



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

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

**MONITORING REPORT**

<b>Title of the project activity</b>	Providencia III: 9.11MW Small Hydro Power Generation Plant	
<b>UNFCCC reference number of the project activity</b>	Project 8759	
<b>Version number of the PDD applicable to this monitoring report</b>	version 7	
<b>Version number of this monitoring report</b>	Version 1	
<b>Completion date of this monitoring report</b>	29/11/2020	
<b>Monitoring period number</b>	1	
<b>Duration of this monitoring period</b>	12/03/2015 – 11/03/2022	
<b>Monitoring report number for this monitoring period</b>	1	
<b>Project participants</b>	Mineros S.A and The Andean Center for Economics in the Environment - CAEMA – ACEE (Colombia)	
<b>Host Party</b>	Colombia	
<b>Applied methodologies and standardized baselines</b>	AMS-I.F, version 02, “Renewable electricity generation for captive use and mini-grid”	
<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	134180 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>	261425 tCO <sub>2</sub> e
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## SECTION A. Description of project activity

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

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The Providencia III project activity operates a new small 11.16MWe capacity hydropower generation plant at the Providencia region, municipality of Anorí, Department of Antioquia, Colombia.

Two Francis-type horizontal axis turbines with a water flow of 7.15m<sup>3</sup>/s each, a net head of 84.06m, and a rotation speed of 600rpm. The turbine's operation control is handled by the speed control who governs the operation of the blades to start the unit, sync, charge and discharge. The generators will be three-phased synchronous generators with a horizontal axis. They will have an operating power of 5.58kW each, with an efficiency of no less than 96.5%, and a rotor temperature increase of 75°C and ambient temperature of 40°C. Their synchronous speed will be 600rpm. The three-phase transformers will be oil submerged with a primary voltage in synchronization with the generation voltage (4160 V) and 60 Hz; a secondary voltage of 44 kV and a nominal power of 12 MVA.

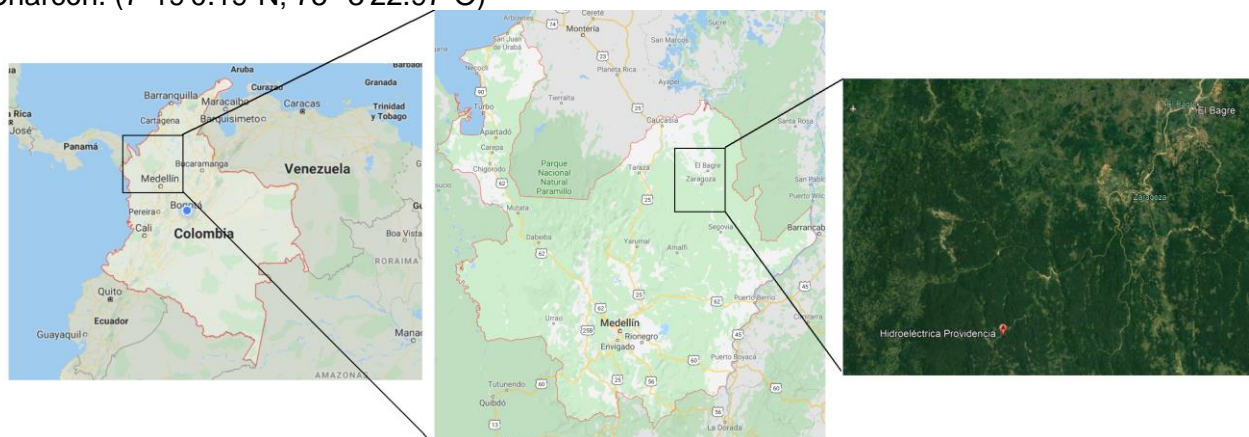
### A.2. Location of project activity

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Colombia

Department of Antioquia

Municipality of Anorí, areas of Providencia, Toná and Usurá; and the human settlement named El Charcón. (7°19'0.19"N; 75° 3'22.97"O)



### A.3. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Colombia	<ul style="list-style-type: none"> <li>Mineros S.A. (private entity)</li> <li>The Andean Center for Economics in the Environment – CAEMA – ACEE</li> </ul>	No

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

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The following approved baseline and monitoring methodology has been applied to the project activity:

- AMS-I.F.: Renewable electricity generation for captive use and mini-grid. Version 2

Tools referenced in this methodology

- Tool to calculate project or leakage CO<sub>2</sub> emissions from fossil fuel combustion. Version 2

- Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation. Version 1.
- Tool to calculate the emission factor for an electricity system. Version 1.1.

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

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Renewable crediting period

12/03/2015 – 11/03/2022

### SECTION B. Implementation of project activity

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

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The Providencia III project activity operates a new small 11.16MWe capacity hydropower generation plant at the Providencia region, municipality of Anorí, Department of Antioquia, Colombia.

Two Francis-type horizontal axis turbines with installed capacity of 5.58MWe each, a water flow of 7.15m<sup>3</sup>/s each, a net head of 84.06m, and a rotation speed of 600rpm. The turbine's operation control is handled by the speed control, by governing the operation of the blades to start the unit, sync, charge and discharge. The generators will be three-phased synchronous generators with a horizontal axis. They will have an operating power of 5.58MWe each, with an efficiency of no less than 96.5%, and a rotor temperature increase of 75°C and ambient temperature of 40°C. Their synchronous speed will be 600rpm. The three-phase transformers will be oil submerged with a primary voltage in synchronization with the generation voltage (4160 V) and 60 Hz; a secondary voltage of 44 kV and a nominal power of 12 MVA.

Prior to the implementation of the project activity no hydropower plant existed at that location. Mineros S.A. is a state owned commercial enterprise that works under private law. Mineros S.A. will use electricity generated at the Providencia III project for dredging and gold mining activities located on the basin of the Anorí river. All dredging, mining and refining activities are connected to a small privately owned electricity grid, with connection to the National Interconnected grid at the point named Bijagual. According to the Mineros S.A. development plans, the national interconnected electricity grid would provide excess electricity demand in the absence of the Providencia III project activity to supply power to all dredging, mining and refining activities. The power plant will have a net head of 84.06m and a design flow of 14.3m<sup>3</sup>/s. Water for power generation at Providencia III is captured from the Anorí River downstream of the Providencia SHP plant water outlet, where the intake and sands retainer channel was built. The discharge is made downstream at the same Anorí river.

Conduction of water from the intake to the powerhouse is underground. The optimal section of the horseshoe shaped tunnel is 3.20m in diameter and the penstock pipe's diameter is 2.0m. Considering hydraulic losses generated by the proposed tunnel and pipe diameters, the net installed capacity for the Providencia III Small Hydroelectric Power (SHP) plant project is of 11.16 MW.

The project will reduce greenhouse gas (GHG) emissions through the operation of the new plant, which will displace electricity consumption from the National electricity grid that serves Mineros S.A. privately owned small local grid, which currently supplies electricity to the encampments and areas of mining of gold and precious minerals.



Figure 1: entrance to the underground location of Providencia III SHP plant



Figure 2: generation machine for turbine 6



Figure 3: generation machine for turbine



7



Figure 4: plate description of mean features of turbine 7



Figure 5: control cabinet for turbine 6



Figure 6: serial number for the turbine 6 electricity meter



Figure 7: calibration tag for turbine 6 of the Providencia III SHP plant



Figure 8: control cabinet for turbine 7



Figure 9: turbine 7 of providencia III SHP plant electricity meter type SATEC PM172E



Figure 10: serial number of turbine 7



Figure 11: calibration tag for turbine 7 of the Providencia III electricity meter

Trespassing the information in the plates of the generators, the equipment plate contains the following data:

Indar		Tel: +34 943 028 200 <a href="mailto:hydro@indar.ingeteam.com">hydro@indar.ingeteam.com</a> 20200 BEASAIN (SPAIN)	IEC G0034-1
Generador Sincrono Synchronous Generator		LSA-1120-M/12	
No.:	3010000410	Output 6975 kVA	
Year: 2013	Mass: 29500 kg	Voltage: 4160 V	
Connection:	Phases: 3~	Current: 968 A	
Duty: S1	IP 44	Frequency: 60 Hz	
Thermal Class: F	IC 81W	Speed: 600 rpm	
Temperature rise: B	IM 1005	Max. Speed: 1069 (10') – 1283 (2') r.p.m.	
Min. Ambient temp: - °C	Max. Ambient Temp.: 40°C	Rated Power Factor (lagging/Leading): 0.8/- p.u.	
Max. Water Temp.: 25°C	Altitude: <1000 m.a.s.l.	Excitation rated voltage: 77V	Excitation rated current: 8.5 A

## B.2. Post-registration changes

### B.2.1. Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents

>>

Changes that are being submitted with this monitoring report as part of the request for issuance (post-registration change - issuance track) as applicable from this monitoring period.

#### Monitoring Parameter

**EG<sub>BL,y</sub>** - net electricity displaced is the gross energy generation by the project activity power plant minus the auxiliary/station electricity consumption

Deviation Observed

Currently the measurement undertaken by energy meter (gross energy generation– EGBL,y) does not subtracts the auxiliary/station electricity consumption.

Deviation Requested

PP requests approval of a temporary deviation in order to estimate the auxiliary/station electricity consumption.

The estimation consists in considering the installed capacity of the transformer installed for auxiliary consumptions (180 kVA) and the transformer installed at the output of generator of Providencia III (14000 kVA), taking into account that the electricity supply to the auxiliary services area passes through the transformer with installed capacity of 180kVA coming from the main transformer with a installed capacity of 14000 kVA, so the Quantity of net electricity displaced by the project activity will be calculated as:

$$\text{Net electricity displaced} = \text{Electricity generation in Providencia III (generation units 6 and 7)} * (1 - (180/14000))$$

Justification for Deviation Request

This temporary deviation will be valid from the beginning of the first crediting period until December 31st/2020, when PP foresees to install an energy meter to measure the auxiliary/station electricity consumption.

**B.2.2. Corrections**

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No additional corrections to the project design but those presented in section B.2.6. below.

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

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Change that affects the start of this monitoring period and is being submitted with this monitoring report as part of the request for issuance (post-registration change – issuance track) and that affects the start of this monitoring period.

It is requested to change the start of crediting period from 25/05/2013 to 12/03/2015 due to delay in the starting of operations of the Providencia III SHP station.

Version number of the revised PDD: version 1

Completion date of the revised PDD: 14/04/2020

DOE validation report: ICONTEC PRC-8759-001 31/08/2020 version 2

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

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No inclusions to the monitoring plan are requested.

**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**

>>

Changes that are being submitted with this monitoring report as part of the request for issuance (post-registration change - issuance track) as applicable from this monitoring period.

Monitoring Parameter



$EF_{CO_2,grid,y}$  Emissions factor of the electricity grid replaced by the Providencia III SHP. As for this project activity, the grid's emissions factor corresponds to the National Electricity Grid Emissions Factor.

#### Deviation Observed

In the original PDD, the grid's emissions factor was fixed ex-ante for the 21 years crediting period. This decision didn't considered increasing fossil fuel consumption for base power use to cope with electricity demand from the National Electricity Grid. The Colombian Ministry of the Environment acting as the National Designated Authority commissioned the Energy and Mining Planning Unit (UPME as per its acronym in Spanish – acting as the authority for determining the expansion of the grid within the Colombian Ministry of Energy and Mines) to calculate, on a yearly basis, the National Grid Emissions Factor. In doing so, a governmental Resolution is billed annually containing the result of the calculation of the National Grid Emissions Factor and applies within the country until a new Resolution is billed. The calculation in the Resolutions is supported by an UPME report that follows the latest version of the Tool to Calculate the Emissions Factor for an Electricity System; data for the calculation is taken from Colombian official sources responding to the UPME call for completing the tool.

#### Deviation Requested

It is requested to remove the limitation to use the National Grid Emissions Factor calculated Resolutions 180947 billed in 2010. Instead, it is requested to allow this project activity to apply the calculated National Grid Emissions Factor billed yearly in the respective year resolution issued by UPME and the Ministry of the Environment.

Table below summarizes the way this parameter is requested to be approved:

Data Parameter	/	$EF_{CO2,grid,y} = EF_{Grid,CM,y}$			
Unit	tCO2e/MWh				
Description	CO2 emission factor of the grid electricity in year y				
Source of data	UPME (National Energy and Mining Planning Unit in charge of the calculation of the Colombian grid emissions factor) sets the official grid emissions factor. Resolutions by UPME recalculates on a yearly basis BM and OM and, therefore, the CM.				
Value(s) applied	Year		Supporting document	Value	Unit
	2013	<a href="#">Documento de Cálculo del factor de emisión de CO2 del SIN 2008</a>		0.2849	tCO2/MWh
	2014	<a href="#">Documento de Cálculo del factor de emisión de CO2 del SIN 2008</a>		0.2849	tCO2/MWh
	2015	<a href="#">Resolución 91304 de 2014 FE del SIN para MDL</a>		0.3740	tCO2/MWh
	2016	<a href="#">Resolución 857 Dic 24 de 2015</a>		0.3880	tCO2/MWh
	2017	<a href="#">Resolución 843 Dic 23 de 2016</a>		0.4010	tCO2/MWh
	2018	<a href="#">Resolución 804 Dic 26 de 2017</a>		0.3670	tCO2/MWh
	2019	<a href="#">Resolución 774 Dic 28 de 2018</a>		0.3800	tCO2/MWh
	2020	<a href="#">Resolución 642 Dic 27 de 2019</a>		0.3810	tCO2/MWh
	<a href="https://www1.upme.gov.co/siame/Paginas/calculo-factor-de-emision-de-Co2-del-SIN.aspx">Source: https://www1.upme.gov.co/siame/Paginas/calculo-factor-de-emision-de-Co2-del-SIN.aspx</a>				
	Measurement methods and procedures	PPs will gather the issuance of yearly official decisions regarding emissions factor recalculation addressed yearly by the Ministry of the Environment and the UPME resolutions (a Resolution is the Spanish name for a technical law billed by a governmental institution in Colombia).			
Monitoring Frequency	On a yearly basis				
QA/QC procedures	-				
Purpose of data	Calculation of emissions reductions.				
Additional comment	The data will be stored for a period of two years after the verification.				

#### Justification for Deviation Request

The limitation in using official resolutions but the one of 2010 results in a too conservative factor, given that the UPME and the Ministry of the Environment calculations assumes the most conservative input data according to the "Tool to calculate the emissions factor for an electricity system". The yearly official National Grid Emissions factor for the corresponding year is the best and more conservative estimate for this project activity. As for this project, over conservativeness may result in miscalculation of emission reductions of the Colombian Emissions Reductions Accounting System (RENARE)

Version number of the revised PDD: version 1

Completion date of the revised PDD: 06/11/2019

DOE validation report: ICONTEC PRC-8759-001 31/08/2020 version 2

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

&gt;&gt;

Changes to the project design are being submitted along with this monitoring report as part of the request for issuance (post-registration change – issuance track) as applicable from this monitoring period.

Deviation Observed

Francis type turbines electricity generation design features described in the original PDD differs from those features of Francis generators installed.

Power output: in the original design stated that “two Francis-type turbines with a combined installed net capacity of 9.11 MWe (4,545kW x 2 =9,090kW gross installed capacity) was to be installed at the Providencia III SHP Plant. The installed generators plates at the Providencia III SHP station states: “Power Output=6975kVA”; “Power factor=0.8”. Therefore, calculating power output (“power output” x “power factor”) equals 5580kW per machine, totalling 11160kWe power output. Summarizing, design proposed in original PDD presents a 2 turbines power plant with total power output of 9.11MWe but the installed 2 turbines power plant total output is 11.16MWe. There is a difference of 1.05MWe installed capacity.

Project design change request

It is requested to modify power output from 9.11MWe to 11.16MWe.

Justification of project design change request

Final specifications of the turbines requested to the turbine generator provider resulted in an increase of the power output. Difference between PDD output and installed output is 22.5%

Version number of the revised PDD: version 1

Completion date of the revised PDD: 06/11/2019

DOE validation report: ICONTEC PRC-8759-001 31/08/2020 version 2

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

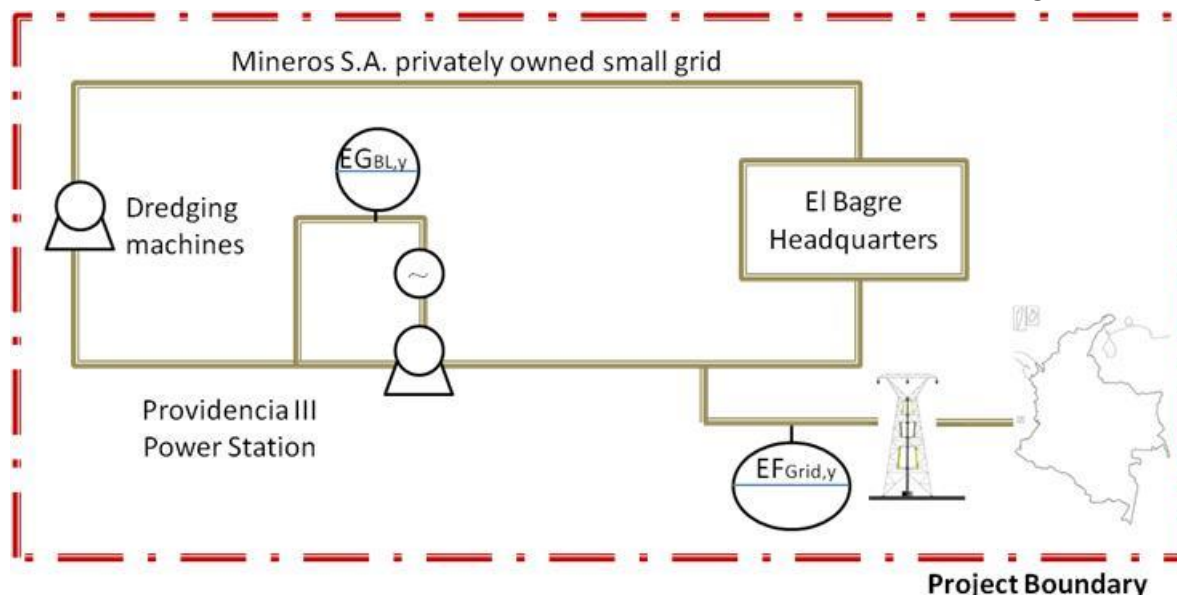
&gt;&gt;

Not applicable

**SECTION C. Description of monitoring system**

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The parameters monitored are consistent with AMS I.F v.2 methodology and the “Tool to calculate the emission factor for an electricity system” version 2.2.1. The Figure below presents the project boundary and the main monitoring instruments for measuring parameters.



**Figure 12: Project Boundary**

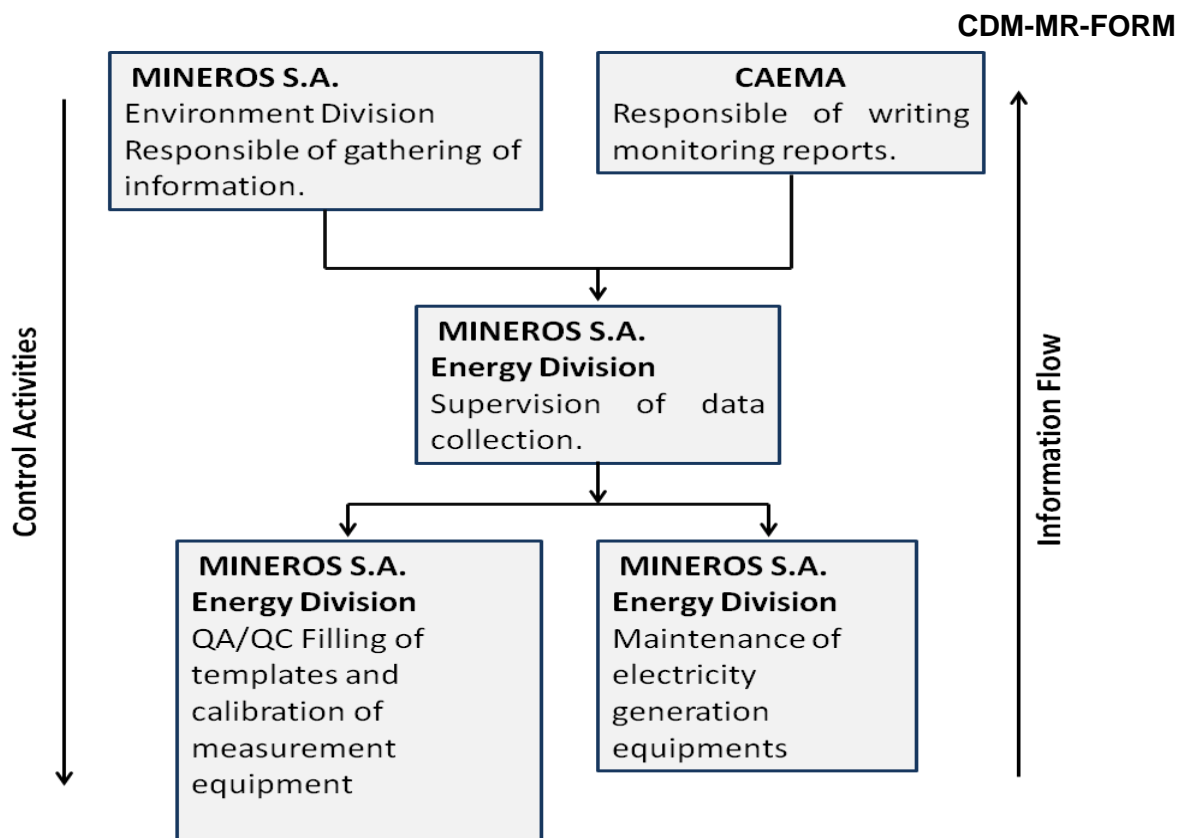
Following paragraph 23 in AMS-I.F, regarding  $EG_{BL,y}$  "measurements are undertaken using energy meters". Calibration should be undertaken as prescribed in the relevant paragraph of the "General Guidelines to SSC CDM Methodologies v.1, EB66 Annex 09". Calibration procedures for  $EG_{BL,y}$ . "In the case of electricity sold to a third party, measurement results shall be cross-checked with records of sold/purchased electricity (e.g. invoices/receipts.)". Records on electricity sold to the grid will be kept available for verification in the Corporate Environment Division of Mineros S.A.. Following paragraph 14 in AMS-I.F., for more accuracy the emission factor will be calculated ex-post according to the Tool to Calculate the Emission Factor for an Electricity System following Simple Adjusted Method

CAEMA and MINEROS S.A. prepared pre-programmed spreadsheets to collect the information described and apply the relevant formulas. XM (the national dispatch center) and UPME are the data providers for the annual ex-post calculation of the Project's ERs. Paper and electronica templates along with a storage system based on SAP will be considered to bring redundancy and robustness to data taking. The on-site designated project staff will confirm these data with their own records.

#### **Organizational Structure of the Monitoring Plan:**

The management and operation of the monitoring program will involve both the environment division and the energy generation division of MINEROS S.A. MINEROS Aluvial will oversee the implementers who must assemble a staff to consolidate monitoring data. CAEMA will use this data to complete periodic monitoring reports and briefings, which will be delivered to the DOE during the verification activities (Figure 13).

Mineros S.A. is responsible for the equipment's operating procedures, and ensuring their maintenance and calibration so that the installed equipment complies with all requirements.



**Figure 13. Organizational Structure**

#### **Monitoring and data storage:**

MINEROS S.A. is responsible for consolidating and storing the primary data collected; a copy of this data will be sent to CAEMA who will periodically review it to verify its consistency. Both CAEMA and MINEROS S.A. store data electronically, and regular backups should be performed. Data must be stored for at least two (2) years after crediting period. CAEMA and Mineros S.A. shall develop procedures for collecting the variables in the event of contingencies.

#### **Quality Assurance and Control:**

All equipment must be calibrated according to manufacturer specifications and inspected periodically according to the standards required by the equipment to ensure the accuracy of data collection. Mineros S.A. shall require monitoring technology suppliers to offer their staff training in the operation of the equipment purchased. Mineros S.A. will keep equipment calibration and maintenance records.

### **SECTION D. Data and parameters**

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

*(Copy this table for each data or parameter.)*

The original PDD sets  $EF_{grid,CM,y}$  fixed ex-ante for the whole crediting period. By means of this Monitoring Report, PPs are soliciting to the Board a deviation on this parameter in order to stop considering it fixed ex-ante but to allow that, on a yearly basis,  $EF_{grid,CM,y}$  include the updated UPME calculation regarding the National Grid Emissions Factor.

#### **D.2. Data and parameters monitored**

*(Copy this table for each data or parameter.)*

<b>Data/Parameter</b>	$EG_{BL,y}$
<b>Unit</b>	MWh/y

Description	Quantity of net electricity generation supplied by the project plant to the small grid in year y																																										
Measured/calculated/default	Measured																																										
Source of data	High precision electricity meter installed at the Providencia III substation.																																										
Value(s) of monitored parameter	<table border="1"> <thead> <tr> <th>Year</th><th>Supporting document</th><th>Value</th><th>Unit</th></tr> </thead> <tbody> <tr> <td>2013</td><td><a href="#">Documento de Cálculo del factor de emisión de CO2 del SIN 2008</a></td><td>0.2849</td><td>tCO2/MWh</td></tr> <tr> <td>2014</td><td><a href="#">Documento de Cálculo del factor de emisión de CO2 del SIN 2008</a></td><td>0.2849</td><td>tCO2/MWh</td></tr> <tr> <td>2015</td><td><a href="#">Resolución 91304 de 2014 FE del SIN para MDL</a></td><td>0.3740</td><td>tCO2/MWh</td></tr> <tr> <td>2016</td><td><a href="#">Resolución 857 Dic 24 de 2015</a></td><td>0.3880</td><td>tCO2/MWh</td></tr> <tr> <td>2017</td><td><a href="#">Resolución 843 Dic 23 de 2016</a></td><td>0.4010</td><td>tCO2/MWh</td></tr> <tr> <td>2018</td><td><a href="#">Resolución 804 Dic 26 de 2017</a></td><td>0.3670</td><td>tCO2/MWh</td></tr> <tr> <td>2019</td><td><a href="#">Resolución 774 Dic 28 de 2018</a></td><td>0.3800</td><td>tCO2/MWh</td></tr> <tr> <td>2020</td><td><a href="#">Resolución 642 Dic 27 de 2019</a></td><td>0.3810</td><td>tCO2/MWh</td></tr> <tr> <td colspan="4"><a href="https://www1.upme.gov.co/siame/Paginas/calculo-factor-de-emision-de-Co2-del-SIN.aspx">Source: https://www1.upme.gov.co/siame/Paginas/calculo-factor-de-emision-de-Co2-del-SIN.aspx</a></td></tr> </tbody> </table> <p>Excel databases for the supporting registers transposed from the paper formats are attached to this Monitoring report in files entitled: "Energia Unidades 2015.xlsx"; and, "EnergySummary Mineros UNIDAD 6y7 SAP Ver 24Nov2020 2911.xlsx"</p> <p>Data in the SAP platform is presented in the excel file entitled: "BD Providencia III ver25nov2020 rJCC.xlsx"</p>			Year	Supporting document	Value	Unit	2013	<a href="#">Documento de Cálculo del factor de emisión de CO2 del SIN 2008</a>	0.2849	tCO2/MWh	2014	<a href="#">Documento de Cálculo del factor de emisión de CO2 del SIN 2008</a>	0.2849	tCO2/MWh	2015	<a href="#">Resolución 91304 de 2014 FE del SIN para MDL</a>	0.3740	tCO2/MWh	2016	<a href="#">Resolución 857 Dic 24 de 2015</a>	0.3880	tCO2/MWh	2017	<a href="#">Resolución 843 Dic 23 de 2016</a>	0.4010	tCO2/MWh	2018	<a href="#">Resolución 804 Dic 26 de 2017</a>	0.3670	tCO2/MWh	2019	<a href="#">Resolución 774 Dic 28 de 2018</a>	0.3800	tCO2/MWh	2020	<a href="#">Resolución 642 Dic 27 de 2019</a>	0.3810	tCO2/MWh	<a href="https://www1.upme.gov.co/siame/Paginas/calculo-factor-de-emision-de-Co2-del-SIN.aspx">Source: https://www1.upme.gov.co/siame/Paginas/calculo-factor-de-emision-de-Co2-del-SIN.aspx</a>			
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Monitoring equipment	<table border="1"> <thead> <tr> <th></th><th>Turbine 6</th><th>Turbine 7</th></tr> </thead> <tbody> <tr> <td>Type</td><td colspan="2">Multifunctional meter SATEC PM172E</td></tr> <tr> <td>Accuracy class</td><td>0.5</td><td>0.5</td></tr> <tr> <td>Serial number</td><td>937045</td><td>937046</td></tr> <tr> <td>Calibration frequency</td><td colspan="2">Every 5 years or according plant's calibration plan</td></tr> <tr> <td>Date of last calibration</td><td>22/10/2019 See file entitle "Prov 6 (2).pdf" for the latest calibration report</td><td>22/10/2019 See file entitle "Prov 7 (1).pdf" for the latest calibration report</td></tr> <tr> <td>Validity</td><td>22/10/2024</td><td>22/10/2024</td></tr> </tbody> </table>				Turbine 6	Turbine 7	Type	Multifunctional meter SATEC PM172E		Accuracy class	0.5	0.5	Serial number	937045	937046	Calibration frequency	Every 5 years or according plant's calibration plan		Date of last calibration	22/10/2019 See file entitle "Prov 6 (2).pdf" for the latest calibration report	22/10/2019 See file entitle "Prov 7 (1).pdf" for the latest calibration report	Validity	22/10/2024	22/10/2024																			
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Measuring/reading/recording frequency	Continuous with monthly and yearly totalizing.																																										
Calculation method (if applicable)	Not applicable																																										



QA/QC procedures	<p>Calibration should be undertaken as per manufacturer specifications. Records will be stored in a spreadsheet and checked daily by the plant's supervisor. Daily information shall be sent to El Bagre headquarters and double checked for quality assurance purposes.</p> <p>At El Bagre Mineros S.A. headquarters information will be stored in data basis and consolidated monthly. Information will be available for third persons under supervision of a Mineros S.A officer. Gathered information will contain all relevant parameters of measurement instruments including: Date of installation, registries taken by the instruments, registry of calibrations and maintenance and certifications of calibration.</p> <p>To ensure the proper functioning of a given instrument MINEROS S.A. undertakes the following activities:</p> <ul style="list-style-type: none"> <li>- <u>Preventive maintenance</u>: every second month MINEROS S.A. staff undergoes routine/preventive maintenance (according to the activities planned with anticipation) of cleaning and revision of a given instrument depending on the type of the equipment, the specifications of the manufacturer and the functioning of the device itself.</li> <li>- <u>Corrective maintenance</u>: In case of the necessity of the replacement of the measurement device, MINEROS S.A. has its stand-by calibrated replacement on stock. The instrument on stock will be stored and maintained according to the indications given by the manufacturer and planned accordingly by MINEROS S.A. staff in the monthly reports of instruments preventive maintenance. Replacement of measurement equipments will be performed by MINEROS S.A. staff assisted by external experts.</li> <li>- <u>Calibration</u>: As per manufacturer specifications and sectoral regulation lead by the National Gas and Energy Regulation Comission (CREG as per its acronym in Spanish). MINEROS S.A. will replace the instrument as per corrective maintenance procedures and perform calibration by means of an external expert entity.<sup>1</sup></li> <li>- <u>Quality control</u>: The MINEROS S.A. Energy Division at El Bagre city will undertake statistical control that indicates deviations from the daily measurements. In cases where deviation is higher than the internal standard data will be placed under revision and the information flow chain will revise data of such period.</li> </ul>
Purpose of data/parameter	Estimation of baseline emissions

<sup>1</sup> According to the Colombian Measurement Code (Codigo de Medida at: <http://apolo.creg.gov.co/Publicac.nsf/Indice01/Codigos-1995-RES.025-1995.COD..REDES-.COD.MEDIDA?OpenDocument>) Article 2: "The owner of the masurement equipment will carry out a maintenance and calibration periodic program following other articles in this code and recommendations from the manufacturer. The measurement equipment will be recalibrated when the security seals are broken or whan any of the internal parameters are changed in digital measurement equipments."

Additional comments	<p>Measurements were undertaken using high precision energy meters located at Providencia Substation. A backup high precision electricity meter should be available at the power plant's warehouse. This measurement will include total electricity delivery by Providencia III power station.</p> <p>Check of the information will be performed by MINEROS S.A. Energy Division at Providencia SHP plant.</p> <p>Prior to 18/05/2017, the MINEROS S.A. power station staff, in an hourly basis, took the readings from the electricity meter in a paper based templates (scanned copy of the format used to carry on the task of recording readings from the electricity meter are presented in files named: scanned paper format reporting *** power delivery all units.xls). Data from the template was aggregated and stored in a daily basis on a spreadsheet and was checked daily by the plant's supervisor. Daily information was sent to El Bagre headquarters where a double check was performed for quality assurance purposes.</p> <p>The records of energy generated were recorded since the start of project.</p> <p>The measurement procedures of electricity supplied to the grid should be in accordance with "Measurement Code", of "Annex CM-I" from Resolution 025/1995 issued by National Commission of Energy and Gas (CREG).</p> <p>Hourly records will be taken by supervisors at Providencia power station in paper formats; daily electricity generation was written in an internal spreadsheet and sent to Mineros S.A. El Bagre Headquarters energy division.</p> <p>After 18/05/2017 the EATON platform recorded on one second basis information from electricity meters. Information was stored on a data base with limited access to relevant staff. Data Base is impossible to modify records, but selected staff is allowed to query on the data base for performance monitoring control of the Providencia III turbines. This report benefits from daily aggregation of records in Eaton Platform.</p>
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Data/Parameter	$EF_{CO2,grid,y} = EF_{Grid,CM,y}$
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	UPME (National Energy and Mining Planning Unit in charge of the calculation of the Colombian grid emissions factor)

Value(s) of monitored parameter	Year	Supporting document	Value	Unit
	2013	<a href="#">Documento de Cálculo del factor de emisión de CO2 del SIN 2008</a>	0.2849	tCO2/MWh
	2014	<a href="#">Documento de Cálculo del factor de emisión de CO2 del SIN 2008</a>	0.2849	tCO2/MWh
	2015	<a href="#">Resolución 91304 de 2014 FE del SIN para MDL</a>	0.3740	tCO2/MWh
	2016	<a href="#">Resolución 857 Dic 24 de 2015</a>	0.3880	tCO2/MWh
	2017	<a href="#">Resolución 843 Dic 23 de 2016</a>	0.4010	tCO2/MWh
	2018	<a href="#">Resolución 804 Dic 26 de 2017</a>	0.3670	tCO2/MWh
	2019	<a href="#">Resolución 774 Dic 28 de 2018</a>	0.3800	tCO2/MWh
	2020	<a href="#">Resolución 642 Dic 27 de 2019</a>	0.3810	tCO2/MWh
	<a href="https://www1.upme.gov.co/siame/Paginas/calculo-factor-de-emision-de-Co2-del-SIN.aspx">Source: https://www1.upme.gov.co/siame/Paginas/calculo-factor-de-emision-de-Co2-del-SIN.aspx</a>			
Monitoring equipment	Gathering of official resolutions setting the National grid emissions factor.			
Measuring/reading/recording frequency	This PDD used Resolution 180947 for ex ante calculations of project activity emissions reductions. PPs gathered the yearly official decisions regarding the National Grid Emissions factor recalculation billed yearly by the Ministry of the Environment and the UPME resolutions (a Resolution is the Spanish name for a technical law billed by a governmental institution in Colombia).			
Calculation method (if applicable)	The Colombian Ministry of the Environment and UPME use the latest tool for calculations of an electricity grid emissions factor.			
QA/QC procedures	Emissions factor is taken from official documents setting the National grid emissions factor which overpasses multiple revision levels.			
Purpose of data/parameter	Calculation of baseline emissions reductions.			
Additional comments	The data will be stored for a period of two years after the verification.			

### D.3. Implementation of sampling plan

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No sampling plan is used

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

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

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Emission reductions are calculated as per formula

$$ER_y = BE_y - PE_y - LE_y$$

Where:

$ER_y$  Emission reductions in year  $y$  (t CO<sub>2</sub>e/y)

$BE_y$  Baseline Emissions in year  $y$  (t CO<sub>2</sub>/y)

$PE_y$  Project emissions in year  $y$  (t CO<sub>2</sub>/y)

$LE_y$  Leakage emissions in year  $y$  (t CO<sub>2</sub>/y)

And

$$BE_y = EG_{BL,y} * EF_{CO_2,y} \quad (1)$$

Where:

$BE_y$  Baseline emissions in year  $y$  (t CO<sub>2</sub>)

$EG_{BL,y}$  Quantity of net electricity displaced as a result of the implementation of the CDM project activity in year  $y$  (MWh)

$EF_{CO_2,y}$  Emission factor (tCO<sub>2</sub>/MWh)

- Emission factor of a grid shall be calculated as per the procedures provided in AMS-I.D;
- For a mini-grid system other than described in paragraph 13 above, the baseline emission factor shall be determined as per the weighted average emissions for the current generation mix following the procedure provided in AMS-I.D;
- Emission factor for captive electricity generation shall be calculated as per the procedures described in the latest version of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption"

Table below summarizes yearly electricity generation. On-site visit, confirmed that paper records used prior to may 2017 had the same information as excel files attached to this monitoring report. The Eaton monitoring platform used after May 2017 contains per second records of electricity generation meters.

year	P.III (UG.6)		P.III (UG.7)		P.III (UG.6+UG.7)	Emissions Factor [tCO <sub>2</sub> e/MWh]	Emission Reductions [tCO <sub>2</sub> ]
	Generation [MWh]	Generation [kWh]	Generation [MWh]	Generation [kWh]	Generation [MWh]		
Mar.12 - Dic.31 2015	16,074	16,073,872	11,771	11,770,622	27,486	0.374	10,280
Ene.1 - Dic.31 2016	28,389	28,389,005	30,648	30,648,081	58,278	0.388	22,612
Ene.1 - Dic.31 2017	31,547	31,547,325	36,181	36,181,245	66,858	0.401	26,810
Ene.1 - Dic.31 2018	31,437	31,436,571	33,612	33,611,885	64,212	0.367	23,566
Ene.1 - Dic.31 2019	36,726	36,725,730	34,105	34,104,644	69,920	0.38	26,569
Ene.1 - Nov.24 2020	32,032	32,031,521	32,693	32,693,446	63,893	0.381	24,343
<b>Total</b>							134,180

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

&gt;&gt;

No project emissions are considered as per methodology AMS-IF v2

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

&gt;&gt;

No leakage emissions are considered as per methodology AMS-IF v2

**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>	134,180	0	0	0	134,180	134,180

**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)
134,180	261425

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

&gt;&gt;

Three reasons related with the three deviations requested by means of this monitoring report explains the reason if the difference between the amount of emission reductions achieved in this monitoring period and the estimated amount of emissions reductions presented in the original PDD:

1. Requested Change in the start date of crediting period: It was expected operation of the Providencia III started on 25/05/2013. However, construction process delay postponed start of operation until 12/03/2015.
2. Requested change in permanent deviation of the project design: Total installed capacity of the installed turbines 6 and 7 of the Providencia III SHP station is 11.16MWe, while the original PDD considered total power output of 9.11MWe. Total yearly electricity generation for the installed capacity considering 86% load factor results in 84075 MWh/y versus 65439MWh/y estimated in the original PDD
3. Requested change in permanent deviation of the monitoring plan: remove the condition of fixed ex-ante Grid Emissions Factor. Original PDD fixed ex-ante emissions factor to 0.2849tCO<sub>2</sub>e, the National grid emissions factor calculated and billed through Resolución 180946 Jun.4/2010. Since National Grid Emissions factor has increased in time due to expansion in use of fossil fuel capacity for electricity generation in Colombia, limiting emissions factor for this project activity to 0.2849tCO<sub>2</sub>e as stated in Resolución 180946 would result in an overly conservative calculation of emission reductions. In addition, also results in an under estimation of emission reduction in Colombia, under valuating emission reduction efforts for the National Emission Reductions Accounting System (RENARE for its acronym in Spanish). If the currently Installed capacity were calculated along with the yearly approved/settled value of the National Grid Emissions factor, the resulting amount of emission reductions would have been 35402 tCO<sub>2</sub> emissions reduced as per this project activity while this monitoring

report for the Providencia I project activity claims for 29981 tCO<sub>2</sub> emissions reduced; therefore,.

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

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Already explained in section E.5. above

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

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In none of the years for the crediting period calculated overpasses 60 thousand tCO<sub>2</sub>e taking into account approval of deviations solicited to the board by means of this monitoring report.

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#### 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 small-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>



<i>Version</i>	<i>Date</i>	<i>Description</i>
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.
Decision Class: Regulatory Document Type: Form Business Function: Issuance Keywords: monitoring report		