

**La Vuelta and La Herradura Hydroelectric Project  
UNFCCC REGISTRATION N° 0735**

**Empresas Publicas de Medellin E.S.P.  
(COLOMBIA)**

**MGM Carbon Portfolio, S.a.r.l.  
(SWITZERLAND)**

**VERIFICATION PERIOD  
01/01/2012 TO 31/12/2013**

**REPORT N° CDMVER-14-009-03**

**FEBRUARY, 2015**

## VERIFICATION REPORT



Date of First Issue:	24/12/2014	Registration N°	0735
Audit Team:	Francy Ramírez Lead Auditor and Technical Expert (Sector 1.2)	Organizational Unit:	Instituto Colombiano de Normas Técnicas y Certificación - ICONTEC Carrera 37 N°52 - 95 Bogotá-Colombia
Project Title:	La Vuelta and La Herradura Hydroelectric Project		
Version N°:	03	Last Version Date:	February 9 <sup>th</sup> , 2014
Sectoral Scope	1.2	Verified Monitoring Period:	5 <sup>th</sup> 01/01/2012 – 31/12/2013
Client:	MGM Innova		

### Summary:

ICONTEC performed the 5<sup>th</sup> periodic verification of the registered CDM project La Vuelta and La Herradura Hydroelectric Project in Colombia on the basis of UNFCCC criteria contained in Article 12 of the Kyoto Protocol and CDM modalities and procedures according to the Marrakech Agreement, the criteria of the CDM Executive Board and the host country, as well as the operational and technical monitoring criteria specific to this type of project.

The proposed project activity under verification process is based on the approved consolidated methodology ACM0002 Grid-connected electricity generation from renewable sources, version 15.0. The project involves the installation of two hydroelectric plants (La Vuelta and La Herradura) in chain, which take advantage of the La Herradura River. The project activity has an installed capacity of 33.48 MW (La Vuelta 12.4 MW and La Herradura 21.08 MW). The energy produced by this project activity is delivered to the Colombian electrical grid.

The verification process consisted of the following three phases:

- I. Desk review of the monitoring documentation, registered PDD, validation report and if apply, previous verification reports and relevant information (e.g. IPCC reports).
- II. On-site visit and follow up interviews with project stakeholders
- III. Resolution of outstanding issues and the issuance of the final verification and certification report.

A step by step description of dates in which the activities related to the project were undertaken is presented as follow:

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Date	Undertaken Activity
28/10/2014	Publication of the Monitoring Report on the UNFCCC CDM website (No later than 14 days before undertaking the site-visit for the verification)
22/10/2014 27/10/2014 and 28/10/2014	Desk review of the monitoring documentation
28/10/2014	Delivery to the client of the audit plan and identified findings during the desk review
13/11/2014 to 14/11/2014	On-site visit to the project activity
14/11/2014	Delivery to the client of the identified findings during the on-site visit
18/12/2014	Review of the proposed action plan for the raised findings
22/12/2014 to 24/12/2014	Writing of the Draft Verification Report
26/01/2015 to 28/01/2015	ICONTEC's internal technical review
30/01/2015	Writing of the final Verification Report
09/02/2015	Attention of comments from the client
05/02/2015	Uploading of the project's documentation to UNFCCC web page.

The review of the monitoring documentation, registered PDD, validation report, previous verification reports, relevant information and interviews during the on-site visit allowed ICONTEC to collect enough evidence to completely assess the verification criteria and determinate that the project has been implemented as planned and as it has been described in the registered PDD version 15. Emission reductions were correctly calculated based on the PDD and the monitoring equipment with an impact on the claimed emission reductions work reliably. The monitoring system is in place and has been calibrated appropriately. ICONTEC can confirm that the GHG emission reductions are calculated without material misstatements.

Hence ICONTEC can confirm the following:

Monitoring Period:	01/01/2012 – 31/12/2013
Baseline Emissions:	161,919 tCO <sub>2</sub> e
Project Emissions:	0 tCO <sub>2</sub> e
Leakage Emissions:	0 tCO <sub>2</sub> e
Emission Reductions:	161,919 tCO <sub>2</sub> e

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Verified emissions in the previous monitoring period: 99,896.65 tCO<sub>2</sub>e.

Work verified by:	Cristian Grisales CDM Technical Reviewer and CDM Technical Expert (Sector 1.2)	<input checked="" type="checkbox"/> No distribution without permission from the client or responsible organizational unit <input type="checkbox"/> Limited distribution <input type="checkbox"/> Unrestricted distribution
Technical review date:	28/01/2015	
Number of pages:	34	

## Abbreviations

CAR	Corrective Action Request
CDM	Clean Development Mechanism
ERs	Emission Reductions
CERs	Certified emission reductions
CL	Clarification Request
CO <sub>2</sub> E	Carbon dioxide equivalent
DNA	Designated National Authority
DOE	Designated Operational Entity
GHG	Greenhouse Gases
ICONTEC	Colombian Institute of Technical Standards and Certification (Instituto Colombiano de Normas Técnicas y Certificación)
MoC	Modalities of Communication
PDD	Project Design Document
MR	Monitoring Report
UNFCCC	United Nations Framework Convention for Climate Change
VVS	CDM Validation and Verification Standard
PP	Project Participant
IPCC	Intergovernmental Panel on Climate Change
PS	CDM Project Standard
PCP	CDM Project Cycle Procedure
EPM	Empresas Públicas de Medellín ESP

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## **1. Introduction**

MGM Innova commissioned ICONTEC to perform the 5<sup>th</sup> verification of La Vuelta and La Herradura Hydroelectric Project (hereafter called “the project”).

This report summarizes the findings in the verification of the project, which was performed on the basis of UNFCCC criteria, as well as criteria given to provide for consistent project operations, monitoring and reporting.

The verification report contains the verification and certification statements for the certified emission reductions from the data collected from 01/01/2012 to 31/12/2013.

According to the documentation of the project activity, it consists in the installation of two hydroelectric plants (La Vuelta and La Herradura) in chain, which takes advantage of the La Herradura River. The project activity has an installed capacity of 33.48 MW (La Vuelta 12.4 MW and La Herradura 21.08 MW). The energy produced by this project activity is delivered to the Colombian electrical grid.

### **1.1. Objective**

According to CDM Modalities and Procedures (Decision 17/CP.7), the purpose of a verification process is the periodical independent review and ex-post determination of the monitored reductions which have occurred as a result of the registered CDM project activity during the verification period.

Based on the applicable requirements of paragraph 62 of the CDM modalities and procedures, the assessment shall:

- a. Ensure that the project activity has been implemented and operated as per the registered PDD and that all physical features (technology, project equipment, and monitoring and metering equipment) of the project are in place.
- b. Ensure that the MR and other supporting documents provided are complete and in accordance with the latest applicable version of the completeness checklist for requests of issuance of CERs and verifiable and in accordance with applicable CDM requirements.
- c. Ensure that the actual monitoring system and procedures comply with the monitoring system and procedures described in the monitoring plan and the approved methodology.
- d. Evaluate the data recorded and stored as per the monitoring methodology.

As a result of the application of the above mentioned assessment, a written certification of the emission reductions achieved and verified by ICONTEC is prepared for the specified time period.



## 1.2. Scope

The verification scope involves an independent and objective review to determine whether the monitoring documents comply with the registered monitoring plan and project design features.

ICONTEC carries out audits according to its ethics code and internal procedures for carrying out validation, verification and certification audits of CDM project activities, which, in turn, are based on the Validation and Verification Standard (VVS). Likewise, ICONTEC focuses on the identification of significant risks for CER generation, and verification of the mitigation during its audits.

The verification does not intend to provide any consulting for the PP. However, stated requests for clarifications and/or corrective actions that may have provided input for improvement of the project monitoring.

## 1.3. Verification Team

The verification team consists of the following personnel:

**Table 1. Verification Team**

ROLE/QUALIFICATION	LAST NAME	FIRST NAME	COUNTRY
Lead Auditor and Technical Expert	Ramirez	Francy	Colombia
Technical Reviewer and Technical Expert	Grisales	Cristian	Colombia

## 1.4. Methodology

The verification consists of the following three phases:

- Desk review and investigation of secondary sources of information.
- On-site assessment and follow up interviews with project stakeholders.
- Resolution of outstanding issues and the issuance the final verification report with the conclusion on the emission reductions achievements.

ICONTEC, based on its ethics code and internal procedures, carries out validation, verification and certification audits of CDM project activities, focused on the identification of significant risks for CER generation and the verification of the contribution to climate change mitigation.

All documentation reviewed during the verification process was included in chapter 11 (REFERENCES).

The findings could take the form of a Corrective Action Request (CAR), Forward Action Request (FAR) or a Clarifications Request (CL).

Corrective action requests (CAR) are issued where:

- The PP made mistakes which directly influenced the ability of the project activity to achieve real, measurable and additional emission reductions;
- The CDM requirements have not been met; or
- There is a risk that emission reductions cannot be monitored or calculated

A Forward Action Request is raised to highlight issues related to project implementation that will require review during the next verification of the project activity.

A Clarification Request is raised when information is insufficient or not clear enough to establish whether a requirement was met.

According to the latest version of the VVS, ICONTEC “*shall resolve or close out CARs and CLs only if the PP modify the project design, rectify the PDD or provide additional explanations or evidence that satisfies the DOE’s concerns*”. In addition, this validation report explains findings raised during the validation process as well as responses provided by the PP, means of validation of such responses and references to any resulting changes in the PDD or supporting annexes.

### **1.5. Internal Quality Control**

This report includes the verification findings that underwent a technical review before being submitted to UNFCCC.

The technical review and the quality control process was performed by an internal technical reviewer team in accordance with the ICONTEC’s internal procedures for carrying out validation, verification and certification audits of CDM project activities.

The technical reviewers are qualified in accordance with the ICONTEC’s professional qualification scheme for CDM validation and verification.

### **1.6. On-site Visit**

An on-site visit to the project was undertaken between 13/11/2014 and 14/11/2014. Interviews were conducted with EPM’s personnel. ICONTEC audited in particular

the procedures for data recording, processing, reporting and associated QA/QC procedures.

During the on-site visit the following people were interviewed:

**Table 2. List of Interviewees**

Interviewee's Name	Position	Entity
Arturo Betancur	La Vuelta and La Herradura Operator	Empresas Públicas de Medellín ESP
Guillermo Ortiz	Engineer	
Oscar Fernandez	Development and Innovation Professional	
Isabel Cardona	Energy Transactions Professional	
Ana María Zapata	Consultant	MGM Innova

## 1.7. Resolution of CLs, CARs and FARs

CARs, CLs and FARs raised by ICONTEC were presented to the PP and resolved through communication and meetings between EPM, MGM Innova and ICONTEC. To guarantee the transparency of the verification process, the concerns raised and the responses provided by the PP are documented inside this verification report.

Since modifications to the MR were necessary to resolve ICONTEC's concerns, the client decided to review the MR and re-submit corrected versions. After the publication of the monitoring report on the UNFCCC CDM website (28/10/2014 to 11/11/2014) and after reviewing the latest version of the MR, ICONTEC issued the verification and certification report.

There was no any FAR, from the previous monitoring period.

## 2. Compliance of the Project Implementation with the Registered Project Design Document

The status of implementation, progress and starting date of operation for each phase is shown on the next table:

**Table 3. Implementation Status**

Phase/Site	Status of Implementation	Progress	Operation	Comments
Star of operation: Two hydroelectric run-of river power	Operation Started	There was no delay in the implementation	The starting date of the project operation was on December, 2004,	The project activity is already implemented and

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Phase/Site	Status of Implementation	Progress	Operation	Comments
generation projects (La Vuelta and La Herradura), with an installed capacity of 33.48 MW			without any abnormal scenarios during its operation.	it is currently operating as it was described in the approved PDD.

The starting date of the 2<sup>nd</sup> crediting period was 01/01/2012.

The monitoring period evaluated during the current verification was: 01/01/2012 to 31/12/2013.

The information (data and variables) provided in the monitoring report is not different from that stated in the approved PDD.

Also, during the on-site visit, ICONTEC by means of documental review and interviews with EPM personnel, confirmed that for this monitoring period (01/01/2012 to 31/12/2013), there were some events with energy generation equal to 0 kWh, which impacted in the emission reductions estimated in the revised PDD, this information was recorded by EPM personnel /11/ and it is publicly available at XM Website<sup>1</sup>. These events are related with the scheduled overhauls. ICONTEC compared these events with the data described in the spreadsheet used for the emission reductions calculation for this monitoring period /6/, /7/ and /8/, and it was found that the information is consistent and coherent.

ICONTEC can confirm that:

- The implementation of the project is consistent with the information provided in the approved PDD.
- The project is operated as per the approved PDD.
- Information provided in the MR is in accordance with that stated in the approved PDD.

<sup>1</sup>

<http://informacioninteligente10.xm.com.co/oferta/Paginas/HistoricoOferta.aspx?RootFolder=%2Foferta%2FHistorico%20Oferta%2FGeneraci%C3%B3n&FolderCTID=0x01200075F2CCF9F779EE4B93D2D54764CDB78A&View={9F21C71E-AD8F-4E3F-B2EA-0B38F49A9BA8}>

### 3. Plan with the Monitoring Methodology Including Applicable Tools and the Standardized Baseline

According to the approved PDD /1/, the CDM project activity "La Vuelta and La Herradura Hydroelectric Project" was monitored following the guidelines of the approved consolidated monitoring methodology ACM0002 Grid-connected electricity generation from renewable sources, version 15.0/UN1/.

The audit team found some editorial inconsistencies in the MR version 1, hence CL 1, CL2, CL3 and CL4 were raised, the PP corrected it all in the updated version of MR/4/ and the clarifications raised were closed by the audit team.

ICONTEC verified through documental review that the MR correctly complies with the latest version of "Monitoring report form"/UN2/ for the 5<sup>th</sup> monitoring period.

### 4. Compliance of Monitoring Activities with the Registered Monitoring Plan

The monitoring parameters related to the GHG emission reductions in the project activity have been implemented in accordance with the monitoring plan contained in the approved PDD /1/.

The following table describes the parameters that were determined ex-ante and not monitored during the monitoring period:

**Table 4. Parameters Determined Ex-Ante in the Registered PDD**

Parameter	Description	Value	Source
EF <sub>grid,CM,y</sub>	Combined margin CO <sub>2</sub> emission factor for grid connected power generation in year y calculated using the latest version of the —Tool to calculate the emission factor for an electricity systemll (version 4.0.0).	0.4239 tCO <sub>2</sub> /MWh	This value was calculated once at the request of renewal of crediting period as it was established in the approved PDD /1/

The following table includes all parameters monitored and describes how ICONTEC verified the fulfillment of each parameter with the registered monitoring plan, including the information flow and the values as reported in the MR.

**Table 5. Monitored Parameters**

Monitored Parameter	Description	Value	Means of Verification
EG <sub>y</sub>	Quantity of	2012	Source of Data and Frequency:

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Monitored Parameter	Description	Value		Means of Verification
	net electricity generation supplied by the project plant/unit to the grid in year y	Power Plant	Electricity Generation (MWh)	<p>Hourly transmission of the information to XM is done by EPM via Internet using the digital and coded mechanisms defined for all the agents of the Wholesale Power Market. The databases for recording the operations of the Colombian market are managed by XM. It is worth to mention that EPM do the transmission of information based on the data transmitted by the measurement system located in Chorodo Electrical Substation.</p> <p>There are two transmission lines of 44 kV, 13.9 km length for La Vuelta Power Plant and 6 km length for La Herradura Power Plant , connecting the power plants with Chorodo Electrical Substation, in Frontino municipality. This substation is owned by Empresas Públicas de Medellín – EPM, the local distributor and grid operator. ICONTEC verified that the connection point of the transmission line from La Vuelta and La Herradura power plants to Chorodo substation is, in fact, the commercial frontier registered by the project responsible in the National Dispatch Center – CND.</p> <p><b>Used Equipment:</b></p> <p>Two power meters installed in the commercial frontier (Chorodo Electrical Subestation) by power plant (Four power meters in total),. These have identical ACTARIS features<sup>2</sup>, with an accuracy of 0.2 IEC.</p> <p><b>Data Cross Checking:</b></p> <p>With the aim to verify the data provided by the PP in the spreadsheet used for emissions reductions calculations /6/, the audit team reviewed the electricity generation reported by the PP in the information service about the Colombian Wholesale Power Market operated by XM<sup>3</sup>. After this review the audit team concluded that the information provided by the PP is reliable, coherent, consistent and</p>
		La Vuelta	65,069	
		La Herradura	126,309	
		2013		
		Power Plant	Electricity Generation (MWh)	
		La Vuelta	68,706	
		La Herradura	121,890	

<sup>2</sup> Actaris Meter

Type SL761A061

Voltage: 3X57.7/100V – 240/415V

Current: 5(10)A

Class: 0.2S

<sup>3</sup> Available at

<http://informacioninteligente10.xm.com.co/oferta/Paginas/HistoricoOferta.aspx?RootFolder=%2Foferta%2FHistorico%20Oferta%2FGeneraci%C3%B3n&FolderCTID=0x01200075F2CCF9F779EE4B93D2D54764CDB78A&View={9F21C71E-AD8F-4E3F-B2EA-0B38F49A9BA8}>

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Monitored Parameter	Description	Value	Means of Verification
			<p>traceable with secondary sources of information.</p> <p><b>Consistency Between the QA/QC Defined in the Methodology:</b></p> <p>On pages 23 and 24 of the methodology ACM0002 version 15 states that QA/QC procedures consists of Cross check measurement results with records for sold electricity. The records for sold energy are issued by XM using the information platform. As it was explained above the audit team review the information in the information platform managed by XM, mence this requirement is fulfilled.</p> <p><b>Consistency Between the QA/QC Established by the Project Participants in the PDD:</b></p> <p>In section B.7.1 of the approved PDD, the methodology and plan are described as the performance of calibration activities for the measurement equipment. As it will explained in the section 5 of this verification report.</p> <p>ICONTEC could verify that according to the monitoring plan approved in the PDD and the methodology ACM0002 version 15, the data from electricity generation from the project activity can be check and it is available in the XM information platform , on the other hand, this monitoring plan is in accordance with the rules established by Colombian Electrical Authorities/5/.</p> <p><b>Application of Default Values:</b></p> <p>Not applicable.</p> <p><b>Findings:</b></p> <p>There was not raised any finding related to this parameter.</p> <p><b>Conclusions:</b></p> <p>During the verification, ICONTEC checked that the parameter is properly applied according to the monitoring plan and the approved PDD, and that the information is consistent with the secondary information source used to verify the information.</p>

ICONTEC could verify the completeness and integrity of the data used by the project proponents for the emission reductions calculations. During the verification, ICONTEC was able to verify that the parameter is properly measured according to the monitoring plan and the registered PDD, and that the information is consistent with the secondary information sources used to verify the information.

In conclusion the process of data management, transfer, storage and reporting was carried out in compliance with the monitoring plan, the registered PDD and the methodology ACM0002 version 15.

ICONTEC can thus conclude that:

The monitoring has been carried out in accordance with the monitoring plan contained in the approved PDD.

All parameters stated in the monitoring plan of the approved PDD have been correctly and sufficiently monitored and listed. The monitored data for required parameters have been verified by ICONTEC and have been found complete, reliable and consistent.

## 5. Compliance with the Calibration Frequency Requirements for Measuring Instruments

The following table includes the current monitoring equipment for the parameters above mentioned and the information about equipment identification and calibration records. ICONTEC verified that the calibration covered the entire 5<sup>th</sup> monitoring period from 01/01/2012 to 31/12/2013.

**Table 6. Monitoring Equipment**

Parameter	Equipment	Calibration Frequency	Calibration Records	Date of Calibration
EG <sub>y</sub>	<p><b>La Vuelta Hydroelectric Power Plant</b></p> <p>Two ACTARIS power meters with an accuracy of 0.2 IEC</p> <ul style="list-style-type: none"> <li>Serial Number of Main Measurement Equipment:</li> </ul>	<p>In accordance with the monitoring plan and applied methodology there is not a stated calibration frequency. However, according to the</p>	<p>N° 50529 issued by EPM Laboratory, for Main and back up meters of La Vuelta and La Herradura hydroelectric power plants /7/.</p> <p>This calibration activity covers this monitoring period. However some calibration activities were</p>	<p>March 29<sup>th</sup>/2011</p>



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Parameter	Equipment	Calibration Frequency	Calibration Records	Date of Calibration
	36099685 <ul style="list-style-type: none"> <li>Serial Number of Backup Measurement Equipment: 36099687</li> </ul>	EPM has a procedure/12/ to carry out on-site electricity meter tests with a pattern metering device; Calibration tasks follow national standards and are in accordance with the calibration instructive specified in Colombian standard NTC 4856 for electricity metering devices. The calibration frequency is maximum every 2 years.	carried out after this date, as it is described below	
			N° 50583 issued by EPM Laboratory, for Main and back up meters of La Vuelta and La Herradura hydroelectric power plants /8/.	May 2 <sup>nd</sup> /2012
			N° 50610 issued by EPM Laboratory, for Main and back up meters of La Vuelta and La Herradura hydroelectric power plants /9/.	May 29 <sup>th</sup> /2013
	<b>La Herradura Hydroelectric Power Plant</b> Two ACTARIS power meters with an accuracy of 0.2 IEC <ul style="list-style-type: none"> <li>Serial Number of Main Measurement Equipment: 36099681</li> <li>Serial Number of Backup Measurement Equipment: 36099684</li> </ul>		N° 50637 issued by EPM Laboratory, for Main and back up meters of La Vuelta and La Herradura hydroelectric power plants /10/.	April 10 <sup>th</sup> /2014

ICONTEC concluded that the calibration is conducted at the frequency specified by the methodology and monitoring plan of the approved PDD.

### 6. Assessment of Data and Calculation of Emission Reductions

Calculations executed by PP in order to determine baseline emissions, project emissions and leakage of the project in the Emission Reductions file /6/ and Emission Factor calculation file /6/ were properly prepared and are in accordance

with the methodology ACM0002, version 15 Grid-connected electricity generation from renewable sources.

On the other hand, the verification team assessed the whole set of data and calculations of GHG emission reductions resulting from the project activity by the application of selected methodology, formulae and default values applied.

A complete set of data for the specified monitoring period is available. As per registered PDD and methodology, emission reductions of the project activity during year “y” are the difference between the baseline emissions ( $BE_y$ ), the project emissions ( $PE_y$ ) and the emissions due to leakage ( $LE_y$ ).

### Baseline Emissions

From methodology ACM0002, version 6, the baseline emissions ( $BE_y$  in  $tCO_2$ ) are the product of the baseline emissions factor ( $EF_y$  in  $tCO_2/MWh$ ) times the electricity supplied by the project activity to the grid ( $EG_y$  in  $MWh$ ):

$$BE_y = EG_y \cdot EF_y$$

$$BE_{2012} = 191,379.35 \text{ MWh} \cdot 0.4239 \frac{tCO_2}{MWh} = 81,125.71 \text{ tCO}_2$$

$$BE_{2013} = 190,597.15 \text{ MWh} \cdot 0.4239 \frac{tCO_2}{MWh} = 80,794.13 \text{ tCO}_2$$

### Project Emissions

In accordance with the applied baseline and monitoring methodology, and the provision described in the approved PDD, this project activity does not have project emissions ( $PE_y = 0$ )

### Leakage Emissions

In accordance with the applied baseline and monitoring methodology, and the provision described in the registered PDD, this project activity does not have leakage ( $L_y = 0$ ).

### Emission Reductions

From methodology ACM0002, version 15, the emission reductions for year y ( $ER_y$ ) are the  $CO_2$  emissions that would have otherwise been generated by the National

Electric System of Colombia. Since for this project, project emissions (PE) and emissions due to leakage (L) are zero, the emissions reductions are the product of the baseline emissions factor (EF), times the electricity produced by the project activity (EG), hence:

$$ER_y = BE_y$$

$$ER_{2012} = 81,125.71 \text{ tCO}_2$$

$$ER_{2013} = 80,794.13 \text{ tCO}_2$$

ICONTEC verified that the emission reductions achieved during this monitoring period are higher than the ex-ante values of emission reductions in the approved PDD given that water availability for 2012 and 2013 was higher than those estimated in the approved PDD.

All aspects related to direct and indirect emissions, including project, baseline and leakage emissions were considered appropriated and also the reductions claimed were covered during the verification. ICONTEC verified the correct application of the formulae according with the methodology and tools, and the data sources for each parameter and the application of default values.

ICONTEC can confirm that:

The data used for determination of the emission reductions are available and have been monitored in accordance with the approved monitoring plan and methodology ACM0002 version 15.

The data used the calculation of ERs in this monitoring period were verified and they were found consistent with those reported in the approved PDD.

The appropriate methods and formulae for calculating baseline emissions, project emissions and leakages emissions were followed in accordance with the approved PDD and applied methodology.

The assumptions, emission factors and default values applied in the MR and the calculations were correctly justified.

## **7. Post Registration Changes**

### **7.1. Temporary Deviations from the Registered Monitoring Plan, Monitoring Methodology or Standardized Baseline**

There are no deviations from the approved monitoring plan and/or methodology.

### **7.2. Corrections**

There are no corrections to project information or parameters fixed at validation, as was described in the approved PDD made by the project participant during the current monitoring period.

### **7.3. Changes to the Start Date of the Crediting Period**

The project participant did not change the start date of the crediting period during the current monitoring period.

### **7.4. Permanent Changes from the Registered Monitoring Plan, Monitoring Methodology or Standardized Baseline**

There are no permanent changes from the approved monitoring plan and/or methodology identified during the current monitoring period.

### **7.5. Changes to the Project Design of a Registered Project Activity**

There are no proposed or actual changes to the project design of the approved CDM project activity reported or identified during the current monitoring period.

## **8. VERIFICATION STATEMENT**

ICONTEC was engaged by MGM Innova to verify the greenhouse gas (GHG) emission reductions reported by the CDM project La Vuelta and La Herradura Hydroelectric Project, project registration number 0735, owned by EPM for the period 01/01/2012 to 31/12/2013, equating to 161,919.84 tCO<sub>2</sub>e.

The verification was performed based on the requirements set by the CDM and relevant guidance provided by CMP and the CDM Executive Board. ICONTEC considers that the project's GHG emissions and resulting GHG emissions reductions reported in the monitoring report version 2.1 dated on 02/02/2015, are fairly stated.

ICONTEC confirms that the project is implemented as described in the validated and approved PDD. Installed equipment essential for generating emission reductions are running reliably and calibrated appropriately. The monitoring system is in place and the project is generating GHG emission reductions as a CDM project.

MGM Innova is responsible for the preparation of the GHG emissions data and the reported GHG emissions reductions on the basis set out within the project's monitoring and verification plan.

EPM is responsible for developing and keeping records and reporting procedures in accordance with the monitoring plan.

ICONTEC received the information and asked for explanations deemed necessary to provide enough evidence about the amount of GHG emissions and the calculation of the GHG emission reductions.

The verification consisted of the three following phases: i) desk review of the PDD, the MR and the monitoring plan ii) follow-up interviews with project stakeholders; iii) resolution of outstanding issues and the issuance of the final verification report and opinion.

It is ICONTEC's responsibility to set an independent GHG verification opinion on the GHG emissions from the project and approved a baseline for the monitoring period.

ICONTEC utilizes a risk-based approach that draws on an understanding of the risks associated with reporting GHG emissions data and the controls in place to mitigate them. ICONTEC's examination process includes test-based assessments of all evidence relevant to the amounts and disclosures of a project's GHG emissions and the calculations of such reductions for the reporting period.

ICONTEC can confirm that the GHG emissions reductions are calculated without material misstatements.

## VERIFICATION REPORT



ICONTEC's opinion applies to the project's GHG emissions and the resulting GHG emission reductions reported and related to the validated and registered baseline, as well as the monitoring plan and its associated documents. ICONTEC confirms the following statements:

CDM project: La Vuelta and La Herradura Hydroelectric Project

Reporting period: 01/01/2012 to 31/12/2013

Baseline emissions: 161,919.84 tCO<sub>2</sub>e

Project emissions: 0 tCO<sub>2</sub>e

Leakage: 0 tCO<sub>2</sub>e

Emission  
Reductions: 161,919.84 tCO<sub>2</sub>e

Bogotá D.C., February 9<sup>th</sup>, 2015

A handwritten signature in black ink, appearing to read 'Monica Vivas'.

Monica Vivas  
Director of Conformity Assessment Services  
ICONTEC

## 9. RESOLUTION OF CORRECTIVE ACTION, FORWARD ACTION AND CLARIFICATION REQUEST

During this verification, the issues identified related to the monitoring, implementation or operations of the proposed CDM project activity that could impair the capacity of the proposed CDM project activity to achieve emission reductions or influence the reporting of emission reductions were discussed and concluded on this verification report.

This report includes all CARs, CLs and FARs raised in this verification. The reporting of them was undertaken in a transparent manner that allowed the reader to understand the issue raised, the responses provided by the project participants, the means of verification of such responses and references to any resulting changes in the monitoring report or supporting annexes.

Report Clarifications and Corrective Action Requests	VVS' Reference	Summary of Project Owner Response	Verification Conclusion
CL 1 The monitoring period number is missing on the cover page of the MR version 01	Monitoring report form, version 04.0. Attachment, section 2 (f)	Corrected. The monitoring period was included on the cover page.	Validation Team Response:  In the version 02 of MR (dated on November 18 <sup>th</sup> ,2014) appears the monitoring period number  Validation Team Conclusion:  Closed 20/11/2014

## VALIDATION REPORT



Report Clarifications and Corrective Action Requests	VVS' Reference	Summary of Project Owner Response	Verification Conclusion
<p>CL 2</p> <p>The methodology version stated in the cover page of MR version 01 is not coherent with the methodology version applied at renewal request time</p>	<p>Monitoring report form, version 04.0. Attachment, section 2 (i)</p>	<p>Corrected.</p>	<p>Validation Team Response:</p> <p>In the version 02 of MR (dated on November 18<sup>th</sup>,2014), the audit team review the methodology version stated in the cover page and it was verified that it is coherent with the methodology version applied at renewal request time</p> <p>Validation Team Conclusion:</p> <p>Closed 20/11/2014</p>
<p>CL 3</p> <p>The crediting period described in section A.5 of the MR version 01 is not coherent with the current crediting period</p>	<p>Monitoring report form, version 04.0. Attachment, section 1</p>	<p>Corrected. Now the crediting period described in section A5 is coherent with the current crediting period</p>	<p>Validation Team Response:</p> <p>In the version 02 of MR (dated on November 18<sup>th</sup>,2014), the audit team review the crediting period described in section A.5 and it was verified that it is coherent with the current</p>



## VALIDATION REPORT



Report Clarifications and Corrective Action Requests	VVS' Reference	Summary of Project Owner Response	Verification Conclusion
			crediting period  Validation Team Conclusion:  Closed 20/11/2014
CL 4 The table used to described the data and parameters fixed ex-ante on Section D.1 of the MR version 01 do not have the same structure requires by the MR form	Monitoring report form, version 04.0. Attachment, section D.2	Corrected. Tables were corrected according to the structure requirements.	Validation Team Response:  In the version 02 of MR (dated on November 18 <sup>th</sup> ,2014), the tables used to described the data and parameters fixed ex-ante on Section D.1 and it was verified that it has the same structure requires by the MR form  Validation Team Conclusion:  Closed 20/11/2014

## **10. EXPERIENCE AND KNOWLEDGE OF AUDIT TEAM AND REVIEWER TEAM**

**Francy Ramírez**

**Lead Auditor and Technical Expert (Sector 1.2)**

### **Education:**

Electrical Engineer. Universidad Los Andes, 2001

Postgrade: Assessment of Social Projects. Universidad Los Andes, 2005

University of Oxford. Course: Applying Knowledge Management, Principle and Practices (December 1 de 2009).

University of Oxford. Course: Successful Change Management for Engineers, Scientists and Staff in Hi-tech Companies (December 2nd 2009).

University of Oxford. Course: Essentials of Project Management for Engineers, Scientists and Staff in Hi-tech Companies (December 3rd 2009).

University of Oxford. Course: Advanced Project Management for Engineers, Scientists and Staff in Hi-tech Companies (December 4th 2009).

Climate Change, Trade and Standardization - in a development perspective". Estocolmo, Suecia (23 and 25 November 2009)

ISO global workshop on Greenhouse Gas Schemes Addressing Climate Change – How ISO Standards Help, Estocolmo, Suecia. (20 and 21 November 2009)

Conference on Climate Change – Deforestation and Standardization. Bali, Indonesia (31 May and 1st June 2010)

### **Professional Background:**

ICONTEC (2005 - Actually)

Professional of Standardization

Planning, coordinate, implement and ensure compliance with the program of national standardization in technical committees among which are electrical installations, electrical power quality, electrical transformers, substations and equipment for medium and high voltage, lighting, appliances and electrical accessories, protection against lightning strikes and electrical equipment. Develop technical standards. Develop and manage special projects assigned. Participate in programs of regional and international standardization.

**CODENSA (2002 - 2005)**

Inspections and electrical works coordinator

Supervise field work and download the results in the central information system, evaluate the inspections performed, reconciled with contractors, addressing the results of inspections to different areas of the company, charging inspections and electrical work to clients of the firm , coordination and support group field sales engineers, technical training for technical staff, administrative support to department business processes and lost control, maintenance of the database for internal management inspections. Project Leader for the Optimization of Technical Processes and Regional Trade in Cundinamarca.

**CDM Experience:****Lead Auditor:**

- Validation of Guanaquitas 9.74 MW hydroelectric project, Colombia
- Validation of Fuel Switching through change of furnaces at Imusa S.A., Colombia
- Validation of Installation of a high-pressure/high-efficiency bagasse boiler to cogenerate heat and power, Argentina
- Validation of Cueva Maria Hydroelectric Expansion Project, Guatemala
- Validation of Paysandú Clean Energy, Uruguay
- Validation of La Vegona Hydroelectric project, Honduras
- Validation of Chamelecón 280 Hydroelectric project, Honduras
- Validation of Pardos SHPs and LOGICarbon CDM Project, Brazil
- Validation of Pequi and Sucupira SHPs and LOGICarbon CDM Project, Brazil
- Validation of Cambará and Embaúba SHPs and LOGICarbon CDM Project, Brazil
- Validation of Bonyic hydroelectric project, Panamá
- Validation of METALDOM Fossil fuel switch from reheat furnace, República Dominicana
- Validation of Toachi – Pilaton Hydroelectric Project, Ecuador
- Validation of EMGEA Small Hydropower (SHP) Run-of-the-River CDM Project Bundle, Colombia
- Validation of Energy efficiency at Malvinas Gas Plant, Perú
- Validation of Marañon Hydroelectric Project, Perú
- Validation of Santa Rita Hydroelectric Plant, Guatemala

- Validation of Ventana, Suba and Usaqué Hydroelectric CDM Bundled, Colombia
- Verification of Los Algarrobos hydroelectric project, Panamá
- Verification of Bio energy in General Deheza –Electric power generation from peanut hull and sunflower husk-, Argentina
- Validation of Taurichuco Hydropower Project, Perú
- Validation of Agua Fresca Multipurpose and Environmental Service Project, Colombia
- Verification of Agua Fresca Multipurpose and Environmental Service Project, Colombia
- Verification of La Joya Hidroelectric project, Costa Rica
- Verification of Amaime Minor Hydroelectric Power Plant, Colombia

### **Specialist:**

- Validation of Rio Bonito and Baitaca SHPs and LOGICarbon CDM Project, Brazil
- Validation VCS of Pequi and Sucupira SHPs and LOGICarbon CDM Project, Brazil
- Verification of three crediting periods of La Vuelta and la Herradura hydroelectric project, Colombia

### **CDM Technical Reviewer:**

- Validation of Improving energy efficiency in a new Gas Plant in Gibraltar - Colombia
- Validation of Tres Valles Cogeneration Project, Honduras
- Validation of Tunjita Diversion Hydroelectric Project, Colombia
- Validation of Ferreira Gomes Hydro Power Plant CDM Project, Brazil
- Verification of two crediting periods of La Venta II, México
- Verification of two crediting periods of La Joya Hidroelectric Project, Costa Rica
- Verification of Bio energy in General Deheza –Electric power generation from peanut hull and sunflower husk-, Argentina
- Verification of Tres Valles Cogeneration Project, Honduras
- Verification of Agua Fresca Multipurpose and Environmental Services, Colombia
- Verification of La Venta II, México

- Verification of two crediting periods of Fertinal Nitrous Oxide Abatement Project, México
- Verification of Co-composting of EFB and POME project, Guatemala
- Verification of Biogas Project, Olmeca III, Tecun Uman, Guatemala
- Verification of Jepirachi Wind Power Project, Colombia
- Verification of Biogas energy plant from palm oil mill effluent, Guatemala
- Verification of Santa Ana Hydroelectric Project, Colombia
- Validation of SHP Morro Azul CDM Project (JUN1164), Colombia
- Verification of Biogas Project, Olmeca III, Tecun Uman, Guatemala

### **Specialist Technical Reviewer:**

- Validation of Biogas project, Olmeca I, Santa Rosa, Guatemala
- Validation of CGR Catanduva Landfill Gas Project, Brazil
- Validation of Macaubas Landfill Gas Project, Brazil

### **Cristian Grisales**

### **CDM and Technical Expert Reviewer (Sector 1.2)**

### **Education:**

Master Executive in Renewable Energies

EOI-Madrid, Spain

February 2015

Certified ISO 14001

ICONTEC

May 2013

Certified ISO 9001

ICONTEC

August 2012

Electrical Engineer

National University of Colombia

Bogotá – Colombia

July 2009

### **Professional Background:**

Professional of Climate Change

ICONTEC

May 2012 - Today

Professional on developing validation and verification on CDM projects as lead auditor and as technical expert in the energy sector.

Electrical Maintenance Engineer

EMGESA S.A ESP. Colombia

November 2009 - May 2012

Electrical maintenance engineer in the Bogotá River Hydroelectric plants. Executing preventive, predictive and corrective maintenance of the generators, auxiliary services, power transformers and electrical substation. Developed the investment projects' inventory in accordance with the annual operating budget. Implementation of RCM maintenance programs. Monthly service availability in the plant, and full-time availability in failure care. Electrical testing of generators, transformers, motors and substation equipment.

Engineering Intern

INGENIERIA ESPECIALIZADA

Commercial visits to different industries, sales, design and assembly of shielding systems, grounding grids, power quality studies, calculation of electrical installations, RETIE inspections, diagnostic grounding systems, implementation, supervision and maintenance of the developed projects.

### **CDM Experience**

#### **Auditor and Specialist:**

- Validation of Biogas Project, Olmeca I, Santa Rosa, Guatemala
- Validation of CGR Catanduva Landfill Gas Project, Brazil
- Validation of Macaubas Landfill Gas Project, Brazil
- Validation of Taurichuco Hydropower Project, Perú
- Validation of Teresina Landfill Gas Project, Brazil
- Validation of Maceio Landfill Gas Project, Brazil
- Verification of Amaime Minor Hydroelectric Power Plant, Colombia
- Validation of Doña Teresa Small Hydro Power Plant, Colombia
- Verification of the Ciudad Juarez Landfill Gas Project, Mexico

- Verification and Renewal of the Crediting Period of LaGeo Geothermal Project, Salvador
- Verification of Santa Ana Hydro Power Project, Colombia.
- Validation of SHPS Tambaú, Das Pedras and Rio Do Sapo Cdm Project (JUN1132), Brazil
- Validation of SHPs Poço Fundo and Providência CDM Project (JUN1133), Brazil
- Verification of Conversion of Open Cycle Gas Turbines to Combined Cycle at Kallpa Thermoelectric Power Plant
- Verification of Biogas project, Olmeca III, Tecún Uman
- Verification of DOÑA JUANA LANDFILL GAS-TO-ENERGY PROJECT

## Technical Reviewer:

- Validation of Thuan Nhen Phong Wind Farm, Vietnam
- Validation of Phuong Mai 3 Wind Power Project, Viet Nam
- Validation of Chamelecón 280 Hydroelectric project, Honduras
- Validation of Providencia I: 1.8MW Small Hydro Power Generation Plant, Colombia
- Validation of Providencia III: 9.11MW Small Hydro Power Generation Plant, Colombia
- Validation of SHP Itaguacu CDM Project (JUN 1146), Brazil, Brazil
- Renewal of Aguafresca Multipurpose and Environmental Service Project, Colombia
- Validation of Feira de Santana Landfill Gas Project, Brazil
- Validation of SHP Morro Azul CDM Project (JUN1164), Colombia
- Verification of Santa Ana Hydroelectric Plant, Colombia
- Verification of Methane recovery and effective use of power generation project Norte III-B Landfill, Argentina
- Verification of DOÑA JUANA LANDFILL GAS-TO-ENERGY PROJECT, Colombia
- Validation of Suba and Usaquen hydroelectric CDM umbrella project, Colombia
- VCS Validation of Hydroelectric Project Ituango, Colombia
- Verification of La Venta II Wind Power Project, México
- Validation of Panuco Bagasse Cogeneration Project, Brazil
- GS Validation of BK ENERGIA ITACOATIARA PROJECT, Brazil
- Verification of MIO Cali, Colombia

- VCS Validation of HYDROELECTRIC PROJECT EL EDÉN, Colombia
- Verification of Biogas energy plant from palm oil mill effluent, Guatemala
- Verification of Agua Fresca Multipurpose and environmental services project, Colombia
- GS Validation of PARAMONGA BAGASSE BOILER PROJECT, Brazil



**11. REFERENCES**

- /1/ CDM Project Design Document, including Baseline Methodology and the Monitoring Plan. Approved PDD Version 15 dated on June 6<sup>th</sup>, 2014.
- /2/ Previous verification report performed by ICONTEC CDMVER-031-01, dated on May 2011
- /3/ Previous Monitoring report Version 1 (monitoring period: 01/01/2009 to 31/12/2009)
- /4/ Current Monitoring report (monitoring period: 01/01/2012 to 31/12/2013), version 1 dated on August 18<sup>th</sup>, 2014, version 02 dated on November 18<sup>th</sup>, 2014 and version 2.1 dated on February 2<sup>nd</sup>, 2015.
- /5/ Regulatory documents:
  - Order CREG 024 of 1995, by which the commercial aspects are regulated regarding Wholesale Power Market in the national interconnected system which are part of the Operation Regulations.
  - Resolution 3670/2003 Superintendencia de Industria y Comercio. Accreditation of Calibration power and transformers meters labs.
  - Grid Code, Order CREG 025 of 1995
  - Distribution Regulations, Order CREG 070 of 1998
  - Order CREG 006 of 2003, by which the following aspects are adopted: standards on record of commercial frontiers and contracts, information supply and report, and liquidation of commercial transactions in the Wholesale Power Market.
- /6/ Calculation data related to emissions reduction (file: LV&LH\_monitoring\_ER 2012\_2013.xls)
- /7/ Calibration certificate N° 50529 issued by EPM Laboratory about power meters and transformers calibration carried out on March 29<sup>th</sup> /2011. Main and back up meters ACTARIS, serial numbers: 36099685 and 36099687.(La Vuelta hydroelectric power plant); 36099684 and 36099681.(La Herradura hydroelectric power plant)
- /8/ Calibration certificate N° 50583 issued by EPM Laboratory about power meters and transformers calibration carried out on May 2<sup>nd</sup>/2012. Main and back up meters ACTARIS, serial numbers: 36099685 and 36099687.(La Vuelta hydroelectric power

plant); 36099684 and 36099681.(La Herradura hydroelectric power plant)

- /9/ Calibration certificate N° 50610 issued by EPM Laboratory about power meters and transformers calibration carried out on May 29<sup>th</sup>/2013. Main and back up meters ACTARIS, serial numbers: 36099685 and 36099687.(La Vuelta hydroelectric power plant); 36099684 and 36099681.(La Herradura hydroelectric power plant)
- /10/ Calibration certificate N° 50637 issued by EPM Laboratory about power meters and transformers calibration carried out on April 10<sup>th</sup>/2014. Main and back up meters ACTARIS, serial numbers: 36099685 and 36099687.(La Vuelta hydroelectric power plant); 36099684 and 36099681.(La Herradura hydroelectric power plant)
- /11/ Operation books for La Vuelta hydroelectric power plant and for La Herradura hydroelectric power plant, years 2012 and 2013
- /12/ Procedure issued by EPM to perform on-site electricity meter tests with a pattern metering device

Background documents related to the design and/or methodologies employed in the design or other reference document

- /UN1/ Approved consolidated monitoring methodology ACM0002 for grid-connected electricity generation from renewable sources, version 15.0
- /UN2/ Monitoring report form, version 04.0
- /UN3/ CDM validation & verification standard, version 07.0
- /UN4/ CDM project standard, version 07.0
- /UN5/ Guideline on the application of materiality in verifications, version 01.0