

MONITORING REPORT

August 14th, 2009 - v1

La Cascada 2.3 MW Hydroelectric Project

(UNFCCC #1411)

Monitoring Period, January 27th, 2008 to August 31st, 2009

Crediting Period, January 27th, 2008 to January 26th, 2018

Project Participants

Prestadora de Servicios Públicos La Cascada S.A. E.S.P.

MGM Carbon Portfolio S.a.r.l.

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Table of Contents

1. INTRODUCTION	3
2. DESCRIPTION OF THE PROJECT ACTIVITY.....	3
3. PROJECT LOCATION.....	3
4. APPLIED METHODOLOGY	4
5. MONITORING PLAN IMPLEMENTATION.....	4
5.1 - Variables under monitoring.....	5
5.2 - Not monitored data.....	7
6. FORMULAS USED FOR CALCULATION OF EMISSION REDUCTIONS	7
7. EMISSION REDUCTIONS CALCULATION.....	8
7.1 - Power generation by La Cascada hydroelectric plant:	8
7.2 - Combined margin emission factors calculation.....	8
7.3 - Achieved emission reductions	9

Monitoring Report La Cascada 2.3 MW Hydroelectric Project

1. INTRODUCTION

The purpose of the present monitoring report is to show the calculation of the emission reductions achieved by the implementation of the project activity. The monitoring period ranges from January 27th, 2008 through August 31st, 2009. Emission reductions are calculated and claimed for the mentioned monitoring period. The crediting period of the project activity is January 27th, 2008 to January 26th, 2018 (fix).

The report also shows the Monitoring and Verification Plan for data collection and auditing followed by Prestadora de Servicios Públicos La Cascada S.A. E.S.P. in order to determine real and credible emission reductions.

The project was registered by the CDM Executive Board on January 27th, 2008. It can be found in <http://cdm.unfccc.int/Projects/DB/DNV-CUK1194339650.07/view>

2. DESCRIPTION OF THE PROJECT ACTIVITY

The purpose of the project activity is to build a hydroelectric power plant with a total installed capacity of 2.3 MW, in order to take advantage of the capacity of the Guacas River.

The project would displace other generation sources connected to the local grid that use fossil fuels to produce energy. The project provides clean energy and reduces CO₂ emissions in Colombia.

The following table shows a description of the technology that was included in the registered PDD:

Table 1: Technical characteristics of La Cascada Hydroelectric Project

Characteristic	Value
Installed Capacity	2.3 MW
Design flow rate	3 m ³ /s
Head	100 m
Hydraulic turbine	Francis, horizontal axis
	One unit

3. PROJECT LOCATION

The project activity is located in San Roque Jurisdiction, Antioquia Department, Colombia Republic, and utilizing water from the Guacas River.

The river basin of the Guacas stream is located in the northeast of Antioquia Department, on the eastern slope of the central mountain range covering the territory of San Roque Jurisdiction; with a utility area of 63 km² before its opening to the Nus River. The project geographical localization is 6°30'37.5" N and 74°55'3.2" W at 700 m of the small town Providencia.

Monitoring Report La Cascada 2.3 MW Hydroelectric Project

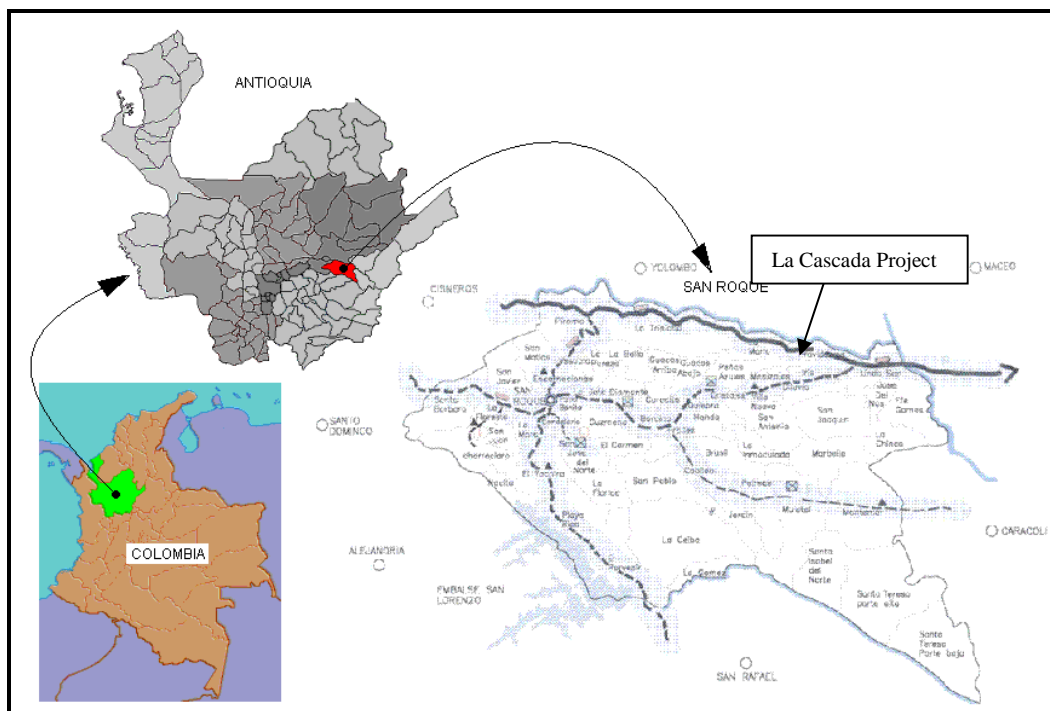


Figure 1: Colombia, Antioquia Department and San Roque

4. APPLIED METHODOLOGY

The methodology applied to the registered CDM project activity is *AMS-I.D (version 10): "Grid Connected Renewable Electricity Generation"*.

Baseline emissions are calculated applying the combined margin emission factor (CM), calculated as the combination of the operating margin (OM) and the build margin (BM). The chosen method to calculate the OM is **option b) Simple Adjusted**. Both, the OM and BM chose **option 2) ex post data**.

The weights applied to the OM and the BM in order to calculate the CM are 0.5 and 0.5 respectively.

5. MONITORING PLAN IMPLEMENTATION

Under the monitoring plan, which was outlined in accordance with the requirements of AMS-I.D Version 10, the variables to be monitored during the crediting period are:

- Electricity generation from the proposed project activity.
- Data needed to recalculate the OM.
- Data needed to recalculate the BM.

Energy measurement are carried out through two energy meters manufactured by Power Measurement, reference ION 8600B (main) and ION 8600C (backup), of 0.2 accuracy, which comply with standards ANSI C12.20-1998 "American national standard for electrical meters, 0.2 and 0.5 accuracy classes for current classes 2 and 20" and IEC

Monitoring Report La Cascada 2.3 MW Hydroelectric Project

60687 “Alternating current static watt-hour meters for active energy (classes 0.2 S and 0.5 S)”.

Both meters are connected to an Automatic Control System through a communication network, which allows its access for visualization of energy measures, and by modem, to the electrical distributing company, Empresas Públicas de Medellín S.A. E.S.P. (Utility Company of Medellín). The internal memory in the acquired meters is able to record the history of measured values during an average period of six months.

Energy meters are mounted on a self-supported panel with sealed door and cover to avoid possible connections access by non-authorized personnel.

The following two sub-sections of this report show variables monitored and also not monitored parameters used to calculate the emission reductions from the CDM project.

5.1 - Variables under monitoring

For the calculation of the combined margin emission factor historical data on the most relevant variables are obtained through UPME, XM and CREG.

The following table shows those variables that were monitored during the crediting period, how they were monitored and the quality assurance procedures applied during their monitoring.

Table 3: Data for Baseline Emissions calculation

Data variable	Electricity Generation (EG)
Data unit	MWh
Source	Prestadora de Servicios Públicos La Cascada S.A. E.S.P
Measurement and recording frequency	Data measured continuously, daily checked and registered electronically Please, see table 6 in section 7.1 for the monitored values.
Measurement procedures And Comments about QA/QC	Measurement of Electricity Generation: Electricity generation is measured by electronic electricity meters. The obtained values are cross-checked with the generation measured in terminals and vs. SCADA system (“Supervisory Control And Data Acquisition”). This information is also read remotely. Quality Control and Quality Assurance: Measurement are crosschecked with invoices Calibration of meters: Electricity meters were calibrated at EE.PP.M laboratory in June 2007. The file “CERTIFICADO CALIBRACIÓN CONTADORES.pdf” shows the calibration protocols used to calibrate the meters and the results. Calibration tasks follow national standards and are in accordance with the calibration instructive specified in Colombian standard NTC 4,856 for

Monitoring Report La Cascada 2.3 MW Hydroelectric Project

	electricity metering devices.
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Data variable	<i>Colombian grid emission factor (EF): Combined Margin emission factor (CM)</i>
Data unit	tCO ₂ /MWh
Source	UPME, XM, CREG
Measurement and recording frequency	This variable is calculated as the weighted sum of OM and BM emission factors. Annually updated.
Measurement procedures And Comments about QA/QC procedures	This variable is calculated from official sources, not measured, and therefore does not need specific quality control procedures.

Data variable	<i>Build Margin emission factor (BM)</i>
Data unit	tCO ₂ /MWh
Source	UPME, XM, CREG
Measurement and recording frequency	Annually updated and recorded.
Measurement procedures And Comments about QA/QC procedures	This variable is calculated from official sources, not measured, and therefore does not need specific quality control procedures.

Data variable	<i>Operating Margin emission factor (OM)</i>
Data unit	tCO ₂ /MWh
Source	UPME, XM, CREG
Measurement and recording frequency	Annually updated and recorded.
Measurement procedures And Comments about QA/QC procedures	This variable is calculated from official sources, not measured, and therefore does not need specific quality control procedures.

Monitoring Report La Cascada 2.3 MW Hydroelectric Project

5.2 - Not monitored data

According to Annex 3 Baseline Data of the Registered PDD, the following data are considered fixed along the first crediting period and are therefore not monitored:

Table 4: Not monitored data

Item	Description	Value/Unit	Source
$OXID_i$	Oxidation factor for: Coal Natural gas	0.98 0.995	IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual Volume 3 (1996)
CEF_i	CO ₂ emission factor for: Coal Natural gas	94.6 t CO ₂ /TJ 56.1 tCO ₂ /TJ	IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual Volume 3 (2006)

6. FORMULAS USED FOR CALCULATION OF EMISSION REDUCTIONS

The following table provides the formulas used for calculation of emission reductions:

Table 5: Formulas

Project emissions	
Variable	Formulas
Estimated CO ₂ emissions, PE	No project emissions are considered in the present project.
Baseline emissions	
Variable	Formulas
Estimated CO ₂ emissions in the baseline, BE	<p>They are calculated applying the combined margin emission factor calculation and the energy generated by the plants:</p> $BE_y (tCO_2 / y) = EG_y (MWh / y) \times EF_y (tCO_2 / MWh)$ <p>Where EG_y is the project generation and EF_y is the grid emission factor calculated as the weighted average of the Operating Margin emission factor (EF_{OMy}) and the Build Margin emission factor (EF_{BMy}).</p>
Leakage	
Variable	Formulas
Estimated CO ₂ emissions, LE	No leakage is considered in the present project.

Monitoring Report La Cascada 2.3 MW Hydroelectric Project

Emission Reductions	
Variable	Formulas
CO ₂ emission reductions, <i>ER</i>	<p>Considering that there are neither project emissions nor leakage for the proposed project activity, the annual emission reductions are equal to:</p> $ER_y(tCO_2 / y) = EG_y(MWh / y) \times EF_y(tCO_2 / MWh)$

7. EMISSION REDUCTIONS CALCULATION

It is important to point out that the emission reductions calculated are slightly different from those estimated and included in the PDD. The reasons for this are, on the one hand, that the grid emission factor is updated annually, leading to a difference with the emission factor used ex-ante to estimate the emission reductions presented in the PDD, and on the other hand, the electricity generation used in the PDD was an estimation while the actual generation is used now.

The emission reductions are calculated as per the formulae shown in the previous section. The following tables show the information related to the calculation of emission reductions:

7.1 - Power generation by La Cascada hydroelectric plant:

Table 6: Generation of the plant

Generation (MWh)	2008	2009
January	179 ¹	1,472
February	1,160	551
March	1,060	1,434
April	856	1,328
May	1,020	1,536
June	1,454	1,383
July	1,138	1,349
August	1,428	1,200 ²
September	1,437	
October	1,618	
November	1,311	
December	1,674	
Total per year	14,335	10,253

7.2 - Combined margin emission factors calculation

¹ For year 2008, January generation was accounted for from the registration date (period 27th - 31st)

² Official data for August 2009 was not yet available. The figure used is an internal value and will be confirmed or adjusted when official value is published.

Monitoring Report La Cascada 2.3 MW Hydroelectric Project

Operating Margin Calculation

According to the methodology and as explained in the PDD, it was calculated applying the Simple Adjusted method (option B) and updated annually *ex-post*:

Year 2008 OM: **0.4633** tCO₂/MWh

Build Margin Calculation

According to the methodology and as explained in the PDD, this factor is updated annually *ex-post*:

Year 2008 BM: **0.2261** tCO₂/MWh

Combined Margin Calculation

Applying a 0.5 weight for both the operating margin and the build margin, the combined margin emission factors for the Colombian grid is:

Year 2008 CM: **0.3447** tCO₂/MWh

Please refer to the corresponding files to see the calculation of the emission factors

7.3 - Achieved emission reductions

	2008 Jan 27 th -Dec 31 st	2009 Jan 1 st -Aug 31 st	Total
EMISSION REDUCTIONS (tCO ₂ e)	4,941	3,534	8,476