Monitoring report form (Version 03.1)

Monitoring report

Title of the 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
Reference number of the project activity	0814
Version number of the monitoring report	01
Completion date of the monitoring report	01/08/2013
Registration date of the project activity	05/02/2007
Monitoring period number and duration of this monitoring period	04th 01/07/2012 – 30/06/2013
Project participant(s)	Oil and Natural Gas Corporation Limited (ONGC)
Host Party(ies)	India
Sectoral scope(s) and applied methodology(ies)	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.
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	5320 tCO_2e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	4960 tCO_2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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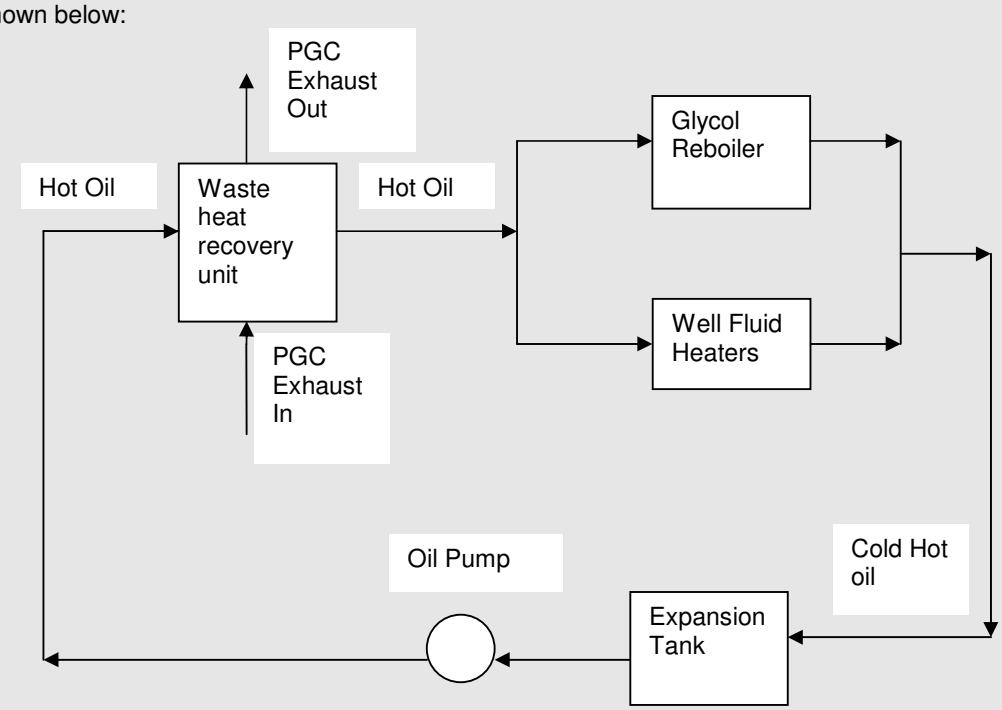
The project activity recovers heat from the exhaust flue gases of two 'Process Gas Compressors' (PGC), (used for compressing the associated gas in crude oil production activities), installed at ONGC's offshore Mumbai South platform (MSP). The MSP is a new platform and the waste heat recovery system is 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 used to heat hot oil which is further used to heat various process streams in the crude oil production activities. The project activity has reduced the consumption of fossil fuels (natural gas), which would otherwise be used for heating of hot oil for crude oil production activities.

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 hot oil through a WHRU. The waste heat of exhaust flue gases of PGC is gained by the process oil, which is circulated from discharge of hot oil pump to the WHRU, through heat transfer. The hot process oil is circulated through two glycol re-boilers in the glycol regeneration system to heat glycol solution.

Total GHG emission reductions achieved in this monitoring period is 4960 tCO2. The units are in continuous operations since the date of commissioning i.e. 31/05/2005 except some shut downs due to operational and maintenance requirements.

Brief description of the installed technology and equipments

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 oil expansion tank, hot oil circulation pumps, hot oil filters, hot 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 oil after picking up heat in the WHRU is available at 230 ℃. Hot 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 oil from the heaters and re-boilers is collected back in the header, which is connected to hot oil expansion tank. The cold hot oil from this expansion tank is in continuous recirculation. The flow diagram is shown below:



A.2. Location of project activity

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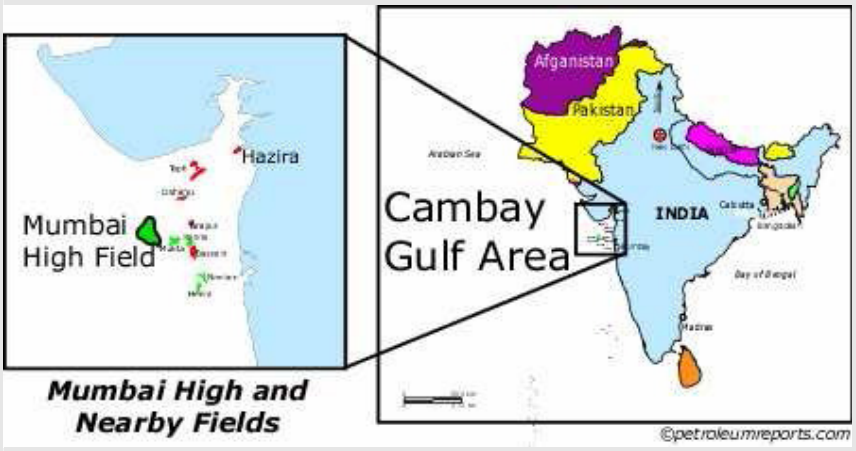
Mumbai High Asset, Mumbai Offshore, India

GPS coordinates: 19'21'45"N, 71'21'47" E



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

A.3. Parties and project participant(s)

Party involved **((host) indicates a host Party)**	**Private and/or public entity(ies) project participants (as applicable)**	**Indicate if the Party involved wishes to be considered as project participant (Yes/No)**
Party A (host) Government of India (host)	Oil and Natural Gas Corporation Ltd. (ONGC)- Public entity	NO
Party B Federal office for the Environment, Swiss Designated National Authority, Switzerland	Oil and Natural Gas Corporation Ltd. (ONGC)- Public entity	NO

A.4. Reference of applied methodology

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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.

A.5. Crediting period of project activity

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05/02/2007 – 04/02/2017 (10 Years) – Fixed Crediting Period

Present Monitoring Period

01/07/2012 – 30/06/2013 (1year)

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

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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.

Train A - Shut Down Details

Date	Running hours	Downtime hours	Reason
05-07-12	19.30	04.30	Stopped for DET wash
06-07-12	08.45	15.15	Loaded after GG wash
08.07.12	21.25	02.35	Trip yard valve seq failure
18.07.12	22.50	01.10	Trip yard valve seq failure
22.07.12	22.55	01.05	Trip yard valve seq failure
12.09.12	18.15	05.45	Stopped for GG wash
20.09.12	10.30	13.30	Stopped for GG wash
19-09-12	20.20	03.40	Unit stopped for 3rd stage fan belt replacement
20-09-12	21.20	02.40	Tripped due to suction pressure LO-LO
21-09-12	22.35	01.25	Tripped due to Suction KOD level HI-HI
23-09-12	22.45	01.15	Tripped due to Suction KOD level HI-HI and ESD at BHS & MSP
10-11-12	19.45	04.15	Stopped for GG wash
11-11-12	13.00	11.00	Started after GG wash
09-12-12	22.25	01.35	Trip yard valve seq failure
18-12-12	08.20	15.40	Tripped due to 1st stage discharge pres.hi-hi.and unit s/b.
19-12-12	18.00	06.00	--
20-12-12	14.15	09.45	Stopped due to less gas and unit s/b
21-12-12	10.50	13.10	unit s/b
01-01-13	0	24	SB
02-01-13	0	24	SB
03-01-13	0	24	SB
04-01-13	0	24	SB
05-01-13	0	24	SB
06-01-13	0	24	SB
10-01-13	14.30	09.30	SB
11-01-13	0	24	SB
12-01-13	07.30	16.30	SB
13-01-13	0	24	SB
14-01-13	0	24	SB
15-01-13	0	24	SB
17-01-13	8	16	--

18-01-13	5	19	TRIPPED DUE TO ESD-PLC SIGNAL
22-01-13	12.35	11.25	PSD AT MSP. Loaded after PSD Normalization
25-01-13	21.00	03.00	Stopped for Maintenance Job
27-01-13	05.00	19.00	LOADED DUE TO PSD AT SHP
28-01-13	21.15	02.45	TRIPPED DUE TO PARTIAL PSD AT MSP
03-02-13	19.00	05.00	PSD
12.02-13	22.30	01.30	TRIPPED DUE TO ESD-PLC SIGNAL
24-02-13	21.25	02.35	ESD AT MSP
04-03-13	22.30	01.30	Tripped due to Yard Valve Sequence Fail
05-03-13	23.50	00.10	Tripped due to 1st stage Discharge Pressure HI-HI
11-03-13	23.00	01.00	Tripped due to Yard Valve Sequence Fail
21-03-13	23.50	00.10	TRIPPED DUE TO 1ST STAGE DISCH PR HIGH
23-03-13	18.20	05.40	GG Wash
24-03-13	09.30	14.30	GG Wash
09-04-13	21.00	03.00	Maintenance Job
15-04-13	18.00	06.00	Stopped for boroscopic study
16-04-13	10.15	13.45	Stopped for boroscopic study
09-05-13	21.30	02.30	Damaged diaphragm replacement of 3rd stage recycle valve
23-05-13	23.45	00.15	cascade Tripping of BHS PGC
28-05-13	18.30	05.30	GG Wash
29-05-11	17.20	06.40	GG Wash
15-06-13	23.20	00.40	Cascade Tripping

Train B - Shut Down Details

Date	Running hours	Downtime hours	Reason
08-07-12	23.50	00.10	Tripped due to delayed T5
20-09-12	10.50	13.10	ESD at BHS & MSP
21-09-12	12.30	11.30	
23-09-12	20.45	03.15	ESD at BHS & MSP
14-10-12	04.00	20.00	GG Wash
02-12-12	19.35	04.25	Tripped due to XVPS-3412 ER Command error
02-12-12	18.00	06.00	Stopped for GG wash.
09-12-12	08.50	15.10	Loaded unit after GG wash.
10-12-12	22.50	01.10	Tripped due to 1st stage discharge pressure HI-HI.
18-12-12	23.45	00.15	Unloaded for 1st stage discharge pre. Hi/hi. Again loaded.
26-12-12	13.00	11.00	Unit S/B .Stopped due to less LP gas.
30-12-12	18.20	05.10	Unit loaded
18-01-13	22.40	01.20	Stopped for Maintenance.
22-01-13	20.30	03.30	PSD AT MSP/SLQ
27-01-13	21.15	02.45	S topped after PSD normalization at SHP
28-01-13	16.15	07.45	Loaded unit due to stopping of BHS PGC-A
03-02-13	17.40	06.20	PSD
08-02-13	18.00	06.00	Stopped for GG Wash
09 -02-13	03.20	20.40	Started due to postponement of GG Wash
11-02-13	21.15	02.45	Stopped for GG Wash & Maintenance
12-02-13	07.00	17.00	Loaded after Maintenance
13-02-13	23.45	00.15	--
24-02-13	21.00	03.00	ESD at MSP
04-03-13	23.50	00.10	TRIPPED DUE TO DELYAED T5
05-03-13	22.45	01.15	TRIPPED DUE TO 1ST STAGE DISCH PR HIGH
06-03-13	22.20	01.40	Tripped due to L//O cooler fan tripping
21-03-13	21.20	02.40	TRIPPED DUE TO 1ST STAGE DISCH PR HIGH
22-03-13	22.00	02.00	TRIPPED DUE TO 1ST STAGE DISCH PR HIGH
04-04-13	18.00	06.00	GG Wash
05-04-13	14.15	09.45	Loaded after GG Wash
13-04-13	18.15	05.45	Stopped for Boroscopic Study

14-04-13	06.45	17.15	Loaded after Boroscopic Study
23-05-13	22.55	01.05	Cascade Tripping of BHS PGC
31-05-13	17.15	06.45	GG wash
01-06-13	16.45	07.15	GG Wash
07-06-13	23.45	00.15	Yard Valve Sequence Fail
15-06-13	20.20	03.40	Cascade Tripping

Train	Downtime hours	Reasons
A	515.50	Tripping/ Maintenance requirement etc.
B	222.25	Tripping/ Maintenance requirement etc.

B.2. Post registration changes

B.2.1. Temporary deviations from registered monitoring plan or applied methodology

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No deviation is applied to the monitoring period.

B.2.2. Corrections

>>

Not applicable.

B.2.3. Permanent changes from registered monitoring plan or applied methodology

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Not applicable.

B.2.4. Changes to project design of registered project activity

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Not applicable.

B.2.5. Changes to start date of crediting period

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Not applicable.

B.2.6. Types of changes specific to afforestation or reforestation project activity

>>

Not applicable.

SECTION C. Description of monitoring system

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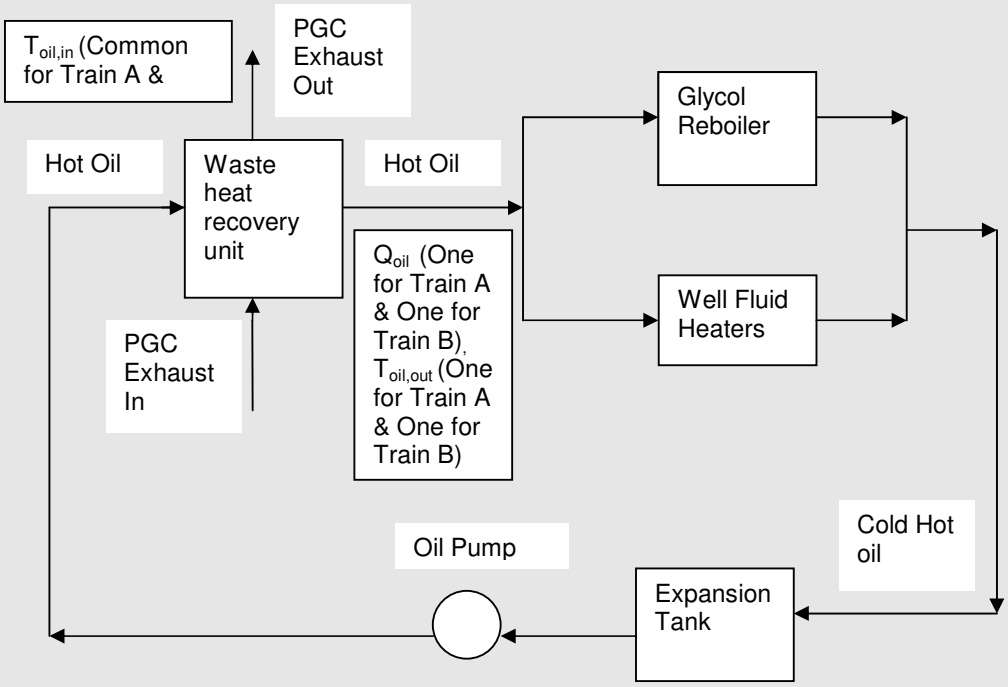
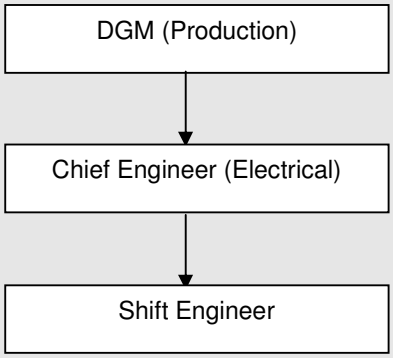


Roles & Responsibilities:

The operational and management structure that is monitoring 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.

- **Emergency procedures for the Monitoring system:**

The equipment will either be repaired or replaced as the case is and the intervening period is shown as operational shut down. There is no alternative measurement system and emission reduction is shown zero for those periods.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante or at renewal of crediting period

Data / Parameter:	Emission Factor
Unit:	tCO2/GJ
Description:	Emission factor for Natural Gas
Source of data:	IPCC default value
Value(s) applied):	0.056
Purpose of data:	Baseline emission calculation
Additional comment:	Not Applicable

Data / Parameter:	Specific heat
Unit:	Kcal/kg/Deg C
Description:	Specific heat of hot oil (Esso therm 500)
Source of data:	Manufacturer's specifications
Value(s) applied):	0.53-0.665
Purpose of data:	Baseline emission calculation
Additional comment:	Conservative value at the lowest available temperature as per the annexure 03 of registered PDD is used. (Refer ER spreadsheet)

Data / Parameter:	Specific gravity
Unit:	-
Description:	Specific gravity of hot oil (Esso therm 500)
Source of data:	Manufacturer's specifications
Value(s) applied):	0.625-0.775
Purpose of data:	Baseline emission calculation
Additional comment:	Conservative value at the highest available temperature as per the annexure 03 of registered PDD is used. (Refer ER spreadsheet)

D.2. Data and parameters monitored

Data / Parameter:	Qoil(PGC Train A)
Unit:	Tonne/hr
Description:	Flow rate of heating oil
Measured/ Calculated / Default:	Measured
Source of data:	Plant Data maintained in the log book.

Value(s) of monitored parameter:	Refer Excel sheet
Monitoring equipment:	Oil flow meter (Tag No FT 54410) Sr No.01212732 Accuracy is ±0.5% Calibration: 29/06/2012, 26/12/12 & 18/06/2013 Validity: Each calibration is valid for one year interval.
Measuring/ Reading/ Recording frequency:	Measured continuously, Recorded daily.
Calculation method (if applicable):	Not Applicable
QA/QC procedures:	As per the QMS standards of the Company, the meters are to be calibrated, once in a year. But to be conservative, the equipment has been calibrated on the frequency of less than a year.
Purpose of data:	This is used for baseline emission calculations.
Additional comment:	Not applicable

Data / Parameter:	Qoil(PGC Train B)
Unit:	Tonne/hr
Description:	Flow rate of heating oil
Measured/ Calculated / Default:	Measured
Source of data:	Plant Data maintained in the log book.
Value(s) of monitored parameter:	Refer Excel sheet
Monitoring equipment:	Oil flow meter (Tag No FT 54420) Sr No. 01212733 Accuracy +0.5% Calibration: 29/06/2012 ,26/12/2012 & 18/06/2013 Validity: Each calibration is for one year interval.
Measuring/ Reading/ Recording frequency:	Measured continuously, Recorded daily.
Calculation method (if applicable):	Not Applicable
QA/QC procedures:	As per the QMS standards of the Company, the meters are to be calibrated, once in a year. But to be conservative, the equipment has been calibrated on the frequency of less than a year.
Purpose of data:	This is used for baseline emission calculations
Additional comment:	Not Applicable

Data / Parameter:	Toil,in
Unit:	0C
Description:	Inlet temp. of heating Oil
Measured/ Calculated / Default:	Measured
Source of data:	Plant Data maintained in the log book.
Value(s) of monitored parameter:	Refer Excel sheet
Monitoring equipment:	Temperature meter (Tag no TT 54541) Sr No. 01227455 Accuracy +0.5% Calibration: 30.06.2012 , 27/12/2012 & 17/062013 Validity: Each calibration is for one year interva
Measuring/ Reading/ Recording frequency:	Measured continuously, Recorded daily
Calculation method (if applicable):	Not Applicable
QA/QC procedures:	As per the QMS standards of the Company, the meters are to be calibrated, once in a year. But to be conservative, the equipment has been calibrated on the frequency of less than a year.
Purpose of data:	This is used for baseline emission calculations.
Additional comment:	Not Applicable

Data / Parameter:	Toil,out
Unit:	0C
Description:	Outlet temp. of heating Oil (PGC Tr A)
Measured/ Calculated / Default:	Measured
Source of data:	Plant Data maintained in the log book.
Value(s) of monitored parameter:	Refer Excel sheet
Monitoring equipment:	Temperature meter (Tag No TT54413) Sr No. 01227410 Accuracy +0.5% Calibration: 30.06.2012 , 27/12/2012 & 17/06/2013 Validity: Each calibration is for one year interval.
Measuring/ Reading/ Recording frequency:	Measured continuously, Recorded daily
Calculation method (if applicable):	Not Applicable

QA/QC procedures:	As per the QMS standards of the Company, the meters are to be calibrated, once in a year. But to be conservative, the equipment has been calibrated on the frequency of less than a year.
Purpose of data:	This is used for baseline emission calculations
Additional comment:	Not Applicable

Data / Parameter:	$T_{oil,out}$
Unit:	^{0}C
Description:	Outlet temp. of heating Oil (PGC Tr B)
Measured/ Calculated / Default:	Measured
Source of data:	Plant Data maintained in the log book.
Value(s) of monitored parameter:	Refer Excel sheet
Monitoring equipment:	Temperature meter (Tag No TT54423) Sr No. 01227358 Accuracy $\pm$0.5% Calibration: 30.06.2012 , 27/12/2012 & 17/06/2013 Validity: Each calibration is for one year interval.
Measuring/ Reading/ Recording frequency:	Measured continuously, Recorded daily.
Calculation method (if applicable):	Not Applicable
QA/QC procedures:	As per the QMS standards of the Company, the meters are to be calibrated, once in a year. But to be conservative, the equipment has been calibrated on the frequency of less than a year.
Purpose of data:	This is used for baseline emission calculations.
Additional comment:	Not Applicable

Data / Parameter:	H
Unit:	hours
Description:	Running hours per day
Measured/ Calculated / Default:	Recorded
Source of data:	Plant Data maintained in the log book.
Value(s) of monitored parameter:	Refer Excel sheet
Monitoring equipment:	-

Measuring/ Reading/ Recording frequency:	continuously, Recorded daily
Calculation method (if applicable):	Not applicable
QA/QC procedures:	-
Purpose of data:	Emission reduction calculation
Additional comment:	_

Data / Parameter:	D
Unit:	days
Description:	Working days per Year
Measured/ Calculated / Default:	Recorded
Source of data:	Plant Data maintained in the log book.
Value(s) of monitored parameter:	Refer Excel sheet
Monitoring equipment:	-
Measuring/ Reading/ Recording frequency:	_
Calculation method (if applicable):	Recorded
QA/QC procedures:	Not Applicable
Purpose of data:	Emission reduction calculation
Additional comment:	Not applicable

D.3. Implementation of sampling plan

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Not Applicable

SECTION E. Calculation of emission reductions or GHG removals by sinks

E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

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Ed = Qoil x Soil x (Toil, in – Toil, out) x H

Ed – Energy recovered by WHRU in a day d (GJ per day)

Qoil - Flow rate of Heating Oil (Tonne/ Hour)

Soil – Specific heat of Heating Oil (Kj/Kg/0C)

Toil, in – Inlet temperature of Heating Oil (0C)

Toil, out – Outlet temperature of Heating Oil (0C)

H – Working hours per day (Hours)

Ey – Energy recovered by WHRU in year y (GJ per year)

d – Working days per year (days)

Sample calculation for Energy saved on 01/07/2012 for PGC Tr A

Ed = Qoil x Soil x (Toil, in – Toil, out) x H

Ed – Energy recovered by WHRU in a day d (GJ per day)

Qoil - Flow rate of Heating Oil (Tonne/ Hour) = 159.994X0.625

Soil – Specific heat of Heating Oil (Kj/Kg/0C) = 2.340 (Conservative value @ 175℃)

Toil, in – Inlet temperature of Heating Oil (0C) = 205.126

Toil, out – Outlet temperature of Heating Oil (0C) = 213.853

H – Working hours per day (Hours)=24

Ed=159.994x0.655x2.640x(205.126-213.853)x24 = -57.94 (The –ve sign shows the energy saved)

All the parameters have been monitored and details and the values recorded for each of the monitoring parameters is provided in the attached excel file

BEy = Baseline emission for energy saved during year y

EFNG – Emission Factor for Natural Gas (tCO2e/GJ) (Source: IPCC 1996)

Sample calculation for Baseline emission 01/07/2012 for PGC Train A

3988 GJ*.0561 TCO2e/GJ=224 tCO2e (Rounded down)

E.2. Calculation of project emissions or actual net GHG removals by sinks

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Not Applicable

E.3. Calculation of leakage

>>

Not Applicable

E.4. Summary of calculation of emission reductions or net anthropogenic GHG removals by sinks

Item	Baseline emissions or baseline net GHG removals by sinks (t CO_2e)	Project emissions or actual net GHG removals by sinks (t CO_2e)	Leakage (t CO_2e)	Emission reductions or net anthropogenic GHG removals by sinks (t CO_2e)
Total	4960	0	0	4960

E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (t CO_2e)	5320	4960

E.6. Remarks on difference from estimated value in registered PDD

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The actual emission reductions are less than the ex-ante estimated emission reductions for the comparable period.

E.7. Actual emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards

Item	Actual values achieved up to 31 December 2012	Actual values achieved from 1 January 2013 onwards
Emission reductions or GHG removals by sinks (t CO_2e)	27200	2061

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Document information

Version	*Date*	*Description*
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net anthropogenic GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01	28 May 2010	EB 54, Annex 34. Initial adoption.

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Business Function: issuance
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