. Refer to CAR 01, CAR 02 and CAR 3 above</p>
Findings	Refer to findings CAR 01, CAR 02 and CAR 3 above
Conclusion	<p>After the findings resolution, the verification team confirms that:</p> <ol style="list-style-type: none"> the monitored data was available in accordance with the registered monitoring plan for the operational period of the SHP; the reported data were crosschecked, as prescribed in the revised approved PDD, with the relevant supporting and were found consistent; appropriate methods and formulae for calculating baseline GHG emissions have been followed; the assumptions, emission factors and default values that were applied in the calculations are correct and evidenced; the calculations are transparent, consistent, correct and complete. <p>Baseline emissions for the whole monitoring period are:</p> $BE = 79,006 \text{ tCO}_2\text{e}$

E.8.2. Calculation of project GHG emissions or actual net anthropogenic GHG removals by sinks

Means of verification	<p>The project emissions are only to be accounted if Power Density is between 4W/m² and 10W/m².</p> <p>The calculation of PD is as follows:</p> $PD = \frac{CAP_{pj} - CAP_{bl}}{Apj - Abl}$ <p>The Apj of the SHP was monitored through topographical measurements and are duly described in the ANEEL's Geo-referenced information^{/22-1/} and cross-checked with valid Operational Licenses^{/22-2/}. No change in the reservoir area from the one described in this document is allowed without its amendment. Regular reports are provided to the Environmental Agency as Licensing conditionings, thus, regular monitoring of reservoir area is ensured, in accordance with required in the registered PDD.</p>
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	<p>For the CAP_{PJ}, no change occurred in the installed capacity and therefore the values remained also unaltered.</p> <p>The PD was calculated as follows,</p> $PD = \frac{12,440,000 - 0}{330,000 - 0}$ $PD = 37.70 \text{ W/m}^2$ <p>No project emissions is to be accounted as the power density is higher than 10 W/m².</p>
Findings	N/A
Conclusion	<p>No project emissions is accounted for this PA.</p> <p>The determination is in accordance with applied methodology and PDD.</p> <p>PE is equal to zero</p>

E.8.3. Calculation of leakage GHG emissions

Means of verification	As this correspond to a greenfield project and no energy is generated from transferred equipment, leakage are considered to be equal to zero. LE _y = 0
Findings	No findings.
Conclusion	No leakage emissions are to be accounted

E.8.4. Summary calculation of GHG emission reductions or net anthropogenic GHG removals by sinks

Means of verification	<p>The emission reductions from the project activity are based on baseline emissions and PE (if applied).</p> <p>The calculations presented at the final MR and corresponding ER calculation spreadsheet were found to be appropriate. However as some findings were raised, No conclusion can be given at this point.</p> <p>The verification team confirms an audit trail that contains the evidences and records of validated figures.</p>
Findings	No findings.
Conclusion	<p>The verification team confirms that appropriate methods and formulae for calculating baseline GHG emissions reductions have been followed.</p> <p>The summary table has been correctly presented at the MR and the figures are correct and justified.</p> <p>ER = BE – PE – LE</p> <p>PE = LE = 0</p> <p>Thus,</p> $ER = BE = 79,006 \text{ tCO}_2\text{e}$

E.8.5. Comparison of actual GHG emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Means of verification	The actual emission reductions were checked against the estimates of the registered PDD. The comparison has been done in accordance with requirements of PS for PA.
Findings	N/A
Conclusion	The comparison of actual values of the monitoring period with the estimates in the registered PDD is properly presented at the MR.

E.8.6. Remarks on difference from estimated value in registered PDD

Means of verification	<p>The verification team has compared the actual ER calculated and the estimated ERs reported in the PDD for the same period and it was observed that the actual emissions are higher than the estimated ones. Two reasons were provided: increase in the actual electricity generation in about 14.5% can be explained due to higher amount of rainfall during the period. The estimated power generation is carried out based on long term hydrological regimes and therefore a variation is</p>
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	<p>expected. It is important to state that there was no increase in the capacity when comparing to the information from the registered PDD. Moreover, the installed capacity as per design (12.44 MW) is duly approved by national regulator (ANEEL). Information was duly provided in the MR and the verification team agrees that although higher electricity generation was observed, it was not related to any change in the PA, but to the fact that during the period, higher amount of water was available when compared to the long term hydrological regime used for estimating the electricity ex-ante.</p> <p>Also, there was an increase in the actual EF_{grid} when comparing to the estimated one. This increase was about 15.3%. Therefore, the total increase of about 32.6% in the emission reductions achieved during this period is reliable. No change in the installed capacity has been observed.</p>
Findings	N/A
Conclusion	An increase in the actual ERs has been observed. Therefore the justification was duly presented in the MR. An increase of about 32.6% in the ERs has two components: an increase of about 14.5% in the actual power generation and an increase of about 15.3% ⁸ in the Emission factor of the grid. These increases were justified in the MR and their justification is reliable and acceptable.

E.8.7. Actual GHG emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards

Means of verification	<p>Earthood Services Private Limited is able to certify that the emission reductions from the CDM project activity “Pesqueiro Energia Small Hydroelectric Project (PESHP)” – Ref. 0242 for the monitoring period from 01/10/2013 to 26/01/2017 (including both days) is as follows:</p> <p>Verified and certified emission reductions as per commitment period:</p> <table border="1"> <thead> <tr> <th>Commitment period</th><th>Amount</th></tr> </thead> <tbody> <tr> <td>Up to 31/12/2012 (1st commitment period)</td><td>0 tCO_{2e}</td></tr> <tr> <td>From 01/01/2013</td><td>79,006 tCO₂</td></tr> </tbody> </table>	Commitment period	Amount	Up to 31/12/2012 (1 st commitment period)	0 tCO _{2e}	From 01/01/2013	79,006 tCO ₂
Commitment period	Amount						
Up to 31/12/2012 (1 st commitment period)	0 tCO _{2e}						
From 01/01/2013	79,006 tCO ₂						
Findings	No findings.						
Conclusion	The GHG emissions reductions have been all generated from 01/01/2013.						

E.9. Assessment of reported sustainable development co-benefits

Means of verification	Not applicable
Findings	No findings.
Conclusion	The PPs have not requested the DOE to verify the sustainable development co-benefits for this project activity

E.10. Global stakeholder consultation

Means of verification	<p>As per PCP paragraph 186, “The DOE shall make the monitoring report publicly available through a dedicated interface on the UNFCCC CDM website, at the latest 21 days prior to undertaking the on-site inspection for the verification, if to be conducted.”</p> <p>The MR was made publicly available on 26/10/2020 whereas the site visit was conducted on 19/11/2020, thus fulfilling the above requirement.</p> <p>The verification team checked the UNFCCC CDM website and observed that no comments have been made public during the comments period.</p>
Findings	No findings.
Conclusion	The assessment was made in accordance with VVS para. 391 and PCP paras 186 and 187. No comments were received.

⁸ Value reached by comparing the EF_{CM} estimated ex-ante (0.2215 tCO_{2e}/MWh) with annual average of the EF_{CM} achieved during this MP (0.2554 tCO_{2e}/MWh)

SECTION F. Internal quality control

The draft verification report that is prepared by verification 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 verification 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 issuance 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 verification team. The decision taken by the technical reviewer is final and is authorized on behalf of ESPL

SECTION G. Verification opinion

Earthood Services Private Limited, contracted by Pesqueiro Energia S.A., has performed the independent verification of the emission reductions for the CDM project activity “Pesqueiro Energia Small Hydroelectric Project (PESHP)” – Ref.: 0242 – in Brazil, for the monitoring period from 01/10/2013 to 26/01/2017 (including both days) as reported in the Monitoring Report (public). Eqao Consultancy company is responsible for the compilation of data in accordance with the monitoring plan and the reporting of GHG emissions reductions from the project activity.

ESPL commenced the verification based on the baseline and monitoring methodology AMS-I.D. ver. 17, the monitoring plan contained in the registered PDD, Monitoring Report (public).

ESPL’s verification approach is based on the understanding of the risks associated with reporting of GHG emission data and the controls in place to mitigate these. ESPL planned and performed the verification by obtaining evidence and other information and explanations that ESPL considered necessary to give reasonable assurance that reported GHG emission reductions are fairly stated.

The verification team confirms that:

- the project activity was found completely implemented as per the description given in the registered PDD for the operational period of the PA; and
- the actual operation conforms to the description in the revised PDD.

SECTION H. Certification statement

Earthood Services Private Limited, contracted by Pesqueiro Energia S.A., has performed the independent verification of the emission reductions for the CDM project activity “Pesqueiro Energia Small Hydroelectric Project (PESHP)” – Ref.: 0242 – in Brazil, for the monitoring period from 01/10/2013 to 26/01/2017 (including both days) as reported in the Monitoring Report (public). Eqao is responsible for the compilation of data in accordance with the monitoring plan and the reporting of GHG emissions reductions from the project activity.

ESPL commenced the verification based on the baseline and monitoring methodology AMS-I.D. ver. 17, the monitoring plan contained in the registered PDD ^{/9/}, Monitoring Report (public) ^{/5/}.

ESPL’s verification approach is based on the understanding of the risks associated with reporting of GHG emission data and the controls in place to mitigate these. ESPL planned and performed the verification by obtaining evidence and other information and explanations that ESPL considered necessary to give reasonable assurance that reported GHG emission reductions are fairly stated.

In our opinion the GHG emissions reductions reported for the project activity for the period from 01/10/2013 to 26/01/2017 (including both days) are fairly stated in the Monitoring Report (final). The GHG emission reductions were calculated correctly based on the baseline and monitoring methodology AMS-I.D. ver. 17 and the monitoring plan contained in the PDD.

Earthood Services Private Limited is able to certify that the emission reductions from the CDM project activity "Pesqueiro Energia Small Hydroelectric Project (PESHP)", in Brazil, for the period from 01/10/2013 to 26/01/2017 (including both days) is equal to:

Verified and certified emission reductions as per commitment period:

Commitment period	Amount
Up to 31/12/2012 (1 st commitment period)	0 tCO ₂ e
From 01/01/2013 onwards	79,006 tCO ₂ e
TOTAL	79,006 tCO₂e

Appendix 1. Abbreviations

Abbreviations	Full texts
ABNT	Brazilian Association of Technical Regulation
ANEEL	National Agency of Electric Power – Electricity regulator
BE	Baseline Emission
BM	Build Margin
CAR	Corrective Action Request
CCEE	Electric Energy Commercialization Chamber (Government Agency)
CDM	Clean Development Mechanism
CL	Clarification Request
CM	Combined Margin
CME	Coordinating/Managing Entity
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
EPE	Energy Research Company of the Ministry of Mines and Energy – Brazil
ESPL	Earthood Services Private Limited
FAR	Forward Action Request
GHG	Green House Gas
GSC/GSP	Global Stakeholder Consultation Process
GW	Giga Watt
GWh	Giga Watt hour
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
MoV	Means of Validation
MP	Monitoring Plan
MW	Mega Watt
MWh	Mega Watt hour
N ₂ O	Nitrous Oxide
OM	Operating Margin
ONS	National System Operator (from Portuguese – Operador Nacional do Sistema)
PA	Project Activity
PCP	Project Cycle Procedure
PDD	Project Design Document
PE	Project Emission
PP	Project Participant
PS	Project Standard
tCO ₂ e	Tonnes of Carbon di oxide equivalent
UNFCCC	United Nations Framework Convention on Climate Change
VT	Verification 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.H, AMS-III.I. 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	05/03/2020
Approved by	Anshika Gupta	Date	05/03/2020

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	Others
2.	UNFCCC	Standard: CDM PCP for PA	version 02.0	Others
3.	UNFCCC	Standard: CDM VVS for PA	version 02.0	Others
4.	UNFCCC	Form: CDM-MR-FORM	version 7.0	Others
5.	PP	Monitoring Report (draft)	version 1.2 – 22/10/2020	PP
6.	PP	Monitoring Report (revised/final)	version 2 – 30/11/2020 Version 2.1 – 21/01/2021 (final)	PP
7.	PP	<u>ER Spreadsheet (draft)</u> - 20201016_Pesqueiro_CERs	Ver 1.1	PP
8.	PP	<u>ER Spreadsheet (revised/final)</u> - 20201016_Pesqueiro_CERs	Ver.2.1	PP
9.	PP	Registered PDD	version 6 – 07/03/2012	Others
10.	UNFCCC	<u>Methodologies:</u> - AMS-I.D.: Grid connected renewable electricity generation - ACM0002: Consolidated baseline methodology for grid-connected electricity generation from renewable sources	Version 17 Version 12.2	Others
11.	UNFCCC	1. TOOL 07: Tool to calculate the emission factor for an electricity system	version 2.2.1	Other
12.	PDD	<u>Assured energy</u> 1. Registered PDD 2. Brazilian Association of SHPs	version 6 – 07/03/2012 https://abrapch.org.br/associado/pesqueiro-energia/	Others
13.	PP	<u>Operation start date</u> 1. ANEEL Resolution # 61 authorizing the implementation and operation of the SHP Pesqueiro	22/03/2000	Other
14.	Bureau Veritas	1. 1 st MP of 2nd CP Verification Report “Pesqueiro Energia Small Hydroelectric Project (PESHP)” issued by Bureau Veritas, report #BVC/BRAZIL-VR/1253110/2014	Revision 02 – 20/03/2014	Other

15.	Google Maps	<p><u>1. Geographical coordinates</u></p> <p>Cross-check carried out against official values confirmed that the SHP is duly installed</p>	<p>- https://www.google.com.br/maps/dir/POCH+Pesqueiro,+Jaguar%C3%ADva+-+PR/-24.1327778,-49.6358333/@-24.1324415,-49.6461436,1430m/data=!3m1!1e3!4m9!4m8!1m5!1m1!1s0x94c23e898aca06a3:0x92812c6bedb030c0!2m2!1d-49.6487164!2d-24.133894!1m0!3e2</p>	Other
16.	ONS (National Electric System Operator)	<p>1. Procedure 12.2 from ONS (National Electric System Operator) regulating the accuracy class of the electricity meters</p> <p>2. Procedure Submodule 12.3 from ONS (National Electric System Operator) regulating the frequency of calibration (2 years calibration frequency)</p> <p>3. New regulation (ONS Grid Procedure, submodule 12.3) issued on 01/01/2017 revision 2016/12 stating that from this date on 5 years calibration frequency is to be applied to electricity meters</p>	-	Other
17.	PP	- Reports of electricity generated by the project activity (E-Meter) for all period for SHP	- From Oct/2013 until Jan/2017	Other
18.	CCEE	- CliqCCEE reports – Official source of electric data used for cross-check electricity measurements	- 2013 to 2017	Other
19.	MCTIC	- Data provided by the Brazilian DNA website regarding the EF _{OM-DD,h} and EF _{BM,y} (last assessed on 02/02/2021)	https://antigo.mctic.gov.br/mctic/opencms/ciencia/SEPED/clima/texto_geral/emissao_despacho.html	Other
20.	MCI LACTEC	<p><u>Calibration Certificates:</u></p> <p><u>Electricity Meter:</u></p> <p>- Main: Serial # 226378 Landys+Gyr SAGA 1000 1681-A</p>	Valid for 2 years	Other

		<ul style="list-style-type: none"> ○ Certificate issued by LACTEC calibrated on 15/05/2012 ○ Certificate issued by LACTEC calibrated on 30/07/2014 ○ Certificate issued by MCI calibrated on 19/10/2017 - Backup: Serial # 226377 Landys+Gyr SAGA 1000 1681-A ○ Certificate issued by LACTEC calibrated on 15/05/2012 ○ Certificate issued by LACTEC calibrated on 30/07/2014 ○ Certificate issued by MCI calibrated on 19/10/2017 		
21.	IAP	- Operational Permit of the SHP Pesqueiro # 17892 issued by IAP (State Environment Secretariat)	Validity: 09/05/2022	Other
22.	ANEEL IAP PP	<u>Reservoir Area</u> 1. ANEEL's Technical sheet of SHP Pesqueiro which contains information from reservoir obtained from ANEEL's Geo-referenced Information Systems of the Electric Sector 2. Operational Permit of the SHP Pesqueiro # 17892 issued by IAP (State Environment Secretariat) 3. Topographical measurement of SHP reservoir	- Validity: 09/05/2022	Other
23.	PP	<u>Manuals:</u> - Operation and Maintenance Manual of Turbine and generators from both SHPs - Pictures from equipment plates	03/2020	PP

24.	PP	<u>Trainings and Duties of Personnel:</u> - SHP operation course – Antonio Santos	24/07/2013	PP
25.	-	DNA of Brazil	http://www.mctic.gov.br/portal	Other
26.	ANEEL	ANEEL – National Agency of Electric Energy	www.aneel.gov.br	Other
27.	PP	Installed capacity ANEEL Resolution # 410 regarding the installed capacity of the plant.	29/06/2001	Other
28.	IPCC	IPCC publications	www.ipcc-nggip.iges.or.jp	Other
29.	UNFCCC	UNFCCC	http://cdm.unfccc.int	Other

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

Table 1. Remaining FAR from validation and/or previous verifications

FAR ID	xx	Section no.	x	Date : xx
Description of CL				
Project participant response				Date : xx
Documentation provided by project participant				
DOE assessment				Date: xx

Table 2. CL from this verification

CL ID	01	Section no.	E.6.2	Date : 20/11/2020
Description of CL				
<i>Section D.2: parameter EGpj,h information regarding type, accuracy class, serial number, calibration frequency, date of last calibration and validity of monitoring equipment were not provided as required by instructions for completing MR.</i>				
Project participant response				Date : 30/11/2020
Information regarding monitoring equipment was included in EGpj,h table according to meter specification (SAGA1000) and last calibration applicable to the monitoring period. Please refer to section D.2 of the revised version of the MR, as well as documents attached to this response.				
Documentation provided by project participant				
<ul style="list-style-type: none"> 20201130_Pesqueiro_MR_v2.0-track.docx; 20201130_Pesqueiro_ER_v2.0.xlsx; 2012 main meter calibration: Ccr40412 CALIBRAÇÃO MEDIDOR -05-2012.pdf; 2012 backup meter calibration: Ccr40312 CALIBRAÇÃO MEDIDOR -05-2012.pdf; 2014 main meter calibration: CCR 722-14_Principal.pdf; 2014 backup meter calibration: CCR 721-14_Retaguarda.pdf; 2017 main meter calibration: RCM 1131-17 PCH PESQUEIRO - MEDIDOR PRINCIPAL.pdf; 2017 backup meter calibration: RCM 1132-17 PCH PESQUEIRO - MEDIDOR RETAGUARDA.pdf; SAGA1000 specifications: Saga1000.pdf. 				
DOE assessment				Date: 13/01/2021
<p>The information regarding type, accuracy class, serial number, calibration frequency, date of last calibration and validity of this calibration related to the monitoring equipment were now duly provided in the MR.</p> <p>Information is now in accordance with requirements of instructions for completing the MR.</p>				
CL is closed				

Table 3. CAR from this verification

CAR ID	01	Section no.	E.6.2	Date : 20/11/2020
Description of CAR				
<i>The values applied for the parameter EGpj did not take into account the net electricity dispatched to the SIN (generated minus consumption) measured by the dispatched meters (SN 226377 and 226378).</i>				
Project participant response				Date : 30/11/2020
EGpj,h values were revised in order to apply discount due to electricity consumption. Please refer to the revised version of the MR and ER spreadsheet.				
Documentation provided by project participant				

<ul style="list-style-type: none"> • 20201130_Pesqueiro_MR_v2.0-track.docx; • 20201130_Pesqueiro_ER_v2.0.xlsx; • Electricity generated and consumed by the project activity: <ul style="list-style-type: none"> - PESQUEIRO_19112020_181149.xlsx; - PESQUEIRO_19112020_191113.xlsx; - CCEE_InfoMercado_PCH Pesqueiro.xlsx. 	Date: 13/01/2021
DOE assessment	
<p>The values are now in accordance with evidences provided, taking into account net electricity exported to grid (generated minus consumed). The measure is conservative and accurate. Nevertheless, in the tab "EF2013" the values of columns G and J are inverted, i.e, the ones from column G are being taken from November in tab EGpj,h and the one from column J are being taken from October in the same tab.</p>	
CAR remains open	
Project participant response	
<p>"EF2013" sheet of ER spreadsheet was revised to correct values in columns G and J. Please refer to the revised version of the MR and ER spreadsheet to address this correction.</p>	
Documentation provided by project participant	
<ul style="list-style-type: none"> - 20210121_Pesqueiro_CERs_v2.1.xlsx; - 20210121_Pesqueiro_MR_v2.1-track.docx 	
DOE assessment	
<p>The calculation is now correct in the ER calculations spreadsheet. The ER calculations are considered accurate and conservative by verification team.</p>	
CAR is closed	

CAR ID	02	Section no.	E.6.2	Date : 20/11/2020
Description of CAR				
<p>Cross check of parameter $EG_{PJ,y}$ has not been demonstrated (reports issued by CCEE)</p>				
Project participant response				Date : 30/11/2020
<p>CCEE Reports are public available at: https://www.ccee.org.br/ The lowest value between CCEE Reports and project owners' data was considered in order to determine net electricity supplied by the project activity to the grid. Please refer to the revised version of the MR and ER spreadsheet.</p>				
Documentation provided by project participant				
<ul style="list-style-type: none"> • 20201130_Pesqueiro_MR_v2.0-track.docx; • 20201130_Pesqueiro_ER_v2.0.xlsx; • CCEE_InfoMercado_PCH Pesqueiro.xlsx. 				
DOE assessment				Date: 13/01/2021
<p>It is now clear in the ER calculations spreadsheet the comparison between the actual measured data (net electricity dispatched) and the cross-check (CCEE data). The lowest values have been applied for the ER calculations. Therefore, the measure is accurate and conservative.</p>				
CAR is closed				

CAR ID	03	Section no.	E.7	Date : 20/11/2020
Description of CAR				
<p>As per monitoring plan (PDD section B.7.2), the calibration frequency shall be conducted every two years. Nevertheless, this frequency has not been followed.</p>				
Project participant response				Date : 30/11/2020

In fact, there were uncovered calibration periods as can be checked in calibration certificates:

Calibration entity	Calibration date	Calibration frequency	Validity	Uncovered period during monitoring
Lactec	15/05/2012	2 years	14/05/2014	n/a
Lactec	30/07/2014	2 years	29/07/2016	15/05/2014 – 29/07/2014
MCI	19/10/2017	5 years	18/10/2022	30/07/2016 – 26/01/2017

Therefore, provisions established in Annex 1 of the VVS-PA v2.0 were followed. Please refer to the revised version of the MR and ER spreadsheet, as well as documents attached to this response.

It is worth mentioning that from January 2017 onwards, calibration periodicity of energy meters was changed from 2-year to 5-year period. However, the project monitoring period ends on 26/01/2017, it is not impacted by the ONS procedure changes.

Documentation provided by project participant

- 20201130_Pesqueiro_MR_v2.0-track.docx;
- 20201130_Pesqueiro_ER_v2.0.xlsx;
- 2012 main meter calibration: Ccr40412 CALIBRAÇÃO MEDIDOR -05-2012.pdf;
- 2012 backup meter calibration: Ccr40312 CALIBRAÇÃO MEDIDOR -05-2012.pdf;
- 2014 main meter calibration: CCR 722-14_Principal.pdf;
- 2014 backup meter calibration: CCR 721-14_Retaguarda.pdf;
- 2017 main meter calibration: RCM 1131-17 PCH PESQUEIRO - MEDIDOR PRINCIPAL.pdf;
- 2017 backup meter calibration: RCM 1132-17 PCH PESQUEIRO - MEDIDOR RETAGUARDA.pdf;
- SAGA1000 specifications: Saga1000.pdf.

DOE assessment

Date: 13/01/2021

It is clear to the verification team that the applied calibration frequency as per applied legislation^{16-2/} is every two years during this whole monitoring period. Delays have been observed and were duly taken into account as per VVS requirements. Equipment maximum error has been applied during the delayed period. This measure is duly observed in the ER calculations spreadsheet and traceable.

CAR is closed.

Table 4. FAR from this verification

FAR ID	xx	Section No.	Date: DD/MM/YYYY
Description of FAR			
<i>Not applicable</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);• Make structural and editorial improvements.
02.1	11 January 2018	Editorial revision to correct the numbering of appendices in the instructions.
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: Issuance Keywords: project activities, verifying and certifying		