CDM VALIDATION REPORT

Ecopetrol, S.A.

VALIDATION OF THE PROJECT ACTIVITY: Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A.

AENOR REFERENCE: 2012/119/CDM/42

VERSION: 02.2

VALIDATION REPORT
"Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A."

Validation Report:	AENOR Reference nº:		Version of this report:	Date:
	2012/119/CDM/42		02.2	2015/07/13
PDD:	Title:		GSC publication date:	Comments received:
	Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A.		2013/01/25	☐Yes* ☒ No
Parties involved:	Host Party:		Other involved Parties:	
	Colombia		NA	
Project Participant(s):	In host Party:		In other involved Parties:	
	Ecopetrol, S.A.		NA	
Size of the project activity:	☐ Small scale ☒ Large scale			
Applied methodology/ies:	Title:		Code:	Nº version / Scope:
	Natural gas-based package cogeneration		AM0014	04 / 1,4
Applied tools:	Title:		Version:	
	Title:		Version:	
Emission reductions (ER): ☒**Annual average of the ER (tCO_2e)** ☐ **Total ER (tCO_2e)**	GSC PDD:		Final PDD:	
	78,089		193,648	
Previous versions of this document:			Version:	Date:
			1	2014/04/04
			2	2014/07/04
			2.1	2015/01/19
Report prepared by:	Climate Change Unit. AENOR			

* The comments are detailed in Section 4 of this Validation Report

Abbreviations

AM0014	Natural gas-based package cogeneration
CAR	Corrective Action Requested
CDM	Clean Development Mechanism
CER	Certified Emission Reductions
CH_4	Methane
CL	Clarification Request
CO_2	Carbon dioxide
DECISION 3/CMP.1	Modalities and Procedures for a Clean Development Mechanism as Defined in Article 12 of the Kyoto Protocol
DECISION 4/CMP.7	Greenhouse gases, sectors and source categories, common metrics to calculate the carbon dioxide equivalence of anthropogenic emissions by sources and removals by sinks, and other methodological issues
DNA	Designated National Authority
EB	Executive Board of the CDM of the Kyoto Protocol
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ESCO	Energy Service Company
FAR	Forward Action Request
GHG	Greenhouse Gasses
GRB	Gerencia Refinería Barrancabermeja (Barrancabermeja Refinery Management)
GSC	Global Stakeholder Consultation
GWP	Global Warming Potential
INDERENA	National Institute for Renewable Natural Resources and the Environment (Instituto de Recursos Naturales Renovables y del Ambiente)
IPCC	Intergovernmental Panel on Climate Change
LoA	Letter of approval

MAVDT	Ministry of Environment, Housing and Territorial Development (Ministerio de Ambiente, Vivienda y Desarrollo Territorial)
MLR	Methane leakage rate
MP	Monitoring Plan
MWh	Mega Watt hour
N_2O	Nitrous oxide
PDD	Project Design Document
PP	Project Participant
PQM	Power Quality Meters
UPME	Unidad de Planeamiento Minero Energético (Mining and Energy Planning Unit)
tCO_2e	Carbon dioxide equivalent tonnes
TJ	Terajoules
UNFCCC	United Nations Framework Convention on Climate Change
VVS	CDM Validation and Verification Standard

Table 1: Abbreviations

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1 INTRODUCTION

This validation concerns a project implemented by Ecopetrol, S.A. in Colombia to reduce emissions of CO_2 by operating a natural gas-based cogeneration system, replacing steam and electricity generated in separate systems by means of a conventional system with steam and turbine generators. The objectives of the validation exercise are to confirm that the project meets the necessary CDM criteria, that the project follows the approved methodology, AM0014 version 04, and that the proposals presented in the final PDD will lead to a realistic determination of the emission reductions.

The scope of the validation covers the additionality assessment (additionality tests), the Environmental Management Plan (EMP) and the stakeholder consultation. In addition, it covers the baseline methodology, the calculation of the emission factor (ex-ante) and the monitoring methodology to quantify the emissions reductions during the operational life of the project.

The project consists of setting up a cogeneration unit (U-5100) in order to supply 30 MW of electricity generation and 150 psi steam at Gerencia Refinería Barrancabermeja, which is located in the Municipality of Barrancabermeja, Santander Department, north east of Colombia.

Due to an incomplete during the Information and reporting Check received on 25 September 2014, the audit team required more information and clarifications to the PDD in order to solve the issues raised by the CDM team and complete the validation by the updating of the PDD, ER calculation and this validation report.

On 24 April 2015, a second incomplete during the Information and reporting Check was received from the CDM Team, then the audit team requested additional information to the project participant in order to response the issues raised as per VVS version 7 paragraphs 66-69, 70 (a) (b) and 78, as a result this validation report has been updated.

1.1 Objective

Ecopetrol, S.A. has commissioned AENOR to validate the project activity "Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A.". The purpose of the validation is to have an independent, third party assess the project design. In particular, the project's baseline, the Monitoring Plan (MP), and the project's compliance with relevant UNFCCC and host country criteria are validated in order to confirm that the project design, as documented, is reasonable and meets the stated requirements and identified criteria.

Validation is a requirement for all CDM projects and is considered necessary to provide assurance of the quality of the project and its intended generation of certified emission reductions (CERs). UNFCCC criteria refer to the Kyoto Protocol criteria and the CDM rules and modalities as agreed upon in the Bonn Agreement and the Marrakech Accords.

1.2 Scope

The scope of the validation is to assess all aspects of GHG reduction involved in the project, including the project design, the baseline, the determination of the emission factor of dedicated fossil fuel power, and the procedures proposed for monitoring the emission reductions in the future.

The following documents were reviewed as part of the scope of the activity:

- PDD /1/ /2/, including baseline study and Monitoring Plan.
- Approved Methodology: AM0014 version 04 /3/
- Decision 3/CMP.1 and relevant decisions and guidelines from the EB
- CDM Validation and Verification Standard, version 07.0 /4/
- Associated documentation (ER calculation, environmental requirements, investment test, etc.)
- Letter of approval from the DNA /5/.

AENOR recognises that the project activity is helping the country to fulfill its goals of promoting sustainable development. The project is expected to be in line with the host-country's specific CDM requirements as it:

- Reduces GHG emissions in the host country compared to the business-as-usual scenario.
- Helps to develop the local community.
- Generates local employment opportunities during the implementation and operation of the project.

The validation scope is defined as an independent and objective review of the PDD, the project's baseline study and monitoring plan, and other relevant documents. The information in these documents is reviewed against Kyoto Protocol requirements, UNFCCC rules and associated interpretations. AENOR, based on the Specific Instruction for the Validation, verification and certification of clean development mechanism (CDM) project activities (IE/DTC/0039), has used a risk-based approach in the validation, focusing on the identification of significant risks for project implementation and the generation of CERs.

The validation is not meant to provide any consultancy services to the Client. However, stated requests for clarifications and/or corrective actions may provide input for improvement of the PDD.

2 METHODOLOGY

The project assessment aims to be a risk-based approach and is based on the methodology developed in the CDM Validation and Verification Standard, an initiative of Designated and Applicant Entities, which aims to harmonise the approach and quality of all such assessments.

The validation of the project started in January 2013, with the submission of the PDD for the global stakeholder consultation process, and will conclude with the submission of the final validation report. The validation was performed in several phases, starting with a desk review of the PDD against the approved methodology and CDM and other relevant criteria. The desk review was followed by a site visit to the project site and main stakeholders in Colombia.

As a final step of the validation, the validation report and the protocol have to undergo internal quality control by means of a technical review following the procedures of AENOR. The technical reviewer is a competent person from AENOR, independent of the team that carried out the validation of the project activity.

In order to ensure transparency, a validation protocol was customised for the project, according to Specific Instruction IE-DCT-039. The protocol shows, in a transparent manner, criteria (requirements), means of verification and the results derived from validating the identified criteria.

The validation protocol serves the following purposes:

- It organises, provides details and clarifies the requirements a CDM project is expected to meet.
- It ensures a transparent validation process where the validator will document how a particular requirement has been validated and the result of the validation.

The validation protocol consists of one table. The completed validation protocol is enclosed in Annex 1 of this report.

The sequence of the validation is given in the table below:

Topic	Date
Submission of PDD for global stakeholder consultation process	2013/01/25
On-site visit	2013/03/05-07
Validation Protocol - Version 01.	2013/03/27
Final Validation Report	2015/07/13

Table 2: Sequence of the main validation activities

2.1 Appointment of team members and technical reviewers

The list of involved personnel and their qualification status are summarised in the table below. The details of the persons that visited the project site are included as well.

Function	**Qualification in Technical Area related with the project activity**	**Name**	**Visited the project site** YES/NO
Chief Validator	TA 1.1	Luis Robles Olmos	Yes
Validator	-	Jose Antonio Gesto Vilacoba	Yes
Validator	-	Freddy Alejandro Garro Flores	Yes
Technical Expert	TA 4.4	Javier Dufour	Yes
Technical Reviewer	-	Marcelino Pellitero Martinez	No
Technical Reviewer	TA 1.1	Ma Carmen Gonzalez Galán	No
Technical Reviewer	TA 4.4	Raul Sanz	No

Table 3: List of the personnel involved

Technical areas (TA) mentioned above correspond to the following:

TA code	Technical area
TA 1.1	Thermal energy generation from fossil fuels and biomass including thermal electricity from solar (COMPLEX)
TA 1.2	Energy generation from renewable energy sources
TA 2.1	Electricity distribution
TA 2.2	Heat distribution
TA 3.1	Energy demand
TA 4. 1	Cement sector (COMPLEX)
TA 4.2	Aluminum (COMPLEX)
TA 4.3	Iron and steel (COMPLEX)
TA 4.4	Refinery (COMPLEX)
TA 5.1	Chemical process industries (COMPLEX)
TA 6.1	Construction

TA 7.1	Transport
TA 8.1	Mining and mineral processes, excluding those included in TA 8.2 below
TA 8.2	Oil and gas industry, coal mine methane recovery and use (COMPLEX)
TA 9.1	Metal production
TA 10.1	Mining and mineral processes, excluding those included in TA 10.2 below
TA 10.2	Oil and gas industry, coal mine methane recovery and use (COMPLEX)
TA 11.1	Chemical process industries (COMPLEX)
TA 11.2	GHG capture and destruction
TA 12.1	Chemical process industries (COMPLEX)
TA 13.1	Waste handling and disposal
TA 13.2	Animal waste management
TA 14.1	Forestry
TA 15.1	Agriculture
TA 15.2	Animal waste management

2.2 Document review

The first version of the Project Design Document submitted by the PP was reviewed against the approved methodology (AM0014) and against CDM requirements and other relevant criteria. Additional background documents related to the project design, baseline and additionality were also made available before and during the on-site visit in Colombia. These additional background documents were also reviewed.

In order to address the corrective actions and clarifications requests that arose from the desk review and on-site visit, the PP had to revise the first PDD, which was submitted for Global Stakeholder Consultation (GSC), and then developed the final version which gathers all the requested clarifications and corrective actions.

Moreover, during the validation process, the PP removed the methodology AMS-II.B. version 09.

Furthermore, the AENOR validation team has validated that the requirements of the applied methodology have been applied correctly in the final PDD.

The final validation findings are presented in this report regarding the project, as described in the final version of the PDD.

The reviewed documents used throughout the validation process are detailed in chapter 7 of this report.

The final PDD is in compliance with in force forms and guidance stated by the CDM documentation.

2.3 Follow-up actions

AENOR conducted interviews with Ecopetrol, S.A. in Colombia to confirm selected information and to resolve issues identified in the document review.

From 05 to 07 March 2013, the validation team carried out the visit to the project site. On these two days, representatives from Ecopetrol, S.A. were interviewed, in addition to relevant local stakeholders such as local authorities and local inhabitants of communities affected by the project. Also, the AENOR team visited the project site.

The main topics of the interviews are summarised below (see Table 4).

Interviewed organization Person/Position	Interview topics
Ecopetrol, S.A. Holmes Camacho Rojas, Project Management Robinson Higgins Cabrera, Procurement Specialist Jose Diovanny Baquero Ropero, Chief Deparment **Novotec Consultores, S.A.** David Llorente Ónega, Project Manager	✓ Technical details of the project design ✓ Methodology applicability ✓ Baseline determination: dedicated power plants, electricity production, start of operation, fuels, efficiencies, most recent data, etc. ✓ Electricity and heat generated by the project ✓ Additionality assessment (additionallity test)
Municipality of Barrancabermeja Ricardo Herrera, Consulting Engineer Heyner Mancera Rincón, Secretary for Environment Vanessa Amado, Project Advisor	✓ Opinion about the project ✓ Benefits for the local community ✓ Local permits ✓ Interviews and comments in the past ✓ Consultation with municipality's authorities
Ministry of Environment and Sustainable Development Margarita Gutierrez, Advisor Diana Barba Patiño, Climate Change Specialist	✓ Comments and opinion about the project ✓ Approval Letter ✓ Legislation applicable to the project ✓ Local permits, etc. ✓ EIA approval ✓ Environmental Management Plan ✓ Environmental regulations: Authorizations

Table 4: Interview topics

2.4 Findings

As an outcome of the validation process, the team can raise different types of findings according to the CDM Validation and Verification Standard.

A Clarification Request (CL) is raised if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met.

Where a non-conformance arises the validation team shall raise a Corrective Action Request (CAR). A CAR is issued, where:

a) The project participants have made mistakes that will influence the ability of the project activity to achieve real, measurable additional emission reductions;

b) The CDM requirements have not been met;

c) There is a risk that emission reductions cannot be monitored or calculated.

Failure to address a CL may result in a CAR. Information or clarifications provided as a result of a CL may also lead to a CAR.

A Forward Action Request (FAR) is raised during validation to highlight issues related to project implementation that require review during the first verification of the project activity. FARs shall not relate to the CDM requirements for registration.

The project participants were requested to address all validation findings and finally provided the validation team with sufficient evidence to determine that the applicable CDM requirements have been met. The project participant modified the initial PDD to resolve the validation team concerns and resubmitted a final version of the PDD. AENOR has prepared this report based on the final PDD.

All the validation findings are summarized in detail in section 6 and in the validation protocol included in Annex 1.

2.5 Internal Quality Control

Following the completion of the assessment process by the validation team, all documentation undergoes an internal quality control through a technical review before submission to the CDM-EB. The Technical reviewer is a qualified member of AENOR, independent from the team that carried out the validation of the project activity. The technical reviewer or the team appointed for the technical review are qualified in the technical area(s) and sectoral scope(s) of the project activity.

3 VALIDATION FINDINGS

3.1 Approval

The project participant for "Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A." is Ecopetrol S.A., from Colombia, as the host country.

Ecopetrol, S.A., from the host country, meets all relevant participation requirements detailed as follows:

- The project activity has been approved by the host party, through a written letter of approval from the host country DNA, dated 28 December 2012 /5/.
- The PP has provided the LoA from the Colombian DNA of the project activity, which confirms that:
    - Colombia is a Party of the Kyoto Protocol (30 November 2001).
    - The voluntary participation of Colombia.
    - The project's contribution to sustainable development.
    - The title of the CDM project activity approved corresponds with the title of the PDD submitted for registration.

The DNA of the host country confirmed the project's contribution to the sustainable development of Colombia. The audit team has confirmed the validity of the signature as per the VVS in accordance with representatives of Climate Change Division, Ministry of Environment and Sustainable Development.

The validation did not reveal any information that indicates that the project can be seen as a diversion of ODA funding towards Colombia.

The LoA does not refer to a specific version of the PDD or validation report. The corresponding references included in the LoA, PDD and validation report are consistent.

AENOR ensures that the LoA has been issued by the respective parties' designated national authorities and does not doubt the authenticity of the letters of approval received from the PP. Hence, AENOR confirms that the LoA is in compliance with paragraphs 40-43 of the VVS v.07.0.

3.2 Participation

As stated above, the project participant in the "Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A." is Ecopetrol, S.A., from Colombia, as the host country.

The project participant has been listed in a consistent manner in the project documentation, and a Party to the Kyoto Protocol, Colombia has approved his participation in the project activity. The host Party ratified the Kyoto Protocol on 30 November 2001 and has appointed a DNA.

The project participant listed in tabular form in section A.4 of the PDD is consistent with the contact details provided in annex 1 of the PDD.

No entities other than those approved as project participants are included in these sections of the PDD.

The participation of the project participant Ecopetrol, S.A. has been approved by the Colombian DNA in the letter of approval dated 28 December 2012.

Hence, AENOR confirms that a Party to the Kyoto Protocol through interviews has approved the participation of the project participants with the people in charge of the approval in the host country DNA.

3.3 Modalities of Communication

The MoC has been provided by the PP to the validation team. The corporate and personal identity of the project participant has been validated through the Citizenship card /6/ and Internal Memo GRP-085-10 /7/ provided by the PP.

The Validation Team confirms that the MoC statement complies with all relevant forms and requirements. Thus:

- The valid version of the form "Modalities of Communication Statement" (F-CDM-MOC) has been used.
- The information required as per the F-CDM-MOC, including its annex 1, is correctly completed.
- The project participant's authorised signatories signing the F-CDM-MOC correspond to the project participant's authorised signatories included in F-CDM-MOC, annex 1.

3.4 Project Design Document

The PDD used as the basis for validation has been prepared in accordance with the in force template and guidance from the CDM Executive Board available on the UNFCCC CDM website and the applicable CDM requirements for completing PDDs under the VVS track. The final PDD is used for a re-submission due to incomplete submission.

The initial version of the PDD was submitted for GSC on 25 January 2013.

Due to the clarifications and corrective actions requested during the validation process and incompletes during the Information and report check, the project participant has made the final version of the PDD, which includes all issues raised to the PP either corrected or clarified.

The relevant changes in the final PDD respect to the PDD for GSC are the following:

Issue	Information in PDD for GSC	Information in final PDD
Description of the	The project will displace electricity from dedicated fossil fuel power	The project will displace only electricity from dedicated fossil

project	and electric grid The project consist of a new cogeneration system of 35 MW and the repowering of a current generation unit by replacing the same with a new one of 42 MW using a more efficient gas	fuel power The project consists of a new cogeneration system of 30 MW.
Project participants	NA	NA
ER	78,089 tCO_2eq/year	193,648 tCO_2eq/year
Additionality	AM00014: Specific additionality analysis has been applied AMS IIB: No additionality analysis has been done for this methodology	AMS IIB has been removed from the final version. Only specific additionality assessment for AM 14 has been correctly applied.
Starting date, crediting period	Starting date: 01 November 2011 Start crediting period: 01 January 2015	Starting date: 18 November 2011 Start crediting period: 01 April 2015
Others	Applied methodologies: AM0014 version 04.0 and AMS-II.B. version 09.0	Applied methodology: AM0014 version 04.0

The mentioned changes are explained in the different sections of this validation report.

This final PDD is in compliance with relevant forms and guidance stated by the CDM documentation.

3.5 Project description

"Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A." consists of operating a cogeneration system, whose input is natural gas, with electricity and steam production, replacing steam and electricity generated in separate systems by means of a conventional system with steam generators and turbine generators. In the cogeneration system, steam is generated from the recovery of heat coming from turbine combustion gases, using a Heat Recovery Steam

Generator (HRSG). This system offers improved efficiency in the process of electric energy generation through the direct use of natural gas as fuel, instead of steam from generators.

The project activity encompasses the installation of a package of cogeneration system whose input is natural gas and whose outputs are electricity and heat supplied to an industry with demand for heat and electricity. Specifically, consists of setting up a cogeneration unit (U-5100) in order to supply 30 MW of electricity generation and 150 psi steam, replacing the steam generators and turbines specified (B-901/2/3/4, B-951/2 and B-956 steam generators and TG-2401/2/3 steam turbine).

During the validation process the audit team conducted a physical site inspection of the existing facilities, reviewed available designs and technical studies in order to validate the accuracy and completeness of the project description, mainly in the differences resulting from the project activity compared to the project pre-situation; therefore, the final PDD clearly describes the facilities directly involved in the project system (units replaced) which applies the methodology AM0014 version 4 due to the PP has voluntary retired from the PDD used for GSC those facilities related with the methodology AMS-II.B. version 9. In this sense the following information of the power/heat/cogeneration facilities has been validated for the baseline and project scenario:

Baseline facilities of the project system:

Heat Generation Facilities (steam at 400 psi)	Code	Steam Capacity	Consuming Facility
Boiler (Heat)	B-901	132 klb/h	Refinery Unit
Boiler (Heat)	B-902	132 klb/h	Refinery Unit
Boiler (Heat)	B-903	132 klb/h	Refinery Unit
Boiler (Heat)	B-904	132 klb/h	Refinery Unit
Boiler (Heat)	B-951	140 klb/h	Refinery Unit
Boiler (Heat)	B-952	140 klb/h	Refinery Unit
Boiler (Heat)	B-956	175 klb/h	Refinery Unit

Heat Generation Facilities (steam at 150 psi)	Code	Degradation Capacity	Consuming Facility
Degradation system (400 psi to 150 psi)	-	600 klb/h	Refinery Unit

Power Generation Facilities	Code	Power Capacity	Consuming Facility
Steam Turbine (Power)	TG-2401	10 MW	Electric System GRB
Steam Turbine (Power)	TG-2402	10 MW	Electric System GRB
Steam Turbine (Power)	TG-2403	10 MW	Electric System GRB

Other baseline facilities that have common head or interconnected with the project system:

Heat Generation Facilities (steam at 400 psi)	Code	Steam Capacity	Consuming Facility
Boiler (Heat)	B-955	175 klb/h	Refinery Unit
Boiler (Heat)	B-954	175 klb/h	Refinery Unit
Boiler (Heat)	B-2401	240 klb/h	Refinery Unit
Boiler (Heat)	B-2402	240 klb/h	Refinery Unit
Boiler (Heat)	B-2403	240 klb/h	Refinery Unit
Boiler (Heat)	B-2404	240 klb/h	Refinery Unit
Boiler (Heat)	B-2405	240 klb/h	Refinery Unit

Heat Generation Facilities (steam at 150 psi)	Code	Steam Capacity	Consuming Facility	Comments*
Steam Turbine (Heat)	TG-951	0 klb/h	Refinery Unit	Out of Service
Steam Turbine (Heat)	TG-952	0 klb/h	Refinery Unit	Out of Service
Steam Turbine (Heat)	TG-901	0 klb/h	Refinery Unit	Out of Service
Steam Turbine (Heat)	TG-902	0 klb/h	Refinery Unit	Out of Service
Steam Turbine (Heat)	TG-903	0 klb/h	Refinery Unit	Out of Service

Power Generation Facilities	Code	Power Capacity	Consuming Facility	Comments*
Steam Turbine (Power)	TG-951	0 MW	Electric System GRB	Out of Service
Steam Turbine (Power)	TG-952	0 MW	Electric System GRB	Out of Service
Steam Turbine (Power)	TG-901	0 MW	Electric System GRB	Out of Service
Steam Turbine (Power)	TG-902	0 MW	Electric System GRB	Out of Service
Steam Turbine (Power)	TG-903	0 MW	Electric System GRB	Out of Service
Steam Turbine (Power)	TG-2951	20 MW	Electric System GRB	-
Steam Turbine (Power)	TG-2952	20 MW	Electric System GRB	-
Steam Turbine (Power)	TG-2953	20 MW	Electric System GRB	-
Gas Turbine (Power)	TG-2961	24 MW	Electric System GRB	-

* According to equipment engineering memos /12/ TG-951/2 and TG-901/2/3 are out of service since 2005 and 2009 respectively.

Baseline consuming facilities

Heat Consuming Facilities	Code	Steam Capacity Demand
Refinery Unit	-	1000 klb/h (400 psi)
Steam Turbine (Heat)	TG-2401	100 klb/h (400 psi)
Steam Turbine (Heat)	TG-2402	100 klb/h (400 psi)
Steam Turbine (Heat)	TG-2403	100 klb/h (400 psi)
Refinery Unit	-	550 klb/h (150 psi)

Power Consuming Facilities	Code	Power Capacity Demand
Electric System GRB	-	94 MW

In the Baseline the Electric System of GRB is also connected to the country's national electricity network as back-up.

Facilities of the project system (Project Activity):

Heat Generation Facilities (steam at 150 psi)	Code	Steam Capacity	Consuming Facility	Comments*
Boiler (Heat)	HRSG B-5100	183 klb/h	Refinery Unit	Natural Gas
Boiler (Heat)	HRSG B-5100	217 klb/h	Refinery Unit	Refinery Gas

* According to Boiler HRSG B-5100/TG-5100 performance datasheet and technical report /8/, the project participant has selected the GT and Boiler Case BASE and SR respectively; therefore, the cogeneration unit will have a capacity of 400 klbh of steam (183 klbh from natural gas combustion and 217 klbh from refinery gas combustion).

Power Generation Facilities	Code	Power Capacity	Consuming Facility	Comments*
Gas Turbine (Power)	TG-5100	30 MW	Electric System GRB	Turbogas

* As mentioned below the real capacity of the TG-5100 of the cogeneration unit will be limited to 30 MW.

Other facilities that have common head or interconnected with the project system (Project Activity):

Heat Generation Facilities (steam at 400 psi)	Code	Steam Capacity	Consuming Facility
Boiler (Heat)	B-955	175 klb/h (400 psi)	Refinery Unit
Boiler (Heat)	B-954	175 klb/h (400 psi)	Refinery Unit
Boiler (Heat)	B-2401	240 klb/h (400 psi)	Refinery Unit
Boiler (Heat)	B-2402	240 klb/h (400 psi)	Refinery Unit
Boiler (Heat)	B-2403	240 klb/h (400 psi)	Refinery Unit
Boiler (Heat)	B-2404	240 klb/h (400 psi)	Refinery Unit
Boiler (Heat)	B-2405	240 klb/h (400 psi)	Refinery Unit

Heat Generation Facilities (steam at 150 psi)	Code	Steam Capacity	Consuming Facility	Comments*
Boiler (Heat)	B-5120	400 klb/h (150 psi)	Refinery Unit	Conventional Boiler

Power Generation Facilities	Code	Power Capacity	Consuming Facility	Comments*
Gas Turbine (Power)	TG-2961	42 MW	Electric System GRB	Repowering

* According to the Technical report of Energy and Steam Project PMSI /10/, there are other efficiency measures that are being implemented in the refinery but that are not part of the project activity.

Project consuming facilities

Heat Consuming Facilities	Code	Steam Capacity
Refinery Unit	-	1064 klb/h (400 psi)
Refinery Unit	-	550 klb/h (150 psi)

Power Consuming Facilities		Power Capacity Demand
Electric System GRB	-	94 MW
Water Plant	-	2 MW

The audit team confirms that the capacity of 30 MW will be obtained by the limitation in 5 MW of the design capacity of 35 MW due to the following reasons:

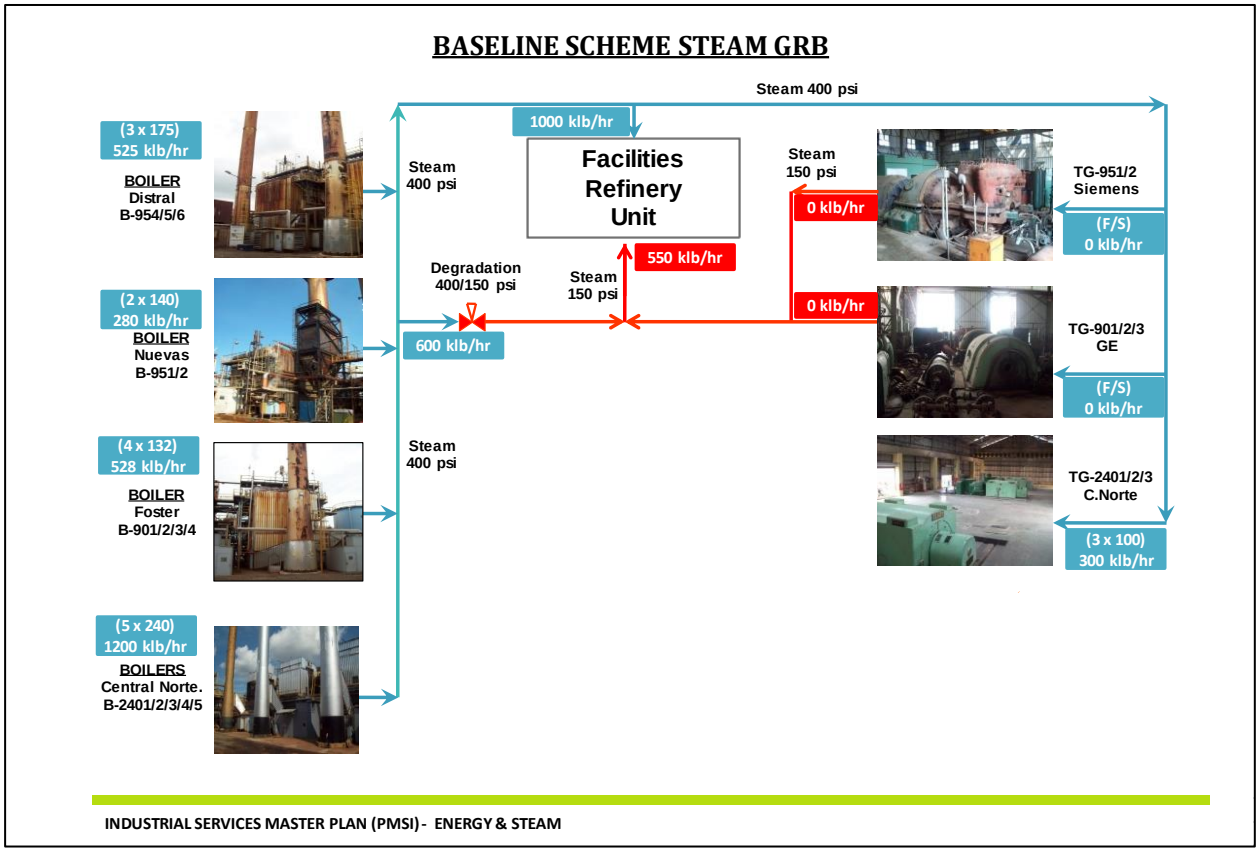
- No benefits or emission reductions will be claimed by the project participant for any power above 30 MW.
- The power monitoring of the TG-5100 will guarantee that during the crediting period any operation above the 30 MW will be detected.
- According to historical operation of TG-2401/2/3, the capacity of 30 MW greatly exceed the historical generation of these facilities (20.14 MW) which cover part of the demand of Refinery Units where the priority is reliability and not the maximum energy production as follows:

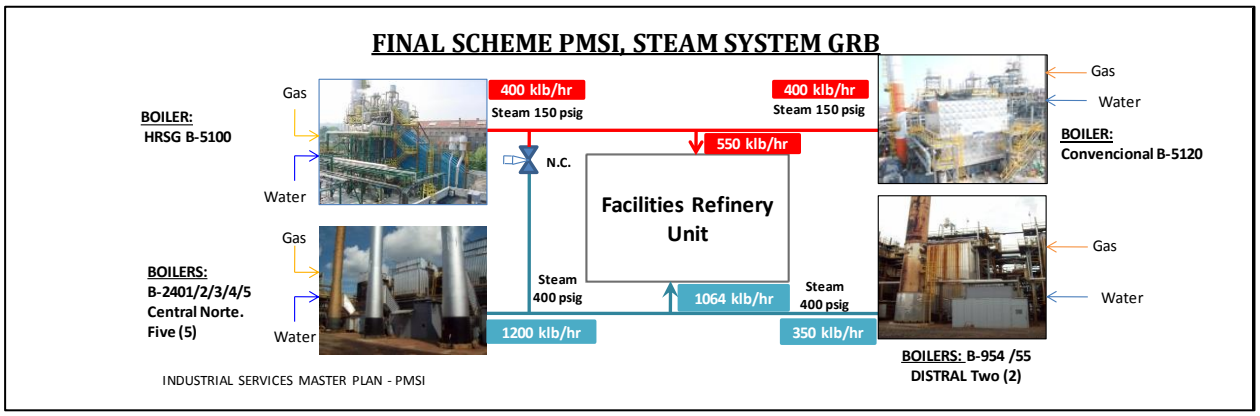
	Boilers	2011	2012	2013	Average
	Historical Generation of MW				MW
	TG-2401	3.23	5.93	7.95	5.70
	TG-2402	7.03	6.4	8.01	7.15
	TG-2403	7.49	7.97	6.42	7.29
✓	TOTAL				20.14

As a back-up, the internal electric generation system of the plant (Electricity System GRB) will be interconnected with the National Electricity Network of Colombia, with a maximum capacity of 80 MW. This connection will be used in the event of internal failure at the Refinery. At the same way, the Refinery continues to keep other units as a back-up as TG-2951/2/3.

On the other side, an energy balance has been carried out by the project participant in order to guarantee the reliability of the power and heat generation in the consuming facilities. The audit team has validated the energy balance based on technical reports /10/ which considers the generation capacities of the baseline and project facilities due to the high variability of the demand of the Refinery. The audit team considers these criteria reasonable considering the complexity of the consuming facility and also confirms that new generation capacity (power and heat) greatly exceed the maximum demand capacity in accordance with an energy balance of the consuming facilities, baseline generation facilities and all the

facilities interconnected with the consuming facilities with common head or interconnected with the project system as follows:





STEAM BALANCE 400-150 PSIG - REFINERY UNIT

BASELINE SCENARIO

Steam capacity at 400 psi			
Boilers	**klb/hr x Unit**	**Units**	**klb/h**
Distral B-954/5/6	175	3	525
Nuevas B-951/2	140	2	280
Foster B-901/2/3/4	132	4	528
C. Norte B-2401/2/3/4/5	240	5	1200
TOTAL			**2533**
Steam Demand at 400 psi			
Consuming Facilities	**klb/hr x Unit**	**Units**	**klb/h**
Degradation of steam to 150 psi	NA	NA	600
Refinery Unit	NA	NA	1000
TG-2401/2/3	100	3	300
TOTAL			**1900**

Steam Capacity at 150 psi	
Units	**klb/h**
Degradation of steam from 400 psi	600
TOTAL	**600**
Steam Demand at 150 psi	
Consuming Facilities	**klb/h**
Refinery Unit	550
TOTAL	**550**

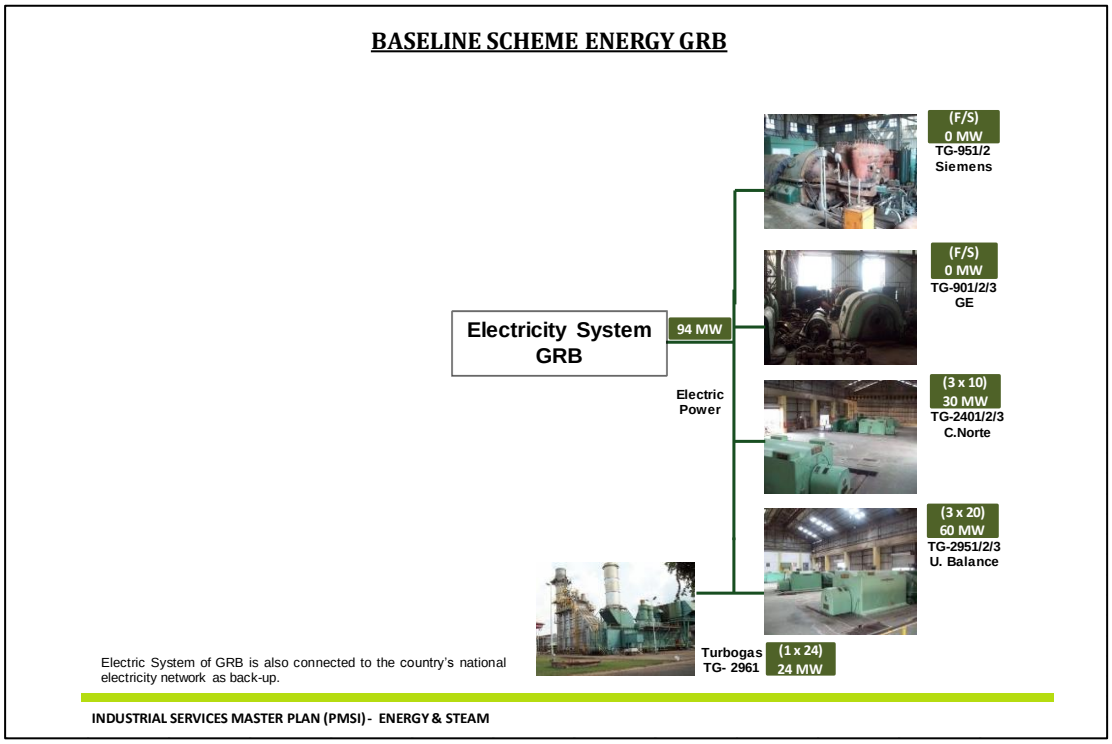
PROJECT ACTIVITY

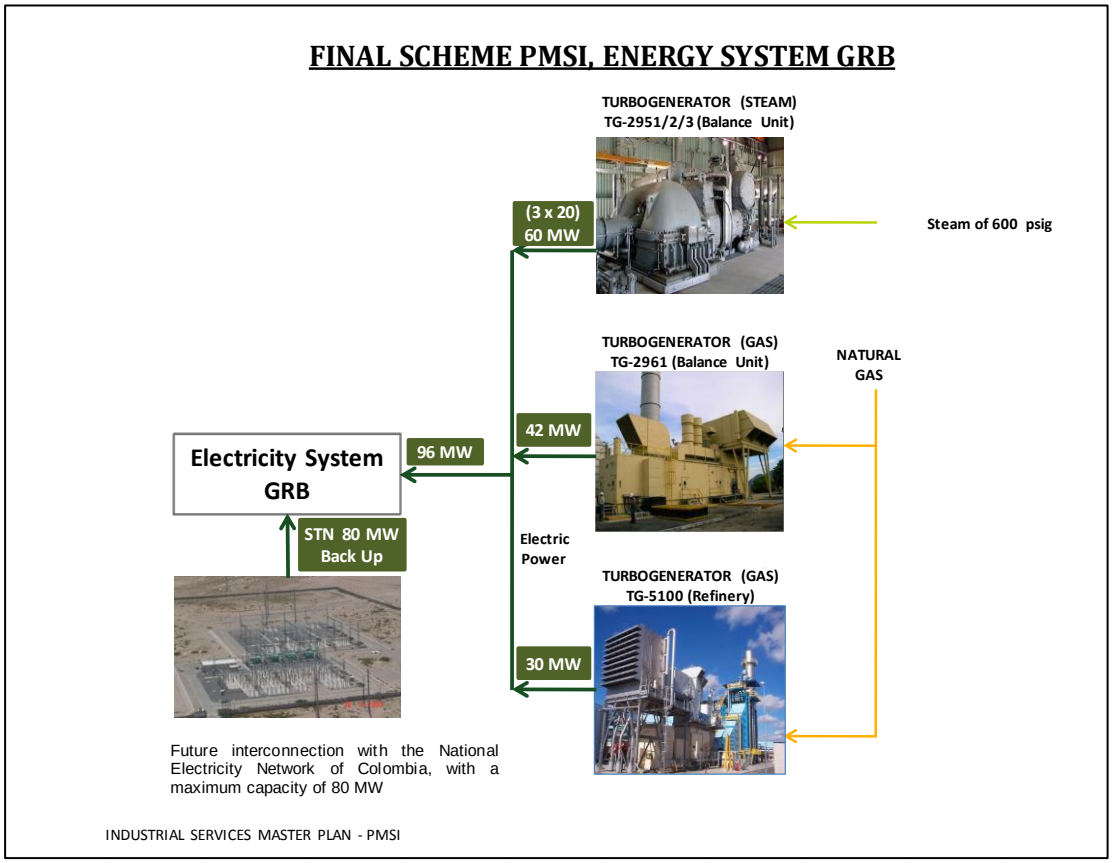
Steam Capacity at 400 psi			
Boilers	**klb/hr x Unit**	**Units**	**klb/h**
Distral B-954/5	175	2	350
C. Norte B-2401/2/3/4/5	240	5	1200
TOTAL			**1550**

Steam Demand at 400 psi			
Consuming Facilities	**klb/hr x Unit**	**Units**	**klb/h**
Refinery Unit	NA	NA	1064
TOTAL			**1064**

Steam Capacity at 150 psi			
Boilers	**klb/hr x Unit**	**Units**	**klb/h**
HRSG B-5100 (natural gas)	183	1	183
HRSG B-5100 (refinery gas)	217	1	217
Conventional Boilerl B-5120	400	1	400
TOTAL			**800**
Steam Demand at 150 psi			
Consuming Facilities			**klb/h**
Refinery Unit			550
TOTAL			**550**

The audit team confirms that the reliability of the heat generation exceed the maximum heat capacity demand despite that the project activity and other efficiency measures are being implemented in the refinery.


BASELINE SCHEME ENERGY GRB
(F/S)
0 MW
TG-951/2
Siemens
(F/S)
0 MW
TG-901/2/3
GE
(3 x 10)
30 MW
TG-2401/2/3
C.Norte
(3 x 20)
60 MW
TG-2951/2/3
U. Balance
Electricity System GRB
94 MW
Electric Power
Turbogas
TG- 2961
(1 x 24)
24 MW
Electric System of GRB is also connected to the country's national electricity network as back-up.
INDUSTRIAL SERVICES MASTER PLAN (PMSI) - ENERGY & STEAM


FINAL SCHEME PMSI, ENERGY SYSTEM GRB
TURBOGENERATOR (STEAM)
TG-2951/2/3 (Balance Unit)
(3 x 20)
60 MW
Steam of 600 psig
TURBOGENERATOR (GAS)
TG-2961 (Balance Unit)
NATURAL GAS
42 MW
Electricity System GRB
96 MW
STN 80 MW
Back Up
Electric Power
TURBOGENERATOR (GAS)
TG-5100 (Refinery)
30 MW
Future interconnection with the National Electricity Network of Colombia, with a maximum capacity of 80 MW
INDUSTRIAL SERVICES MASTER PLAN - PMSI

ENERGY BALANCE OF PROJECT SYSTEM - ELECTRIC SYSTEM GRB

BASELINE SCENARIO

Power Capacity Generation (MW)			
Turbo generator	**MW x Unit**	**Units**	**MW**
TG-951/2	0	2	0
TG-901/2/3	0	3	0
TG-2401/2/3	10	3	30
TG-2951/2/3	20	3	60
TG-2961	24	1	24
TOTAL			**114**

Power Demand (MW)			
Consuming Facilities	**MW x Unit**	**Units**	**MW**
S.E. GRB	NA	NA	94
TOTAL			**94**

PROJECT ACTIVITY

Power Capacity Generation (MW)			
Turbo generator	**MW x Unit**	**Units**	**MW**
TG-5100	30	1	30
TG-2951/2/3	20	3	60
TG-2961	42	1	42
TOTAL			**132**

Power Demand (MW)			
Consuming Facilities	**MW x Unit**	**Units**	**MW**
S.E. GRB	NA	NA	94
New Water Plant	NA	NA	2
TOTAL			**96**

In the same way, the audit team confirms that the reliability of the power generation also exceed the maximum power capacity demand despite that the project activity and other efficiency measures are being implemented in the refinery.

The project will be carried out at Gerencia Refinería Barrancabermeja, which is located in the Municipality of Barrancabermeja, Santander Department, in the Andean region, north east of Colombia (Magdalena Medio).

The consumption of refinery gas and the steam production (heat output) assigned to refinery gas are not taken into account in the calculation of project activity emissions, according to methodology AM0014.

As established in the final PDD, the project's contribution to sustainable development is not only related to reduction of GHG emissions, but also to the environmental, social economic and technological benefits that will be introduced in the area.

The project design engineering reflects good practise. As the project will reduce greenhouse gas (GHG) emissions by setting-up and operating a natural gas cogeneration plant with an electricity production capacity of 30 MW.

In conclusion, all of the characteristics included in the PDD were checked during the on-site visit and against technical documentation submitted by the PP. The validation team has primarily checked the project design against the technical information:

- Cogeneration system datasheets: "Boiler HRSG B-5100 and TG-5100 performance datasheet and technical report" /8/,
- Historical operating data: "Internal reports containing operation information of facilities (B-954/5)" /9/,

- Technical specifications of equipment and operating conditions: "Technical report of Energy and Steam Project PMSI, which include the project activity (cogeneration plant) and other efficiency measures. This report includes energy balance, future power and heat demand of consuming facilities, generation capacities of facilities" and "Report with future energy demand of Electric System GRB" /10/,
- Equipment datasheets: "Summary performance sheet of equipment (B-901/2/3/4, B-951/2, B-956, TG-2401/2/3, TG-901/2/3, TG-951/2)", "Performance sheet of repowering TG-2961 (LM-6000)" and "Nameplate of TG-2951/2/3" /11/,
- Equipment engineering memos: "Internal memo CPO-10000305-271 with historical information of equipment (B-901/2/3/4, B-951/2, B-956, TG-2401/2/3, TG-901/2/3, TG-951/2)" and "Internal memo CPO-10000305-418 with historical information of TG-2961 (LM-5000)" /12/,
- Water concession /13/, Discharge Permit /14/ and Emission permit /15/.

The latest version of the PDD details the project's design in a precise manner, in accordance with the accuracy and completeness principles required for the CDM process.

AENOR's validation team states that the description of the proposed CDM project activity as contained in the PDD sufficiently covers all relevant elements, is accurate and provides the reader with a clear understanding of the nature of the proposed CDM project activity.

In conclusion, AENOR confirms that the project description, as included in the PDD, is sufficiently accurate and complete in order to comply with the requirements of the CDM and therefore in compliance with VVS paragraphs 65-69.

3.6 Baseline methodology

The final version of the PDD describes the baseline methodology, which is in conformance with the approved methodology AM0014 (version 04.0) "Natural gas-based package cogeneration". The key conclusions about the correct application are summarised below.

The methodology is applicable because the project consists of the installation of a package of cogeneration system whose input is natural gas and whose outputs are electricity and heat supplied to an industry with demand for heat and electricity. Specifically, consists of setting up a cogeneration unit in order to supply 30 MW of electricity generation and 150 psi steam. Based on the on-site visit assessment and relevant documents provided by the project participant during the validation process, such as the cogeneration system datasheets, historical operating data, technical specifications of equipment and operating conditions, equipment datasheets, equipment engineering memos and permits, AENOR checked the applicability of the methodology to the project activity.

The baseline emissions included in the final PDD has been determined with the ex-ante option according to the steps stated in the applied methodology AM0014 "Natural gas-based package cogeneration" version 04.

The formulae included in the ER calculation spreadsheet /16/ were checked and they were in accordance with the methodology, using the same values and variables.

The following sources of data were taken into account:

- Cogeneration system Datasheets
- Engineering study of the cogeneration system /17/
- National data taken from UPME (Mining and Energy Planning Unit) /18/
- 2006 IPCC Guidelines for National Greenhouse Gas Inventories, /19/
- Historical operating data and technical specifications

AENOR confirms that the baseline and monitoring methodologies selected by the project participants comply with the methodologies previously approved by the CDM Executive Board, that the selected methodology is applicable to the project activity and that the PP has correctly applied the selected methodology.

3.6.1 Applicability of the selected methodology to the project activity

The selected methodology for the proposed project activity is the approved baseline methodology AM0014 "Natural gas-based package cogeneration". The final version of the PDD identifies, in section B.2, the applicability conditions of the approved methodology and describes how the project fulfils the conditions.

The applicability of the selected methodology to the proposed CDM project activity has been assessed in the following way:

1. The electricity and heat requirement of the consuming facility is generated in separate systems (i.e. electricity and heat in the baseline cannot be generated in another cogeneration facility) in the absence of the project activity;

   The electricity and heat of the project system in the baseline are not generated in a cogeneration facility. The baseline situation, heat and electricity generation in separate systems, has been checked against diagrams /20/ and visual inspection during the on-site visit. The audit team has confirmed that in the baseline scenario the steam is generated in existing steam generators, upgrade as needed (B- 901/2/3/4, B-951/2 y B-956) and the electricity is generated by the dedicated baseline power plants which are TG-2401/2/3; also these units are classified as total-condensation turbines in accordance with technical information from the operations area /11/12/. In addition, the audit team has validated that the heat and electricity of the consuming facilities that is not

supplied by the project activity are generated in other separate systems. All the other baseline heat/power sources supplying the consuming facilities (Refinery Unit and Electric System GRB) through a common head or interconnected system mentioned in section 3.5 of this validation report are boilers (B-954/5 and B-2401/2/3/4), non-functional partial condensation turbines with steam extraction (TG-951/2 and TG-901/2/3/4), steam turbines (TG-2951/2/3) and gas turbine (TG-2961). In addition, the audit team has confirmed that the exhaust gases of TG-2961 are used in the HRSG B-2961 in order to produce steam at 600 psi to cover the demand of the Balance Unit, other consuming facility that is not part of the project system; therefore, this unit has not a common head with the consuming and heat facilities of the project system as per technical diagrams /20/.

2. The cogeneration system is either third party cogeneration systems, i.e. not owned or operated by the consuming facility that receives the heat and electricity from project cogeneration systems or the cogeneration system is owned by the industrial user (henceforth referred to as self-owned) that consumes the heat and electricity from project cogeneration systems;

   The cogeneration system in Gerencia Refinería Barrancabermeja (GRB) will be legally owned and operated by Ecopetrol S.A. The ownership of Gerencia Refinería Barrancabermeja by Ecopetrol, S.A. has been verified as per the Water Concession, Discharge Permit Emission Permit and Environmental Management Plan /21/. The audit team confirms that the cogeneration system is self-owned.

3. The cogeneration system provides all or a part of the electricity and or heat demand of the consuming facility;

   The project activity will supply part of electricity and steam demand of the Refinery Unit in accordance with the energy balance /22/. According to the balance mentioned in section 3.5 of this validation report which includes all the power/heat/cogeneration facilities that have common head or interconnected with the project system, the project activity will supply 183 klb/h of steam from natural gas combustion and 30 MW of electricity to the Refinery Unit and Electric System GRB respectively; therefore, this heat/power supply is only a part of the total steam demand of 550 klb/h and electricity demand of 96 MW.

4. No excess electricity is supplied to the power grid and no excess heat from the cogeneration system is provided to another user;

   The project activity will supply electricity and steam to the Refinery Unit. Also, in accordance with Resolution 084 of 1996 of the Energy and Gas Regulatory Commission /23/, the PP is auto generator.

5. In the case project activity displaces electricity from fossil fuel based, dedicated power plant(s), methodology can only claim reductions from only that fraction of displaced electricity from the baseline dedicated power plant(s), for which it can be demonstrated that project activity led to reduction in generation of baseline dedicated power plant (s).

The project activity displaces all electricity from baseline dedicated power plant (TG-2401/2/3) in accordance with diagrams stated in the PDD and technical information.

Based on the on-site visit, interviews with relevant authorities, permits and technical documentation provided by the PP during the validation process, AENOR confirms the applicability condition of the selected methodology to the project activity.

The project activity is not expected to result in emissions other than those allowed by the methodology, and there are no greenhouse gas emissions occurring within the proposed CDM project activity boundary as a result of the implementation of the proposed CDM project activity which are expected to contribute more than 1 per cent of the overall expected average annual emissions reductions, which are not addressed by the applied methodology.

3.6.2 Project boundary

The boundary of the project activity is as per methodology AM0014 version 04, the spatial extent of the project boundary encompasses all the anthropogenic emissions by sources of greenhouse gases under the control of the project participants that are significantly and reasonably attributable to the project activity.

The project activity encompasses the natural gas based cogeneration system where from no excess heat or electricity is exported outside the industrial facility. The spatial extent of baseline system boundary encompasses refinery gas boiler to meet up the thermal demand of the industrial facility and steam for steam turbines for generating electricity, and present cogeneration system for electricity generation.

In addition, all emission sources and gases related to the baseline scenario, project scenario, and leakage are clearly identified and described in a complete manner in the final PDD. CO_2 is the main emission source and is included in the baseline, also CH_4 and N_2O in compliance with the methodology. CO_2, N_2O and CH_4 are included in the project activity as an emission source in compliance with applicable methodology. Leakage is also considered according to methodology.

AENOR has validated the project boundary of the project during the on-site visit and technical information, permits and diagrams. The validation team concludes that the identified boundary and selected sources and gases are justified for the project activity.

The identified boundary and the selected sources and gases are justified for the project activity. The project activity is not expected to result in emissions other than those allowed by the methodology, and there are no greenhouse gas emissions occurring within the proposed CDM project activity boundary as a result of the implementation of the proposed CDM project activity which are expected to contribute more than 1 per cent of the overall expected average annual emissions reductions, which are not addressed by the applied methodology.

3.6.3 Baseline identification

The final PDD describes the baseline scenario, which is in conformance with the approved methodology AM0014, version 04 "Natural gas-based package cogeneration".

The baseline scenario represents the most potential alternative from among the different scenarios or option existing before the project activity. The baseline scenario for the project activity is selected through analysis of alternative baseline scenarios consistent with current laws and regulation. The scenario below represents the potential alternatives that presented themselves to the project proponent:

1. Industrial plant continues to operate with equipment replacement as needed with no change in equipment efficiency (baseline scenario)
2. Industrial plant continues to operate with improved efficiency new equipment at the time of equipment replacement using a less carbon intensive fuel.
3. Industrial plant upgrades the thermal energy generating equipment and therefore increases the efficiency of boiler(s) immediately.
4. The heat and or electricity demand of the industrial plant is reduced through improvements in end-use efficiency.
5. Installation of a cogeneration system owned by the industrial plant (project activity).
6. Installation of a package cogeneration system owned by a company other than the industrial plant
7. Installation of a cogeneration system by a third party.

All the alternatives identified are in compliance with the legislation in Colombia. From the identified alternatives, alternative (2) has been eliminated because there is refinery gas available and that current equipment with separated heat and electricity generation is highly efficient, it would not be feasible to use other equipment with similar features using less carbon intensive fuels, not being cogeneration systems (project scenario). Alternative (3) is eliminated given that the baseline scenario considers a high efficiency of 90%, there is little scope for increasing the efficiency of the burners further, nor this would provide outputs comparable with the project activity. Alternative (4) is eliminated as the improvement of energy efficiency is a corporate strategy and is regularly implemented considering the operations conditions, planned stops and renovations of process units; therefore, it cannot be considered as baseline scenario. The alternatives of (6) and (7) have been eliminated as it has been evaluated that the best option is the project developed by Ecopetrol, S.A., the validation team considers this information reasonable considering the fact that the ESCO market scheme (third party cogeneration systems) is not well developed in Colombia as checked in section 3.7 of this report. Alternative (5), i.e. the project activity, faces as discussed in Section 3.7, institutional and technological barriers. Hence the selection of the baseline scenario of (1) that is the continuation of the heat generation using refinery gas boilers and usage of electricity from steam turbines is justified.

The assumptions and data used in the identification of the baseline scenario are appropriately justified, supported by evidence and can be deemed reasonable. In addition, relevant national and/or sectoral policies and circumstances are indicated in the final PDD.

The PDD identifies the baseline for the proposed CDM project activity, defined as the scenario that reasonably represents the anthropogenic emissions by sources of GHGs that would occur in the absence of the proposed CDM project activity.

3.6.4 Algorithms and/or formulae used to determine emission reductions

The methodology for calculating emission reductions is transparently documented and complies with the requirement of the selected methodology AM0014 version 04.

The GHG emissions are calculated as the difference of the baseline emission and the project emissions. The CER formulae used and the Emission reduction calculation worksheets /16/ have been verified by AENOR and found to be transparent and correct.

The baseline emissions are calculated as the sum of

1) The CO_2, CH_4 and N_2O emissions corresponding to the combustion of a baseline fuel "Refinery Gas" that would have been used if the cogeneration system did not provide heat to the plant. The conservative boiler efficiency of 90% was assumed in line with the methodology. Emission factors have been taken from 2006 IPCC and national data from Mining and Energy Planning Unit (UPME) used for the National GHG inventory, and the NCV values sourced from the 2006 IPCC.

2) CO_2 emissions associated with the electricity that would have to be generated through dedicated fossil fuel power plant(s) if the cogeneration system did not provide electricity to the plant.

3) CH_4 leakage emissions from natural gas production and leaks in the transport and distribution pipeline supplying the plant and leaks in the gas distribution piping within the plant, based on 2006 IPCC emission factors.

The project emissions are caused by CO_2, CH_4 and N_2O emissions from the combustion of natural gas in the cogeneration system and by CH_4 emissions from natural gas production and leaks in the transport and distribution pipeline supplying the plant and leaks in the gas distribution piping within the plant, associated with the natural gas consumption.

An annual operating hours (AOH) of 8,540 for the electricity generation is assumed and the heat generation is assumed as 246.6 GJ/h (183 klbh) of steam which correspond to boiler case SR (simple recovery) in accordance with Cogeneration datasheet.

The parameter "Efficiency of conventional electricity generator units" has been validated by the audit team as per this parameter is based on data taken from operating conditions (historical data) as provided by the

Department of Process Engineering based in the last three years of full operation before the implementation of the project activity.

On the other hand, the parameter $BEF_{elec\ fossil\ fuel}$ "Baseline CO2 emissions factor for electricity from the dedicated fossil fuel power plant(s)" is based on the following parameters:

- PGi,n "Power generated by sources i (in MWh), by relevant power sources n, sources delivering electricity to the consuming facility", and
- SEFi,n "Specific CO2 emissions factor of the fossil fuel power generation sources n (in terms of kg/ MWh), sources delivering electricity to the consuming facility".

These parameters have been validated by the audit team as the baseline is the continuation of use of same equipment with a refurbishment (equipment replacement) and operation at nominal capacity but with historical efficiency (no change in equipment efficiency) in accordance with the frozen-efficiency scenario of the applied methodology; therefore, the audit team confirms that the estimation is conservative.

The resulting emission reductions under these assumptions are 193,648 tCO_2e per year.

Spreadsheet calculations have been reproduced by the validation team and the same results have been obtained achieving the transparency, accuracy and consistency principles required for the CDM projects. The data sources mentioned have been verified by AENOR.

In summary, the GHG calculations are complete and transparent, and their accuracy has been verified. No other project emission or leakage sources contributing more than 1% and not mentioned by the methodology have been found.

Based on the calculations and results presented in the sections above the implementation of the project activity will result in an average ex-ante estimation of emission reduction conservatively calculated to be 193,648 tCO_2e per year for the selected crediting period.

Therefore, AENOR confirms that all assumptions and data used by the project participants are listed in the final PDD and/or supporting documents, including their references and sources. Furthermore, all documentation used by the project participants as the basis for assumptions and source of data is correctly quoted and interpreted in the final PDD. All values used in the PDD are considered reasonable in the context of the proposed CDM project activity. The baseline methodology has been applied correctly to calculate project emissions, baseline emissions, leakage and emission reductions. All estimates of the baseline, project and leakage emissions can be replicated using the data and parameter values provided in the PDD.

3.7 Additionality

3.7.1 Evidence for prior CDM consideration and continuous actions to secure CDM status

In the first PDD /1/ published for GSC, the starting date of the project was 01/11/2011. In the final version of the PDD the starting date has been definitively defined as 18/11/2011, when the project developer signed the Purchase of equipment that involves major expenditure (TG-5100) /25/.

The starting date is determined in compliance with the applicable version of the Glossary of CDM Terms /26/, since the identified starting date will be the earliest date at which either the implementation or construction or real action of a project activity begins. The start date and the timeline of project implementation described in section B.5 of the PDD was also confirmed during the onsite interviews with the project developers. The determination of the date of the purchase contract as the start date of the project is considered reasonable since signing of the TG 5100 purchase contract is a key milestone in the project development and indicates commitment of the project participants with the implementation of the project activity.

Regarding prior consideration of the CDM and taking into account the "Guidance on the demonstration and assessment of prior consideration of the CDM" (VVS)/, as the project starting date is after 02 August 2008 and the PDD has not been published for global stakeholder consultation or a new methodology has not been proposed to the Board before the project activity start date, AENOR has confirmed by referring to the list of prior consideration notifications from the UNFCCC website and communication between the project proponent, the secretariat and the host Party DNA regarding the commencement of a new project activity. AENOR validation team has confirmed that such notifications have been provided by the project participants within 180 days of the project activity start date, therefore AENOR determines that the CDM was seriously considered in the decision to implement the project activity.

The validation team has checked that the timeline of the project is consistent with the notifications.

Date	Event
10 october 2008	No objection letter of DNA/27/.
September 2011	Approval of Fase III of PMSI: Plan Maestro de Servicios Industriales (Industrial Services Master Plan); time of investment decision/28/.
18 november 2011	**Purchase of equipment that involves major expenditure (TG-5100): start date** /25/.
22 december 2011	**Project participant sent the Prior Consideration of the Project to the UNFCCC** /29/.
10 january 2012	**Project participant sent the Prior Consideration of the Project to the DNA**/20/.
19 jun 2012	Stakeholders consultation
13 november 2012	Agreement with DOE for validation services
28 december 2012	Letter of approval (LoA) from Colombian DNA/5/.
25 january 2013 to	Public stakeholder consultation of PDD

Date	Event
23 february 2013	
01 april 2015	Starting Crediting Period

3.7.2 Analysis of the additionality

The Methodology provides two options to demonstrate additionality:

a) Option 1 "apply Step 2 of the latest version of the "Tool for demonstration and assessment of additionality" (Investment Analysis)" and

b) Option 2 "Methodology-specific process for determination of additionality".

The project proponent used Option 2 to demonstrate the project's additionality by demonstrated its ability to meet the four additionality tests. Each of the individual four tests is discussed below.

TEST 1: Are there technological barriers to cogeneration in the country?

AENOR was able to verify by using the additionality tool test 1 that the project activity faces technological barriers by establishing the following facts:

a) As per the report "Informe Preliminar de Expansión de Referencia Generación–Transmisión 2011-2025)" |34|, from the projects implemented in 2010 and January 2011 (Table 3-1, Page 45) only one was a cogeneration project, with a capacity of 19.9 MW (Mayagüez Cogenerator).This means that, according to the most recently available information, the installed cogeneration capacity of the country is 76.9 MW. AENOR validation team has assessed how the Pp has calculated the total economic cogeneration potential in Colombia. AENOR validation team has studied the reports:

   i. Development of Cogeneration Potential in the Country (Desarrollo del potencial de cogeneración en el país) |46|

   ii. Determination of Cogeneration Potential in the Tertiary Sector of the Country (Determinación del potencial de cogeneración en el sector terciario del país).|47|

   iii. Determination of the Economic and Technical Potential of the Rational and Efficient Use of Energy in the Colombian Textile Industry (Determinación del potencial técnico y económico del URE en el sector textil colombiano).|48|

   iv. Cogeneration in the Sugar Industry Introducing and Using the ESCO Approach (Cogeneración para el sector azucarero introduciendo y aplicando el enfoque ESCO),|49|

The information provided in the reports has been assessed and deemed correct, and the calculation carried out by the PP has correctly used the figures described in the reports:

Sector	Cogeneration Potential (MW)
Excluding Sugar Industries and textile Industries	200 -38 =162
Hotels and hospitals	31.6
Textile Industry	100
Sugar Industry	164
TOTAL Economic Potential	**457.6 = 458**

Consequently, according to these values, it may be concluded that 10 % of the estimated economic potential of the country has been reached, since this capacity accounts for 16.8 % of the potential.

B) The current cogeneration capacity in industries is 76.9 MW. According to Chapter 3.2.1 of the Reference Expansion Plan Generation-Transmission 2010-2014 (Plan de Expansión de Referencia Generación-Transmisión 2010-2024) [31] of UPME of the Colombian Ministry of Mining and Energy (Ministerio de Minas y Energía de la República de Colombia), the cogeneration capacity of the country by the end of 2009 was 57 MW. According to the Reference Expansion Preliminary Plan Generation-Transmission 2011-2025 (Plan Preliminar de Expansión de Referencia Generación–Transmisión 2011-2025) [32], from the projects implemented in 2010 and January 2011 (Table 3-1, Page 45) only one of them was a cogeneration project, with a capacity of 19.9 MW (Mayagüez Cogenerator). This means that, according to the most recently available information, the installed cogeneration capacity of the country is 76.9 MW. Consequently, according to these values, it may be concluded that 10 % of the estimated economic potential of the country has been reached, since this capacity accounts for 16.8 % of the potential.

C) The information available estimates on the installed co-generation capacity is 76.9 MW Consequently, lower than 500 MW and thus less than 5% of the total installed thermal capacity (4,467 MW), since the total net installed capacity is 13,543 MW. According to the cogeneration capacity of the country, it may be noted that it does not account for more than 5 % of the total thermal generation of the country (it accounts for 1.7 %).

As per information published in the official webpage of UPME the total number of cogeneration plants amounts to 13; hence it is lower than 25.

Based on the above 3 points AENOR confirms in line with the additionality test 1 of the methodology and its associated diagram the project activity faces technological barrier.

TEST 2a Institutional barrier: Are there institutional barriers to cogeneration in general?

AENOR confirmed with the DNA [35] that no special incentives are provided for cogeneration projects in Colombia.

During this meeting it was confirmed that there are no direct penalties to cogeneration system operators per se. However, if the cogeneration system has to be shut down, either due to technical difficulties or for equipment maintenance, the electricity demand needs to be purchased from the grid. Furthermore, during the site interviews it was verified that the Barrancabermeja plant will be connected to the grid for safety reasons and for back-up power. Since Barrancabermeja will act as a selfgenerator, the PP cannot use the Public Network for purposes other than gaining SIN's (National Interconnected System) support.

AENOR could prove that in the Colombian power sector, as per information provided by UPME and CREG and after assessing the applicable rules, the cogenerators face economic penalties when the system is down, penalties that are more onerous than those faced by other generators when they are down and unjustified on a purely economic basis, inter alia:

- Due to the national legislation, the cogenerator acting as selfgenerator cannot sign continuous supply contracts with favorable rates (E.G. the specific duration and hours have to be fixed in the contract).
- The PP cannot receive any payment in concept of capacity tariff from the system to compensate additional cost when the system is down.
- The price paid by the PP is the maximum price (market price without any potential discount). This acts as an 'economic disincentive'. Therefore, the current billing structure for connecting to the grid is economically unfavorable, and represents a financial risk for the developer.
- Ecopetrol will undertake the construction and continuous maintenance of an associated infrastructure that complies with all the technical requirements provided by the CREG, which will also be subject to permanent audits for the verification of its compliance (even though the power drawn from the grid is small or nil). The conditions, characteristics, maintenance, etc of the equipment are determined by the regulator and paid by the PP, which represents and extra cost for the operation.

AENOR validation team deems that this penalties are in line with the methodology because they can be considered as "significant penalty for users of cogeneration systems" (EG in Colombia all the agents can

sing a supply contract opting to lower prices, except cogenerators, whnthis situation is not based on any economic rationality). Even in the case that these penalties were considered as not enough significant in line with the description provided by the methodology; this test would be inconclusive with respect to institutional barrier 2A. In this hypothetic case, as per the *methodology "If institutional barriers are not present, but there are no specific incentives to cogeneration, then the test indicated is inconclusive with respect to institutional barrier A. Other barriers (such as technological barrier or institutional barrier B) will need to be considered to determine additionality."*

TEST 2b Institutional barrier for ESCOs: Are there institutional barriers to the "package cogeneration" operational context?

In absence of any clear definition of ESCO in AM0014 a commonly and internationally used definition of ESCO (Energy Service Companies) is adapted from the National Association of Energy Service Companies, (http://www.naesco.org/resources/esco.htm) [36]. According to NAESCO "*An ESCO, or Energy Service Company, is a business that develops, installs, and arranges financing for projects designed to improve the energy efficiency and maintenance costs for facilities over a seven to twenty year time period. ESCOs generally act as project developers for a wide range of tasks and assume the technical and performance risk associated with the project. Typically, they offer the following services:*

- *develop, design, and arrange financing for energy efficiency projects;*
- *install and maintain the energy efficient equipment involved;*
- *measure, monitor, and verify the project's energy savings; and*
- *assume the risk that the project will save the amount of energy guaranteed.*

These services are bundled into the project's cost and are repaid through the dollar savings generated."
AENOR validation team has checked several sources to verify whether "package cogeneration" systems have been installed under the ESCO scheme in Colombia, and whether the ESCO scheme is widely extended in Colombia.

According to the report titled "EVALUATION OF THE POTENTIAL MARKET STRUCTURE AND SERVICES AND RATIONAL USE OF ENERGY EFFICIENT (Feb 2002)" [37]: "*In principle it is necessary to differentiate the market for ESE's market for energy services. The ESE's market is not active in Colombia. In the past two companies to act as such, but the lack of demand and market development opportunities, determined that these companies diversified into other businesses linked within the energy sector*"

As per the report "APPLYING THE ESCO APPROACH UNDP - ASOCAÑA – Ministry of the Environment – UPME" (2011) [38] the authors confirm that the ESCO scheme is not widely spread in Colombia, due to several reasons (legal and commercial barriers inter alia). The author mentions: "*One of the proposals for the elimination of the barriers identified consists of the creation of Energy Service Companies, ESCOs*" (…) "*Currently, in Colombia there exist co-generation companies, energy consultants and research centers oriented at energy savings, but no ESCOs exist*" (…) "*It is important to note that in the framework of this last study, a workshop was carried out to train a group of engineers*

associated to ASOCAÑA on the subject of the ESCOs". These statements clearly shows that the significant ESCO market scheme is not implemented in Colombia. The development of ESCOs is still in its initial stages in the Host Country. And it could be concluded that ESCOs have not previously installed commercial natural gas package cogeneration systems at energy users' locations in the Host Country.

The report Regulatory Analysis SEF Colombia identifying barriers and measures (IFC -2013) |39| shows that "*Lack of dynamism in the market for Energy Service Companies - ESCOs-(beyond consulting) due to distrust*"

AENOR validation team has conducted a market research analysis to verify how many ESCOs are operating in this moment in Colombia, and the type of activities developed by these companies. The companies identified in 2014 are:

- Creara
- E2 energia eficiente
- Supernova
- Air técnica ingeniería
- Garper energía
- GT ESCO SA

Analyzing the type of service provided and the type of projects developed by these companies, it is clear that the grading of the local companies denotes ability to carry out energy efficiency audits and implement energy saving project (Air condition, Illumination, Energy Management Systems, etc). No mention is given that any of these companies has been active also in co-generation power generation planning, implementation, financing etc. (just one of these companies mention a future project regarding the installation during 2014/2015 of a microcogeneration system of 800 KW in a residential building in Bogotá) Furthermore, the scope of business of these companies does not entirely fit the above quoted definition of ESCO as provided by NAESCO (due to the market conditions of the Colombian energy sector). These companies only provide a few activities from the possible scope of activities ESCOs typically perform. Therefore, it can be concluded that there are no active ESCOs operating in Colombia that have co-generation plants operating.

In addition phone consultations with DNA were held in which it could be confirmed "*that the concept of ESCO as typically operating in European countries is still starting in Colombia*".

Although several sources confirm that the ESCO market scheme is not well developed in Colombia, and the market conditions do not make possible complex projects, beyond energy efficiency consultancy, such as the installation of "package Cogeneration", the lack of official information, require to improve the analysis in order to clarify the existence of Institutional barrier for ESCOs: Are there institutional barriers to the "package cogeneration" operational context.

AENOR validation team, could check that none of the 13 cogenerations described in the above section have been installed or developed by an ESCO scheme, in any case this figure is clearly under the 20 mentioned in the methodology.

Taking into consideration a wide interpretation, the only potential cogeneration system undertaken by an ESCO in Colombia, is the mentioned, microcogeneration project in a residential building in Bogota, which installed capacity is 800 KW. In order to improve the percentage of installed thermal capacity (5%) in the country, the installed capacity of cogeneration implemented by ESCOs should be higher than 223.35 MW, which is clearly impossible.

AENOR was able to confirm based on an independent sources that the concept of energy service companies is still in the infancy and at there are less than 6 companies that can be included (aprox) under the definition of NAESCO, and none of them has shown the capacity to undertake during the recent past complex projects such the installation of Cogeneration Packages. Furthermore it has been proved that in accordance with the AM0014 there is an institutional barrier since it is not possible that the ESCOs have been responsible of undertaking more than 20 recent installations. Therefore AENOR confirms that the project faces institutional barrier B.

TEST 2c Institutional barriers for Industrial Users:

AENOR has been verified through direct communication from UPME [40] that there are 13 cogeneration units installed by the industrial energy users at their location. The installed number is less than 20 and also the installed capacity is less than 5% of the total installed capacity (thermal) of Colombia, and hence faces barriers.

AENOR confirms that sufficient and reliable evidence was presented to AENOR to demonstrate that the project faces barriers in accordance with the barrier tests 1, 2a; 2b and 2c of AM0014 to demonstrate additionality.

In the hypothetical case that the Test 2.a could be considered as inconclusive, as per the *methodology "If institutional barriers are not present, but there are no specific incentives to cogeneration, then the test indicated is inconclusive with respect to institutional barrier A. Other barriers (such as technological barrier or institutional barrier B) will need to be considered to determine additionality*", once technological barrier or institutional barrier B have been undoubtedly demonstrated, validation team considers that, even in this case, the methodology requirements to demonstrate the additionality would have been met. This interpretation have been approved and accepted by the CDM EB during the registration of the project "Pakarab Fertiliser Co-generation Power Project" (CDM REF 2867).

The project activity is thus deemed additional.

3.7.3 Common practice analysis

As per para 135 of the applicable version of the Clean development mechanism validation and verification standard: "*for proposed large-scale project activities, unless the proposed project type is first-of-its kind as determined in accordance with the relevant guidelines, the DOE shall assess whether the project participants have conducted a common practice analysis*" and although in this case the Common Practice analysis is not mandatory, the DOE has decided to assess the information provided to prove that the project is not common practice.

Hence it can be confirmed that the proposed CDM activity is not a common practice in the defined region in line with the UNFCCC requirements:

(a) AENOR has assessed that the geographical scope (Colombia) of the common practice analysis is appropriate for the assessment of common practice related to the project activity's technology or industry type.

(b) AENOR has determined what extent similar and operational projects (e.g. using similar technology or practice), other than project activities have been undertaken in Colombia;

(c) AENOR has assessed in line with specific guidelines that similar and operational projects, other than project activities, are not already "widely observed and commonly carried out" in Colombia, describing the essential distinctions between the proposed project activity and the other similar activities.

3.8 Monitoring Plan

The project activity uses the approved monitoring methodology AM0014, version 04 "Natural gas-based package cogeneration".

Applicability of this methodology is justified in the final PDD and discussed in section 3.6.1 of this report. The methodology is applicable because the project consists of the installation of a package of cogeneration system whose input is natural gas and whose outputs are electricity and heat supplied to an industry with demand for heat and electricity.

The monitoring plan will give opportunity for real measurements of achieved emission reductions. As stated in the applied methodology AM0014, version 04 "Natural gas-based package cogeneration", the Monitoring Plan of the final version of the PDD includes the monitoring parameter as follows:

Volume of natural gas consumed in cogeneration system (MEC_{NG}): This parameter will be measured by fuel flow meters installed in the cogeneration system equipment and recorded monthly. The meters will have a precision rate of +/- 0.25 % and will be checked either in accordance with the local/national standards, or as per the manufacturer's specifications. All data will be archived electronically, and data will be retained for the full crediting period.

Cogeneration electricity supplied to industrial plant (MCEO): This data will be measured by Power Quality Meters (PQM) and monthly recorded. These meters will be checked according to the manufacturer's specifications or the applicable regulations. All data will be archived electronically, and data will be retained for the full crediting period.

Cogeneration heat supplied to industrial plant (MCHO): The steam produced from the volume of natural gas consumed by cogeneration plant will be determined as follows:

MCHO = *["*total steam cogeneration output"*] – ["*steam cogeneration output from refinery gas burning"*]*

Where:

"Total steam cogeneration output" will be monitored considering the total steam flow measured with a Venturi meter installed in the steam generator; and steam enthalpy determined from thermodynamic tables using values of temperature and pressure monitored by measurement instruments installed in the steam generator.

"steam cogeneration output from refinery gas burning" is determined considering the refinery gas consumption monitored by flow meters installed in the cogeneration system, the low heating value (LHV) of refinery gas monitored through accredited laboratories, and the annual operating hours.

Ex-ante values have been validated in accordance with the technical specifications of the cogeneration system and refinery gas.

All measurement equipment will be calibrated in accordance with the manufacturer's specifications or the local/national standards or international standards.

The audit team confirms that the final PDD clearly states that all dedicated power plant(s) (TG-2401/2/3) will not continue operating along with the project activity; therefore, electricity generated by dedicated power plant(s) is not necessary to be monitored.

In the opinion of the AENOR team all necessary parameters required by the selected approved methodology are contained in the monitoring plan. They are clearly described and the means of monitoring described in the plan comply with the requirements of the methodology. Thus, the monitoring plan is in compliance with the applicable methodology. Furthermore, archiving, measuring and calculation procedures, equipment details, calibration frequency and maintenance needs are clearly mentioned.

3.8.1 Compliance of the monitoring plan with the approved methodology

The parameter for achieving emission reduction calculation by the prescribed equations for baseline emissions, project emissions, leakage and emission reductions has been listed in B.7.1 of the PDD in a complete manner. The monitoring frequency, recording frequency and QA/QC procedures, have been prescribed for each parameter in compliance with the methodology.

Therefore, in the opinion of the AENOR team all necessary parameters required by the selected approved methodology are contained in the Monitoring Plan. They are clearly described and the means of monitoring described in the plan complies with the requirements of the methodology. Thus, the Monitoring Plan is in compliance with the applicable methodology.

3.8.2 Implementation of the Monitoring Plan

After the review of evidence provided by the PP and the interview and communications with PP, AENOR confirms that monitoring arrangements described in the Monitoring Plan are feasible within the project design and that the means considered for the implementation, including data management, quality and assurance control procedures, are sufficient to ensure that the emission achieved resulting from the proposed CDM project activity can be reported and verified ex post.

Therefore, in the opinion of the AENOR validation team the PP will be able to implement the Monitoring Plan.

3.9 Comments by Local Stakeholders

In order to assess the adequacy of the local stakeholder consultation the AENOR team requested to visit the PP during the on-site visit, not only to provide the evidence about the consultation process, but also to hold interviews with some of the local stakeholders affected by the project activity in order to know their opinions about the implementation of the project.

The AENOR team could verify that a socialization session was organized on 19 June 2012 at Barrancabermeja with local stakeholders, including neighbors and local authorities.

By means of documents reviewed and the interviews performed, AENOR considers that the summary of the comments received during the consultation process, along with the PP responses included in section E.2 of the PDD is complete. The main conclusions of the meetings and opinions collected from questionnaires are included in the PDD, section E.2. A complete summary of the comments received during the process is included in the PDD.

Local stakeholders had been invited by the PP to comment on the proposed CDM project activity prior to the publication of the PDD on the UNFCCC website.

The PP provided the DOE team with formal invitations and announcements /41/, analysis of the comments /42/ and Great Social Agreement for Barrancabermeja City-Region 100 years /43/ about the consultation process from the meeting conducted during the process. AENOR checked all the related documents and can confirm that the consultation was appropriate.

3.10 Environmental Impacts

In Colombia, according to environmental regulations: Auto 2692 Environmental Permits /44/ and Decree 2820/2010 Regulation of Environmental Permits /45/ the project activity only requires to carry out a management environmental plan.

Therefore, the PP has performed an environmental management plan /21/ to analyse the impacts of the project activity.

The final PDD includes further information in section D about the main potential impacts on each environmental component (e.g. atmospheric emissions, discharge, water consumption, noise) in the operation of the project activity and future projects carried out at GRB.

AENOR confirms that environmental information in the PDD is consistent with the regulatory documents and that the PP has followed a correct analysis of environmental impacts in accordance with the environmental management plan.

Therefore, in the opinion of AENOR, the project will not have any significant impacts on the environment and has followed a correct analysis of environmental impacts in accordance with procedures as required by the host Party.

In addition, AENOR confirms that the project participant has the following environmental permits:

- Water concession. Resolution 80, February 10, 1994, the National Institute for Renewable Natural Resources and the Environment (Instituto de Recursos Naturales Renovables y del Ambiente), INDERENA /13/
- Discharge permit. On February 25, 2009, under Resolution 204, INDERENA /14/
- Atmospheric emission permit. Under Resolution 846, passed on September 5, 2011 /15/.

4 COMMENTS BY PARTIES, STAKEHOLDERS AND NGOS

According to Decision 3/CMP.1, the validator shall make publicly available the PDD and receive comments on the validation requirements from parties, stakeholders and UNFCCC accredited NGOs within 30 days, and make them publicly available.

AENOR published the first PDD, version 01, on the CDM website (http://unfccc.cdm.int) on 25 January 2013 and invited comments by parties, stakeholders and non-governmental organisations. No comments were received during this period.

5 VALIDATION OPINION

AENOR has performed the validation of the "Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A." in Colombia. The validation process was performed on the basis of all UNFCCC requirements and criteria for CDM projects, the host country criteria and also on the criteria given to provide for consistent project operations, monitoring and reporting.

The conclusions of this report show that the project, as was described in the project documentation, is in line with all applicable criteria for the validation.

The validation consisted of the following three phases: i) a desk review of the project design, the baseline and the monitoring plans; ii) follow-up interviews with project stakeholders; iii) the resolution of outstanding issues and the issuance of the final validation report and opinion. In the course of the validation process, 6 corrective actions and 16 clarifications raised have been successfully closed.

The project participant used the method stated in the applied methodology AM0014 "Natural gas-based package cogeneration", version 04, option 2: Methodology-specific process for determination of additionality as follows, to demonstrate the additionality of the project. In line with this method, the PDD provides a barrier analysis to determine that the project activity itself is not the baseline scenario.

The barrier analysis demonstrates that the proposed project activity is not a likely baseline scenario. Emission reductions attributable to the project are, hence, additional to any that would occur in the absence of the project activity.

The review of the project design documentation and additional documents related to baseline and monitoring methodology, and the subsequent background investigation, follow-up interviews and review of comments by parties and stakeholders have provided AENOR with sufficient evidence to validate the fulfillment of the stated criteria.

The conclusions can be summarised in detail as follows:

- The project is in line with all relevant host country criteria of the host country DNA and with all relevant UNFCCC requirements for CDM. The LoA from Colombia is dated 28 December 2012.

- The project additionality is sufficiently justified in the PDD.

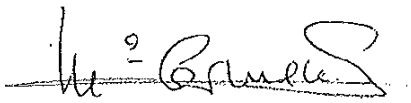
- The Monitoring Plan is transparent and adequate.

- The calculation of project emission reductions has been carried out in a transparent and conservative manner, so that the annual calculated emission reductions of 193,648 tCO_2e are most likely to be achieved within the renewable crediting period.

In our opinion, the project correctly applies and meets the relevant UNFCCC requirements for the CDM and the relevant host country criteria.

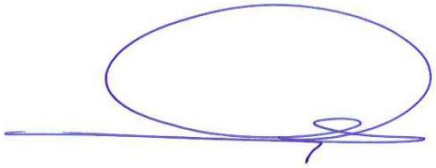
The validation has been performed using a risk-based approach, as described above. The only purpose of this report is its use during the registration process as part of the CDM project cycle. Hence, AENOR cannot be held liable by any party for decisions made or not made based on the validation opinion, which would go beyond the purpose.

DATE: 2015/07/13



Mª Carmen Gonzales Galán
Authorized person

DATE: 2015/07/13



Luis Robles Olmos
Validation Team Leader

6 CORRECTIVE ACTION REQUESTS, CLARIFICATIONS AND FORWARD ACTION REQUESTS

TITLE	Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A		
FINDING	**Nº 1**		
Classification	**CAR** ☒	**CL** ☐	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	**The PP is requested to justify the correct selection of the baseline as per both methodologies.**		
PP RESPONSE #1	*This section shall be filled by the PP.*		
It shall address the corrective action taken in details	The project activity consists of operating a cogeneration system with electricity and steam production, replacing steam and electricity generated in separate systems, so the baseline and monitoring methodology applicable is AM0014 'Natural gas-based package cogeneration'. The cogeneration system is made up of a new cogeneration unit and of a repowered existing unit with increased capacity. Therefore, the project activity entails additionally improved energy efficiency in the existing generation capacity. In addition, in order to assess improvement of energy efficiency in the capacity of the existing cogeneration system, as a result of its repowering, methodology AMS.II.B "Supply side energy efficiency improvements-generation" has been used. This improvement in efficiency would only occur if the installation of the package cogeneration system (project activity) took place and is a consequence thereof. Therefore, the baseline scenario definition and the demonstration of the additionality is performed based on the project activity (installation of the package cogeneration system) and, consequently, based on AM0014 methodology. AMS.II.B methodology is only applicable		

	to account additional reductions.	
It shall provide and indentified the evidences proposed (if applicable)	Sections B.1 and B.2 of the CDM-PDD have been modified in order to incorporate the correct selection of the baseline.	
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	The selection of the baseline as per AMS-II.B. is not indicated in the PDD. In addition, this CAR will be closed once CL 7 is solved. CAR is not closed.	
PP RESPONSE #2	*This section shall be filled by the PP.*	
Corrective action	AMS.IIB. has been removed from the baseline scenario and from the project activity, so all sections of the CDM PDD have been modified in order to consider only the AM0014 methodology.	
Evidences proposed		
DOE Assessment #2	The baseline has been selected in accordance with the applied methodology AM0014 version 04.	
Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐

TITLE	**Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A**		
FINDING	**Nº 2**		
Classification	**CAR** ☒	**CL** ☐	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	**The PP is requested to provide an adequate justification of the steps, equations and parameters applied to calculate the emissions reductions in accordance with the applied methodology and tool. In particular, the equations of step e) of baseline emission shall be revised based on the choice of the baseline scenario and other evidence provided.**		
PP RESPONSE #1	*This section shall be filled by the PP.*		
It shall address the corrective action taken in details	In the baseline scenario the Barrancabermeja Refinery Unit continues to operate with equipment replacement and/or equipment upgrade as needed with no change in equipment efficiency. The steam generators and electricity generation by steam turbines that would be used in the baseline scenario are the existing ones, upgrade as needed. The Refinery is connected to the country's national electricity network, only being used as back-up to the project activity equipment in case they fail. So in baseline scenario there is no consumption of electricity from Colombian national grid, being applied step e.2) of AM0014 methodology (step e.1) is no applicable. The electricity consumption of the network in recent years is consequence of it was decided not to update the baseline scenario equipments TG-951/952 TG-901/2/3 waiting for the implementation of the project activity. So the electricity generated by these equipments had to be supplied from the network temporarily while cogeneration is being implemented.		
It shall provide and indentified the evidences	Section B.6 of the CDM-PDD has been modified in order to		

proposed (if applicable)	incorporate an adequate justification of the steps, equations and parameters applied to calculate the emissions reductions.
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	The PP is requested to clarify the following issues: • CO2 emissions associated with the electricity that would have to be purchased from the power grid in case of failure (back-up system). • Factors of refinery gas and natural gas in lower heating value basis are not used. • Value of CEO is not calculated as per the methodology AM00014. • Power generated by sources (MWh) of existing equipment TG-2401/2/3, TG-901/2/3 and TG-951/2 (dedicated fuel power plants) are not the real ones. • Power capacity of new unit LM6000 used for project emissions calculation according to AMS-II.B. • Cogeneration electricity output of 53 MW used in the calculation of emission reductions • High efficiency of conventional electricity generator units (boilers and steam generators). In particular, units TG-901/2/3, TG-951/2 CAR is not closed.
PP RESPONSE #2	*This section shall be filled by the PP.*
Corrective action	The refinery is connected to the country's national electricity network only as back-up. In case of electricity consumption from the Colombian network, the project equipment will not operate and will not be achieved emission reductions. Factors of refinery gas and natural gas have been obtained from FECOC tool; tool from the UPME for calculation the emission factor of the Colombian fuels. CEO (cogeneration electricity output) from dedicated fossil fuel plants (MWh/year) is calculated from the cogeneration electric power output (CPO) and annual operating hours (AOH). CPO (57.2 MW) = 35 MW (new cogeneration unit U-5100) + 22.2 MW (new cogeneration capacity of U-2961 with the LM600 turbine). 22.2 MW is new cogeneration capacity of U-2961 and corresponds with total power capacity of U-2961 with the LM6000 turbine (42 MW), discounting the power capacity of this unit with the existing LM 5000 turbine (19.8 MW). The value of 19.8 MW of existing LM5000 comes from historical operating

	data (see evidence "CPO-10000305-418 historical of electricity generation of TG-2961.pdf"). A corrective factor (load factor of 94.5%) has been applied to net capacity of existing equipment TG-2401/2/3, TG-901/2/3 and TG-951/2, in order to adjust the energy balance. So we ensure the same energy production in the baseline scenario and in the project scenario. (see evidence "*Ajuste balance electrico.pdf*"). Efficiency of conventional electricity generator units (boilers and steam generators) are provided by process engineering based on technical specifications of equipment and operating conditions (see evidence "Efficiency of U900_U950.pdf")	
Evidences proposed	FECOC toolkit (excel and guidelines) and refinery gas analysis. "*balance eléctrico ajustado.pdf*" (energy balance adjusted). "Efficiency of U900_U950.pdf" "*CPO*-10000305-418 *historical of electricity generation of TG*-2961.*pdf*" "Colombian network back up_Explanation.pdf"	
DOE Assessment #2	The calculation procedure of the emission reductions stated in the final PDD is in accordance with applied methodology and all ex-ante parameters have been taken from technical information provided by the project participant.	
Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐

TITLE	**Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A**		
FINDING	**Nº 3**		
Classification	**CAR** ☒	**CL** ☐	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	**The PP is requested to clearly indicate all data sources and assumptions used in the calculation stated in section B.6.2 of the PDD and the calculation spreadsheet. In addition, all evidence that justified the parameters shall be provided to the DOE.**		
PP RESPONSE #1	*This section shall be filled by the PP.*		
It shall address the corrective action taken in details	All data used in emissions reductions spreadsheets has been provided by department of "Engineering of process" (Technical Management of Barrancabermeja Refinery). Document "CAR 03_Data sources for calculations.V.01" includes the primary data used for ex ante calculations and references to evidence that justifies the parameters applied in calculations (sections B.6.2 and B.7.1 of CDM-PDD).		
It shall provide and indentified the evidences proposed (if applicable)	Document "CAR 03_Data sources for calculations.V.01", datasheets and technical specifications of boilers and steam generators in the baseline scenario and cogeneration system in the project scenario.		
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	To assess when CAR 2 is closed.		
PP RESPONSE #2	*This section shall be filled by the PP.*		
Corrective action	See PP response of CAR 2		
Evidences proposed	"*CAR 03_Data sources for calculations.V.02.docx*"		

DOE Assessment #2	The audit team verified that all data sources and assumptions used in the calculation of emission reductions are taken from technical information provided by the PP.	
Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐

TITLE	**Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A**		
FINDING	**Nº 4**		
Classification	**CAR** ☒	**CL** ☐	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	**The PP is requested to correct the monitoring plan stated in the PDD in accordance with the applied methodology and other relevant tools. Please revise the following issues:** • **The list of parameters required by the applied methodology is not complete. The "electricity generated by baseline dedicated power plant" is not included.** • **Specification of the calibration frequency for all the measuring equipments is not specified in accordance with the CDM-Project Standard.** • **A diagram indicating the emission sources and GHGs included in the project boundary and the data and parameters to be monitored shall be provided.**		
PP RESPONSE #1	*This section shall be filled by the PP.*		
It shall address the corrective action taken in details	Dedicated power plant(s) (TG-2401/2/3, TG-901/2/3 and TG-951/2) will not continue to operate along with the project activity cogeneration systems, so according to AM0014, electricity generated by dedicated power plant(s) is not necessary to be monitored. According to the CDM-Project Standard, the measurement equipments will be calibrated either in accordance with the local/national standards, or as per the manufacturer's specifications. If local/national standards or the manufacturer's specifications are not available, international standards will be used		
It shall provide and indentified the evidences proposed (if applicable)	Sections B.7.1 and B.7.3 of the CDM-PDD have been modified in order to incorporate justification regarding non inclusion of "electricity generated by dedicated power plant(s)" and calibration frequency in monitoring plan.		

	Sections A.3 and B.3 of the CDM-PDD have been modified in order to incorporate diagrams of baseline scenario and project scenario and description of emissions sources and GHGs included in the project boundary.	
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	The PP is requested to clarify the following issues: • Ensure that dedicated power plants will be no more operating once the project activity begins. • Monitoring of Volume of refinery gas consumed in cogeneration system is not required by the methodology. • Value of cogeneration heat supplied to industrial plant. CAR is not closed.	
PP RESPONSE #2	*This section shall be filled by the PP.*	
Corrective action	Dedicated power plant(s) (TG-2401/2/3, TG-901/2/3 and TG-951/2) will not continue operating along with the project activity cogeneration systems. At the time that the project begins, these equipment will be removed from the refinery operation. Refinery gas consumed in cogeneration system has been removed from the project scenario, so it is not necessary to be monitored directly in the monitoring plan. Value of cogeneration heat supplied to industrial plant (MCHO: 2,105,668 GJ) is calculated from cogeneration system heat output rate (CHOR: 246.6 GJ/h) and annual operating hours (AOH: 8,540 h/year).	
Evidences proposed		
DOE Assessment #2	The monitoring plan stated in the final PDD is in accordance with the applied methodology and EB Guidance.	
Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐

TITLE	**Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A**		
FINDING	**Nº 5**		
Classification	**CAR** ☒	**CL** ☐	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	**The PP is requested to clarify the inconsistencies between the permits stated in the PDD and the evidence provided. In particular, dates and the Sanitary Authorization are not consistent.**		
PP RESPONSE #1	*This section shall be filled by the PP.*		
It shall address the corrective action taken in details	Gerencia Complejo Barrancabermeja has the following permits required by environmental laws in force: Water Concession (Resolution 1194, on October 22, 2010), Emission Permit (Resolution 846, on September 5, 2011) and Discharge Permit (Resolution 204, On February 25, 2009). Solid waste authorisation does not apply, because the waste landfill in the facility is closed. Gerencia de Refinería Barrancabermeja (GRB) has a contract agreement with BIOTA SA ESP in order to manage, in the municipal landfill of Barrancabermeja, all solid waste generated in the refinery. So waste sanitary authorisation is not applicable today.		
It shall provide and indentified the evidences proposed (if applicable)	Section D.1 of the CDM-PDD has been modified in order to correct dates of permits and remove reference to Resolution 00002 relating to sanitary authorization. BIOTA SA ESP contract. Certification of solid waste disposal in municipal landfill of Barrancabermeja.		
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	The PP has corrected the inconsistencies in the final PDD.		

Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐

TITLE	Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A		
FINDING	**Nº 6**		
Classification	**CAR** ☒	**CL** ☐	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	**The PP is requested to clarify an inconsistency in the date of the announcement in the local press (Qhubo newspaper). In addition, all formal invitations to organizations/entities shall be provided.**		
PP RESPONSE #1	*This section shall be filled by the PP.*		
It shall address the corrective action taken in details	Date of the announcement in the local press (Qhubo newspaper) is May 31, 2012 instead July 1, 2012.		
It shall provide and indentified the evidences proposed (if applicable)	Section E.1 of the CDM-PDD has been modified in order to correct wrong date. The following formal invitations are provided: -Ministry of Environment and Sustainable Development (Ministerio de Ambiente y Desarrollo Sostenible) -Municipal Secretariat of Environment (Secretaria Municipal de Medio Ambiente) -Town Council -Regional Autonomous Corporation of Río Grande de la Magdalena (Corporación Autónoma Regional del Río Grande de la Magdalena, CORMAGDALENA) -Regional Autonomous Corporation of Santander (Corporación Autónoma Regional de Santander, CAS) -Monasterio Verde Corporation -Conciencia Verde Environmental Foundation -Oikos Environmental Corporation -Barrancabermeja Ecological Oversight -Local Administrative Boards and Community Action		

	Committee (Juntas de Acción Comunales, JAC) Chairpersons, Community Development Office	
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	The date has been corrected and all invitation has been provided.	
Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐

TITLE	Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A		
FINDING	**Nº 1**		
Classification	**CAR** ☐	**CL** ☒	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	**MOC has to be provided to the validation team.**		
PP RESPONSE #1	*This section shall be filled by the PP.*		
It shall address the corrective action taken in details	MoC is provided.		
It shall provide and indentified the evidences proposed (if applicable)	MOC		
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	The MoC statement of the project activity has been provided by the PP. Also, the audit team confirms that the MoC statement has been correctly completed and duly authorized. However, the PP is requested to provide evidence in order to confirm the corporate identity of the PP and focal point included in the Modalities of Communication (MoC) statement, as well as the personal identity, including specimen signature and employment status, of their authorized signatories. CL is not closed.		
PP RESPONSE #2	*This section shall be filled by the PP.*		
Corrective action			
Evidences proposed	Evidence of corporate identity of the PP and focal point in the MoC. Personal identity (cédula identificativa) of the authorized signatory.		
DOE Assessment #2	The audit team has verified the corporate and personal identity of the PP and focal point.		

Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐

TITLE	**Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A**		
FINDING	**Nº 2**		
Classification	**CAR** ☐	**CL** ☒	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	**The PP is kindly requested to include a table with the timeline of the project, describing the main milestones.**		
PP RESPONSE #1	*This section shall be filled by the PP.*		
It shall address the corrective action taken in details	**Date** / **Event** 10 october 2008 — No objection letter of DNA September 2011 — Approval of Fase III of PMSI: Plan Maestro de Servicios Industriales (Industrial Services Master Plan); time of investment decision 18 november 2011 — Purchase of equipment that involves major expenditure (TG-5100): start date 22 december 2011 — Project participant sent the Prior Consideration of the Project to the UNFCCC and DNA 19 jun 2012 — Stakeholders consultation 13 november 2012 — Agreement with DOE for validation services 28 december 2012 — Letter of approval (LoA) from Colombian DNA 25 january 2013 to 23 february 2013 — Public stakeholder consultation of PDD 01 january 2015 — Starting Crediting Period		
It shall provide and indentified the evidences proposed (if applicable)	Section B.5 of the CDM-PDD has been modified in order to incorporate the timeline of the project and main milestones.		
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	The date of sent the Prior Consideration of the project to the DNA is not consistent with the evidence ECP-10000273-0001-12. Please clarify. CL is not closed.		
PP RESPONSE #2	*This section shall be filled by the PP.*		
Corrective action	CDM PDD has been modified in order to incorporate the correct date of sent the Prior Consideration of the project to the DNA		

	(10 January 2012).	
Evidences proposed		
DOE Assessment #2	The dates of timeline stated in the final PDD are in accordance with the evidence provided by the PP.	
Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐

TITLE	Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A		
FINDING	**Nº 3**		
Classification	**CAR** ☐	**CL** ☒	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	**The PP is kindly requested to clarify the description of the project activity. In doing so, please refer to the characteristics of the methodologies, technologies to be applied, etc.**		
PP RESPONSE #1	*This section shall be filled by the PP.*		
It shall address the corrective action taken in details	The project activity consists of operating a cogeneration system with electricity and steam production, replacing steam and electricity generated in separate systems by means of a conventional system with steam generators and turbine generators. The project activity encompasses the installation of a package of cogeneration system whose outputs are electricity and heat supplied to an industry with demand for heat and electricity. Specifically, consists of setting up a cogeneration unit (U-5100) in order to supply 35 MW of electricity generation and 150 psia steam and increase 18 MW of an existing generation system U-2961 (current 24 MW LM5000 for new 42 MW LM6000), replacing the existing steam generators and turbines (B-901/2/3/4, B-951/2 and B956 steam generators and TG-2401/2/3, TG-901/2/3 and TG-951/2 steam turbine).		
It shall provide and indentified the evidences proposed (if applicable)	In order to clarify the description of the project activity, diagrams of baseline scenario and project scenario are included in section A.3 of the CDM-PDD. In addition, description in these sections has been clarified.		
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional*	The PP is requested to clarify the description of the project activity regarding the following inconsistencies: • Capacity of new cogeneration unit U-5100 (35 MW of TG-		

corrective action and DOE assessments (#2, #3, etc.) shall be added	5100) stated in the PDD and the datasheet. • Capacity of new LM6000 turbine (42 MW) stated in the PDD and the datasheet. • Capacity of existing steam turbines (53 MW from: TG-2401/2/3, TG-901/2/3 and TG-951/2) stated in the PDD and datasheet. Also, the PP is requested to provide evidence of the following: • Capacity of the existing cogeneration system U-2961/LM5000 (24 MW) • Load factor of 87.6% applied to the capacity of the existing steam turbines. • Additional steam production of 451 Klbh is not necessary in the Refinery unit. CL is not closed.	
PP RESPONSE #2	*This section shall be filled by the PP.*	
Corrective action	Capacity of the new cogeneration system (U-5100), capacity of the existing cogeneration system (U-5100/LM5000) and load factor applied (94.5% instead 87.9%, due of the historical values of U-2961/LM5000 electricity generation have been applied), are indicated in PP response of CAR 2 Steam production of 451 klbh is indicated in the energy balance of the PDD in order to clarify total steam capacity of the refinery.	
Evidences proposed	See PP response of CAR 2.	
DOE Assessment #2	Description of the project activity has been clearly stated in the PDD as per the technical evidence provided by the project participant.	
Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐

TITLE	Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A		
FINDING	**Nº 4**		
Classification	**CAR** ☐	**CL** ☒	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	**The PP is kindly requested to clarify and clearly describe the situation pre and post operational of the installations involved in the project activity.**		
PP RESPONSE #1	*This section shall be filled by the PP.*		
It shall address the corrective action taken in details	Section A.3 of the CDM-PDD has been modified in order to incorporate a table with a summary of the equipment in baseline and in project activity and energy balance of power and steam in both scenarios		
It shall provide and indentified the evidences proposed (if applicable)	See section A.3 of the CDM-PDD.		
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	The PP has clarified the baseline and project situation. However, some issues are still not clear. To assess when CL 3 is solved. CL is not closed.		
PP RESPONSE #2	*This section shall be filled by the PP.*		
Corrective action	The description of baseline and project scenario have been clarified in PDD considering that only methodology AM0014 is applied. In addition see PP response of CL 3.		
Evidences proposed			
DOE Assessment #2	The PP has voluntary retired the applied methodology AMS-II.B.; therefore, the baseline has been described as per applied methodology AM0014 "Natural gas-based package Cogeneration".		

Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐

TITLE	**Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A**		
FINDING	**Nº 5**		
Classification	**CAR** ☐	**CL** ☒	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	**The PP is requested to clarify whether the geographic coordinates of the project activity are in decimal points.**		
PP RESPONSE #1	*This section shall be filled by the PP.*		
It shall address the corrective action taken in details	Geographic coordinates are latitude and longitude in degrees, minutes and seconds, according to the WGS84.		
It shall provide and indentified the evidences proposed (if applicable)			
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	The coordinates are not stated in decimal points, for example: Latitud 4.598197 Longitud -74.075833 CL is not closed.		
PP RESPONSE #2	*This section shall be filled by the PP.*		
Corrective action	The coordinates stated in decimal points have been included in the PDD.		
Evidences proposed			
DOE Assessment #2	The geographic coordinates have been stated in decimal points.		
Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐	

TITLE	**Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A**		
FINDING	**Nº 6**		
Classification	**CAR** ☐	**CL** ☒	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	**The PP is kindly requested to clarify the sectoral scopes and the categories of the project activity.**		
PP RESPONSE #1	*This section shall be filled by the PP.*		
It shall address the corrective action taken in details	Sectoral Scope 1: Energy industries (renewable - / non-renewable sources) and Sectoral Scope 4: Manufacturing industries		
It shall provide and indentified the evidences proposed (if applicable)	See initial summary table in CDM-PDD.		
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	The sectoral scopes of the project activity have been clarified in the final PDD: 01 Energy industries (renewable - / non-renewable sources) 04 Manufacturing industries.		
Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐	

TITLE	Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A		
FINDING	**Nº 7**		
Classification	**CAR** ☐	**CL** ☒	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	**The PP is kindly requested to clarify the applicability of the methodologies, including evidence to back up the assumptions made.**		
PP RESPONSE #1	*This section shall be filled by the PP.*		
It shall address the corrective action taken in details	The project activity consists of operating a cogeneration system with electricity and steam production, replacing steam and electricity generated in separate systems, so the baseline and monitoring methodology applicable is AM0014 'Natural gas-based package cogeneration'. The cogeneration system is made up of a new cogeneration unit and of a repowered existing unit with increased capacity. Therefore, the project activity entails additionally improved energy efficiency in the existing generation capacity. In addition, in order to assess improvement of energy efficiency in the capacity of the existing generation system, as a result of its repowering, methodology AMS.II.B "Supply side energy efficiency improvements-generation" has been used. This improvement in efficiency would only occur if the installation of the package cogeneration system (project activity) took place and is a consequence thereof. Therefore, the baseline scenario definition and the demonstration of the additionality is performed based on the project activity (installation of the package cogeneration system) and, consequently, based on AM0014 methodology. AMS.II.B methodology is only applicable to account additional reductions.		
It shall provide and indentified the evidences	These considerations have been incorporated in sections B.1		

proposed (if applicable)	and B.2 of the CDM-PDD, including the justification of compliance with the criteria of the methodology. Evidence that electricity is not supplied to the power grid (Certification that GRB power equipment are operated in self-generating condition ("condicion de autogenerador"), according to Resolution CREG 084 1996 and Resolucion CREG 084 1996).	
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	The PP is requested to clarify the applicability of the methodologies regarding the following issues: • Use of a back-up system to the project activity. • Use of additional refinery gas burning system (post-combustion). • Reduction of fuel consumption in less than 180 GWh_{th} because the generation unit LM5000 of 24 MW will be replaced by a new generation unit LM6000 of 42 MW. In addition, the PP is requested to clarify the project activity conditions of the page 2 of the applied methodology AM0014. CL is not closed.	
PP RESPONSE #2	*This section shall be filled by the PP.*	
Corrective action	The refinery has three generators (TG-2951/2/3), which only being used in order to complete demand requirements of the refinery and as back-up to the project activity equipment in case they fail. These generators take part in the baseline scenario and in the project scenario, therefore, are not included in the CDM project activity. AMS-II.B. has been removed from the baseline scenario and from the project activity, so it is not necessary justified the reduction of fuel consumption in less than 180 GWth. Refinery gas consumed in cogeneration system has been removed from the project scenario.	
Evidences proposed		
DOE Assessment #2	The PP has clarified in the final PDD all issues regarding the applicability of the applied methodology AM0014 version 04.	
Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐

TITLE	Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A		
FINDING	**Nº 8**		
Classification	**CAR** ☐	**CL** ☒	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	**The PP is kindly requested to include further information in the PDD to clarify the milestone selected as starting date. In doing so please refer to CDM Glossary.**		
PP RESPONSE #1	*This section shall be filled by the PP.*		
It shall address the corrective action taken in details	The milestone selected as starting date, is the date of signing the purchase order of the cogeneration turbine TG-5100 (November 18, 2011). This milestone represents the most relevant spending in equipment, and is the earliest date at which a real action of the CDM project activity begins, as stated in the CDM procedures.		
It shall provide and indentified the evidences proposed (if applicable)	Purchase order MA-0003703 (cogenerator turbine TG-5100)		
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	Start date is in line with the CDM requirements, AENOR validation team has checked the evidence provided which is deemed correct.		
Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐	

TITLE	**Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A**		
FINDING	**Nº 9**		
Classification	**CAR** ☐	**CL** ☒	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	**The PP is kindly requested to provide further justification on how the additionality is demonstrated as per AMS IIB**		
PP RESPONSE #1	*This section shall be filled by the PP.*		
It shall address the corrective action taken in details	The project activity consists of operating a cogeneration system with electricity and steam production, replacing steam and electricity generated in separate systems, so the baseline and monitoring methodology applicable is AM0014 'Natural gas-based package cogeneration'. The cogeneration system is made up of a new cogeneration unit and of a repowered existing unit with increased capacity. Therefore, the project activity entails additionally improved energy efficiency in the existing cogeneration capacity. In addition, in order to assess improvement of energy efficiency in the capacity of the existing cogeneration system, as a result of its repowering, methodology AMS.II.B "Supply side energy efficiency improvements-generation" has been used. This improvement in efficiency would only occur if the installation of the package cogeneration system (project activity) took place and is a consequence thereof. Therefore, the baseline scenario definition and the demonstration of the additionality is performed based on the project activity (installation of the package cogeneration system) and, consequently, based on AM0014 methodology. AMS.II.B methodology is only applicable to account additional reductions.		
It shall provide and indentified the evidences	These considerations have been incorporated in sections B.1		

proposed (if applicable)	and B.2 of the CDM-PDD.	
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	As per the applicable version of the Clean development mechanism project standard: Project participants shall demonstrate, in accordance with the selected methodology and the requirements relating to prior consideration of the CDM contained in section 6.3 above, that the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the proposed CDM project activity. Since additional reductions are obtained applying AMS IIB, the PP is requested to justify that these reductions are additional in line with par 47 and 96. CL is not closed.	
PP RESPONSE #2	*This section shall be filled by the PP.*	
Corrective action	AMS.IIB. has been removed from the baseline scenario and from the project activity.	
Evidences proposed		
DOE Assessment #2	CL is closed.	
Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐

TITLE	**Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A**		
FINDING	**Nº 10**		
Classification	**CAR** ☐	**CL** ☒	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	**Expression "*This implies that the total thermal capacity of the country amounts to 14 284 MW. None of the projects listed is thermal. As a consequence, the thermal capacity has not been modified and still is 4467 MW.*" Has to be clarified.** **The PP is kindly requested to provide further information to back up that ESCOs conducted are fewer than 20 recent installations in the country or a number of installations representing 5% of total installed thermal generating capacity in the country.** **The PP is requested to provide evidence to back the expression *Ecopetrol has only a cogeneration system (TG-2961), which is the system repowered in the project activity, so Ecopetrol has no experience in the operation of these kind of systems. In addition, Ecopetrol has two cogeneration systems in operation in the department of Meta, but they do not exploit the residual energy of the exhaust gases from the turbine, so really they don't function as cogeneration systems.* In doing so, please refer to applicability conditions of the methodology.**		
PP RESPONSE #1	*This section shall be filled by the PP.*		
It shall address the corrective action taken in details	Expression "Table 3-1 of the Reference Expansion Preliminary Plan Generation-Transmission 2011-2025 shows a list of the projects that were implemented in 2010 and January 2011, with a total power of 741 MW. This implies that the total thermal capacity of the country amounts to 14 284 MW. None of the projects listed is thermal. As a consequence, the thermal capacity has not been modified and still is 4467 MW" has been replaced by "Table 3-1 of the Reference Expansion Preliminary Plan Generation-Transmission 2011-2025 shows a list of the projects that were implemented in 2010 and January 2011, with a total power capacity of 741 MW, that means that total capacity of the country amounts to 14 284 MW (13543 MW + 741 MW). Due that none of these projects listed is thermal, so thermal capacity still is 4467 MW".		

	Information about ESCOS has been requested to UPME (Unidad de Planeacion Minero Energética) of colombian goverment and ANDI (Asociación Nacional de Empresarios de Colombia). As soon as the information is available, it will be submitted to the DOE.	
It shall provide and indentified the evidences proposed (if applicable)	See section B.5 (step 3a) of the CDM-PDD. Memorandum related to power generators Ocoa and Suria, which do not operate as cogeneration system.	
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	This CL will be assessed once all the information and evidence is available.	
PP RESPONSE #2	*This section shall be filled by the PP.*	
Corrective action		
Evidences proposed	Information supplied by UPME about ESCOS and cogeneration capacity of Colombia. Memorandum related to cogeneration systems in Ecopetrol.	
DOE Assessment #2	Information has been provided and deemed correct and in accordance with the UNFCCC requirements. Therefore Cl is closed.	
Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐

TITLE	**Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A**		
FINDING	**Nº 11**		
Classification	**CAR** ☐	**CL** ☒	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	**The PP is requested to provide the Environmental Management Plan. In addition, a summary of the analysis shall be stated in the PDD.**		
PP RESPONSE #1	*This section shall be filled by the PP.*		
It shall address the corrective action taken in details	GRB Environmental Management Plan.		
It shall provide and indentified the evidences proposed (if applicable)			
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	The Environmental Management Plan (EMP). However, a summary of the analysis of the environmental impacts shall be stated in section D.1 of the PDD. CL is not closed.		
PP RESPONSE #2	*This section shall be filled by the PP.*		
Corrective action	Section D of the CDM-PDD has been modified in order to incorporate the summary of the analysis of the environmental impacts required.		
Evidences proposed			
DOE Assessment #2	A summary of environmental impacts has been indicated in the final PDD as per EMP provided by the project participant.		
Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐	

TITLE	**Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A**		
FINDING	**Nº 12**		
Classification	**CAR** ☐	**CL** ☒	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	**The PP is requested to provide evidence that neither Environmental Impact Assessment (EIA) nor its approval is required.**		
PP RESPONSE #1	*This section shall be filled by the PP.*		
It shall address the corrective action taken in details	Memorandum explaining that neither Environmental Impact Assessment (EIA) nor its approval is required.		
It shall provide and indentified the evidences proposed (if applicable)			
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	The PP has clarified that the project activity does not require any Environmental Impact Assessment (EIA) or its approval because it is considered part of the activities of the industrial plant.		
Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐	

TITLE	**Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A**		
FINDING	**Nº 13**		
Classification	**CAR** ☐	**CL** ☒	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	**The PP is requested to provide the analysis of the surveys indicated in the PDD.**		
PP RESPONSE #1	*This section shall be filled by the PP.*		
It shall address the corrective action taken in details	The analysis of the survey is included in the CDM-PDD. No additional documentation available in relation to the analysis of surveys.		
It shall provide and indentified the evidences proposed (if applicable)			
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	All documents of the surveys have been provided.		
Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐	

TITLE	**Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A**		
FINDING	**Nº 14**		
Classification	**CAR** ☐	**CL** ☒	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	**The PP is requested to provide the complete "Corporate Social Responsibility Procedures for Activities Outsourced by Ecopetrol S.A.", which contains all the points stated in section E.3 of the PDD.**		
PP RESPONSE #1	*This section shall be filled by the PP.*		
It shall address the corrective action taken in details	ECP-DABB-P-054 procedure "Corporate Social Responsibility Procedure for Activities Outsourced by Ecopetrol S.A." is provided.		
It shall provide and indentified the evidences proposed (if applicable)			
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	The evidence provided does not include information of the social investment state in the PDD. CL is not closed.		
PP RESPONSE #2	*This section shall be filled by the PP.*		
Corrective action	The information about social investment has been updated according to data indicated in the Integrated sustainable management report 2011		
Evidences proposed	Integrated sustainable management report 2011		
DOE Assessment #2	All evidence of social activities has been provided by the project participant.		
Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐	

TITLE	**Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A**		
FINDING	**Nº 15**		
Classification	**CAR** ☐	**CL** ☒	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	**The PP is requested to provide more information and clarifications in order to response the issues raised by the CDM team in the incomplete during the Information and reporting check on 25 September 2014.**		
PP RESPONSE #1	*This section shall be filled by the PP.*		
It shall address the corrective action taken in details	The project description and diagrams in the PDD have been updated in order to clarify the only dedicated baseline power plants (TG-2401/2/3), which are total-condensation turbines. PDD has been updated clearly stated that the efficiency of Efficiency of conventional electricity generator units (boilers and steam generators) is real efficiencies from the last three years of operation. Ex-ante calculation of BEFelec fossil fuel has been clarified in the final PDD. Reference to justified have been provided The monitoring of the parameter MCHO has been clarified and it has been state that it will be determined based on measurements.		
It shall provide and indentified the evidences proposed (if applicable)	PDD_Barrancabermeja versión 03		
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	The evidence and clarifications provided by the PP is considered correct by the audit team. The validation report has been updated to include the information.		
Conclusion	**CAR/CL CLOSED**	To be checked during the first ☐	

Tick the appropriate checkbox	☒	periodic verification

TITLE	**Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A**		
FINDING	**Nº 16**		
Classification	**CAR** ☐	**CL** ☒	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	**The PP is requested to provide more information and clarifications in order to response the issues raised by the CDM team in the incomplete during the Information and reporting check on 24 April 2015.**		
PP RESPONSE #1	*This section shall be filled by the PP.*		
It shall address the corrective action taken in details	Technical information is provided to audit team		
It shall provide and indentified the evidences proposed (if applicable)	PPT of the PMSI – GRB (design and balance) Historical data of consumption/production of facilities not included in the project activity Criteria of limitation for capacity of 30 MW Evidence of facility is auto generation		
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	The evidence and clarifications provided by the PP is considered correct by the audit team. The validation report has been updated to include the information.		
Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐	

7 REFERENCES

Reference	Document Name	Author/Competent Authority
1	PDD Barrancabermeja Version 1, dated 17 August 2012	PROJECT PARTICIPANT
2	PDD Barrancabermeja Version 3, dated 08 January 2015	PROJECT PARTICIPANT
3	AM0014 version 04 "Natural gas-based package cogeneration"	CDM – EXECUTIVE BOARD
4	CDM Validation and Verification Standard, version 07.0	CDM – EXECUTIVE BOARD
5	Letter of Approval from Colombia, dated 28 December 2012.	COLOMBIAN DNA - MAVDT
6	Citizenship card of representative	PROJECT PARTICIPANT
7	Internal Memo GRP-085-10, dated July 2010	PROJECT PARTICIPANT
8	Cogeneration system datasheets	PROJECT PARTICIPANT
9	Historical operating data	PROJECT PARTICIPANT
10	Technical specifications of equipment and operating conditions	PROJECT PARTICIPANT
11	Equipment datasheets	PROJECT PARTICIPANT
12	Equipment engineering memos, dated 2013	PROJECT PARTICIPANT
13	Water concession. Resolution 80, February 10, 1994	INDERENA
14	Discharge Permit. Resolution 204	INDERENA
15	Emission permit. Resolution 846	INDERENA
16	ER calculation spreadsheet	PROJECT PARTICIPANT
17	Engineering study of the cogeneration system	PROJECT PARTICIPANT
18	National data taken from UPME, dated 2013	UPME
19	2006 IPCC Guidelines for National Greenhouse Gas Inventories	IPCC
20	Technical diagrams	PROJECT PARTICIPANT
21	Environmental Management Plan	PROJECT PARTICIPANT
22	Energy balance of the project activity	PROJECT PARTICIPANT
23	Resolution 084 of 1996 of the Energy and Gas Regulatory Commission	UPME
24	List of plant/systems of GRB	PROJECT PARTICIPANT

Reference	Document Name	Author/Competent Authority
25	Purchase of equipment that involves major expenditure (TG-5100)	PROJECT PARTICIPANT
26	Glossary of CDM Terms	CDM – EXECUTIVE BOARD
27	No objection letter of DNA, dated 28 December 2012.	MAVDT
28	Plan Maestro de Servicios Industriales (Industrial Services Master Plan)	PROJECT PARTICIPANT
29	Prior Consideration of the Project to the UNFCCC	PROJECT PARTICIPANT
30	Prior Consideration of the Project to the DNA	PROJECT PARTICIPANT
31	Official information provided by UPME	UPME
32	Communication by Angela Inés Cadena Moroy (UPME´s Director)	UPME
33	Reference Expansion Plan Generation-Transmission 2010-2014	UPME
34	Reference Expansion Preliminary Plan Generation-Transmission 2011-2025	UPME
35	Confirmation of the Colombian DNA	COLOMBIAN DNA – MAVDT
36	National Association of Energy Service Companies	NAESCO
37	Evaluation of the Potential Market Structure and Services and Rational Use of Energy Efficient (Feb 2002)	
38	Report "Applying the ESCO approach UNDP - ASOCAÑA – Ministry of the Environment – UPME"	UPME
39	Report Regulatory Analysis SEF Colombia	
40	Direct communication from UPME	UPME
41	Formal invitations and announcements of social event	PROJECT PARTICIPANT
42	Analysis of the comments of social meeting	PROJECT PARTICIPANT
43	Great Social Agreement for Barrancabermeja City-Region 100 years	PROJECT PARTICIPANT
44	Auto 2692 Environmental Permits, dated 2008	MAVDT
45	Decree 2820/2010 Regulation of Environmental Permits, dated 2010	MAVDT
46	Development of Cogeneration Potential in the Country (Desarrollo del potencial de cogeneración en el país)	UPME
47	Determination of Cogeneration Potential in the Tertiary Sector of the Country (Determinación del potencial de cogeneración en el sector terciario del país).	UPME
48	Determination of the Economic and Technical Potential of the Rational and Efficient Use of Energy in the Colombian Textile Industry (Determinación del potencial técnico y económico del URE en el sector textil colombiano).	UPME
49	Cogeneration in the Sugar Industry Introducing and Using the ESCO Approach (Cogeneración para el sector azucarero introduciendo y aplicando el enfoque ESCO	UPME

ANNEX 1: CDM VALIDATION PROTOCOL

VALIDATION PROTOCOL

PROJECT: "Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A."

PROJECT PARTICIPANT: Ecopetrol, S.A.

Validation Type	
☒ Validation of a Project Activity	
Validation Team: Luis Robles Olmos – Chief Validator Freddy Alejandro Garro Flores - Validator Jose Antonio Gesto Vilacoba - Validator Javier Dufour – Technical Expert	
Version of this Validation Protocol: 05	Date: 13/07/2015

CHECKLIST TOPIC / QUESTION	MoV/Ref *	COMMENTS	Draft Conclusion	Final Conclusion
A. GENERAL DESCRIPTION OF PROJECT ACTIVITY				
A.1. Approval				
A.1.1 Have all the Parties involved in the project activity provided a written Letter of Approval of the project activity? Are they valid for the project activity?	DR I	Yes, the Colombian DNA has issued the Letter of Approval (LoA) of the project activity on 28 December 2012. The audit team confirmed that the LoA is valid for the project activity.	OK	OK
A.1.2 Do the Letters of Approval confirm that: • The Party is a Party to the Kyoto Protocol • The participation is voluntary • The CDM project activity contributes to the sustainable development (host Party) • The title of the project activity is precise and coincides with the title included in the PDD	DR I	Yes, The LoA confirms that: • Colombia is a Party to the Kyoto Protocol • The participation is voluntary • The CDM project activity contributes to the sustainable development (host Party). • The title of the project activity is precise and coincides with the title included in the PDD	OK	OK
A.1.3 Has the Letter of Approval been obtained from the project participants or directly from the DNA? In case that it has been obtained from the project participant, how has its authenticity been assessed?	DR	The LoA has been provided by the PP. Validation team has confirmed the authenticity of the LoA during interview with the DNA.	OK	OK
A.1.4. If LoA contains either additional specification or conditions of the project activity, then has the request for registration been based on the documents specified in the LoA?	DR	LoA does not contain either additional specification or conditions of the project activity.	NA	NA
A.1.5. If the LoA references a specific version of the Validation Report or PDD and this version cannot be	DR	LoA does not reference a specific version of the Validation Report or PDD.	NA	NA

submitted, then has either of the following been submitted? a) a statement indicating final LoA has not been received, or b) an updated Validation Report/ PDD				
A.2. Authorization of Project participants				
A.2.1. Is the form of required for the indication of project participants correctly applied in the PDD?	DR	Yes, the form is correctly fulfilled.	OK	OK
A.2.2. Has each project participant been authorized in a letter of approval by at least one Party involved?	DR	Yes, the project participant ECOPETROL S.A. has been authorized by the DNA of Colombia.	OK	OK
A.2.3. Is all information on participants / Parties provided in consistency with details provided by further chapters of the PDD (in particular annex 1)?	DR	Yes, information on participants/Parties is correct and consistent.	OK	OK
A.2.4. Are any other project participants approved but not listed in the PDD?	DR	No, ECOPETROL S.A. is the only project participant.	OK	OK
A. 3. Modalities of communication				
A.3.1. Has the corporate and personal identity of all project participants and focal points included in the MoC statement been validated? Have the signatures and employment status been checked? This has been validated through: (a) Directly checking evidence for corporate, personal	DR	**CL 1: MOC has to be provided to the validation team.** The MOC has been provided. **CL 1 is closed.** The audit team has validated the corporate and personal identity of the PP and focal point in accordance with the Citizenship card and Internal Memo GRP-085-10 provided by the PP.	**CL 1**	OK

identity and other relevant documentation; (b) Notarized documentation; or (c) Written confirmation from the project participant or the coordinating/managing entity that submits to it the MoC statement that all corporate and personal details, including specimen signatures, are valid and accurate. In this case, the official who signed the written confirmation (if a different person that the signatory in the MoC) is duly authorized to do so.				
A.3.2. Has the MoC statement been received from the PP with whom the DOE has a contractual relationship?	DR	Yes, the MoC has been provided by ECOPETROL S.A.	**CL 1**	**OK**
A.3.3. In the case of a CDM PoA, has the MoC statement been received from the coordinating/managing entity?	DR	N/A.	N/A	N/A
A.3.4 Has the MoC statement been correctly completed and duly authorized? (a) The latest version of the form "Modalities of Communication statement" (F CDM MOC) has been used; (b) The information required as per the F-CDM-MOC, including its annex 1, is correctly completed; (c) The project participant's authorized signatories signing the F-CDM-MOC correspond to the project participant's authorized signatories included in F-CDM-	DR	Yes, the MoC statement has been correctly completed and duly authorized as per the latest version.	**CL 1**	**OK**

MOC, annex 1.				
A.4. Project Design Document				
A.4.1. Does the used project title clearly enable to identify the unique CDM project activity? Is it consistent in all section of the PDD and in all documents?	DR	Yes, the project title Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A, clearly enables to identify the unique CDM project activity. The information is consistent in the PDD.	OK	OK
A.4.2. Is there any indication concerning the version number and the date of the version?	DR	Version of the PDD for GSC is version 01, dated on 17 August 2012. Due to an Incomplete during the Information and reporting Check, the PP has updated the version of the PDD. Finally, the version and date of the final PDD is clearly indicated.	OK	OK
A.4.3. Is this consistent with the time line of the project's history?	DR	**CL 2: The PP is kindly requested to include a table with the timeline of the project, describing the main milestones.** A table with relevant dates of the project activity has been stated in the final PDD in accordance with evidence provided by the PP: • No objection letter of DNA • Approval of Phase III • Contract purchase of equipment • CDM Prior consideration sent to the UNFCCC • CDM Prior consideration sent to the DNA • Socialisation event ta Barrancabermeja • Contract with DOE • LoA issued by Colombian DNA • Email of UNFCCC regarding the publication of PDD	**CL 2**	OK

		CL is closed. The version and date of the final version of the PDD is consistent with the timeline.		
A.4.4. Is the PDD prepared in accordance with the latest template and requirements from the CDM Executive Board?	DR	The Project Design Document Form for CDM Project Activities (F-CDM-PDD) Version 04.1 has been used by the Project participant. The PDD template used by the PP for re-submission due to incomplete during the Information and reporting Check has been updated.	OK	OK
A.4.5. Has the PDD been published for Global Stakeholder Consultation (GSC) in UNFCCC website?	DR	Yes, the PDD was published on 25 January 2013.	OK	OK
A.4.6. Have there been any comments during the GSC process?	DR	No comments were received during Global Stakeholder Consultation.	OK	OK
A.4.7. Have they been correctly addressed by the validation team?	DR	N/A	NA	NA
A.5. Description of the project activity The PDD (section A.1) shall contain a clear description of the project activity that provides the reader with a clear understanding of the precise nature of the project activity.				
A.5.1. Is the description delivering a transparent overview of the project activities? Does the description of the proposed CDM project activity as contained in the PDD sufficiently cover all relevant elements? Is it accurate and does it provide the reader with a clear understanding of the nature of the proposed CDM project activity?	DR	**CL 3: The PP is kindly requested to clarify the description of the project activity. In doing so, please refer to the characteristics of the methodologies, technologies to be applied, etc.** The PP has updated the description of the project activity in accordance with the technical evidence provided. **CL 3 is closed.** The project activity consists of operating a cogeneration system, whose input is natural gas, with electricity and steam production, replacing steam and electricity generated in separate systems by means of a conventional system with steam generators and turbine generators. In cogeneration system, steam is generated from the recovery of heat coming from turbine combustion gases,	**CL 3**	OK

		using a Heat Recovery Steam Generator (HRSG).This system offers improved efficiency in the process of electric energy generation through the direct use of natural gas as fuel, instead of steam from generators. Due to an Incomplete during the Information and reporting Check, the PP has updated the description of the project activity in the final PDD. The project activity encompasses the installation of a package of cogeneration system whose input is natural gas and whose outputs are electricity and heat supplied to an industry with demand for heat and electricity. Specifically, consists of setting up a cogeneration unit (U-5100) in order to supply 30 MW of electricity generation and 150 psi steam, replacing the steam generators and turbines specified (B-901/2/3/4, B-951/2 and B-956 steam generators and TG-2401/2/3 steam turbine). Therefore, the audit team verified that the description is complete and accurate.		
A.5.2. What proofs are available for demonstrating that the project description is in compliance with the actual situation or planning?	DR	The PP has provided the technical specification of the current and new equipment: • Cogeneration system Datasheets: 1088-C-311 of "Macchi- Steam power generation" and "Barranca LM6PC SPRINT". • Historical operating data "CPO-10000305-418 historical of electricity generation of TG-2961" and "Rendimientos U900_U950" • Technical specifications of equipment and operating conditions "Efficiency of U900_U950", • Equipment datasheets "Boilers_TG Efficiency", • Equipment engineering memos "Colombian network back up_Explanation", "Balance electrico ajustado" The audit team verified that description is in accordance with technical evidence provided by the PP.	**CL 3**	OK

A.5.3. Is the information provided by these proofs consistent with the information provided by the PDD?	DR	Yes, the technical information is consistent with the PDD and ER calculation spreadsheet.	**CL 3**	OK
A.5.4. Has the validation team conducted a physical site inspection to confirm the description of the PDD? If not, justify.	DR	Yes, the validation team conducted a physical site inspection to confirm the description of the PDD during day's 5 to 7 march 2013.	OK	OK
A.5.5. If the proposed CDM project activity involves the alteration of an existing installation or process, does the project description clearly state the differences resulting from the project activity compared to the pre-project situation?	DR	**CL 4: The PP is kindly requested to clarify and clearly describe the situation pre and post operational of the installations involved in the project activity.** The pre and post operational situation of the project have been clearly described in the final PDD. **CL 4 is closed.** In addition, the audit team verified that all references of methodology AMS-I.B. have been voluntary retired of the final PDD. **CL 16: The PP is requested to provide more information and clarifications in order to response the issues raised by the CDM team in the incomplete during the Information and reporting check on 24 April 2015.** Required information has been provided of other facilities. **CL is closed.**	**CL 4** **CL 16**	OK
A.5.6. In the case of greenfield project activity, is the project design described sufficiently by means of specifications, drawings and manuals?	DR	N/A	N/A	N/A
A.5.7. Does the PDD explain how the proposed project activity reduces greenhouse gas emissions (i.e. what type of technology is being employed, what measures	DR	Due to an Incomplete during the Information and reporting Check, the PP has updated the description of the project activity in the final PDD. The project activity consists of Replacing conventional electricity	**CL 3**	OK

are undertaken as part of the project activity, etc)?		and steam generation equipment (400 psi steam by B-901/2/3/4, B-951/2, B-956 steam generators and 30 MW from TG-2401/2/3 steam turbine) with a cogeneration system, consisting in new cogeneration unit U-5100 (30 MW from TG-5100 natural gas turbine and 150 psi steam by B-5100 heat recovery steam generator).		
A.6. Technical description of the project activity The PDD (section A.2 and A.3) shall contain a clear description of the project activity that provides the reader a clear understanding of the technical aspects of its implementation.				
A.6.1. Location of the project activity				
A.6.1.1. Does the information provided on the location of the project activity allow for a clear identification of the site(s)? Are the latitude and longitude on the site indicated (decimal points)?	DR I	Yes, the project will be carried out at Gerencia Refinería Barrancabermeja, which is located in the Municipality of Barrancabermeja, Santander Department, in the Andean region, north east of Colombia (Magdalena Medio). **CL 5: The PP is requested to clarify whether the geographic coordinates of the project activity are in decimal points.** The geographic coordinates have been stated in decimal points in the final PDD. **CL 5 is closed.**	**CL 5**	OK
A.6.1.2. How is it ensured and/or demonstrated that the project proponents can implement the project at this site (ownership, licenses, contracts etc.)?	DR	Local and national Authorities have been interviewed by the validation team, and they confirmed that license, permits, etc are correct. During the on site visit, validation team could check the documentation that ensures and demonstrate that the PP can implement the project. The audit team verified the Water Concession, Discharge Permit and Emission Permit.	OK	OK
A.6.2. Category of the project activity				
A.6.2.1. Does the project qualify as a small scale CDM	DR	N/A	N/A	N/A

project activity as defined in paragraph 6 (c) of decision 3/CMP.1 on the modalities and procedures for the CDM?				
A.6.2.2. To which category(ies) does the project activity belong to? Is this category correctly identified and indicated?	DR	**CL 6: The PP is kindly requested to clarify the sectoral scopes and the categories of the project activity.** The sectoral scopes of the project activity are: • 01 Energy industries (renewable - / non-renewable sources) • 04 Manufacturing industries **CL is closed.**	**CL 6**	OK
A.6.2.3. Does proposed project activity confirm to one of the project categories defined for small scale CDM project activities?	DR	N/A	N/A	N/A
A.6.2.4. In the case of a small scale project activity, is it justified that it is not a debundled component of a larger project activity?	DR	N/A	N/A	N/A
A.6.2.5. In case of small scale project activities, is the estimate of emissions reductions increasing during the crediting period? In affirmative case, have project participants demonstrated in the CDM-SSC-PDD that the project activity characteristics are defined in a way that precludes project activities to go beyond the limits for SSC Project activities (as stipulated in paragraph 3 of	DR	N/A	N/A	N/A

the General Guidelines to SSC CDM methodologies)?				
A.6.3. Technology to be employed by the project activity				
A.6.3.1. Does the description of the technology to be applied provide sufficient and transparent input/information to evaluate its impact on the greenhouse gas balance? And, is the explanation how the project will reduce greenhouse gas emission transparent and suitable?	DR	Yes, the description of the technology is sufficient and transparent supported by technical evidence and visual inspection during the on site visit. Also, the audit team has validated that the project activity, cogeneration system, whose input is natural gas, with electricity and steam production, will reduce GHG emissions by replacing steam and electricity generated in separate systems by means of a conventional system with steam generators and turbine generators.	**CL 3**	OK
A.6.3.2. Does the project require extensive initial training and maintenance efforts in order to be carried out as scheduled during the project period? If so, does the project make provisions for meeting training and maintenance needs?	DR	Due to the characteristics of the project activity and the experience of the PP, the PP has available enough experience to operate and maintenance of the project.	OK	OK
A.6.3.3. Is a schedule available for the implementation of the project and are there any risks for delays? Is the schedule consistent with the starting date of the crediting period?	DR	A timeline of the project activity has been stated in the PDD. The schedule is consistent with the starting date of crediting period.	**CL 2**	OK
A.6.4. Estimated amount of emission reductions over the chosen crediting period				
A.6.4.1. Is the form required for the indication of projected emission reductions correctly applied?	DR	Yes, the form is correct.	OK	OK
A.6.4.2. Are the figures provided consistent with other	DR	Figures provided are consistent with other data presented in the	OK	OK

data presented in the PDD?		PDD		
A.6.5. Public funding of the project activity				
A.6.5.1. In case of public funding from Annex I Parties, is it confirmed that such funding does not result in a diversion of official development assistance?	DR	This Project will not receive public funding. N/A	N/A	N/A
A.6.5.2. Is all information provided consistent with the details given in remaining chapters of the PDD (in particular annex 2)?	DR	N/A	N/A	N/A
B. BASELINE AND MONITORING METHODOLOGY				
B.1. Title and reference of the approved baseline and monitoring methodology				
B.1.1. Are reference number, version number, and title of the approved baseline and monitoring methodology clearly indicated?	DR	The project uses approved methodology AM0014 'Natural gas-based package cogeneration' version 4 and the methodology AMS.II.B "Supply side energy efficiency improvements-generation", version 9. Both versions are valid at the time of GSC. During the validation process the project participant voluntary removed the methodology AMS.II.B "Supply side energy efficiency improvements-generation"; therefore, the final PDD only indicates the version and title of the applied AM0014.	OK	OK
B.1.2. Is the applied version the most recent one and / or is this version still applicable?	DR	Yes, the applied version is the version 4.0 and requests for registration can be submitted until 25 Jul 2015.	OK	OK
B.1.3. Does the PDD refer to the corresponding tools with their latest approved versions?	DR	Tool to calculate the Emission Factor for an electricity system", version 02.2.1 is applied. This version is correct and valid. During the validation process the option of supplying energy to the electric grid was removed; therefore, the project activity does	OK	OK

		not use this tool.		
B.1.4. Have any sources of greenhouse gas emissions been identified by the DOE ,within the project boundary following project implementation, which are expected to contribute more than 1% of the overall expected average annual emissions reductions, and which are not addressed by the applied methodology?	DR	All the GHG emission sources have been correctly identified in the final PDD.	OK	OK
B.2. Applicability of the selected methodology to the project activity				
B.2.1. Are the chosen tools considered applicable in accordance with the design of the project and the provisions of the applied methodology?	DR	Yes, in the PDD for GSC: Tool to calculate de Emission Factor for an electricity system", version 02.2.1. According to the methodology AM0014, the project developer can demonstrate additionality by selecting one of the following two options: - Option 1: apply step 2 of the latest version of "Tool for demonstration and assessment of additionality" (Investment Analysis). - Option 2: Methodology-specific process for determination of additionality included in the methodology AM0014. For this project activity has been selected option 2, therefore tool of additionality is not used. During the validation process, the emissions from electricity displaced from Public System have been removed from the PDD because all electricity in baseline scenario would have to be generated through dedicated fossil fuel power plants (TG-2401/2/3) Finally, the audit team verified that any tool is used in the final PDD.	**CAR 2**	OK

B.2.2. Is the choice of the methodology correctly justified by the PDD and is the project in conformance with all applicability criteria of the applied methodology and tools?	DR	**CL 7: The PP is kindly requested to clarify the applicability of the methodologies, including evidence to back up the assumptions made.** The PP has clarified the applicability of the applied methodology AM0014. **CL 7 is closed.** The audit team confirms that the applied methodology AM0014 is correctly justified in accordance with technical information provided by the PP.	**CL 7**	OK
B.2.3 Has been applied the specific guidance provided by the CDM Executive Board in respect to the approved methodology?	DR	Yes, it is.	**CL 7**	OK
B.2.4. Is the evidence provided to the validation team enough to prove that all applicability criteria are completely met?	DR	Yes, information of the on site visit and technical specification is considered enough by the audit team.	**CL 7**	OK
B.2.5. In the case of project activities consisting in different sites or implementation phases, are all applicability criteria met for all the sites and phases?	DR	The project activity does not consist in different sites or implementation phases.	**CL 7**	OK
Fill in the required amount of sub checklists for applicability criteria as given by the methodology applied and comment at least every line answered with "No"				
B.2.6. Criterion 1 – AM 0014 The electricity and heat requirement of the consuming facility is generated in separate systems (i.e. electricity and heat in the baseline cannot be generated in another cogeneration facility) in the absence of the project activity;	DR I	**Applicability checklist** / **Yes/No** Criterion discussed in the PDD? / Yes Evidence provided? / Yes	**CL 7** **CL 15** **CL 16**	OK

		<table><tr><td>Compliance verified?</td><td>Yes</td></tr></table> **CL 15: The PP is requested to provide more information and clarifications in order to response the issues raised by the CDM team in the incomplete during the Information and reporting check on 25 September 2014.** The heat and electricity would be generated in separate systems, i.e. as the steam and electricity would be generated by existing steam generators and steam turbines respectively. The audit team has confirmed that in the baseline scenario the steam is generated in existing steam generators, upgrade as needed (B-901/2/3/4, B-951/2 y B-956) and the electricity is generated by the existing steam turbines (TG-2401/2/3 - total-condensation turbines) in accordance with visual inspection during on site visit and technical information provided by the PP. **CL is closed.** **CL 16: The PP is requested to provide more information and clarifications in order to response the issues raised by the CDM team in the incomplete during the Information and reporting check on 24 April 2015.** Additional information of other facilities with common head or interconnected with project system has been provided. **CL is closed.**		
B.2.7. Criterion 2 - AM 0014 The cogeneration system is either third party cogeneration systems, i.e. not owned or operated by the consuming facility that receives the heat and electricity from project cogeneration systems or the cogeneration system is owned by the industrial user (henceforth referred to as self-owned) that consumes the heat and electricity from project cogeneration systems	DR I	<table><tr><th>Applicability checklist</th><th>Yes/No</th></tr><tr><td>Criterion discussed in the PDD?</td><td>Yes</td></tr><tr><td>Evidence provided?</td><td>Yes</td></tr><tr><td>Compliance verified?</td><td>Yes</td></tr></table> The cogeneration system is owned by Gerencia Refinería	**CL 7**	OK

<table>
<tr><td></td><td></td><td>Barrancabermeja which is legally owned by the PP in accordance with purchase orders and licences. The cogeneration facility is self-owned.</td><td></td><td></td></tr>
<tr><td>B.2.8. Criterion 3 – AM 0014

The cogeneration system provides all or a part of the electricity and or heat demand of the consuming facility</td><td>DR
I</td><td><table><tr><th>Applicability checklist</th><th>Yes/No</th></tr><tr><td>Criterion discussed in the PDD?</td><td>Yes</td></tr><tr><td>Evidence provided?</td><td>Yes</td></tr><tr><td>Compliance verified?</td><td>Yes</td></tr></table>The cogeneration system will provide a part of the electricity and heat demand of Gerencia Refinería Barrancabermeja owned by the PP in accordance with energy balance stated in the PDD.

CL 16: The PP is requested to provide more information and clarifications in order to response the issues raised by the CDM team in the incomplete during the Information and reporting check on 24 April 2015.

Required information of other facilities with common head or interconnected with project system has been provided.

CL is closed.</td><td>CL 7
CL 16</td><td>OK</td></tr>
<tr><td>B.2.9. Criterion 4 – AM 0014

No excess electricity is supplied to the power grid and no excess heat from the cogeneration system is provided to another user</td><td>DR
I</td><td><table><tr><th>Applicability checklist</th><th>Yes/No</th></tr><tr><td>Criterion discussed in the PDD?</td><td>Yes</td></tr><tr><td>Evidence provided?</td><td>Yes</td></tr><tr><td>Compliance verified?</td><td>Yes</td></tr></table></td><td>CL 7</td><td>OK</td></tr>
</table>

		No electricity generated by the cogeneration system will be exported to the grid in accordance with Resolution 084 of 1996 of the Energy and Gas Regulatory Commission. No heat will be provided to another user since will be entire used for the own demand.		
B.2.10. Criterion 5 – AM 0014 In the case project activity displaces electricity from fossil fuel based, dedicated power plant(s), methodology can only claim reductions from only that fraction of displaced electricity from the baseline dedicated power plant(s), for which it can be demonstrated that project activity led to reduction in generation of baseline dedicated power plant (s).	DR I	**Applicability checklist** / **Yes/No** Criterion discussed in the PDD? / Yes Evidence provided? / Yes Compliance verified? / Yes The project activity displaces all electricity from baseline dedicated power plant (TG 2401/2/3) in accordance with diagrams stated in the PDD and technical information.	**CL 7**	OK
B.2.11. Was there a request for clarification, revision or deviation made for the adopted methodology in relation to the proposed project activity? If so, were the correct procedures provided by the CDM EB followed?	DR	No clarification, revision or deviation for the applied methodology is required.	**CL 7**	OK
B.3. Description of the Project Boundary				
B.3.1 Are all the sources and gases included in the project boundary of the project activity (baseline scenario, project scenario and leakage) in accordance	DR	Yes, all the sources and gases are included in the project boundary of the project activity (baseline scenario, project scenario and leakage) in accordance with the applied methodology.	OK	OK

with the applied methodology?				
B.3.2. Are the all the sources and gases included in the project boundary of the project activity (baseline scenario, project scenario and leakage) in accordance with the applied methodology of gases correctly justified?	DR	Yes, the sources and gases included in the project boundary of the project activity (baseline scenario, project scenario and leakage) are in accordance with the applied methodology. Emission from pipeline leakage associated with transport and distribution of natural gas consumed in baseline are not included because conservative approach is applied.	**CL 7**	OK
B.3.3. Do the spatial and technological boundaries as verified on-site comply with the discussion provided by the PDD?	DR I	The spatial extent of the project boundary encompasses all the anthropogenic emissions by sources of greenhouse gases under the control of the project participants that are significantly and reasonably attributable to the project activity. The project activity encompasses the natural gas based cogeneration system where from no excess heat or electricity is exported outside the industrial facility.	OK	OK
B.3.4. In case of grid connected electricity projects, is the relevant grid correctly identified in accordance with EB guidance and the underlying methodology?	DR	Yes, The electric power system is the National Grid of Colombia. National grid has been selected, which is in accordance with the methodology. During the validation process, the emissions from electricity displaced from Public grid have been removed from the PDD because all electricity in baseline scenario would have to be generated through dedicated fossil fuel power plants.	OK	OK
B.4. Description of the baseline scenario identification				
B.4.1. Is the baseline scenario clearly described?	DR	**CAR 1: The PP is requested to justify the correct selection of the baseline as per both methodologies.** The baseline scenario is correctly described as per the applied methodology AM0014.	**CAR 1**	OK

		CAR 1 is closed. The PP has selected the baseline scenario of the project activity as "Industrial plant continues to operate with equipment replacement as needed with no change in the equipment efficiency (The frozen-efficiency scenario)".		
B.4.2. Have there been other alternative scenarios considered? Is it justified the selected scenario as the most likely one?	DR	Yes, other scenarios have been considered as per the applied methodology.	**CAR 1**	OK
B.4.3. Does the PDD follow the steps to determine the baseline scenario required by the methodology?	DR	Yes, the PP follows the steps indicated by the applied methodology.	**CAR 1**	OK
B.4.4. Has the baseline scenario been determined using conservative assumptions where possible?	DR	Yes, it is.	**CAR 1**	OK
B.4.5. Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies? (*Note: refer Annex 3 EB 22*). Are they listed in the PDD?	DR	Yes, national and/or sectoral policies are taken into account.	**CAR 1**	OK
B.4.6 If alternatives are excluded: a.- Is sufficient evidence/ justification provided to support every exclusion of alternatives? Is it reasonable? b.- Is it shown that at least one credible and feasible alternative does not face a barrier? Is this reasonable?	DR	Yes, the justification provided to exclude the alternatives is considered reasonable. Also, the audit team verified that the current equipment upgrading as need does not face any technological or other barrier.	**CAR 1**	OK
B.4.7 Is the baseline scenario determination compatible	DR	Yes, it is.	**CAR 1**	OK

with the available data and is all literature and sources clearly referenced?				
B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):				
B.5.1 Is the start date defined in accordance with the "Glossary of CDM terms"? What evidence is provided to verify that this was the official start date? Is this considered reliable and reasonable?	DR	**CL 8: The PP is kindly requested to include further information in the PDD to clarify the milestone selected as starting date. In doing so please refer to CDM Glossary.** Starting date has been clarified and it is in accordance with the CDM Glossary **CL is closed**	**CL 8**	OK
B.5.2 Is it a new project activity (start date on or after August 2008) or an existing project?	DR	The project is a new project activity, with SD after August 2008.	OK	OK
B.5.3 For a new project which does not require a new methodology and has not published its PDD for stakeholder comments prior to the start date, then: a. Have the project proponents informed the DNA and/or UNFCCC secretariat in writing? How has this notification been verified? (i.e. confirmation from the DNA or UNFCCC) b. Was the notification made within 6 months of the project activity start date? c. Does the letter/ notification indicate the precise geographic location and provide a brief description of the proposed project?	DR	a.- Yes, the PP has informed to the DNA and the UNFCCC b.- Yes, the PP has informed to the DNA and the UNFCCC within six months of the SD. Evidence have been provided and deemed correct and in line with the CDM requirements c.- precise geographic location is clearly described in the notification. d.- Notification was in January 2012, and therefore no additional communication is needed	OK	OK

d. Have the project proponents informed the DNA and/ or UNFCCC secretariat of the progress of the project activity every subsequent two years after the initial notification?				
B.5.4 For an existing project which has a start date prior to the publication of the PDD for global stakeholder comments, has the project proponent provided the following: a. Evidence of awareness of the CDM prior to the project activity start date and that the benefits of the CDM were a decisive factor in the decision to proceed with the project? (e.g. Board minutes, notes etc) Is this sufficient? b. Reliable evidence that demonstrates real actions were taken to secure CDM status in parallel with the project's implementation? (e.g. contracts with consultants for CDM/PDD/methodology services, ERPAs, correspondence with CER buyers, DOEs, DNAs or the UNFCCC). Is this sufficient?	DR	NA	NA	NA
B.5.5. Is the project additionality assessed according to the applicable methodology? Detail the Tool used to demonstrate the Additionality of the project activity.	DR	Acording to the methodology AM0014, the project developer can demonstrate additionality by selecting one of the following two options: - Option 1: apply step 2 of the latest version of "Tool for demonstration and assessment of additionality" (Investment Analysis). - Option 2: Methodology-specific process for determination of additionality included in the methodology AM0014.	**CL 9**	NA

		For this project activity has been selected option 2, therefore tool of additionality is not used **CL 9: The PP is kindly requested to provide further justification on how the additionality is demonstrated as per AMS IIB** AMS IIB has been removed CL is closed		
B.5.6. In the case of a small scale project activity, is the additionality justified according to the applicable CDM requirements specific for small scale project activities?	DR	**To be assessed once CL 9 is solved.** AMS IIB has been removed CL is closed	**CL 9**	NA
B.5.7 Have realistic and credible alternatives been identified providing comparable outputs or services?	DR	In accordance to the approved baseline methodology AM0014 version 04 the determination of baseline scenario involves consideration of alternatives to the proposed project. Alternatives have been correctly selected 1. Industrial plant continues to operate with equipment replacement as needed with no change in equipment efficiency (The frozen-efficiency scenario). 2. Industrial plant continues to operate with improved efficiency new equipment at the time of equipment replacement using a less carbon intensive fuel. 3. Industrial plant upgrades the thermal energy generating equipment and therefore increases the efficiency of boiler(s) immediately. 4. The heat and or electricity demand of the industrial plant is reduced through improvements in end-use efficiency. 5. Installation of a cogeneration system owned by the industrial plant. 6. Installation of a package cogeneration system owned by a company other than the industrial plant (The proposed project). 7. Installation of a cogeneration system by a third party.	OK	OK

B.5.8. Is the project activity without CDM included in these alternatives?	DR	As per the methodology, Tool for the demonstration and assessment of additionality, is not followed.	NA	NA
B.5.9. Is a discussion provided for all identified alternatives concerning the compliance with applicable laws and regulations?	DR	Yes, a discussion has been described for each alternative. Assumptions are deemed correct a reliable.	OK	OK
B.5.10. In case of using a FSR as a basis of the decision, is this analysis made in accordance with the EB Guidance?	DR	No national regulation rules the technical studies.	NA	NA
B.5.11. In case the PDD argues that specific laws are not enforced in the country or region: Is evidence available concerning that statement?	DR	PDD does not argue that specific laws are not enforced in the country.	NA	NA
B.5.12. In case of applying step 2 / investment analysis of the additionality tool: Is the analysis method identified appropriately?	DR	NA	NA	NA
B.5.13. In case of Option I (simple cost analysis): Is it demonstrated that the activity produces no economic benefits other than CDM income? a. Are the assumptions for all alternatives compared consistent (including discount rates if applicable)?	DR	NA	NA	NA
B.5.14. In case of Option II (investment comparison analysis): Is the most suitable financial indicator clearly	DR	NA	NA	NA

identified (IRR, NPV, cost benefit ratio, or (levelized) unit cost)? a. Are the assumptions for all alternatives compared consistent (including discount rates if applicable)?				
B.5.15. In case of Option III (benchmark analysis): Is the most suitable financial indicator clearly identified (IRR, NPV, cost benefit ratio, or (levelized) unit cost)? a. If an IRR indicator is used, is the choice of benchmark appropriate to the type of IRR calculated? b. Is the choice of benchmark or discount rate justified with supporting evidence for its appropriateness?	DR	NA	NA	NA
B.5.16 If risk premiums are applied in the development of the benchmark, are they reasonable and justified?	DR	NA	NA	NA
B.5.17 Do the project participants justify the period of assessment in the context of the underlying project activity?	DR	NA	NA	NA
B.5.18 Regarding the assessment: a. Complete the following time periods (years): - Period of assessment: - Crediting period: -Technical lifetime of the project activity:	DR	NA	NA	NA

b. Are these periods consistent with paragraph 3 of the "Guidelines on the assessment of investment analysis (version 05)". c. Is the period of assessment appropriate?				
B.5.19 Is any residual value of the project activity assets included in the analysis? Are residual value calculations reasonable and justified and consistent with local accounting rules or international best practice?	DR	NA	NA	NA
B.5.20 Are depreciation and other non-cash items related to the project activity deducted from net profits used for calculating the financial indicator (e.g. IRR, NPV)?	DR	NA	NA	NA
B.5.21 Is the treatment of taxation consistent with the chosen benchmark? (i.e. taxation should only be treated as an expense in the IRR/NPV calculation if the chosen benchmark is intended for post-tax calculations?	DR	NA	NA	NA
B.5.22 Recommenced project: If the implementation of the project ceased and then recommenced due to consideration of the CDM, then: a. Are input values valid and applicable at the time of making the decision to recommence the project? b. Are capital costs incurred prior to the revised project	DR	NA	NA	NA

activity start date input as the recoverable value of the assets (limited to the potential reuse/ resale of tangible assets)? c. How has the fair market value of the capital expenditures been calculated and validated? (e.g. by chartered specialists). Is this fair market value reasonable and justified?. d.- Is the book value as well as the expectation of the potential profit or loss included in the fair value calculation?				
B.5.23 Has the project participant supplied unprotected and traceable spreadsheet versions of all investment analysis?	DR	NA	NA	NA
B.5.24 From the investment analysis provided, is it possible to reproduce the results?	DR	NA	NA	NA
B.5.25 Costs of financing expenditures (i.e. loan repayments and interest) should only be included in the cashflow as costs if an equity IRR is used, not if a project IRR is used. Are interest payments taken into account in the calculation of tax, if the benchmark is for after-tax comparison?	DR	NA	NA	NA

B.5.26 If an Equity IRR has been used, is the debt portion of the investment cost included as a cash outflow? (i.e. as well as interest costs and principle repayments – double counting)	DR	NA	NA	NA
B.5.27 Sensitivity analysis: a. Are all variable and critical costs and revenues in the analysis included in the sensitivity analysis? b. Is the assessed range of variations reasonable in light of the reliability of the estimated input values and the likely range? c. Is the sensitivity analysis possible to reproduce?	DR	NA	NA	NA
B.5.28 Are **input values** used in all the investment analysis valid and applicable at the time of the investment decision taken by the project participant? Is the time of investment decision appropriately justified by evidences?	DR	NA	NA	NA
B5.29 Does the PDD present the investment analysis in a transparent manner and provide all the relevant assumptions (preferably in the CDM-PDD form, or in separate appendices to the CDM-PDD)?	DR	NA	NA	NA

B.5.30 Have the listed input values been consistently applied in all calculations?	DR	NA	NA	NA
B.5.31 Are all references made in the investment analysis correctly referenced/ sourced? Have these sources been verified?	DR	NA	NA	NA
B.5.32 Have financial calculations been verified by: assessing all parameters and assumptions against the available evidence and expertise; crosschecking the parameters against 3rd party or publicly available sources; reviewing feasibility reports, public announcements and annual financial reports; assessing the correctness of computations and the sensitivity analysis?	DR	NA	NA	NA
B.5.33 Have values from a feasibility study report (FSR) approved by national authorities been used? If so: a. Has the FSR been the basis of the decision to proceed with the investment in the project? How has this been verified? b. Are the values used in the PDD and associated annexes valid and consistent with the FSR? c. At the time of the investment decision, are the input values from the FSR valid and applicable (based on	DR	NA	NA	NA

specific local and sectoral expertise and knowledge)?				
B.5.34. In case of applying step 3 (barrier analysis) of the additionality tool: Is a complete list of barriers developed that prevent the different alternatives to occur?	DR	Barrier Analysis as per the methodology is applied. Specific test have been applied in order to demonstrate the additionality. Technological barrier: Institutional Barrier **CL 10: Expression "*This implies that the total thermal capacity of the country amounts to 14 284 MW. None of the projects listed is thermal. As a consequence, the thermal capacity has not been modified and still is 4467 MW.*" Has to be clarified.** **The PP is kindly requested to provide further information to back up that ESCOs conducted are fewer than 20 recent installations in the country or a number of installations representing 5% of total installed thermal generating capacity in the country.** **The PP is requested to provide evidence to back the expression *Ecopetrol has only a cogeneration system (TG-2961), which is the system repowered in the project activity, so Ecopetrol has no experience in the operation of these kind of systems. In addition, Ecopetrol has two cogeneration systems in operation in the department of Meta, but they do not exploit the residual energy of the exhaust gases from the turbine, so really they don't function as cogeneration systems.* In doing so, please refer to applicability conditions of the methodology.** Barrier analysis has been clarified and back by third parties evidences CL is closed	**CL 10**	Ok
B.5.35. Do any such identified barriers have a clear and direct impact on the financial returns of the project activity? (these are not barriers and should be assessed in the investment analysis)	DR	NA	NA	NA

B.5.36 Are the identified barriers real and substantiated by independent sources of data such as relevant national legislation, surveys of local conditions and national or international statistics?	DR	**To be assessed once CL 10 is solved** Barrier analysis has been clarified and back by third parties evidences CL is closed	**CL 10**	OK
B.5.37. Is it clearly explained how approval of the project in the CDM would enable the proposed project activity to surmount the barrier? Is the rationale reasonable and justified with evidence?	DR	NA	NA	NA
B.5.38. Does the review of relevant background information on the nature of the company(ies) and entitiy(ies) involved in the financing and implementation of the project sufficiently justify that the barriers related to the lack of access to capital, technologies and skilled labour are real?	DR	NA	NA	NA
B.5.39 Has common practice analysis been undertaken? Mention the tool or guidelines applied for this analysis.	DR	As per the applicable version of the VVS, for proposed large-scale project activities, unless the proposed project type is first-of-its-kind as determined in accordance with the relevant guidelines, the DOE shall assess whether the project participants have conducted a common practice analysis. In the VVS the common practice analysis is described as a test to complement the investment analysis (step 2 of the additionality tool) or barrier analysis (step 3 of the additionality tool) to confirm that the project activity is not widely observed and commonly carried out in the region. Since the Tool is not applied in the PDD, common practice is not mandatory. Nevertheless it has been proved by the PP that the cogeneration in terms of number of installations and installed capacity is not so relevant in the energy sector of Colombia, and therefore it can be	OK	OK

		concluded that the cogeneration is not widely observed n the host country.		
B.5.40 Is the geographical and temporal scope of the common practice analysis appropriate for the assessment related to the project activity's technology or industry type? Which is the relevant geographical area assessed for the common practice analysis?	DR	NA	NA	NA
B.5.41 Have all similar projects regarding the same technology and industrial sector been included in the common practice analysis? Which are these projects? What sources of information have been used to assess the existence of similar projects? (official sources, local and industry expertise). If some projects have been excluded as non comparable or not similar, is the exclusion reasonable and justified?	DR	NA	NA	NA
B.5.42 Have similar and operational projects other than CDM project activities been undertaken in the region?	DR	NA	NA	NA
B.5.43 Are these widely observed and commonly carried out? If so:	DR	NA	NA	NA

a. How have the essential distinctions with the proposed CDM project activity been assessed? b. Are such distinctions justified with sufficient evidence? c. If inaccessibility of data is the reason why some projects have not been included in the analysis, is justification of this claim provided?				
B.5.44 Overall, is the proposed CDM project activity considered common practice?	DR	NA	NA	NA
B.5.45. Is it demonstrated/justified that the project activity is not a likely baseline scenario?	DR	**To be assessed once CL 10 is solved.**	**CL 10**	
B.6. Emissions reductions				
*B.*6.1. *Explanation of methodological choices*				
B.6.1.1. Is it explained how the procedures provided in the methodology are applied by the proposed project activity?	DR	**CAR 2: The PP is requested to provide an adequate justification of the steps, equations and parameters applied to calculate the emissions reductions in accordance with the applied methodology and tool. In particular, the equations of step e) of baseline emission shall be revised based on the choice of the baseline scenario and other evidence provided.** The audit team verified that the calculation procedure stated in the final PDD is correctly applied by the project participant as per the applied methodology. **CAR 2 is closed.**	**CAR 2**	OK

B.6.1.2. Is every selection of options offered by the methodology correctly justified and is this justification in line with the situation verified on-site?	DR	Yes, all options selected by the PP is justified in the final PDD and the audit team verified that is in accordance with the information review during the on site visit.	**CAR 2**	OK
B.6.1.3. Are the formulae required for the determination of emissions reductions correctly presented and used? *(Open excel, traceability of data, etc)*	DR	**CAR 3: The PP is requested to clearly indicate all data sources and assumptions used in the calculation stated in section B.6.2 of the PDD and the calculation spreadsheet. In addition, all evidence that justified the parameters shall be provided to the DOE.** All data sources and assumptions are correctly presented and used in the final PDD and ER calculation spreadsheet. **CAR 3 is closed.**	**CAR 3**	OK
B.6.1.4 Are all the data and assumptions listed in the PDD? Are they appropriate and do calculations result in a conservative estimate of emission reductions?	DR	All data and assumptions listed in the PDD and the calculation spreadsheet have been clearly justified. The audit team confirms that the calculation of emission reductions is conservative.	**CAR 2** **CAR 3**	OK
B.6.2. Data and parameters that are available at validation				
B.6.2.1. Is the list of parameters presented in chapter B.6.2 considered to be complete with regard to the requirements of the applied methodology? Is all the information required for each parameter included?	DR	Yes, for each parameter all information required by the applied methodology is stated in the final PDD.	**CAR 2**	OK
B.6.2.2. Are all the data derived from official data sources or replicable records and have they been correctly quoted?	DR	Yes, the audit team verified that all data derived from national data and technical information.	**CAR 2** **CAR 3**	OK
B.6.2.3. For each parameter: **CHOR**	DR	a. Yes	**CAR 2**	OK

a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described? i. Purpose of data indicated?		b. Yes c. Yes d. Yes, the value is taken from the specification of the cogeneration equipment e. Yes f. Yes, the audit team reviewed the Datasheet 1088-C-311 of "Macchi- Steam power generation" g. Yes h. Yes i. Yes	**CAR 3**	
B.6.2.4. For each parameter: e_b a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described? i. Purpose of data indicated?	DR	a. Yes b. Yes c. Yes d. Yes, default value proposed by AM0014 Methodology e. Yes f. Yes, it was verified g. Yes h. Yes i. Yes	**CAR 2** **CAR 3**	OK

B.6.2.5. For each parameter: **AOH** a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described? i. Purpose of data indicated?	DR	a. Yes b. Yes c. Yes d. Yes, it was determined from the engineering study of the proposed cogeneration system e. Yes f. Yes, it was verified g. Yes h. Yes i. Yes	**CAR 2** **CAR 3**	OK
B.6.2.6. For each parameter: **EF** a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified?	DR	a. Yes b. Yes c. Yes d. Yes, national data taken from UPME (Mining and Energy Planning Unit) e. Yes, the value is conservative f. Yes, it were g. Yes h. Yes i. Yes	**CAR 2** **CAR 3**	OK

h. Measurement method correctly described? i. Purpose of data indicated?				
B.6.2.7. For each parameter: **MEF** a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described? i. Purpose of data indicated?	DR	a. Yes b. Yes c. Yes d. Yes, the date is taken from 2006 IPCC e. Yes f. Yes, the value is correct g. Yes h. Yes i. Yes	**CAR 2** **CAR 3**	OK
B.6.2.8. For each parameter: **GWP (CH4)** a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided?	DR	a. Yes b. Yes c. Yes d. Yes, data is taken from IV Assessment Report of IPCC e. Yes f. Yes g. Yes h. Yes i. Yes	**CAR 2** **CAR 3**	OK

f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described? i. Purpose of data indicated?				
B.6.2.9. For each parameter: **NEF** a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described? i. Purpose of data indicated?	DR	a. Yes b. Yes c. Yes d. Yes, the date is taken from 2006 IPCC e. Yes f. Yes, the value is correct g. Yes h. Yes i. Yes	**CAR 2** **CAR 3**	OK
B.6.2.10. For each parameter: **GWP (N_2O)** a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description?	DR	a. Yes b. Yes c. Yes d. Yes, data is taken from IV Assessment Report of IPCC e. Yes f. Yes	**CAR 2** **CAR 3**	OK

d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described? i. Purpose of data indicated?		g. Yes h. Yes i. Yes		
B.6.2.11. For each parameter: **MLR** a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described? i. Purpose of data indicated?	DR	j. Yes k. Yes l. Yes m. Yes, the date is taken from 2006 IPCC n. Yes o. Yes, the value is correct p. Yes q. Yes r. Yes	**CAR 2** **CAR 3**	OK
B.6.2.12. For each parameter: **CPO** a. Title in line with Methodology?	DR	a. Yes b. Yes c. Yes d. Yes, data taken from the specifications of the new	**CAR 2** **CAR 3**	OK

b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described? i. Purpose of data indicated?		cogeneration equipment and from historical operation data e. Yes, 30 MW will be obtained by the limitation in 5 MW of the design capacity of 35 MW; therefore, only emission reduction will be claimed by the capacity of 30 MW. f. Yes, the audit team verified the Cogeneration system Datasheet "Barranca LM6PC SPRINT" g. Yes h. Yes i. Yes		
B.6.2.13. For each parameter: **Eficiency of conventional electricity generator units** a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described? i. Purpose of data indicated?	DR	a. Yes b. Yes c. Yes d. Yes, data taken from engineering information based on technical specifications of equipment and operating conditions e. Yes, the data is conservative since the efficiency data is taken from last available years of operations. f. Yes, the audit team verified the technical information "Boilers_TG efficiency" and "Rendimientos U900_U950" g. Yes h. Yes i. Yes	**CAR 2** **CAR 3** **CL 15**	OK

B.6.2.14. For each parameter: **$BEF_{elec\ fossil}$fuel** a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described? i. Purpose of data indicated?	DR	a. Yes b. Yes c. Yes d. Yes, calculated as per applied methodology and technical information e. Yes, based on $PG_{i,n}$ "Power generated by sources i (in MWh), by relevant power sources n, sources delivering electricity to the consuming facility" and $SEF_{i,n}$ "Specific CO2 emissions factor of the fossil fuel power generation sources n (in terms of kg/ MWh), sources delivering electricity to the consuming facility" f. Yes, the audit team verified the value and confirms that is correct. As the baseline is the continuation of use of same equipment with a refurbishment and operation at nominal capacity but with historical efficiency in accordance with the frozen-efficiency scenario of the applied methodology. g. Yes h. Yes i. Yes	**CAR 2** **CAR 3** **CL 15**	OK
B.6.2.15. Will the data and parameters result in a conservative estimate of emissions reductions?	DR	Yes, the estimation of the emission reductions is conservative.	**CAR 2**	OK
B.6.3 Calculation of GHG Emission Reductions – Baseline Emissions *It is assessed whether the baseline emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.*				
B.6.3.1 Are the calculations documented according to the approved methodology and in a complete and	DR	Yes, it is considered that each one of the parameters detailed in the PDD is correctly described including all provisions stated in	**CAR 2** **CAR 3**	OK

transparent manner?		the applied methodology and in accordance with the ER calculation spreadsheet. The validation team has checked the provided information in the final ER calculation spreadsheet and it is considered correct and appropriate. Inputs, assumptions, outputs and evidence are considered complete and transparent.		
B.6.3.2. Have conservative assumptions been used when calculating the baseline emissions?	DR	Yes, all of the assumptions made are considered as in accordance with the requirements stated in the AM0014, so they are conservative.	**CAR 2** **CAR 3**	OK
B.6.3.3 Are uncertainties in the baseline emission estimates properly addressed?	DR	The validation team has checked that uncertainties have been properly addressed.	**CAR 2** **CAR 3**	OK
B.6.3.4. Is additional background information on baseline data provided in Appendix 4 of the PDD? Is this information consistent with data presented by other sections of the PDD?	DR	No.	**CAR 2** **CAR 3**	OK
B.6.4 Calculation of GHG Emission Reductions – Project Emissions *It is assessed whether the project emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.*				
B.6.4.1 Are the calculations documented according to the approved methodology and in a complete and transparent manner?	DR	Yes, all data and sources are clearly documented in the final PDD and ER calculation spreadsheet.	**CAR 2**	OK
B.6.4.2. Have conservative assumptions been used when	DR	Yes, all of the assumptions made are considered as in accordance	**CAR 2**	OK

calculating the project emissions?		with the requirements stated in the AM0014, so they are conservative.		
B.6.4.3 Are uncertainties in the project emission estimates properly addressed?	DR	The validation team has checked that uncertainties have been properly addressed.	**CAR 2**	OK
*B.*6.5. *Calculation of GHG Emission Reductions – Leakage* *It is assessed whether leakage emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.*				
B.6.5.1 Are the leakage calculations documented according to the approved methodology and in a complete and transparent manner?	DR	Not applicable since leakage emissions are not considered.	**CL 4**	OK
B.6.5.2. Have conservative assumptions been used when calculating the leakage emissions?	DR	Not applicable since leakage emissions are not considered.	**CL 4**	OK
B.6.5.3. Are uncertainties in the leakage emission estimates properly addressed?	DR	Not applicable since leakage emissions are not considered.	**CL 4**	OK
*B.*6.6. *Ex-ante calculation of emission reductions*				
B.6.6.1. Are the GHG calculations documented in a complete and transparent manner? Are all the calculations correct?	DR	Yes, the calculations have been reproduced by the validation team, and the results obtained are the same as those estimated by the PP.	**CAR 2** **CAR 3**	OK
B.6.6.2. Is the data provided in this section consistent	DR	Yes, the data is consistent with data presented in other chapters.	**CAR 2** **CAR 3**	OK

with data as presented in other chapters of the PDD?				
B.6.7. Summary of the ex-ante estimation of emission reductions				
B.6.7.1. Will the project result in fewer GHG emissions than the baseline scenario?	DR	Yes, the project will result in fewer GHG emissions than the baseline scenario through the production of clean energy. It is demonstrated in the Section B.6 of the PDD.	**CAR 2** **CAR 3**	OK
B.6.7.2. Are the emissions reductions projected in line with the envisioned time schedule for the project' implementation and the indicated crediting period?	DR	The emission reductions projected are in line with the starting date of the crediting period.	**CAR 2** **CAR 3**	OK
B.7. Application of the monitoring methodology and description of the monitoring plan				
B.7.1. Description of the monitoring plan				
B.7.1.1 Is the monitoring plan documented according to the approved methodology and relevant tools and in a complete and transparent manner?	DR	**CAR 4: The PP is requested to correct the monitoring plan stated in the PDD in accordance with the applied methodology and other relevant tools. Please revise the following issues:** • **The list of parameters required by the applied methodology is not complete. The "electricity generated by baseline dedicated power plant" is not included.** • **Specification of the calibration frequency for all the measuring equipments is not specified in accordance with the CDM-Project Standard.** • **A diagram indicating the emission sources and GHGs included in the project boundary and the data and parameters to be monitored shall be provided.**	**CAR 4**	OK

		The audit team verified that the monitoring plan is documented in the PDD in accordance with the applied methodology and EB Guidance. **CAR 4 is closed.**		
B.7.1.2. Does the monitoring methodology provide a consistent approach in the context of all parameters to be monitored and further information provided in the PDD?	DR	Yes, the monitoring plan provides all relevant data necessary for the calculation of emission reductions.	**CAR 4**	OK
B.7.1.3. Does the monitoring plan provide a clear description of the organization structure involved in monitoring activities and their responsibilities?	DR	Yes, the responsible for monitoring will be the area of instrumentation.	OK	OK
B.7.1.4. If applicable: Does appendix 5 provide useful information enabling a better understanding of the envisioned monitoring provisions?	DR	Yes, Appendix 5 indicates archiving procedures.	OK	OK
B.7.1.5. Is the registration, monitoring, measurement and reporting procedure defined?	DR	Yes, the registration, monitoring, measurement and reporting are defined.	**CAR 4**	OK
B.7.2 Compliance of the monitoring plan with the approved methodology				
B.7.2.1 Is the list of parameters considered to be complete with regard to the requirements of the applied methodology? Are all of them clearly described in the monitoring plan and in accordance with the methodology and tools?	DR	Yes, the list of monitored parameters is complete. The parameters MEC_{GN}, MCEO and MCHO are clearly described in the monitoring plan in accordance with the applied methodology. Also, electricity generated by dedicated power plant(s) is not necessary to be monitored due to dedicated power plant(s) (TG 2401/2/3) will not continue to operate along with the project activity cogeneration systems as stated in the final PDD.	**CAR 4**	OK

B.7.2.2. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for estimation or measuring the emission reductions within the project boundary during the crediting period?	DR	Yes, the monitoring plan provides all relevant data necessary for the calculation of emission reductions.	**CAR 4**	OK
B.7.2.3. For each parameter, is the: **MEC_{NG}** a. Title in line with methodology? b. Data unit correctly expressed? c. Parameter appropriately described? d. Source clearly referenced? e. Correct value provided for the purpose of PDD estimations? f. Has this value been verified? g. Measurement methods correctly described and in line with the methodology/tools? h. Correct reference to standards (i.e. for calibration and maintenance)? i. Indication of accuracy provided? j. QA/QC procedures appropriate and described? k. Purpose of data indicated?	DR	The information of this parameter is considered correct in accordance with the technical evidence Datasheet 1088-C-311 of "Macchi- Steam power generation" provided by the project participant. Also, the audit team confirms that the monitoring plan of this parameter stated in the final PDD is in line with the requirements of the applied methodology.	**CAR 4**	OK

B.7.2.3. For each parameter, is the: **MCEO** a. Title in line with methodology? b. Data unit correctly expressed? c. Parameter appropriately described? d. Source clearly referenced? e. Correct value provided for the purpose of PDD estimations? f. Has this value been verified? g. Measurement methods correctly described and in line with the methodology/tools? h. Correct reference to standards (i.e. for calibration and maintenance)? i. Indication of accuracy provided? j. QA/QC procedures appropriate and described? k. Purpose of data indicated?	DR	The information of this parameter is considered correct in accordance with the engineering study and technical information provided by the project participant. Also, the audit team confirms that the monitoring plan of this parameter stated in the final PDD is in line with the requirements of the applied methodology.	**CAR 4**	OK
B.7.2.3. For each parameter, is the: **MCHO** a. Title in line with methodology? b. Data unit correctly expressed? c. Parameter appropriately described?	DR	The information of this parameter is considered correct in accordance with the technical information of the cogeneration system and refinery gas provided by the project participant. Also, the audit team confirms that the monitoring plan of this parameter stated in the final PDD is in line with the requirements of the applied methodology. The parameter MCHO is determined based on "total steam cogeneration output" and "steam cogeneration output from	**CAR 4** **CL 15**	OK

d. Source clearly referenced? e. Correct value provided for the purpose of PDD estimations? f. Has this value been verified? g. Measurement methods correctly described and in line with the methodology/tools? h. Correct reference to standards (i.e. for calibration and maintenance)? i. Indication of accuracy provided? j. QA/QC procedures appropriate and described? k. Purpose of data indicated?		refinery gas burning"; where these parameters are measured in the same frequency as MCHO is required and the measurement equipment will be calibrated. Also, a monitoring system diagram has been included in the final PDD.		
B.7.3 Implementation of the Monitoring Plan				
B.7.3.1 Do the means of monitoring of each of the parameters included in the plan comply with the requirements of the methodology?	DR	Means of monitoring described in the final PDD are in compliance with the applicable methodology.	**CAR 4**	OK
B.7.3.2. Is the measurement equipment described and deemed appropriate?	DR	Yes, the measurement equipment will only measure the volume of natural gas, cogeneration electricity and heat of the project activity.	**CAR 4**	OK
B.7.3.3. Are procedures identified for maintenance of monitoring equipment and installations? Are provisions regarding the calibration intervals included in the	DR	Yes, the measurement equipment will be calibrated either in accordance with the local/national standards, or as per the manufacturer's specifications. If local/national standards or the manufacturer's specifications are not available, international standards will be used.	**CAR 4**	OK

monitoring plan?				
B.7.3.4. Is the measurement accuracy addressed and deemed appropriate? Are procedures in place on how to deal with erroneous measurements or lack of data?	DR	Yes, accuracy and emergency procedures are considered appropriate.	**CAR 4**	OK
B.7.3.5. Is the monitoring Plan sufficient to ensure the verification of a proper implementation of the monitoring plan?	DR	Yes. The monitoring plan is sufficient to ensure proper implementation of the monitoring. All data gathered in the monitoring plan of the PDD provides sufficient information about the estimation or measurement of emission reductions. The uncertainties and possible data adjustments are considered in the Monitoring Plan in order to avoid them.	**CAR 4**	OK
C. DURATION OF THE PROJECT ACTIVITY / CREDITING PERIOD				
C.1. Duration of the project activity				
C.1.1. Are the project's starting date and operational lifetime clearly defined and reasonable?	DR	Yes, the starting date of the project activity has been stated in the final PDD on 18 November 2011. Also, the operational lifetime has been indicated as 20 years.	**CL 8**	OK
C.2. Choice of the crediting period and related information				
C.2.1. Is the assumed crediting period clearly defined and reasonable (renewable crediting period of max 7 years with potential for 2 renewals or fixed crediting period of max. 10 years)? And, is the starting date of the crediting period corrected considered?	DR	Yes, the assumed crediting period is a renewable crediting period of seven years which starts on 01 April 2015 when is expected that it will enter into operation.	**CL 8**	OK

D. ENVIRONMENTAL IMPACTS				
D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts				
D.1.1. Has the analysis of the environmental impacts of the project activity been sufficiently described in the PDD?	DR	A list of permits has been listed in the PDD. **CAR 5: The PP is requested to clarify the inconsistencies between the permits stated in the PDD and the evidence provided. In particular, dates and the Sanitary Authorization are not consistent.** Dates of approval are according to the permits provided. • Water concession • Discharge permit • Atmospheric emission permit **CAR 5 is closed.** An analysis of the environmental impacts of the project activity has been carried out by the "Environmental Management Plan". **CL 11: The PP is requested to provide the Environmental Management Plan. In addition, a summary of the analysis shall be stated in the PDD.** The audit team verified that a summary of environmental impacts has been indicated in the final PDD as per Environmental Management Plan. **CL 11 is closed.**	**CAR 5** **CL 11**	OK

D.1.2. Are there any Host Party requirements for an Environmental Impact Assessment (EIA), and if so, has an EIA been approved?	DR	**CL 12: The PP is requested to provide evidence that neither Environmental Impact Assessment (EIA) nor its approval is required.** No, the project activity does not require an EIA or its approval. **CL is closed.**	**CL 12**	OK
D.1.3. Will the project create any adverse environmental effects? Has any environmental impact identified as significant?	DR	Significant environmental impacts have not been identified.	**CL 12**	OK
D.1.4. Are transboundary environmental impacts identified in the analysis?	DR	Transboundary impacts are not identified in the PDD.	**CL 11**	OK
D.1.5. Does the project comply with any other environmental legislation in the host country?	DR	Yes, it is.	**CL 12**	OK
D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party.				
D.2.1. Have the identified environmental impacts been sufficiently addressed in the PDD?	DR	Yes, environmental impacts identified during the operation of the project activity have been resumed in the PDD in accordance with the EIA.	**CL 11**	OK
E. STAKEHOLDERS' COMMENTS				
E.1. Brief description how comments by local stakeholders have been invited and compiled				
E.1.1. Have relevant local stakeholders been consulted prior to the publication of the PDD? Is the exact date of the consultation process included in the PDD?	DR	Yes, the PDD clearly states that a local stakeholder consultation was carried out on 19 June 2012 prior the publication of the PDD on 25 January 2013 in accordance with evidence provided.	OK	OK

E.1.2. Have appropriate media been used to invite comments by local stakeholders?	DR	Local stakeholders were invites by formal invitation. Announcements on radio and local press were also used. **CAR 6: The PP is requested to clarify an inconsistency in the date of the announcement in the local press (Qhubo newspaper). In addition, all formal invitations to organizations/entities shall be provided.** Appropriate media has been used. **CAR is closed.**	**CAR 6**	OK
E.1.3. If a stakeholder consultation process is required by regulations/laws in the host country, has the stakeholder consultation process been carried out in accordance with such regulations/laws?	DR	Yes, the PP has carried out the stakeholder consultation required by the host country in order to obtain the LoA.	OK	OK
E.1.4. Is the undertaken stakeholder process that was carried out described in a complete and transparent manner?	DR	Yes, it is.	**CAR 6**	OK
E.2. Summary of the comments received				
E.2.1. Is a summary of the stakeholder comments received provided?	DR	A summary of the comments has been stated in the PDD. **CL 13: The PP is requested to provide the analysis of the surveys indicated in the PDD.** The analysis of the surveys has been stated in the final PDD. **CL 13 is closed.**	**CL 13**	OK
E.3. Report on how due account was taken of any comments received				
E.3.1. Has due account been taken of any stakeholder	DR	Yes, a "Great Social Agreement for Barrancabermeja City-Region 100 years" has been elaborated.	**CL 14**	OK

comments received?		**CL 14: The PP is requested to provide the complete "Corporate Social Responsibility Procedures for Activities Outsourced by Ecopetrol S.A.", which contains all the points stated in section E.3 of the PDD.** The Social Agreement described the obligations of the PP such as employment and investment in social issues. **CL 14 is closed.**		
E.4. Sampling				
E.4.1. Has sampling been applied as part of the validation activities? Explain where it has been applied.	DR	N/A	N/A	N/A
E.4.2. Has the standard for sampling currently in force been applied?	DR	N/A	N/A	N/A

ANNEX 2: CERTIFICATES OF QUALIFICATION

CERTIFICATE OF QUALIFICATION

Subject: Validation and Technical Review Team for "Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A.

Madrid, 2nd November 2014

Hereby I confirm the following records of qualification, according with AENOR internal instruction "Validation, Verification and Certification of Clean Development Mechanism (CDM) project activities" IE-DTC-039, and in relation with the validation process of the above mentioned project activity:

Name: Luis Robles Olmos

CDM Chief Validator: Yes

CDM Validator: N.A.

CDM Chief Verifier: N.A.

CDM Verifier: N.A.

External Technical Expert: N.A.

Technical areas related with the project activity:

TA 1.1. Thermal energy generation from fossil fuels and biomass including thermal electricity from solar (COMPLEX)

Mª Carmen Gonzalez Galan
Quality Manager

CERTIFICATE OF QUALIFICATION

Subject: Validation and Technical Review Team for "Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A.

Madrid, 2nd November 2014

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Name: Jose Antonio Gesto Vilacoba

CDM Chief Validator: N.A

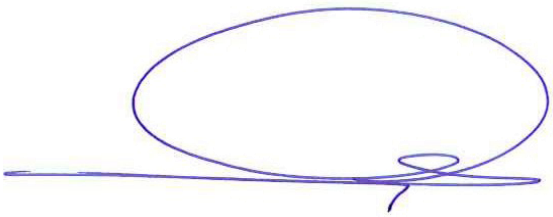
CDM Validator: Yes

CDM Chief Verifier: N.A.

CDM Verifier: N.A.

External Technical Expert: N.A.

Technical areas related with the project activity:



Luis Robles Olmos
Climate Change Manager

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Name: Freddy Garro Flores

CDM Chief Validator: N.A

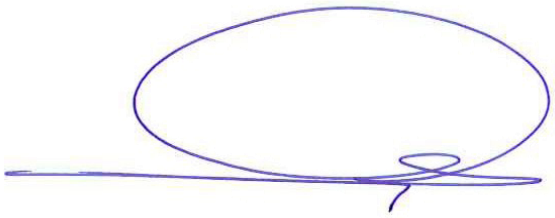
CDM Validator: Yes

CDM Chief Verifier: N.A.

CDM Verifier: N.A.

External Technical Expert: N.A.

Technical areas related with the project activity:



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Name: Javier Dufour

CDM Chief Validator: N.A

CDM Validator: N.A.

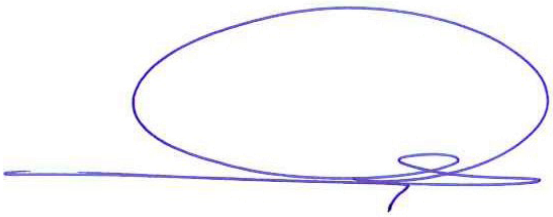
CDM Chief Verifier: N.A.

CDM Verifier: N.A.

External Technical Expert: Yes

Technical areas related with the project activity:

TA 4.4. Refinery (COMPLEX)



Luis Robles Olmos
Climate Change Manager

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Subject: Validation and Technical Review Team for "Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A.

Madrid, 2nd November 2014

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Name: Marcelino Pellitero Martinez

CDM Chief Validator: Yes

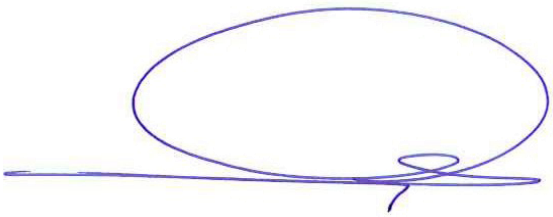
CDM Validator: N.A.

CDM Chief Verifier: N.A.

CDM Verifier: N.A.

External Technical Expert: Yes

Technical areas related with the project activity:



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Climate Change Manager

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Name: Ma Carmen Gonzalez Galán

CDM Chief Validator: Yes

CDM Validator: N.A.

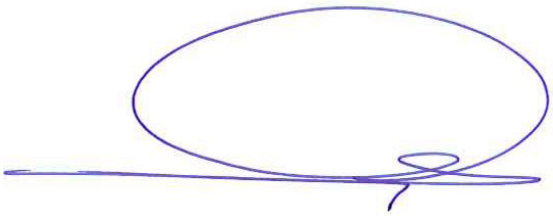
CDM Chief Verifier: N.A.

CDM Verifier: N.A.

External Technical Expert: Yes

Technical areas related with the project activity:

TA 1.1. Thermal energy generation from fossil fuels and biomass including thermal electricity from solar (COMPLEX)



Luis Robles Olmos
Climate Change Manager

CERTIFICATE OF QUALIFICATION

Subject: Validation and Technical Review Team for "Electricity and heat Generating through a cogeneration system in Gerencia Refinería Barrancabermeja (GRB), Ecopetrol, S.A.

Madrid, 2nd November 2014

Hereby I confirm the following records of qualification, according with AENOR internal instruction "Validation, Verification and Certification of Clean Development Mechanism (CDM) project activities" IE-DTC-039, and in relation with the validation process of the above mentioned project activity:

Name: Raul Sanz

CDM Chief Validator: N.A

CDM Validator: N.A.

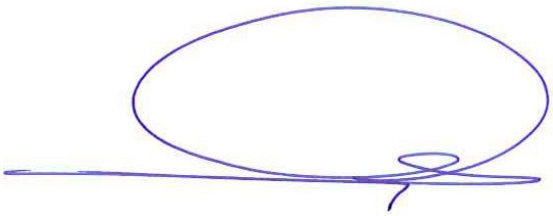
CDM Chief Verifier: N.A.

CDM Verifier: N.A.

External Technical Expert: Yes

Technical areas related with the project activity:

TA 4.4. Refinery (COMPLEX)



Luis Robles Olmos
Climate Change Manager