



**Monitoring report form for CDM project activity**  
**(Version 07.0)**

**MONITORING REPORT**

<b>Title of the project activity</b>	Potrero Hydropower Plant, Peru	
<b>UNFCCC reference number of the project activity</b>	8414	
<b>Version number of the PDD applicable to this monitoring report</b>	08	
<b>Version number of this monitoring report</b>	01	
<b>Completion date of this monitoring report</b>	04-March-2020	
<b>Monitoring period number</b>	01	
<b>Duration of this monitoring period</b>	01-June-2016 to 31-December-2019 (Inclusive of both the days)	
<b>Monitoring report number for this monitoring period</b>	01	
<b>Project participants</b>	Empresa Eléctrica Agua Azul S.A	
<b>Host Party</b>	Peru	
<b>Applied methodologies and standardized baselines</b>	ACM0002 ver. 12 - Consolidated baseline methodology for grid-connected electricity generation from renewable sources	
<b>Sectoral scopes</b>	Sectoral Scope 1 : Energy industries (renewable/ non-renewable sources)	
<b>Amount of GHG emission reductions or net anthropogenic GHG removals achieved by the project activity in this monitoring period</b>	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013
	0 tCO <sub>2</sub> e	160,449 tCO <sub>2</sub> e
<b>Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD</b>	327,225 tCO <sub>2</sub> e	

## SECTION A. Description of project activity

### A.1. General description of project activity

The Project "Potrero Hydropower Plant, Peru" (hereafter referred to as the "Project") is a run of river hydroelectric power plant located in the Province of San Marcos, Region of Cajamarca, in Peru (Host Country), and it is to be implemented by the company named "Empresa Electrica Agua Azul S.A.". The total installed capacity of the Project is 19.9 MW.

The project activity is intended to generate renewable electricity by using water from the Crisnejas River, who receives its water from two main river basins, Cajamarca River basin (111.9 km of length) and Condebamba River basin (92.7 km of length). This energy is supplied to the National Interconnected Electricity Grid (SEIN). The reduction of baseline emissions results from the displacement of electricity generated by power plants within the SEIN, which include fossil/fuel power plants emitting CO<sub>2</sub>. The spatial extent of the Project boundary is the SEIN.

The project activity involves the construction of a substation located in the left margin of Crisnejas River, called Potrero substation (less than 200 meters away from Power House), it comprises of 2 horizontal Francis turbines for a nominal water flow maximum of 9 m<sup>3</sup>/s. A transmission line of 60 kV and 4.97 kms length is installed between the Potrero substation and the Aguas Calientes substation.

The scenario prior to the implementation of the project activity was electricity was electricity supplied by the grid and the same has been considered as the baseline scenario i.e. the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid. The project has led to reduced greenhouse gas emissions because it displaces electricity from fossil fuel based electricity generation plants and through the electricity supply to the grid the project activity has a direct environmental benefit by reducing the amount of fossil fuels combusted for energy generation and the associated pollutant emissions (like GHGs, PM, SO<sub>x</sub>, NO<sub>x</sub>).

The construction of the project activity started in 15-January-2013 (the date corresponds to the signature of the contract of the equipment like turbines, generators and electromechanical equipment) and has been in operation since 29-April-2017. The project activity is operational with normal operation and maintenance during current monitoring period i.e. 01-June-2016 to 31-December-2019. The project activity has supplied 246,984 MWh electricity to grid during current monitoring period, which has resulted emission reduction of 160,449 tCO<sub>2</sub>e.

### A.2. Location of project activity

The project is located in the north of Peru, in the district of Eduardo Villanueva, Province of San Marcos, Region of Cajamarca. The intake of the hydroelectric power plant is located in the town Aguas Calientes, at approximately 1,950 m.a.s.l., while the discharge is located in the place called Potrero, at approximately 1,625 m.a.s.l.

The intake structure is developed in the Crisnejas River. The Project is located at the following geographical coordinates:

Item	Location	Geo-coordinates	Altitude
Water Intake	UTM WGS84 9 174 661 North 822 399 East	Longitude : - 66.0793 Latitude : -7.4570	1,950 m.a.s.l.
Water Discharge	UTM WGS84 9 174 299 North 825 835 East	Longitude:- -66.0482 Latitude : -7.4600	1,625 m.a.s.l.

Power House	UTM PSAD 56 9 174 283 North 824 238 East	Longitude: -66.0632 Latitude : -7.4598	1,810 m.a.s.l.
Substation Potrero	UTM PSAD 56 9 174 342 North 824 183 East	Longitude: -66.0627 Latitude : -7.4603	1,825 m.a.s.l.
Substation Aguas Calientes	UTM PSAD 56 9 175 235 North 819 689 East	Longitude: -66.1039 Latitude : -7.4520	2,000 m.a.s.l.

The location of the Project can be seen in the following figures.

**Figure 1: Project macro- location in Peru**



Source: Project report submitted to the Ministry of Energy and Mines



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### A.3. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Republic of Peru (host)	Empresa Eléctrica Agua Azul S.A (Private entity)	No

### A.4. References to applied methodologies and standardized baselines

Methodology Title: of ACM0002: Consolidated baseline methodology for grid-connected electricity generation from renewable sources (Version 12.3.0, EB 58)<sup>1</sup>.

The tools associated with the methodology are:

- Version 02.2.1 of the Tool to calculate the emission factor for an electricity system (EB 63/Annex 19)
- Version 06.1.0 of the Tool for demonstration and assessment of additionality (EB 69/Annex 20)

### A.5. Crediting period type and duration

01 June 2016 – 31 May 2023 (Renewable)

## SECTION B. Implementation of project activity

### B.1. Description of implemented project activity

The project activity is implemented and operated as per registered PDD, there were no incident which affects the applicability of applied baseline and monitoring methodology. The project activity

<sup>1</sup>

<https://cdm.unfccc.int/filestorage/4/W/1/4W1SCKX3EMPO6AYGRJUTD7BQ8IVN0H/Consolidated%20baseline%20methodology%20for%20grid-connected%20electricity%20generation%20from%20renewable%20sources.pdf?t=N0Z8cTZud3Q3fDBhVqE9MrutKLSzpmzFVgLr>

is a 19.9 MW run-of-river hydroelectric project, which utilizes hydro potential to generate GHG emission-free electricity and exports it to the regional grid. The project was commissioned on 29-April-2017 and since then the project is operational.

The technology employed for power generation in the project activity involves the conversion of potential energy available in the water flow into mechanical energy using hydro turbines and then into electric energy using alternators. The electricity generated by this project activity is delivered to the National Interconnected Electricity Grid (SEIN).

The project activity is a run-of-river hydropower technology that utilizes the water flow of the Crisnejas River to generate electricity. The water is directly diverted from this river through a submerged intake because it is appropriated to the emplacement configuration and the river slope. Then, the water goes to an absorbing channel which captures the water through the absorbing grillages when it crosses the river channel. The captured water goes through a rock-removal, that retain the rocks passing the absorbing grillages, before going through the intake gates to the derivation channel (that return the excess water to the river). After this, the water goes through sand trap, then through a head-race channel (940 meters length) to a tunnel (790 meters length with a rectangular form and with a circular vault with concrete coating), and then, the water goes into the loading chamber to guarantee hydraulic charge, avoiding air from causing cavitation and efficiency loss. Finally, water will be fed through the penstock (455 meters length) into the downstream turbines to transform the potential energy of water into mechanical energy. The measuring equipment will be located in the substation. It is important to mention that the Project is not considering any reservoir or regulation tank for its normal operation.

The project activity includes a design flow of maximum 18 m<sup>3</sup> /s (9 m<sup>3</sup> /s per turbine) diverted from Crisnejas river, and a net head of 126.288 m. There will be 2 turbines with a nominal capacity of 9.95 MW each, which totalizes a 19.9 MW capacity of Potrero Hydropower plant. The net electricity production is injected into the Interconnected National Electric Grid (SEIN) through a 4.97 km transmission line of 60 KV (Potrero – Aguas Calientes). Aguas Calientes substation connects the Project to the SEIN: Cajamarca – San Marcos – Cajabamba.

The head race channel, the tunnel, load chamber and all civil works and electromechanical equipment, will be located at the left margin of the river. The Project will employ two new horizontal Francis turbines, with a nominal speed of 600 rpm, a nominal capacity of 9 m<sup>3</sup> per second each, a nominal potency of 9.95 kW each and a lifetime of 30 to 50 years, as known in the energy industry. Each generator (two generators, one for each turbine) has the same lifetime of the turbine, a speed of 514 RPM, and a tension of 10 kV. The equipment efficiency (turbine and generator) is going to depend on the finally signed contract with the selected supplier (the project is not in this stage yet). However, the Project developer has indirectly included the specific efficiencies in the load factor of the Project. The energy meter is going to be placed in Aguas Calientes SE (substation), in order to monitor the net energy (even discounting transmission losses) that is finally supplied to the SEIN.

Parameter	Value	Unit
Installed Capacity	19.9	MW
Head-race Channel	940	m
Water Tunnel	790	m
Penstock	455	m
Turbine Type	Francis horizontal axis	2 turbines
Turbine Rated Net Head	126.288	m
Turbine and generator lifetime	50	Years

The project activity was operation with normal operation and maintenance during current monitoring period i.e. 01-June-2016 to 31-December-2019. There were no shut down during current monitoring period.

**B.2. Post-registration changes****B.2.1. Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents**

There was no deviation from registered monitoring plan and or applied methodology during current monitoring period.

**B.2.2. Corrections**

There was no correction from registered PDD during current monitoring period.

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

There was no change in crediting period start date.

**B.2.4. Inclusion of monitoring plan**

Not applicable

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

There were no changes from registered monitoring plan, applied methodology during current monitoring period.

**B.2.6. Changes to project design**

No change in project design during current monitoring period.

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

As the project activity falls under Sectoral Scope 1: Energy industries (renewable - / non-renewable sources) this section is not applicable.

**SECTION C. Description of monitoring system**

The monitoring methodology follows the ACM0002 definition, which states that “the monitoring shall consist of metering the electricity generated by the renewable energy technology.” However, for more accuracy the emission factor will be calculated ex-post according to the *Tool to Calculate the Emission*.

The project activity needs special monitoring equipment. The project activity implements a Monitoring Plan and use pre-programmed spreadsheets for the emission reduction calculation. The Project Proponent defines a person responsible for the monitoring of the entire data required. Three main participants are identified for the MP, being:

- **The Operation Department:** Obligated to ensure that sufficient and accurate information is available to calculate ERs in a transparent manner, and that adequate information is collected and maintained to facilitate verification of accounted ERs.
- **The Maintenance provider:** Maintenance and calibrations of the measuring equipment will be developed as required by the methodology with a specialized firm, and will follow applicable requirements of the COES as well as manufacturer’s specifications.

- **General Manager:** The General Manager will have final responsibility for all aspects related to data measurements and the monitoring of data recordings.

COES, the dispatch centre, will provide the data for the annual ex-post calculation of the Project ERs, and the energy generation of the Project will be provided by the Project developer. Further details of the MP are available in Appendix 1.

Project emissions will be calculated based on the operating hours of the diesel generators during the monitoring period using the engine specific fuel consumption at full load of each generator. It is however envisaged that diesel emissions will result in less than 1% of the baseline emissions, as the generators will be used only in emergency situations in which main transmission line is out of service.

## SECTION D. Data and parameters

### D.1. Data and parameters fixed ex ante

The Project does not have any ex ante parameters.

### D.2. Data and parameters monitored

Data/Parameter	EG facility,y		
Unit	MWh		
Description	Net electricity supplied by the project to the grid.		
Measured/calculated/default	Measured		
Source of data	Bi-directional meter readings		
Value(s) of monitored parameter	Year	Net Electricity Supplied to the grid	
	2016	0.00	
	2017	33314.67	
	2018	97749.39	
	2019	115920.59	
	Total	246984.65	
Monitoring equipment	The project uses a bidirectional meter that allows to measure both the electricity acquired by the Project (in case the Project consumes electricity from the grid) and the electricity supplied to the grid. Therefore, the net electricity supplied to the grid is measured continuously and recorded at least each hour.		
	A high level of accuracy of the measurements will be achieved due to the use of high-precision equipment. The project electricity meter is an electronic device with a precision class of 0.2 (as required by COES). The meters will be located at the power plant substation.		
	The project measures the net electricity supplied to the grid after the internal consumption. In case of project consumption of electricity from the grid this amount of energy will be discounted from the total electricity supplied to the grid in the emission reduction calculation process.		
	The proportion of data to be monitored is 100% and the data is archived electronically.		
	Meter details are given below:		
	Meter	Serial No.	Date of calibration
1	00000000194632530	22-May-2017	
2	00000000194634633	22-May-2017	
Measuring/reading/recording frequency	Continuous monitoring and Monthly recording		

Calculation method (if applicable)	This parameter is measured by the equipment (energy meter) and considered accordingly; hence calculation method is not applicable
QA/QC procedures	Measuring equipment will be verified with calibrated pattern or calibrated according to relevant industry standards or national regulation but at least every two years. Additionally, it must be considered that the accuracy of the electric meters can be a demand from the centre of dispatch, COES, or also from final customers in regard to their energy purchase contracts. Any modification in the regulatory framework will be applied by the project during the operation phase. As per the requirement by COES, energy meters need to be auto-calibrated and hence no calibration is needed other than in the case of malfunctioning
Purpose of data/parameter	For the calculation of baseline emissions
Additional comments	Data will be kept for at least two years after the end of the crediting period or the last issuance of CERs for this project activity, whatever occurs later. Complete information of every year during the crediting period will be available from the COES during the first six months of the following year.

<b>Data/Parameter</b>	<b>EF<sub>grid, CM, y</sub></b>	
Unit	tCO <sub>2</sub> e/MWh	
Description	CO <sub>2</sub> emission factor of the grid electricity in year y	
Measured/calculated/default	Calculated	
Source of data	COES data	
Value(s) of monitored parameter	Year	EF <sub>grid, CM, y</sub>
	2016	0.64969
	2017	0.64969
	2018	0.64969
	2019	0.64969
Monitoring equipment	-	
Measuring/reading/recording frequency	Yearly	
Calculation method (if applicable)	A combined margin (CM) will be used, consisting of the combination of operating margin (OM) and build margin (BM), according to the procedures prescribed in the "Tool to calculate the Emission Factor for an electricity system". This is included for reference purposes as in the ex-post calculation this monitoring parameter should be monitored each year during the crediting period, as per the "Tool to calculate the Emission Factor for an electricity system"	
QA/QC procedures	Calculated using data available (emission factors and annual statistics), that is monitored 100% by COES.	
Purpose of data/parameter	For the calculation of baseline emissions	
Additional comments	It is envisaged that the diesel generators will not be operational for more than 12 hours per year, and therefore, the emissions will be lower than 1% of the baseline emissions. The diesel engines will be maintained as per the manufacturer specifications in order to assure its proper functioning and that the specific consumption at full load remains within the limit specified by the manufacturer. Data will be archived and kept at least for two years after the end of the crediting period or the last issuance of CERs, whichever occurs later.	

<b>Data/Parameter</b>	<b>EG<sub>PJ, h</sub></b>
Unit	MWh
Description	Electricity displaced by the project activity in hour h of year y



Measured/calculated/default	Default value
Source of data	COES data
Value(s) of monitored parameter	Data used is presented in the spreadsheet for "Grid Emission Factor calculation"
Monitoring equipment	Directly measured and/or based on the information provided by COES. The proportion of data to be monitored is 100% and the data will be archived electronically
Measuring/reading/recording frequency	Data will be monitored every 15 minutes and aggregated in an hourly and annual basis.
Calculation method (if applicable)	Not applicable
QA/QC procedures	Information of invoices of electricity sold to the grid will be cross-checked with metered information and/or COES information. To ensure consistency, if applicable other records may be used if necessary.
Purpose of data/parameter	For the calculation of baseline emissions
Additional comments	Data will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whatever occurs later.

<b>Data/Parameter</b>	<b>EG<sub>n, h</sub></b>
Unit	MWh
Description	Electricity generated and delivered to the grid by power units n in hour h
Measured/calculated/default	Default value
Source of data	COES data
Value(s) of monitored parameter	Data used is presented in the spreadsheet for "Grid Emission Factor calculation"
Monitoring equipment	Directly measured and/or based on the information provided by COES. The proportion of data to be monitored is 100% and the data will be archived electronically
Measuring/reading/recording frequency	Data will be monitored every 15 minutes and aggregated in an hourly and annual basis.
Calculation method (if applicable)	Not applicable
QA/QC procedures	Official data
Purpose of data/parameter	For the calculation of baseline emissions
Additional comments	Data will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whatever occurs later.

<b>Data/Parameter</b>	<b>EG<sub>m, y</sub></b>
Unit	MWh
Description	Net quantity of electricity generated and delivered to the grid by power unit m in year y.
Measured/calculated/default	Default value
Source of data	COES data
Value(s) of monitored parameter	Data used is presented in the spreadsheet for "Grid Emission Factor calculation"

Monitoring equipment	Directly measured and/or based on the information provided by COES. The proportion of data to be monitored is 100% and the data will be archived electronically
Measuring/reading/recording frequency	Annual
Calculation method (if applicable)	Not applicable
QA/QC procedures	Official data
Purpose of data/parameter	For the calculation of baseline emissions
Additional comments	Data will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whatever occurs later.

<b>Data/Parameter</b>	$\eta_{m,y}$
Unit	--
Description	Average net energy conversion efficiency of power unit m in year y (ratio).
Measured/calculated/default	Default value
Source of data	COES data
Value(s) of monitored parameter	Data used is presented in the spreadsheet for "Grid Emission Factor calculation"
Monitoring equipment	Each year this data will be checked with the last available annual report of COES. The proportion of data to be monitored is 100% and the data will be archived electronically
Measuring/reading/recording frequency	Annual
Calculation method (if applicable)	Not applicable
QA/QC procedures	If the data used is significantly lower than the default value of the applicable technology, project proponents should assess the reliability of the values, and provide appropriate justification if deemed reliable. Otherwise, the default values above shall be used
Purpose of data/parameter	For the calculation of baseline emissions
Additional comments	Data will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whatever occurs later.

<b>Data/Parameter</b>	$EF_{CO_2, m, i, y}$
Unit	tCO <sub>2</sub> /GJ
Description	Average CO <sub>2</sub> emission factor of fuel type i used in power unit m in year y
Measured/calculated/default	Default value
Source of data	IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.
Value(s) of monitored parameter	Data used is presented in the spreadsheet for "Grid Emission Factor calculation"
Monitoring equipment	-
Measuring/reading/recording frequency	Annual
Calculation method (if applicable)	Not applicable
QA/QC procedures	Every update of IPCC reports will be taken into account
Purpose of data/parameter	For the calculation of baseline emissions

Additional comments	Data will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whatever occurs later. There is no information provided by the fuel supplier of the power plants in invoices, or regional or national average default values, therefore IPCC default values are suitable for these parameters.
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### D.3. Implementation of sampling plan

Sampling is not applicable in this project activity

## SECTION E. Calculation of emission reductions or net anthropogenic removals

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

As described in the section above, the total emission reduction achieved in a year would be  
 $ER_y = BE_y - PE_y - LE_y$

Where,

$ER_y$  is the Emission reductions during the year y

$BE_y$  is the Baseline emissions during the year y

$PE_y$  is the Project emissions during the year y

$LE_y$  is the Leakage emissions during the year y

#### Baseline emissions:

The baseline emissions are calculated based on the given formula:

$$BE_y = EG_{BL,y} * EF_{CO2,grid,y}$$

Where,

$EG_{facility,y}$  is the net electricity supplied to grid by the project activity

$EF_{CO2,grid,y}$  is CO2 emission factor of the grid

$$EF_{CO2, grid, y} = 0.64969 \text{ tCO}_2 / \text{MWh}$$

Net electricity supplied to the grid by the Project during current monitoring period i.e. 01-June-2016 to 31-December-2019 = 246984.65 MWh (Please refer Spreadsheet for details of calculations)

#### Year-wise calculation of Baseline Emissions

Year	$EG_{BL,y}$ (MWh)	$EF_{CO2, grid, y}$ (tCO <sub>2</sub> /MWh)	$BE_y$ (tCO <sub>2</sub> )
2016	0.00	0.64969	0
2017	33314.67	0.64969	21641
2018	97749.39	0.64969	63500
2019	115920.59	0.64969	75308
<b>Total</b>	<b>246984.65</b>		<b>160449</b>

**Total Baseline Emissions ( $BE_y$ ) = 160,449 tCO<sub>2</sub>e**

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

As per ACM0002 (Version 12.3.0), for most renewable energy project activities, project emissions are neglected, and following the methodology as the project activity is a run-of-the-river project, it does not lead to any GHG emissions; therefore project emissions are considered equal to zero. Therefore

$$PE_y = 0 \text{ tCO}_2\text{e}$$

**E.3. Calculation of leakage emissions**

In accordance with the applied methodology ACM0002, Version 12.3.0, no leakage emissions are considered. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, and transportation). Therefore,

**LE<sub>y</sub> = 0 tCO<sub>2</sub>e**

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

	Baseline GHG emissions or baseline net GHG removals (t CO <sub>2</sub> e)	Project GHG emissions or actual net GHG removals (t CO <sub>2</sub> e)	Leakage GHG emissions (t CO <sub>2</sub> e)	GHG emission reductions or net anthropogenic GHG removals (t CO <sub>2</sub> e)		
				Before 01/01/2013	From 01/01/2013	Total amount
<b>Total</b>	160,449	0	0	0	160,449	160,449

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

Amount achieved during this monitoring period (t CO <sub>2</sub> e)	Amount estimated ex ante for this monitoring period in the PDD (t CO <sub>2</sub> e)
160,449	327,225

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

Considering the annual average emission reductions as per the registered PDD which is 91,243 tCO<sub>2</sub>e per year, the number of days covered during the current monitoring period comes out to be 1309 days, based upon which the estimated emission reductions attributed to this monitoring period comes out to be 327,225 tCO<sub>2</sub>e. The detailed calculation can be referred from the emission reduction sheet.

**E.6. Remarks on increase in achieved emission reductions**

During this project activity, the actual emission reductions obtained is lower than the estimated value.

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

Not applicable to this project as this is a large-scale project activity and it remains so throughout the monitoring period.

## Appendix 1: Further background information on Monitoring Plan

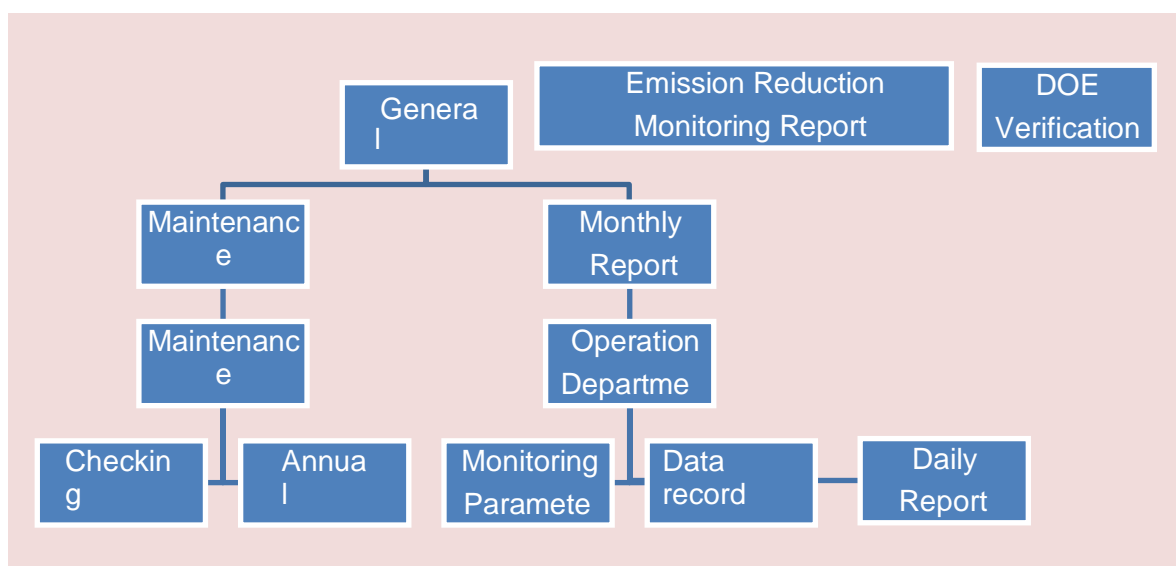
This report presents the Monitoring Plan (MP) for the Project activity. The MP defines a standard against which the performance in terms of the Project's ERs will be monitored, following the selected methodology ACM0002 (version 12.3.0) and in compliance with all relevant requirements of the CDM of the Kyoto Protocol. Both the Baseline and the MP are subject to monitoring procedures.

*The MP identifies key performance indicators of the Project activity and sets out the procedures for metering, monitoring and calculating the ERs generated by the Project activity annually. Adherence to the instructions in the MP is necessary for the project operator to successfully measure and track the impact of the Project activity, and to prepare all data required for the periodic audit and verification process that must be undertaken to confirm the attainment of the corresponding ERs.*

### Organizational:

The following figure outlines the operational and management structure that the project proponent will implement to monitor the emission reductions generated by the project activity. The Project Proponent will define a person responsible for the monitoring of the entire data required.

### Organization Monitoring



### The Operations department

*The monitoring performance of the Project requires the fulfillment of operational data collection and processing obligations by the Project operator. The Project operator is obligated to ensure that sufficient and accurate information is available to calculate ERs in a transparent manner, and that adequate information is collected and maintained to facilitate successful verification of accounted ERs.*

The Operations department will be responsible for:

1. Monitoring of the following parameters

a) The energy and power supplied by the project activity to the national grid. b) The installed capacity of the hydro power plant. c) The quantity of electricity supplied to the SEIN, which will be based on latest available data from the COES. d) The net electricity generated by the power plants/units included at the top of the dispatch order, and the power plants/units included in the building margin. e) The average net energy conversion efficiency of thermal power plants/units, available in the COES annual statistics report. f) The marginal cost. The merit order in which power plants dispatches, available in the COES annual statistics report.

2. Record and store the data of the project meter.
3. Register the values of the monthly invoices of net electricity sold and have the latest COES reports of net electricity supply in order to develop proper crosschecking of the information. In case of discrepancies the official information will be used (COES).
4. Control the accurate operation of any meters or equipment needed for monitoring, and preliminarily determine the needs for maintenance or repair work.
5. Elaborate the daily monitoring reports of the Project.
6. The daily reports will serve as back-up purpose and archived at the Project site. All the data will be kept for at least for 2 years after the end of the last crediting period.
7. Consolidate daily reports on a monthly monitoring report and send them to the General Manager

The amount of energy and power generation of the hydropower plant will be measured by the project meter. The energy and power generation parameters will be checked and monitored in real time in both the power plant and the substation. Energy generation will be registered electronically at the power plant and the substation each 15 minutes of every hour, day and month, and will be kept for at least two years after the end of the crediting period.

The substation site will have at least a 0.2 class meter working as principal measuring and recording equipment that will be used for the net electricity measurements.

The meters could be configured to work either in a unidirectional or bi-directional way, but for the project purposes the meter will be configured to work in a bidirectional way. To ensure the quality of the parameters and the recording, all the equipment that are going to be used for monitoring and registering will comply with the IEC and ANSI international standards.

In case of failure of the principal recording equipment, a secondary measuring equipment located also in the substation, will continue the monitoring of the project parameters. If there is no other measurement system, COES official information will be used. If problems which can affect the quality of data occur, the Operations Department will initiate and supervise the implementation of corrective actions by the Maintenance Provider. First, the monitoring system will be checked on whether it runs properly and whether the monitored results are correct.

### **The Maintenance Provider**

Maintenance and calibrations of the measuring equipment will be developed as required by the methodology with a specialized firm, and will follow applicable requirements of the COES as well as manufacturer's specifications. Calibration or verification certificates of the accredited agency, and the relevant certificate document, will be collected by the General Manager and archived for at least 2 years after the end of the crediting period.

### **General Manager**

The General Manager will have final responsibility for all aspects related to data measurements and the monitoring of data recordings. Mainly:

- Compile and analyze all the monthly monitoring reports every year.
- Elaborate an estimate of emission reductions in an Emission Reduction Monitoring Report.
- Calculate the Combined Margin and recalculate the Grid Emission Factor every year.
- Compile and analyze all the calibration reports in a Maintenance Report Status every year.
- Manage and supervise all monitoring activities under the generation project.

- Ensure that all data is recorded accurately.
- Supervise the maintenance and operation departments.
- Ensure that the operators from the maintenance and operations departments are appropriately trained for monitoring/checking the different parameters/meters with training sessions and an instruction manual.
- Draft the Emission Reduction Monitoring Report with all its attachments, which will be verified by the DOE.

### Data Collection and Integration

Grid Emission Factor: It is required that the project operator calculate the Project's ERs based on the most recent available information. The CO<sub>2</sub> emission factor for the electricity grid will be based on latest available data from the Official COES website.

All data required for calculating the Combined and Build Emission Margins will come from the COES information system.

Project performance parameter: Electricity production by the plant and any internal usage will be metered continuously to account for the net level of electricity dispatch. Procedures for maintenance and installation of equipment, as well as calibration, will be performed according to manufacturer specifications and will follow applicable requirements of the Electricity General Direction of the Peruvian Energy and Mines Ministry (these requirements are currently under development by the Ministry).

Data gathering and processing should be done monthly by the operator, as follows:

#### Monthly Data Collection

	At the end of each month:
<b>COES (Data Provide)</b>	<ul style="list-style-type: none"> <li>• Report the hourly generation of plants in the SEIN (measurement: 15').</li> <li>• Report dispatch merit orders, data will come from COES.</li> <li>• Use real NECs per power plant in the SEIN.</li> </ul>
<b>Operator (Data Processor )</b>	<ul style="list-style-type: none"> <li>• Direct measurement. The operator will make a monthly report for the energy and power provided to the grid.</li> <li>• Fill in monthly data in all required spreadsheets.</li> <li>• Issue a monthly report.</li> </ul>



## Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
07.0	31 May 2019	Revision to: <ul style="list-style-type: none"> <li>• Ensure consistency with version 02.0 of the “CDM project standard for project activities” (CDM-EB93-A04-STAN);</li> <li>• Add a section on remarks on the observance of the scale limit of am-scale project activity during the crediting period;</li> <li>• Add "changes specific to afforestation or reforestation project activity" as a possible post-registration changes;</li> <li>• Clarify the reporting of net anthropogenic GHG removals for A/R project activities between two commitment periods;</li> <li>• Make editorial improvements.</li> </ul>
06.0	7 June 2017	Revision to: <ul style="list-style-type: none"> <li>• Ensure consistency with version 01.0 of the “CDM project standard for project activities” (CDM-EB93-A04-STAN);</li> <li>• Make editorial improvements.</li> </ul>
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: <ul style="list-style-type: none"> <li>• Include provisions related to delayed submission of a monitoring plan;</li> <li>• Provisions related to the Host Party;</li> <li>• Remove reference to programme of activities;</li> <li>• Overall editorial improvement.</li> </ul>
04.0	25 June 2014	Revisions to: <ul style="list-style-type: none"> <li>• Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0));</li> <li>• Include provisions related to standardized baselines;</li> <li>• Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1;</li> <li>• Change the reference number from <i>F-CDM-MR</i> to <i>CDM-MR-FORM</i>;</li> <li>• Editorial improvement.</li> </ul>
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB 70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01.0	28 May 2010	EB 54, Annex 34. Initial adoption.

<i>Version</i>	<i>Date</i>	<i>Description</i>
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