VALIDATION REPORT

Flare gas recovery project at Uran plant, Oil and Natural Gas Corporation (ONGC) limited in India

REPORT NO. 2007-9103-04

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VALIDATION REPORT

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Client: Oil and Natural Gas Corporation Limited	Client ref.: Ashok B Chakraborty

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Project Name: Flare gas recovery project at Uran plant, Oil and Natural Gas Corporation (ONGC) limited
Country: India
Methodology: AM0037
Version: 1.1
GHG reducing Measure/Technology: Installation of flare gas recovery system.
ER estimate: 97,740 tonnes CO_2 per annum
Size
☒ Large Scale
☐ Small Scale
Validation Phases:
☒ Desk Review
☒ Follow up interviews
☒ Resolution of outstanding issues
Validation Status
☒ Corrective Actions Requested
☒ Clarifications Requested
☒ Full Approval and submission for registration
☐ Rejected

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Report title:
Flare gas recovery project at Uran plant, Oil and Natural Gas Corporation (ONGC) limited in India

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Key words:

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Abbreviations

CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction
CH_4	Methane
CII	Confederation of Indian Industries
CL	Clarification request
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
DNV	Det Norske Veritas
DNA	Designated National Authority
FGRU	Flare gas recovery unit
FICCI	Federation of Indian Chambers of Commerce and Industry
GHG	Greenhouse gas(es)
GPG	Good Practice Guidelines
GT	Gas turbine.
GWP	Global Warming Potential
HSE	Health, safety and environment.
IPCC	Intergovernmental Panel on Climate Change
MMSCM	Million Standard Cubic Meter
MP	Monitoring Plan
N_2O	Nitrous oxide
NGO	Non-governmental Organisation
ODA	Official Development Assistance
ONGC	Oil and Natural gas corporation
PDD	Project Design Document
PLC	Programatic logic controller
SCMD	Standard cubic meter per day
UNFCCC	United Nations Framework Convention on Climate Change

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1 EXECUTIVE SUMMARY – VALIDATION OPINION

Det Norske Veritas Certification AS (DNV) has performed a validation of the "Flare gas recovery project at Uran plant, Oil and Natural Gas Corporation (ONGC) limited*" in India. 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 have provided DNV with sufficient evidence to determine the fulfillment of stated criteria.

The host country is India. No Annex I country has been identified yet. India fulfils the participation criteria and has approved the project and authorized the project participants. The DNA of India confirmed that the project assists in achieving sustainable development.

The project correctly applies AM0037 "Flare reduction and gas utilization at oil and gas processing facility", version 1.1.

By installation of a flare gas recovery unit the waste gas that would have been flared in the baseline is recovered and processed in the gas processing complex to produce energy yielding products, the project results in reductions of CO_2 emissions that are real, measurable and give long-term benefits to the mitigation of climate change. It is demonstrated that the project is not a likely baseline scenario. Emission reductions attributable to the project are hence additional to any that would occur in the absence of the project activity.

The total emission reductions from the project are estimated to be on the average 97,740 tCO_2e per year over the selected 10 year crediting period. The emission reduction forecast has been checked and it is deemed likely that the stated amount is achieved given that the underlying assumptions do not change.

Adequate training and monitoring procedures have been implemented.

In summary, it is DNV's opinion that the "Flare gas recovery project at Uran plant, Oil and Natural Gas Corporation (ONGC) limited" in India, as described in the PDD of 05 October 2007, meets all relevant UNFCCC requirement for the CDM and all relevant host country criteria and correctly applies the baseline and monitoring methodology AM0037, version 1.1. DNV thus requests the registration of the project as a CDM project activity.

2 INTRODUCTION

Oil and Natural Gas Corporation Limited of India has commissioned DNV Certification AS to perform a validation of the “Flare gas recovery project at Uran plant, Oil and Natural Gas Corporation (ONGC) limited” in India. This report summarises the findings of the validation of the project, performed on the basis of UNFCCC criteria for the CDM, as well as criteria given to provide for consistent project operations, monitoring and reporting. UNFCCC criteria refer to Article 12 of the Kyoto Protocol, the CDM modalities and procedures and the subsequent decisions by the CDM Executive Board.

2.1 Objective

The purpose of a validation is to have an independent third party assess the project design. In particular, the project's baseline, monitoring plan, and the project’s compliance with relevant UNFCCC and host Party 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 to provide assurance to stakeholders of the quality of the project and its intended generation of certified emission reductions (CERs).

2.2 Scope

The validation scope is defined as an independent and objective review of the project design document (PDD). The PDD is reviewed against the criteria stated in Article 12 of the Kyoto Protocol, the CDM modalities and procedures as agreed in the Marrakech Accords and the relevant decisions by the CDM Executive Board, including the approved baseline and monitoring methodology. The validation team has, based on the recommendations in the Validation and Verification Manual employed a risk-based approach, focusing on the identification of significant risks for project implementation and the generation of CERs.

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

3 METHODOLOGY

3.1 Desk Review of the Project Design Documentation

The following table outlines the documentation reviewed during the validation:

/1/ *ONGC: CDM-PDD initial version dated 6 February 2006 and final version dated 05 October 2007*

/2/ *ONGC: CER calculations excel spreadsheets, "CER-URAN-AM0037-07-Jun-07.xls"*

/3/ *ONGC: Natural gas average calorific value determination spreadsheet, "NCV-uran.xls".*

/4/ *ONGC: Fuel consumption for power generation spreadsheet, "GT FUEL DIS 05-06.xls"*

/5/ *ONGC: Schematic diagram of flare gas compressor system with hookup diagram*

/6/ *ONGC: Write-up on the modifications done post project implementation on the fuel gas compressor system.*

/7/ *ONGC: Schematic diagram of the original flare system in Uran.*

/8/ *ONGC: Write-up on the presentation made at NPMP award on Zero emission.*

/9/ *ONGC: Documentation on stakeholder consultation process, "Minutes of meeting_stakeholders.doc"*

/10/ *Nicco Corporation Ltd.: Correspondences with ONGC regarding pump seal failure and fan failure.*

/11/ *Kirloskar Pneumatics Ltd.: Correspondence with M/s ONGC regarding the compressor failure and vibration in compressor skid.*

/12/ *Nicco Corporation Ltd.: Correspondence with M/s Kirloskar Pneumatics Ltd. On the request of deployment of technical personnel from M/s Howden compressors and on the project being the first of its kind in the region.*

/13/ *ONGC: Conference Program at 5th SPE international conference held at Stavanger, Norway from 26th to 28th June 2000.*

/14/ *ONGC: Communication from TERI to Mr. A B Chakraborty for participation and presentation at the "Corporate Roundtable on development of strategies for the Envrionment (CORE)" dated 11 December 2001.*

/15/ *International Emission Trading Association (IETA) & the World Bank's Prototype Carbon Fund (PCF): Validation and Verification Manual. http://www.vvmanual.info*

/16/ *AM0037, version 1.1 'Flare reduction and gas utilization at oil and gas processing facility" sectoral scope 10 and 5 dated 29 September 2006.*

/17/ *DNA of India: Letter of Approval dated 14 June 2006.*

3.2 Follow-up Interviews with Project Stakeholders

On 15 June 2006, DNV performed interviews with project stakeholders to confirm selected information and to resolve issues identified in the document review. Representatives of ONGC were interviewed. The main topics of the interviews are summarised in Table 1.

Table 1 Interview topics

Interviewed organisation	Interview topics
ONGC- Uran asset	➢ Starting date of project activity ➢ Assessment of project additionality and discussed barriers ➢ Validation of emission reduction calculations and data used therein ➢ Review of project design and technology used therein. ➢ Review of monitoring and verification procedure of the project and management structure of the organisation for the project activity. ➢ Review of the stakeholder consultation process.

3.3 Resolution of Outstanding Issues

The objective of this phase of the validation is to resolve any outstanding issues which need be clarified prior to DNV's positive conclusion on the project design. In order to ensure transparency a validation protocol is customised for the project. The protocol shows in transparent manner criteria (requirements), means of verification and the results from validating the identified criteria. The validation protocol serves the following purposes:

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

The validation protocol consists of two tables. The different columns in these tables are described in the figure below. The completed validation protocol for the "Flare gas recovery project at Uran plant, Oil and Natural Gas Corporation (ONGC) limited" is enclosed in Appendix A to this report.

Findings established during the validation can either be seen as a non-fulfilment of CDM criteria or where a risk to the fulfilment of project objectives is identified. Corrective action requests (CAR) are issued, where:

i) mistakes have been made with a direct influence on project results;
ii) CDM and/or methodology specific requirements have not been met; or
iii) there is a risk that the project would not be accepted as a CDM project or that emission reductions will not be certified.

A request for clarification (CL) may be used where additional information is needed to fully clarify an issue.

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Validation Protocol Table 1: Mandatory Requirements for CDM Project Activities		
Requirement	***Reference***	***Conclusion***
The requirements the project must meet.	*Gives reference to the legislation or agreement where the requirement is found.*	*This is either acceptable based on evidence provided (**OK**), a **Corrective Action Request (CAR)** of risk or non-compliance with stated requirements or a request for **Clarification (CL)** where further clarifications are needed.*

Validation Protocol Table 2: Requirement checklist				
Checklist Question	***Reference***	***Means of verification (MoV)***	***Comment***	***Draft and/or Final Conclusion***
The various requirements in Table 2 are linked to checklist questions the project should meet. The checklist is organised in different sections, following the logic of the large-scale PDD template, version 03 - in effect as of: 28 July 2006. Each section is then further sub-divided.	*Gives reference to documents where the answer to the checklist question or item is found.*	*Explains how conformance with the checklist question is investigated. Examples of means of verification are document review (DR) or interview (I). N/A means not applicable.*	*The section is used to elaborate and discuss the checklist question and/or the conformance to the question. It is further used to explain the conclusions reached.*	*This is either acceptable based on evidence provided (**OK**), or a **corrective action request (CAR)** due to non-compliance with the checklist question (See below). A request for clarification (CL) is used when the validation team has identified a need for further clarification.*

Validation Protocol Table 3: Resolution of Corrective Action and Clarification Requests			
Draft report clarifications and corrective action requests	***Ref. to checklist question in table 2***	***Summary of project owner response***	***Validation conclusion***
If the conclusions from the draft Validation are either a CAR or a CL, these should be listed in this section.	*Reference to the checklist question number in Table 2 where the CAR or CL is explained.*	*The responses given by the project participants during the communications with the validation team should be summarised in this section.*	*This section should summarise the validation team's responses and final conclusions. The conclusions should also be included in Table 2, under "Final Conclusion".*

Figure 1 Validation protocol tables

3.4 Internal Quality Control

The draft validation report including the initial validation findings underwent a technical review before being submitted to the project participants. The final validation report underwent another technical review before requesting registration of the project activity. The technical review was performed by a technical reviewer qualified in accordance DNV's qualification scheme for CDM validation and verification.

3.5 Validation Team

The validation team consisted of the following personnel:

Chandrashekara Kumaraswamy	DNV Certification India	Team Leader
Soumik Biswas	DNV Certification India	CDM validator.
Subhendu Biswas	DNV Certification India	Sector expert
Michael Lehmann	DNV Certification Oslo	Technical reviewer.

The qualification of each individual validation team member is detailed in Appendix B to this report.

4 VALIDATION FINDINGS

The findings of the validation are stated in the following sections. The validation criteria (requirements), the means of verification and the results from validating the identified criteria are documented in more detail in the validation protocol in Appendix A.
The final validation findings relate to the project design as documented and described in the revised and resubmitted project design documentation version 3 dated 5 October 2007.

4.1 Participation Requirements

"Oil and Natural Gas Corporation Limited" of India is the only participating entity in the project. The project is proposed as a unilateral project and no Annex-I country has yet been identified. The host country India meets all the requirements for participating in a CDM project. The Ministry of Environment and Forests, the DNA of India has approved the project with a letter of approval dated 14 June 2006 which also confirms that the project assists in achieving sustainable development in India.

4.2 Project Design

The project involves installation of a flare gas recovery unit in the existing oil and gas processing complex at the Uran asset of ONGC. The Uran plant is an on-shore installation that receives oil and part of the gas produced in Mumbai High offshore oil field and adjoining basin. The gas processing complex at Uran has an integrated flare network for flaring of tail gases generated from the processing units and storage facility. In the absence of the project around 95 000 SCMD to 150 000 SCMD of tail gas were flared at the installation.

Under the project, the tail gas which was previously flared is being recovered by installing an oil flooded screw compressor, which takes suction from the flare header network and discharges the flare gas to the gas processing complex for conversion to LPG, C2-C3, naphtha and lean gas. The flare gas recovery unit consists of a suction piping along with knock out drums, discharge piping and related instrumentation along with auxiliary units. The flare gas

compressor is of M/s Howden Compressor make supplied by M/s Kirloskar Pneumatic Company Limited. The compressor is designed to handle flare gas of molecular weight from 19.5 to 36.2.

The contract for setting up the FGRU was awarded to M/s Nicco Corporation on 20 November 2001 which is taken as the start date of the project. The project was subsequently commissioned on 2 August 2003 and the lifetime of the project is 18 years. The lifetime of the project activity is reasonable. The project has selected a non-renewable crediting period of 10 years starting from 15 September 2007.

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

4.3 Baseline Determination

The project applies the approved baseline methodology AM0037, version 1.1 dated 29 September 2006. AM0037 is applicable to projects which recover tail gas from a gas processing complex and utilize the gas for production use. The selected baseline methodology is applicable to the project activity as it has been demonstrated that:

- Prior to installation of the compressor skid the tail gas was flared at the gas processing complex,
- The recovered tail gas is further processed in the gas processing complex to produce value added fuel products which replace like intensity fuel in the market,
- The fuel products produced from the recovered tail gas will substitute fuel imported for meeting the supply scenario in the region and will not lead to increase in fuel pool,
- The energy required for recovery of the tail gas and processing of the same is generated with gas based self generated power and
- Accurate data is available on the carbon content of the recovered gas and the quantity of gas recovered by the FGRU unit.

In line with the requirement of the methodology all the plausible baseline scenarios for the project have been identified. These include the following baseline options:

- Flaring of the tail gas at the oil and gas processing complex
- Onsite consumption of the tail gas for power generation at site.
- Injection of the tail gas into oil reservoir
- Other alternative feed stocks to an off-site facility
- Use of tail gas as feedstock at offsite facility and
- The project activity itself without CDM benefits.

All the baseline options are evaluated against a set of common barriers which included technical feasibility, technological barrier, organizational barrier with respect to availability of skilled manpower and availability of infrastructural facility. It is demonstrated that flaring of the tail gas at the oil and gas processing complex is the most likely baseline scenario for the project.

The baseline emissions for the project is estimated based on the monitored amount of daily average quantity of flare gas recovered by the FGRU for the period January 2006 to

December 2006. Carbon content of the gas recovered is taken as the average carbon content of the gas as analyzed in the in-plant laboratory.

4.4 Additionality

The project's additionality is demonstrated using "Tool for the demonstration and assessment of additionality", version 03.

Step 0: Since the project activity does not seek for retroactive credits, this step is not applicable to the project activity. However as the start date of the project is prior to registration of the project, the following documents were presented as evidence that CDM was considered during project inception.

- Internal note dated 5 January 2001 from Head, Environment management, to all asset managers, Basin Managers and Head work centers which urges the assets to develop CDM projects as per the Kyoto protocol framework.
- Communication from Head HSE dated 31 August 2002 to Head, Corporate communication, providing related information on principals of global compact for inclusion in the ONGC annual report. The note clearly states that "All possible efforts are continuing to ensure reduction of emissions that contribute to global warming". It stresses that work is on to reduce gas flaring and achieve "zero gas flaring" at the assets.
- Proof of participation of ONGC in the senior level seminar organized by CII and "The Atlantic Council, USA" to promote clean air and reduce pollution associated with energy use in India and China. The invitation letter from CII to ONGC is dated 8 April 2002.
- Proof of Participation of ONGC in FICCI-LBG roundtable on "The greenhouse gas protocol and opportunities for its adoption by Indian industries and electrical utilities".
- Proof of participation of ONGC in fifth SPE International conference on health, safety and environment in oil and gas exploration held on 26 June 2000. The program schedule includes presentations from ONGC on control measures in offshore E&P contractor operations and includes technical sessions on "global climate change".

Step 1: 6 alternatives to the project activity were considered for assessing the baseline scenarios for the project. All the alternatives were in compliance with the statutory and regulatory requirements of host country India. All the baseline options are evaluated against a set of common barriers which included technical feasibility, technological barrier, organizational barrier with respect to availability of skilled manpower and availability of infrastructural facility. It is demonstrated that flaring of the tail gas at the oil and gas processing complex is the most likely baseline scenario for the project.

Step 2: Investment analysis

This step has not been selected.

Step 3: The additionality of the project has been demonstrated by assessing the prevailing practice barrier and the technological barrier.

Technological barrier; The project involves installation of a compressor unit that would take suction from the flare header and transport the recovered gas to the gas processing units for conversion to value added products. Detailing of the compressor unit required extensive data collection in all possible scenarios and mode of operation of the unit and the most daunting task was to design a unit to suitable to cater the wide variability in flare gas flow.

Data collection during detail engineering phase confirmed that the flare gas flow varied from around 30000 SCMD to 150000 SCMD. The molecular weight of the flare gas also varied from 19.5 to 36.2 kg/kg-mole. This variation in flare gas is also evident from the gas analysis of actually recovered gas in the FGRU during the period January 2006 to December 2006. The wide variation in gas flow and molecular weight called for installation of a screw compressor with stepless loading facility.

There are no indigenous suppliers of screw compressor and thus the organization had to contract M/s Howden Compressor for supply of the compressor through M/s Kirsolkar Pneumatics Limited. Lack of operational and maintenance knowledge of the installed unit is also a barrier to the successful operation of the unit. Training records from the plant confirmed that specialized training had to be imparted to the operation personnel to overcome this barrier to the project.

The project being the “first of its kind” faced technological barrier during commissioning and streamlining of the unit. Several modifications had to be carried out post installation to overcome these technical barriers. Communication from M/s Nicco Corporation limited, project division, to M/s Kirloskar Pneumatics limited dated 17 December 2003 confirmed that the flare gas recovery project was the first of its kind in the country.

Communications between ONGC, Kirloskar Pneumatics and Nicco Corporation limited confirmed that

- The compressor block had been under shutdown on several occasions since 13 December 2003 due to high thrust vibration problem. Expertise had to be sought from M/s Howden Compressor, UK, and M/s Bentley Nevada for assessment and mitigation of the problem. The problem had been recurring ever since and continued to affect the operations of the unit until late 2005.
- The unit encountered repetitive failure of the mechanical seal of oil pumps installed by M/s Nicco Corporation limited. These repeated failures resulted in loss to ONGC in the form of leakage and heavy loss of costly imported synthetic oil from the unit.
- The unit encountered repeated failure of the lube oil cooler fan due to problems in the gear box which is not a standard supply as confirmed by M/s Paharpur who had supplied the same.
- The organization had to organize a specialized training of the instrumentation personnel by M/s Seimens on usage and configuration of PLC software for the FGRU.
- Blade angle of the lube oil coolers had to be re-oriented post commissioning as the incorrect blade angle had been adversely affecting the performance of the oil coolers.
- Several modifications had to be carried out since the operation and maintenance departments were facing severe problem in monitoring the oil level in the gear reducer of the compressor lube oil unit during operation.

- The unit had to carry out structural modifications as designed by M/s Nicco Corporation to reduce high vibration in the skid.

Prevailing practice barrier: Communication from M/s Nicco Corporation limited, project division, to M/s Kirloskar Pneumatics limited dated 17 December 2003 confirmed that the flare gas recovery project was the first of its kind in the country. The organization received the National Petroleum Management Program (NPMP) award in the year 2003~2004 as a recognition of the organizations' pioneering effort in flare gas recovery.

Step 4: As discussed under the "Prevailing practice barrier" the project is the first of its kind in the region and there are no precedence for the project.

The CDM benefits will provide additional funds for risk coverage due to the technical complexity and uniqueness of the project. It will also provide funds to ensure proper operation of the system and identifying other avenues of potential GHG mitigating projects.

The above mentioned barriers adequately demonstrate that the project activity is not a likely business-as-usual activity and hence can be deemed additional to what would otherwise occur.

4.5 Monitoring

The project applies the approved monitoring methodology AM0037. The monitoring methodology AM0037 is used in conjunction with the baseline methodology and the applicability criteria is the same. The project involves recovery of the tail gas generated in the oil and gas processing unit which would have been flared in the absence of the project.

The methodology is justifiably applicable to the project as it is demonstrated that:

- Prior to installation of the compressor skid the tail gas was flared at the gas processing complex,
- The recovered tail gas is further processed in the gas processing complex to produce value added fuel products which replace like intensity fuel in the market.,
- The fuel products produced from the recovered tail gas will substitute fuel imported for meeting the supply scenario in the region and will not lead to increase in fuel pool,
- The energy required for recovery of the tail gas and processing of the same is generated with gas based self generated power and
- Accurate data is available on the carbon content of the recovered gas and the quantity of gas recovered by the FGRU unit.

The monitoring parameters and the frequency of recording of the data are in line with the requirements of the approved methodology AM0037. The monitoring plan provides for the collection of all relevant data necessary for the estimation of the baseline and project emissions.

The Indian DNA does not ask for inclusion of sustainable developmental indicators in the monitoring plan of the project.

4.5.1 Parameters determined ex-ante

The following parameters have been determined ex-ante for the project:

- Fugitive emission factor for methane associated with transportation of gas from flare header to the processing facility. IPCC GPG 2000, tier-01 emission factor has been used in calculation and is confirmed to be in order.
- Travel length of the suction and discharge piping of the FGRU. This has been confirmed from the as built diagram of the unit.
- GWP of the emission sources. This is as per IPCC default and is confirmed to be correct.
- Dimensions of the suction and discharge piping for estimation of release of gas in the event of an accident. This parameter has been cross verified against the as built diagram and confirmed to be in order.

4.5.2 Parameters monitored ex-post

The following parameters will be monitored under the project activity:

- Amount of flare gas recovered by the FGRU and transported to the processing unit for further processing.
- Carbon content of the tail gas that is recovered which would have been flared in the baseline.
- Energy consumption by the FGRU skid for transportation of the recovered gas.
- Emission factor for self generated power which is used for transportation of the recovered gas.
- Parameters for estimation of methane emission associated with accidental release of the gas from pipeline.
- Number of purge points in the flare header and related flow to discount the same from emission reduction calculations.
- Net calorific value of the gas used in the gas turbines for generation of power.

No leakage is envisaged for the project activity. The products from the recovered gas do not lead to increase in fuel pool and do not replace any other fuel type of lower carbon intensity.

4.5.3 Management system and quality assurance

The project proponent has provided for experts who are responsible for overseeing the whole monitoring plan. Procedures for monitoring and verification have been presented and found to be in order. The monitoring plan details the parameters, source, method of collection and method of archiving the data which is adequate. The organisation has established a management structure for the CDM project with clear roles and responsibilities, calibration of measuring instruments and authority for necessary corrective actions.

4.6 Estimate of GHG Emissions

The GHG calculations are documented in a transparent manner and as per the equations provided in AM0037.

The baseline emissions are estimated based on the daily average amount of gas recovered by the FGRU. The amount of purge flow from the 21 purge points are estimated and discounted from the recovered gas flow value to make the estimate conservative in nature.

The carbon content of the recovered gas is monitored on a daily basis and the monthly average carbon content is taken for estimation of the baseline emissions.

Project emissions are estimated to account for fugitive emissions associated with transport of tail gas from flare header to the process units, energy consumed by the FGRU for recovery of the tail gas and energy consumed in the process plant for processing the gas recovered by the FGRU.

The energy consumed in the FGRU is based on monthly average monitored amount of energy consumed by the compressor unit and name plate rating of the auxiliary units which are a part of the skid. The emission factor for power consumed in the FGRU is calculated based on the actual amount of natural gas used in the power generation plant and the total amount of power generated in the unit. Detailed spreadsheet "GT FUEL DIS 05~06.xls" presented for the determination of amount of gas consumed for power generation per KWH of power consumed by the FGRU unit and found to be in order.

The specific energy consumed by the processing unit, KWh per MMSCM of gas processed, is calculated as a function of the total amount of energy consumed by the unit and the total amount of gas processed in the gas processing plant. This factor is used to determine the energy consumed for processing the additional amount of gas recovered by the FGRU.

Project emissions associated with release of gas due to accident is taken as zero as there are no such records of accidental release during the baseline period.

The outputs generated from the recovered gas are likely to meet the supply demand gap in domestic fuel production and demand. In the absence of the project this gap is being made up from imports. Supply and demand scenario verified from statistics available with the Ministry of Petroleum and Natural gas. Thus no leakage due addition to the fuel pool is envisaged due to the project activity.

Spreadsheet with details of emission reduction calculations, CER-URAN-AM0037-07-Jun-07.xls, have been presented and is assessed to be in order. The calculations are documented in a transparent manner and values used therein are found to be as per monitored records from the plant.

The project is likely to result in 97 740 t CO_2 emission reductions per annum. It is likely that the stated emission reductions are achievable provided the underlying assumptions are not changed.

4.7 Environmental Impacts

It has been confirmed that the project does not require an environmental impact analysis. The project complies with environmental regulations in India and has obtained necessary licenses and environmental clearances. The project is not likely to create any adverse environmental effects.

4.8 Comments by Local Stakeholders

Comments from local stakeholders have been invited through a meeting held at Uran plant on 25 August 2006. All relevant stakeholders were invited to the meeting which included representatives from the village panchayat, employees of the unit, local villagers and members from statutory bodies. The project did not receive any adverse comment and hence no mitigating actions were necessary.

4.9 Comments by Parties, Stakeholders and NGOs

The PDD of 6 February 2006 was initially webhosted for public commenting for a period of 30 days from 15th June 2006 to 14th July 2006 using approved methodology AM0009. The project was re-webhosted due to change in methodology applied and made publicly available on DNV's climate change website (www.dnv.com/certification/climatechange) and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period from 21 February 2007 to 22 March 2007. No comments were received during these periods.

APPENDIX A

CDM VALIDATION PROTOCOL

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

Requirement	Reference	Conclusion
About Parties		
The project shall assist Parties included in Annex I in achieving compliance with part of their emission reduction commitment under Art. 3.	Kyoto Protocol Art.12.2	NA
The project shall assist non-Annex I Parties in contributing to the ultimate objective of the UNFCCC.	Kyoto Protocol Art.12.2.	OK
The project shall have the written approval of voluntary participation from the designated national authority of each Party involved.	Kyoto Protocol Art. 12.5a, CDM Modalities and Procedures §40a	~~CL 1~~ OK
The project shall assist non-Annex I Parties in achieving sustainable development and shall have obtained confirmation by the host country thereof.	Kyoto Protocol Art. 12.2, CDM Modalities and Procedures §40a	~~CL 1~~ OK
In case 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.	Decision 17/CP.7, CDM Modalities and Procedures Appendix B, § 2	NA
Parties participating in the CDM shall designate a national authority for the CDM.	CDM Modalities and Procedures §29	OK
The host Party and the participating Annex I Party shall be a Party to the Kyoto Protocol.	CDM Modalities §30/31a	OK
The participating Annex I Party's assigned amount shall have been calculated and recorded.	CDM Modalities and Procedures §31b	NA
The participating Annex I Party shall have in place a national system for estimating	CDM Modalities and Procedures §31b	NA

Requirement	Reference	Conclusion
GHG emissions and a national registry in accordance with Kyoto Protocol Article 5 and 7.		
About additionality		
Reduction in GHG emissions shall be additional to any that would occur in the 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.	Kyoto Protocol Art. 12.5c, CDM Modalities and Procedures §43	~~CL 4,5~~ OK
About forecast emission reductions and environmental impacts		
The emission reductions shall be real, measurable and give long-term benefits related to the mitigation of climate change.	Kyoto Protocol Art. 12.5b	OK
For large-scale projects only		
Documentation on the analysis of the environmental impacts of the project activity, including transboundary impacts, shall be submitted, and, if those impacts are considered significant by the project participants or the Host Party, an environmental impact assessment in accordance with procedures as required by the Host Party shall be carried out.	CDM Modalities and Procedures §37c	OK
About stakeholder involvement		
Comments by local stakeholders shall be invited, a summary of these provided and how due account was taken of any comments received.	CDM Modalities and Procedures §37b	OK
Parties, stakeholders and UNFCCC accredited NGOs shall 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.	CDM Modalities and Procedures §40	OK

Requirement	Reference	Conclusion
Other		
The baseline and monitoring methodology shall be previously approved by the CDM Executive Board.	CDM Modalities and Procedures §37e	OK
A baseline shall be established on a project-specific basis, in a transparent manner and taking into account relevant national and/or sectoral policies and circumstances.	CDM Modalities and Procedures §45c,d	OK
The baseline methodology shall exclude to earn CERs for decreases in activity levels outside the project activity or due to force majeure.	CDM Modalities and Procedures §47	OK
The project design document shall be in conformance with the UNFCCC CDM-PDD format.	CDM Modalities and Procedures Appendix B, EB Decision	OK
Provisions for monitoring, verification and reporting shall be in accordance with the modalities described in the Marrakech Accords and relevant decisions of the COP/MOP.	CDM Modalities and Procedures §37f	OK

Table 2 Requirements Checklist

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
A. General Description of Project Activity *The project design is assessed.*					
Project Boundaries *Project Boundaries are the limits and borders defining the GHG emission reduction project.*					
Are the project's spatial boundaries (geographical) clearly defined?	*/1/*	DR/I	The spatial boundary of the project includes the compressor package area including the flare system and the CSU unit that processes the recovered gas.		OK
Are the project's system boundaries (components and facilities used to mitigate GHGs) clearly defined?	*/1/*	DR/I	The physical boundary of the project includes the piping that connects the flare system to the recovery compressor and the discharge piping that transports the gas to the CSU unit.		OK
Participation Requirements *Referring to Part A, Annex 1 and 2 of the PDD as well as the CDM glossary with respect to the terms Party, Letter of Approval, Authorization and Project Participant.*					
Which Parties and project participants are participating in the project?	*/1/*	DR/I	The sole project participant is ONGC, Uran unit.		OK

VALIDATION REPORT

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
Have all involved Parties provided a valid and complete letter of approval and have all private/public project participants been authorized by an involved Party?	/1/	DR/I	Clarification is requested on the status of the host country approval for the project activity.	~~CL 1~~	OK
Do all participating Parties fulfil the participation requirements as follows: - Ratification of the Kyoto Protocol - Voluntary participation - Designated a National Authority	/1/	DR/I	India has ratified the Kyoto protocol, established a DNA and thus meets the requirements to participate in the CDM.		OK
Potential public funding for the project from Parties in Annex I shall not be a diversion of official development assistance.	/1/	DR/I	There is no Annex-01 country involved in the project activity.		OK
Technology to be employed *Validation of project technology focuses on the project engineering, choice of technology and competence/ maintenance needs. The validator should ensure that environmentally safe and sound technology and know-how is used.*					
Does the project design engineering reflect current good practices?	/1/	DR/I	The flare recovery unit represents a state of the art technology in oil and gas sector. It is beyond the current practices in the sector of oil and gas and reflects current good practices.		OK

VALIDATION REPORT

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
Does the project use state of the art technology or would the technology result in a significantly better performance than any commonly used technologies in the host country?	*/1/*	DR/I	Yes		OK
Does the project make provisions for meeting training and maintenance needs?	*/1/*	DR/I	Providing technical training to the operating personnel is presented as a barrier to the project activity. Clarification is requested on the type of training imparted as a part of project implementation to ensure smooth operation of the unit.	~~CL 2~~	OK
Contribution to Sustainable Development *The project's contribution to sustainable development is assessed.*					
Has the host country confirmed that the project assists it in achieving sustainable development?	*/1/*	DR/I	Clarification is requested on status of host country approval.	~~CL 1~~	OK
Will the project create other environmental or social benefits than GHG emission reductions?	*/1/*	DR/I	The project has received host country approval.		OK
B. Project Baseline *The validation of the project baseline establishes whether the selected baseline methodology is appropriate and whether the selected baseline represents a likely baseline scenario.*					
Baseline Methodology					

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
It is assessed whether the project applies an appropriate baseline methodology.					
Does the project apply an approved methodology and the correct version thereof?	*/1/*	DR/I	The project applies the approved baseline methodology AM0037 version 1.0 to the project activity. The PDD needs to be revised based on the latest version of the methodology, version 1.1	~~CAR 1~~	OK
Are the applicability criteria in the baseline methodology all fulfilled?	*/1/*	DR/I	The methodology is applicable for project which recovers tail gas and utilise the same for productive use either as a fuel or feedstock to some downstream units. Clarification is requested as to how the gas recovered in the FGRU is utilised in the project. Clarification is requested as to what are the products that recovered in the project which substitute like intensity fuel in the market.	~~CL 3~~	OK
Baseline Scenario Determination *The choice of the baseline scenario will be validated with focus on whether the baseline is a likely scenario, and whether the methodology to define the baseline scenario has been followed in a complete and transparent manner.*					
What is the baseline scenario?	*/1/*	DR/I	The baseline scenario for the project is the continuation of present practice of flaring of the tail gas onsite. Baseline selection has to be aligned to the	~~CAR 2~~	

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			methodology applied to the project using a common set of barriers for evaluation of all probable alternatives to the project activity.		
What other alternative scenarios have been considered and why is the selected scenario the most likely one?	*/1/*	DR/I	The baseline scenario identified in the project is in line with the methodology applied, AM0037.		OK
Has the baseline scenario been determined according to the methodology?	*/1/*	DR/I	The selection of the baseline scenario is not in line with the requirement of the methodology. The methodology calls for establishing a complete list of barriers that prevent alternate scenarios including those faced by the project itself without CDM benefits. Evaluation of the baseline scenarios is to be done for a common set of barrier which is not presented in the project.	~~**CAR 2**~~	OK
Has the baseline scenario been determined using conservative assumptions where possible?	*/1/*	DR/I	Yes		OK
Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies, macro-economic trends and political aspirations?	*/1/*	DR/I	The continuation of flaring of tail gas at the project site is in compliance with all regulatory and sectoral policies and national policies.		OK
Is the baseline scenario determination compatible with the available data and are all literature and sources clearly referenced?	*/1/*	DR/I	Yes		OK

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
Have the major risks to the baseline been identified?	*/1/*	DR/I	Future regulatory requirement are taken in to account in determination of baseline for the project.		OK
Additionality Determination *The assessment of additionality will be validated with focus on whether the project itself is not a likely baseline scenario.*					
Is the project additionality assessed according to the methodology?	*/1/*	DR/I	Same as CAR 02		OK
Are all assumptions stated in a transparent and conservative manner?	*/1/*	DR/I	In line with the guidelines for CDM projects, clarification is requested on the consideration of CDM during project inception in 2001. It is argued that the organisation had to depend on the expertise of the OEM for repair and maintenance of the project equipment. Clarification is requested on the R&M contract with the OEM for the project. Clarification is requested on the modifications that had to be carried out to overcome technical hurdles faced by the project during actual operation.	~~CL 4~~ ~~CL 5~~	OK
Is sufficient evidence provided to support the relevance of the arguments made?	*/1/*	DR/I	The project involves installation of an flare gas recovery compressor for recovery of gas being	~~CL 6~~	OK

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			flared and not reduction of gas being send to flare header. It is argued that the project is fist of its kind in the country and there are no similar projects taken up in the region prior to the project. Clarification is requested on the basis of this argument and the region defined in the project.		
Calculation of GHG Emission Reductions – Project emissions *It is assessed whether the project emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.*					
Are the calculations documented according to the approved methodology and in a complete and transparent manner?	*/1/*	DR/I	The notation used for methane emission associated with transport of recovered gas to end use facility is not consistent as used in equation -02 and 03 of the PDD. The gas recovered in the compressor facility is transported to the CSU unit for recovery of products which substitute like intensity fuel in the market. Project emissions are associated with the processing of this additional amount of gas in the in-plant facility prior to use but FFU_y is not accounted for in the project.	~~CAR 3~~	OK
Have conservative assumptions been used when calculating the	*/1/*	DR/I	The compressor used for recovery of flare gas is	~~CL 7~~	OK

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
project emissions?			electrically powered. Clarification is requested as to why the emission associated with the same are computed in terms of fuel consumed per m3 of gas recovered. Clarification is requested on the determination of emission factor of power consumed in the plant.		
Are uncertainties in the project emission estimates properly addressed?	*/1/*	DR/I	The methodology requires that the gas volumes used in calculation are converted to standard temp and pressure values. A clarification is requested as to whether the conversion has been accounted for in calculation.	~~CL 8~~	OK
Calculation of GHG Emission Reductions – Baseline emissions *It is assessed whether the baseline emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.*					
Are the calculations documented according to the approved methodology and in a complete and transparent manner?	*/1/*	DR/I	The calculation of project and baseline emissions has been presented in a excel format and is found to be complete in itself.		OK
Have conservative assumptions been used when calculating the baseline emissions?	*/1/*	DR/I	In the project plant part of the flare gas is contributed by the fuel gas which is used as a purge gas for the flare gas and not a part of the upset gas going to the flare header. This is removed from the emission reduction calculation		OK

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			making the estimation conservative in nature.		
Are uncertainties in the baseline emission estimates properly addressed?	/1/	DR/I	yes		OK
Calculation of GHG Emission Reductions – Leakage *It is assessed whether leakage emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.*					
Are the leakage calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR/I	The design document does not provide for assessment as whether the supplies of additional fossil fuel from the project lead to additional fuel consumption and whether the fuel produced substitute's fuel of lower carbon intensity.	~~CAR 4~~	OK
Have conservative assumptions been used when calculating the leakage emissions?	/1/	DR/I	Not applicable		OK
Are uncertainties in the leakage emission estimates properly addressed?	/1/	DR/I	Not applicable		OK
Emission Reductions *The emission reductions shall be real, measurable and give long-term benefits related to the mitigation of climate change.*					

VALIDATION REPORT

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
Are the emission reductions real, measurable and give long-term benefits related to the mitigation of climate change.	*/1/*	DR/I	The emission reductions are calculated on the basis of monitored amount of gas recovered by the compressor system. Thus the emission reductions are for real and measurable in nature.		OK
Monitoring Methodology *It is assessed whether the project applies an appropriate baseline methodology.*					
Is the monitoring plan documented according to the approved methodology and in a complete and transparent manner?	*/1/*	DR/I	The project identifies all relevant parameters for determination of baseline and project emissions within the project boundary.		OK
Will all monitored data required for verification and issuance be kept for two years after the end of the crediting period or the last issuance of CERs, for this project activity, whichever occurs later?	*/1/*	DR/I	The project has selected a fixed crediting period of ten year duration. All monitoring record will be archived for a period of 2 yrs beyond the 10 year crediting period.		OK
Monitoring of Project Emissions *It is established whether the monitoring plan provides for reliable and complete project emission data over time.*					
Does the monitoring plan provide for the collection and archiving of all relevant data necessary for estimation or measuring the greenhouse gas emissions within the project boundary during the crediting period?	*/1/*	DR/I	All parameters relevant to determination of project emissions are included in the monitoring plan of the project.		OK
Are the choices of project GHG indicators reasonable and conservative?	*/1/*	DR/I	The parameter "F" is indicated as zero during validation. Clarification is requested as to why it is taken as "0" when V_y monitored during project	~~**CL 9**~~	OK

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			period is in conjunction with the parameter F.		
Is the measurement *method* clearly stated for each GHG value to be monitored and deemed appropriate?	*/1/*	DR/I	Yes		OK
Is the measurement *equipment* described and deemed appropriate?	*/1/*	DR/I	Yes		OK
Is the measurement *accuracy* addressed and deemed appropriate? Are procedures in place on how to deal with erroneous measurements?	*/1/*	DR/I	All measuring instruments will be calibrated as per the calibration schedule of the organisation. Meter accuracy will be checked and confirmed to be within the manufacturers' specification.		OK
Is the measurement *interval* identified and deemed appropriate?	*/1/*	DR/I	The monitoring frequency is in line with the requirement of the methodology.		OK
Is the *registration*, *monitoring*, *measurement* and *reporting* procedure defined?	*/1/*	DR/I	Yes		OK
Are procedures identified for *maintenance* of monitoring equipment and installations? Are the calibration intervals being observed?	*/1/*	DR/I	Yes		Ok
Are procedures identified for day-to-day records handling (including what records to keep, storage area of records and how to process performance documentation).	*/1/*	DR/I	The roles and responsibilities of the personnel who are a part of the monitoring team are clearly defined in the project.		OK

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
Monitoring of Baseline Emissions *It is established whether the monitoring plan provides for reliable and complete baseline emission data over time.*					
Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining baseline emissions during the crediting period?	*/1/*	DR/I	The baseline emissions are calculated ex-post based on the monitored amount of gas recovered in the project period		OK
Are the choices of baseline GHG indicators reasonable and conservative?	*/1/*	DR/I	CH4 emissions associated with transport of the tail gas to the compressor block have been negated for conservative estimation of the baseline emissions.		OK
Is the measurement *method* clearly stated for each baseline indicator to be monitored and also deemed appropriate?	*/1/*	DR/I	All measuring method and instruments are clearly identified in the project activity.		OK
Is the measurement *equipment* described and deemed appropriate?	*/1/*	DR/I	All measuring method and instruments are clearly identified in the project activity.		OK
Is the measurement *accuracy* addressed and deemed appropriate? Are procedures in place on how to deal with erroneous measurements?	*/1/*	DR/I	All measuring instruments will be calibrated as per the calibration schedule of the organisation. Meter accuracy will be checked and confirmed to be within the manufacturers' specification.		OK
Is the measurement *interval* for baseline data identified and deemed appropriate?	*/1/*	DR/I	The baseline emission is calculated based on ex-post measurement of amount of flare gas recovered in the project.		OK

VALIDATION REPORT

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
Is the *registration*, *monitoring*, *measurement* and *reporting* procedure defined?	*/1/*	DR/I	Yes		OK
Are procedures identified for *maintenance* of monitoring equipment and installations? Are the calibration intervals being observed?	*/1/*	DR/I	Organisation has clearly defined maintenance schedule of the monitoring equipment and are covered under the existing quality management system of the organisation		OK
Are procedures identified for day-to-day records handling (including what records to keep, storage area of records and how to process performance documentation)	*/1/*	DR/I	The roles and responsibilities of the operating personnel are clearly defined in the project.		OK
Monitoring of Leakage *It is assessed whether the monitoring plan provides for reliable and complete leakage data over time.*					
Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining leakage?	*/1/*	DR/I	Not applicable		OK
Monitoring of Sustainable Development Indicators/ Environmental Impacts *It is assessed whether choices of indicators are reasonable and complete to monitor sustainable performance over time.*					
Is the monitoring of sustainable development indicators/ environmental impacts warranted by legislation in the host	*/1/*	DR/I	The DNA of India does not require monitoring of sustainable development indicator during the		OK

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
country?			project period.		
Project Management Planning *It is checked that project implementation is properly prepared for and that critical arrangements are addressed.*					
Is the authority and responsibility of overall project management clearly described?	*/1/*	DR/I	The overall management of the project lies with a core group of personnel of the unit led by DGM(GPG)		OK
Are procedures identified for training of monitoring personnel?	*/1/*	DR/I	The organisation has in place an ISO 9001 certified quality management system in place for the Uran plant. Annual training need identification and training plan are already covered in the existing management system.		OK
Are procedures identified for emergency preparedness for cases where emergencies can cause unintended emissions?	*/1/*	DR/I	The organisation has in place an ISO 14001 certified Envrionment management system in place for the Uran plant. Emergency preparedness plan in case of unintended emissions from the project plant is covered in the existing set up.		OK
Are procedures identified for review of reported results/data?	*/1/*	DR/I	Yes		OK
Are procedures identified for corrective actions in order to provide for more accurate future monitoring and reporting?	*/1/*	DR/I	Yes		OK

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
C. Duration of the Project/ Crediting Period *It is assessed whether the temporary boundaries of the project are clearly defined.*					
Are the project's starting date and operational lifetime clearly defined and evidenced?	*/1/*	DR/I	The start date of the project is 20th November 2001`and the operational lifetime of the project is 18 years which is deemed justified for the project		OK
Is the start of the crediting period clearly defined and reasonable?	*/1/*	DR/I	The project has selected a 10 yrs fixed crediting period starting from date of registration of the project. A tentative starting date of crediting period needs to be specified for the project and the end of crediting period cannot be beyond the end of lifetime of the project which ends on 19th November 2016.	~~CAR 5~~	OK
D. Environmental Impacts *Documentation on the analysis of the environmental impacts will be assessed, and if deemed significant, an EIA should be provided to the validator.*					
Has an analysis of the environmental impacts of the project activity been sufficiently described?	*/1/*	DR/I	The design document clearly identifies the impacts of the project during implementation and during operation.		OK
Are there any Host Party requirements for an Environmental Impact Assessment (EIA), and if yes, is an EIA approved?	*/1/*	DR/I	The project does not require an EIA to be conducted prior to project implementation.		OK

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
Will the project create any adverse environmental effects?	/1/	DR/I	The project is not likely to create any adverse environmental effects.		OK
Are transboundary environmental impacts considered in the analysis?	/1/	DR/I	There are no trans-boundary impacts due to the project..		OK
Have identified environmental impacts been addressed in the project design?	/1/	DR/I	Since there are no negative environmental impacts due to the project no such action was necessary.		OK
Does the project comply with environmental legislation in the host country?	/1/	DR/I	Yes, the project complies with the environmental legislation of India.		OK
E. Stakeholder Comments *The validator should ensure that stakeholder comments have been invited with appropriate media and that due account has been taken of any comments received.*					
Have relevant stakeholders been consulted?	/1/	DR/I	The local community, consumers, project consultants, employees and statutory regulatory bodies have been identified as stakeholders for the project.		OK
Have appropriate media been used to invite comments by local stakeholders?	/1/	DR/I	A stakeholder meeting was conducted on 25th August 2006 and relevant stakeholders were invited in the same.		OK
If a stakeholder consultation process is required by regulations/laws in the host country, has the stakeholder	/1/	DR/I	No		OK

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
consultation process been carried out in accordance with such regulations/laws?					
Is a summary of the stakeholder comments received provided?	/1/	DR/I	The comments received during the stakeholder consultation have been summarised in the design document.		OK
Has due account been taken of any stakeholder comments received?	/1/	DR/I	Yes		OK

Table 2 Resolution of Corrective Action and Clarification Requests

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
~~CAR 1~~ The project applies the approved baseline methodology AM0037 version 1.0 to the project activity. The PDD needs to be revised based on the latest version of the methodology, version 1.1		The PDD has been revised as per the latest version 01.1 of AM0037.	OK. Changes incorporated in the final PDD, version- 02, and found to be in order. CAR closed.
~~CAR 2~~ The selection of the baseline scenario is not in line with the requirement of the methodology. The methodology calls for establishing a complete list of barriers that prevent alternate scenarios including those faced by the project itself without CDM benefits. Evaluation of the baseline scenarios is to be done for a common set of barrier which is not presented in the project.		Common set of barriers has been identified and listed in section B.4 and subsequent sections are modified accordingly.	OK, baseline selection aligned with the requirement of the methodology and found to be in order. CAR closed.
CAR 3 The notation used for methane emission associated with transport of recovered gas to end use facility is not consistent as used in equation -02 and 03 of the PDD. The gas recovered in the compressor facility is transported to the CSU unit for recovery of products which substitute like intensity fuel in the market. Project emissions are associated with the		The PDD and the excel sheet has been revised to make the notation consistent with respect to equation 2 and 3. Further the project emission calculation has been revised to incorporate FFUy and the same has been incorporated in the revised PDD.	OK. Project emissions associated with energy consumed for processing the recovered flare gas has been incorporated in the revised PDD. CAR closed.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
processing of this additional amount of gas in the in-plant facility prior to use but FFU_y is not accounted for in the project.			
CAR 4 The design document does not provide for assessment as whether the supplies of additional fossil fuel from the project lead to additional fuel consumption and whether the fuel produced substitute's fuel of lower carbon intensity.		Maharashtra's energy demand is met by using primarily fossil fuel, further there exists a demand supply gap, so if not by the project activity the equivalent quantity of fossil fuel would have been supplied by some other entity. So the project activity is not leading to additional fossil fuel consumption.	OK. The outputs generated from the recovered gas are likely to meet the supply demand gap in domestic fuel production and demand. In the absence of the project this gap is being made up from imports. Supply and demand scenario verified from statistics available with the Ministry of Petroleum and Natural gas CAR closed.
CAR 5 A tentative starting date of crediting period needs to be specified for the project and the end of crediting period cannot be beyond the end of lifetime of the project which ends on 19th November 2016.		The construction start date for the project was on 20/11/2001. The project life time is considered is 18 years which is reasonable. Thus the project will remain operational till 2019 which is beyond the last year of the crediting period i.e. 2017.	OK. The start date of the project has been verified and found to be in order. CAR closed.
CL 1 Clarification is requested on the status of the host country approval for the project activity.		The project has obtained Host Country Approval from Ministry of Environment and Forest (MoEF), which is the Designated National Authority (DNA) for India. A copy of the same is enclosed for reference.	OK.HCA from the Host country dated 14 June 2006 has been presented and found to be in order. CL closed.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
CL 2 Providing technical training to the operating personnel is presented as a barrier to the project activity. Clarification is requested on the type of training imparted as a part of project implementation to ensure smooth operation of the unit		Training was imparted by Siemens for operation of PLC system associated with the FGRU to instrumentation engineers of ONGC. Further on the job training was provided by Kirloskar Pumps (distributor of OEM M/S Howden Compressors) to ONGC personnel during the commissioning of the instrument. These trainings were necessary to familiarize ONGC personnel with the new technology of the equipment.	OK, training records of the operational and maintenance personnel presented and found to be in order. CL closed.
CL 3 The methodology is applicable for project which recovers tail gas and utilise the same for productive use either as a fuel or feedstock to some downstream units. Clarification is requested as to how the gas recovered in the FGRU is utilised in the project. Clarification is requested as to what are the products that recovered in the project which substitute like intensity fuel in the market		The gas recovered is used as a feed stock for the gas processing plant within the Uran plant. The products extracted are LPG, C2C3, Naphtha and lean gas which will substitute like intensity fuel in the market.	OK. The piping layout diagram from installation confirms that the gas recovered from the FGRU is processed in the Uran plant itself. CL closed.
CL 4 In line with the guidelines for CDM projects, clarification is requested on the consideration of CDM during project inception in 2001.		ONGC was aware of CDM at the corporate level prior to the inception of the project in 2001. The evidence for the same is enclosed for reference. It is true that ONGC is dependent on the	OK. Relevant documentation on the organizations consideration of CDM in the project presented and found to be in order. Documentation on support services from

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
It is argued that the organisation had to depend on the expertise of the OEM for repair and maintenance of the project equipment. Clarification is requested on the R&M contract with the OEM for the project.		expertise of the OEM for repair and maintenance of the equipment. However ONGC does not have any R&M contract with the OEM but seek their advices as and when required. There were occasions in the past when ONGC have called engineers from M/s Howden Compressors (OEM), M/S Bentley Nevada and Tushaco Pumps for rectifying various technical problems faced during the operations of the equipment. The supportings for the same are enclosed for reference.	the OEM for repair and maintenance of the flare gas recovery unit presented during validation. Same found to be in order. CL closed.
CL 5 Clarification is requested on the modifications that had to be carried out to overcome technical hurdles faced by the project during actual operation.		Following modifications were carried out during the operation of the FGRU at Uran plant. These modifications had to be carried to overcome technical problems faced during the operations. These problems were not envisaged during the design and commissioning of the project. The modifications are listed below. • One gear pump was provided along with a separate ¼" tubing from this pump to loader/unloader valves to charge the lube oil to oil tank separator to avoid the use of main lube oil pump for unloading the compressor. This	Ok, Details of modifications carried out in the project plant provided during validation. CL closed.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
		modification was required to avoid damage of the seal and to improve the efficiency of unloading • Whenever compressor is shut down for a long time or to be started after system depressurization for maintenance purpose, there is no pressure in oil tank separator as a result lube oil pump did not get sufficient liquid pressure at the suction of the pump. This gave lot of vibration and abnormal sound in the lube oil pump. To provided required liquid pressure at the suction of the pump to the lube oil pump at the startup of the compressor, a ¼ " tubing was given to oil tank separator from fuel gas header. If the pressure in the oil tank separator is less than 1 kg/cm2G then it is first pressurized to minimum 1 kg/cm2g and then lube oil pump is stared. • The NRV is provided on the suction line of the compressor. This NRV has to function at very low	

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
		pressure (150 to 250 mm water column). After few days of commissioning, this NRV started malfunctioning as a result there was wide fluctuation in suction pressure. Moreover system used to get depressurized when the compressor is stopped or tripped. Vendor was called to look into the problem. It was found that valve seat was damaged and counter weight was imbalanced. Necessary repairs and adjustment was done. • Lube oil pumps seal was damaging frequently. They were modified. A detailed write-up on the modification along with schematic sketches of the modifications is provided for reference.	
CL 6 It is argued that the project is fist of its kind in the country and there are no similar projects taken up in the region prior to the project. Clarification is requested on the basis of this argument and the		The gas flaring reduction project activity of ONGC Uran was a noble effort towards achieving zero hydrocarbon emission at ONGC Uran plant. The project was not only first of its kind in the entire ONGC but also in the country. As recognition for the	OK. Copy of the report presented during validation and found to be in order. CL closed.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
region defined in the project		same the project was awarded National Petroleum Management Program (NPMP) award for excellence in creativity and innovation in the year 2003-04. A copy of the report providing details about the above mentioned award is enclosed for reference.	
CL 7 The compressor used for recovery of flare gas is electrically powered. Clarification is requested as to why the emission associated with the same are computed in terms of fuel consumed per m3 of gas recovered. Clarification is requested on the determination of emission factor of power consumed in the plant		The emission associated with power consumption in the compressors is due to natural gas combustion in the captive power plant of Uran. Based on actual historical data of the captive power plant gas combusted/kWwh of power generation has been worked out. Further from power consumption data of the compressor and the corresponding gas compressed, m3 of gas combusted/m3 of gas compressed has been calculated.	Ok. Detailed spreadsheet "GT FUEL DIS 05~06.xls" presented for the determination of amount of gas consumed for power generation per kWh of power consumed by the FGRU unit. CL closed.
~~CL 8~~ The methodology requires that the gas volumes used in calculation are converted to standard temp and pressure values. Clarification is requested as to whether the conversion has been accounted for in calculation.		Gas volumes are measured at standard temperature and pressure only. Thus no conversion is required.	OK. All the volumetric flow units taken for emission reduction estimates are converted to standard temp and pressure conditions. CL closed.
CL 9		The flow rate is 1.5 m3/sec. This is now	OK.

VALIDATION REPORT

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
The parameter “F” is indicated as zero during validation. Clarification is requested as to why it is taken as “0” when Vy monitored during project period is in conjunction with the parameter F		mentioned in the revised PDD.	Change incorporated in the revised PDD and found to be in order. CL closed.

APPENDIX B

CERTIFICATES OF COMPETENCE

CERTIFICATE OF COMPETENCE

Michael Lehmann

Qualification in accordance with DNV's Qualification scheme for CDM/JI (ICP-9-8-i1-CDMJI-i1

GHG Auditor:	Yes		
CDM Validator:	Yes	***JI Validator:***	Yes
CDM Verifier:	Yes	***JI Verifier:***	Yes
Industry Sector Expert for Sectoral Scope(s):	Sectoral scope 1,2,3 & 9		
Technical Reviewer for (group of) methodologies:			
ACM0001, AM0002, AM0003, AM0010, AM0011, AM0012, AMS-III.G	Yes	*AM0021*	Yes
ACM002, AMS-I.A-D, AM0019, AM0026, AM0029	Yes	*AM0023*	Yes
ACM003, ACM0005, AM0033, AM0040	Yes	*AM0024*	Yes
ACM0004	Yes	*AM0027*	Yes
ACM0006, AM0007, AM0015, AM0036, AM0042	Yes	*AM0028, AM0034*	Yes
ACM0007	Yes	*AM0030*	Yes
ACM0008	Yes	*AM0031*	Yes
ACM0009, AM0008, AMS-III.B	Yes	*AM0032*	Yes
AM0006, AM0016, AMS-III.D	Yes	*AM0035*	Yes
AM0009, AM0037	Yes	*AM0038*	Yes
AM0013, AM0022, AM0025, AM00379, AMS-III.H, AMS-III.I	Yes	*AM0041*	Yes
AM0014	Yes	*AM0034*	Yes
AM0017	Yes	*AMS-II.A-F*	Yes
AM0018	Yes	*AMS-III.A*	Yes
AM0020	Yes	*AMS-III.E, AMS-III.F*	Yes

Høvik, 6 November 2006

Einar Telnes
Director, International Climate Change Servicer

Michael Lehmann
Technical Director

CERTIFICATE OF COMPETENCE

Chandrashekara Kumaraswamy

Qualification in accordance with DNV's Qualification scheme for CDM/JI (ICP-9-8-i1-CDMJI-i1

GHG Auditor:	Yes		
CDM Validator:	Yes	***JI Validator:***	-
CDM Verifier:	Yes	***JI Verifier:***	-
Industry Sector Expert for Sectoral Scope(s):	Sectoral scope-04 & 05		
Technical Reviewer for (group of) methodologies:			
ACM0001, AM0002, AM0003, AM0010, AM0011, AM0012, AMS-III.G	Yes	*AM0021*	Yes
ACM002, AMS-I.A-D, AM0019, AM0026, AM0029	Yes	*AM0023*	Yes
ACM003, ACM0005, AM0033, AM0040	Yes	*AM0024*	Yes
ACM0004	Yes	*AM0027*	Yes
ACM0006, AM0007, AM0015, AM0036, AM0042	Yes	*AM0028, AM0034*	Yes
ACM0007	Yes	*AM0030*	Yes
ACM0008	Yes	*AM0031*	Yes
ACM0009, AM0008, AMS-III.B	Yes	*AM0032*	Yes
AM0006, AM0016, AMS-III.D	Yes	*AM0035*	Yes
AM0009, AM0037	Yes	*AM0038*	Yes
AM0013, AM0022, AM0025, AM00379, AMS-III.H, AMS-III.I	Yes	*AM0041*	Yes
AM0014	Yes	*AM0034*	Yes
AM0017	Yes	*AMS-II.A-F*	Yes
AM0018	Yes	*AMS-III.A*	Yes
AM0020	Yes	*AMS-III.E, AMS-III.F*	Yes

Høvik, 6 November 2006

Einar Telnes
Director, International Climate Change Servicer

Michael Lehmann
Technical Director

CERTIFICATE OF COMPETENCE

Subhendu Biswas

Qualification in accordance with DNV's Qualification scheme for CDM/JI (ICP-9-8-i1-CDMJI-i1

GHG Auditor:	Yes		
CDM Validator:	Yes	***JI Validator:***	-
CDM Verifier:	-	***JI Verifier:***	-
Industry Sector Expert for Sectoral Scope(s):	Sectoral scope-10		

Høvik, 6 November 2006

Einar Telnes
Director, International Climate Change Servicer

Michael Lehmann
Technical Director

Soumik Biswas

Qualification in accordance with DNV's Qualification scheme for CDM/JI (ICP-9-8-i1-CDMJI-i1

GHG Auditor:	Yes		
CDM Validator:	Yes	***JI Validator:***	-
CDM Verifier:	-	***JI Verifier:***	-
Industry Sector Expert for Sectoral Scope(s):			

Høvik, 6 November 2006

Einar Telnes
Director, International Climate Change Servicer

Michael Lehmann
Technical Director