

	<p>PERIODIC VERIFICATION REPORT</p>	<p>Page 1 of 32</p>
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**VERIFICATION OF THE
SANTA ANA HYDROELECTRIC PLANT
(UNFCCC REGISTRATION REF. N°: 0275)**

**EMPRESA DE ACUEDUCTO Y ALCANTARILLADO DE BOGOTÁ (EAAB)
(COLOMBIA)**

**VERIFICATION PERIOD:
2006-08-01 TO 2007-07-31**

**REPORT N°. CDM VER-003
ver 5**

OCTUBRE 2008

PERIODIC VERIFICATION REPORT

Date of second issue: 2008 06 06	Project No.: 0275 (CDM.UNFCCC Web page)
Approved by: Climate Change Committee of ICONTEC	Organizational unit: Instituto Colombiano de Normas Técnicas y Certificación – ICONTEC Cra. 37 52-95 Phone: +57-1-6078888 Ext.: 1251/1353 Bogotá
Client: Empresa de Acueducto y Alcantarillado de Bogotá – Santa Ana Hydroelectric Plant	Client ref.: CR 0275
<p>Summary:</p> <p>The Instituto Colombiano de Normas Técnicas y Certificación - ICONTEC, carried out the second verification the GHG emissions reduction due to Santa Ana Hydroelectric Plant project in Bogotá, Colombia by reviewing the findings of the project from 2006 08 01 to 2007 07 31.</p> <p>Santa Ana Hydroelectric Plant is a small run-of-river type hydroelectric plant, introduced into the municipal potable water supply system of Bogotá – Colombia, located on the outskirts of the city. It was scheduled to begin operations in the second semester of 2005.</p> <p>We carried out a Verification plan that included: i) planning meeting, ii) desk review and investigation of secondary sources of information, iii) on-site assessment and iv) reporting, as follows:</p> <ul style="list-style-type: none"> ▪ February 22, 2008: Planning meeting for the verification at the headquarters of the Company and Opening meeting for the service. ▪ March 13 and 14, 2008: Desk review and investigation of secondary sources of information ▪ May 21 to June 06, 2008: On-site Visits ▪ June 06 to July 22: Reporting. A preliminary report was sent to the owner of the project on 2008-06-10 for comments. The final report is issued on 2008 07 23. ▪ October 1st, 2008: The final report was updated for the correction request of the EB. <p>For the verification ICONTEC used as reference the 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 for this type of project.</p> <p>The verification team applied the recommendations of Validation and Verification Manual, addressed to the identification of risks associated to the verification process. In this case we did not identify potential risks.</p> <p>Documentation review, interviews and on-site visits allowed us to collect enough evidence to completely assess the verification criteria and determine that the emissions reduction were correctly calculated based on PDD, monitoring plan and appropriate application of Appendix B of the Simplified M&P for Small Scale CDM Project Activities (see option a) (taking into account the decision / amendments to Appendix B of EB 12)).</p> <p>Based on the above issues, ICONTEC is able to certify that the GHG emissions reduction of Santa Ana Hydroelectric Plant in Bogotá during the crediting period assessed from 2006 08 01 to 2007 07 31 amounted</p>	

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Work carried out by: Eng. Juan Alberto Gracia (AL) Eng. Fernando Gómez (EE) Eng. Martha Lucia Castro(A)			
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Abbreviations

ICONTEC	Instituto Colombiano de Normas Técnicas y Certificación
DNA	Designated National Authority
CER	Certified Emission Reduction (s)
CODENSA	Comercializador y Distribuidor de Energía Eléctrica S.A.. (Grid Operator)
EMGESA	Empresa Generadora de Energía Eléctrica S.A. (Electricity Market Agent)
FAR	Forward Action Request
CDM	Clean Development Mechanism
CO2	Carbon Dioxide
DOE	Designated Operational Entity
GHG	Greenhouse Gases
MP	Monitoring Plan

PERIODIC VERIFICATION REPORT

PDD	Project Design Document
UNFCCC	United Nations Framework Convention for Climate Change
AL	Lead Auditor
EE	Energy Sector Expert
EAAB	Empresa de Acueducto y Alcantarillado de Bogotá
XM	"XM" (Experts Market) is a company of the ISA Group providing integral services. (www.xm.com.co). It is an information service about the Colombian Wholesale Power Market that allows the market agents to obtain, in an interactive way, information of the operational process and the results of the liquidation of the transactions done in the Power Block Market.
NEON	
CAM	Compañía Americana de Multiservicios (Maintenance and calibration company)
CREG	Comisión de Regulación de Energía y Gas (Regulatory entity of energy sector in Colombia)
IAC	Ingeniería Internacional en Automatización y Control (Representative of AMETEK meters in Colombia)
SIC	Trade and Industrial Superintendence, Accreditation body of Colombia

Table of Contents	Page
1 INTRODUCTION	6
1.1 Objective	6
1.2 Scope	6
1.3 Description of the Project Activity	7
2 METHODOLOGY	8
2.1 Verification team	8
2.2 Verification Schedule	8
2.3 Planining	8
2.4 Desk Review and Investigation of secondary sources of information	8
2.5 On site visits	9
2.6 Assesment	10
2.7 Reporting of Findings	11
3 VERIFICATION FINDINGS	11
3.1 Remaining Issues, CARs, FARs from Previous Validation or Verification	11
3.2 Project Implementation	11
3.3 Completeness of Monitoring	12
3.4 Accuracy of Emission Reduction Calculations	16
3.5 Quality of Evidence to Determine Emission Reductions	16
3.6 Management System and Quality Assurance	16
4 PROJECT SCORECARD	17
5 VERIFICATION STATEMENT	18
5.1 Introduction	18
5.2 Responsibilities of EAAB project management and ICONTEC	18
5.3 Basis for GHG Verification Opinion	18
5.4 Opinion	18
6 REFERENCES	20

Annex 1: Periodic Verification Checklist

1. INTRODUCTION

The Empresa de Acueducto y Alcantarillado de Bogotá (EAAB) has commissioned an independent verification by ICONTEC of its reported greenhouse gas (GHG) emission reductions from the Santa Ana Hydroelectric Plant project. ICONTEC have reviewed the GHG data collected from the period 2006 08 01 to 2007 07 31. This report contains the findings of the verification and the certification statement for the certified emission reductions.

1.1 Objective

According to CDM Modalities and Procedures (Decision 17/CP.7) the purpose of the verification is the periodic independent review and ex-post determination by the DOE of the monitored reductions in anthropogenic GHG emissions by sources, which have occurred as a result of a registered CDM project activity during the verification period.

Certification is the written assurance by the DOE that, during a specified time period, a project activity achieved the reductions in anthropogenic GHG emissions as verified.

Taking into account that the monitoring methodology included in the PDD for this project is based on the measurement of the power generated, the verification was mainly focused on establishing both the validity of the procedure followed to obtain and record this measurement and its reliability and quality.

1.2 Scope

The verification aims:

- To determine whether the project documentation provided is in compliance with the requirements of the registered project design document, relevant provisions of decision 17/CP.7 and relevant decisions of the COP/MOP;
- To conduct on-site inspections, including a review of performance records, interviews with project participants and local stakeholders, measurements, compliance of established practices and testing of the accuracy of monitoring equipment;
- To review monitoring results and verify that the monitoring plan has been correctly applied and their documentation is complete and transparent.
- To recommend to the project participants the appropriate changes to the monitoring plan, if necessary.
- To determine the reductions in anthropogenic GHG emissions by sources that would not have occurred in absence of the CDM project activity, using calculation procedures according to the registered Project Design Document and the Monitoring Plan.

- To identify and inform the project participants of any concerns related to the actual project activity and its operation compliance with the registered project design document. Project participants shall address the concerns and supply relevant additional information.
- To provide a verification report to the project participants, the parties involved and the Executive Board. The report shall be made publicly available.

The verification does not provide consultancy service to the client. ICONTEC, based on its ethics code and internal procedures for validations, verifications and certification of CDM project activities (which, in turn, are based on the Validation and Verification Manual) focused on the identification of significant risks for CER generation, and verification of the mitigation.

1.3 Description of the Project Activity

Project Parties:	Empresa de Acueducto y Alcantarillado de Bogotá
Title of project activity:	Santa Ana Hydroelectric Plant in Bogotá – Colombia
UNFCCC registration No:	0275
Project Entity:	Santa Ana Hydroelectric Plant is part of Empresa de Acueducto y Alcantarillado de Bogotá Official Contact: Oscar Garcia Poveda Corporate Manager of the Master System Address: Av. Calle 24 No. 37 - 15 Bogotá – Colombia ogarcia@acueducto.com.co phone: + 57-1 – 3447111 fax: + 57-1- 3447411 / 3447441
Location of the project activity:	Latitude 110360 North, longitude 105800 East Bogotá, Distrito Capital Colombia
Project's crediting period	10 years
Verification period	2006 08 01 to 2007 07 31
Projects starting date	2005 08 01

Santa Ana Hydroelectric Plant is a small run-of-river type hydroelectric plant, introduced into the municipal potable water supply system of Bogotá – Colombia, located on the outskirts of the city. It was scheduled to begin operations in the second semester of 2005.

Santa Ana Hydroelectric Plant project has installed at the base of the Usaquén Alternate tunnel a power house with hydroelectric power conversion equipment, that turbines the water passing from the Wiesner water treatment plant into the distribution / storage system of the city, producing clean electricity to be placed into the Colombian National Interconnected Grid, following local existing electricity market regulations and required environmental and operational permits. Its exact location corresponds to the coordinates 110324.65 North and 105849.56, at north of Bogotá

A key objective of the project is to reduce Greenhouse Gas Emissions that would have otherwise been generated by the National Interconnected System of Colombia.

2. METHODOLOGY

2.1 Verification team

The verification team is composed of the following staff:

Mr. Juan Alberto Gracia ICONTEC Team Leader, CDM Lead Auditor
Ms. Martha Lucia Castro ICONTEC CDM Auditor
Mr. Fernando Gómez ICONTEC Energy sector expert
Ms. Josefina Baldrich ICONTEC Internal verifier (Climate Change Committee)
Ms. Rosa Cano ICONTEC Expert (Climate Change Committee)

2.2 Verification Schedule

Planning:	2008 02 22
Desk Review:	From 2008 03 13 and 2008 03 14
On-site verification:	From 2008 05 21 to 2008 06 06
Reporting:	Preliminary report: 2008-06-10 Final report: 2008 09 26

2.3 Planning

According to the owner of the project request, a planning meeting for the verification was held at the headquarters of the Company. This meeting included the opening meeting for the service.

2.4 Desk Review and investigation of secondary sources of information

In order to carry out the desk review, the following documents were requested to the project participants:

- Validation report 2006 04 03 rev 1.
- Last version of PDD and attached documents (including the last version of the monitoring plan, Version 2).
- Verification report No. 002 – 2007 CDM VER – July 4th, 2007
- Reports and records of daily, monthly and annual monitoring data on the items defined in the monitoring plan and the Monitoring Report for the Second crediting period from 2006 08 01 to 2007 07 31.
- Quality Assurance Manual, procedures for internal audit and plant operation and maintenance, as well as for measuring equipment calibration, and information security.
- Information on the applicable environmental regulations (see 5. References).
- Specifications for the Plant equipment.

- Communications with the project stakeholders.

The whole documentation was reviewed and a verification audit plan was structured and sent to the project participants.

The monitoring report of the second crediting period was made publicly available in UNFCCC web site the 2008 05 23.

2.5 On-Site Visits

Between, May 21st to June 06th the project was visited at the following facilities:

- Santa Ana Hydroelectric Plant (Calle 119 No. 0-10 Este, Bogotá).
- Control Center (Av. Calle 22 No 80 A 81, Bogotá),
- EAAB Headquarter Office (Av. Calle 24 No. 37 – 15, Bogotá),
- Usaquén Electrical Substation of EAAB (Calle 110 No. 9-80, Bogotá), and
- Usaquén Electrical Substation of Codensa (Calle 110 Cra 9, Bogotá)

Interviews were conducted to the plant's personnel and to EAAB Directors and Technical Supervisor (see list below). Other project stakeholders were also interviewed (CAM, ENGESA, IAC).

During on-site visit the following personnel were interviewed:

Entity	Name	Position
EAAB	Mr. Roosevelt Apache	Director of Electromechanical Services.
EAAB	Mr. Juan Carlos Sánchez	Power Management Specialist Professional (previously Chief of Electrical Services Division)
EAAB	Mr. Luis Abelardo Cruz,	Electronic Maintenance Technician
EAAB	Mr. Mauricio Jiménez	Director of Network Matrix Aqueduct
EAAB	Ms. Claudia Milena Vargas	Quality Coordinator of Network Matrix Aqueduct Direction
EAAB	Ms. Sonia Raquel Duarte	Director of Environmental Sanitation (previously Director of Technical Direction)
EAAB	Ms. Martha Patricia Cruz	Specialist Professional of Environmental Management
EAAB	Ms. Magda Ivonne Castaño	Specialist Professional of Quality and Process Direction
CAM	Mr. Erick Camilo León	Professional Trainer
EMGESA	Mr. Luis Eduardo Ríos	Commercial Area Coordinator
IAC	Mr. William Riaño	General Manager

2.6 Assessment

ICONTEC performed the verification by:

- reviewing project documentation;
- on-site inspections, including review of plant installations (water conduction system, power generation and transformation), performance records, and interviews with project participants;
- collecting measurements, observing established practices and verifications of the accuracy and liability of monitoring equipment;
- cross-checking measurements of plant generation;
- reviewing monitoring results and checking the correct application of monitoring methodologies, and quality control of the data collection and its report, and
- setting the GHG emissions reductions.

The verification assessment included the following aspects:

- a) Implementation and follow up to the monitoring plan, including verification of:
 - all data on project emissions reduction and follow up indicators of sustainable development;
 - responsibilities and related authorities;
 - monitoring frequency;
 - accuracy and liability of the equipment used for monitoring, control and calibration;
 - consistency of results, their approval and revision;
 - controls to prevent, detect, and correct any errors or omissions during the monitoring.
- b) Materiality of the project information including assessment of the absence of:
 - inconsistencies in the use of formulas in spreadsheets and their connections;
 - inappropriate use of the methodology approved;
 - errors in data due to failures during the digitizing process;
 - inappropriate use of data.

- c) Verification of consistency of data resulting from the project operation regarding the baseline.
- d) Analysis of potential risks to the project.
- e) Quality assurance and management system

The verification process was carry out using the checklist included in Annex 1. The use of this checklist ensures a complete verification process, and demonstrates how emission reductions have been verified and how the verification findings have been reached.

2.7 Reporting of Findings

There are not FARs or CARs identified for the project.

3. VERIFICATION FINDINGS

3.1 Remaining issues, CARs, FARs, from previous validation or verification

There are no remaining open issues, FARs or CARs, from previous verification.

3.2 Project Implementation

In our opinion the individuals responsible for the project have implemented all the activities according to the PDD and the monitoring plan. Additionally, and under responsibility of EAAB, social and environmental benefits have been implemented particularly by using the guidelines of the Environmental Management Plan submitted by EAAB and approved through Order 1913 on 2000-11-23 by Corporación Autonoma Regional (Environmental Authority).

As established in the PDD of Santa Ana Hydroelectric Plant, “according to the Monitoring Methodology as specified under the relevant M&P for small scale CDM project activities related to renewable electricity connected to a grid, the monitoring shall consist of metering the electricity generated by the renewable technology, that is, the Santa Ana Hydropower Plant”. In addition, the table included in the PDD states that the “Data variable” to be considered are “Electricity generated, provided to the Colombian National Interconnected System at the bus bar of commercial transactions”.

As a matter of fact, EAAB Quality Plan (Form: 3MC050504-01), as far as the Power Generation Procedures are concerned, establishes that electricity provided to the national grid generated by Santa Ana Hydroelectric Plant is measured at Usaquén Electrical Substation of CODENSA, under the following statement:

“In order to obtain generated power data, the Empresa de Acueducto y Alcantarillado de Bogotá and the entity in charge of Commercialization have stated that the meter located in the land of Usaquén Electrical Substation will be the equipment of reference for measuring generated power”.

This statement sharply matches the PDD Monitoring Plan requirement, above mentioned.

A cross checking between energy measurements at the point where Santa Ana Hydroelectric Plant generation enters to the grid in Usaquén Electrical Substation of CONDESA, and those in power plant site was made. The small differences found in the series compared are consistent with energy losses in the very short line connecting the two points. Site measurements are taken using the meter S/N 014600825, installed in the Usaquén electrical substation, which is referenced in the reviewed documentation.

Based on the above considerations, ICONTEC considers that the power received at the arrival point of the transport line connecting Santa Ana Plant and Usaquén Electrical Substation in the distribution system of CODENSA adequately represents the renewable power that effectively originates the emissions reduction.

3.3 Completeness of Monitoring

The physical conditions related to the plant capacity described in the PDD were verified in order to establish the validity of the basic parameters used in power and energy calculations. In fact, it was found that the technical characteristics of the turbine and generator correspond exactly to those specified in the PDD: capacity of the turbine 13,43 MW, as the plate exhibits; net design head 105.9 m, as showed in the plant design document revised by the verification team. (As explained in that document the net head of 105.9 m. corresponds to a gross head of 120 m.). With a design flow of 13,5 m³/s., as mentioned in the PDD, the application of the known formula $P = g \cdot h \cdot q \cdot \eta$ produces the 13.43 Mw value for installed capacity. Real operation water flows have historic values of 7,0 m³/s, which means that the power plant is being used near to a half of its capacity. As explained by the interviewed personnel, these reductions are due to changes in the behavior of the consumption of water in the city of Bogotá; these changes are mainly the result of governmental campaigns for saving water and control of water leaks in the water distribution system. In any case, the generation data recorded, used to calculate GHG emission reductions, discussed later on, are consistent with these reduced water flows.

In order to establish the correspondence between the power registered at Usaquén Electrical Substation and the power generated by Santa Ana Plant, the connection between them was physically verified according to the single line diagram, which is part of the connection contract, referred ahead.

Besides, a checking was made to verify that no feed back energy flows from the substation are eventually considered as generated by the power plant. This verification was based on a review of electrical connections inside the power plant room control. It was clear that either the equipment or the control system installed allows this type of operation, thus assuring that there is no feed back energy accounted as energy generated by the plant.

The Verification Team checked during the onsite assessment that there were not other electrical connections, different from the main connection, through which there could be energy feedback counted from other systems. In fact, ICONTEC found that additional to the main connection two auxiliary outputs exist: one for providing auxiliary services to the Hydroelectric Plant and the other one as substitution for the Wiesner drinking water treatment Plant. The Verification Team verified that in both cases the control system does not allow importation of energy that could be counted as

energy generated by the Santa Ana Hydroelectric Plant. A clarification request was identified to Owner of the project with the objective of change the Monitoring report for including the reference of the single line diagram and the explanation about the two additional lines (see CR 1).

These issues allow us to affirm that the metering carried out at that substation of the power delivered by this circuit appropriately represents the power generated to be considered for GHG emission reduction calculations, as claimed by the Monitoring Plan.

As far as obtaining, recording and verification operations of the measurement in Usaquén Electrical Substation of CODENSA are concerned, these are included in the procedure "Measurement and Analysis of Data" of the process "Power Generation" (Code 1NM101505 - 02).

The Verification Team established that this procedure complies with the operational and commercial scheme prevailing in Colombia, and that it strictly fulfils the regulatory requirements about this topic, especially those included in the Orders CREG 024 of 1995 (by which the commercial aspects are regulated regarding Wholesale Power Market in the national interconnected system which are part of the Operation Regulations) and CREG 006 of 2003 (by which the following aspects are adopted: standards on record of commercial frontiers and contracts, information supply and report, and liquidation of commercial transactions in the Wholesale Power Market), according with the following demonstration:

a) Technical Operation of Santa Ana

In operational terms, the power generated by Santa Ana is delivered to the distribution system in the city of Bogotá through the Grid Operator CODENSA, at Usaquén Electrical substation according to the Contract of Connection 9-99-25400-566-2004 signed by CODENSA and EAAB on December 23, 2004, in which the parties commit themselves to comply with the Grid Code (Order CREG 025 of 1995) and the Distribution Regulations (Order CREG 070 of 1998).

As per the Technical Attachment to the Contract two power meters were installed, the main one and the supporting one, with identical SIEMENS features, with accuracy of 0.2 IEC, which directly and reliably calculate the power for each phase, with four (4) impulse transmitters to three wires free from potential to carry pulses to the CLD, anti-retrogression device with non-volatile memory. These meters are assembled in the cell identified as C05, "Aguadora" which is connected to row 3 at 11,4 kV and its use is exclusive for Santa Ana power generation plant.

ICONTEC performed an inspection visit to Usaquén sub-station to establish the operational features and conditions of the metering systems above mentioned, and found that these ones fairly adjust to the Contract of Connection.

In order to verify the reliability and accuracy of the metering, Tests Certificates were checked with their relevant Protocols corresponding to potential transformers (PT), current transformers (CT) and power meters, and the following results were found:

Potential Transformers:

Manufacturer: AREVA, Serial number: MK-77620, Type ME-1505

Tests performed at the manufacturer's laboratories as per the standard IEC 44-2, on July 22, 2005.

Tests performed: Dielectric tests, partial discharges measurement, and accuracy verification.

Test results: Satisfactory.

Current Transformers:

Manufacturer: AREVA, Serial number: MK-77750, Type KIG-24

Tests performed at the manufacturer's laboratories as per the standard IEC 44-2, on August 2, 2005.

Tests performed: Dielectric tests, partial discharges measurement, and accuracy verification.

Test results: Satisfactory.

Power Meters

Manufacturer: SIEMENS

Serial number: Main Meter, 30031; Supporting Meter, 30029. Type 3F4H, Model: 99-SWB, Accuracy Class 0.2S

Calibration certificates: CAM-IM0506-000786 and CAM-IM0506-000785 issued on July 1, 2005.

Tests performed at the Meters Laboratory of CAM, as per the Colombian Technical Standard NTC 4856.

Tests performed: Accuracy tests, Constant verification test, and operation without charge.

Test results: CONFORM

The Meters Laboratory of the American Company of Multiservices (Compañía Americana de Multiservicios, CAM) has Accreditation 10165 issued on May 18, 2004, extended with the Order 5899 issued on March 9, 2006, of the Superintendence of Commerce and Industry of Colombia.

Based on the above mentioned visits and certifications, ICONTEC provides positive opinion on the reliability and accuracy of the metering. And this calibration records evidence the continue confidence about the meters.

b) Commercial Operation of Santa Ana

In commercial terms, power produced by Santa Ana is delivered to the power generating and commercializing company EMGESA, as per the power sale contract No. 1-99-26300-671-2005 signed by the Company and EMGESA for three years from December 1, 2005. Previously, between June 9 (date of the official registration of the commercial frontier of Santa Ana in SIC) and November 30 of 2005, the commercial relation was managed through the contract of mandate

between the same two entities, under similar conditions. The crediting period object of the current verification, August 1, 2006 - July 31, 2007, is covered by the commercial contract No. 1-99-26300-671-2005 in which EMGESA is the representative of Santa Ana Plant in the Wholesale Power Market.

The record of the power bought and sold by the commercializing agents in the Wholesale Power Market in Colombia, and which is the basis for the execution of power sale contracts, is officially kept by the Company XM Experts Market (company of the ISA Group providing integral services of operation, administration and development of wholesale power markets), based on the information of the meters installed in the commercial frontiers.

According to the communication 010916-1 of June 9, 2005 addressed to EMGESA by ISA (Head Company of the Administrator of the Commercial Interchange System – SIC, later merged into XM Market Experts), the commercial frontier of Santa Ana Hydroelectric Plant was officially registered in the Wholesale Power Market, with an effective capability of 8 MW, under the following features:

SIV CODE	METER SERIAL NUMBER	EXPORTER	IMPORTER	VOLTAGE LEVEL (kV)	METER CLASS	CR	START
ESNT 1001	30031	EMGESA	CODENSA	11,4	0.2	CR21	2005-06-09 0:00
CR:	Collection center (where the meter data are reported).						
START	Date from which the frontier is registered in SIC.						

Through a telephonic system located in the Usaquén Electrical substation, and with the support of a GPRS (Global Packet Radio System) system the company CAM is questioning daily the commercial frontier meter of Santa Ana installed at Usaquén Electrical substation, about the power delivered. This information is daily store.

Daily transmission of the information to XM is done by CAM 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 on the NEON platform (information service about the Colombian Wholesale Power Market) operated by XM.

The person from EAAB in charge of verification and validation of data acquired, transmitted and recorded within this framework is the Chief of Electrical Services Division at the Control Center, by an automatically and electronically remote reading, of the power meter AMETEK which is in the Usaquén Electrical Substation, owned by the EAAB – ESP. The Chief of Electrical Services Division, supervised by the Director of Electromechanical Services, was appointed as interlocutor with external entities for these concerns, as per official communications subscribed by The Corporative Manager of Technology.

Soundness of the monthly power sale reports submitted by EMGESA to the Company was verified by direct consultation of the NEON platform databases, performed by the Verification Entity. These reports provide the information on a daily basis in accordance with the monitoring methodology.

The Monitoring Report reliably shows the measurement of the power delivered to the grid by Santa Ana Hydroelectric Plant, added on a monthly basis that corresponds to a value of 54 374 MWh during the crediting period. Reduced emissions were calculated by multiplying the power delivered in MWh by the emissions reduction factor of 0,4392 kg of CO_{2e} per kWh officially approved in Colombia in 2005 for small-scale renewable power projects connected to the national grid.

ICONTEC carried out the comparison of actual generation of 54 374 MWh during the period from August 2006 to July 2007 with the estimation of 47 000 MWh/year established in the PDD. ICONTEC found that the generation during the verified period was higher than the expected in the PDD. ICONTEC could establish that EAAB could not, for technical and operational reasons regarding water supply reliability concerns, carry out the planned annual improvements works in the water conduction system, thus the power plant was not taking out for the expected time (3 months approx). We have reviewed the documentation furnished by EAAB supporting the above mentioned reasons, and we have found it clear and correct.

Therefore, it was difficult to adjust the operation of the Aqueduct System during the second period of accreditation to carry out the improvements activities above mentioned which allowed the Santa Ana Hydroelectric Plant operate all the twelve months of the year and generate a 15,68% more electricity compared to the estimated annual generation.

Based on the studies carried out and analyzed, presented in this Verification Report, ICONTEC was able to determine that Santa Ana generation plant, during the second year of the crediting period, from August 1st, 2006 to July 31st, 2007 showed a reduction of 23 881 tons CO_{2e}.

3.4 Accuracy of Emission Reduction Calculations

Regarding the measurement record and storage, which is based on the procedures for data transmission and recording of the Wholesale Power Market, and according to previous description (see 3.2) and the control described in 3.1 about the maintenance and calibration of the equipment, we may assure the data's accuracy and certainty.

3.5 Quality of Evidence to Determine Emission Reductions

Santa Ana Hydroelectric plant provided enough evidence of maintenance and calibration of the equipment, as well as data collection and analysis which allows ICONTEC to rely on the information and data presented during the verification.

Internal technical verifications are made to the operation of Santa Ana Plant by interdisciplinary teams, which ensure an appropriate control of power generation, and there also are detailed preventive plans for electrical, electronic and mechanical maintenance of the plant that assure its reliability. The Scheduled Maintenance of electrical, electronic and mechanical components equipment of the plant was carried out by the Department of Electromechanical Services. This maintenance is part of a Service Agreement signed between the Network Matrix Aqueduct Department and the Department of Electromechanical Services.

3.6 Management System and Quality Assurance

EAAB is implementing a quality management system based on the Standard ISO 9001:2000 in the project, and its structure guarantees that documentation and records are within a control scheme ensuring reliability of the information provided during the verification.

Within the EAAB Audits Program, Power Generation Process was included in an Internal Audit, and was conducted in July 2007 by the Quality and Process Direction of the Planning and Control Corporate Management. The implementation of improvements compared to the comments raised in the audit will be highlighted in the Verification of the third accreditation period CDM project.

As an improvement opportunity, EAAB, during its internal audit, detected the need to obtain data about power generation by an automatically and electronically remote reading of power meter AMETEK, located in the Usaqué Electrical Substation.

This remote reading mechanism was implemented and it allows the Electrical services division of EAAB to daily measure the data about power generation, which will be later cross-checked against the data generated by EMGESA. To make this cross-checking, an Excel application was developed and implemented. For EAAB, the information recorded by EMGESA is valid as long as the difference between the data is less than 5%.

It was relevant that a Quality Management System was implemented for this Project, which will ensure a complete control of the plant's management even though it is not a mission activity of EAAB.

4. PROJECT SCORECARD

The conclusions on this scorecard are based on the Monitoring report.

Risk Areas		Conclusions			Summary and findings and comments
		Baseline Emissions	Project Emissions	Emissions Reductions	
Completeness	Source coverage / Boundary definition	✓	✓	✓	All the relevant areas are covered by the monitoring plan and the boundaries of the project are defined correctly and transparently.
Accuracy	Physical Measurement and analysis	✓	✓	✓	The technology is applied in an appropriate manner.
	Data calculation	✓	✓	✓	The emissions reductions are calculated correctly.

PERIODIC VERIFICATION REPORT

	Data Management & Reporting	✓	✓	✓	An eligible data management system is in place.
Consistency	Changes in the project	✓	✓	✓	Results are consistent with underlying raw data.

5. VERIFICATION STATEMENT

Reporting period: From 2006 08 01 to 2007 07 31

Verified emissions in the above reporting period: Emission reductions: 23 881 Tons of CO₂ equivalent.

5.1 Introduction

ICONTEC has been engaged by EAAB Project Developer to examine the greenhouse gas (GHG) emission reductions reported from the Santa Ana Hydroelectric plant for the corresponding period, equating to 23 881 tons of CO₂ equivalent.

We consider that the project's GHG emissions and resulting GHG emissions reductions reported in the Monitoring Report version 03 of 2008 09 26 are fairly stated.

5.2 Responsibilities of EAAB Project Management and ICONTEC

The Management of the Santa Ana Hydroelectric Plant 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.

The Management of Santa Ana Hydroelectric plant 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 and approved baseline for the same period.

In a planned way ICONTEC got 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.

5.3 Basis for GHG Verification Opinion

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

ICONTEC 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 assessment, on a test basis, of evidence relevant to the amounts and disclosures in relation to the project's GHG emission and the calculations of GHG emission reductions for this reporting period.

5.4 Opinion

ICONTEC is able to certify that the emission reduction from the Santa Ana Hydroelectric Plant during the period from August 1st, 2006 to July 31st, 2007 equals to 23 881 tons of CO₂ equivalent.

Bogotá D.C., October 1st, 2008



Fabio Tobón
Executive Director
ICONTEC

6. REFERENCES

- /1/ PDD registered version 2
- /2/ Monitoring Plan Annex of the PDD
- /3/ Validation report REV 1 2006 04 03
- /4/ Monitoring Report 2008 04 15
- /5/ Measuring records 2006 – 2007
 - Opportunity of Improvement: Automated collection of data.
 - Purchasing Monthly Reports – Power Sale and Representation of Santa Ana, August, 2006 – July, 2007
 - Copy of the Sale Contract of Santa Ana Minor Plant Power 1-99-26300-671-2005
 - Order CREG 024 of 1995, by which the commercial aspects are regulated regarding Wholesale Power Market in the national interconnected system which are part of the Operation Regulations.
 - Grid Code, Order CREG 025 of 1995
 - Distribution Regulations, Order CREG 070 of 1998
 - Contract of Connection 9-99-25400-566-2004 signed by CODENSA and EAAB on December 23, 2004, in which the parties commit themselves to comply with the Grid Code (Order CREG 025 of 1995) and the Distribution Regulations (Order CREG 070 of 1998).
 - Order CREG 006 of 2003, by which the following aspects are adopted: standards on record of commercial frontiers and contracts, information supply and report, and liquidation of commercial transactions in the Wholesale Power Market
 - Ministry of Mines and Energy Order 181421 of 2005, by which establishes the Colombian official emissions factor for small scale CDM projects.
- /6/ Internal Procedures:
 - 1NM101505-01 Measurement and analysis of data
 - 1NM101510-01 Conciliation of Results
 - 1NM 101010-01 PCH operation procedure
 - EAAB, Quality Plan for the process of Power Generation, Form: 3MC050504-01
- /7/ International Emission Trading Association(IETA) & the World Bank's Prototype Carbon Fund (PCF): Validation and Verification Manual <http://www.vvmanual.info>

PERIODIC VERIFICATION REPORT

Annex 1

Periodic Verification Protocol

VERIFICATION OF THE SANTA ANA HYDROELECTRIC PLANT

TABLE 1: DATA MANAGEMENT SYSTEM/CONTROLS

The project operator's data management system/controls are assessed to identify reporting risks and to assess the data management system's/control's ability to mitigate reporting risks. The GHG data management system/controls are assessed against the expectations detailed in the following table. A score is assigned as follows:

- Full - all best-practice expectations are implemented.
- Partial - a proportion of the best practice expectations is implemented
- Limited - this should be given if little or none of the system components is in place.

Expectations for GHG data management system/controls	Score	Verifiers Comments (including <i>Forward Action Requests</i>)
A. Defined organizational structure, responsibilities and competencies		
A.1. Position and roles <i>Position and role of each person in the GHG data management process is clearly defined and implemented, from raw data generation to submission of the final data. Accountability of senior management must also be demonstrated.</i>	Full	All the Roles and Responsibilities of the personnel involved in the project are clearly defined in Santa Ana Plant and Empresa de Acueducto y Alcantarillado de Bogotá EAAB's documents.

Expectations for GHG data management system/controls	Score	Verifiers Comments (including <i>Forward Action Requests</i>)
A.2. Responsibilities <i>Specific monitoring and reporting tasks and responsibilities are included in job descriptions or special instructions for employees.</i>	Full	All the Roles and Responsibilities of the personnel involved in the project are clearly defined in Santa Ana Plant and Empresa de Acueducto y Alcantarillado de Bogotá EAAB.
A.3. Competencies needed <i>Competencies needed for each aspect of the GHG determination process are analyzed. Personnel competencies are assessed and training program implemented as required.</i>	Full	Documentation and records of all the personnel involved in the Project were verified. In particular the competence of the contractors of maintenance and calibration was verified.
B. Conformance with monitoring plan		
B.1. Reporting procedures <i>Reporting procedures should reflect the monitoring plan contents. Where deviations from the monitoring plan occur, the impact of this on the data is estimated and the reasons justified.</i>	Full	The Monitoring Report that was presented, which had to be aligned with the Monitoring Plan, is consistent with the presentation of data taken and the documents control, according to the internal procedures of the company.
B.2. Necessary Changes <i>Necessary changes to the monitoring plan are identified and changes are integrated in local procedures as necessary.</i>	Full	It is not necessary to do changes to the Monitoring Report. But some clarification about the names of the positions was performed.
C. Application of GHG determination methods		

Expectations for GHG data management system/controls	Score	Verifiers Comments (including <i>Forward Action Requests</i>)
<p>C.1. Methods used</p> <p><i>There is a documented description of the methods used to determine GHG emissions and justification for the chosen methods. If applicable, procedures for capturing emissions from non-routine or exceptional events are in place and implemented.</i></p>	Full	<p>The methodology defined in the PDD is used for calculating the emissions reduction.</p> <p>The methods are supported by the information included in the internal procedure, i.e. Quality plan of Energy Generation Process, Electrical and mechanical maintenance, Quality procedures.</p>
<p>C.2. Information/process flow</p> <p><i>An information/process flow diagram, describing the entire process from raw data to reported totals is developed.</i></p>	Full	<p>Procedures and records, needed to describe the whole plant operation and the way in which the different parameters are measured, have been developed. In the Monitoring Report the description of the process is included.</p> <p>The Figure 5 of the Monitoring report showed the single line diagram. The new version of the monitoring report was reviewed by ICONTEC, where an explanation clarifying that the lines are outputs were included. Additionally, the figure was improved. These changes make clear that there is not importation of energy from another grid that could be counted as energy generated by the Santa Ana Hydroelectric Plant (see CR 1).</p>

Expectations for GHG data management system/controls	Score	Verifiers Comments (including <i>Forward Action Requests</i>)
C.3. Data transfer <i>Where data is transferred between or within systems /spreadsheets, the method of transfer (automatic / manual) is highlighted - automatic links/updates are implemented where possible. All assumptions and the references to original data sources are documented.</i>	Full	<p>The data is saved in the System in magnetic files or in hard disks and also in physical form by the commercialization staff. This data is transferred on the website page of XM (www.xm.com.co).</p> <p>All data sources are clearly referenced.</p>
C.4. Data trails <i>Requirements for documented data trails are defined and implemented and all documentation is physically available.</i>	Full	<p>Documentation is available and although it has restricted access for recording, it can be verified at the web page and also in physical documents. There is an internal procedure 1NM101505-01, Measurement and analysis of data.</p>
D. Identification and maintenance of key process parameters		
D.1. Identification of key parameters <i>The key physical process parameters that are critical for the determination of GHG emissions (e.g. meters, sampling methods) are identified.</i>	Full	<p>All parameters are defined and supported by the internal documentation.</p>
D.2. Calibration/maintenance <i>Appropriate calibration/maintenance requirements are determined.</i>	Full	<p>Maintenance and verification of the equipment used in the measurements are carried out periodically. And it is important that the main power meter will be programmed for calibration in the short time.</p> <p>The Electromechanical team of EAAB carries out the periodical preventive maintenance to the equipment and the infrastructure of the Santa Ana Hydroelectric Plant.</p>

Expectations for GHG data management system/controls	Score	Verifiers Comments (including <i>Forward Action Requests</i>)
E. GHG Calculations		
E.1. Use of estimates and default data <i>Where estimates or default data are used, these are validated and periodically evaluated to ensure their ongoing appropriateness and accuracy, particularly following changes to circumstances, equipment etc. Validation and periodic evaluation of this are documented.</i>	Full	<p>In accordance with the defined PDD all calculations can be done.</p> <p>The Order 181421 of 2005 that defined the Colombian emission factor for Small Scale Projects is in force.</p> <p>The frontier power meter used for the project has the number 30031 and security labels. A supporting meter, number 30029, is available.</p>
E.2. Guidance on checks and reviews <i>Guidance is provided on when, where and how checks and reviews are to be carried out, and what evidence needs to be documented. This includes spot checks by a second person not performing the calculations over manual data transfers, changes in assumptions and the overall reliability of the calculation processes.</i>	Full	<p>All the procedures are implemented in the Santa Ana Plant. The EAAB is implementing the Quality Management System based on ISO 9001:2000 in the Santa Ana project.</p>
E.3. Internal verification <i>Internal verifications include the GHG data management systems, to ensure consistent application of calculation methods.</i>	Full	<p>The Electromechanical team of EAAB carries out the periodical preventive maintenance to the equipment and the infrastructure of the Santa Ana Hydroelectric Plant.</p> <p>Periodic inspections and measurements are carried out by CAM which ensures reliable measurements.</p>

Expectations for GHG data management system/controls	Score	Verifiers Comments (including <i>Forward Action Requests</i>)
E.4. Internal validation <i>Data reported from internal departments should be validated visibly (by signature or electronically) by an employee who is able to assess the accuracy and completeness of the data. Supporting information on the data limitations, problems should also be included in the data trail.</i>	Full	<p>Internal verification reports and all the technical records related to the operational activities of the plant have been signed by qualified personnel under supervision of the Chief and the top management, which demonstrates their commitment to the project.</p> <p>Internal quality audit was carried to the project in order to establish the effective implementation of the procedures and quality controls.</p>
E.5. Data protection measures <i>Data protection measures for databases/spreadsheets should be in place (access restrictions and editor rights).</i>	Full	<p>There is control of the project data records and the key information of the processes is kept with confidentiality. There is an internal procedure "1NM101510 Conciliation of results". They keep a back up of the data records.</p>
E.6. IT systems <i>IT systems used for GHG monitoring and reporting should be tested and documented.</i>	Full	<p>A control is used for the project equipments, which is automatically managed from a console, and collection of performance data of the Plant is being adjusted in order to do it on-line.</p>

TABLE 2: GHG CALCULATION PROCEDURES AND MANAGEMENT CONTROL TESTING

Identification of potential reporting risk	Identification, assessment and testing of management controls	Areas of residual risks
<p>Potential risks have been identified for the evaluation of procedures for estimating the emissions reduction.</p>	<p>The on-line measurement of the power generation of the plant is being implemented, which will allow an easy cross-check with the frontier meter.</p> <p>A risk analysis has been done to the whole system including Santa Ana Plant and measures to be taken to minimize any potential risks were taken into account, starting with the design. A low risk installation was considered.</p>	<p>There are no areas of residual risk.</p>

TABLE 3: DETAILED AUDIT TESTING OF RESIDUAL RISK AREAS AND RANDOM TESTING

Areas of residual risks	Additional verification testing performed	Conclusions and Areas Requiring Improvement (including <i>Forward Action Requests</i>)
There are no areas of residual risk.	Simple cross checking of data logged by hand data to online data will be improved.	EAAB shall continue automating its metering systems in order to have available the back up elements that allow doing internal verifications of the plant generation, as well as accountability verifications of the billing of energy sold to the wholesale market.

TABLE 4. RESOLUTION OF CORRECTIVE ACTION AND CLARIFICATION REQUESTS

Draft report clarifications and corrective action requests by Verification team	Ref. to checklist question in Table 1.	Summary of project owner response	Verification team conclusion
<p>CR 1.</p> <p>The monitoring report (p. 11) shows two lines additional to the main line connected to the site. Clarification is required on whether electricity has been imported from these lines.</p>	<p>C.2</p>	<p>Project Owner Response:</p> <p>Explanation of the single line diagram of Santa Ana Hydroelectric Plant:</p> <p>Figure 5 of the Monitoring report shows the main line driving the power generated from the plant to the commercial frontier power meter, which is delivered to the interconnected national grid. The two additional lines showed are output energy lines: one provides energy to the auxiliary services of the hydroelectric plant and the other one as an emergency line to supply energy to the Wiesner Plant. In none of the cases, the control system allows importation of energy from another grid that could be counted as energy generated by the Santa Ana Hydroelectric Plant.</p> <p>This explanation will be included in a new version of the monitoring report. Additionally, the Figure 5 will be complemented in order to clarify the destination of these outputs.</p>	<p>Verification Team Response</p> <p>The Verification Team checked during the on site assessment that there not were other electrical connections, different from the main connection, through which there could be energy feedback counted from other systems. In fact, ICONTEC found that additional to the main connection two auxiliary outputs exist: one for providing auxiliary services to the Hydroelectric Plant and the other as substitution for the Wiesner drinking water treatment Plant. The Verification Team verified that in both cases the control system does not allow importation of energy that could be counted as energy generated by the Santa Ana Hydroelectric Plant.</p> <p>The new version of the monitoring report was reviewed by ICONTEC, where an explanation clarifying that the lines are outputs were included. Additionally, the figure</p>

			<p>was improved. These changes make clear that there is not importation of energy from another grid that could be counted as energy generated by the Santa Ana Hydroelectric Plant.</p> <p>Verification Team Conclusion.</p> <p>Close.</p> <p>2008 09 30</p>
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