



VERIFICATION REPORT OF: "SUBA AND USAQUEN HYDROELECTRIC UMBRELLA PROJECT"



Document Prepared by Colombian Institute for Technical Standards and Certification (ICONTEC)

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Summary:

ICONTEC performed the 2nd verification of the registered VCS project Suba and Usaquen Hydroelectric Umbrella Project located in Bogota, Colombia. The assessment was performed based on VCS criteria contained in VCS standard version 4.2, as well as the operational and technical monitoring criteria specific to this type of project.

The proposed project activity under this verification process is based on methodology AMS-I.D: Grid connected renewable electricity generation, version 18.0. The project involves the installation of two small run-of-river hydroelectric plants (Suba and Usaquen), which take advantage of the water flow supply system of Bogotá. The project activity has a total effective capacity of 3.77 MW (rated capacity of turbine-generator system). The energy produced by this project activity will be delivered to the Colombian electrical grid.

The monitoring period under assessment is between January 1st/ 2019 to December 31st/ 2021.

The verification process consisted of the following three phases:

- I. Desk review of the monitoring documentation, registered PD, validation report.
- II. Onsite inspection and follow up interviews with project stakeholders.
- III. Resolution of outstanding issues and the issuance of the final verification and certification report.

The review of the monitoring documentation, registered PD, validation report for registration purposes, previous validation and verification reports, relevant information and interviews 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 approved PD version 02. Emission reductions were correctly calculated based on the PD and the monitoring equipment with an impact on the claimed emission reductions work reliably. The monitoring system is in place and has been calibrated. ICONTEC can confirm that the GHG emission reductions are calculated without material misstatements.

During this verification process, 1 finding occurred to be classified as 1 corrective action request, which was treated by the project owner and clarified in a new version of the MR (version 03). Upon review of the documentation and explanations provided by the Project Proponent, all findings were closed out in a clear and transparent manner.

ICONTEC verified the project implementation status and the emissions reduction claimed by the PP through the documental review, addressing conservatively the restrictions and uncertainties associated to this verification process. ICONTEC confirms that it achieved a reasonable level of assurance during validation; see Section 1.3 on this report.

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:

VCS Project	: 2060 - Suba and Usaquen Hydroelectric Umbrella Project.
Reporting period	: 01/01/2019 to 31/12/2021.
Baseline emissions	: 15,525 tCO ₂ e.
Project emissions	: 0 tCO ₂ e.
Leakage	: 0 tCO ₂ e.
Emission Reductions	: 15,525 tCO ₂ e.

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INTRODUCTION

Objective

The purpose of verification is to secure the opinion of an independent third party in order to assess the implementation and the reported GHG emission reductions or net anthropogenic GHG removals by a registered VCS project activity with relevant VCS requirements.

Verification is a requirement for all VCS projects with the aim to claimed emission reductions for project's implementation and it is seen as necessary to provide assurance to stakeholders of the quality of the project and its generation of certified voluntary emission reductions (VERs).

Scope and Criteria

The verification scope involves an independent and objective review to determine that the project design meets the following VCS criteria:

- VCS Program Guide, version 4.1.
- VCS Standard, version 4.2.
- Program Definitions, version 4.1.
- Program Fee Scheduled, version 4.1.
- Registration & Issuance Process, version 4.1.
- Approved Small Scale Methodology AMS-I.D, Version 18.0.

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

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

Level of Assurance

The information sources used are deemed reliable, these are: registered PD, previous validation reports, MR, on-site visit to the project activity, interviews, document review and secondary sources for confirmation.

All the revisions of the verification report before being submitted to the client were subjected to an independent internal technical review to confirm that all verification activities had been completed according to the pertinent ICONTEC instructions.

The technical review was performed by a technical reviewer(s) qualified in accordance with ICONTEC's qualification scheme VCS VER validation and verification. The validation team and the technical reviewers consist of the following personnel:

Table 1. Verification team.

Role/Qualification	Last Name	Fist name
Lead Auditor and Technical Expert in Sectoral Scope 1	Ramírez	Francy
Lead Technical Reviewer and Expert Reviewer in Sectoral Scope 1	Aubad	Ana Isabel

Besides the above mentioned, during the verification ICONTEC ensured to fulfil the requirements additional to ISO 14064-3 and ISO 14065, set in VCS standard version 4.2, which are as follows:

- The level of assurance is reasonable for verification;
- The criteria are VCS standard version 4.2 or other GHG Program as approved under the VCS Program;
- The objective is in conformance with the VCS standard version 4.2 requirements and VCS program methodologies as applicable to the specific project; and
- The project is classified like a Project (Less than or equal to 300,000 tons of CO₂e per year). In consequence, the materiality with respect to the aggregate of errors, omissions and misrepresentations relative to the total reported GHG emissions reduced, is five per cent.

With the issues explained in this Section ICONTEC confirms that it achieved a reasonable level of assurance during validation.

Summary Description of the Project

The Project consists of two new hydroelectric power plants, both of them take advantage of the water flow supply system of Bogotá, they are called Suba and Usaquen. The project is being implemented by Empresa de Acueducto y Alcantarillado de Bogotá E.S.P (EAAB).

The technology to develop this type of project consists of the installation of a hydraulic turbines in parallel of pressure reduce structures in the distribution system. In other words, the hydraulic turbines will do the same job of dissipation valves (dissipation valve = hydraulic turbine), however it is worth mentioning that

the dissipation valve is installed and it remains in Stand By and it will enter in operation during outages (planned or not) of hydraulic turbines. This system is responsible for transporting the treated water from the treatment plants to its final users, nevertheless it is worth to mention that the design of these two hydropower plants ensure that the potable water supply service is always a priority over the power generation. The design flow for Suba hydroelectric power plant is 5.64 m³/s and for Usaquen hydroelectric power plant is 2.85 m³/s.

The maximum output of the project activity is given by the installed/rated capacity as indicated by the manufacturer of the equipment or plant, therefore for these renewable electricity generating units those involve turbine-generator systems, the installed/rated capacity are based on the installed/rated capacity of the generators, hence for this umbrella project activity the rated capacity is 4.85 MW. However the emissions reduction calculations were made based on the effective power ratings which is the maximum output of the system turbine-generator-connection (the turbine capacity is smaller than the generator and transformer capacity), this value was calculated taking into account the installed/rated capacity of turbines, generator and transformers considering their efficiencies according to the manufacturer's specification. So, the total effective capacity is 3.77 MW. ICONTEC deemed this assumption conservative.

The project delivered to the Colombian electrical grid during the monitoring period under assessment: 40,734.32 MWh. Thus, the project increased the supply of electricity to the grid, offsetting thermal generation with a renewable source of energy, and consequently reducing greenhouse gases emissions. The project reduced 15,525 tCO₂e per year.

VERIFICATION PROCESS

The verification consisted of the three following phases: i) desk review of the registered PD, the MR and the monitoring plan; ii) onsite inspection and 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.

Method and Criteria

As it was mentioned above, a verification consists of the following three phases:

- i) A desk review of the VCS project activity documents,
- ii) Follow up interviews with project stakeholders,

iii) Resolution of outstanding issues and the issuance of a final validation report and opinion.

As mentioned in clause 1.2 of this report ICONTEC, based on its ethics code and internal procedures, carries out validation, verification and certification audits of VCS project activities (which, in turn, are based on the VCS standard) focused on the identification of significant risks for VER generation and the verification of the contribution to climate change mitigation. For this verification the audit team assessed 100% of project´s information hence, no sampling approach was required.

All documentation review during the validation process has been including in section 2.2 – Document Review.

Findings established during the verification can be seen as:

- A non-fulfillment of verification protocol criteria, or
- An identified risk to the fulfillment of the project objectives

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:

- i) The project participants have made mistakes which directly influence the ability of the project activity to achieve real, measurable and additional emission reductions;
- ii) The VCS requirements have not been met; or
- iii) There is a risk that emission reductions cannot be monitored or calculated

A Clarification Request is required when information is insufficient or not clear enough to establish whether a requirement has been met.

ICONTEC resolved or “closed out” CARs and CLs only if the project participants modify the monitoring report, rectify the MR or provide additional explanations or evidence that satisfy the ICONTEC’s concerns.

This verification report explains the issues raised, the responses provided by the project proponent, the means of validation of such responses and references to any resulting changes in the MR or supporting annexes.

Document Review

MR submitted by Empresa de Acueducto y Alcantarillado E.S.P and the additional background documents related to the project implementation and monitoring were assessed during the verification.

Main documents reviewed are:

- /1/ Registered Project Description version 02, issued on December 27th, 2019 prepared by Environmental Business and Technologies S.A.S.

- /3/ Monitoring Report for second monitoring period under VCS (01/01/2019 – 31/12/2021) of Suba and Usaquen hydroelectric umbrella project, prepared by Environmental Business and Technologies S.A.S. (Version 01 dated on December 10th/2021, Version 02 dated on March 31st/2022, and Version 03 dated on may 10th/2022)
- /4/ Spreadsheet used for emissions reduction issued by Empresa de Acueducto y Alcantarillado E.S.P. Files:
 - Version 1: 100322 SUBA AND USAQUEN_ER Calculation-V1.xlsx
 - Version 2: 310322 SUBA AND USAQUEN_ER Calculation-V2.xlsx
 - Version 3: 100522 SUBA AND USAQUEN_ER Calculation-V3.xlsx
- /5/ 2019 power generation technical report of Suba Hydroelectric power plant, issued by Empresa de Acueducto y Alcantarillado E.S.P., dated on April 2020.
- /6/ 2019 power generation technical report of Usaquen Hydroelectric power plant, issued by Empresa de Acueducto y Alcantarillado E.S.P., dated on April 2020.
- /7/ 2020 power generation technical report of Suba Hydroelectric power plant, issued by Empresa de Acueducto y Alcantarillado E.S.P., dated on April 2021.
- /8/ 2020 power generation technical report of Usaquen Hydroelectric power plant, issued by Empresa de Acueducto y Alcantarillado E.S.P., dated on April 2021.
- /9/ 2021 power generation technical report of Suba Hydroelectric power plant, issued by Empresa de Acueducto y Alcantarillado E.S.P., dated on April 2022.
- /10/ 2021 power generation technical report of Usaquen Hydroelectric power plant, issued by Empresa de Acueducto y Alcantarillado E.S.P., dated on April 2022.
- /11/ Colombian electrical measurement code, Resolution 038, date?
- /12/ Calibration certificate ME-1701-20379, issued by Veritest Ltda on January 30th/2017. Calibration activity performed on January 29th/2017 for electric measurement equipment MW-1203A089-01.
- /13/ Calibration certificate ME-1701-20378. issued by Veritest Ltda on January 30th/2017. Calibration activity performed on January 29th/2015 for electric measurement equipment MW-1203A090-01.
- /14/ Calibration certificate CAM-IM-1501-016399, issued by CAM Colombia Multiservicios S.A.S, dated on January 30th/2015. Calibration activity performed on January 26th/2015 for electric measurement equipment MW-1203A086-01.

- /15/ Calibration certificate CAM-IM-1501-016399, issued by CAM Colombia Multiservicios S.A.S, dated on January 30th/2015. Calibration activity performed on January 26th/2015 for electric measurement equipment MW-1203A087-01.
- /16/ Accreditation certificate 10-LAC-032, issued by ONAC granted to Veritest S.A.S., dated on June 17th/2011, due date: June 16th/2024. <https://onac.org.co/certificados/10-LAC-032.pdf>
- /17/ Accreditation certificate 10-LAB-032, issued by ONAC granted to Veritest S.A.S., dated on June 17th/2011, due date: June 16th/2024. <https://onac.org.co/certificados/10-LAB-032.pdf>
- /18/ Accreditation certificate 11-LAC-055, issued by ONAC granted to CAM Colombia Multiservicios S.A.S., dated on August 6th/2012, due date: August 5th/2025. <https://onac.org.co/certificados/11-LAC-055.pdf>
- /19/ Accreditation certificate 11-LAB-055, issued by ONAC granted to CAM Colombia Multiservicios S.A.S., dated on August 21st/2012, due date: August 20th/2025. <https://onac.org.co/certificados/11-LAB-055.pdf>
- /20/ Matrix of environmental impacts and risks of Empresa de Acueducto y Alcantarillado E.S.P, dated on January 31st/2022.
- /21/ Procedure for the reception, filing and distribution of official communications (MPFD0205P), version 91 dated on November 6th/2019.
- /22/ Procedure for the processing, response and sending of official communications (MPFD206P), version 03 dated on July 13th/2020
- /23/ Photographs taken during the onsite visit by the lead auditor on March 24th/2022

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

- /UN1/ Approved Consolidated Methodology for small scale AMS-I.D: Renewable electricity generation for a grid, version 18.0.
- /UN2/ Methodological tool for baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation, version 03.0.

Interviews

The following table outlines the persons that have directly been in contact with ICONTEC during the verification process by means of virtual meetings performed on Microsoft Teams:

Table 2. Interviewees during verification process.

Date	Interviewed person	Organization and role	Topics
March 24 th /2022	Juan Carlos Sanchez	Specialized Professional EAAB	<ul style="list-style-type: none"> • Tour by the project's facility • Visit to the interconnection Point (Usaquen substation and Morato Substation) • Verification of the monitoring system in place • Verification of compliance of the project implementation with the registered project design document • Possible post-registration changes • Verification of operational and maintenance activities • Description of the nature of the project, its implementation and its operation • Compliance of the project implementation and operation with the registered PD
	Jorge Jaramillo	Specialized Professional EAAB	
	Martha Cruz	Specialized Professional EAAB	
	Francisco Charry	Consultant EBT	
	Andrea Pacheco	Consultant EBT	
	Ivonne Navarro	Division Chief of Control Center	
March 24 th /2022	Martha Cruz	Specialized Professional EAAB	<ul style="list-style-type: none"> • Environmental and socio-economic impacts • Local stakeholder consultation
	Natasha Forero	Contractor of the Environmental Sanitation Department	
	John Alexander Bolaños	Contractor of the Environmental Sanitation Department	
	Andrea Pacheco	Consultant EBT	

Date	Interviewed person	Organization and role	Topics
March 25 th /2022	Martha Cruz	Specialized Professional EAAB	<ul style="list-style-type: none"> • Compliance of the monitoring report with the monitoring report form • Compliance of the registered monitoring plan with the methodologies including applicable tools and standardized baselines • Compliance of monitoring activities with the registered monitoring plan • Compliance with the calibration frequency requirements for measuring instruments • Assessment of data and calculation of emission reductions
	Francisco Charry	Consultant EBT	

Site Inspections

An onsite inspection was carried out by the lead auditor on March 24th/2022 to both hydroelectric power plants (Suba and Usaquen), with the aim to:

- assess the implementation and operation of the umbrella project in accordance with the registered PD/1/.
- assess the compliance of monitoring activities with the registered monitoring plan/1/ and applied methodology /UN1/.

The onsite inspection included interviews with personnel involved in the project activity operation, as well as it was performed an exhaustive documental review of operational records (e.g. annual maintenance program and event reports) in order to ensure an assessment free of material misstatements.

Resolution of Findings

The verification audit process was prepared following a desk review of the monitoring documentation, registered PD, validation report for registration purposes, previous verification report and relevant information, as well as an onsite inspection and interviews during which all issues identified during the desk review were discussed. It has not been found remaining FARs from previous validation or verification

assessment. Corrective action by ICONTEC (1 CAR) was presented to the PP and resolved through communication and meetings between Empresa de Acueducto y Alcantarillado E.S.P. and ICONTEC. To guarantee the transparency of the validation process, the concerns raised and the response provided by the project participants are documented in more detail in Appendix 1.

Forward Action Requests

No forward action request was raised during the verification.

Eligibility for Validation Activities

During this verification process, ICONTEC did not undertake validation activities. Nevertheless, in accordance with the footnote 3 in Section 5 of VCS Program guide, version 4.1, ICONTEC is eligible to provide validation and verification services under the VCS Program since ICONTEC holds an accreditation granted by the Colombian Accreditation Organization - ONAC (by its acronym in Spanish)¹, furthermore ICONTEC also holds an accreditation granted by CDM Executive Board (CDM EB) as designated operational entity for validation/verification functions for sectoral scope 1.

VALIDATION FINDINGS

Participation under Other GHG Programs

The project under verification assessment is registered under CDM scheme (reference number: 9798), however the audit team verified that Empresa de Acueducto y Alcantarillado E.S.P has not requested issuance of CERs for the monitoring period under assessment on this verification (January 1st/2019 to December 31st/2021)².

The gap validation with the aim to seek registration under the VCS Program was performed previously and the overall conclusion regarding whether the project is eligible to participate under the VCS Program is stated in the joint report for validation and verification available at VCS Web page³.

¹ <https://onac.org.co/certificados/19-GEI-001.pdf>

² <https://cdm.unfccc.int/Projects/DB/ICONTEC1385825845.93/view>

³ <https://registry.verra.org/app/projectDetail/VCS/2060>

Methodology Deviations

The project activity has been fully implemented in accordance with the approved Consolidated Methodology for small scale AMS-I.D: Renewable electricity generation for a grid, version 18.0. /UN1/ and hence deviation of methodology is not applicable.

Project Description Deviations

No deviation from registered project description has been presented or introduced during the monitoring period under assessment.

Grouped Project

The project consists of two small hydroelectric power plants presented as a single project (umbrella project). It is not a grouped project.

VERIFICATION FINDINGS

Project Implementation Status

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 PD. No inconsistencies were found.

During the onsite visit, the implementation status and monitoring plan reported on MR/1/ 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 3. Implementation status.

Phase/site	Status of implementation	Operation	Comments
Start of operation: Two hydroelectric run-of river power generation projects with a total effective capacity of 3.77 MW (rated capacity of	Operation started.	Both power plants began delivery of electrical energy to the Colombian electrical grid on April 15 th /2013 as the audit team verified by means of documental review	The project activity is already implemented and it is currently operating as it was described in the registered PD.

turbine-generator system)

of The Webpage of Colombian Electrical Wholesale market administrator (XM)⁴.

Likewise, the audit team reviewed the periodic maintenance activities for the equipment involved in the project activity which covers the entire monitoring period /6/→/11/. These maintenance activities ensure a proper operation of the project activity.

The audit team verified the electricity generation data with 0 MWh of generation in the spreadsheet with ERs calculation /4/ with the electricity generation reported in the information service about the Colombian Wholesale Power Market operated by XM. The information provided by the PP is coherent, traceable and reliable with other information sources.

Compliance of the registered monitoring plan with the methodology including applicable tools

During the desk review phase, it was checked the monitoring plan against the monitoring methodology established in the approved Consolidated Methodology for small scale AMS-I.D: Renewable electricity generation for a grid, version 18.0./UN1/.

According to the PD /1/, the VCS project activity Suba and Usaquen hydroelectric umbrella project was monitored following the guidelines of the applied methodology /UN1/.

Data and parameters fixed ex ante at registration time for monitoring plan

In section 5.1 of the registered PD, titled: “Data and Parameters Available at Validation”, it is listed the parameters, and its values, used to calculate the emission factor for national electrical interconnected grid of Colombia at validation time and then used for emission reductions estimation at that time. These parameters are:

- $EG_{j,y}$: Net electricity generated by non-low-cost/must-run power plants j in year y.
- $EG_{k,y}$: Net electricity generated by non-low-cost/must-run power plants k in year y.
- $EF_{EL,i,y}$: Emission factor of non low-cost/must-run power plants in year y.
- $EF_{EL,k,y}$: Emission factor of low-cost/must-run power plants in year y.
- $EF_{grid,OMadj,y}$: Simple adjusted operating margin emission factor in year y.
- $EG_{m,y}$: Electricity supplied to the grid by each source m in the year y.
- $EF_{EL,m,y}$: CO₂ emission factor for each plant m in the year y.
- $EF_{grid,BM,y}$: Build margin emission factor in year y.
- $EF_{CO2,i,y}$: CO₂ emission factor for each fuel type i used.

These parameters were used to calculate the combined emission factor for national electrical interconnected grid of Colombia at validation time, which is also a parameter available at validation time (fixed exante):

⁴ <http://paratec.xm.com.co/paratec/SitePages/generacion.aspx?q=capacidad>

- The operating margin emission factor for the national electrical interconnected grid, which shall be calculated annually with the dispatch data analysis method, and
- The build margin emission factor for the national electrical interconnected grid of, which was determined ex-ante and it is not monitored during the entire crediting period:

Table 4. Data and parameters fixed ex ante at registration time.

Parameter	Description	Value	Source
Installed Capacity	The installed capacity of the project activity.	Suba hydroelectric power plant: 2.6 MW Usaquen hydroelectric power plant: 1.8 MW	Nameplates of the equipment involved with energy generation, verified by the audit team during the onsite inspection/23/.
$EF_{grid,y}$ / $EF_{grid,CM,y}$	Combined margin emission factor in year y.	0.38115 tCO ₂ /MWh	This value was calculated once at the request of registration of the project activity as it was established in the registered PD /1/

Data and parameters monitored

The following table includes all parameters monitored and describes how the audit team 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. Data and parameters monitored.

Parameter	EG _{facility,y}		
Description	Quantity of net electricity generation supplied by the project plant to the grid in year y.		
Value	40,739.244 MWh		
	Note: this value is the electricity generation recorded by the measurement equipment during the monitoring period under assessment. However, the PP has performed a discount due to the delay in the execution of calibration activities in accordance with the registered monitoring plan. The appraisal of the impact of this delay in the emission reduction calculation is explained latter on this report		
	Year	Suba hydroelectric power plant (MWh)	Usaquen hydroelectric power plant (MWh)
	2019	6,595.409	4,275.191
	2020	8,966.372	0.068
2021	13,445.221	7,456.981	
Subtotal	29,007.002	11,732.242	
Means of verification	<p>Source of data and frequency:</p> <p>Hourly transmission of the information to XM is done by EMGESA 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 EMGESA does the transmission of information based on the data transmitted by the measurement systems located in Morato (Suba) and Usaquen Electrical Substations, respectively.</p> <p>These substations are owned by Enel, the local distributor and grid operator. ICONTEC verified that the connection point of the transmission line from both hydroelectric power plants to its respective substation, which, in fact, are the commercial frontiers registered by the project responsible in the National Dispatch Center – CND (Frt 20217 for Usaquen hydroelectric power plant and Frt 20218 for Suba hydroelectric power plant).</p> <p>For this parameter the PP used the information recorded by CND. This data is publicly available, and ICONTEC verified by documental review that the information used for this parameter and hence utilized in the emissions reduction calculation /4/ are credible and reliable (Sheets: Suba-Generation 2019, Usaquen-Generation 2019, Suba-Generation 2020, Usaquen-Generation 2020 Suba-Generation 2021,and Usaquen-Generation 2021).</p>		

Equipment used:

Two power meters installed in the commercial frontier (Morato and Usaquen Electrical Substations, for Suba and Usaquen hydroelectric power plants, respectively); four power meters in total. These have identical Schneider Electric features, with an accuracy of 0.2 IEC. Since these four power meters are installed in the commercial frontier, they fulfill the requirement stated in Regulation CREG 038 /5/ article 8 therefore, they record the net electricity generation delivered to the Colombian electrical grid by a power plant (electricity generated and delivered to the grid minus electricity consumed from the grid by a power plant).

Data cross checking:

In order to verify the data provided by the PP in the spreadsheet used for emission reduction calculations, ICONTEC reviewed the electricity generation reported in the information service of the Colombian Wholesale Power Market operated by XM⁵.

After this review, the audit team concluded that information provided by PP is reliable, coherent, consistent and traceable with secondary sources of information; spreadsheet with emissions reduction calculation /4/ (Sheets: Suba-Generation 2019, Usaquen-Generation 2019, Suba-Generation 2020, Usaquen-Generation 2020 Suba-Generation 2021, and Usaquen-Generation 2021).

Consistency with the QA/QC defined in methodology:

In Section 6.1, in Data / Parameter table 2 of the applied methodology /UN1/ it was not established a QA/QC for this parameter, however in the methodological tool for baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation, version 03.0./UN2/, Section 7.2, Data / Parameter table 12, it is stated as the performance of calibration activities for the measurement equipment. The compliance of this QA/QC procedure it will explained later in this verification report.

Consistency Between the QA/QC Established by the Project Participants in the PD:

In section 5.2 of the registered PD, the QA/QC for this parameter it is stated as the performance of calibration activities for the measurement equipment. The compliance of this QA/QC procedure it will explained later in this verification report.

Conclusion:

During the verification process, ICONTEC checked that this parameter is properly applied according to the monitoring plan/1/ and the applied

⁵ Available at <https://sinergox.xm.com.co/oferta/Paginas/Historicos/Historicos.aspx>

methodology/UN1//UN2/, and that the information is consistent with the secondary information sources used to verify the information.

Compliance with the calibration frequency requirements for measuring instruments

The following table includes the current monitoring equipment for the parameter $EG_{\text{facility},y}$ above mentioned and the information on equipment identification and calibration records. ICONTEC verified that there was a delay in the calibration activities during the monitoring period under assessment for all four electric measurement equipment.

Table 5. Calibration activities for parameter monitored.

Equipment	Calibration Records	Date of Calibration	
Parameter	$EG_{\text{facility},y}$ Quantity of net electricity generation supplied by the project plant to the grid in year y.		
Calibration frequency	4 years		
Suba hydroelectric power plant	Schneider Electric power meter with an accuracy of 0.2 IEC. Serial number of Main measurement equipment: MW-1203A089-01	Calibration Certificate N° ME-1701-20379. Dated on January 30 th /2017. /12/	29/01/2017
	Schneider Electric power meter with an accuracy of 0.2 IEC. Serial number of Back up measurement equipment: MW-1203A090-01	Calibration Certificate N° ME-1701-20378. Dated on January 30 th /2017	29/01/2017
	Usaquen hydroelectric power	Schneider Electric power meter with an accuracy of 0.2 IEC. Serial number of Main measurement equipment: MW-1203A086-01	Calibration Certificate N° CAM-IM-1501-016399. Dated on January 30 th /2015
Schneider Electric power meter with an accuracy of 0.2 IEC.		Calibration Certificate N° CAM-IM-1501-016399. Dated on January 30 th /2015	26/01/2015

Serial number of Back up measurement equipment: MW-1203A087-01		
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In order to verify if the calibration activities were carried out by an accredited institution, ICONTEC search in the public available information in the Web page of the Colombian National Accreditation Body⁶. By means of documental review, ICONTEC concluded that the calibration activities for all four electrical measurement equipment were carried out by an accredited institution: Veritest Ltda /16//17/ and CAM Colombia Multiservicios S.A.S /18//19/.

For the measurement equipment which record the energy generated by both hydroelectric power plants, the calibration activities have a delay. The ERs calculation /4/ was adjusted in accordance with the maximum permissible error (0.2%) of the measurement equipment. The maximum permissible error should be applied to the measured values taken during the period between the scheduled date of calibration (January 29th/2021 for Suba hydroelectric power plant and January 26th/2019 for Usaquen hydroelectric power plant) and the final date of monitoring period under assessment (December 31st/2021).

However the PP applied the maximum permissible error for the electricity generated for Suba hydroelectric power plant during 2021 (See 310322 SUBA AND USAQUEN_ER Calculation-V2.xlsx /4/, Sheet : “Raw Data” Cells: E30 and C11); and for Usaquen hydroelectric power plant during whole monitoring period under assessment (See 310322 SUBA AND USAQUEN_ER Calculation-V2.xlsx /4/, Sheet : “Raw Data” Cells: E33 – E35 and D9 -D11).

Participation under Other GHG Programs

The project under verification assessment is registered under CDM scheme (reference number: 9798), however the audit team verified that Empresa de Acueducto y Alcantarillado E.S.P has not requested issuance of CERs for the monitoring period under assessment on this verification (January 1st/2019 to December 31st/2021)².

The gap validation with the aim to seek registration under the VCS Program was performed previously and the overall conclusion regarding whether the project is eligible to participate under the VCS Program is stated in the joint report for validation and verification available at VCS Web page³.

Other forms of environmental credit or inclusion in an emission trading programs

Currently, the project does not apply to other forms of environmental credit and is not part of any compliance scheme (binding limits).

Sustainable development contributions.

⁶ <https://onac.org.co/directorio-de-acreditados/>

Regarding to sustainable development contributions, the PP argued in MR /3/ as the project activity involves delivering a clean energy (energy source: water), that will help to Colombian Government to fulfil their commitment to achieve INDC target. Since one of the objectives of this assessment process carried out by ICONTEC is to identify GHG assertion by this project activity, the assessment regarding the sustainable development contribution will be developed along this report.

The audit team can confirm that:

- The implementation of the project is consistent with the information provided in the registered PD (Physical features such as technology project equipment, monitoring and metering equipment).
- The project is operated as per PD.
- Information provided in the MR is in accordance with that stated in the PD.
- Parameters are properly measured according to the monitoring plan and the PD, and that the information is consistent with the secondary information sources used to verify the information.
- Data aggregation related with electrical energy generation is appropriate to comply with the methodology and it is in accordance with the PD and operation of metering equipment.
- The information of the ERs spreadsheet /4/ is consistent with raw data information generated by the official source from Colombian Wholesale Power Market operated by XM).
- The process of data management, transfer, storage and reporting was carried out in compliance with the monitoring plan in the PD and the applied methodology /UN1/.

1.1.1 No Net Harm

Currently, Empresa de Acueducto y Alcantarillado E.S.P is implementing an environmental management system with the aim to obtained the certification under the standard ISO 14001; with this framework, the organization has implemented a matrix (still under construction)/20/ which identifies the environmental impacts and risks related with the operation of both hydroelectric power plant.

The impacts identified in that matrix are:

- Depletion of water resources due to water consumption due to the operation of hydroelectric power plants.
- Noise generation that affects the neighboring communities.
- GHG emission reduction due to the project activity involves delivering a clean energy (energy source: water).
- Soil contamination due to hazardous waste like oils used or PCB.

The audit team deemed the list provided by the PP in Table 3 of MR /3/ as complete and it is coherent with project activity nature. Regarding the action plans to mitigate such impacts are reasonable and all of the identified impacts have a control plan in order to supervise continuously how the proposed action plans contribute to mitigate the identified impact.

ICONTEC based on the above arguments validated that the project is carrying out the environmental mitigation actions (environmental programs) in accordance with national legislation and impacts identified.

1.1.2 Local Stakeholder Consultation

During operation stage, Empresa de Acueducto y Alcantarillado E.S.P maintains an ongoing communication with local stakeholders of both hydroelectric power plants. The PP has various channels to received communications from local stakeholder like letters, telephonic calls, on the Web page, and emails. The audit team reviewed the procedure established by made by Empresa de Acueducto y Alcantarillado E.S.P to record the queries from local stakeholders/21/, and it was also reviewed the procedure established by made by the organization to response the requests made by the local stakeholder /22/; and it was also verified that during the monitoring period under assessment there were no complaints regarding project's operation.

AFOLU-Specific Safeguards

Since this project activity is not an AFOLU project, this section is not required.

Accuracy of GHG Emission Reduction and Removal Calculations

Calculation of baseline GHG emissions

In accordance with AMS I.D, version 18 /UN1/, the baseline is the kWh produced by project activity (Suba & Usaquen Hydroelectric Plant) multiplied by the emission factor of the national interconnected grid of Colombia.

It is worth to drawn attention, that a discount was carried out by PP in the electricity delivered by the project activity to Colombian interconnected electrical grid, since there was a delay in the calibration activities,

$$BE_y = EG_{\text{facility},y} \times EF_{\text{grid},CM,y}$$

For Suba hydroelectric power plant :

$$BE_y = 29,004,313.82 \text{ kWh} \times 0.38115 \text{ kgCO}_2e/\text{kWh}$$

$$BE_y = 11,054 \text{ tCO}_2e$$

For Usaquen hydroelectric power plant :

$$BE_y = 11,730,004.37 \text{ kWh} \times 0.38115 \text{ kgCO}_2e/\text{kWh}$$

$$BE_y = 4,741 \text{ tCO}_2e$$

The audit team concludes that a complete set of data for the specified monitoring period is available. The audit team also concludes that baseline emission reductions have been correctly calculated without material misstatements.

Likewise, the audit team confirmed that monitored parameter $EG_{\text{facility},y}$ involved in the baseline GHG emissions calculation was cross checked as it was described in Section 4.1 Table 5 on this report.

Calculation of project GHG emissions

In accordance to the applied methodology AMS.I-D, version 18/UN1/ section 5.6, project emissions of GHG due to the project activity are zero, since both hydroelectric power plant can be considered as run-of-river power plants.

Calculation of leakage GHG emissions

In accordance to the applied methodology AMS.I-D, version 18/UN1/ paragraph 42, emissions by leakage of GHG are zero.

Summary calculation of GHG emission reductions

In accordance with the applied methodology /UN1/ and the description provided above for baseline emission, project emission and leakage:

$$ER_y = BE_y$$

$$ER_y = 15,525 \text{ tCO}_2\text{e}$$

The data used for determination of the emission reductions are available and have been monitored in accordance with the registered monitoring plan and methodology AMS-I.D, version 18.0 The data used for the calculation of ERs in this monitoring period were verified and they were found consistent with those reported in the PD.

The appropriate methods and formulae for calculating baseline emissions, project emissions and leakage were followed in accordance with the PD and applied methodology /UN1/.

Quality of Evidence to Determine GHG Emission Reductions and Removals

In accordance with the applied methodology /UN1/ to determine the GHG emission reductions, it is only necessary to take into account the baseline emissions, since project emissions and leakage are considered as 0 as it was described previously on this report.

Consequently, the baseline emissions and hence the emission reductions are determined by quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the Larimar wind farm project (in MWh) multiplied by the combined margin CO_2 emission factor for electrical interconnected grid of Colombia (in $\text{tCO}_2\text{e}/\text{MWh}$).

The combined margin CO_2 emission factor for Colombian electrical interconnected grid was fixed ex-ante at registration time.

Regarding to the quantity of net electricity generation supplied by Suba and Usaquen hydroelectric umbrella project to the grid, in section 4.1 on this report is described the assessment carried out to determine the sufficiency of quantity, and appropriateness of quality of the evidence. Including details of the reliability of the evidence, and the source and nature of the evidence, the information flow from

data generation and aggregation, to recording, calculation, and crosschecks performed on the reported values.

On section 4.1 on this report is described how was assessed by the audit team the appropriateness of implemented calibration frequency for monitoring equipment for the parameter: Quantity of net electricity generation supplied by Suba and Usaquen hydroelectric umbrella project to the grid.

The audit team can conclude that the PP has presented a complete and appropriate set of values to determine the GHG emission reductions.

Non-Permanence Risk Analysis

Since this project activity is not an AFOLU project and its emission reductions generated, does not have risk of reversibility, it is not necessary to perform a non-permanence analysis.

VERIFICATION CONCLUSION

ICONTEC was engaged by Empresa de Acueducto y Alcantarillado E.S.P. to verify the greenhouse gas (GHG) emission reductions reported by the VCS project Suba and Usaquen hydroelectric umbrella project, project registration number 2060, owned by Empresa de Acueducto y Alcantarillado E.S.P. for the period 01/01/2019 to 31/12/2021, equating to 15,525 tCO₂e.

The verification was performed based on the requirements set out in VCS Version 4.2. ICONTEC considers that the project's GHG emissions and resulting GHG emissions reductions reported in the monitoring report version 03 dated on 10/05/2022, are fairly stated.

ICONTEC confirms that the project is implemented as described in the validated and registered PD. Installed equipment essential for generating emission reductions are running reliably. The monitoring system is in place and the project is generating GHG emission reductions as a VCS project.

Empresa de Acueducto y Alcantarillado E.S.P. 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.

Empresa de Acueducto y Alcantarillado E.S.P. 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 PD, the MR and the monitoring plan; ii) onsite inspection and 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.

During the audit, it was carried out the assessment of project description deviations. ICONTEC can confirm that this assessment complies with the validation criteria for projects set out in VCS Version 4.2.

Verification period: From 01/01/2019 to 31/12/2021.

Verified GHG emission reductions and removals in the above verification period:

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
2019	4,143	0	0	4,143
2020	3,417	0	0	3,417
2021	7,965	0	0	7,965
Total	15,525	0	0	15,525

APPENDIX 1: RESOLUTION OF CORRECTIVE ACTION, FORWARD ACTION AND CLARIFICATION REQUEST

The following table explains how ICONTEC resolve or “close out” CARs and CLs describing how the PP modify the project design, rectify the MR or provide additional explanations or evidence that satisfy the ICONTEC’s concerns.

This table explains the issues raised, the responses provided by the PP, the means of validation of such responses and references to any resulting changes in the MR or supporting annexes.

CAR No.	1	Requirement No.	Validation and Verification Manual, version 3.2. Section 3.2.7	Date:	25-03-2022
Description of CAR					
During the interviews carried out in the onsite inspection it was not possible to review the records regarding to the calibration activities executed for the measurement equipment of electrical energy generation of Suba and Usaquen hydroelectric power plants.					
Project Participant response					Date: 31-03-2022
Due to the operational limitations of the power plants during the Pandemic (e.g. long technical stops for repairing), the calibration processes of the measurement equipment were delayed; to date there is a service order for the calibration of these equipments, with the aim of carrying it out in the coming weeks. As a consequence, project Monitoring Report has been updated to inform this condition and ER calculations have been corrected to apply the maximum permissible error to data measured during non-calibrated period.					
Documentation provided by project participant					
Attached you can find the Monitoring Report updated and the Excel spreadsheet with ER calculations adjusted.					
Audit team assessment					Date: 01-04-2022
The audit team reviewed the updated version of MR and the spreadsheet of emissions reduction and it is reflected the delay in the calibration activities for energy measurement equipment.					
Audit team conclusion: Closed					