

VALIDATION REPORT



VALIDATION REPORT **Improving energy efficiency in a new Gas Plant in Gibraltar-Colombia.**

ECOPETROL S.A
COLOMBIA

REPORT No. CDMVAL 025-03

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VALIDATION REPORT



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Client:	ECOPETROL S.A	Client ref.:	CDMVAL025

Summary:

ICONTEC has performed the validation of the project “Improving energy efficiency in a new Gas Plant in Gibraltar-Colombia” on the basis of UNFCCC criteria referred to Article 12 of the Kyoto Protocol and CDM modalities and procedures according to the Marrakech Agreement, the criteria of the CDM Executive Board and the Host country. This validation report summarizes the findings of the validation.

The project activity under validation is based on methodology AMS II.D “Energy efficiency and fuel switching measures for industrial facilities” Ver 12. The project activity is about the treatment of 30.3 MSCFD of associated gas from the field of Gibraltar through a more efficient technology (System TWISTER) adapted for the gas characteristics of the field. The project expects to reduce 130,885.25 tonnes of CO₂e during crediting period of 10 years.

The validation consisted of the following three phases: i) a desk review of the project design documents, ii) follow up interviews with project stakeholders and iii) the resolution of outstanding issues and the issuance of the final validation report and opinion.

In summary, it is ICONTEC’s opinion that the project “Improving energy efficiency in a new Gas Plant in Gibraltar-Colombia”, as described in the version 03 of the project design document meets all relevant UNFCCC requirements for the CDM and all relevant host country criteria and correctly applies the baseline and monitoring methodology AMS II D “Energy efficiency and fuel switching measures for industrial facilities” v. 12. Hence, ICONTEC requests the registration of the project as CDM project activity.

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Work carried out by	Eng. Ana Maria Zapata (CDM auditor) Jorge Pinto (Technical expert)			
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This report should not be read without reference to the annexed Validation Protocol.

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Abbreviations

CAR	Corrective Action Request
CDM	Clean Development Mechanism
CERs	Certified emission reductions
CLA	Clarification Request
CO ₂	Carbon Dioxide
CO ₂ eq	Carbon dioxide equivalent
DNA	Designated National Authority
DOE	Designated Operational Entity
DR	Document Review
GHG	Greenhouse Gases
I	Interview
ICONTEC	Colombian Institute of technical standards and certification (Instituto Colombiano de Normas Técnicas y Certificación)
IPCC	Intergovernmental Panel on Climate Change
MoV	Means of verification
MP	Monitoring Plan
PDD	Project Design Document
UNFCCC	United Nations Framework Convention for Climate Change
MSCFD	Million standard cubic feet day
UTGG	Union Temporal Gas Gibraltar (Gas Gibraltar Temporal Union)

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1 INTRODUCTION

ECOPETROL S.A has commissioned ICONTEC to perform the Validation for the registration of its proposed CDM project: Improving energy efficiency in a new Gas Plant in Gibraltar-Colombia (hereinafter called “the project”).

This report summarizes the findings of the validation of the project, which was performed on the basis of UNFCCC criteria referred in Article 12 of the Kyoto Protocol and CDM modalities and procedures according to the Marrakech Agreement, as well as criteria given to provide for consistent project operations, monitoring and reporting

The project activity under validation consist in the treatment of 30.3 MSCFD of associated gas from the field of Gibraltar through a more efficient technology (System TWISTER) adapted for the gas characteristics of the field. The project activity contributes to sustainable development, due to the reduction of fossil fuel used with conventional technologies, and, therefore, reducing CO₂ emissions to the atmosphere.

1.1 Objective

The purpose of a validation is to have the opinion of an independent third party in order to assess the project’s design. In particular, baseline, monitoring plan, and the project’s compliance the relevant UNFCCC criteria.

Host Party’s criteria are validated in order to confirm that the project design, as documented, is sound and reasonable and meets the identified criteria. Validation is a requirement for all CDM projects and is seen as necessary as to provide assurance to stakeholders of the quality of the project and its intended generation of certified emission reductions (CERs).

1.2 Scope

The validation scope involves an independent and objective revision to determine that the project design meets the following criteria:

UNFCCC criteria: The Kyoto Protocol Article 12 criteria, modalities and procedures for CDM (Marrakech Accords) and the relevant decisions by the CDM Executive Board, and

Host Party criteria: National CDM requirements, including sustainable development priorities and potential specific requirements contained, for example, the preliminary approval issued by the Designated National Authority or project agreements between parties involved.

ICONTEC, based on its ethics code and internal procedures for carrying out validation, verification and certification audits of CDM project activities (which, in turn, are based on the validation and verification manual ver.1.2) focused on the identification of significant risks for CER generation, and verification of the climate change mitigation.

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

2 METHODOLOGY

The validation consists of the following three phases:

- i) A desk review of the project design documents
- ii) Follow up interviews with project stakeholders
- iii) The resolution of outstanding issues and the issuance of the final validation report and opinion.

As mentioned in clause 1.2 of this report ICONTEC, based on its ethics code and internal procedures, carries out validation, verification and certification audits of CDM project activities (which, in turn, are based on the validation and verification manual ver.1.2) focused on the identification of significant risks for CER generation, and verification of the contribution to climate change mitigation.

These internal procedures define the validation protocol which consists of three tables. The different columns in these tables are described in Table 1 "Validation protocol tables".

The validation protocol was resulting from the Validation of Improving energy efficiency in a new Gas Plant in Gibraltar-Colombia", is enclosed in Annex A of this report.

Findings established during the validation can be seen as:

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

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

Corrective Action Requests (CAR) are issued, where

Project participants have made mistakes which will directly influence the ability of the project activity to achieve real, measurable and additional emission reductions; CDM requirements have not been met; or
There is a risk that emission reductions cannot be monitored or calculated.

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

A Clarification is required where information is insufficient, or not clear enough to establish if a requirement is met.

2.1 Documents Review

PDD submitted by ECOPETROL S.A and additional background documents related to the project design and baseline were assessed during the validation. (See section 6 for details)

Main documents reviewed are (see section 6 for the whole references):

- PDD of Improving energy efficiency in a new Gas Plant in Gibraltar-Colombia” Ver. 1.0 dated 02/12/2009, version 02 dated 06/10/2011, version 03 dated 14/12/2011 and version 04 dated 21/05/2012.
- Baseline calculation data and spreadsheet addressed “Emissions Calculation Project New Gas Plant in Gibraltar”.
- Documents related with baseline determination
- Quality assurance documents
- Documents of the analysis of the related environmental impacts,
- Letter of Approval of the project issued by the Designated National Authority of Colombia on 26/05/2010
- Letter confirming the voluntary participation of the parties.
- Comments of the interested parties received up to date and how these have been treated.
- Relevant Colombian regulation related with the project.

2.2 Follow up interviews

ICONTEC visited the project site on 18/08/2010 to 20/08/2010 at the Gibraltar facilities. Interviews were conducted with Gibraltar Directors and the personnel related with plant design and maintenance (see list below). Other project stakeholders were also interviewed.

Table 1: Follow up interviews

DATE	PLACE	INTERVIEW	ORGANIZATION	INTERVIEW TOPICS
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		DELEGATE		
18/08/2010 to 20/08/2010	Gibraltar facilities	Oscar Garcés Parra	ECOPETROL S.A	-Chronological description of the project activity. - General description of the plant. -Technical details of the project realization and Project Design Report -Description of the project boundary. -Investment analysis. -Technology chosen. - Operational data – technical specification, start up, volume of gas to be treated, etc. -Environmental impacts and regulatory requirements. -Comments of the interested parties received up to date and how these have been treated
18/08/2010 to 20/08/2010	Gibraltar facilities	Jose Moris Ruiz	ECOPETROL S.A	
18/08/2010 to 20/08/2010	Gibraltar facilities	Esperanza Ochoa	ECOPETROL S.A	
18/08/2010 to 20/08/2010	Gibraltar facilities	Victor Marier	UTGG	
18/08/2010 to 20/08/2010	Gibraltar facilities	Mario Maranes	UTGG	
18/08/2010 to 20/08/2010	Gibraltar facilities	Giannina Ibarra	DEUMAN	-Editorial aspects of PDD. -Methodology applied Establishment of baseline, monitoring plan and emission reductions calculation. -Consistency of baseline calculation data and default values. -Prior consideration. - Crediting period and its starting date. - Information on maintenance and calibration of equipment related to the baseline calculation data.
20/08/2010	Gibraltar facilities	Edwin Robinson Martinez	Stakeholder Local community	
20/08/2010	Gibraltar facilities	Miguel Amaya	Stakeholder Local community	
20/08/2010	Gibraltar facilities	Kuanakubo Tegria	Stakeholder Native community UWA	
10/09/2010	DNA Office	Sandra Lopez	Ministry of Environment of Colombia.	- Letter of approval validation -Environmental authority's perspective on environmental impacts of the project and its consideration within the current environmental license of the gas processing plant.

2.3 Resolution of clarification and corrective action request

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Corrective action and clarification requests raised by ICONTEC were presented to project participants and resolved through communication and meetings between ECOPETROL S.A and ICONTEC. In order to guarantee the transparency of the validation process, the concerns raised and the response provided by the project participants are documented in more detail in the validation protocol in Annex A.

Since modifications to the project design document were necessary to resolve ICONTEC's concerns, the client decided to review the PDD and re-submit corrected versions of the PDD. After the period of public consultation (01/07/2010 to 30/07/2010) and after reviewing the last version of the PDD (version 3.0), ICONTEC issued this validation report and opinion.

2.4 Internal Quality Control

This report that includes the validation findings underwent a technical review before being submitted to the project participants.

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

2.5 Validation team

The validation team consists of the following personnel:

Role/Qualification	Last Name	First Name	Country	Type of involvement		
				Desk review	Site Visit/ Interviews	Reporting
Lead Auditor	Gracia	Juan Alberto	Colombia	X	X	
Auditor Sectoral Specialist	Pinto	Jorge	Colombia	X	X	X
Auditor in training	Zapata	Ana Maria	Colombia	X	X	X

The validation team is qualified in according to ICONTEC's qualification scheme for CDM validation and verification. See Annex B.

3 VALIDATION FINDINGS

3.1 Overview

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Validation findings are stated in the following sections. During validation process ICONTEC identified 5 CLA and 6 CAR which were closed successfully during validation process (See annex A table A3).

3.2 Participation requirements

The project activity is being proposed by ECOPETROL S.A as project participants from the host country, Colombia. The participation of ECOPETROL S.A and the project activity had been approved by Colombian DNA through the letter of approval issued on 26/05/2010. It had provided confirmation that the project contributes to the country in the search of sustainable development. Lead auditor carried out the interview of the member of the Ministry of environment (DNA) in charge of the Climate Change Mitigation Office and he received a copy of the correspondent letter of approval.

Tabla 2: Letters of Approval

Colombia Letter of approval		
Date of issue:	26/05/2010	
Description:	It provides confirmation that the project contributes to the country in the search of sustainable development	
Supporting documentation (if it is applicable)	N.A	
Date of ICONTEC reception	10/08/2010	
Entity that sent the letter to ICONTEC	Project participants	Directly from the DNA
		X
Means of validation employed to assess the authenticity	Document review and interview with personal of Ministry of Environment of Colombia.	
ICONTEC Conclusion	<p>All parties involved have approved the project activity. The letter is authentic and valid for the proposed CDM project activity under validation. It confirms and is unconditional with respect to:</p> <ul style="list-style-type: none">(a) The Country is a Party to the Kyoto Protocol;(b) Participation is voluntary and has been approved by a Party to the Kyoto Protocol;(c) In the case of the host Party, the proposed CDM project activity contributes to the sustainable development of the country;(d) It refers to the precise proposed CDM project activity title in the PDD being submitted for registration. <p>After documental revision and interview with personal of Ministry of environmental of Colombia, the DOE considers the letters are in accordance with paragraphs above.</p>	

3.3 Project Design Document

ICONTEC can certify that the PDD is in line with the relevant form and guidance as provided by UNFCCC. The most recent version of the PDD form was used. ICONTEC considers that the guidelines for the completion of the PDD in their most recent version have been followed. Relevant information was provided by the participants in the applicable PDD sections.

ICONTEC has been able to validate that the project has been designed according to the characteristics indicated in the PDD and the equipments that were specified in the PDD are being used for project implementation.

3.4 Project Description

The project activity under validation is a new plant to treat of 30.3 MSCFD of associated gas from the field of Gibraltar. ECOPETROL S.A. is the owner of the Gibraltar facility in which the project activity is implemented, and is located between the Municipality of Toledo (North of Santander department) and the municipality of Cubará (Boyacá department).

The proposed project activity will use a new and more efficient technology to treat the associated natural gas from the field of Gibraltar. This technology, called System TWISTER, has been adapted for the specific gas characteristic of the field. The conventional system to process natural gas is performed by Mechanical Refrigeration Plants, Joule-Thompson, Turbo Expansion and Absorption Plants, which are well-known and the mostly used technologies regarding the natural gas treatment activity. Also, this conventional system is considered as the baseline scenario and not the proposed technology (System Twister).

Due to the introduction of this new technology, CO₂ emissions will be lower than with traditional technology (The fuel economy is estimated at about 5,033.70 tons of fuel per year. In this case, natural gas, and thus reducing the emission of gases like CO₂ that contribute to global warming. Emission reduction regarding the project activity implementation would reach an amount of 13,088 tCO₂e/year.

The project activity contributes to sustainable development, due to the reduction of fossil fuel used with conventional technologies, and, therefore, reducing CO₂ emissions to the atmosphere.

This project is based on the methodology AMS II.D "Energy efficiency and fuel switching measures for industrial facilities" ver. 12. Additionally the combined tool to identify the baseline and demonstrate additionality, version 3.0 (EB 60 annex 7) was used.

The only GHG emission relevant to the project activity is the CO₂ emissions related with the combustion of fossil fuels used for the natural gas treatment activity. The impact in global warming expected during the crediting period of the Project is an emission reduction of 130,885 tonnes CO₂e during a fixed crediting period of 10 years.

In the same way ICONTEC validated the boundaries of the project. During on site assessment ICONTEC verified the project boundaries and could confirm the physical location coordinates described in the PDD and the facilities' boundaries. ICONTEC found that project boundaries are in line with the methodology being used by the PP. ICONTEC could validate that the sources of emissions of both, baseline and project emissions (emissions from fuel gas combustion for heat, electricity generation, and flare) are located inside the physical limits marked by the project's coordinates. During the site visit, ICONTEC also validated the following UTM project's coordinates:

Point	East	North
A	878,509.78	1,269,792.58
B	879,421.53	1,270,145.95
C	879,421.53	1,271,039.62
D	878,527.86	1,271,039.62
E	878,174.42	1,270,660.54

During validation process, ECOPETROL S.A provided to the validation team available technical information leaflets about the Gibraltar plant characteristics. ICONTEC verified that with the information included in the PDD and the information provided during on site assessment, it is possible to demonstrate that the emission reductions are real, measurable and for long term and also for the calculations required in methodology AMS II.D. The validation team considers there is enough supporting information documenting the project design technical data.

The project description is considered by ICONTEC completed and accurate /1//6//23/.

3.5 Baseline determination

The baseline determination has been developed using the following Methodology: AMS II D "Energy efficiency and fuel switching measures for industrial facilities" ver. 12". The energy baseline consists of the facility that would otherwise be built; the most plausible baseline scenario for the project activity shall be evaluated based on the related and relevant requirements in the General Guidance for SSC methodologies.

The applicability criteria of the methodology was completed by the project participant and verified by ICONTEC.

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Applicability criteria	Means of Validation
This category comprises any energy efficiency and fuel switching measures implemented at a single or several industrial or mining and mineral production facility(ies). This category covers project activities aimed primarily at energy efficiency; a project activity that involves primarily fuel switching falls into category III.B.1 Examples include energy efficiency measures (such as efficient motors), fuel switching measures (such as switching from steam or compressed air to electricity) and efficiency measures for specific industrial or mining and mineral production processes (such as steel furnaces, paper drying, tobacco curing, etc.).	ICONTEC verified through documents related to plant design, planes and manuals /5/, /14/, that the project comprises the gas treatment by an efficiency new technology.
The measures may replace, modify or retrofit existing facilities or be installed in a new facility.	As was verified by ICONTEC through visual inspection during on site visit,, the project is a new facility, it does not replace, modify or retrofit existing facilities. By the time of ICONTEC visit, the project was under construction.
This category is applicable to project activities where it is possible to directly measure and record the energy use within the project boundary (e.g., electricity and/or fossil fuel consumption).	During on site assessment ICONTEC verified that the project had been installed appropriate measurement equipment and it is possible to directly measure and record the energy use within the project boundary.
This category is applicable to project activities where the impact of the measures implemented (improvements in energy efficiency) by the project activity can be clearly distinguished from changes in energy use due to other variables not influenced by the project activity (signal to noise ratio).	As was verified by ICONTEC through visual inspection during on site visit, the project is a new facility; by the time of ICONTEC visit, the project was under construction. therefore, there are no changes in energy use due to other variables no influenced by the project activity.
The aggregate energy savings of a single project (inclusive of a single facility or several facilities) may not exceed the equivalent of 60 GWhe per year. A total saving of 60 GWhe per year is equivalent to a maximal saving of 180 GWh _{th} per year in fuel input.	ICONTEC verified the project calculation (spreadsheet Emission_ Calculation_ Project_New Gas Plant in Gibraltar.xls) about the energy amount saving by the project and could confirm that the project will be save less than 180 GWh _{th} .

ICONTEC verified that the PP had been carried out the assessment of the baseline scenario according to the methodology AMS II D, which stated that baseline scenarios shall be evaluated based on the related and relevant requirements in the General Guidance for SSC methodologies.

ICONTEC verified the information presented by the PP in order to identify the baseline scenario. ICONTEC verified that the alternatives identified by the PP through step 1, are appropriate and it is in accordance with the technologies available in Colombia to treat the gas, as is explained in the PDD section B.4, the selected alternative “plant of gas treatment using traditional technology”, is the most conservative since allow the lower energy consumption between the other traditional technologies available /23/. ICONTEC also verified that all of the alternatives identified per step 1 are fulfil the current regulation in Colombia.

Through step 3, PP identified the barriers related with each of one the alternatives identified through step 1. ICONTEC verified that there are not barriers identified for the alternative corresponding with Mechanical refrigeration technology, since this is one of the most used technologies in Colombia. On the other hand, to the alternative identified as twister technology (it is the project activity proposed without being registered as a CDM), it was identified a barrier due to prevailing practice. ICONTEC verified through the web page of the Twister technology provider /13/, and also through a letter issued by Twister B.V on 10/02/201 that this kind of technology has not been developed in Latin America /14/. Petrobras has purchased, successfully tested, a Twister system in Brazil, but this is no yet operating on a commercial application.

According to the verification carried out by ICONTEC, was possible to validate that there is only one alternative scenario that there are no obstacles and not the proposed project, which would be the baseline scenario, which is the plant of gas treatment using traditional technology Mechanical Refrigeration.

ICONTEC found the project participant has correctly applied the selected methodology with respect to the Baseline identification. The scenario selected reasonably represents the anthropogenic emissions by sources of GHGs that would occur in the absence of the proposed CDM project activity. All information, assumptions and data used in the identification of the baseline scenario are relevant, justified appropriately, correctly quoted and interpreted, supported by evidence and can be deemed reasonable, this information was verified during interviews with the environmental authority, and the documents reviewed during the validation. All estimates of the baseline emissions can be replicated using the data and parameter values provided in the PDD.

ICONTEC found no GHG emission sources within the proposed CDM project activity boundary expecting to contribute more than 1% of the overall expected average annual emissions reduction, which are not addressed by the applied methodology.

3.6 Additionality

Additionality was addressed through the use of the “Guidelines on additionality of first-of-its-kind project activities, v01.0” (EB63), which state that a project activity that is identified as the First-of-its-kind project activity is additional.

In accordance with the guidelines on additionality of first of its kind project activities, the applicable geographical area is the host country. The proposed project activity is located within one of the measures covered in the framework established in this guideline: *(b) Switch of technology with or without change of energy source (including energy efficiency improvement)*. The output of the technology is define as the volume of processed gas, measured in MSCFD.

ICONTEC verified trough the web page of the Twister technology provider /13/, and also through a letter issued by Twister B.V on 10/02/201 that this project is the first of its kind to regional level, since this technology has not been developed in Latin America /14/. ICONTEC also verified that Petrobras has purchased, successfully tested, a Twister system in Brazil, but this is no yet operating on a commercial application. Therefore, the project is the first of its kind in the applicable geographical area that applies a technology that is different from any another technology able to deliver the same output.

3.6.1 Prior consideration

The DOE confirmed that the start date of the project activity, reported in the PDD, is in line with the “Glossary of CDM terms.” It means “the earliest date at which either the implementation or construction or real action of a project activity begins.” According to this definition, ICONTEC verified that the start date of the project activity is September 19, 2008. On that date, the contract 5203383 of “Financing, design, purchase of equipment, supplies, construction, testing, operation and maintenance for 15 years of surface facilities for treating Gibraltar gas field, belonging to the vice president of ECOPETROL S.A production” between ECOPETROL S.A and UTGG was signed.

In addition, the following milestones of the project were verified to prove that CDM was considered since the beginning of the project to assurance the CDM status:

19/09/2008	Contract N°5203383 signed between ECOPETROL and Union Temporary Gas Gibraltar (UTGG). On clause 6 are included special obligations of the contractor to delivery to ECOPETROL, the information that it requires, with the purpose of to advance before the pertinent entities to Clean Development Mechanism – CDM”.
04/12/2008	Project Idea Note (PIN) for the Gibraltar Project
09/12/2008	Letter to the DNA with the intention of Ecopetrol S.A. of submitting the project to the CDM.
23/12/2008	No objection letter from the DNA

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11/11/2009 Local Stakeholder consultation
26/05/2010 Colombian letter of approval
16/06/2012 Global stakeholder consultation

ICONTEC verified that by the time of project starting date, the guidelines available to demonstrate and assess the prior consideration, was the one issued during the EB 49 and identified as annex 22. This document stated: "The Board decided that for project activities with a starting date on or after 02 August 2008, the project participant must inform a Host Party DNA and/or the UNFCCC secretariat in writing of the commencement of the project activity and of their intention to seek CDM status". ICONTEC verified that the PP informed the Colombian DNA on 09/12/2008 through the Letter of intention (LoI), ICONTEC also verified that this notification was made within the six months of the project activity start date.

3.7 Monitoring plan

ICONTEC verified that the monitoring plan present in the PDD is in line with the approved monitoring methodology AMS II D Energy efficiency and fuel switching measures for industrial facilities" ver. 12". According to the methodology, in the case of new facility, monitoring shall consist of:

- (a) Metering the energy use of the equipment installed;
- (b) Calculating the energy savings due to the equipment installed.

Baseline Parameters determined ex-ante

Baseline parameters that were determined ex-ante are indicated in the section B.6.2 and Annex 3 of the PDD in its latest version. The following parameters were determined at the start of the project. Due to the project was not implemented up to date and the gas wells, were recently surveyed, and not yet exploited, the development of the baseline was estimated on the most common used technology for this type of gas well which is the Mechanical Refrigeration technology. The following parameters were verified during the validation process:

Parameter	Valued applied	Validation means
Net calorific value of Natural Gas (FG) - NCV_{FG,BE}	47.11 Tj/Gg	This value was calculated from: Gas molecular weight: 28.37 lb/lbmol Lower heating value: 5.783e5 Btu/lbmol ICONTEC verified that those values are the ones presented by MASA in the moment of concourse prequalification /23/. Those values were obtained through a simulation in the software Aspen Hysys/21/.

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- Yearly fuel gas consumption by the Mechanical Refrigeration process for electricity generation $Q_{BE,FG,G}$.	3,663 tonne/year	<p>ICONTEC verified that this value was calculated as the sum of the energy consumptions of the equipments offered by MASA. The individual values were obtained through a simulation in the software Aspen Hysys/21/</p> <p>The fuel gas was calculated from the consummation of power of the used equipment demonstrated in a simulation using Hysys software that models the operation of the baseline plant (mechanical Refrigeration) and the Twister process. This consumption of electricity is calculated by the Hysys simulator in units of power such as HP that are convertible to units of Tonne/year. The fuel gas is obtained by multiplying the combustible gas consumed by the equipment for the generation of electricity, heat and flare by the NCV of the combustible gas and by the emissions factor for natural gas in accordance with the 2006 IPCC Guidelines on National GHG Inventories.</p>
Yearly fuel gas consumption by the Mechanical Refrigeration process for heat $Q_{BE,FG,H}$	3,513 tonne/year	
- Yearly fuel gas consumption by the Mechanical Refrigeration process for flare $Q_{BE,FG,F}$	259.46 tonne/year	
CO ₂ emission factor for Natural Gas (NG).	54,300 kgCO ₂ /TJ	<p>ICONTEC verified that this values correspond to IPCC default values in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories./22/</p>

ICONTEC finds the values chosen appropriate and the selection of the values is transparent and conservative. All the data sources used were available and were verified during validation process.

Parameters monitored

Project emissions parameters that are monitored ex-post are indicated in the section B.7.1 of the PDD in its latest version. According to the methodology, in the case of new facility, monitoring shall consist of:

- (a) Metering the energy use of the equipment installed;
- (b) Calculating the energy savings due to the equipment installed.

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Parameter	Valued applied in PDD	Validation means
Net calorific value of Natural Gas (FG) - $NCV_{FG, BE}$	38.80 Tj/Gg	<p>This parameter will be monitored though chromatographic analysis.</p> <p>ICONTEC could validate that the Net Caloric Value of the baseline (process of mechanical cooling) is different from the Net Caloric Value of the Gibraltar process of the UTGG owing to the fact that they are different processes that use different operation paramters and equipment, which results in a combustible gas of different properties (see Table A2 CLA 4).</p>
- Yearly fuel gas consumption by the project activity for electricity generation $Q_{PE, FG, G, y}$	2,044.83 tonne/year	<p>ICONTEC verified that the energy use of the equipment installed will be monitored through direct measure of energy consumption of each equipment installed.</p> <p>Measurements will be undertaken in line with the standard AGA Report No. 3 "Orifice Metering of natural Gas" Part3 "Natural Gas Applications" or its equivalent API Manual of Petroleum Measurement Standards, Chapter 14 "Natural Gas Fluids Measurement Section 3 "Concentric Square Edged Orifice Meters"</p> <p>The fuel gas used to determine the ex-ante project emission was calculated from the consummation of power of the used equipment demonstrated in a simulation using Hysys software that models the operation of the baseline plant (mechanical Refrigeration) and the Twister process. This consumption of electricity is calculated by the Hysys simulator in units of power such as HP that are convertible to units of</p>
Yearly fuel gas consumption by the project activity for heat. $Q_{PE, FG, H, y}$	547.65 tonne/year	
- Yearly fuel gas consumption by the project activity for flare. $Q_{PE, FG, F, y}$	259.46 tonne/year	
- Yearly fuel gas consumption by the treatment of additional gas. $Q_{PE, FG, T, y}$	0,57 tonne/year	

		Tonne/year. The fuel gas is obtained by multiplying the combustible gas consumed by the equipment for the generation of electricity, heat and flare by the NCV of the combustible gas and by the emissions factor for natural gas in accordance with the 2006 IPCC Guidelines on National GHG Inventories.
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The application of the monitoring plan is transparent and ICONTEC considers the project participants are able to implement the monitoring plan.

3.8 Calculation of GHG emissions

According to the methodology project emissions were calculated as follow:

$$ER_y (tCO_2e/y) = BE_y - PE_y - Ly$$

Where:

ER_y: Emission reductions
 BE_y: Baseline emissions in year y in tCO₂e;
 PE_y: Project emissions in year y in tCO₂e;
 Ly: Leakage of the project in tCO₂e

To verify the calculation of GHG emissions ICONTEC conducted an interview with the project developer. ICONTEC verified by means of the review of the excel sheet "Emissions Calculation Project New Gas Plant in Gibraltar" that the project is expected to reduce GHG emissions in 13,088.53 tCO₂ annually compared with the baseline scenario in the single 10 year crediting period. ICONTEC was able to confirm during the site visit that the assumptions used to calculate the project emissions, baseline emissions and leakage are appropriate and correct.

ICONTEC validated that Baseline emissions were calculated as follow:

$$BE_y = (Q_{BE,FG,G} + Q_{BE,FG,H} + Q_{BE,FG,F}) \times NCV_{FG, BE} \times EF_{CO_2,NG} / 1,000,000$$

Where:

BE_y (tCO₂/year): the baseline emission of the Mechanical Refrigeration process if this technology were used instead of the project activity.
Q_{BE,FG,G} (tonne/year): Yearly fuel gas consumption by the Mechanical Refrigeration process for electricity generation.

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$Q_{BE,FG,H}$ (tonne/year): Yearly fuel gas consumption by the Mechanical Refrigeration process for heat.

$Q_{BE,FG,F}$ (tonne/year): Yearly fuel gas consumption by the Mechanical Refrigeration process for flare.

$NCV_{NG,BE}$ (TJ/Gg): Net calorific value of Fuel Gas (FG.)

$EF_{CO_2,NG}$ (kgCO₂/TJ): CO₂ emission factor for NG.

The baseline is a process of mechanical refrigeration that, from a load of gas coming from wells in the Gibraltar field, produces a gas equipped for sales according to government regulations and a volume of stabilized condensates that will be traded like oil.

At the top of the condensate stabilization tower there is produced a gas rich in ethane, LPG and, at the bottom, stabilized condensates that can be sold as oil. The gas on top mixes with a small portion derived from the gas being sold and said gas is used as a combustible gas in the facility (gas for electrical, heat and torch generation). The molecular weight of this gas is 28.37 Lb/Lbmol and the Net Caloric Value is 47.11 Tj/Gg.

ICONTEC also validated that Project emissions were calculated as follow:

$$PE_y = (Q_{PE,FG,G,y} + Q_{PE,FG,H,y} + Q_{PE,FG,F,y} + Q_{PE,FG,T,y}) \times NCV_{FG,PE,y} \times EF_{CO_2,NG} / 1,000,000$$

Where:

PE_y (tCO₂/year): Project emission of the Twister process of the project activity.

$Q_{PE,FG,G,y}$ (tonne/year): Yearly fuel gas consumption by the project activity for electricity generation..

$Q_{PE,FG,H,y}$ (tonne/year): Yearly fuel gas consumption by the project activity for heat.

$Q_{PE,FG,F,y}$ (tonne/year): Yearly fuel gas consumption by the project activity for flare.

$Q_{PE,FG,T,y}$ (tonne/year): Yearly fuel gas consumption by the treatment of additional gas.

$NCV_{FG,PE,y}$ (TJ/Gg): Yearly Net calorific value of Fuel Gas (FG).

$EF_{CO_2,NG}$ (kgCO₂/TJ): CO₂ emission factor for NG.

In this process, the gas used for internal combustion (electrical, heat and torch generation) is the gas coming from the top of the condensate stabilizing tower and has a molecular weight of 24.49 Lb/Lb mol and a Net Caloric Value of 38.80 Tj/Gg.

Both, baseline and project emissions include the energy required to treat the amount of natural gas coming from the wells or inlet gas.

As stated on the Methodology, no leakage will be considered, because the technology is new, and all equipment is also brand new.

3.9 Environmental impacts

According to the Colombian legislation the activity being developed by ECOPETROL S.A requires both, the Environmental Impact Assessment (EIA) and the Environmental License. ICONTEC verified that the project developed the environmental assessment titled “Environmental Impact Assessment for the Exploitation Activities of the Gibraltar Gas Field”. The study was developed on 10/10/2008 in order to require the environmental license of the project.

ICONTEC verified that the project obtained the licenses required by the Colombian legislation:

- Exploration and exploitation License issued by the National Hydrocarbons Agency of Colombia on 20/10/2006. /8/
- Global environmental license issued by the Environmental, Housing, and Territorial Development Ministry of Colombia. Resolution number 0502 dated 27/03/2008. /7/

Taking into account the environmental impacts identified in the EIA and the obligations established in the environmental license; ICONTEC could verify that all impacts are treated accordingly to local regulation and solved in the same manner. Environmental commitments were defined on the Resolution and are followed by the project proponent as stated on this permit i.e. to inform the local authorities ICONTEC verified the Informe de Cumplimiento Ambiental –ICA- (Environmental Compliance Report) prepared by the PP each six months./9/

3.10 Comments by local stakeholders

Project developer organized two meetings, the first one was held with the Community of Toledo and Curaba (community living in the area of influence of the project), and the second one with the native community UWA. ICONTEC verified that the public meeting was called by the local authorities of Toledo and it was held in the community hall on the 11 and 12 of November of 2009 respectively. A total of 72 persons from several institutions and communities attended the meeting. ICONTEC made a cross check between the list presented in the PDD and the original attendance list signed by stakeholders.

The DOE verified the execution of this meeting by the attendance list attached to the PDD, pictures, files and thoughts interviews with some of the persons who attended the meeting.

ICONTEC verified that there were no negative comments by local stakeholders. The survey /12/ shows that the proposed CDM project will have only positive impacts on

the local, ecological, environmental, employment and social life. ICONTEC verified that the comments received by the local stakeholders were taken into account; some of them were related with environmental compliance, social programs and investment in the community needs. ICONTEC could verify that the project is in line with environmental legislation (see section 3.9 above). Social programs and investment in the community was verified through the Gibraltar Gas Plant social report and through interviews with local community.

4 GLOBAL STAKEHOLDERS CONSULTATION

According to Decision 17/CP.7, the PDD version 01 submitted by ECOPETROL S.A was made publicly available at UNFCCC website during a 30 days period from 16/06/2010 to 15/07/2010.

Parties, stakeholders and NGOs were invited to provide comments through the website. No comments were received during the public consultation.

5 VALIDATION OPINION

ICONTEC has performed a validation of the project “Improving energy efficiency in a new Gas Plant in Gibraltar-Colombia”. The validation was performed on the basis of UNFCCC criteria for the Clean Development Mechanism and host country criteria, as well as criteria given to provide for consistent project operations, monitoring and reporting.

The review of the Project Design Documentation and the subsequent follow up interviews has provided ICONTEC with sufficient evidence to determine the fulfilment of the stated criteria.

The project activity is being proposed as unilateral project by ECOPETROL S.A. Colombia provided approval of voluntary participation and meets all requirements to participate in CDM. The Colombian DNA confirmed that the project helps achieving sustainable development.

The project correctly applies the methodology: AMS II D “Energy efficiency and fuel switching measures for industrial facilities” Ver 12.

The project The project activity is about the treatment of 30.3 MSCFD of associated gas from the field of Gibraltar through a more efficient technology (System TWISTER) adapted for the gas characteristics of the field.

The total emission reductions from the project are estimated to be on the average of 130,885 tCO₂e over the selected 10 year crediting period. The emission reduction forecast has been checked and it is deemed likely that the stated amount will be achieved because the underlying assumptions are not likely to change substantially.

In summary, it is ICONTEC’s opinion that the “Improving energy efficiency in a new Gas Plant in Gibraltar-Colombia”, as described in the PDD version 4.0 dated 28/05/2012, meets all relevant UNFCCC requirements for the CDM and all relevant host country criteria and correctly applies the baseline and monitoring methodology AMS II-D “Energy efficiency and fuel switching measures for industrial facilities” Ver 12.

Bogotá D.C., October 31, 2012



Diego Caballero
Director of Conformity Assessment
ICONTEC

6 REFERENCES

Documents provided by the project proponent directly related to the project

- /1/ PDD version 01 dated 02/12/2009; version 02 dated 06/10/2011; version 03 14/12/2011 and version 04 dated 28/05/2012
- /2/ Monitoring plan annex of the PDD
- /3/ Spread sheet "Emission_Calculation_Project_New Gas Plant in Gibraltar.xls
- /4/ Colombian letter of approval dated 26/05/2010.
- /5/ Contract N° 5203383 signed between ECOPETROL S.A and UTGG.
- /6/ Environmental Impact Assessment for the Exploitation Activities of the Gibraltar Gas Field
- /7/ Global environmental license, Resolution number 0502, 27/03/2008.
- /8/ Exploration and exploitation License, dated 20/10/2006.
- /9/ Environmental compliance reports issued on August 2009, February 2010.
- /10/ Gibraltar Gas Plant Social report, year 2009.
- /11/ Invitation letter to stakeholder consultation, dated 10/10/2009.
- /12/ Minutes and survey of the meeting of stakeholder's consultation to present the project, including the attendance list, 11 to 12/11/2009
- /13/ www.twisterbv.com
- /14/ Twister technology letter, issued by Twister B.V on 10/01/2011.
- /15/ Letter sent by ECOPETROL to MAVDT, 14/08/2006
- /16/ Agreement signed between ECOPETROL and the Inter American Development Bank, 19/03/2008
- /17/ PIN submitted to DNA, 04/12/2008
- /18/ Letter of intention (LoI), 09/12/2008
- /19/ No objection letter from the DNA, 23/12/2008
- /20/ MASA simulation results.
- /21/ UTGG Simulation results
- /22/ IPCC Guidelines on National GHG Inventories. Chapter 1 vol 2.
- /23/ Proposals submitted in the prequalification concourse PRECGEA-512215

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

- /24/ Methodology AMS II D "Energy efficiency and fuel switching measures for industrial facilities" Ver 12.
- /25/ Guidelines on additionality of first-of-its-kind project activities, ver 01.0 (EB 63 annex 11
- /26/ Validation and verification Manual, ver 1.2

Annex A

Validation Protocol

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TABLE 1. Mandatory Requirements for Clean Development Mechanism (CDM) Project Activities.

REQUIREMENT	Reference	CONCLUSION	Cross Reference / Comment
1. <i>The project shall assist Parties included in Annex I in achieving compliance with part of their emission reduction commitment under Art. 3</i>	<i>Kyoto Protocol Art. 12.2</i>	OK	The project has been proposed as unilateral project.
2. <i>The project shall assist non-Annex I Parties in achieving sustainable development and the project has obtained confirmation by the host country that the project assists in achieving sustainable development</i>	<i>Kyoto Protocol Art. 12.2, Procedures for Small Scale CDM Project Activities §23a</i>	OK	The project assists Colombia, a non-annex I Country, to achieve sustainable development. The project already received the Letter of Approval, dated 26/05/2010, from the Colombian DNA (Ministry of Environment, Housing and Territorial Development), confirming the contribution of the proposed CDM project activity to the sustainable development of the host Party.
3. <i>The project shall assist non-Annex I Parties in contributing to the ultimate objective of the UNFCCC</i>	<i>Kyoto Protocol Art. 12.2.</i>	OK	The project assist non-annex I Parties.

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<p>4. <i>The project shall have the written approval of voluntary participation from the designated national authorities of each party involved</i></p> <p><i>Each letter confirms that:</i></p> <p>(a) <i>The Party is a Party to the Kyoto Protocol;</i> (b) <i>Participation is voluntary;</i> (c) <i>In the case of the host Party, the proposed CDM project activity contributes to the sustainable development of the country;</i> (d) <i>It refers to the precise proposed CDM project activity title in the PDD being submitted for registration.</i></p>	<p><i>Kyoto Protocol Art. 12.5a, Procedures for Small Scale CDM Project Activities §23a V/V Manual (v 1.2) art.44 to 48</i></p>	<p>OK</p>	<p>Yes, The project received a Letter of Approval, dated 26/05/2010, from the Colombian DNA confirming the contribution of the proposed CDM project activity to the sustainable development of the host Party.</p>
<p>5. <i>The emission reductions shall be actual, measurable and give long-term benefits related to the mitigation of climate change</i></p>	<p><i>Kyoto Protocol Art. 12.5b</i></p>	<p>OK</p>	<p>Yes, the emission reductions are calculated in section B.6 of the PDD. The estimated emission reductions validated by the DOE for the project are 130,885 tCO₂ in 10 years. See section 3.8 of this report.</p>
<p>6. <i>Reduction in GHG emissions shall be additional to any that would occur in absence of the project activity, i.e. a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity</i></p>	<p><i>Kyoto Protocol Art. 12.5c, Marrakesh Accords, CDM Modalities §43</i></p>	<p>OK</p>	<p>This project is additional and anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity.</p>

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7. <i>In case that public funding from Parties included in Annex I is used for the project activity, these parties shall provide an affirmation that such funding does not result in a diversion of official development assistance and is separate from and is not counted towards the financial obligations of these parties</i>	<i>Decision 17/CP.7, CDM Modalities and Procedures Appendix B, § 2</i>	OK	There is no public funding involved in the project
8. <i>Parties participating in the CDM shall designate a national authority for the CDM</i>	<i>CDM Modalities and procedures §29</i>	OK	The Colombian Ministry of Environment, Housing and Territorial Development has been designated as National Authority for the Clean Development Mechanism.
9. <i>The host party and the participant Annex I Party shall be a party to the Kyoto protocol</i>	<i>CDM Modalities and Procedures § 30, 31b</i>	OK	Colombia ratified the Kyoto protocol on 30 November 2001.
10. <i>The participant Annex I Party's assigned amount shall have been calculated and recorded</i>	<i>CDM Modalities and Procedures §31b</i>	OK	The project has been proposed as unilateral project.
11. <i>The participating Annex I Party shall have in place a national system for estimating GHG emissions and a national registry in accordance with Kyoto Protocol article 5 and 7</i>	<i>CDM Modalities and Procedures §31b</i>	OK	The project has been proposed as unilateral project.
12. <i>The proposed project activity shall meet the eligibility criteria for small scale CDM project activities set out in § 6 © of the Marrakesh Accords and shall not be a debundled component of a larger project activity (if applicable)</i>	<i>Simplified Modalities and Procedures for Small Scale CDM Project Activities §12a,c Decision -/CMP.2,</i>	OK	The proposed project activity qualifies for small scale project as defined in Appendix B of M&P for small scale project activities (UNFCCC, 2006).

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	<i>paragraph 28.</i>		Section B.2 in PDD.
13. <i>The project design document shall conform with the latest template and guidance from the CDM Executive Board available on the UNFCCC CDM website</i>	<i>Simplified Modalities and Procedures for Small Scale CDM Project Activities, Appendix A V/V Manual (v 1.2)art. 55</i>	OK	Yes, DOE verified that the PDD is in line with the CDM-PDD for small-scale CDM project activities (Version 03 of 22 December, 2006).
14. <i>The proposed project activity shall conform to one of the project categories defined for small scale CDM project activities and uses the simplified baseline and monitoring methodology for that project category</i>	<i>Simplified Modalities and Procedures for Small Scale CDM Project Activities §22e</i>	OK	The project activity falls under the approved small scale methodology AMS II D - <i>"Energy efficiency and fuel switching measures for industrial facilities" Ver 12.</i> The applicability conditions of each parameter of the baseline methodology in the context of the project activity are given in section B.2 in PDD and section 3.5 of this report.
15. <i>Comments by local stakeholders are invited, and a summary of these provided</i>	<i>Simplified Modalities and Procedures for Small Scale CDM Project Activities §22b</i>	OK	As described in section E of the PDD, local stakeholders have been consulted by the project proponents. See section 3.10 of this report.
16. <i>If required by the host country, an analysis of the environmental impacts of the project activity is carried out and documented.</i>	<i>Simplified Modalities and Procedures for Small Scale CDM Project Activities §22c</i>	OK	Yes, the host country required an analysis of the environmental impacts. The PP carried out the

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			analysis called "Environmental Impact Assessment for the Exploitation Activities of the Gibraltar Gas Field. See section 3.9 of this report.
<i>17. Parties, stakeholders and UNFCCC accredited NGOs have been invited to comment on the validation requirements for minimum 30 days, and the project design document and comments have been made publicly available (45 days for A/R projects)</i>	<i>Simplified Modalities and Procedures for Small Scale CDM Project Activities §23b,c,d.</i>	OK	The PDD version 01 submitted by ECOPETROL S.A was made publicly available at ICONTEC's climate change website and Parties, stakeholders and NGOs were invited to provide comments through the CDM website during a 30 days period from 16/06/2010 to 15/07/2010. No comments were received.
<i>18. The project participants are listed in tabular form in section A.3 of the PDD and this information is consistent with the contact details provided in annex 1 of the PDD.</i>	<i>V/V Manual (v 1.2) art.51</i>	OK	DOE verified the consistency between section A.3 and Annex 1 in the proposed PDD.

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Table A2. Requirements Checklist (ACCORDING VALIDATION AND VERIFICATION MANUAL Version 1.2)

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
General Description of Project Activity The project design is assessed.					
1. Approval					
All Parties involved have approved the project activity. V/V Manual (v 1.2) art.44.					
A letter of approval has been issued by the respective Party's DNA and include the confirmation of: (a) The Party is a Party to the Kyoto Protocol; (b) Participation is voluntary; (c) In the case of the host Party, the proposed CDM project activity contributes to the sustainable development of the country; (d) It refers to the precise proposed CDM project activity title in the PDD being submitted for registration. V/V Manual (v 1.2) art.45 -46.	/5/, /6/	DR, I	Yes, the project already received the Letter of Approval, dated 26/05/2010, from the Colombian DNA (Ministry of Environment, Housing and Territorial Development).	OK	OK
Confirmation of the letter of approval has been issued by the respective Party's designated national authority (DNA) and is valid for the proposed CDM project activity under validation and confirmation about the authenticity of the letter. V/V Manual (v 1.2) art.47-48.	/5/, /6/	DR, I	ICONTEC received this letter on 10/09/2010 from the Colombian DNA in a meeting carried out the same day in Ministry of environmental offices.	OK	OK
2. Participation					
All project participants have been listed in a consistent manner in the project documentation (section A3 and annex 1) , and their participation in the project activity has been approved by a Party to the Kyoto Protocol. V/V Manual (v 1.2) art.51-52	/1/	DR, I	Yes, the project participant has been listed in the Section A.3 of the PDD and it corresponds with the annex 1 of the same document. The project participants is ECOPETROL S.A and its participation had been approved by the Colombian DNA.	OK	OK

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<i>The approval of participation has been issued from the relevant DNA V/V Manual (v 1.2) art.53.</i>	/5/,/6/	DR	The letter of approval for the project dated 26/05/2010 from the Colombian DNA (Ministry of Environment, Housing and Territorial Development) includes the approval of participation.	OK	OK
3. Project design document					
<i>3.1 The PDD used as a basis for validation shall be prepared in accordance with the latest template and guidance from the CDM Executive Board available on the UNFCCC CDM website. V/V Manual (v 1.2) art.55 -56.</i>	/1/	DR	Yes, The PDD has been prepared in accordance with the latest template and guidance from the CDM Executive Board (Version 03 - in effect as of: 22 December 2006).	OK	OK
<i>3.2 Does the PDD correctly describe the project boundary, including the physical delineation? (components and facilities used to mitigate GHG's</i>	/1/	DR, I	Yes, the PDD describes correctly the project boundary of the project activity. The project is located in the municipality of Toledo and the municipality of Cubará. The boundary includes all GHG emission sources from the gas treatment plant. (See section 3.4 of this report)	OK	OK
<i>3.3. Will the project result in technology transfer to the host country?</i>	/1/	DR, I	Yes, project results in technology transfer to the host country.	OK	OK
<i>3.4 Does the project require extensive initial training and maintenance efforts in order to work as intended during the project period? Does the project make provisions for meeting training and maintenance needs?</i>	/1/	I	<p>The technology used by the project participant is a new technology that has not been tested on a local or regional level and such it requires personnel training, both for operation and maintenance, improving the workers skills.</p> <p>It shall be ensured by training provided by the suppliers of the technology and equipments during the process of establishment of the plant.</p> <p>The owner of the project has a defined training and maintenance schedule that was provided</p>	OK	OK

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4. Project description

4.1 The PDD contain a clear description of the project activity that provides the reader with a clear understanding of the precise nature of the project activity and the technical aspects of its implementation. V/V Manual (v 1.2) art.58 -60.	/1/	DR, I	Yes, the PDD provides the reader with information necessary to understand clearly the activities to be undertaken by the project. See section 3.4 of this report.	OK	OK
4.2 Duration of the Project/ Crediting Period Are the project's starting date and operational lifetime clearly defined and reasonable?	/1/	DR	ICONTEC verified that the start date of the project activity is September 19, 2008. In that date, the contract 5203383 of "Financing, design, purchase of equipment, supplies, construction, testing, operation and maintenance for 15 years of surface facilities for treating Gibraltar gas field, belonging to the vice president of ECOPETROL S.A S.A. production" between ECOPETROL S.A S.A. and UTGG was signed. The operational lifetime was also clearly defined as 21 years. This time is related with the quantity of reserves on the well.	OK	OK
4.3 Is the assumed crediting period clearly defined and reasonable (renewable crediting period of seven years with two possible renewals or fixed crediting period of 10 years with no renewal)?	/1/	DR	Yes, Project participants have used the "guidelines on additionality of first-of-its-kind" which stated that the project activity shall select a fixed crediting period of 10 years and 0 months with no option of renewal.	OK	OK

5. Baseline and monitoring methodology

5.1 General requirements The baseline and monitoring methodologies selected by the project participants comply with the methodologies previously approved by the CDM Executive Board, including that the used version is valid. V/V Manual (v 1.2) art.65 -67.	/1/ /20/	DR	Yes, the project applies one of the simplified methodologies proposed for the small scale project activity category AMS II D "Energy efficiency and fuel switching measures for industrial facilities" ver. 12. ICONTEC verified that the version used is valid since 18/11/2009.	OK	OK
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5.2 Applicability of the select methodology to the project activity <i>The methodology is correctly quoted and applied by comparing it with the actual text of the applicable version of the methodology available on the UNFCCC CDM website. Validate that the used version is valid.</i> <i>V/V Manual (v 1.2) art.68 -70.</i>	/1/ /20/	DR	The methodology selected was correctly applied. In section B.2. of the PDD it was explained why the project activity refers to AMS-II-D version 12. It fulfils all the criteria stipulated for the chosen (small-scale) CDM methodology. See section 3.5 of this report.	Partial CAR 6	OK
5.3 Project boundary <i>The project boundary, including the physical delineation of the proposed CDM project activity included within the project boundary for the purpose of calculating project and baseline emissions for the proposed CDM project activity.</i> <i>V/V Manual (v 1.2) art.78-79</i>	/1/	DR, I	Yes, the project boundaries are defined in accordance with the selected methodology AMS-II D. The Project includes a physical delineation of the activities scope included in the calculation of project and the baseline emissions.	Partial CLA 2	OK
5.3.1 Have all sources and GHGs required by the methodology been included within the project boundary? <i>V/V Manual (v 1.2) art.79</i>	/1/	DR	Yes, all sources and GHG required by the methodology had been included within the project boundary.	Partial CLA 2	OK
5.4 Baseline identification <i>The PDD identify 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.</i> <i>V/V Manual (v 1.2) art.81-82</i>	/1/	DR	The baseline scenario identified is a representation of the anthropogenic emissions of GHG that would occur in the absence of the project. See section 3.5 of this report.	Partial CAR 1	OK
5.4.1 Is the application of the methodology and the discussion and determination of the chosen baseline transparent and conservative?	/1/	DR	Yes, the application of the methodology and the baseline scenario chosen are transparent and conservative.	OK	OK
5.4.2 Are the assumptions and data used in the identification of the baseline scenario relevant, justified appropriately, correctly quoted and interpreted, supported by evidence and can be deemed reasonable? <i>V/V Manual (v 1.2) art.83 - 84</i>	/1/	DR, I	ICONTEC found that all information, assumptions and data used in the identification of the baseline scenario are relevant, appropriately justified, correctly quoted and interpreted, supported by evidence and can be deemed reasonable.	Partial CLA 4 CLA 5	OK

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5.4.3 Are relevant national and/or sectoral policies and circumstances taken into account? V/V Manual (v 1.2) art.85.	/1/	DR, I	Yes, circumstances and policies were taken into account in the project.	OK	OK
5.4.4 Does the selected baseline represent the most likely scenario among other possible and/or discussed scenarios? Description includes a description of the technology that would be employed and/or the activities that would take place in the absence of the proposed CDM project activity. V/V Manual (v 1.2) art.86	/1/ /12/ /13/ /17/	DR, I	Yes, the baseline scenario selected represents the most likely scenario among the possibilities presented in the PDD. ICONTEC verified the information presented by PP to select the baseline scenario.	Partial CAR 1	OK
5.4.5 Does the steps taken and equations applied to calculate baseline emissions, comply with the requirements of the selected baseline and monitoring methodology.	/1/	DR, I	Yes. The equations applied are according with the selected methodology. DOE verified the use of these equations in the corresponding spreadsheet addressed "Emissions Calculation Project New Gas Plant in Gibraltar"	Partial CLA 1	OK
5.5 Algorithms and/or formulae used to determine emission reductions The steps taken and equations applied to calculate project emissions, baseline emissions, leakage and emission reductions shall comply with the requirements of the selected baseline and monitoring methodology. V/V Manual (v 1.2) art.89	/1/ /3/ /4/	DR, I	Formulae and equations used for calculating baseline emissions comply with the selected methodology AMS II D.	OK	OK
5.5.1 The equations and parameters in the PDD have been correctly applied by comparing them to those in the selected approved methodology. V/V Manual (v 1.2) art.90 -91	/1/	DR, I	The equation and parameters used have been correctly applied.	OK	OK
6 Additionality of a project activity					
6.1 Prior consideration of CDM					
6.1.1 Is the start date of the project in accordance with the "Glossary of CDM terms"? V/V Manual (v 1.2) art.99	/1/	DR, I	Yes, the starting date is in accordance with the Glossary of CDM terms. It had been defined as 19/09/2008, In that date, the contract 5203383 of "Financing, design, purchase of equipment,	Partial CAR 5	OK

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			supplies, construction, testing, operation and maintenance for 15 years of surface facilities for treating Gibraltar gas field, belonging to the vice president of ECOPETROL S.A production" between ECOPETROL S.A and UTGG was signed.		
6.1.2 If the project start date is prior to the date of publication of the PDD for stakeholder comments, has it been demonstrated that the CDM benefits were considered necessary in the decision to undertake the project as a proposed CDM project activity? V/V Manual (v 1.2) art.99 -101	/23/	I	Project start date: 19/09/2008 Publication of the PDD for stakeholder comments: 01/07/2010 to 30/07/2010 Project start date is prior to publication of the PDD for stakeholder comments, the DOE verified the events been demonstrated that the CDM benefits were considered necessary in the decision to undertake the project related in section B.5 of the PDD. See section 3.6.1 in this report.	OK	OK
6.1.3 Has the project been correctly identified as a new or existing project V/V Manual (v 1.2) art. 100	/1/	I	Yes, the project has been correctly identified as a new project.	OK	OK
6.2 Identification of alternatives					
6.2.1. Have credible alternatives been identified to the project activity in order to determine the most realistic baseline scenario (unless the approved methodology that is selected by the proposed CDM project activity prescribes the baseline scenario and no further analysis is required)? V/V Manual (v 1.2) art. 105	/1/ /12/ /13/ /14/	DR, I	Yes, the project identified the adequate alternatives in the most realistic scenario. For determining the baseline scenario, the methodology AMS.IID v.12 states: the energy baseline consists of facility that would otherwise be built; the most plausible baseline scenario for the project activity shall be evaluated based on the related and relevant requirements in the General Guidance for SSC methodologies ICONTEC verified the use of the steps 1 to 3 of the "the General Guidance for SSC methodologies" was	Partial CAR 1	OK

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			used to assess the baseline.		
6.2.2. Is the list of alternatives included as one of the options that the project activity is undertaken without being registered as a proposed CDM project activity? V/V Manual (v 1.2) art. 106(a)	/1/	DR,I	Yes, the project presents the alternatives that are possible in the Colombian context.	OK	OK
6.2.3 Does the list contain all plausible alternatives that the DOE, on the basis of its local and sectoral knowledge, consider to be viable means of supplying the outputs or services that are to be supplied by the proposed CDM project activity? V/V Manual (v 1.2) art. 106 (b)	/1/	DR,I	Yes, although in Colombia specific legislation does not exist for this type of project, the development of the activities addressed the fulfillment of legal requirements that could be applicable.	OK	OK
6.2.4 Does the alternative comply with all applicable and enforced legislation? V/V Manual (v 1.2) art. 106 ©	/1/	DR,I	Alternatives identified are credible and can occur in the context of the palm oil mill industry in Colombia.	OK	OK
6.3 Investment analysis (if applicable)					
6.3.1 If investment analysis has been used to demonstrate the additionality of the proposed CDM project activity, Does the PDD provide evidence that the proposed CDM project activity would not be: (a) The most economically or financially attractive alternative; or (b) Economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs)? V/V Manual (v 1.2) art. 108	/1/	DR,I	For the project activity a barrier analysis was carried out in order to demonstrate project additionality. The investment analysis has not been used to demonstrate additionality.	OK	OK
6.3.2 Which approach has been selected to demonstrate 6.3.1? (a) The proposed CDM project activity would produce no financial or economic benefits other than CDM-related income. Document the costs associated with the proposed CDM project activity and the alternatives identified and demonstrate that there is at least one alternative which is less costly than the proposed CDM project activity; (b) The proposed CDM project activity is less economically or financially attractive than at least one other credible and realistic alternative;			N.A		

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© The financial returns of the proposed CDM project activity would be insufficient to justify the required investment. V/V Manual (v 1.2) art. 109					
6.3.3 Have the parameters of the financial calculations been correctly used? V/V Manual (v 1.2) art. 111			N.A		
6.3.4 Is the benchmark suitably applied? Ensure that any risk premiums applied in determining the benchmark reflect the risks associated with the project type or activity. V/V Manual (v 1.2) art. 112			N.A		
6.3.5 Are the assumptions appropriate and the financial calculations correct?			N.A		
6.4 Barrier analysis (if applicable)					
6.4.1 Does the CDM project activity face barriers that prevent the implementation of this type of projects? Does the CDM project activity face barriers that do not prevent the implementation of at least one of the alternatives? V/V Manual (v 1.2) art. 115	/1/	DR,I	For the project activity a barrier analysis was carried out in order to demonstrate project additionality.	OK	OK
6.4.2 Issues that have a clear direct impact on the financial returns of the project activity cannot be considered barriers and shall be assessed by investment analysis. V/V Manual (v 1.2) art. 116	/1/	DR,I	Investment assessment was not used to demonstrate additionality.	OK	OK
6.5 Common practice analysis (For proposed large-scale CDM project activities, unless the proposed project type is first-of-its kind) V/V Manual (v 1.2) art. 119	/1/	DR,I	This project is the first of its kind in Colombia	OK	OK
6.5.1 Is the project activity widely observed and commonly carried out in the region? V/V Manual (v 1.2) art. 120(a-b).	/1/ /13/	DR,I	No, the project is first of its kind in Colombia.	OK	OK
6.5.2 If similar and operational projects are already widely observed and	/1/	DR,I	There are not similar projects like this in Colombia.	OK	OK

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commonly carried out in the defined region, are there essential distinctions between the proposed CDM project activity and the other similar activities? V/V Manual (v 1.2) art. 120©.					
7 Monitoring Plan <i>The monitoring plan review aims to establish whether all relevant project aspects deemed necessary to monitor and report reliable emission reductions are properly addressed.</i>					
7.1 Is the selected monitoring plan in line with the approved methodology and are applicable for this project? V/V Manual (v 1.2) art. 122.	/1/ /2/	DR, I	Yes, the monitoring plan presented complies with the methodology selected.	OK	OK
7.2 Are the means of implementation of the monitoring plan, including the data management and quality assurance and quality control procedures, sufficient to ensure that the emission reductions achieved by/resulting from the proposed CDM project activity can be reported ex post and verified? V/V Manual (v 1.2) art. 123.	/1/	DR, I	Yes, the means to ensure data management, quality assurance and quality control procedures are sufficient to ensure that the emission reductions achieved by/resulting from the proposed CDM project activity can be reported ex post and verified	Partial CAR 7	OK
7.3 Monitoring of Project Emissions <i>It is established whether the monitoring plan provides for reliable and complete project emission data over time.</i>					
7.3.1 Does the monitoring plan provide for the collection and filing of all relevant data necessary for estimation or measuring the greenhouse gas emissions within the project boundary during the crediting period?	/1/	DR, I	Yes, the monitoring report includes all relevant data necessary for the calculation of GHG.	OK	OK

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7.4 Monitoring of Leakage <i>It is assessed whether the monitoring plan provides for reliable and complete leakage data over time.</i>	/1/	DR, I	According to the methodology AMS II D “if the technology used is equipment transferred from another activity leakage effects at the site of the other activity are to be considered and estimated (LEy). As the project will not consider transferring technology or equipment from other activity, the leakage can be neglected.	OK	OK
7.4.1 Does the monitoring plan provide for the collection and filing of all relevant data necessary for determining leakage?			N.A		
7.4.2 Are the choices of leakage indicators reasonable?			N.A		
7.4.3 Will it be possible to monitor the specified GHG leakage indicators?			N.A		
7.4.4 Will the indicators give opportunity for real measurement of leakage effects?			N.A		
7.5 Monitoring of Baseline Emissions <i>It is established whether the monitoring plan provides for reliable and complete project emission data over time.</i>	/1/	DR, I	Yes, the monitoring plan presented in the PDD is in line with the approved methodology AMS II D	OK	OK
7.5.1 Does the monitoring plan provide for the collection and filing of all relevant data necessary for determining baseline emissions during the crediting period?	/1/	DR, I	Yes, the monitoring plan includes all relevant parameters for baseline emission determination during the crediting period.	OK	OK
7.5.2 Is the choice of baseline indicators, in particular for baseline emissions, reasonable?	/1/	DR, I	Yes, the indicators are reasonable.	OK	OK
7.5.3 Will it be possible to monitor the specified baseline indicators?	/1/	DR, I	Yes, the indicators established for baseline monitoring are reasonable and it will be possible to monitor.	OK	OK
7.5.4 Will the indicators give opportunity for real measurements of baseline emissions?	/1/	DR, I	Yes, some indicators will be able to be measured in real time.	OK	OK

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7.6 Project Management Planning

It is checked that project implementation is properly prepared for and that critical arrangements are addressed.

7.6.1 Is the authority and responsibility of project management clearly described?	/1/	DR,I	Yes, Chapter B.7.2 describes the authority and responsibility for the personnel of the project.	OK	OK
7.6.2 Is the authority and responsibility for registration, monitoring, measurement and reporting clearly described?	/1/	DR,I	Yes, Chapter B.7.2 describes the authority and responsibility for the personnel of the project.	OK	OK
7.6.3 Are procedures for training of monitoring personnel identified?	/1/	DR,I	The DOE identified that the PP does not have procedures for training of monitoring personnel.	OK	OK
7.6.4 Are procedures for emergency preparedness for cases where emergencies can cause unintended emissions identified?	/1/	DR,I	Currently PP does not have any emergency procedures.	OK	OK
7.6.5 Are procedures for calibration of monitoring equipment identified?	/1/	DR,I	Yes, Chapter B.7.2 and annex 4 indicates how the equipment calibrations will be done.	OK	OK
7.6.6 Are procedures for maintenance of monitoring equipment and installations identified?	/1/	DR,I	Yes, Chapter B.7.2 and annex 4 indicates how the equipment calibrations will be done.	OK	OK
7.6.7 Are procedures for monitoring, measurements and reporting identified?	/1/	DR,I	Yes, Chapter B.7.2 and annex identifies the measurements, monitoring and reports that will be performed.	OK	OK
7.6.8 Are procedures for day-to-day records handling identified (including what records to keep, storage area of records and how to process performance documentation)?	/1/	DR,I	Yes, Chapter B.7.2 and annex 4 indicates that the monitoring is performed on line and in real time.	OK	OK
7.6.9 Are procedures for dealing with possible monitoring data adjustments and uncertainties identified?	/1/	DR,I	Yes, Chapter B.7.2 and annex 4 indicates the procedure to be followed.	OK	OK
7.6.10 Are procedures for internal audits of GHG project compliance with operational requirements, where applicable, identified?	/1/	DR,I	Yes, Chapter B.7.2 and annex 4 indicates the procedure to perform internal audit.	OK	OK
7.6.11 Are procedures for project performance review identified?	/1/	DR,I	Yes, Chapter B.7.2 and annex 4 indicates the procedure to be followed.	OK	OK

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7.6.12 Are procedures for corrective actions identified?	/1/	DR,I	Yes, Chapter B.7.2 and annex 4 indicates the procedure to be followed.	OK	OK
7.7. Calculation of GHG Emissions by Source <i>It is assessed whether all material GHG emission sources are addressed and how sensitivities and data uncertainties have been addressed to arrive at conservative estimates of projected emission reductions.</i>					
E.1 Project GHG Emissions <i>The validation of ex-ante estimated project GHG emissions focuses on transparency and completeness of calculations.</i>					
E.1.1 Are all aspects related to direct and indirect GHG emissions captured in the project design?	/1/	DR,I	Yes the project addressed the direct and indirect emissions.	OK	OK
E.1.2 Have all relevant GHG and sources been evaluated?	/1/	DR,I	Yes, all the sources were evaluated.	OK	OK
E.1.3 Do the methodologies for calculating project emissions comply with existing good practices?	/1/	DR,I	Yes, the methodologies for calculating project emissions comply with existing good practices	OK	OK
E.1.4 Are the calculations documented in a complete manner?	/1/ /4/	DR,I	Yes, the calculations are complete.	Partial CLA 1 CLA 3	OK
E.1.5 Have conservative assumptions been used?	/1/	DR,I	Yes, the project is conservative.	OK	OK
E.1.6 Are uncertainties in the project emissions estimates properly addressed?	/1/	DR,I	Yes, the emissions estimates are properly addressed.	OK	OK
7.8 Leakage <i>It is assessed whether there are leakage effects and they have been properly assessed, i.e. change of an emission which occurs outside the project boundary and which are measurable and attributable to the project.</i>					
7.8.1 Are leakage calculation required for the selected project category and if yes, are the relevant leakage effects assessed?	/1/	DR,I	There are no leakages calculations required for the project activity.	OK	OK

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7.8.2 Have these leakage effects been properly accounted for in calculations (If applicable)?			N.A		
7.8.3 Are the calculations documented in a complete and transparent manner (If applicable)?			N.A		
7.8.4 Have conservative assumptions been used when calculating leakage (If applicable)?			N.A		
7.8.5 Are uncertainties in the leakage estimates properly addressed (If applicable)?			N.A		
7.9 Baseline GHG Emissions <i>The validation of ex-ante estimated GHG emissions focuses on transparency and completeness of calculations.</i>					
7.9.1 Are the baseline emission boundaries clearly defined and do they sufficiently cover sources and sinks for baseline emissions?	/1/	DR,I	The boundaries of the project are clearly defined. ICONTEC verified during the on site assessment the correspondence between boundaries describe in PDD and physical location.	OK	OK
7.9.2 Are all aspects related to direct and indirect baseline emissions captured in the project design?	/1/	DR,I	Yes, direct and indirect baseline emissions were addressed.	OK	OK
7.9.3 Have all relevant GHG and sources been evaluated?	/1/	DR,I	Yes the project assessed all the sources.	OK	OK
7.9.4 Do the methodologies for calculating baseline emissions comply with existing good practices?	/1/	DR,I	Yes, the project complies with good practices of the methodology AMS-II D.	OK	OK
7.9.5 Are the calculation documented in a complete and transparent manner?	/1, /4/	DR,I	Yes, a spreadsheet detailing the calculation was provided for validation. DOE verified the spreadsheet addressed "Emissions Calculation Project New Gas Plant in Gibraltar.xls".	OK	OK
7.9.6 Have conservative assumptions been used	/1/	DR,I	Conservative data have been taken.	Partial CLA 4	OK

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				CLA 5 CAR 4	
7.9.7 Are uncertainties in the baseline emissions estimates properly addressed?	/1/	DR,I	Emissions estimates were properly calculated.	OK	
7.9.8 Do the steps taken and equations applied to calculate baseline emissions comply with the requirements of the selected baseline and monitoring methodology?	/1/	DR,I	Yes, the steps taken and equation applied complies with the monitoring methodology requirements. DOE verified the spreadsheet used to calculate baseline emissions.	OK	
7.10 Emission Reductions Validation of ex-ante estimated emissions.					
7.10.1 Will the project result in fewer GHG emissions than the baseline scenario?	/1/	DR,I	Yes, the project will result in fewer GHG emissions than the baseline scenario.	OK	OK
7.10.2 Do the steps taken and equations applied to calculate emission reductions comply with the requirements of the selected baseline and monitoring methodology?	/1/ /4/	DR,I	Yes, a spreadsheet detailing the calculation was provided for validation. DOE verified the spreadsheet addressed "Emissions Calculation Project New Gas Plant in Gibraltar.xls"	OK	OK
8 Sustainable development The project's contribution to sustainable development is assessed.					
8.1 The letter of approval by the DNA of the host Party confirms the contribution of the proposed CDM project activity to the sustainable development of the host Party. V/V Manual (v 1.2) art.126.	/1/	DR,I	Yes, the letter of approval by the DNA confirms the contribution of the project to sustainable development.	OK	OK
8.2 Will the project create other environmental or social benefits than GHG emission reductions?	/1/	DR,I	Yes, the project will create other social and environmental benefits.	OK	OK
8.3 Will the project create any adverse environmental or social effects?	/1/	DR,I	Installation and operation of the equipment being	OK	OK

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			part of the CDM project do not generate negative environmental impacts.		
8.4 Is the project in line with sustainable development policies of the host country?	/1/	DR,I	Yes, the project received the letter of approval by the Colombian DNA to confirm that this specific project activity is line with sustainable development policies of Colombia.	OK	OK
8.5 Is the project in line with relevant legislation and plans in the host country?	/1/	DR,I	Yes, the project is in line with relevant legislation and it has the licenses required to build the project. There is no specific legislation related to methane emissions from waste water treatment in Colombia.	Partial CLA 3	OK
9 Local stakeholders consultation					
9.1 Have relevant stakeholders been consulted?	/1/	DR,I	Yes, all relevant stakeholders were consulted. Please see the list of participants in Annex 5 of the PDD.	OK	OK
9.2 Have appropriate media been used to invite comments by local stakeholders? V/V Manual (v 1.2) art.128	/1/	DR,I	The notification was done by invitations to community members, representatives of the municipality and regional government, the local environmental institution, universities, and NGOs among others.	OK	OK
9.3 Were stakeholders invited to comment on the proposed CDM project activity prior to the publication of the PDD on the UNFCCC website? V/V Manual (v 1.2) art.128	/1/	DR,I	Yes, the PDD was made publicly available at UNFCCC website during a 30 days period from 01/07/2010 to 30/07/2010. Parties, stakeholders and NGOs were invited to provide comments through the website. No comments were received during the public consultation.	OK	OK
9.4 If a stakeholder consultation process is required by regulations/laws in the host country, has the stakeholder consultation process been carried	/1/	DR,I	The consultation process is not required by the authorities of the country.	OK	OK

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<i>out in accordance with such regulations/laws?</i>					
9.5 <i>Is a summary of the stakeholder comments received /provided? V/V Manual (v 1.2) art. 129</i>	/1/	DR,I	Yes, in section E.2 and Annex 5 a summary of stakeholder comments is found.	OK	OK
9.6 <i>Has due account been taken of any stakeholder comments received? V/V Manual (v 1.2) art. 129</i>	/1/	DR,I	Comments or questions by the stakeholders were considered. See section 3.10 of this report.	OK	OK
10 Environmental impacts					
10.1 <i>Does the host country legislation require analysis of the environmental impacts of the project activity? V/V Manual (v 1.2) art. 132</i>	/1/	DR,I	According to the Colombian legislation the activity being developed by ECOPETROL S.A requires both, the Environmental Impact Assessment (EIA) and the Environmental License. ICONTEC verified that the project developed the environmental assessment titled "Environmental Impact Assessment for the Exploitation Activities of the Gibraltar Gas Field". The study was developed on 10/10/2008 in order to require the environmental license of the project.	OK	OK
10.2 <i>Does the project comply with environmental legislation in the host country? V/V Manual (v 1.2) art. 132</i>	/1/	DR,I	Yes, the project complies with the environmental legislation in Colombia.	OK	OK
10.3 <i>Will the project create any adverse environmental impacts?</i>	/1/	DR,I	As a result of the analysis, environmental impacts due to the implementation of the project activity are not considered significant. The measures adopted in this project activity will result in the improvement of the environmental performance of the company.	OK	OK
10.4 <i>Have environmental impacts been identified and addressed in the PDD?</i>	/1/	DR,I	Yes, section D.2 in the PDD contains the environmental impacts considering the stages of the construction and operation of the proposed project.	OK	OK

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SPECIFIC VALIDATION ACTIVITIES

A.1 SMALL SCALE PROJECT ACTIVITY (IF APPLICABLE)

A.1.1 Does the project qualify as a small scale CDM project activity as defined in paragraph 6 (c) of decision 17/CP.7 on the modalities and procedures for the CDM (Decision-/CMP.2 (Further guidance relating to the clean development mechanism) revises the definitions for small-scale CDM project activities referred to in paragraph 6 (c) of decision 17/CP.7.)?	/1/	DR,I	Yes, the project activity qualifies as small scale. In section B.2. of the PDD it is explained why the project activity refers small scale project type II.	OK	OK
A.1.2 The small scale project activity is not a debundled component of a larger project activity? V/V Manual (v 1.2) art. 136	/1/	DR,I	No, the small scale project activity is not a debundled component of a larger project activity.	OK	OK
A.1.3 Does the proposed project activity conform to one of the project categories defined for small scale CDM project activities? V/V Manual (v 1.2) art. 136	/1/	DR,I	Yes, the proposed project activity qualifies for a small scale project as defined in Appendix B of M&P for small scale project activities (UNFCCC, 2006).	OK	OK

A.3 PROJECT DESIGN OF SMALL-SCALE A/R PROJECT ACTIVITIES

N.A					
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VALIDATION REPORT



Validation Protocol Table A3: Resolution of Corrective Action, Forward Action and Clarification Request

Report clarifications and corrective action requests	Ref. to checklist question in table A1 or A2	Summary of project owner response	Validation conclusion
<p>CLA 1</p> <p>Clarify whether the formula used for the recovery of fluid (Liquid recovery index) includes or not propane.</p>	<p>PDD section A.4.2</p>	<p>Project Owner Response:</p> <p>The formula (page 11) includes propane and others condensate.</p> <p>PDD has been changed in order to answer this CL:</p> <ul style="list-style-type: none"> – Before: <i>Liquid Recovery Index (lb mass of C3+ inlet gas in process / lb mass of C3+ stabilized condensate).</i> – Now: Stabilized Condensate Recovery Index (lb mass of C3+ inlet gas in process / lb mass of C3+ stabilized condensate). 	<p>Validation Team Response:</p> <p>The explanation had been accepted. PDD was correctly updated.</p> <p>Validation Team Conclusion:</p> <p>CLOSED</p>
<p>CLA 2</p> <p>In Table 4 is necessary to clarify the difference between the gases used as fuel and the gases emissions.</p>	<p>PDD section B.7.1</p>	<p>Project Owner Response:</p> <p>Table 4 (page 12) is changed according to the request in the PDD.</p>	<p>Validation Team Response:</p> <p>PDD had been correctly updated.</p> <p>Validation Team Conclusion:</p> <p>CLOSED</p>

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Report clarifications and corrective action requests	Ref. to checklist question in table A1 or A2	Summary of project owner response	Validation conclusion
<p>CLA 3</p> <p>In the formula for project emissions calculation, the PE parameter was defined incorrectly as "Baseline emissions".</p>	PDD	<p>Project Owner Response:</p> <p>PDD has been changed in order to answer this CL (page 15):</p> <ul style="list-style-type: none"> - Before: P_{Ey}: the baseline emission of the Mechanical Refrigeration process if this technology were used instead of the project activity - Now: P_{Ey}: the project emission of the Twister process of the project activity 	<p>Validation Team Response:</p> <p>PDD had been correctly updated.</p> <p>Validation Team Conclusion:</p> <p>CLOSED</p>
<p>CLA 4</p> <p>In the literal B.6.2 corresponding to description of "Net Calorific Value of the Natural Gas", was used as a reference the default value of the IPCC, but in the local market this NCV data is available.</p>	PDD section B.6.2	<p>Project Owner Response:</p> <p>PDD has been changed in order to answer this CL:</p> <p>The net calorific value source was changed for both the baseline and the project. It is noted that the gas fuel considered in the PDD is not the natural gas but a fuel gas of similar composition and properties, for this reason it is changing in the document the term "Natural Gas" for "Fuel Gas".</p> <p>Therefore, the net calorific value that is used as new reference were delivered in the concourse prequalification:</p> <ul style="list-style-type: none"> - Baseline: value presented for the company MASA S.A., which is indicated in the item 	<p>Validation Team Response:</p> <p>The explanation was accepted by the DOE.</p> <p>Validation Team Conclusion:</p> <p>CLOSED</p>

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Report clarifications and corrective action requests	Ref. to checklist question in table A1 or A2	Summary of project owner response	Validation conclusion												
		<p>B.6.2.</p> <ul style="list-style-type: none"> - Project: value presented for the company UTGG, which is included in the item B.7.1 because such value will be monitored. <p>The net calorific value were obtained from the proposals presented during the concourse prequalification PRECGEA-512215. It is noteworthy that in this concourse were presented 5 proposals, of which 4 tendered the mechanical refrigeration technology (Traditional technology) and 1 new technology "Twister". Based on the information more completed submitted in the concourse and to meet the requirements established by Ecopetrol SA, baseline was considered the proposal submitted by MASA SA. (Informe del Concurso de Precalificacion , Item 4).</p> <p>Therefore, the source of the net calorific value are obtained from the simulation Hysys results presented by the company MASA S.A. (baseline) and company UTGG (project).</p> <p>Table 1. Comparison of Fuel Gas Specification</p> <table border="1"> <thead> <tr> <th>Especificación</th><th>Baseline</th><th>Project</th><th>Unit</th></tr> </thead> <tbody> <tr> <td>Molecular Weigth</td><td>28.37</td><td>24. 9</td><td>L Lb mol</td></tr> <tr> <td>Lower he ting value</td><td>1,523.18</td><td>1,254.48</td><td>BTU/PCE</td></tr> </tbody> </table> <p>*El poder calorífico neto se obtuvo al multiplicar el poder calorífico neto en unidades BTU/Lbmol por su</p>	Especificación	Baseline	Project	Unit	Molecular Weigth	28.37	24. 9	L Lb mol	Lower he ting value	1,523.18	1,254.48	BTU/PCE	
Especificación	Baseline	Project	Unit												
Molecular Weigth	28.37	24. 9	L Lb mol												
Lower he ting value	1,523.18	1,254.48	BTU/PCE												

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Report clarifications and corrective action requests	Ref. to checklist question in table A1 or A2	Summary of project owner response	Validation conclusion
		<p>equivalente de 1 Lb mol/379.6 PCE.</p> <p>Is attached as supporting documents the results of the simulation:</p> <ul style="list-style-type: none"> – “Anexx 2.pdf”: Simulation Results Mechanical Refrigeration Technology (company MASA SA). “Anexx 3.pdf”: Simulation Results Twister Technology (company UTGG). 	
<p>CLA 5</p> <p>In the literal B.6.2 corresponding to description of $Q_{BE,NG}$, was used Ecopetrol as a source of this parameter, however the estimation was made by MASA S.A.</p>	<p><i>PDD section B.6.2</i></p>	<p>Project Owner Response:</p> <p>Ecopetrol S.A. realized the concourse of Prequalification PRECGEA-512215, taking as one of the participants the company MASA S.A., who provided exclusive technical information for the gas plant Gibraltar. For this reason in the description of the parameter $Q_{BE,NG}$ indicated that the source of the data will be Ecopetrol S.A. since it is they who are proprietors of the information delivered by the participants to the concourse.</p> <p>This parameter at request of Incontec (CAR4) was also broken down into the following uses:</p> <ul style="list-style-type: none"> – $Q_{BE,FG,G}$: Yearly fuel gas consumption by the Mechanical Refrigeration process for electricity generation. – $Q_{BE,FG,H}$: Yearly fuel gas consumption by the Mechanical Refrigeration process for heat. – $Q_{BE,FG,F}$: Yearly fuel gas consumption by manufacturer for flare. 	<p>Validation Team Response:</p> <p>The explanation and the evidences sent were accepted by the DOE</p> <p>Validation Team Conclusion: CLOSED</p>

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<i>Report clarifications and corrective action requests</i>	<i>Ref. to checklist question in table A1 or A2</i>	<i>Summary of project owner response</i>	<i>Validation conclusion</i>
		<p>It should be noted that the source used to determine the amount of fuel gas for electricity generation and heat are based on the results of simulation Hysys of mechanical refrigeration plant presented by the company MASA S.A. in the concourse prequalification. For the amount of fuel gas used for flare (TEAs) is based on estimate made by the company Ecopetrol S.A. product of the data provided by the manufacturer since that information was not delivered by the company in the concourse.</p> <p>As mentioned above lines were modified the formules for calculating baseline emissions in the PDD according to the breakdown by the fuel gas applications.</p> <p>Is attached as supporting documents the results of the simulation "Values MASA.pdf" and "Summary of the Energy Consumption_MASA.doc". Also, the terms of reference where showing the index of evaluation using in the concourse prequalification 512215 ("Annex 1.pdf").</p>	
<p>CAR 1</p> <p>The description of the baseline that is presented in the literal B.4 not include historical performance data of the gas plants operated by the project owner to determine</p>		<p>Project Owner Response:</p> <p>Indicated above, has been confirmed by officials of the Colombian Petroleum Institute (ICP) by letter N° ICP 20-20000, who confirmed that it is not feasible to use for comparison purposes the index of different</p>	<p>Validation Team Response:</p> <p>The explanation and the evidences sent were accepted by the DOE</p>

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Report clarifications and corrective action requests	Ref. to checklist question in table A1 or A2	Summary of project owner response	Validation conclusion
<p>which scenario would be more conservative in comparison to the system used as a baseline in the PDD.</p>		<p>gas plants in Colombia, given that different processes exist and therefore different energy consumption according to treatment that requires the input gas.</p> <p>Ecopetrol SA based on the gas composition of Gibraltar and the profitability of the project (i.e., maximizing the production of higher value products), considered as better alternative the gas treatment production in accordance with government specifications (sales and / or supply) and liquids of greater value, why it considered in the evaluation of the prequalification tender PRECGEA-512 215 the following rates *:</p> <ul style="list-style-type: none"> – Index 1: Volumetric Efficiency Index (greater volume of gas available for sale). – Index 2: Stabilized Condensate Recovery Index (greater volume of stabilized condensate). – Index 3: Energy Efficiency Index (lower energy consumption). <p>In accordance with the statements in the preceding paragraph, 4 of the proponents presented in the concourse considered that the technology that allowed them to perform better in the indexes established by Ecopetrol S.A. is mechanical refrigeration compared to other traditional technologies. Should be noted that Ecopetrol S.A. in the letter “Letter Ecopetrol _technologies.pdf” explains the differences in the use of each of the</p>	<p>Validation Team Conclusion:</p> <p>CLOSED</p>

VALIDATION REPORT



<i>Report clarifications and corrective action requests</i>	<i>Ref. to checklist question in table A1 or A2</i>	<i>Summary of project owner response</i>	<i>Validation conclusion</i>
		<p>traditional technologies of gas treatment and the reasons why the indexes were considered.</p> <p>Therefore, the baseline scenario considered in the PDD is the most conservative, since the indexes used in the prequalification concourse PRECGEA-512215 were exclusively for evaluation the gas Gibraltar when using different processes for its treatment.</p> <p>It should be noted that for the type of gas to be treated in the proposed project activity, the mechanical refrigeration is the best alternative applicable in traditional technology because it does not require large pressure losses (lower energy consumption). Others alternatives that may be applicable, are either the "Joule-Thompson expansion" or "Tturboexpansión" technologies; but, these technologies produce sharp falls in pressure that would demand the use of compressors (energy-consuming equipment) for pressure recovery so they could deliver the gas for sale at a pressure of 1,200 psig (value required by the regulations RUT-Unique Vehicle regulatory, and the supply contract for sale of gas conditioning). There are also other traditional alternative technologies (such as absorption and adsorption), but these technologies are old and require a greater amount of processing equipment, more space for the installation, and increased energy consumption for gas conditioning. For these reasons,</p>	

VALIDATION REPORT



Report clarifications and corrective action requests	Ref. to checklist question in table A1 or A2	Summary of project owner response	Validation conclusion
		<p>the traditional technology "Mechanical Refrigeration" is the best alternative to be used for the proposed project activity because it requires a low energy consuming equipment compared to other traditional technologies. The above is also evident in the proposals submitted in the prequalification concourse PRECGEA-512215.</p> <p>(*) Attached Terms of Reference of the concourse prequalification 512215 (Anexx 1).</p>	
<p>CAR 2</p> <p>The dates of the chronology identified to support the CDM prior consideration in the literal B.5 not include all documents have been verified by the DOE during the on-site visit.</p>	<p>AMS III-F Para: 34</p>	<p>Project Owner Response:</p> <p>CDM Consideration presented in the PDD version 1:</p> <ul style="list-style-type: none"> • March 27th, 2008. Global Environmental License for the Project "Gibraltar gas field". • August 8th, 2008. Proposal Evaluation Report submitted to the closed concourse Nº 513582. • September 19th, 2008. Contract Nº5203383 of the contract 5203383 of "Financing, design, purchase of equipment, supplies, construction, testing, operation and maintenance for 15 years of surface facilities for treating Gibraltar gas field, 	<p>Validation Team Response:</p> <p>The correction was made in the last version of the PDD, it was accepted by DOE.</p> <p>Validation Team Conclusion:</p> <p>CLOSED</p>

VALIDATION REPORT



Report clarifications and corrective action requests	Ref. to checklist question in table A1 or A2	Summary of project owner response	Validation conclusion
		<p>belonging to the vice president of Ecopetrol production" between Ecopetrol and Union Temporary Gas Gibraltar (UTGG)¹. Clause 6. Special obligations of the contractor, paragraph 39: "Delivery to Ecopetrol, the information that it requires, with the purpose of to advance before the pertinent entities to Clean Development Mechanism – CDM". → Start date of the project activity</p> <ul style="list-style-type: none"> December 4th, 2008. Project Idea Note (PIN) for the Gibraltar Project. December 9th, 2008. Letter to the DNA with the intention of Ecopetrol S.A. of submitting the project to the CDM. December 23th, 2008. No objection Letter from the DNA for the project in analysis². <p>The previous schedule included the following evidence:</p> <ul style="list-style-type: none"> August 14th, 2006, Ecopetrol S.A. informs to "Environmental, Housing, and Territorial Development Ministry" on your interest to start structuring a portfolio of CDM projects and requested the support of Group Mitigation of Change Climate³. 	

¹ Conformed for the companies: Montecz S.A. (50%), Conequipos Ingenieros LTDA (40%), Gasmocam S.A. (5%) and Twister BV (5%).

² This letter is a mechanism established by the DNA to give early warning of interest to consider the CDM to develop a project.

³ The Ministry denied the support.

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Report clarifications and corrective action requests	Ref. to checklist question in table A1 or A2	Summary of project owner response	Validation conclusion
		<ul style="list-style-type: none"> March 19th, 2008. Ecopetrol S.A. signed a collaboration agreement with the Inter-American Development Bank for the identification and development under the CDM of potential emission reduction projects associated with its activities. <p>Also corrected paragraph “August 8th, 2008. Proposal Evaluation Report submitted to the closed concourse N° 513582” for “May 29th, 2008. Evaluation Committee Report of the prequalification concourse PRECGEA-512215”.</p>	
<p>CAR 3</p> <p>The criteria used to define the choice of technology for the Gibraltar project, no evidence that the prevailing approach has been the technological barrier, not economic</p>	<p>PDD section B.7.1</p>	<p>Project Owner Response:</p> <p>According to the “Guidelines for demonstration and Objective Assessment of barriers” technological barrier (lines above) presented as support for the demonstration of additionality should be monetized, because the project “Improving energy efficiency in a new Gas Plant in Gibraltar-Colombia” no there has been an investment analysis that barrier is removed.</p> <p>It also removed the barrier “other barriers (d)” (lines above) since it means a risk to the construction of the gas plant in Gibraltar itself and not for implementation as CDM project.</p> <p>Therefore, in order to demonstrate the additionality</p>	<p>Validation Team Response:</p> <p>The explanation was accepted by the DOE</p> <p>Validation Team Conclusion:</p> <p>CLOSED</p>

VALIDATION REPORT



Report clarifications and corrective action requests	Ref. to checklist question in table A1 or A2	Summary of project owner response	Validation conclusion
		would only be used as support the barrier: (c) Barriers due to prevailing practice PDD has been changed in order to answer this CR.	
<p>CAR 4</p> <p>Literal B.7.1 also need to include the total consumption of Natural Gas according with three sources identified during the on-site visit (NG of flare, NG to Boiler and NG for electricity generation).</p>	PDD section A2	<p>Project Owner Response:</p> <p>The parameter "$Q_{PE,NG}$" at request of Icontec was broken down into the following uses:</p> <ul style="list-style-type: none"> – $Q_{PE,FG,G}$: Yearly fuel gas consumption by the activity project for electricity generation. – $Q_{PE,FG,H}$: Yearly fuel gas consumption by the activity project for heat. – $Q_{PE,FG,F}$: Yearly fuel gas consumption by manufacturer for flare. <p>The amount of fuel gas for electricity generation and heat are base on the values presented by the company UTGG in the concourse prequalification which are results of simulation Hysys of twister plant. In the case, of the amount of fuel gas used for flare (TEAs) is based on estimate made by the company Ecopetrol S.A. product of the data provided by the manufacturer since that information was not delivered by the company in the concourse. Such values will be monitored by Ecopetrol S.A. during the crediting period.</p> <p>As mentioned above lines were modified the</p>	<p>Validation Team Response:</p> <p>The explanation was accepted by the DOE</p> <p>Validation Team Conclusion: CLOSED</p>

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Report clarifications and corrective action requests	Ref. to checklist question in table A1 or A2	Summary of project owner response	Validation conclusion
		<p>formulas for calculating baseline emissions in the PDD according to the breakdown by the fuel gas applications.</p> <p>Is attached as supporting documents the results of the simulation "Letter UTGG_Values.pdf" (It should be noted that in this letter confirms that the company UTGG values used in the calculations correspond to those presented in the pre-qualification concourse). Also, the terms of reference where showing the index of evaluation using in the concourse prequalification 512215 ("Annex 1.pdf").</p>	
<p>CAR 5</p> <p>The start date of the first crediting period is not properly defined.</p>	PDD	<p>Project Owner Response:</p> <p>PDD has been changed in order to answer this CR.</p> <p>The estimated date for the beginning of the first crediting period is December 1st, 2011 but the project plans to start its Monitoring and Crediting period only as soon as it is officially registered as a CDM activity.</p> <p>In addition was corrected the date of start operation of activity project, it is June 1st, 2011.</p>	<p>Validation Team Response:</p> <p>The explanation was accepted by the DOE, the PDD had been correctly updated.</p> <p>Validation Team Conclusion: CLOSED</p>
<p>CAR 6</p> <p>For the development of the final version of the PDD should use</p>	PDD section A2	<p>Project Owner Response:</p> <p>The new version of the PDD includes all changes seen in the latest version of the methodology</p>	<p>Validation Team Response:</p> <p>PDD had been correctly updated</p>

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Report clarifications and corrective action requests	Ref. to checklist question in table A1 or A2	Summary of project owner response	Validation conclusion
<p>the latest version of the methodology AMS II.D "Energy efficiency and fuel switching Measure for industrial facilities (see 12)."</p>		<p>AMS.II.D. "Energy efficiency and fuel switching Measure for industrial facilities" (version 12).</p> <p>In the case of determining the baseline scenario, the methodology AMS.IID v.12 states: the energy baseline consists of facility that would otherwise be built; the most plausible baseline scenario for the project activity shall be evaluated based on the related and relevant requirements in the General Guidance for SSC methodologies.</p> <p>The calculations of associated baseline emissions will be determined based on emissions that would generate the Mechanical Refrigeration plant in the treatment of the natural gas from the Gibraltar field.</p> <p>These parameters are not known ex-ante but were obtained from the project owner based on a tender requested by them to provide an efficient system to treat the gas from the Gibraltar field (prequalification concourse PRECGEA-512215). The information available for the baseline calculation is taken from the analysis of the better traditional technology offer for Mecánicos Asociados S.A. (MASA S.A.)⁴, which</p>	<p>Validation Team Conclusion: CLOSED</p>

⁴ Evaluation Committee Report of the prequalification concourse PRECGEA-512215 "Financing, design, purchase of equipment, supplies, construction, testing, operation and maintenance for 15 years of surface facilities for treating Gibraltar gas field, belonging to the vice president of Ecopetrol production. (Informe Comité Evaluador del Concurso de Precalificación PRECGEA-512215 "Financiación, diseño, compra de equipos, suministros, construcción, pruebas, operación y mantenimiento por 15 años de las facilidades de superficie para el tratamiento del gas del campo Gibraltar perteneciente a la vicepresidencia de producción de Ecopetrol S.A.

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<i>Report clarifications and corrective action requests</i>	<i>Ref. to checklist question in table A1 or A2</i>	<i>Summary of project owner response</i>	<i>Validation conclusion</i>
		<p>used the Mechanical Refrigeration process; such offer was evaluated based on the following indices:</p> <ul style="list-style-type: none"> • Volumetric Efficiency Index, greater volume of gas available for sale (Unit: lb mass inlet gas / lb mass sales gas). • Stabilized Condensate Recovery Index, greater volume of stabilized condensate (Unit: lb mass of C3+ inlet gas in process / lb mass of C3+ stabilized condensate) • Energy Efficiency Index, lower energy consumption (Unit: (MBtu consumed in process / lb mass inlet gas). <p>It should be noted that Ecopetrol S.A. established the above mentioned indexes in base the gas composition of Gibraltar and the profitability of the project (i.e., maximizing the production of higher value products), considered as better alternative the gas treatment production in accordance with government specifications (sales and / or supply) and liquids of greater value,. In accordance with the indicated, 4 of the proponents presented in the concourse considered that the technology that allowed them to perform better in the indexes established by Ecopetrol S.A. is mechanical</p>	

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<i>Report clarifications and corrective action requests</i>	<i>Ref. to checklist question in table A1 or A2</i>	<i>Summary of project owner response</i>	<i>Validation conclusion</i>
		refrigeration compared to other traditional technologies ⁵ .	

⁵ Ecopetrol SA in the letter “Letter Ecopetrol _technologies.pdf” explains the differences in the use of each of the traditional technologies of gas treatment and the reasons why the indexes were considered.

	<p>VERIFICATION REPORT</p>	
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ANNEX B TEAM AUDIT EXPERIENCE AND KNOWLEDGE

CDM lead Auditor Eng. Ana Maria Zapata Velez

Master of Science in Chemistry, 2010. Universidad de Antioquia (Colombia)

Chemical Engineer, 2005. National University of Colombia.

Environmental Management Systems. ICONTEC 2010.

Life Cycle Assessment: Introduction to life cycle analysis and advanced modelling. Conducted by the Center for LCA and sustainable design of Mexico, Medellin, Colombia, August 2009.

Course ISO 14064 "Greenhouse Gases inventory." Costa Rica, April 2009.

Theoretical Course about Clean Development Mechanisms (CDM). National Cleaner Production Center -Colombia. April 2008.

May 2010 – present

Climate Change Professional ICONTEC.

To prepare and perform the certification services assigned as per her Career Plan qualification, according to the stated on the procedures. To provide guidance to the certification costumers about the technical aspects of the assigned services provision. To participate in changing or designing Certification services, by changing or creating the respective procedures.

2008-2010

Chemical Engineer in Life cycle assessment. National Cleaner Production Center.

Development of projects related to inventories of greenhouse gas emissions, life cycle assessment applied to design processes and products and carbon footprint. Implementation of CDM projects (Clean Development Mechanism), related to the transport sector (AMS methodologies IIIU, ACM0016 and AM0031), participation in cleaner production projects related to efficient use of water, energy and waste management.

Experience in CDM activities: 2010

Participation as GHG auditor of:

- Validation of Improving energy efficiency in a new Gas Plant in Gibraltar Colombia.
- Verification Gibraltar Gas Plant
- Verification Agua La Joya Hydroelectric Project
- Verification Biogas energy plant from palm oil mill effluent
- Validation of Greenfield biogas project at Biocastilla industrial complex

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Participation as GHG specialist of:

- Verification Fertilizer Nitrous Oxide Abatement Project
- Verification of Monomers Nitrous Oxide Abatement project

Sectoral specialist Jorge Pinto N.

PHD Energy Economics, Dijon University of France, France Institute of oil, 1983
MSC Hydrocarbons Economics, Simon Bolivar University, Venezuela, 1979
Mechanical Engineer, National University of Colombia, 1977

Work experience

Consultant, from October, 1998.

Consultant in energy, and in the regulatory area of public services, with emphasis in Electricity, oil and gas. Among the advised institutions are Colombian public agencies, national and multinational companies working Colombia as UPME, CREG, Ministry of Energy and Mines of Colombia, TGI (Ecogas), Cerromatosa, Texas Petroleum, INTERCOR (Cerrejón), ISA, Asocaña, Enron, Agrengas, Gas Natural S.A., Camara de Comercio de Cuenca (Ecuador), PDVSA and ECOPETROL.

1998 / 1995

Regulatory Commission in Electricity and Gas of Colombia (CREG)
Commissioner in the CREG and Executive Director from January till July 1998.
Expert in public services regulation of electricity and gas. Commissioner first and then Executive Director of the CREG in Colombia. Development of the tariff and regulatory frames in electricity, natural gas and LPG. Participation in the initial structuration of the new regulatory policy from 1995 till the end of 1998.

1995 / 1993

Adviser in the Hydrocarbons in the Infrastructure and Energy unit, Departamento Nacional de Planeación, DNP (National Planning Department of Colombia). Participation in the preparation of the National Energy Plan of Colombia.
Planning about all issues related to exploration, and oil and gas production, oil refining and marketing of refined products. Participation in the project of restructuring the hydrocarbon sector in Colombia.

1992 / 1984

Esso Colombiana Ltd.
Senior Analyst in the Financial and Planning Department and Engineer in the Production Department.
Economic evaluation of exploration projects and production of hydrocarbons.

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Another training Courses

1998, 3rd. International Training Program on Utility Regulation and Strategy. Gainesville, Florida, USA.

1997, Natural Gas for Power Generation – Economics, Technologies and Markets. Oxford, UK.

1996, Price Risk Management for the Natural Gas and Electricity Industries. Oxford, UK.

1995, Electricity Regulatory Course, Adam Smith Institute, UK

1994, Managing International Petroleum Investment, University of Dundee, UK.

1986, School of Field Engineering, Exxon Production Research Co., Houston, Texas, USA.

1985, Production Engineering - Exxon Production Research Co., Houston, Texas, USA.

1985, Introduction to Production Engineering - Exxon Production Research Co., Bogotá.

1985, Producción Operations I, Oil and Gas Consultants Int., Lagunillas, Venezuela.

1985, Artificial Lift - Exxon Production Research Co., Provincia, Colombia.

1981 Diploma in studies in mathematics applied to economy. Ecole Nationale Supérieure du Pétrole et des Moteurs. Paris, France, 1981.

1980, Management Simulation - IBM de Venezuela. Caracas.

Experience in CDM activities 2010 -2011

- Validation of Reduction of energy consumption during hydraulic lime production for construction purposes by adding Alternative Materials and Additives