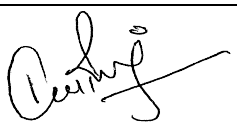
Verification and certification report form for CDM project activities

(Version 02.1)

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	SHP MORRO AZUL CDM PROJECT (JUN1164) UNFCCC ref. #: 8879
Version number of the verification and certification report	1
Completion date of the verification and certification report	19/11/2018
Monitoring period number and duration of this monitoring period	1st Monitoring period 10/09/2016 to 30/06/2018 (both days included)
Version number of the monitoring report to which this report applies	1
Crediting period of the project activity corresponding to this monitoring period	Type: Renewable Start date: 10/09/2016, Length: 7 years
Project participants	Risaralda Energía S.A.S. E.S.P.
Host Party	Colombia
Applied methodologies and standardized baselines	ACM0002 version 13 - Consolidated baseline methodology for grid-connected electricity generation from renewable sources
Mandatory sectoral scopes linked to the applied methodologies	Sectoral Scope 1 – Energy Industries (Renewable / Non-renewable Sources)
Conditional sectoral scope(s) linked to the applied methodologies	N/A
Estimated amount of GHG emission reductions or GHG removals for this monitoring duration in the registered PDD	76,023 tCO_2e
Certified amount of GHG emission reductions or GHG removals for this monitoring period	67,065 tCO_2e
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

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 installed capacity of 19.9 MW. The SHP project also comprehends a small reservoir of 0.027 km².

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

The SHP is located in the Risaralda River, Cauca River basin, in the municipalities of Belén de Umbria and Anserma – Risaralda and Caldas Departments, Colombia.

The operation start date of the SHP is on 10/09/2016/12/ (Start of commercial operation).

Scope of verification

Risaralda Energía S.A.S. E.S.P. has contracted Earthood Services Private Limited to conduct the verification and certification of emission reductions reported for the CDM project activity "SHP MORRO AZUL CDM PROJECT (JUN1164)" for the period from 10/09/2016 to 30/06/2018 (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 Risaralda Energía S.A.S. E.S.P. 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 "SHP MORRO AZUL CDM PROJECT (JUN1164)", having UNFCCC Ref. Number 8879 for the monitoring period 10/09/2016 to 30/06/2018. 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 (ACM0002 version 13). 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 67,065 tCO_2e 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	EI	Sebben	Marcelo	Central Office	Y	Y	Y	Y
2.	Verifier	EI	Sebben	Marcelo	Central Office	Y	Y	Y	Y
3.	Technical Expert	EI	Sebben	Marcelo	Central Office	Y	Y	Y	Y
4.	Methodological Expert	EI	Sebben	Marcelo	Central Office	Y	Y	Y	Y
5.	Local Expert	EI	Lopes	Ricardo	Central Office	Y	N	N	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	EI	Cruz	Sergio	Central Office
2.	Technical Expert	EI	Cruz	Sergio	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.	*Human error in recording the readings*	*Low*	*Recording of readings for most of the parameters is automated and electronic and there is limited human intervention. Therefore, chances of possible human errors, in recording and archiving, are minimised.*	*Electronic records used for ER calculation to be checked with the source data available as plant records.*
2.	*Error in transferring the data to ER sheet*	*Medium*	*Transfer of data from source to ER calculation involve human intervention*	*The values reported in ER sheet to be checked with their respective source data. The values for all parameters*

			and might lead to inconsistencies.	*reported at the interval of were verified from the source data.*
3.	*Calculation of parameters*	*Low*	*Human errors entering formulas and data.*	*All formulas are checked and compared to applied methodology and tools. In addition, entry data are crosschecked with raw data.*

C.2. Consideration of materiality in conducting the verification

In accordance with CDM VVS for PA – version 01.0 – para 329 the prescribed thresholds for materiality for CDM PAs are as under:

Emission Reductions (tCO_2e)/year	**500,000 or more**	**300,001 to 499,999**	**300,000 or less**	**Small Scale CDM PAs**	**Micro Scale CDM PAs**
Materiality Threshold	**0.5%**	**1.0%**	**2.0%**	**5.0%**	**10.0%**

The materiality threshold is 2% as this PA generates less than 300,000 tCO_2e/year . Nevertheless, it is not applicable to the project activity at this verification, as no sampling has been applied.

Particulars / Monitoring Report	**MR Version (Public)**	**MR Version (Revised/Final)**
Emission Reductions Achieved (tCO_2e) in this monitoring period	67,091	67,065
Applicable Threshold (%) as per para 329 of CDM VVS for PA– version 01.0	1,341 (2%)	1,342 (2%)

The verification team has identified the impact of errors observed and those were corrected by PP during verification for all monitoring parameter at individual level. The extrapolation is not applicable as 100% of data was checked.

Monitored Parameter (Symbol / Description)	**Reporting Frequency**	**Number of Discrete Data (Total)** **Total (100%)**	**Sample selected for verification** **Sample (100%)**	**Type of error identified**	**Impact on ERs**	
					ERs impacted (Sample)	**ERs impacted (Population based on extrapolation)**
$EG_{Morro\ Azul,,y}$	Monthly and Yearly aggregated from continuous monitoring and also reported at 1 hour interval	100%	100%	CAR 3	Impact in generation data	Same impact as no sampling was conducted
$CAP_{PJ\text{-}Morro\ Azul}$	Monitored every year	100%	100%	CAR 1	No impact	No impact
$A_{PJ\text{-}Morro\ Azul}$:	Monitored every year	100%	100%	CAR 4	Impact in PE calculation	No impact as no sampling was conducted

Based on the above table it can be confirmed that the materiality threshold -is not reached for the registered PA as per CDM VVS.

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: 18/09/2018 to 24/09/2018				
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 Morro Azul – Anserma, Colombia	18/09/2018	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 Morro Azul – Anserma, Colombia	18/09/2018	Marcelo Sebben
3.	Physical inspection of the project activity: - Site visit to the SHP (turbines and generators) - Site visit to Electricity Substation (ANSERMA SUBSTATION – Check electricity meters Serial Number)	SHP Morro Azul – Anserma, Colombia	18/09/2018	Marcelo Sebben
4.	Cross check of raw data at Company's Office	SHP Morro Azul – Anserma, Colombia	19/09/2018	Marcelo Sebben
5.	Management and monitoring procedures followed at project site.	SHP Morro Azul – Anserma, Colombia	19/09/2018	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 Morro Azul – Anserma, Colombia	19/09/2018	Marcelo Sebben
7.	Verification checklist: compliance of monitoring procedures followed at project site with registered PDD and monitoring methodology.	SHP Morro Azul – Anserma, Colombia	19/09/2018	Marcelo Sebben
8.	Review of monitored data and relevant document in accordance with registered monitoring plan and applied monitoring methodology.	SHP Morro Azul – Anserma, Colombia	19/09/2018	Marcelo Sebben
9.	Closing meeting at SHP: Compilation of the audit findings.	SHP Morro Azul – Anserma, Colombia	19/09/2018	Marcelo Sebben

	Agreement on the issues raised and agreement on timelines.			
10.	Review of ER calculations in accordance with applied methodology and relevant tools with Carbotrader	Carbotrader Office– SP – Brazil	24/09/2018	Marcelo Sebben
11.	Submission of the audit findings to the client and Draft Verification report.	Carbotrader Office– SP – Brazil	24/09/2018	Marcelo Sebben
12.	End of verification site visit.	Carbotrader Office– SP – Brazil	24/09/2018	Marcelo Sebben

D.3. Interviews

No.	Interviewee			Date	Subject	Team member
	Last name	First name	Affiliation			
1.	Lopes	Ana Maria	Alupar	18/09/2018 19/09/2018	- Description of project activity. Physical Inspection of site. Human Resources	Marcelo Sebben
2	Alonso	Hernan	Risaralda Energía	18/09/2018 19/09/2018	- Description of project activity. Physical Inspection of site. Installed Capacity Download of electricity meter data	Marcelo Sebben
3	Losano	Oscar	Alupar	18/09/2018 19/09/2018	Meter diagram, Electricity measurement; Download from cross-check data technical information	Marcelo Sebben
3	Garcia	Pilar	Risaralda	18/09/2018	Operation and Maintenance	Marcelo Sebben
7	Moraes	Arthur	Carbotrader	24/09/2018	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		CAR 1 CAR 2	
Compliance of the registered monitoring plan with the methodologies including applicable tools and standardized baselines			

Compliance of monitoring activities with the registered monitoring plan		CAR 3 CAR 4	
Compliance with the calibration frequency requirements for measuring instruments		CAR 5	
Assessment of data and calculation of emission reductions or net removals		CAR 6	
Assessment of reported sustainable development co-benefits			
Global stakeholder consultation			
Others (please specify)			
Total	-	6	-

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 06.0) 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 validation report /14/ has been reviewed and it was observed that no FAR was open during the validation phase.
Findings	N/A
Conclusion	No FAR was raised during validation phase.

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 one small hydro power plant (SHP) with installed capacity of 19.9 MW, reducing the GHG emissions through dispatching GHG-free electricity to the Colombian Interconnected System.

The following equipment were installed under project activity

Generators

Characteristic	**Unit**	**value**
Manufacturer/model		WEG/ SH10 1120
Quantity	-	2
Serial Numbers	-	1030028785 1030009633
Type		Synchronic
Apparent power[1]	kVA	11,250
Cos ϕ	-	0.90
Frequency	Hz	60

Turbines

Characteristic	**Unit**	**value**

[1] It is important to state that the installed power of the hydropower plant is equal to 19.9 MW which was given by discounting the internal generator losses from the nameplate installed capacity. This value was validated in the PDD and is reported in official sources/20/ as being the effective installed capacity of SHP.

	<table><tr><td>Manufacturer</td><td></td><td>Hisa</td></tr><tr><td>Quantity</td><td>-</td><td>2</td></tr><tr><td>Serial Numbers</td><td>-</td><td>2265 2266</td></tr><tr><td>Type</td><td></td><td>Synchronic</td></tr><tr><td>Power</td><td>MW</td><td>10.260</td></tr><tr><td>Flow</td><td>m³/s</td><td>8.80</td></tr><tr><td>Rotation</td><td>rpm</td><td>720</td></tr><tr><td>Head</td><td>m</td><td>127.22</td></tr></table> The operational start date of the SHP is on 10/09/2016/12/ The verification team checked prior dates and it was confirmed that no electricity was dispatched to the grid. During verification period, however, it was observed that technical characteristics of the installed turbines and generators described in the PDD was not in accordance with actual information observed on site. Thus CARs have been raised. Refer to CAR 1 in section E.4.2 and CAR 2 in section E.4.3 below -
Findings	*Refer to CAR 1 and CAR 2 below*
Conclusion	According to information verified during the site visit, the verification team has confirmed that all physical features (technology, project equipment, and monitoring and metering equipment) of the SHP Morro Azul were in place and are in accordance with the proposed revised PDD. The SHP Morro Azul was operated as per as the registered PDD. Only small corrections were requested regarding technical information of turbines and generators stated in the PDD. Moreover, a request to postpone the start date of the crediting period was also carried out. Refer to sections E.4.2 and section E.4.3 below.

E.4. Post-registration changes

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

No temporary deviations have been identified for the present monitoring period.

E.4.2. Corrections

Not applicable as no corrections in the registered project activity took place prior and/or during the current monitoring period

E.4.3. Change to the start date of the crediting period of the project activity

Means of verification	During verification process, it was observed that the project activity did not start its operation as per PDD. The project participants provided evidences/xx/ that the commercial start date of the PA is on 10/09/2016. Thus, the PPs requested the change of the start date of crediting period from 01/02/2015 to 10/09/2016 in issuance track. Thus, a CAR has been raised.
Findings	CAR 2 *The project activity has not being monitored from the start date of its crediting period.*
Conclusion	As the PP is postponing the start date of crediting period more than 1 year and less than 2 years, a post registration change was required. The verification team attests that this change is in accordance with provisions from Project Standard for PA version 01.0. For further details, please refer to Validation report on PRC attached to this verification report.

E.4.4. Inclusion of a monitoring plan

Not applicable as monitoring plan is part of the registered PDD

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

Not applicable as no permanent changes from the registered monitoring plan or from monitoring methodology have been submitted to the UNFCCC prior and/or during the current monitoring period

E.4.6. Changes to the project design

Means of verification	During verification period, however, it was observed that information of the installed generators described in the PDD was not in accordance with actual information observed on site. Thus a CAR has been raised.
Findings	CAR 1 *The number of generators stated in the PDD is not in accordance with actual installed generators observed during site visit.*
Conclusion	The information regarding the project activity were duly corrected in a revised PDD as a PRC (design change) has been requested during this verification process. Moreover, the change does not adversely impact the application of methodology, additionality and scale of project activity. For further details, refer to the assessment of Post registration changes attached to this report. The main equipment used at the project activity is given below: SHP Morro Azul - Installed capacity = 19.9 MW * - 02 horizontal axis Generators (Synchronous) with 10,125 kW each, Serial #s 1030009633 and 1030028785 - 02 horizontal axis turbines (Francis) with 10,260 kW each, Serial #s 2266 and 2265; - Reservoir area 0.027 km² - Average flow: 18.22 m³/s * It is important to state that the effective power of the hydropower plant is equal to 19.9 MW which was given by discounting the internal generator losses from the nameplate installed capacity. This value was validated in the PDD and is reported in official sources/20/ as being the installed capacity of SHP. However the installed capacity does not influence the estimated electricity generation as it is given by the assured energy (MW average) which is determined by hydrological studies/30/.

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

Not applicable as it is not an afforestation and reforestation PA.

E.5. Compliance of the registered monitoring plan with the methodology including applicable tools and standardized baselines

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 (ACM0002 version 13 - Consolidated baseline methodology for grid-connected electricity generation from renewable sources).

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:

	- 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 (m^2). For new reservoirs, this value is zero. - $EF_{grid-CM,y}$: Combined Margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system". The applied value for the whole CP is fixed and equal to 0.36777 tCO_2e/MWh - $EF_{grid-OM\_adj,y}$: CO_2 Operating Margin emission factor of the grid, in a year y. The applied value for the whole CP is fixed and equal to 0.54340 tCO_2e/MWh - $EF_{grid,BM,y}$: CO_2 Build Margin emission factor of the grid, in a year y. The applied value for the whole CP is fixed and equal to 0.19215 tCO_2e/MWh
Findings	N/A
Conclusion	All fixed parameters were included in the MR section D.1 and are in accordance with registered PDD.

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. ***$EG_{Morro\ Azul,y}$: Quantity of Net Electricity generation supplied by the project activity to the grid in year y***	
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 Anserma Substation. The raw data is available for download in the project plant. However the used data for ER calculations are the one available in XM website protected by user and password (used for cross-checking). Thus, the parameter was not monitored as per monitoring plan. Refer to CAR 3
Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology?	Yes
Monitoring equipment	02 (two) bi-directional electricity meters (main and backup). 1- Main - S/N: 51385986. 2- Backup - S/N: 51385982
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	The accuracy of the equipment is 0.25 as required by Colombian Regulations/15/

equipment comply with local/national standards, or as per the manufacturer's specification?	
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	4 years as per resolution/15/
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/15/.
Is the calibration of measuring equipment carried out by an accredited person or institution?	An accredited institution has carried out calibration of equipment.
Is(are) the calibration(s) valid for the entire reporting period?	No gaps in calibration have been observed.
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 and their aggregated values of the Excel spreadsheets. However, issues have been observed. Refer to CAR 3 below.
If applicable, has the reported data been crosschecked with other available data?	As per monitoring plan, the monitored values are to be cross-checked with values from XM website (electric market operator in Colombia). However, as the cross-check data has been used for calculations, a CAR has been raised. Refer to CAR 3 below
Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Refer to CAR 3
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 232 b) the CDM Project Standard for PA– version 01.0?	Not applied

2. $CAP_{PJ\text{-}Morro\ Azul}$: 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 presented in the documents

	technical description and licenses. The effective power of the hydropower plant is equal to 19.9 MW which was given by discounting the internal generator losses from the nameplate installed capacity. This value was validated in the PDD and is reported in official sources/20/ as being the installed capacity of SHP.
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 and provided evidences during site visit.
If applicable, has the reported data been crosschecked with other available data?	The installed capacity has been checked with documents evidenced to the verification team/20-1/ /20-2/ and /20-3/.
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.
In case project participants have temporarily not monitored the parameter, has either i) a deviation	N/A

been approved by the CDM EB or ii) has the parameter been estimated as stipulated by paragraph 232 b) the CDM Project Standard for PA– version 01.0?	

3. $A_{PJ\text{-}Morro\ Azul}$: 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. However the applied data is not correct. Thus a CAR has been raised. Refer to CAR 4
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 topographical study of reservoir area /13/.

	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.
	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 232 b) the CDM Project Standard for PA– version 01.0?	N/A
Findings	CAR 03 *The source of data used to determine the parameter $EG_{MorroAzul,y}$ is not in accordance with the monitoring plan.* CAR 04 *The parameter A_{PJ} applied in the calculations is not in accordance with evidences provided*	
Conclusion	After the findings resolutions all parameters were determined in a conservative manner and in accordance with requirements of applied tools, methodology and monitoring plan. The data used for the parameter $EG_{Morro,Azul}$ was the one measured by meters installed in the grid connection point (Anserma Substation) and cross-checked with values from XM (official source). The smaller values from each month were applied, which is a conservative measure as less ERs were achieved with it. Regarding the parameter A_{PJ}, a current topographical measurement has been provided to the verification team stating the area of the reservoir. This study determines that the highest water height, when water starts to overflow the spillway, is the largest area of reservoir (reservoir full). Thus, the biggest area was considered in the parameter determination. The area is then annually monitored by checking the topographic study, the height of the maximum water level at the reservoir and any change in the Environmental permit due to any changes in the dam height. 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.	

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	-
Conclusion	No sampling plan was used.

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

Means of verification	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. In this project activity, the only equipment used are electricity meters that measure the parameter $\boldsymbol{EG_{Morro\ Azul,y}}$. These equipment comprehend the following electricity meters: main and backup. The calibration periods are as follows 1- Main - S/N: 51385986. a. 16/03/2016 valid until 15/03/2020 2- Backup - S/N: 51385982 a. 08/03/2016 valid until 07/03/2020

	However the meters stated in the MR are not the ones actually installed in the project activity. Thus a CAR has been raised. Refer to CAR 5 below
Findings	CAR 5 *The Electricity meters stated in the MR are not the ones used for determining the parameter* $EG_{MorroAzul,y}$
Conclusion	All calibration certificates were provided to the verification team. No delays were observed

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	The calculations of baseline emission have been done in accordance with registered monitoring plan and applied methodology. The equation used is the follow: $$BE_y = EF_{grid,CM,y} x EG_{,y}$$ Where: BE_y = Baseline emissions in the year y $EF_{grid,CM,y}$ = Combined Margin Emission factor of the grid in the year y $EG_{SHP,y}$ = Net electricity of the SHP delivered to grid in the year y (hourly value aggregated for each year) The Combined margin emission factor of the grid ($EF_{grid,CM,y}$) is fixed for the whole crediting period and it is equal to 0.36777 tCO_2e/MWh However, as the monitored parameter $EG_{MorroAzul}$ has not being determined as per monitoring plan, a CAR has been raised. Refer to CAR 03 above
Findings	Refer to CAR 3 above
Conclusion	The verification team confirms that: a. the monitored data was available in accordance with the registered monitoring plan for the operational period of the SHP; b. the reported data were crosschecked, as prescribed in the revised approved PDD, with the relevant supporting and were found consistent; c. appropriate methods and formulae for calculating baseline GHG emissions have been followed; d. the assumptions, emission factors and default values that were applied in the calculations are correct and evidenced; e. the calculations are transparent, consistent, correct and complete. Baseline emissions for the whole monitoring period are: BE = 67,065 tCO_2e

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

Means of verification	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. However, as the parameter A_{PJ} has not being dully reported, a CAR has been raised. Refer to CAR 05 above.
Findings	Refer to CAR 5 above
Conclusion	After the findings resolution it was observed that the power density calculated for this project activity is equal to 735 W/m². Thus, no project emissions apply to this PA. Project emissions are not applied to this PA as the power density is higher than 10W/m².

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	-
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	The emission reductions from the project activity are based on baseline emissions only. 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. The verification team confirms an audit trail that contains the evidences and records of validated figures.
Findings	-
Conclusion	The verification team confirms that appropriate methods and formulae for calculating baseline GHG emissions reductions have been followed. The summary table has been correctly presented at the MR and the figures are correct and justified. ER = BE – PE – LE PE = LE = 0 Thus, ER = BE = 67,065 tCO_2e

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. However, the calculation has not been done correctly. Thus a CAR has been raised.
Findings	CAR 06 *The number of days for 2016 and 2018 have not being correctly determined in the calculation of ER estimated ex ante and actual ER calculations.*
Conclusion	The comparison of actual values of the monitoring period with the estimates in the registered PDD is now properly presented at the MR as it is taking into consideration the correct period of this monitoring period. Moreover, due to design change proposed, conservatively the estimated ERs have been recalculated. With this recalculation, the estimated emission reductions are closer than the actual emission reductions.

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

Means of verification	The verification team has compared the actual ER calculated and the estimated ERs reported in the PDD for the same period. However, CARs have been raised.
Findings	Refer to CAR 03 and CAR 06 above
Conclusion	The actual ERs are lower than the estimated emission reductions reported in the revised PDD, thus, no justification is needed

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	Earthood Services Private Limited is able to certify that the emission reductions from the CDM project activity "SHP Morro Azul CDM Project (JUN1164)" – Ref. 8879 for the monitoring period from 10/09/2016 to 30/06/2018 (including both days) is as follows: Verified and certified emission reductions as per commitment period:

Commitment period	Amount
Up to 31/12/20121 (1st commitment period)	0 tCO_2e
From 01/01/2013	67,065 tCO_2

Findings	-
Conclusion	The GHG emissions reductions have been totally generated from 01/01/2013.

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

Means of verification	Not applicable
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	As per PCP paragraph 183, "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." The MR was made publicly available on 21/08/2018 whereas the site visit was conducted on 18/09/2018, thus fulfilling the above requirement. According to the Project Cycle Procedure for project activities, version 01.0, paragraph 184, "For the monitoring report for the first monitoring period, stakeholders may submit comments, in English, within 14 days of publication of the monitoring report, to the DOE through a dedicated interface on the UNFCCC CDM website". The verification team checked the UNFCCC CDM website and observed that no comments have been made public during the comments period.
Findings	-
Conclusion	The assessment was made in accordance with VVS para. 394 and PCP paras 183 and 184. No comments were received.

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 Risaralda Energía S.A.S. E.S.P., has performed the independent verification of the emission reductions for the CDM project activity "SHP MORRO AZUL CDM PROJECT (JUN1164)" – Ref.: 8879 – in Colombia, for the monitoring period from 10/09/2016 to 30/06/2018 (including both days) as reported in the Monitoring Report (public) – version 1. Carbotrader Assessoria e Consultoria em Energia 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 ACM0002 – version 13, the monitoring plan contained in the registered PDD – version 2/9/, Monitoring Report (public) – version 1/5/.

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.

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 version 3./29/.

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SECTION H. Certification statement

Earthood Services Private Limited, contracted by Risaralda Energía S.A.S. E.S.P, has performed the independent verification of the emission reductions for the CDM project activity "SHP MORRO AZUL CDM PROJECT (JUN1164)" – Ref.: 8879 in Colombia, for the monitoring period from 10/09/2016 to 30/06/2018 (including both days) as reported in the Monitoring Report (public) – version 0. Carbotrader Assessoria e Consultoria em Energia 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 ACM0002 version 13, the monitoring plan contained in the registered PDD – version 2/9/, Monitoring Report (public) – version 0/5/.

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 10/09/2016 to 30/06/2018 (including both days) are fairly stated in the Monitoring Report (final)/6/. The GHG emission reductions were calculated correctly based on the baseline and monitoring methodology ACM0002 – version 13 and the monitoring plan contained in the revised PDD – version 3/29/.

Earthood Services Private Limited is able to certify that the emission reductions from the CDM project activity "SHP MORRO AZUL CDM PROJECT (JUN1164)", in Colombia, for the period from 10/09/2016 to 30/06/2018 (including both days) is equal to 67,065 tCO2e.

Verified and certified emission reductions as per commitment period:

Commitment period	Amount
Up to 31/12/2012 (1st commitment period)	0 tCO_2e
From 01/01/2013 onwards	67,065 tCO_2e

Appendix 1. Abbreviations

Abbreviations	Full texts
BE	Baseline Emission
BM	Build Margin
CAR	Corrective Action Request
CARDE	Environmental Agency of Risaralda (Corporacion Autonoma Regional de Risaralda)
CDM	Clean Development Mechanism
CL	Clarification Request
CM	Combined Margin
CME	Coordinating/Managing Entity
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
CP	Crediting Period
CREG	Commission of Gas and Energy Regulation
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
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
MME	Ministry of Mines and Energy from Colombia
MoC	Modalities of Communication
MoV	Means of Validation
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
PP	Project Participant
PS	Project Standard
tCO_2e	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)		
Local expert	Brazil, Chile, Honduras		
Financial Expert	No		
Technical Reviewer	Yes		
TA Expert	Yes (TA 1.1, 1.2, 5.1, 13.1)		
Reviewed by	Abhishek Mahawar	**Date**	01/03/2018
Approved by	Ashok Kumar Gautam	**Date**	01/03/2018

Competence Statement			
Name	Ricardo Lopes		
Country	Brazil		
Education	Technical Diploma in Data Processing		
Experience	12 years		
Field	CDM, Energy, Environment		
Approved Roles			
Team Leader	Yes		
Validator	Yes		
Verifier	Yes		
Methodology Expert	Yes (ACM0001, ACM0002, AM0026, AMS ID, AMS IIIH)		
Local expert	Brazil, Argentina, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Honduras, Mexico, Nicaragua, Uruguay		
Financial Expert	NO		
Technical Reviewer	Yes		
TA Expert	Yes (1.2, 13.1)		
Reviewed by	Abhishek Mahawar	**Date**	22/02/2018
Approved by	Ashok Kumar Gautam	**Date**	22/02/2018

Competence Statement	
Name	Sergio Bonanno Cruz
Country	Brazil
Education	Post Graduate Diploma in Environment
Experience	25 Years
Field	Environmental Law, CDM, Energy, Climate Change
Approved Roles	
Team Leader	Yes

Validator	Yes		
Verifier	Yes		
Methodology Expert	Yes (ACM0001, ACM0002, AM0026, ACM0006, AMS ID)		
Local expert	Brazil, Chile		
Financial Expert	No		
Technical Reviewer	Yes		
TA Expert	Yes (TA 1.2, 13.1)		
Reviewed by	Abhishek Mahawar	**Date**	01/03/2018
Approved by	Ashok Kumar 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 01.0	Others
2.	UNFCCC	Standard: CDM PCP for PA	version 01.0	Others
3.	UNFCCC	Standard: CDM VVS for PA	version 01.0	Others
4.	UNFCCC	Form: CDM-MR-FORM	version 6.0	Others
5.	PP	Monitoring Report (draft)	version 0 – 10/07/2018	PP
6.	PP	Monitoring Report (revised/final)	version 1 – 05/10/2018	PP
7.	PP	ER Spreadsheet (draft)	Rev 0	PP
8.	PP	ER Spreadsheet (final)	Rev 3	PP
9.	PP	Registered PDD	version 2 – 12/11/2012	Others
10.	UNFCCC	Methodology: ACM0002 Consolidated baseline methodology for grid-connected electricity generation from renewable sources	version 13	Others
11.	UNFCCC	Tool to calculate the emission factor for an electricity system	version 02.1.1	Others
12.	PP – Operational Start date MME	1. Declaration of Operation Start date issued by Risaralda Generación de Energía (GC-008 2016 XM Declaración en Operación Comercial PCH Morro Azul 19.9 MW - Firma G Comercial) – Operation start date on 10/09/2016 2. Decree 869 from 24/05/2018 stating that the operation start date was on 10/09/2016 issue by Mines and Energy Ministry	1. Issue: 09/09/2016 2. http://es.presidencia.gov.co/normativa/normativa/DECRETO%20869%20DEL%2024%20DE%2	PP

	XM	3. SHP list where it is stated the start date of each SHP	0MAYO%20DE%202018.pdf 3. http://paratec.xm.com.co/paratec/SitePages/generacion.aspx?q=lista	
13.	Reservoir Area	SHP Morro Azul: AutoCad topographical study with current reservoir area – taken from Anexo 12 MZL-DE2P-GEC01-0130-4	Rev. 4 - 18/06/2018	PP
14.	ICONTEC	Validation Report issued by ICONTEC, report # CDMVA 12-023-1.1	Version 1.1 from April 2013	Others
15.	CREG - (Commission of Gas and Energy Regulation)	Resolucion CREG 038 from 2014 (Art. 28) which regulates the frequency of calibration (4 years calibration frequency)		Others
16.	Electricity meter	Reports of electricity generated by the project activity (MAP-110) for all period		PP
17.	XM	XM reports – Official source of electric data used for cross-check electricity measurements		PP
18.	EPM	Calibration Certificates: Electricity Meter: 1. Main: Serial # 51385986, Landis & Gyr, model ZMD402CT44.0459 S3 o Certificate # 19980480-1-1 issued by EPM calibrated on 16/03/2016 2. Backup: Serial # 51385982, Landis & Gyr, model ZMD402CT44.0459 S3 o Certificate # 19967755-1-7 issued by EPM calibrated on 08/03/2016		PP
19.	CARDE	Operational Permit - Resolution 834 from 20/04/2015 issued by CARDE (Corporacion Autonoma Regional de Risaralda)	Valid for all project lifetime	PP
20.	MME XM	Installed capacity evidences 1. Resolution 227 issued in 29/07/2013 by the Ministry of Mines and Energy of Colombia regarding the installed capacity of the SHP Morro Azul 2. XM website where it is stated the nominal capacity of the plant. 3. Lapatria website	1. https://www.minminas.gov.co/documents/10180//23517//20281-10572.pdf 2. http://paratec.xm.com.co/paratec/SitePages/generacion.aspx?q=lista 3. http://www.lapatria.com/economia/morro-azul-cumple-	

	La Patria		normas-ambientales-carder-186062	
21.	Risaralda	Manuals: Operation and Maintenance Manual of SHP Morro Azul issued by Risaralda, Code: RE-FT4Z-GPC00-0001-2 version 2 from 05/01/2018		PP
22.	Pictures – PP	1. Pictures of plaques of Generators and Turbines of SHP Morro Azul 2. Pictures of Electricity meters of SE Ancerma		PP
23.	PP	**Trainings and Duties of Personnel:** Operator: Pilar Garcia		PP
24.	-	DNA of Colombia (Ministry of Environment and Sustainable Development)	http://www.minambiente.gov.co/	Other
25.	XM	Electric Market Operation in Colombia	www.xm.com.co/	
26.	CREG	CREG – Commission of Gas and Energy Regulation	ww.creg.gov.co	Other
27.	IPCC	IPCC publications	www.ipcc-nggip.iges.or.jp	Other
28.	UNFCCC	UNFCCC	http://cdm.unfccc.int	Other
29.	PP	Revised PDD – version 3 (clean and tracking changes)	05/10/2018	PP
30.	MEK HATCH	Report regarding the new value of assured energy (MW average) for calculation of Estimated Emission Reductions (13.07 MW average) - **Power and energy Evaluation – Main characteristics of SHP Morro Azul issued by MEK &HATCH ref # H347219-0000-00-223-0001**	Issued on Dec/2014	PP
31.	PP	Ex-ante estimated Emission reductions (CERs_MA_v3.xls)	Version 3	PP

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.**		**Date :**
Description of FAR				
Not applicable				
Project participant response				**Date :**
Documentation provided by project participant				
DOE assessment				**Date:**

Table 2. CL from this verification

CL ID	xx	**Section no.**		**Date :**
Description of CL				
Not applicable				
Project participant response				**Date :** 23/04/2018
Documentation provided by project participant				
DOE assessment				**Date:** 04/05/2018

Table 3. CAR from this verification

CAR ID	01	**Section no.**	E.4.2	**Date :** 19/09/2018
Description of CAR				
The number of generators stated in the PDD is not in accordance with actual installed generators observed during site visit.				
Project participant response				**Date :** 05/10/2018
The number of generators were adjusted accordingly in the PDD version 3 and MR version 2. *2 generators instead of 3 originally planned were installed. The Net Installed Capacity remains the same with 19.90 MW (on the generators output terminals).*				
Documentation provided by project participant				
Pictures (obtained during site visit) *PDD version 3* *MR version 2*				
DOE assessment				**Date:** 08/10/2018
A PRC (Change of project design) is being requested along with this verification in order to correct the information in PDD. The MR section B.2.6 was filled accordingly and the Estimated emission reductions were duly updated in the PDD and MR using the updated assured energy data. For further details please refer to Validation Report on PRC, attached to this report. **CAR is closed**				

CAR ID	02	**Section no.**	E.4.3	**Date :**19/09/2018
Description of CAR				
The project activity has not being monitored from the start date of its crediting period.				
Project participant response				**Date :** 24/09/2018
The PA monitoring start date shall be 10/09/2016 instead of 01/02/2015 due to the SHP construction delay (see document "GC-008 2016 XM Declración en Operación Comercial PCH Morro Azul 19.9 MW - Firma G Comercialpdf"). *By this way a Post registration change shall be provided to the DOE defining the new crediting period: 10/09/2016 until 09/09/2013 (first 7 year) - renewable twice, 21 years on total.*				
Documentation provided by project participant				
GC-008 2016 XM Declración en Operación Comercial PCH Morro Azul 19.9 MW - Firma G Comercialpdf"				
DOE assessment				**Date:** 28/09/2018
The start date has been defined as the commercial start date of the Hydro power plant. The evidence provided informs that the power plant starts its operations at 0:00 hs of the 10/09/2016, unlike stated originally in the PDD. Thus, the PP is being requesting the adjustment of the start date of the crediting period. A PRC has been requested. However, as per as per the PS for PA, para 236 "if the proposed change to the start date of the crediting period of a registered CDM project activity is between one and two years…the project participants shall (a) Demonstrate that no changes have occurred to the project activity that would result in a less conservative baseline, or update the baseline using conservative data; and (b) Demonstrate that substantive progress has been made by the project participants to start the project activity. These demonstrations were not provided. **CAR remains open**				
Project participant response				**Date :** 05/10/2018

The project activity had an adjustment in the project design after the project activity CDM registration. The generation set was reduced from 3 to 2 set units. By this way the Assured Energy (MW average) parameter was reduced from 14.12 MW average to 13.07 MW average (-7.4%). *See evidence: "**MZL-NT2P-GEG00-0001-5 estudio energia y potencia.pdf**" Table 3.3.4-3 on page 53. Based on the above explanation the baseline was updated accordingly (from 45,489 CER/year to 42,107 CER/year).* *See also: "**CERs_MA_v3.xls**" spreadsheet* *And besides the delay on operation start (when compared with original SHP construction schedule) the project activity had started operation on September 2016, so this fact demonstrates that the project participant made substantive progress to start the PA. Delays in operation start occurred due to several technical problems faced during the construction phase and also technical parameters from SHP Morro Azul main equipment (turbines and generators set unit number) and also average river flow.*
Documentation provided by project participant
*"**MZL-NT2P-GEG00-0001-5 estudio energia y potencia.pdf*** *"**CERs_MA_v3.xls***
DOE assessment — **Date:** 08/10/2018
As change in the start date is between 1 and 2 years, the PPs had to update the baseline using conservative data and had to demonstrate that substantive progress has been made by the project participants to start the project activity. The PPs had to update the baseline emissions[/31/] as the assured energy was updated due to change in the number of generation sets (proposed change of project design) as a result of a new generation study[/30/] . The update was conservative as it resulted in reduction of annual estimated Emission reductions. Regarding substantive progress, it is important to point out that delays occurred due to several technical issues during the construction phase that delayed the start of operation. However, the operation start date of the project activity has already occurred on 10/09/2016. Thus it is demonstrated that progress has been made for start the operation of the PA. For further details, please refer to Assessment on post registration changes attached to this report. **CAR is closed**

CAR ID	03	**Section no.**	E.6.2	**Date :**19/09/2018
Description of CAR				
The source of data used to determine the parameter $EG_{MorroAzul,y}$ is not in accordance with the monitoring plan.				
Project participant response				**Date :** 24/09/2018
The source of data used to the parameter $EG_{MorroAzul,y}$ was adjusted accordingly in the MR version 1. Risaralda's monitoring software instead of XM database.				
Documentation provided by project participant				
Generation raw data (from monitoring software at power plant) *XM database (cross-check data)* *Geração_PCH MA_rev1.xls (comparison between raw data and cross-check data)*				
DOE assessment				**Date:** 28/09/2018
The PP provided to the verification team the correct set of data (raw data) obtained from the monitoring software at the power plant. The raw data was compared to the XM database (official data and used cross-check purposes) and the most conservative data every month was used in the ER calculations. The verification team confirms that the calculations were done conservatively using most conservative data in accordance with registered monitoring plan. **CAR is closed**				

CAR ID	04	**Section no.**	E.6.2	**Date :**19/09/2018
Description of CAR				
The parameter A_{PJ} applied in the calculations is not in accordance with evidences provided.				
Project participant response				**Date :** 24/09/2018
The parameter A_{PJ} was adjusted accordingly (value = 0,027067 km^2 as per evidence provided).				
Documentation provided by project participant				
Topographical measurements -Rev. 4 - 18/06/2018[/13/]				
DOE assessment				**Date:** 28/09/2018

A current topographical measurement has been provided to the verification team stating the area of the reservoir. This study determines that the highest water height, when water starts to overflow the spillway, is the largest area of reservoir (reservoir full). Thus, the biggest area was considered in the parameter determination. The area is then annually monitored by checking the topographic study, the height of the maximum water level at the reservoir and any change in the Environmental permit due to any changes in the dam height. 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.

CAR is closed

CAR ID	05	**Section no.**	E.7	**Date :**19/09/2018
Description of CAR				
The Electricity meters stated in the MR are not the ones used for determining the parameter $EG_{MorroAzul,y}$				
Project participant response				**Date :**24/09/2018
The electricity meters presented on Table 4 was adjusted accordingly in MR version 1. Also the calibration data.				
Documentation provided by project participant				
Calibration certificates of electricity meters - S/N: 51385986 (Main) and S/N: 51385982 (Backup)				
DOE assessment				**Date:** 28/09/2018
The correct meters were now reported in the Monitoring report as well as the correct calibration certificates were provided to the verification team. The meters serial numbers were checked during site visit and are now in accordance with information provided in the MR. **CAR is closed**				

CAR ID	06	**Section no.**	E.8.5	**Date :**19/09/2018
Description of CAR				
The number of days for 2016 and 2018 have not being correctly determined in the calculation of ER estimated ex ante and actual ER calculations				
Project participant response				**Date :**05/10/2018
The number of days for 2016 and 2018 was adjusted accordingly in the ex ante and actual ER calculations spreadsheets.				
Documentation provided by project participant				
ER calculations spreadsheet rev 2				
DOE assessment				**Date:** 08/10/2018
The estimated ERs is now correctly determined as the number of days in the monitoring period has been duly reported. It could be observed that the estimated ERs are higher than the actual ERs, thus, no justification is needed. It is important to point out that due to the proposed change of project design, conservative assumptions were taken to recalculate the estimated ERs. Even with this recalculation, the estimated ERs are higher than the actual ERs. **CAR is closed**				

Table 4. FAR from this verification

FAR ID	xx	**Section No.**	xx	**Date:**
Description of FAR				
Not applicable				
Project participant response				**Date:**
Documentation provided by project participant				
-				
DOE assessment				**Date:**