CLEAN DEVELOPMENT MECHANISM
SIMPLIFIED PROJECT DESIGN DOCUMENT
FOR SMALL-SCALE PROJECT ACTIVITIES (SSC-CDM-PDD)
Version 02

CONTENTS

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.

SECTION A. General description of the small-scale project activity

A.1. Title of the small-scale project activity:

>>
Waste heat recovery from Process Gas Compressors (PGCs), Mumbai high south (offshore platform) and using the recovered heat to heat process heating oil.
Version: 02
13/10/2006

A.2. Description of the small-scale project activity:

>>
The purpose of the project activity is to recover heat from the exhaust flue gases of two 'Process Gas Compressors' (PGC), (used for compressing the associated gas in crude oil production activities), installed at ONGC's offshore Mumbai South platform (MSP). The MSP is a new platform and the waste heat recovery system is installed with the process gas compressor. This is the first platform in ONGC having process gas compressor with waste heat recovery unit.

ONGC has installed waste heat recovery units (WHRU) at each of the PGC exhaust points, and the waste heat is being used to heat process oil which is further used to heat various process streams in the crude oil production activities. The project activity has resulted in reducing the consumption of fossil fuels (natural gas), which would otherwise be used for heating of process oil for crude oil production activities.

Project Description:

The WHRU is designed to extract heat from exhaust flue gases of process gas compressors and heat the well fluid and glycol reboiler in the glycol regeneration system. In the project activity the exhaust flue gases from PGC, which are at a very high temperature (approximate 450-500 deg C), is brought into contact with circulating process oil through a WHRU. The waste heat of exhaust flue gases of PGC is gained by the process oil, which is being circulated from discharge of hot oil pump to the WHRU, through heat transfer. The hot process oil is then circulated through two glycol re-boilers in the glycol regeneration system to heat glycol solution.

Project's contribution to Sustainable development:

The project has contributed to sustainable development in several ways by reducing fossil fuel consumption for oil production activities. The indicators for sustainable development as stipulated by Designated National Authority (DNA) of India in the interim approval guidelines for Indian CDM projects have been studied in the context of project activity to ensure that project activity contributes to the sustainable development.

Social Well Being:

The project activity has created direct and indirect employment opportunities for skilled/semi-skilled manpower, during the construction and operational phase of the project. Indirect employment has been generated for the equipment supplier, contractors & technical consultants. The project activity has also resulted in providing better Occupational Health and Safety (OH&S) conditions at the work place.

Economic Well Being:
The project activity reduces consumption of fossil fuels for the oil production activities, thereby reducing expenditure on production of petroleum products. The project activity helps in reducing the operating costs. The project activity has also created business opportunities for various stakeholders like suppliers/manufacturers, contractors etc.

Environmental Well Being:
The project activity promotes the recovery of waste heat, which otherwise would have been discharged to the atmosphere. This recovered heat is utilized in heating the process oil which is further used to heat various process streams, thereby reducing the consumption of fossil fuels for oil production activities. Reduction in use of fossil fuels for oil production reduces the net GHG emissions to the atmosphere. The project activity also addresses the problem of depletion of fossil fuels to a certain extent.

Technological Well Being:
The project activity has resulted in reducing the fossil fuel consumption for the oil production activities by using waste heat recovery principle. The technology used can also be applied to other similar projects in oil and gas installations in the country, resulting in reductions in the use of fossil fuels for oil production.
Hence, the project activity contributes to sustainable development.

A.3. Project participants:

>>

Name of Party involved	Private and/or public entity (ies) project participants	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/ No)
India (Host Country)	Oil and Natural Gas Corporation	No

A.4. Technical description of the small-scale project activity:

>>

A.4.1. Location of the small-scale project activity:

>>

A.4.1.1. Host Party(ies):

>> India

A.4.1.2. Region/State/Province etc.:

>> Offshore near Mumbai seashore in Maharastra

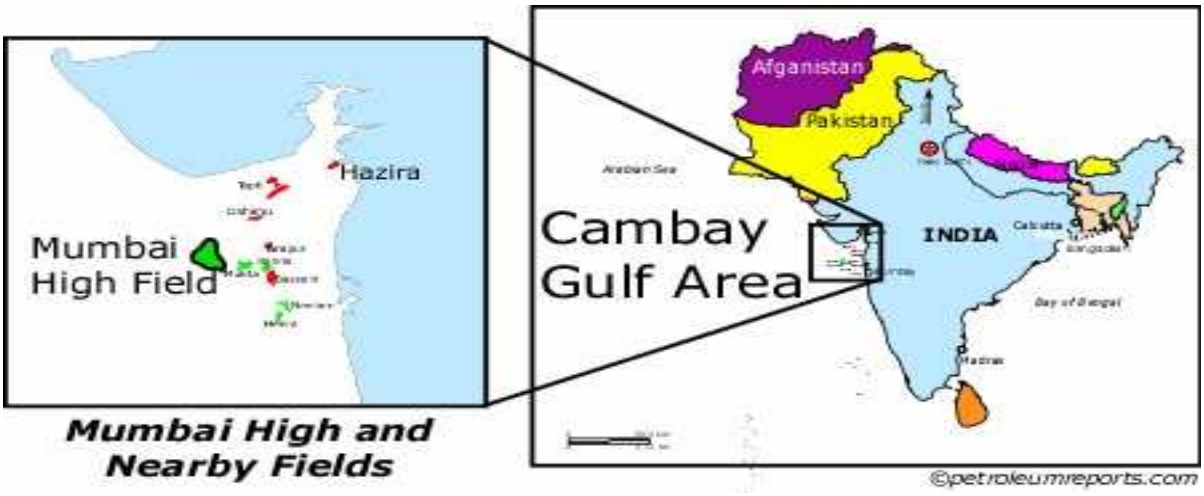
A.4.1.3. City/Town/Community etc:

>> Mumbai South Platform (MSP), Mumbai high

A.4.1.4. Detail of physical location, including information allowing the unique identification of this small-scale project activity(ies):

>>Mumbai High (MH) asset is approximately 200 km away from Mumbai Coastal area. The figure A.1 shows the physical location of MH field in the Arabian Sea.

Fig A.1. Location Map of Mumbai High field



A.4.2. Type and category(ies) and technology of the small-scale project activity:

>> The project activity is covered under Sectoral Scope – 1, Energy Industries (Renewable/non-renewable sources) as per 'List of Sectoral Scopes' available in UNFCCC website. As per Appendix B of the simplified modalities and procedures for small scale CDM project activities, the small scale methodology AMS II.D i.e. "Type II – Energy efficiency improvement projects of Category II.D – Energy efficiency and fuel switching measures for industrial facilities" has been selected for the project as it meets the following requirements:

- The project activity is an energy efficiency project implemented at a single industrial facility.
- The energy efficiency measure involves installation of two waste heat recovery units aimed primarily to utilize the waste heat available, thus improving the overall energy efficiency of the site.
- The thermal energy savings acchievd per year in the project activity is 26.39 GWh (Maximum energy saving based on the actual data)[1] which is below the limit of 45 GWh as specified in the methodology AMS II.D.

As explained above, the project activity meets all the applicability criteria of the methodology as well as the stipulations of small scale projects.

[1] Based on average inlet outlet temperature and average flow rate of for the most current past three months data ;i.e. July 2006 to September 2006 for both Train –A and Train B.

Technology to be employed

The waste heat recovery unit is designed to extract heat from the exhaust flue gases of process gas compressors and further used to heat well fluid and glycol re-boiler in the glycol regeneration system. The system includes hot process oil expansion tank, hot process oil circulation pumps, hot process oil filters, hot process oil dump coolers and well fluid heaters. The recirculation of hot process oil takes place from the discharge of the hot process oil pump to the waste heat recovery units for picking up the heat from the exhaust flue gases. The hot process oil after picking up heat in the WHRU is available at 230^0C. Hot process oil is then circulated through (a) two glycol re-boilers in the glycol regeneration system to heat the glycol solution and (b) well fluid heaters to heat the well fluid. The outlet hot process oil from the heaters and re-boilers is collected back in the header, which is connected to hot process oil expansion tank. The cold hot process oil from this expansion tank is in continuous recirculation. The flow diagram is shown below:

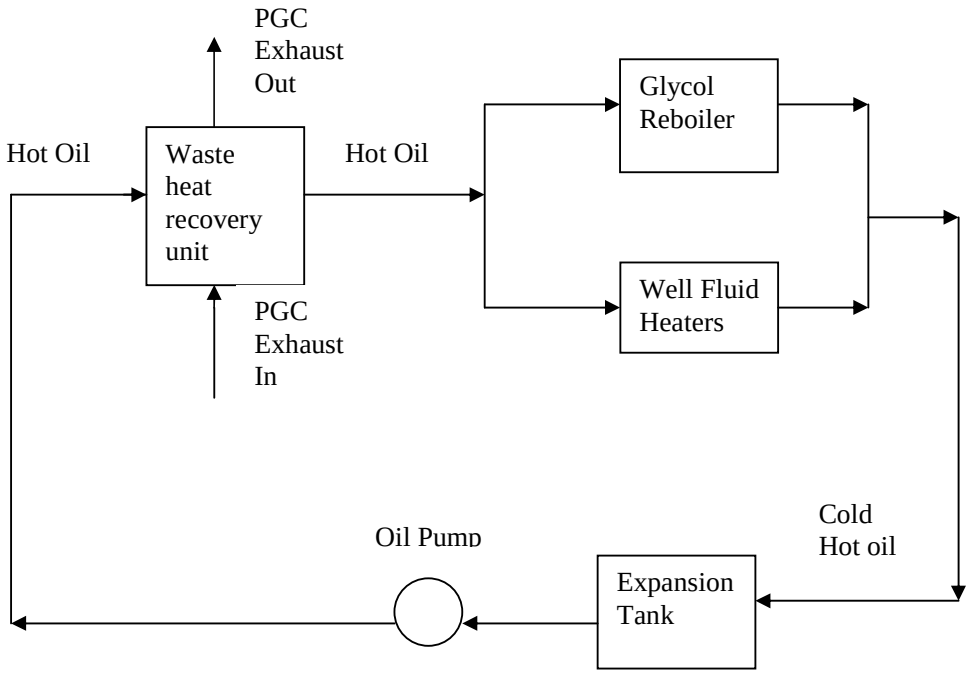


Fig A.2 Process flow diagram of the waste heat recovery system

A.4.3. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed small-scale project activity, including why the emission reductions would not occur in the absence of the proposed small-scale project activity, taking into account national and/or sectoral policies and circumstances:

>>

The project proposes to recover and use the waste heat from PGC exhaust flue gases, through WHRU, which otherwise would have been discharged into the atmosphere. The waste heat recovered by the project activity replaces the use of energy, derived from fossil fuels, which would have been used in the absence of project activity. In the absence of project activity, all the energy required for heating the process oil (used for other process heating applications), would have been derived from fossil fuels (associated gas/ natural gas) only. The use of fossil fuels for heating purposes results in CO_2 emissions into the atmosphere. Due to the project activity, the energy required for the heating of process oil is supplied through WHRU, this results in net decrease in consumption of fossil fuel for the heating of process oil, thereby reducing the net GHG emissions to the atmosphere. So the project activity leads to reduction in net GHG emissions to the atmosphere. The project activity would result in net GHG emission reductions of 53,200 tCO2 over the 10 years crediting period.

A.4.3.1 Estimated amount of emission reductions over the chosen crediting period:

>> The estimated emission reductions from the project activity are as below:

Year	Estimated Emission Reductions tCO_2e
2006 (1st November to 31st December)	444
2007	5320
2008	5320
2009	5320
2010	5320
2011	5320
2012	5320
2013	5320
2014	5320
2015	5320
2007 (1st January to 31th October)	4876
Total tCO_2e	**53,200**
Crediting Period	10 Years
Average Emission reduction per year over the crediting period	5,320

A.4.4. Public funding of the small-scale project activity:

>>There is no public funding available to the project activity from parties included in Annex 1.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a larger project activity:

>> The proposed small-scale project activity is not a debundled component of a large project activity since there is no registered small-scale CDM project activity or an application to register another small-scale CDM project activity.

- With the same project participants
- In the same project category and technology/measure.
- Registered within the previous 2 years
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

SECTION B. Application of a baseline methodology:

B.1. Title and reference of the approved baseline methodology applied to the small-scale project activity:

>>**Title:** Small scale methodology AMS. II.D (Ver 07, 28th November 2005)

Type II. Energy efficiency improvement projects

Category D - Energy efficiency and fuel switching measures for industrial facilities.

Reference: Paragraph '3 and 4' as provided in Type AMS II.D of Appendix B of the simplified modalities and procedures for small-scale CDM project activities - Indicative Simplified Baseline and Monitoring Methodologies for Selected Small-Scale CDM Project Activity Categories.

B.2 Project category applicable to the small-scale project activity:

>> The project activity is covered under Sectoral Scope – 1, Energy Industries (Renewable/non-renewable sources) as per 'List of Sectoral Scopes' available in UNFCCC website. As per Appendix B of the simplified modalities and procedures for small scale CDM project activities, the small scale methodology AMS II.D i.e. "Type II – Energy efficiency improvement projects of category II.D – Energy efficiency and fuel switching measures for industrial facilities" has been selected for the project as it meets the following requirements:

- The project activity is an energy efficiency project implemented at a single industrial facility.
- The energy efficiency measure involves installation of two waste heat recovery units aimed primarily to utilize the waste heat available, thus improving the overall energy efficiency of the site.
- The annual thermal energy savings achieved in the project activity is 26.39 GWh which is below the limit of 45 GWh as specified in the methodology AMS II.D.

As explained above, the project activity meets all the applicability criteria of the methodology as well as the stipulations of small scale projects. The emission reductions will be calculated based on the heat gained by the process oil through waste heat recovery unit.

Table B.1 Parameters used to determine baseline for the project activity

Sl No	Parameters used to determine baseline	Unit	Remarks
1	Q_{oil} (Flow rate of heating oil)	Tonne/hr	Monitored continuously and recorded daily
2	$T_{oil,in}$ (inlet temp. of heating Oil)	^0C	Monitored continuously and recorded daily
3	$T_{oil,out}$ (Outlet temp. of heating Oil)	^0C	Monitored continuously and recorded daily
4	H (Running Hours per day)	Hours	Monitored continuously and recorded daily
5	D (working days per year)	Days	Monitored continuously and recorded daily
6	Specific gravity of heating oil	Kg/litre	Standard value of the Heating Oil
7	Specific Heat of Heating oil	Kcal/kg/^{o}C	Standard value of the Heating Oil

B.3. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

>> In accordance with paragraph 7 of the simplified modalities and procedures for small-scale CDM project activities, a simplified baseline and monitoring methodology listed in Appendix B may be used for a small-scale CDM project activity if project participants are able to demonstrate to a designated operational entity that the project activity would otherwise not be implemented due to the existence of one or more barrier(s) listed in Attachment A of Appendix. B which are as below:

- Investment barrier
- Technological barrier
- Barrier due to prevailing practice
- Other barriers

The implementation of the project activity is a voluntary step undertaken by with no direct or indirect mandate by law. The project proponent was aware of the various barriers associated to project implementation but it was realised that the availability of carbon financing against a sale consideration of carbon credits (generated due to project activity) would help to overcome these barriers. Some of the key barriers faced by the project proponent for the project activity are discussed below:

Investment barrier

The unit cost of service is calculated for both the cases (project activity and natural gas based heater) and it is evident that the cost INR/Million Kcal in the waste heat recovery (project activity) is more than in the case of natural gas based heating.

Particulars	Unit	Value
Unit cost of heat in WHRU	INR/Million Kcal	1670.8
Unit cost of heat in NG based Heater	INR/Million Kcal	340.55

The detailed analysis is presented in Enclosure 2:

Other Barriers

The alternative of the project activity is natural gas based heater for the heating application in the plant. This option is credible and realistic options available to ONGC. The natural gas heater is well established practice and used for the similar application. This is less costly and technologically much simpler as compared to WHRU unit

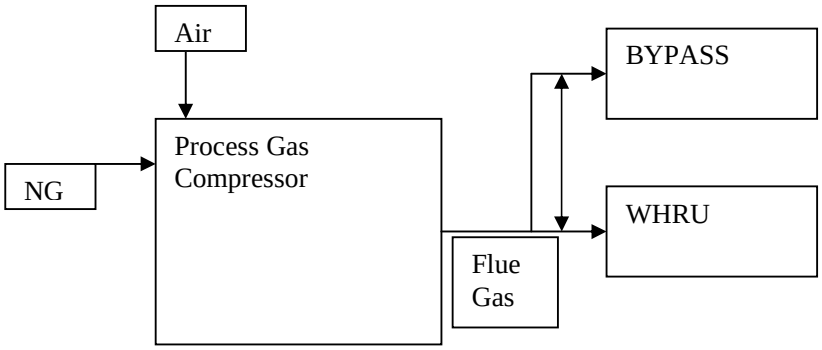
For the project activity, ONGC had taken a lot of risk in terms technological unfamiliarity and risk of stoppage of operations. Other barriers associated were plant shutdown for retrofitting, resulting into production loss. The project activity has not been undertaken at any of the ONGC's sites. The project

activity has the possibility of not giving desired results, leading to loss of production and operational problems especially considering its implementation at offshore location.

The project activity chosen also has higher operation cost when compared to other options as it requires regular operation and maintenance. The project activity requires a higher capital investment. The project proponent is facing the risk of other barriers such as disturbance in production, which can have a impact on the company's financial performance. ONGC is also taking additional investment for preparing documents and developing and maintaining monitoring methodology to fulfil CDM requirements.

Barrier due to prevailing practice

Generally PGC installed at offshore platforms are not equipped with WHRU and therefore the exhaust of from a PGC is released into the atmosphere. However for PGCs with WHRU, exhaust of PGC is routed through WHRU and Bypass. Openings of WHRU & Bypass are interlinked through control & instrumentation, so that hot oil temperature at the outlet of WHRU meets the process requirement.



However in case of problem in WHRU, PGC has to be stopped in order to avoid overheating of hot oil. Overheating of hot oil results in coke formation in the WHRU heat exchanger therefore creates operational problems in the WHRU and increases the maintenance as well.

Alternative of the project activity does not face any of the barriers faced by the project activity. There are no barriers associated with the alternative The alternatives do not pose any investment barrier in terms of capital investment and transaction costs. So, the identified barriers to the project activity do not prevent the implementation of alternative.

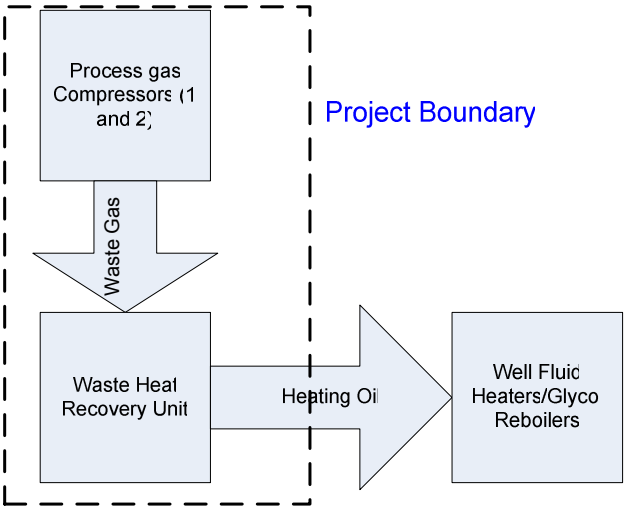
The barriers faced by ONGC demonstrate that the project activity is over and above business as usual scenario and is additional.

B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the small-scale project activity:

>>

The project boundary is the physical, geographical site of the facility / equipment affected by the project activity. The project boundary will consist of exhaust point of PGC and WHRU and Natural gas heater for oil heating. In the baseline scenario, the heat requirement for heating the oil will be met by using natural gas. In the project scenario the heat required for heating oil will be met by using WHRU.

The project boundary is shown below:



B.5. Details of the baseline and its development:

>>

Date of completion of baseline study: 13/05/06

Name of the persons/entity determining the baseline: Oil and Natural Gas Corporation Limited, Mumbai Region, 602, Vasudhara Bhavan, Bandra (E), Mumbai- 400051, Maharashtra

SECTION C. Duration of the project activity / Crediting period:

C.1. Duration of the small-scale project activity:

>>

C.1.1. Starting date of the small-scale project activity:

>> 08/06/2005

C.1.2. Expected operational lifetime of the small-scale project activity:

>> 20 Years 0 Months

C.2. Choice of crediting period and related information:

>>Fixed crediting period has been chosen for the project activity.

C.2.1. Renewable crediting period:

>>Not Applicable

C.2.1.1. Starting date of the first crediting period:

>>Not Applicable

C.2.1.2. Length of the first crediting period:

>> Not Applicable

C.2.2. Fixed crediting period:

>>

C.2.2.1. Starting date:

>> 01/02/2007

C.2.2.2. Length:

>> 10 Years 0 months

SECTION D. Application of a monitoring methodology and plan:

>>

D.1. Name and reference of approved monitoring methodology applied to the small-scale project activity:

>>

Title: Monitoring Methodology for the category AMS II D – Energy efficiency and fuel switching measures for industrial facilities.

Reference: 'Paragraph 6 to 8' as provided in Type AMS II.D of Appendix B of the simplified modalities and procedures for small-scale CDM project activities - Indicative Simplified Baseline and Monitoring Methodologies for Selected Small-Scale CDM Project Activity Categories.

D.2. Justification of the choice of the methodology and why it is applicable to the small-scale project activity:

>>

As established in Section A.4.2 and B.2, the project activity falls under Category AMS II.D. The project involves installation of two waste heat recovery units to recover heat from the process gas compressors, which otherwise would have been vented to the atmosphere, and using recovered heat for process heating will lead improved energy efficiency, thereby reducing the consumption of fossil fuel based energy at the offshore platform of ONGC. This reduction in fossil fuel consumption will lead to reduction of GHG emissions related with the oil production activities.

The selected monitoring methodology covers both the retrofit and new installations, and therefore the methodology can be applied to the project activity. Monitoring of GHG emission reductions due to project activity will be based on the heat gained by the process heating oil from the waste heat recovery unit. There are no project emissions envisaged from the project activity. Based on the IPCC emission factors and monitored data the emission will be calculated.

There is no technology transfer in the project activity and therefore, the project activity would not lead to any leakage emissions. The baseline emissions would be the emission reductions from the project activity.

D.3 Data to be monitored:

>>

Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :

ID number	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1	Q_{oil} (Flowrate of heating oil)	Plant Data	Tonne/hr	M	Continuous	100%	Electronic/Paper	Monitored continuously and recorded daily Retention Period: Crediting period + 2 years Instrument used: online flowmeter
2	$T_{oil,in}$ (Inlet temp. of heating Oil)	Plant Data	^0C	M	Continuous	100%	Electronic/Paper	Monitored continuously and recorded daily Retention Period: Crediting period + 2 years Instrument used: Online temperature sensor based on thermocouple.
3	$T_{oil,out}$ (Outlet temp. of heating Oil)	Plant Data	^0C	M	Continuous	100%	Electronic/Paper	Monitored continuously and recorded daily Retention Period: Crediting period + 2 years Instrument used: Online temperature sensor based on thermocouple
4	H (Running Hours per day)	Plant Data	Hours	M	Continuous	100%	Electronic/Paper	Monitored continuously and recorded daily Retention Period: Crediting period + 2 years
5	D (working days per year)	Plant Data	Days	M	Continuous	100%	Electronic/Paper	Monitored continuously and recorded daily Retention Period: Crediting period + 2 years

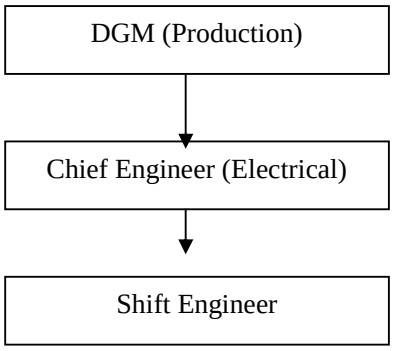
D.4. Qualitative explanation of how quality control (QC) and quality assurance (QA) procedures are undertaken:

>>

Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored		
Data	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
1	*Low*	*ISO 9001 or similar management system will be used to retrieve data*
2	*Low*	*ISO 9001 or similar management system will be used to retrieve data*
3	*Low*	*ISO 9001 or similar management system will be used to retrieve data*
4	*Low*	*ISO 9001 or similar management system will be used to retrieve data*
5	*Low*	*ISO 9001 or similar management system will be used to retrieve data*

D.5. Please describe briefly the operational and management structure that the project participant(s) will implement in order to monitor emission reductions and any leakage effects generated by the project activity:

>> The operational and management structure that will monitor the project activity is shown below:



Roles and Responsibilities:

1. DGM (Production):
    - Has the overall responsibility of monitoring measurements and reporting.
    - Internal audit and performance conformance review
    - Reviewing of records and dealing with monitored data
2. Chief Engineer (Electrical):
    - To assist DGM in record handling, record checks, and review
    - To assist DGM in internal audits
    - Check the data recorded by shift engineer
3. Shift Engineer:
    - Collect and record appropriate data mentioned in the monitoring table as per the monitoring frequency

D.6. Name of person/entity determining the monitoring methodology:

>> ONGC and their technical consultants.

Contact Information:

Oil and Natural Gas Corporation Limited, Mumbai High Asset, Vasudhara Bhavan, Bandra (E), Mumbai-400 051.

SECTION E.: Estimation of GHG emissions by sources:

E.1. Formulae used:

>>

E.1.1 Selected formulae as provided in appendix B:

>> No formulae provided in Appendix B

E.1.2 Description of formulae when not provided in appendix B:

>>

E.1.2.1 Describe the formulae used to estimate anthropogenic emissions by sources of GHGs due to the project activity within the project boundary:

>> No emission is envisaged from project activity.

E.1.2.2 Describe the formulae used to estimate leakage due to the project activity, where required, for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities

>> No leakage is envisaged from the project activity.

E.1.2.3 The sum of E.1.2.1 and E.1.2.2 represents the small-scale project activity emissions:

>> Nil

E.1.2.4 Describe the formulae used to estimate the anthropogenic emissions by sources of GHGs in the baseline using the baseline methodology for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities:

>> **Baseline emissions Calculations**

$E_d = Q_{oil} \times S_{oil} \times (T_{oil,\,in} - T_{oil,\,out}) \times H$ (1)

E_d – Energy recovered by WHRU in a day d (MJ per day)

Q_{oil} - Flow rate of Heating Oil (Tonne/ Hour)

S_{oil} – Specific heat of Heating Oil (MJ/tonne/^{0}C)

$T_{oil,\,in}$ – Inlet temperature of Heating Oil (^{0}C)

$T_{oil,\,out}$ – Outlet temperature of Heating Oil (^{0}C)

H – Working hours per day (Hours)

$$E_y = \sum_{1}^{d} E_d \quad \textbf{(2)}$$

E_y – Energy recovered by WHRU in year y (MJ per year)

d – Working days per year (days)

$BE_y = E_y \times EF_{NG}$ (3)

BE_y = Baseline emission for energy saved during year y

EF_{NG} – Emission Factor for Natural Gas (tCO_2e/MJ)

E.1.2.5 Difference between E.1.2.4 and E.1.2.3 represents the emission reductions due to the project activity during a given period:

>> **Emission Reduction = Baseline Emissions – Project Emissions - Leakage**

E.2 Table providing values obtained when applying formulae above:

>>

Year	Estimated Project Emissions tCO_2e	Estimated Baseline Emissions tCO_2e	Estimated Leakage tCO_2e	Estimated Emission Reductions tCO_2e
2006 (1st November to 31st December)	0	4,44	0	4,44
2007	0	5,320	0	5,320
2008	0	5,320	0	5,320
2009	0	5,320	0	5,320
2010	0	5,320	0	5,320
2011	0	5,320	0	5,320
2012	0	5,320	0	5,320
2013	0	5,320	0	5,320
2014	0	5,320	0	5,320
2015	0	5,320	0	5,320
2007 (1st January to 31st August)	0	4,876	0	4,876
Total tCO_2e	**0**	**53,200**	**0**	**53,200**

SECTION F.: Environmental impacts:

F.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

>>

As per Ministry of Environment & Forests, Government of India notification, the project does not fall under the purview of Environmental Impact Assessment (EIA). Hence, the project proponent has not carried out the same. However the environmental aspects related to the project activity have been studied and the project does not result in any significant adverse impacts on environment.

The project activity does not cause any significant adverse environmental impacts. The project is an environmentally friendly project as it utilizes the waste heat from the plant and reduces the net fossil fuel requirement for the oil production activities, thereby reducing net GHG emissions to the atmosphere. Project proponent has implemented hazard management system as per OSHAS 18001 to mitigate any operational hazard arising from the project activity.

SECTION G. Stakeholders' comments:

G.1. Brief description of how comments by local stakeholders have been invited and compiled:

>> **Identification of stakeholders**

ONGC had communicated to their employees (stakeholders identified offshore) about the project. The stakeholders identified for the project activity are as under:

1. Employees
2. Consultants
3. Equipment suppliers
4. Ministry of Environmental and Forest

Stakeholder list includes the government and non-government parties, who are involved in the project activity at various stages. At the appropriate stage of project development, the project proponent has consulted stakeholders / relevant bodies to obtain the comments.

G.2. Summary of the comments received:

>> The project is an environmentally friendly project, with no adverse social and environmental impacts. The project contributes to the reduction of GHG emissions to the atmosphere and contributes to sustainable development. The project also addresses the problem of depletion of fossil fuel to a certain extent.

The employees working at the MSP platform have lauded the efforts to reduce the emissions of harmful gases to the atmosphere through installation of a waste heat recovery unit at the PGC turbine exhaust. They have appreciated the efforts that have helped the organisation, as a whole, in fulfilling its commitment towards environmental protection and providing its employees at the MSP platform a cleaner and healthier workplace.

The consultants and equipment suppliers have already completed their work and do not have any adverse/ negative comments. The project has received host country approval from the National CDM Authority (i.e. the Climate Change Cell, MoEF, GoI)

G.3. Report on how due account was taken of any comments received:

>> There is no adverse comment received for the project activity.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Oil and Natural Gas Corporation (ONGC) Limited
Street/P.O.Box:	Energy Centre, 10 Floor
Building:	South Tower, SCOPE Minar Laxmi Nagar
City:	Delhi
State/Region:	
Postfix/ZIP:	110092
Country:	India
Telephone:	+91 11 22440829/22406479
FAX:	+91 11 22011783
E-Mail:	Chakraborty_ab@ongc.co.in
URL:	www.ongcindia.com
Represented by:	
Title:	General Manager
Salutation:	Mr.
Last Name:	Chakraborty
Middle Name:	
First Name:	Ashok B.
Department:	Alternate Energy
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding was available for the project activity including Annex I countries.

Annexure 3

Baseline Information

PROPERTIES OF ESSO THERM 500 (HOT OIL)		
Temp, (^oC)	Sp. Gravity (kg/litre)	Sp.Heat (Kcal/kg/^oC)
100	0.775	0.53
125	0.755	0.559
150	0.72	0.57
175	0.69	0.6
200	0.66	0.625
225	0.64	0.65
250	0.625	0.665

Emission reduction Calculations(Train A)	**Value**	**Units**
Operating Range of WHRU	195-218	^0C
Flow Rate of Oil	127	m3/hr
Density at 195^o C	0.67	ton/m3
Density at 218^o C	0.65	ton/m3
Average Density	0.66	ton/m3
Flow Rate of Oil	84.06	ton/hr
Specific heat of Oil 195^o C	2.604	kJ/kg/^0C
Specific heat of Oil 218^o C	2.702	kJ/kg/^0C
Average Specific Heat	2.653	kJ/kg/^0C
Inlet Temprature of Oil	195	^0C
Outlet Temprature of Oil	218	no
No. of Units	1	no
Emission factor	0.056	tCO_2/GJ
Calculations for One unit		
Heat Gained by Oil	5106.5439	MJ/ hr
Working Hours Per day	24	hours
Working Days Per year	365	days
Energy saved per year (GJ/year)	44733.325	GJ/year
Total Energy saved per year for one unit	44733.325	GJ/year
Emission Reduction	2505	tCO_2/year

Emission reduction Calculations(Train B)	Value	Units
Operating Range of WHRU	195-217	^{0}C
Flow Rate of Oil	149	m3/hr
Density at 195^o C	0.67	ton/m3
Density at 217^o C	0.65	ton/m3
Average Density	0.66	ton/m3
Flow Rate of Oil	97.70	ton/hr
Specific heat of Oil 195^o C	2.604	kJ/kg/^{0}C
Specific heat of Oil 217^o C	2.698	kJ/kg/^{0}C
Average Specific Heat	2.651	kJ/kg/^{0}C
Inlet Temprature of Oil	195	^{0}C
Outlet Temprature of Oil	217	No
No. of Units	1	No
Emission factor	0.056	tCO_2/GJ
Calculations for One unit		
Heat Gained by Oil	5737.5585	MJ/ hr
Working Hours Per day	24	hours
Working Days Per year	365	days
Energy saved per year (GJ/year)	50261.012	GJ/year
Total Energy saved per year for one unit	50261.012	GJ/year
Emission Reduction	2815	tCO_2/year

Appendix A

List of Abbreviations

ONGC	Oil and Natural Gas Corporation
PGC	Process Gas Compressors
WHRU	Waste Heat Recovery Unit
MSP	Mumbai South Platform
CDM	Clean Development Mechanism
DNA	Designated National Authority
MH	Mumbai High
GHG	Green house Gases
UNFCCC	United Nations Framework Convention for Climate Change
EIA	Environmental Impact Assessment
GoI	Government of India
MoEF	Ministry of Environment and Forest
PSU	Public Sector Undertaking
DGM	Deputy General Manager
R&D	Research and Development

Enclosure 1

Reference List

i. Kyoto Protocol to the United Nations Framework Convention for Climate Change (UNFCCC) www.cdm.unfccc.int
ii. Website of CDM India, Ministry of Environment and Forests, Government of India www.cdmindia.nic.in
iii. Oil and Natural Gas Corporation Limited, Home www.ongcindia.com
iv. Website of Maps of India www.mapsofindia.com

Enclosure 2
Unit Cost analysis

Unit cost of Service calculation for ONGC MSP WHR project																	
Particulars	**Units**	**2004-05**	**2005-06**	**2006-07**	**2007-08**	**2008-09**	**2009-10**	**2010-11**	**2011-12**	**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**2019-20**
Initial investment	INR Millions	20.00															
Amortisation cost (capatial amortise in 15 years)	INR Millions		1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33
Maintenance Cost @ 3% of cost of project with 5% escalation every year.	INR Millions		0.20	0.21	0.22	0.23	0.24	0.26	0.27	0.28	0.30	0.31	0.33	0.34	0.36	0.38	0.40
Production Loss due to PGC shutdown due to WHR (3% of operating days=10 days)	INR Millions		60.80	60.8	60.80	60.8	60.80	60.8	60.80	60.8	60.80	60.8	60.80	60.8	60.80	60.8	60.80
Operating cost	INR Millions		0.00	0	0.00	0	0.00	0.3	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total expense	INR Millions	20.00	62.33	62.34	62.35	62.36	62.38	62.69	62.40	62.41	62.43	62.44	62.46	62.48	62.49	62.51	62.53
Wate heat recovered	Million Kcal/year		37307	37307	37307	37307	37307	37307	37307	37307	37307	37307	37307	37307	37307	37307	37307
Unit cost of heat	**(INR/Million Kcal)**		**1670**	**1671**	**1671**	**1671**	**1671**	**1680**	**1672**	**1672**	**1673**	**1673**	**1674**	**1674**	**1675**	**1675**	**1676**

Unit cost of Service calculation for NG based heater																	
Particulars	**Units**	**2004-05**	**2005-06**	**2006-07**	**2007-08**	**2008-09**	**2009-10**	**2010-11**	**2011-12**	**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**2019-20**
Initial investment (equity)	INR Millions	10.00															
Amortization cost (capital amortize in 15 years)	INR Millions		0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
Maintenance Cost @ 3% of cost of project with 5% escalation every year.	INR Millions		0.10	0.21	0.22	0.23	0.24	0.26	0.27	0.28	0.30	0.31	0.33	0.34	0.36	0.38	0.40

Production Loss due to PGC shutdown due to NG heater (3% of operating days=10 days)	INR Millions		0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Operating cost (Cost of NG)	INR Millions		11.94	11.94	11.94	11.94	11.94	11.94	11.94	11.94	11.94	11.94	11.94	11.94	11.94	11.94	11.94
Total expense	INR Millions	10.00	12.71	12.82	12.83	12.84	12.85	12.86	12.87	12.89	12.90	12.92	12.93	12.95	12.96	12.98	13.00
Wate heat recovered from WHR (ued in project activity)	Million Kcal/year		37307.52	37307.52	37307.52	37307.52	37307.52	37307.52	37307.52	37307.52	37307.52	37307.52	37307.52	37307.52	37307.52	37307.52	37307.52
Unit cost of heat	**(INR/Million Kcal)**		**340.55**	**343.49**	**343.78**	**344.07**	**344.39**	**344.71**	**345.05**	**345.41**	**345.79**	**346.18**	**346.60**	**347.03**	**347.50**	**347.97**	**348.48**

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