

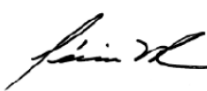


Verification and certification report form for CDM project activities

(Version 01.0)

Complete this form in accordance with the "Attachment: Instructions for filling out the verification and certification report form for CDM project activities" at the end of this form.

VERIFICATION AND CERTIFICATION REPORT

Title of the project activity	La Vuelta and La Herradura Hydroelectric Project
Reference number of the project activity	0735
Version number of the verification and certification report	4.0
Completion date of the verification and certification report	09/03/2017
Monitoring period number and duration of this monitoring period	7 th monitoring period: 01/01/2015 – 31/12/2015
Version number of monitoring report to which this report applies	03.0
Crediting period of the project activity corresponding to this monitoring period	Renewable, 01/01/2012 – 31/12/2018, 7 years.
Project participant(s)	Empresas Públicas de Medellín E.S.P. MGM Carbon Portfolio, S.a.r.l.
Host Party	Colombia
Sectoral scope(s), selected methodology(ies), and where applicable, selected standardized baseline(s)	1: Energy Industries (renewable/ non-renewable sources) ACM0002 (version 15)
Estimated GHG emission reductions or net anthropogenic GHG removals for this monitoring period in the registered PDD	77,149 tCO ₂ e
Certified GHG emission reductions or net anthropogenic GHG removals for this monitoring period	66,997 tCO ₂ e
Name of DOE	Colombian Institute for Technical Standards and Certification (ICONTEC)
Name, position and signature of the approver of the verification and certification report	 Monica Vivas Conformity Assessment Director

SECTION A. Executive summary

ICONTEC performed the 7th 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 consists in the operation 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:

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

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.

Emission reductions were correctly calculated based on the registered PDD and the monitoring equipment with an impact on the claimed emission reductions work reliably. The monitoring system is in place and it has been appropriately calibrated.

ICONTEC can confirm that the GHG emission reductions are calculated without material misstatements for the current monitoring period.

SECTION B. Verification team, technical reviewer and approver**B.1. Verification team member**

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)	Involvement in			
						Desk review	On-site inspection	Interview(s)	Verification findings
1.	Team Leader	OR	Grisales	Cristian	ICONTEC	X	X	X	X
2.	Technical Expert	OR	Grisales	Cristian	ICONTEC	X	X	X	X

B.2. Technical reviewer and approver of the verification and certification report

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)
1.	Lead technical reviewer and Technical Expert Reviewer in Sectoral Scope 1.2	IR	Ramirez	Francy	ICONTEC
2.	Approver	IR	Vivas	Monica	ICONTEC

SECTION C. Application of materiality**C.1. Consideration of materiality in planning the verification**

No.	Risk that could lead to material errors, omissions or misstatements	Assessment of the risk		Response to the risk in the verification plan and/or sampling plan
		Risk level	Justification	
1.	Human error in the quantification of emissions	Low	The project uses a software to export the values of energy generation to the excel file for emission reduction calculation.	The audit team reviewed deeply the coherence between the spreadsheet used for emission reductions calculations and the data acquired by the monitoring system.
2.	Undue reliance on a poorly designed information system, which may have few effective quality controls	Low	The values of energy generation are cross checked by the project and also by the power system administrator in order to ensure an effective QA/QC.	During the onsite visit the audit team checked the effectiveness of the quality controls and deemed them as reliable.
3.	Calibration delays on monitoring equipment	Low	At the time of the desk review, calibration delays were not identified.	On the onsite visit was included the review of all the calibration certificates (100%).
4.	Use of outdated parameters for the calculation of the ERs	Low	During the desk review ICONTEC did not identify the application of outdated parameters in the calculation of the ERs (i.e. grid emission factor).	During the onsite visit, ICONTEC checked the overall calculations for emission reductions.
5.	Possibility of post-registration changes	Low	During the desk review, ICONTEC did not identify any possible post registration change.	During the onsite visit, ICONTEC verified the implementation status of the project and any post-registration change was identified.

C.2. Consideration of materiality in conducting the verification

ICONTEC performed a risk assessment by means of onsite inspection and document review. The audit team checked 100% of possible material misstatements, hence, no sampling plan was required. The verification team is able to confirm that all material misstatements were properly conducted and required corrections were performed by PP on MR, version 3.

SECTION D. Means of verification**D.1. Desk review**

The verification of the project documentation provided by the project proponent is based upon both quantitative and qualitative information on emission reductions. Quantitative information comprises the reported numbers in the monitoring report submitted. Qualitative information comprises information on internal management controls, calculation procedures, and procedures for transferring of data, frequency of emission reports, and reviewing and internal audits to calculations.

Main documents reviewed during the desk review stage:

- Monitoring report version 01.0, dated on November 2016.
- Emission reduction calculation file "2015 LV&LH monitoring ER", version 01.0, dated on December 23rd 2016.
- Verification and certification report for the 6th monitoring period, dated on July 2015.
- Calibration certificates for the 6th monitoring period, issued on July 2015.
- Methodology ACM0002 version 15.
- CDM VVS, PCP and PS version 09.0.
- Guideline on the application of materiality in verifications, version 02.0

D.2. On-site inspection

Duration of on-site inspection: 16/12/2016 to 17/12/2016				
No.	Activity performed on-site	Site location	Date	Team member
1.	Compliance of the MR with the MR form.	Headquarters of EPM in (Medellin)	December 16 th 2016	Cristian Grisales
2.	Implementation status and operation of the project.			
3.	Interviews with the Staff responsible of the CDM data management, data checking and ERs calculation.			
4.	Completeness of the Monitoring Plan in accordance with the CDM standards and approved PDD.			
5.	Emission reduction calculation			
6.	Calibration status			
7.	Interview with responsible personnel in charge of the management and checking of data (data achieving and reporting).	La Vuelta and La Herradura hydroelectric power plants	December 17 th 2016	Cristian Grisales
8.	Visit to the interconnection point (Chorodó substation)			
9.	Implementation status and operation during the monitoring period.			
10.	Metrology assurance and calibration activities.			

D.3. Interviews

No.	Interviewee			Date	Subject	Team member
	Last name	First name	Affiliation			
1.	Roldan Agudelo	Gloria Maria	EPM Energy market professional	December 16 th 2016	Real energy generation- Cross check with XM. Availability of energy generation to be offered to the NIS.	Cristian Grisales
2	Correa Correa	Edwin Adrián	EPM Business professional (E)		Implementation status and operation for the monitoring period.	
3.	Echavarría Eusse	Aquiles	EPM Integrated Operation Leader			
4.	Ortiz González	Guillermo	EPM Business professional			
5.	Fernandez Taborda	Oscar	EPM Innovation and development professional			
6.	Torres Marín	Yeny Oliva	EPM Planning and performing professional		Compliance of the MR with the MR form. Implementation status and operation of the project. Interviews with the Staff responsible of the CDM data management, data checking and ERs calculation. Completeness of the Monitoring Plan in accordance with the CDM standards and approved PDD.	
7.	Salazar Henao	Margarita María	EPM Sustainable development manager			
8.	Herrón Durango	Ana Gertrudis	EPM Planning and performing professional			
9.	Giraldo Ospina	Isabel Cristina	EPM Planning and performing professional			
10.	Echavarria Gómez	Cesar Augusto	EPM Operation and maintenance technologist	December 17 th 2016	Implementation status. Calibration activities Project's operation	
11.	Pereira López	Luis Fernando	EPM Operation technologist			

D.4. Sampling approach

ICONTEC checked the 100% of project's information hence, no sampling approach was required.

D.5. Clarification requests, corrective action requests and forward action requests raised

Areas of verification findings	No. of CL	No. of CAR	No. of FAR
Compliance of the monitoring report with the monitoring report form	2		
Compliance of the project implementation with the registered PDD			
Post-registration changes			
Compliance of the monitoring plan with the monitoring methodology including applicable tool and standardized baseline			
Compliance of monitoring activities with the registered monitoring plan			
Compliance with the calibration frequency requirements for measuring instruments	1		
Assessment of data and calculation of emission reductions or net removals	1		
Others (please specify)			
Total	4		

SECTION E. Verification findings**E.1. Compliance of the monitoring report with the monitoring report form**

Means of verification	Monitoring report version 1 was submitted to the verification team by the project participants on November 2016. ICONTEC has made this report publicly available prior to the start of the verification activities. No comments were received. During the verification, mistakes and clarifications were identified. The PP conducted the requested corrections on the later version 3 of the MR. It can be confirmed that the monitoring report is complete, transparent and in accordance with the registered PDD, relevant CDM requirements and applicable monitoring report form. ICONTEC confirms that the MR version 3 is free of material misstatements.
Findings	CL 1 and CL 2.
Conclusion	ICONTEC verified through documental review that the latest version of the MR for the 7 th monitoring period was applied.

E.2. Remaining forward action requests from validation and/or previous verification

No remaining FARs from previous verifications has been assessed during this monitoring period.

E.3. Compliance of the project implementation with the registered project design document

Means of verification	At the time of the desk review, the audit team assessed the implementation of the project reported on MR version 01, against the one established on the registered PDD. No inconsistencies were found.													
	During the onsite visit, the implementation status and monitoring plan reported on MR version 01 were compared with the onsite evidence, physical inspection and interviews. No inconsistencies were found.													
	The status of implementation, progress and operation's starting date for each phase are shown on the next table:													
	<table><tr><th>Phase/Site</th><th>Status of Implementation</th><th>Progress</th><th>Operation</th><th>Comments</th></tr><tr><td>Star of operation: Two hydroelectric run-of river power generation projects (La Vuelta and La Herradura), with an installed capacity of 33.48 MW</td><td>Operation Started</td><td>There was no delay in the implementation</td><td>The starting date of the project operation was on December, 2004, without any abnormal scenarios during its operation.</td><td>The project activity is already implemented and it is currently operating as it was described in the approved PDD.</td></tr></table>					Phase/Site	Status of Implementation	Progress	Operation	Comments	Star of operation: Two hydroelectric run-of river power generation projects (La Vuelta and La Herradura), with an installed capacity of 33.48 MW	Operation Started	There was no delay in the implementation	The starting date of the project operation was on December, 2004, without any abnormal scenarios during its operation.
Phase/Site	Status of Implementation	Progress	Operation	Comments										
Star of operation: Two hydroelectric run-of river power generation projects (La Vuelta and La Herradura), with an installed capacity of 33.48 MW	Operation Started	There was no delay in the implementation	The starting date of the project operation was on December, 2004, without any abnormal scenarios during its operation.	The project activity is already implemented and it is currently operating as it was described in the approved PDD.										
Findings	During the onsite visit, ICONTEC checked the continuous operation of the project for the 7 th monitoring period and validated that the average project's availability was 94.28% for La Vuelta and 95.33% for La Herradura.													
	The total unavailability of the project during the 7 th monitoring period was 256 hours, representing 2,896 MWh.													
Findings	No findings were raised regarding to this issue													
Conclusion	The audit team can confirm that:													
	<ul style="list-style-type: none">• The implementation of the project is consistent with the information provided in the registered PDD.• The project is operated as per the registered PDD.• Information provided in the MR is in accordance with that stated in the registered PDD.													

E.4. Post-registration changes

E.4.1. Temporary deviations from the registered monitoring plan, monitoring methodology or standardized baseline

No temporary deviations have been approved by the Board for this monitoring period or will be submitted with the request for issuance.

E.4.2. Corrections

No corrections have been approved by the Board for this monitoring period or will be submitted with the request for issuance.

E.4.3. Changes to the start date of the crediting period

No changes to the start date of the crediting period have been requested to the secretariat or approved by the Board during this monitoring period.

E.4.4. Inclusion of a monitoring plan to a registered project activity

No inclusion of a monitoring plan to the registered project activity has been requested to the Board during this monitoring period.

E.4.5. Permanent changes from registered monitoring plan, monitoring methodology or standardized baseline

No permanent changes have been approved by the Board for this monitoring period or will be submitted with the request for issuance.

E.4.6. Changes to the project design of a registered project activity

No changes to the project design have been approved by the Board for this monitoring period or will be submitted with the request for issuance.

E.4.7. Types of changes specific to afforestation and reforestation project activities

N/A

E.5. Compliance of monitoring plan with the monitoring methodology including applicable tool and standardized baseline

Means of verification	According to the approved PDD, 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. ICONTEC verified through documental review that the MR correctly complies with the latest version of "Monitoring report for the 7 th monitoring period.
Findings	No findings were raised to this section.
Conclusion	ICONTEC concludes that the registered monitoring plan (MR version 03.0) is in accordance with the approved methodology ACM0002 version 15 and the registered PDD.

E.6. Compliance of monitoring activities with the registered monitoring plan**E.6.1. Data and parameters fixed ex ante or at renewal of crediting period**

Means of verification	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 registered PDD . The following table describes the parameters that were determined ex-ante and not monitored during the monitoring period:											
	<table><tr><th>Parameter</th><th>Description</th><th>Value</th><th>Source</th></tr><tr><td>EF_{grid,CM,y}</td><td>Combined margin CO₂ 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 system (version 4.0.0).</td><td>0.4239 tCO₂/MWh</td><td>This value was calculated once at the request of renewal of crediting period as it was established in the approved PDD.</td></tr></table>				Parameter	Description	Value	Source	EF _{grid,CM,y}	Combined margin CO ₂ 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 system (version 4.0.0).	0.4239 tCO ₂ /MWh	This value was calculated once at the request of renewal of crediting period as it was established in the approved PDD.
	Parameter	Description	Value	Source								
EF _{grid,CM,y}	Combined margin CO ₂ 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 system (version 4.0.0).	0.4239 tCO ₂ /MWh	This value was calculated once at the request of renewal of crediting period as it was established in the approved PDD.									
Findings												
Conclusion		No findings were identified for this section.										
		ICONTEC can conclude that all data sources and assumptions are appropriate and calculations are correctly used on the monitoring report version 02.0 and them result in a conservative estimate of the emission reductions.										

E.6.2. Data and parameters monitored

Means of verification	The compliance of monitoring plan was verified through of desk review, interviews and on site visit.																								
	The assessment was performed in accordance with the section 11.4.4 of CDM VVS version 09.0, section 13.7 of CDM PS version 09.0 and section 7 of the CDM PCP version 09.0 and methodology ACM0002 version 15.																								
	The following table describes the parameters that were determined ex-post and monitored during the monitoring period:																								
	<table><tr><th>Monitored Parameter</th><th>Description</th><th colspan="2">Value</th><th>Means of Verification</th></tr><tr><td rowspan="4">EG_y</td><td rowspan="4">Quantity of net electricity generation supplied by the project plant/unit to the grid in year y</td><td colspan="2"></td><td>Source of Data and Frequency:</td></tr><tr><td colspan="2"></td><td>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 performs the transmission of information based on the data transmitted by the measurement system located in Chorodo Electrical Substation.</td></tr><tr><td colspan="2"></td><td>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.</td></tr><tr><td colspan="2"></td><td>Used Equipment:</td></tr><tr><td colspan="2"></td><td colspan="2"></td><td>Two power meters installed in the commercial frontier (Chorodo Electrical Substation) by power plant (Four power meters in total),. These have identical ACTARIS</td></tr></table>	Monitored Parameter	Description	Value		Means of Verification	EG _y	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y			Source of Data and Frequency:			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 performs the transmission of information based on the data transmitted by the measurement system located in Chorodo Electrical Substation.			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.			Used Equipment:					Two power meters installed in the commercial frontier (Chorodo Electrical Substation) by power plant (Four power meters in total),. These have identical ACTARIS
Monitored Parameter	Description	Value		Means of Verification																					
EG _y	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y			Source of Data and Frequency:																					
				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 performs the transmission of information based on the data transmitted by the measurement system located in Chorodo Electrical Substation.																					
				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.																					
				Used Equipment:																					
				Two power meters installed in the commercial frontier (Chorodo Electrical Substation) by power plant (Four power meters in total),. These have identical ACTARIS																					

				<p>features¹, with an accuracy of 0.2 IEC.</p> <p>Data Cross Checking:</p> <p>In order to verify the data provided by the PP in the spreadsheet used for emissions reduction calculations, ICONTEC reviewed the electricity generation reported by the PP in the information service about the Colombian Wholesale Power Market operated by XM². After this review the audit team concluded that the information provided by the PP is reliable, coherent, consistent and traceable with secondary sources of information.</p> <p>Consistency Between the QA/QC Defined in the Methodology:</p> <p>On pages 23 and 24 of the methodology ACM0002 version 15 is established that QA/QC procedures consists of Cross checking of 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, hence this requirement is fulfilled.</p> <p>Consistency Between the QA/QC Established by the Project Participants in the PDD:</p> <p>In section B.7.1 of the approved PDD, the methodology and monitoring plan are described as the performance of calibration activities for the measurement equipment.</p> <p>ICONTEC verified 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</p>
--	--	--	--	---

¹ Actaris Meter
Type SL761A061

Voltage: 3X57.7/100V – 240/415V

Current: 5(10)A

Class: 0.2S

² Available at <http://informacioninteligente10.xm.com.co/oferta/Paginas/HistoricoOferta.aspx>

				<p>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.</p> <p>Application of Default Values:</p> <p>Not applicable.</p> <p>Findings:</p> <p>No findings were raised any for this parameter.</p> <p>Conclusions:</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>
Findings	No findings were raised for this section.			
Conclusion	<p>ICONTEC can thus conclude that: The monitoring has been carried out in accordance with the monitoring plan contained in the registered PDD.</p> <p>All parameters stated in the monitoring plan of the registered PDD have been correctly and sufficiently monitored and listed. The monitored data for required parameters has been verified by ICONTEC and has been found complete, reliable and consistent.</p>			

E.6.3. Implementation of sampling plan

Means of verification	The PP did not apply a sampling approach for the determination of data and parameters monitored.
Findings	NA
Conclusion	NA

E.7. Compliance with the calibration frequency requirements for measuring

Means of verification	<p>ICONTEC reviewed the metrological plan for 2015, where is included the calibration plan for the electricity meters of the project.</p>
	<p>Despite LV & LH are not included in the scope of the quality management system, there is a metrological plan for them with the kinds of maintenance to be performed (predictive, preventive and corrective), the frequencies (annual, biannual, quarterly) and the dates.</p>
	<p>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 7th monitoring period from 01/01/2015 to 31/12/2015.</p>

	EGy	(Main LV) Bidirectional electricity meters, ACTARIS, type SL761A061 Serial N° 36099685	Maximum every 2 years	Calibration certificate 50637, issued by accredited EPM's calibration laboratory, dated on April 10 th 2014.	April 10 th 2014.
				Calibration certificate 50666, issued by accredited EPM's calibration laboratory, dated on April 29 th 2015.	April 29 th 2015.
		(Backup LV) Bidirectional electricity meters, ACTARIS, type SL761A061 Serial N° 36099687		Calibration certificate 50637, issued by accredited EPM's calibration laboratory, dated on April 10 th 2014.	April 10 th 2014.
				Calibration certificate 50666, issued by accredited EPM's calibration laboratory, dated on 29 th April 2015.	April 29 th 2015.
		(Main LH) Bidirectional electricity meters, ACTARIS, type SL761A061 Serial N° 36099681		Calibration certificate 50637, issued by accredited EPM's calibration laboratory, dated on April 10 th 2014.	April 10 th 2014.
				Calibration certificate 50666, issued by accredited EPM's calibration laboratory, dated on April 29 th 2015.	April 29 th 2015.
		(Backup LH) Bidirectional electricity		Calibration certificate 50637,	April 10 th 2014.

		meters, ACTARIS, type SL761A061 Serial N° 36099684		issued by accredited EPM's calibration laboratory, dated on April 10 th 2014.	
				Calibration certificate 50666, issued by accredited EPM's calibration laboratory, dated on April 29 th 2015.	April 29 th 2015.
Findings	CL 3				
Conclusion	ICONTEC concluded that the calibration at the frequency specified by the methodology and monitoring plan in registered PDD.				

E.8. Assessment of data and calculation of emission reductions or net removals

E.8.1. Calculation of baseline GHG emissions or baseline net GHG removals by sinks

Means of verification	From methodology ACM0002, version 15, 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): $BE_y = EG_y \cdot EF_y$ $BE_{2014} = 158,052 \text{ MWh} \cdot 0.4239 \frac{tCO_2}{MWh} = 66,998 tCO_2$
Findings	CL 4
Conclusion	ICONTEC concludes that emission reductions have been correctly calculated without material misstatements.

E.8.2. Calculation of project GHG emissions or actual net GHG removals by sinks

Means of verification	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)
Findings	NA
Conclusion	NA

E.8.3. Calculation of leakage GHG emissions

Means of verification	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).
Findings	NA
Conclusion	NA

E.8.4. Summary of calculation of GHG emission reductions or net anthropogenic GHG removals by sinks

Means of verification	From methodology ACM0002, version 15, the emission reductions for year y (ER _y) are estimated as follows: ER=BE - PE
------------------------------	---

	Hence, ER = 66,997 tCO ₂ e.
Findings	No findings were raised for this section.
Conclusion	<p>The data used for determination of the emission reductions are available and have been monitored in accordance with the registered monitoring plan and methodology ACM0002 version 15.</p> <p>The data used for the calculation of ERs in this monitoring period were verified and they were found consistent with those reported in the registered PDD.</p> <p>The appropriate methods and formulae for calculating baseline emissions, project emissions and leakage were followed in accordance with the registered PDD and applied methodology.</p> <p>The assumptions, emission factors and default values applied in the MR version 03.0 and the calculations were correctly justified.</p>

E.8.5. Comparison of actual GHG emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Means of verification	ICONTEC verified that the emission reductions achieved during the 7 th monitoring period (66,997 tCO ₂ e) are lower than the ex-ante value (77,149 tCO ₂ e) of emission reductions in the registered PDD.
Findings	No findings were raised for this section.
Conclusion	During on site visit, ICONTEC validated the explanations for the difference provided by the PP in the monitoring report (Section E.6) and considered them as appropriate and consistent.

E.8.6. Remarks on difference from estimated value in registered PDD

Means of verification	During the verification ICONTEC confirm that there was not increase of emission reductions compared with the emissions reductions registered on the PDD, as it was explained in Section E.8.5. above
Findings	No finding was raised regarding to this issue
Conclusion	During the verification ICONTEC confirm that there was not increase of emission reductions compared with the emissions reductions registered on the PDD.

E.8.7. Actual GHG emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards

Means of verification	The overall ERs reported on the current Monitoring Period are part of the period from 1 January 2013 onwards. ICONTEC checked the ER's calculation file and verified that all the reported ERs are part of the period between 01/01/2015 to 31/12/2015.
Findings	No finding was raised regarding to this issue
Conclusion	ICONTEC deems that the current ERs have been correctly reported on the period from 1 January 2013 onwards.

SECTION F. 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. After this step the submission for requesting for issuance has been conducted.

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

SECTION G. Verification opinion

ICONTEC was engaged by EPM S.A. ESP to verify the greenhouse gas (GHG) emission reductions reported by the CDM project La Vuelta and La Herradura Hydroelectric Project, registration number 0735, owned by PP for the period 01/01/2015 to 31/12/2015, equating to 66,997 tCO₂e.

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 03 dated on 09/03/2017, are fairly stated.

ICONTEC confirms that the project is implemented as described in the validated and registered 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.

EPM S.A. ESP 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 S.A. ESP 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.

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: 01/01/2015 to 31/12/2015
 Baseline emissions: 66,997 tCO₂e
 Project emissions: 0 tCO₂e
 Leakage: 0 tCO₂e
 Emission Reductions: 66,997 tCO₂e

SECTION H. Certification statement

ICONTEC has been engaged by EPM S.A. ESP to examine the greenhouse gas (GHG) emission reductions reported from La Vuelta and La Herradura Hydroelectric Project for the corresponding period, equating to 66,997 tonnes of CO₂ equivalent.

We consider that the project's GHG emissions and resulting GHG emissions reductions reported in the Monitoring Report version 3 (09/03/2017) are fairly stated. Monitoring Report first version was publicly available on November 2016.

The owner of the project La Vuelta and La Herradura Hydroelectric Project is responsible for the preparation of the GHG emission data and the reported GHG emission reductions on the basis set out within the project's Monitoring and Verification Plan.

The owner of the project La Vuelta and La Herradura Hydroelectric Project is responsible for developing and keeping records and reporting procedures in accordance with the Monitoring Plan.

ICONTEC is responsible to set an independent GHG verification opinion on the GHG emissions from the Project activity and approved baseline for the same period.

For this verification audit, ICONTEC was provided the information and asked for explanations we deemed necessary to provide enough evidence that the amount of GHG emission and the calculation of the GHG emission reductions, based on the Monitoring Report, are fairly stated for the reporting period.

Our verification approach was based on the Kyoto Protocol requirements, Marrakech Agreement, as well as those defined by the CDM Executive Board.

ICONTEC's approach is risk-based, drawing on an understanding of the risks associated with reporting GHG emissions data and the controls in place to mitigate them. Our examination includes review and assessment, of the evidence related to the project's GHG emission and calculations for this reporting period.

ICONTEC is able to certify that the emission reductions from the La Vuelta and La Herradura Hydroelectric Project during the 7th verification period from January 1st/2015 to December 31st/2015 equals to 66,997 tonnes of CO₂ equivalent.

Appendix 1. Abbreviations

Abbreviations	Full texts
CAR	Corrective Action Request
CDM	Clean Development Mechanism
ERs	Emission Reductions
CERs	Certified emission reductions
CL	Clarification Request
CO ₂ 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
PRC	Post Registration Change
BDJ	Biogas Doña Juana S.A E.S.P
UPME	Colombian Mining and Energy Planning Unit
UAESP	Administrative Unit of Bogota for Public Services

Appendix 2. Competence of team members and technical reviewers

Cristian Grisales

Lead auditor and specialist

Education:

Clean Technologies – Environmental technology, innovation and management systems as means for regional and local economic development
Weitz Center for Development Studies – Israel
June 16th - July 10th 2015

Master Executive in Renewable Energies
EOI-Madrid, Spain
February 2015

Certified ISO 14001
ICONTEC
May 2012

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
- Validation of Doña Teresa Hydroelectric Power Plant, Colombia
- Validation of SHPs Poço Fundo and Providência CDM Project (JUN1133), Brazil
- Validation of SHPs Tambaú, das Pedras and Rio do Sapo CDM Project (JUN1132), Brazil
- Verification of Amaime Minor Hydroelectric Power Plant, Colombia
- Verification of Ciudad Juarez Landfill Gas to Energy Project, Mexico
- Verification of Santa Ana Hydroelectric Plant, Colombia
- Verification of Biogas Project, Olmeca III, Tecún Uman, Guatemala
- Verification of Berlin Geothermal Project, Phase Two, San Salvador

Technical Reviewer:

- Validation of Thuan Nhen Phong Wind Farm, Viet Nam
- 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

Francy Ramírez **Technical reviewer**

Education:

Electrical Engineer. Universidad Los Andes, 2001

Postgrade:

Assessment of Social Projects. Universidad Los Andes, 2005

Environmental Management. Universidad Los Andes, 2016

University of Oxford. Course: Applying Knowledge Management, Principle and Practices (December 1st/ 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 - 2010)

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 Usaquén 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 Aguafresca 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

Appendix 3. Documents reviewed or referenced

No.	Author	Title	References to the document	Provider
1.	EPM	Monitoring report version 01.0,	Dated on November 2016.	EPM
2.	EPM	Monitoring report version 02.0,	Dated on December 23 rd 2016.	EPM
3.	EPM	Emission reduction calculation file "2015 LV&LH monitoring ER", version 01.0	Dated on December 23 rd 2016.	EPM
4.	ICONTEC	Verification and certification report for the 6 th monitoring period	Dated on July 2015.	UNFCCC
5.	EPM	Calibration certificates for the 6 th monitoring period	Issued on April 2014.	EPM
6.	EPM	Calibration certificates for the 7 th monitoring period	Issued on April 2015.	EPM
7.	UNFCCC	Methodology ACM0002	Version 15.	UNFCCC
8.	UNFCCC	CDM VVS, PCP and PS	Version 09.0	UNFCCC
9.	UNFCCC	Guideline on the application of materiality in verifications,	Version 02.0	UNFCCC
10.	EPM	Operation books for La Vuelta hydroelectric power plant and for La Herradura hydroelectric power plant,	Issued on 2015	EPM
11.	EPM	Procedure to perform onsite energy meters tests with a pattern metering device	NA	EPM

Appendix 4. Clarification requests, corrective action requests and forward action requests

CL ID	1	Section no.	Cover page	Date: 25/11/2016
Description of CL				
On cover page of MR version 01.0, section: "Total amount of GHG emission reductions or net GHG removals by sinks achieved in this monitoring period" are not presented neither the "GHG emission reductions or net GHG removals by sinks reported up to 31 December 2012" nor the "GHG emission reductions or net GHG removals by sinks reported from 1 January 2013 onwards". Please correct.				
Project participant response				Date: 23/12/2016
It was corrected on the cover page, version 02.0.				
Total amount of GHG emission reductions or net GHG removals by sinks achieved in this monitoring period		GHG emission reductions or net GHG removals by sinks reported up to 31 December 2012	GHG emission reductions or net GHG removals by sinks reported from 1 January 2013 onwards	
		0 tCO ₂ e	66,998.09 tCO ₂ e	
Documentation provided by project participant				
2015 MR LV&LH version 02.0. 2015 LV&LH monitoring ER				
DOE assessment				Date: 07/01/2017
The project participant corrected the information in the version 02.0 of the MR. The finding was closed.				
CL ID	2	Section no.	A.1	Date: 25/11/2016
Description of CL				
On MR version 01, section A.1, table 1, the reported value of nominal capacity for La Herradura hydroelectric power plant does not agree with the one reported on the registered PDD.				
Project participant response				Date: 23/12/2016
The value of nominal capacity for La Herradura hydroelectric power plant was corrected. It agrees with the one reported on the registered PDD. See section A.1, table 1.				
Documentation provided by project participant				
2015 MR LV&LH version 02.0.				
DOE assessment				Date: 07/01/2017
On MR, version 03, the value of nominal capacity of the project has been corrected with the one reported on the registered PDD. The finding was closed.				
CL ID	3	Section no.	D.2	Date: 25/11/2016
Description of CL				
On MR version 01, section D.2, parameter E _{Gy} , is not clear enough if calibration of the measuring equipment has been conducted by the project participants at a specified frequency on the registered PDD.				
Project participant response				Date: 23/12/2016
Even though the registered PDD specifies that calibration frequency is maximum every 2 years, EPM performed a calibration on 10/04/2014 and another one on 29/04/2015.				
Documentation provided by project participant				
Calibration certificate dated 2015-04-29. Calibration certificate dated 2014-04-10. 2015 MR LV&LH version 02.0.				
DOE assessment				Date: 07/01/2017
ICONTEC reviewed the calibration certificates presented by the PP and the corrections made on the MR version 03.0. ICONTEC can conclude that the monitoring equipment has been calibrated in accordance with the PDD and it is working appropriately. Finding closed.				
CL ID	4	Section no.	E.4	Date: 25/11/2016
Description of CL				
On MR version 01, section E.4, are not clear enough the GHG emission reductions achieved in the monitoring period up to 31/12/2012 and from 01/01/2013. Please specify.				
Project participant response				Date: 23/12/2016

It was corrected. See MR version 02.0, section E.4.

Item	Baseline emissions or baseline net GHG removals by sinks (t CO ₂ e)	Project emissions or actual net GHG removals by sinks (t CO ₂ e)	Leakage (t CO ₂ e) ⁵	GHG emission reductions or net GHG removals by sinks (t CO ₂ e) achieved in the monitoring period		
				Up to 31/12/2012	From 01/01/2013	Total amount
Total	66,998.09	0	0	0	66,998.09	66,998.09

Documentation provided by project participant

2015 MR LV&LH version 02.0.

2015 LV&LH monitoring ER

DOE assessment

Date: 07/01/2016

On MR version 03.0, the emission reductions achieved up to 31/12/2012 and onwards were correctly reported. The finding was closed.

CL ID

5

Section no.

B.1

Date: 16/12/2016

Description of CL

On section B.1 is not clear enough the continuous operation of the project during the monitoring period.

Project participant response

Date: 23/12/2016

Section B.1 was complemented with information about real plant availability, as well as the information about the more significant maintenance during the monitoring period.

Documentation provided by project participant

2015 MR LV&LH version 02.0.

DOE assessment

Date: 07/01/2017

On MR version 03.0 the project participant updated the information about continuous operation and relevant maintenance and shutdowns. The finding was closed.