



**Monitoring report form for CDM project activity  
(Version 08.0)**

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

**MONITORING REPORT**

<b>Title of the project activity</b>	Candelaria Hydroelectric Project		
<b>UNFCCC reference number of the project activity</b>	0604		
<b>Version number of the PDD applicable to this monitoring report</b>	10		
<b>Version number of this monitoring report</b>	1		
<b>Completion date of this monitoring report</b>	31/05/2021		
<b>Monitoring period number</b>	9 <sup>th</sup> monitoring period (3 <sup>rd</sup> monitoring period of the 2 <sup>nd</sup> Crediting Period)		
<b>Duration of this monitoring period</b>	01/01/2019 to 31/12/2020 24 months		
<b>Monitoring report number for this monitoring period</b>	NA		
<b>Project participants</b>	Hidroeléctrica Candelaria, S.A.(Host) Ecoinvest Carbon (Other)		
<b>Host Party</b>	Guatemala		
<b>Applied methodologies and standardized baselines</b>	AMS-I.D. Grid Connected renewable electricity generation (version 17)		
<b>Sectoral scopes</b>	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 until 31 December 2020	Amount achieved from 1 January 2021
	0	20,767 tCO <sub>2</sub> e	0
<b>Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD</b>	23,600 tCO <sub>2</sub> e		

## SECTION A. Description of project activity

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

- **Purpose of the project activity and measures taken for GHG emissions reductions**

The objective of the project activity is to generate renewable electricity using hydrological resources and to sell the generated output to the national grid. The project has the capacity to reduce CO<sub>2</sub> emissions by avoiding electricity generation by the fossil fuel-fired power plants connected to the grid.

- **Brief description of the installed technology and equipment**

The project has an installed capacity of 4.3 MW<sup>1</sup> and utilizes water from the Trece Aguas River. Currently, this watercourse is also utilized for electricity generation in an existing 16 MW hydropower plant (Secacao) located upstream of Candelaria plant. Secacao plant was developed in 1998 and is owned and operated by Candelaria's sponsors.

Total differential altitude (head) between the head pond and the turbine/generator of Candelaria is approximately 130 meters. The project consists of a 4.456 MW Francis type turbine, a 430-meter-long tunnel, a 770-meter-long penstock. The water used, once having gone through both plants, is returned to the original river basin downstream.

The plant delivers electricity to the Guatemalan National Electric Grid and is connected to it through a 69-kilovolt transmission line. The plant has the capacity to deliver part of its output locally, when required, through an existing 13.8 kilovolt distribution line owned by a Utility serving this rural area, thus giving access to electricity to several local communities.

- **Total GHG emission reductions achieved in this monitoring period**

The calculation of the emissions reductions is based on validated and registered parameters in the PDD and justified during the validation. The baseline combined margin emission factor for Candelaria Hydroelectric plant is 0.4833 tCO<sub>2</sub>/MWh.

Total emission reductions achieved in the third monitoring period of the second crediting period from 01/01/2019 to 31/12/2020 is 20,767 tCO<sub>2</sub>e.

### A.2. Location of project activity

The Candelaria Hydroelectric plant is in the north-central area of Guatemala. The project is located on the Polochic River Valley, in the Department (State) of Alta Verapaz, Municipality of Senahú around 200 kilometres North-east of Guatemala City.

The geographical coordinates are: 15.38695, -89.75510

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<sup>1</sup> The installed capacity of the hydroelectric plant is determined and delimited by the capacity of the generator. As indicated by the manufacturer of the generator of Candelaria, the generator has an apparent power of 5,397 kVA and a power factor of 0.8. The maximum output capacity of the generator is the real power (in kW) and results from multiplying the apparent power (in kVA) by the power factor, as follows: 5,397 kVA × 0.8 = 4,318 kW = 4.3 MW.



Figure 1. Alta Verapaz Department, Guatemala

### A.3. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Guatemala (host)	Hidroeléctrica Candelaria, S.A. (private)	No
Switzerland (other)	Ecoinvest Carbon, S.A. (private)	No

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

The project activity does not use a standardized baseline.

- “AMS-I.D. Grid connected renewable electricity generation, version 17.0 (<http://cdm.unfccc.int/methodologies/DB/RSCTZ8SKT4F7N1CFDXCSA7BDQ7FU1X>)

In addition, the following tool is applicable to the project activity:

- “Assessment of debundling for small-scale project activities” - for debundling assessment – Version 4.0. <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-20-v1.pdf>
- “Tool to calculate the emission factor for an electricity system” - for the calculation of emissions factor – Version 4.0. <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v6.pdf>
- “Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period” – Version 3.0.1

## A.5. Crediting period type and duration

Type: Renewable crediting period (7 years x 3)

Starting date: 01/01/2014

Length: 7 years

Crediting period: 01/01/2014 to 31/12/2020

## SECTION B. Implementation of project activity

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

#### a) Description of the installed technologies, technical processes and equipment

The Candelaria Hydroelectric Project has an installed capacity of 4.3 MW and 130 meters of net head utilizing water from the Trece Aguas River. The water flows through a tailrace channel from where it enters a 430-meter-long tunnel. The water then runs through a head pond and into a 770 meters long penstock, and finally propels in a 4.456 MW Francis type turbine located at Candelaria's power house. The water used is returned to the original river basin downstream.

The plant delivers electricity to the Guatemalan National Electric Grid and it is connected to a 69-kilovolt transmission line. It has also the capacity to deliver, when required, part of its output locally through an existing 13.8 kilovolt distribution line, giving access to electricity to several local communities.

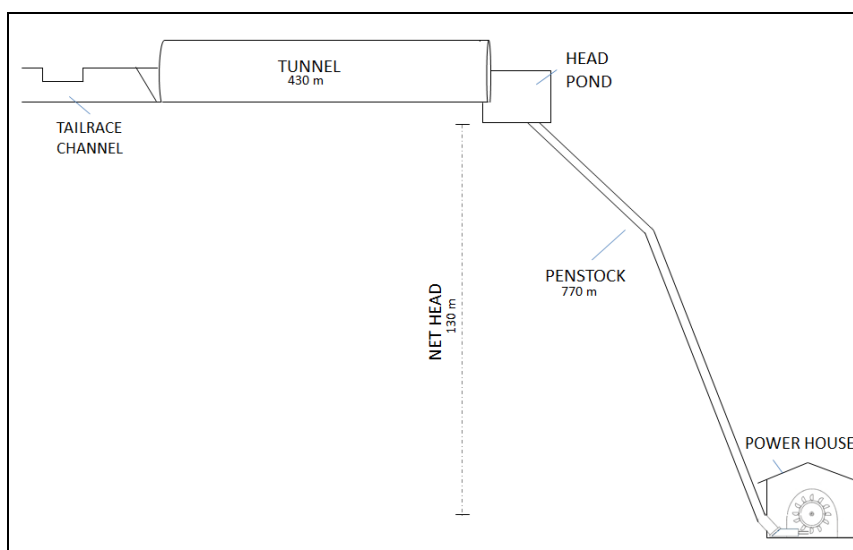


Figure 2. Candelaria's outline

No exchange of electric generation equipment was made on these maintenance periods nor during this monitoring report period. The plant continues operating with the same electric generation equipment as indicated in the registered PDD.

#### b) Relevant dates for the project activity (e.g. construction, commissioning, continued operation periods, etc.)

The construction of Candelaria Hydroelectric Project began in January 2005 as indicated in the PDD . The commissioning took place from 12/06/2006 to 30/06/2006, to successfully start power

generation on 01/07/2006. Since 2006, Candelaria Hydroelectric plant has been continuously operating and delivering energy to the National Grid.

Every year, the operations management executes the annual programmed maintenance between April and May. On 2019, the annual programmed maintenance started on April 25 and finished on May 12; on 2020, it started on April 16 and finished on April 21.

The Project was registered under the Clean Development Mechanism on 09/11/2006, starting its first crediting period on 01/01/2007. The second crediting period started on 01/01/2014, with the renewable date on 12/04/2014.

## **B.2. Post-registration changes**

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

Not applicable.

### **B.2.2. Corrections**

Not applicable.

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

Not applicable.

### **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**

Not applicable.

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

Approval date: 28 Mar 14

Reference number: PRC-0604-001

The project installed capacity did not change during this monitoring period regarding the registered project design, since it is determined and delimited by the capacity of the generator, which has a maximum output capacity of 4.3 MW (result of multiplying the apparent power of 5,397 kVA and the power factor of 0.8).

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

Not applicable.

## SECTION C. Description of monitoring system

Equipment used to measure the energy produced by the Candelaria Hydroelectric Plant consists in a main and a backup meter. This is in line with the stipulations described in the Commercial Coordination Norm, No. 14, (NCC-14) issued by the Wholesale Market Administrator (Administrador del Mercado Mayorista - AMM)<sup>2</sup>, clauses 14.2 and 14.6.

Data is measure using the following commercial electricity meters:

Features	Main meter	Back-up meter
<b>Model</b>	ION8650	ION8650
<b>Manufacturer</b>	Power Logic (Schneider Electric)	Power Logic (Schneider Electric)
<b>Commercial serial number</b>	F-76197	F-76198
<b>Manufacturer serial number</b>	MW-1610A743-02	MW-1610A744-02
<b>Calibration date during monitoring period</b>	17/01/2019	17/01/2019

The metering units are shown in the following diagram.

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<sup>2</sup> The Wholesale Market Administrator (Administrador del Mercado Mayorista) is the entity in charge of dispatching and programming the operation and coordination of the National Power Grid.

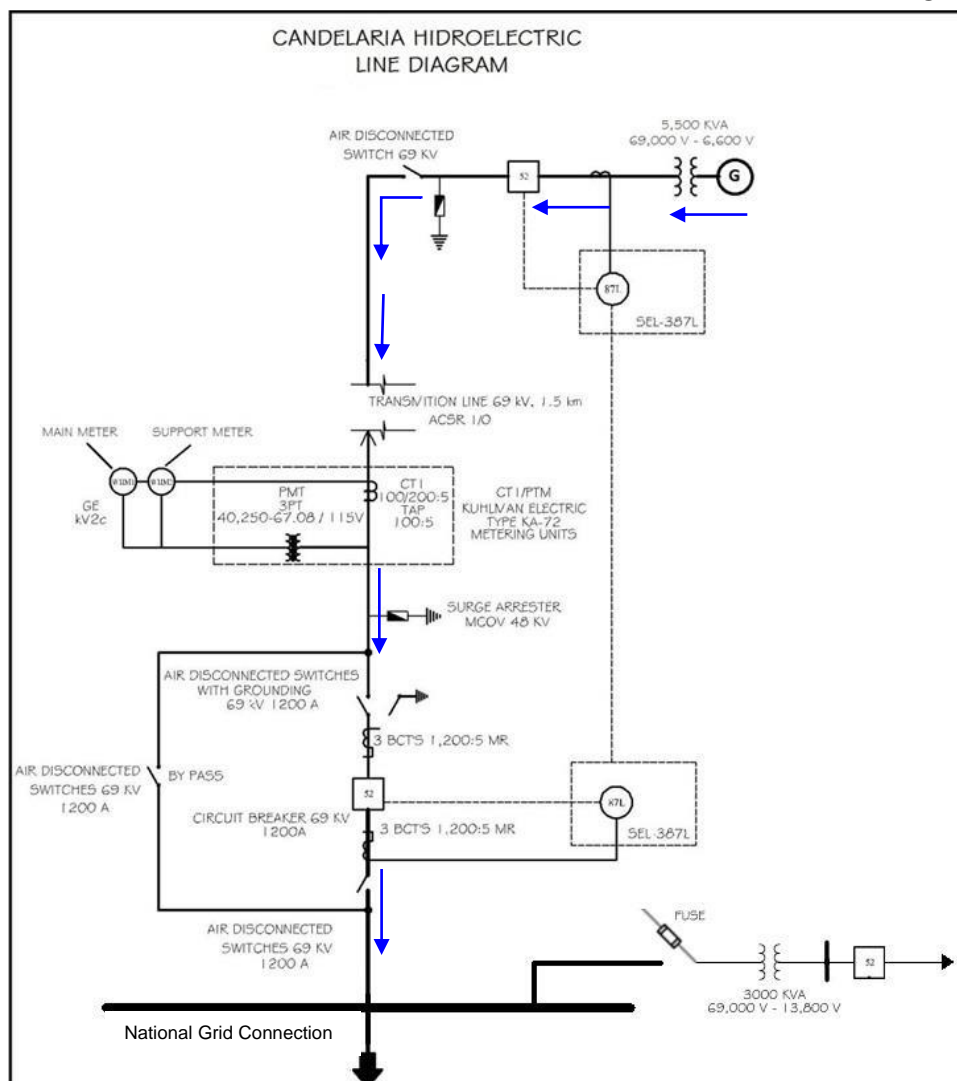


Figure 3. Candelaria Hydroelectric Line Diagram

- **Data quality obtained from the energy meters**

As set forth, by the Wholesale Market Administrator, in the Commercial Coordination Norm number 14 (NCC-14), clause 14.12, the Wholesale Market Administrator is in charge of verifying the commercial meters and associated installations of the producer agent at least once a year, in order to guarantee the precision and quality required. If the results of the verification show inaccuracy and imprecision in the energy measurement, then the producer agent will be notified and a corrective action (defined in the NCC-14) should be taken. (Verification's results are notified to the producer agent just in those cases when an accuracy and precision problem is detected).

Additionally, as an internal quality control procedure, to guarantee the precision and quality required, a verification of the calibration of both commercial meters used in Candelaria Hydroelectric Project is executed periodically by the meteorology lab METRIC.

- **Data collection and monitoring procedures**

Energy data of the Candelaria Hydroelectric Project are monitored, captured, and recorded by three different procedures. Each procedure and data collected are also verified by different

persons to ensure the accuracy of measured data. Procedures used to collect, monitor, and register the data of the produced energy are described below.

Each process is fed by an input and consists of a series of activities that produce a result or output. The following chart illustrates how the monitoring processes are interrelated:

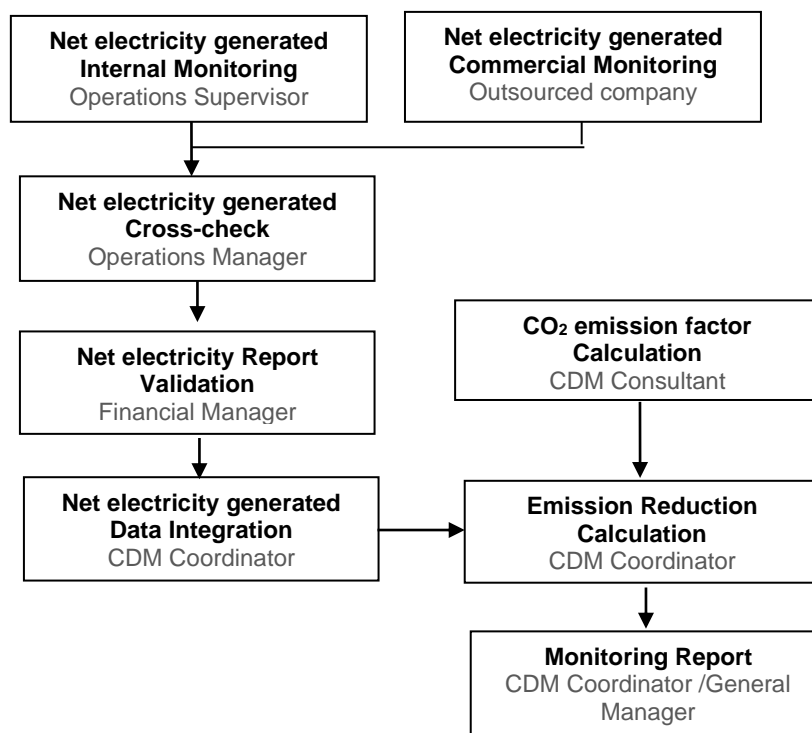


Figure 4. Monitoring System Process

### 1. Monthly Readings Procedure for Commercial Monitoring Purposes and Emission Reduction Calculation

**Source of data:** Main and Support commercial meters

**Responsible of quality data:** Operations Manager

**Purpose of collected data:** Energy sales

#### Procedure:

On the first days of every month, for billing purposes, the Operations Manager gets the hourly reading and quarterly hours monthly report from Enérgica<sup>3</sup>, for his review and validation. The Operation Manager crosscheck the data from Enérgica against the data from the internal monitoring process. This report allows the calculation of that month generated energy.

The validated report is sent to the Financial Manager, General Manager Assistant, Candelaria's Client, and AMM's Measuring Coordinator, for their revision and reference. Commercial invoice is issued by Candelaria Hydroelectric plant for the energy provided to the national grid, based on the monthly validated report.

For commercial monitoring purposes, the AMM also has remote access to the main and support meters.

<sup>3</sup> Company that provides Candelaria Hydroelectric the service of remote main meter lectures on real time.



## 2. Hourly and Daily Readings Procedure for Internal Monitoring Purposes

**Source of data:** SCADA system / Main and Support commercial meters

**Responsible of quality data:** Operations Supervisor

**Purpose of collected data:** Internal control

### Procedure:

SCADA system reports permanently the instantaneous power and other generation conditions. This system works using a computer with SCADA (Supervisory Control and Data Acquisition) software, connected to a PLC (Programmable Logic Controller) device that automatically captures the information and converts it to data. This generation data is available to the operator continuously 24 hours a day on the computer screen. The Operator is responsible for transcribing the hourly data to the "Operation Control Sheets", which are kept in the Control Room of the plant.

Besides this, at 00:00hrs, the Operator takes directly visual meter readings (from the main commercial meter). The difference from the previous day's reading and the current reading corresponds to the energy produced over that day.

In addition, an internal daily report is made by an automatic Data Monitoring System (Sistema de Monitoreo de Información –SIMON-), which is fed by the Operator with the SCADA and the commercial meter data. This program allows the access to updated data and graphics of the daily, weekly, monthly and yearly power and energy produced by Candelaria Hydroelectric Plant.

## 3. Yearly Data Collection Procedure

**Source of data:** Monthly commercial invoice reports

**Responsible of quality data:** CDM Coordinator

**Purpose of collected data:** Baseline emissions calculation

### Procedure:

In order to prepare the monitoring report to calculate the total energy produced by the Candelaria Hydroelectric Plant and estimate the baseline emission reductions, the Financial Division and CDM Division collect in a single report all the monthly reports used for billing purposes in an Excel spreadsheet, calculating the annual emission reductions. This report is reviewed and approved by the General Manager.

## SECTION D. Data and parameters

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

<b>Data/Parameter</b>	$EF_{CO_2, grid, y} / E_{grid, CM, y}$
<b>Unit</b>	tCO <sub>2</sub> /MWh
<b>Description</b>	CO <sub>2</sub> emission factor of the grid electricity in year y / Combined Margin CO <sub>2</sub> emission factor of the grid electricity in year y
<b>Source of data</b>	Data provided by the Wholesale Market Administrator (official source)
<b>Value(s) applied</b>	0.4833
<b>Choice of data or measurement methods and procedures</b>	In accordance with paragraph 12 of the methodology, Option (a) was selected: a combined margin, consisting of the combination of operating margin and build margin is calculated based on the procedures prescribed in version 04.0 of the "Tool to calculate the emission factor for an electricity system".

Purpose of data/parameter	Data used to calculate baseline emissions.
Additional comments	Data updated at the time of submission of the request for renewal of the crediting period to the DOE. No monitoring and recalculation of the emission factor during the second crediting period is required.

<b>Data/Parameter</b>	$EF_{CO_2,m/k,i,y} / EF_{CO_2,m,i,y}$
Unit	tCO <sub>2</sub> /GJ
Description	Average CO <sub>2</sub> emission factor of fuel type <i>i</i> used in power unit <i>m</i> or <i>k</i> in year <i>y</i> .
Source of data	Data from the 2006 IPCC Guidelines on National GHG Inventories, Table 1.4, Chapter 1, Vol. 2 (Energy).
Value(s) applied	See Appendix 4 of the PDD.
Choice of data or measurement methods and procedures	According to version 04.0 of the “Tool to calculate the emission factor for an electricity system”, if there is no data from fuel supplier of the power plants in invoices or local average default values, IPCC default values at the lower limit of the uncertainty at a 95 per cent confidence interval should be used. In accordance with the Tool, where several fuel types are used in the power unit, the fuel type with the lowest CO <sub>2</sub> emission factor is used.
Purpose of data/parameter	Data used to calculate baseline emissions.
Additional comments	For the simple adjusted OM emission factor calculation: data updated once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation or request for renewal of the crediting period (ex-ante option). For the BM emission factor calculation: for the first crediting period, data determined once ex ante, based on the most recent information available on units already built for sample group <i>m</i> at the time of PDD submission to the DOE for validation. For the second and third crediting period, data updated only once ex ante at the start of the second crediting period, based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE.

<b>Data/Parameter</b>	$EG_{m,y} / EG_{k,y}$
Unit	MWh
Description	Net quantity of electricity generated and delivered to the grid by power unit <i>m</i> or <i>k</i> in year <i>y</i>
Source of data	Data provided by the Wholesale Market Administrator (official source).
Value(s) applied	See Appendix 4 of the PDD.
Choice of data or measurement methods and procedures	According to version 04.0 of the “Tool to calculate the emission factor for an electricity system”, data from utility or government records or official publications should be used.
Purpose of data/parameter	Data used to calculate baseline emissions.
Additional comments	For the simple adjusted OM emission factor calculation: data updated once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation or request for renewal of the crediting period (ex-ante option). For the BM emission factor calculation: for the first crediting period, data determined once ex ante, based on the most recent information available on units already built for sample group <i>m</i> at the time of PDD submission to the DOE for validation. For the second and third crediting period, data updated only once ex ante at the start of the second crediting period, based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE.

<b>Data/Parameter</b>	$\eta_{m/k,y} / \eta_{m,y}$
Unit	-
Description	Average net energy conversion efficiency of power unit <i>m</i> or <i>k</i> in year <i>y</i>
Source of data	Data from the Appendix 1 of the "Tool to calculate the emission factor for an electricity system" (version 04.0).
Value(s) applied	See Appendix 4 of the PDD and the attached spreadsheet named "Grid EF and ER_Candelaria_Simple Adjusted OM 27Dec13".
Choice of data or measurement methods and procedures	According to version 04.0 of the "Tool to calculate the emission factor for an electricity system", if the efficiencies are not directly available for the power plants, default values from the Appendix 1 of the Tool should be used.
Purpose of data/parameter	Data used to calculate baseline emissions.
Additional comments	Data determined once for the crediting period.

## D.2. Data and parameters monitored

Data/Parameter	EGBL,y																	
Unit	MWh																	
Description	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y.																	
Measured/calculated/default	Measured																	
Source of data	Electricity meters onsite																	
Value(s) of monitored parameter	<table><tr><td>Year</td><td>E<sub>facility,y</sub></td></tr><tr><td>2019</td><td>19,469 MWh</td></tr><tr><td>2020</td><td>23,502 MWh</td></tr><tr><td><b>Total</b></td><td><b>42,971 MWh</b></td></tr></table> <p>(Hourly readings from 01/01/2019 to 31/12/2020. Details are shown in Excel spreadsheet titled “Energy data and CERs calc. – 3<sup>rd</sup> MP – 2<sup>nd</sup> CP”)</p>			Year	E <sub>facility,y</sub>	2019	19,469 MWh	2020	23,502 MWh	<b>Total</b>	<b>42,971 MWh</b>							
Year	E <sub>facility,y</sub>																	
2019	19,469 MWh																	
2020	23,502 MWh																	
<b>Total</b>	<b>42,971 MWh</b>																	
Monitoring equipment	Data measured using the following commercial electricity meters: <table><tr><td></td><td>Main Meter</td><td>Back up Meter</td></tr><tr><td>Model:</td><td>ION8650</td><td>ION8650</td></tr><tr><td>Brand:</td><td>Power Logic</td><td>Power Logic</td></tr><tr><td>Serial number:</td><td>F-76197</td><td>F-76198</td></tr><tr><td>Manufacturer serial number:</td><td>MW-160A743-02</td><td>MW-1610A744-02</td></tr></table>				Main Meter	Back up Meter	Model:	ION8650	ION8650	Brand:	Power Logic	Power Logic	Serial number:	F-76197	F-76198	Manufacturer serial number:	MW-160A743-02	MW-1610A744-02
	Main Meter	Back up Meter																
Model:	ION8650	ION8650																
Brand:	Power Logic	Power Logic																
Serial number:	F-76197	F-76198																
Manufacturer serial number:	MW-160A743-02	MW-1610A744-02																
Measuring/reading/recording frequency	Data monitored continuously, measured hourly and daily, and recorded hourly, daily, monthly and yearly.																	
Calculation method (if applicable)	Not applicable.																	

QA/QC procedures	<ul style="list-style-type: none"> <li>A cross-check procedure is followed, in which the monitored data is compared monthly with the commercial data (electricity invoices or AMM's Monthly Transactions Report), and the monitored data is compared with the data registered manually by the plant operator.</li> <li>According to the Commercial Coordination Norm number 14 (NCC-14), clause 14.12, "Periodic Verifications", issued by the Wholesale Market Administrator (<i>Administrador del Mercado Mayorista</i>, AMM), meters and related equipment verifications/audits are carried out annually in order to guarantee the precision and quality required. If the results of the verification show inaccuracy and imprecision in the energy measurement, then the producer agent is notified and a corrective action (defined in the NCC-14) should be taken. Additionally, as an internal quality control procedure, in order to guarantee the precision and quality required, a verification of the calibration of both commercial meters used in Candelaria Hydroelectric Project is executed periodically, by a metrology lab.</li> </ul>
Purpose of data/parameter	Data used to calculate baseline emissions.
Additional comments	Verifications of the calibration of both commercial meters were performed by the meteorology lab METRIC on January 17, 2019. The calibration process was executed according to the COGUANOR NGR/ISO/IEC 17025 – 2005 national standard and the ANSI C12-20-2015 (American National Standard for Electricity Meters 0.1, 0.2 and D.5 Accuracy Classes). The emission reduction calculation periods, not covered by the one-year validity calibration, were adjusted with a correction factor (0.2%) for conservative purposes.

### D.3. Implementation of sampling plan

Not applicable.

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

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

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y(1)$$

Where:

<b>ER<sub>y</sub></b>	=	Emission reductions in year y (tCO <sub>2</sub> )
<b>BE<sub>y</sub></b>	=	Baseline emissions in year y (tCO <sub>2</sub> )
<b>PE<sub>y</sub></b>	=	Project emissions in year y (tCO <sub>2</sub> )
<b>LE<sub>y</sub></b>	=	Leakage emissions in year y (tCO <sub>2</sub> )

As per the registered PDD, the ex-ante calculation of the combined emission factor is **0.4833 tCO<sub>2</sub>/MWh**. This value is considered fixed throughout the second crediting period.

The net electricity delivered to the grid, generated by Candelaria during the 3<sup>rd</sup> Monitoring Period of the 2<sup>nd</sup> Commitment Period is summarized in the next table. A complete report of the delivered electricity is shown in the attached "*Energy data and CERs calc. – 3<sup>rd</sup> MP – 2<sup>nd</sup> CP*" spreadsheet.

**Candelaria Hydroelectric Plant**  
**Monthly Net Electricity Delivered to the Grid**

Period: January 2019 to December 2020, 3rd Monitoring Period 2nd CP

Year	Month	MWhour
2019	January	1,621
	February	1,295
	March	1,213
	April	842
	May	828
	Jun	1,464
	Jul	1,883
	Ago	1,798
	Sep	2,065
	Oct	2,656
	Nov	1,983
	Dic	1,820
2020	January	1,608
	February	1,297
	March	1,318
	April	915
	May	1,144
	Jun	1,848
	Jul	2,019
	Ago	2,642
	Sep	2,568
	Oct	2,371
	Nov	2,818
	Dic	2,952
<b>TOTAL</b>		<b>42,971</b>

**Table 1. Candelaria's Monthly Generation**

The emission reductions calculated for this Monitoring Period are as follows:

Parameter	$EF_{grid,CM,y}$ (tCO <sub>2</sub> /MWh)	$EG_{BL,y}$ (MWh/year)	$ER_y$ (tCO <sub>2</sub> )
Data	0.4833	42,971	20,767

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

As per the methodology, project emissions in year  $y$  ( $PE_y$ ) for hydroelectric power projects without reservoir are null. Thus,  $PE_y = 0$ .

## E.3. Calculation of leakage emissions

As per the methodology, as energy generating equipment was not transferred from another activity, the leakage emissions are null. Thus,  $LE_y = 0$ .

**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 until 31/12/2020	From 01/01/2021	Total amount
<b>Total</b>	20,767	0	0	0	20,767	0	20,767

**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)
20,767 tCO <sub>2</sub> e	23,600 tCO <sub>2</sub> e

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

Emission reductions were calculated as follows:  $BE_y = E_{GBL, y} \times EF_{CO_2, grid, y}$

Where:

$BE_y$  = Baseline emission in year y (tCO<sub>2</sub>)

$E_{GBL, y}$  = Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)

For the ex ante calculation of emission reductions, the quantity of net electricity supplied to the grid was estimated based on historical data of real electricity delivered by Candelaria plant. The annual average net electricity delivered by the plant from 2007 to 2012 is 24,415 MWh.

$EF_{grid, CM, y}$  = CO<sub>2</sub> emission factor of the grid in year y (tCO<sub>2</sub>/MWh)

$EF_{grid, CM, y} = EF_{grid, OM, y} \times w_{OM} + EF_{grid, BM, y} \times w_{BM}$

According to the Tool, for hydroelectric power generation projects the weights applied for the second crediting period are:  $w_{OM} = 0.25$  and  $w_{BM} = 0.75$ .

The OM emission factor was determined as a 3-year generation-weighted average, based on the most recent data available at the time of submission of the request for renewal of the crediting period to the DOE. Specifically, data from years 2010, 2011 and 2012 were used, and the resulting OM emission factor was 0.8085 tCO<sub>2</sub>/MWh.

The BM emission factor was determined based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. Specifically, data from year 2012 was used, and the resulting BM emission factor was 0.3750 tCO<sub>2</sub>/MWh. Thus, the resulting CM emission factor was 0.4833 tCO<sub>2</sub>/MWh.

As a consequence, the annual value of emission reductions estimated ex ante for the project activity was 11,800 tCO<sub>2</sub> per year, which results in 23,600 tCO<sub>2</sub>e for a 2-year period.

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

The actual emission reductions achieved during the current monitoring period have been lower than expected in the registered CDM-PDD.

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

Project activity consists just of Candelaria Hydroelectric Project (4.3 MW), and not a bundle of project activities. Since there has not been any changes to Candelaria's installed capacity, the project activity remains under the limit of that type (15 MW).

## Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
08.0	6 April 2021	Revision to: <ul style="list-style-type: none"> <li>• Reflect the "Clarification: Regulatory requirements under temporary measures for post-2020 cases" (CDM-EB109-A01-CLAR).</li> </ul>
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>
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).



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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		