Monitoring report form
(Version 03.1)

Monitoring report

Title of the project activity	Amine Circulation Pumps Energy Efficiency at Hazira Works of ONGC
Reference number of the project activity	2648
Version number of the monitoring report	01
Completion date of the monitoring report	22/05/2013
Registration date of the project activity	23/09/2009
Monitoring period number and duration of this monitoring period	2nd MONITORING PERIOD 01/08/2011-31/07/2012 (First and Last Day Included)
Project participant(s)	Oil and Natural Gas Corporation Ltd. (ONGC)
Host Party(ies)	India (host)
Sectoral scope(s) and applied methodology(ies)	Sectoral Scope: 4-Manufacturing Industries Applicable approved small scale methodology: AMS II: D- Energy Efficiency and Fuel Switching Measures for Industrial Facilities, Version 11
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	4043 tCO_{2e}
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	2707 tCO_{2e}

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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Oil and Gas Corporation Limited (ONGC) is one of the leading oil & gas producers in the country. One of the major oil and gas fields owned as well as operated by it, is located off the coast of Mumbai and is collectively known as Mumbai Offshore. ONGC has a gas processing facility located at Hazira in the state of Gujarat, which carries out processing of gas received from the Mumbai offshore fields. During processing, desulphurization is one of the operations carried out to remove Sulphur (which is present in the form of H2S) from the natural gas received. This removal of H2S is carried out in Gas Sweetening Units (GSU's) mainly consisting of eight absorption towers. These towers use Methyl Di- Ethanol Amine (Amine) as the absorbent. The lean amine (free from H2S) is pumped into the absorption tower using eight stage high capacity centrifugal pumps. Each absorption tower is serviced by two such pumps (one operating and another standby). The rich amine containing H2S absorbed from the sour gas, is stripped of the H2S in the Sulphur recovery units, and re-circulated back into the tower. The GSU facility comprising of two sets of trains (each set comprises of four trains), currently, processes approximately 41 million metric standard cubic meters of gas per day.

The amine charge pumps are critical to the operation of GSU's. They are energy intensive and constitute about 15% of the total power load of the Hazira Processing Plant. The CDM project activity comprises of improving the energy efficiency of some of the amine circulation pumps by carrying out stage blanking of the eight stage amine circulation pump. With the stage blanking the eight stage pump has been converted to a seven stage pump. Improvement in the energy efficiency of some of the amine circulation pumps has reduced to power consumption for the same level of performance. The reduction in consumption of power in turn leads to reduction in the emissions of GHG.

The project activity comprises of stage blanking of five amine circulation pumps. As mentioned in the registered PDD, the activity of stage blanking of the pumps has been completed prior to CDM registration of the project activity as under:

Pump TAG Number	Commissioning date after modifications	Status of Implementation
31P301B	July 2006	Implemented
32P301B	July 2007	Implemented
33P301B	April 2008	Implemented
34P301A	September 2008	Implemented
35P301A	August 2007	Implemented

It was planned earlier to carry out the stage blanking in additional five pumps in a phased manner. Table below gives the planned schedule to carry out the stage blanking in additional pumps and the status of implementation as on date:

Pump TAG Number	Location	Planned Commissioning date after modifications	Status of implementation
31P301A	GSU-I	Feb 2010	Not implemented
32P301A	GSU-I	Dec 2010	Not implemented
35P301B	GSU-II	June 2009	Not implemented
33P301A	GSU-I	October 2009	Not implemented
34P301B	GSU-II	August 2010	Not implemented

However, the modification in the remaining pumps (above mentioned Pump TAG number) is yet to be carried out. As a standard practice modifications in the remaining pumps would be carried out at the time of overhauling of the same. Thus the implementation of a part of the project activity would be delayed. Based on a broad statistical guesstimate taking into consideration the changed scenario of modified maintenance practices and its effect on the health of the pumps, operational requirement trends and other contributing factors, the remaining pumps may undergo for major repair and stage blanking by 2016. However, conscious efforts shall be made to prevent occurrence of such events. As such the monitoring plan given in the registered PDD mentions modification of the pumps as one of the monitored parameters. As modification of the pump is a monitored parameter it is a variable for the purpose of computation of emissions. In

accordance with the monitoring plan the parameter regarding the actual modification of the pump has been monitored and reported in section D.2 of document.

Total emission reductions achieved during monitoring period from 01/08/2011 to 31/07/2012 is 2707 t CO2 e.

A.2. Location of project activity

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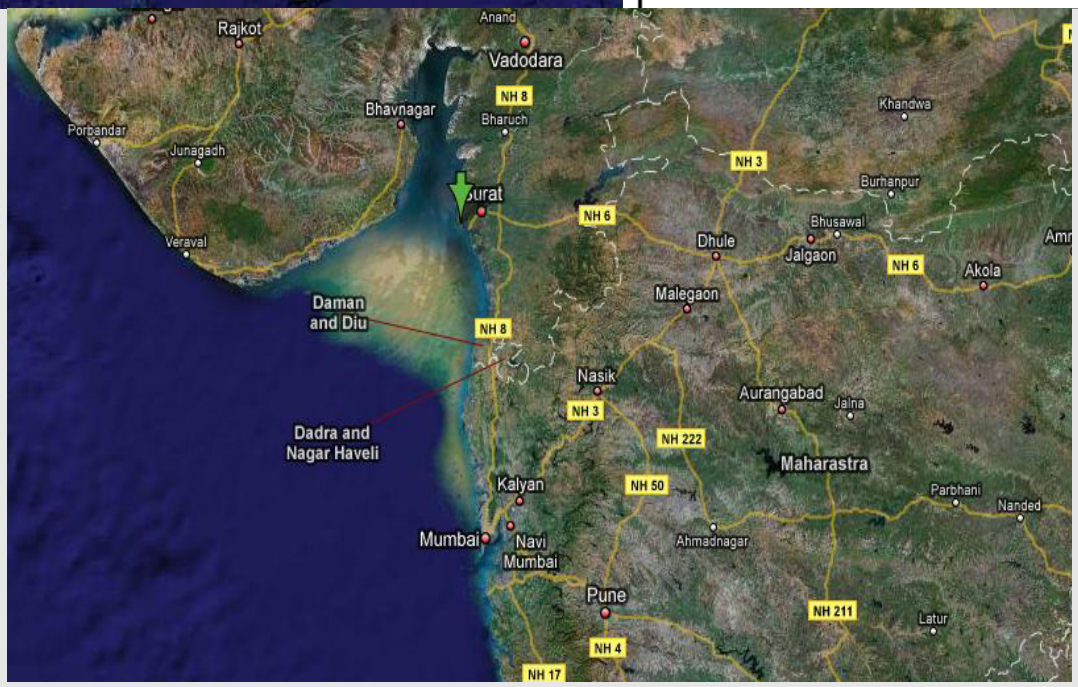
Project activity is located at Hazira in Surat district, Gujarat state of India. The location map of the project activity is given below:

Hazira is located 230km north of Mumbai, 21 km from Surat city on the right bank of river Tapi. Unimpeded passage to the Arabian Sea is just 8 km away, with the Surat-Hazira port at a distance of 10.2 km from the works. The industrial hub is well connected with the National Highway #8 passing by the town and the presence of an airport just 8 km away.

Longitude – 21° 9' 42" N
Latitude – 72° 43' 44" E

Hazira
Gujarat
India



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)
India (host) Federal office for the Environment, Swiss Designated National Authority, Switzerland	Oil and Natural Gas Corporation Ltd. (ONGC)	No

A.4. Reference of applied methodology

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As mentioned in section B.1 of registered PDD of project activity, title and reference of the applicable methodology to project activity is as under:

- Sectoral Scope: 4-Manufacturing Industries
- Project Category: Type II: Energy Efficiency Improvement Projects
- Applicable approved small scale methodology: AMS II: D, Version 11. "Energy Efficiency and Fuel Switching Measures for Industrial Facilities"

A.5. Crediting period of project activity

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As mentioned in section C.2.2., of registered PDD of project activity, a fixed crediting period of 10 years has been chosen by selecting the registration date as crediting period start date for the project activity under consideration. The project activity has been registered on 23/09/2009; accordingly, the crediting period of project activity starts on 23/09/2009. The choice of crediting period in this case is the fixed time period of 10 years thus the crediting period of the project activity starts on 23/09/2009 and will end on 22/09/2019 (both days inclusive).

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

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The project activity comprises of stage blanking of five amine circulation pumps. As mentioned in the registered PDD, the activity of stage blanking of the pumps has been completed prior to CDM registration of the project activity as under:

Pump TAG Number	Commissioning date after modifications	Status of Implementation
31P301B	July 2006	Implemented
32P301B	July 2007	Implemented
33P301B	April 2008	Implemented
34P301A	September 2008	Implemented
35P301A	August 2007	Implemented

It was planned earlier to carry out the stage blanking in additional five pumps in a phased manner. Table below gives the planned schedule to carry out the stage blanking in additional pumps and the status of modifications as on date:

Pump TAG Number	Location	Planned Commissioning date after modifications	Status of modifications
31P301A	GSU-I	Feb 2010	Not modified
32P301A	GSU-I	Dec 2010	Not modified
35P301B	GSU-II	June 2009	Not modified
33P301A	GSU-I	October 2009	Not modified
34P301B	GSU-II	August 2010	Not modified

However, the modification in the remaining pumps (above mentioned Pump TAG number) is yet to be carried out. As a standard practice modifications in the remaining pumps would be carried out at the time of overhauling of the same. Thus the implementation of a part of the project activity would be delayed. Based on a broad statistical guesstimate taking into consideration the changed scenario of modified maintenance practices and its effect on the health of the pumps, operational requirement trends and other contributing factors, we may have to send another pump for major repair and stage blanking by 2016. However, conscious efforts shall be made to prevent occurrence of such events. As such the monitoring plan given in the registered PDD mentions modification of the pumps as one of the monitored parameters. As modification of the pump is a monitored parameter it is a variable for the purpose of computation of emissions. In accordance with the monitoring plan the parameter regarding the actual modification of the pump has been monitored and reported in section D.2 of document.

During the operation of Project activity, some downtime periods with respect to different trains were also reported. The details of downtime are provided as Annexure 1- Downtime Details.

B.2. Post registration changes

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

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Not Applicable

B.2.2. Corrections

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As mentioned earlier in section B.1 above, the schedule for performing stage blanking (energy efficiency measure) in the remaining 5 pumps has been delayed due to technical issues and will be done tentatively in 2016. Therein, in line with paragraph 212 of Clean development mechanism project standard, version 02.1, the project implementation schedule has been revised in PDD during the 1st verification. There has been no correction during the monitoring period of 01/08/2011 to 31/07/2012.

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

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Not Applicable

SECTION C. Description of monitoring system

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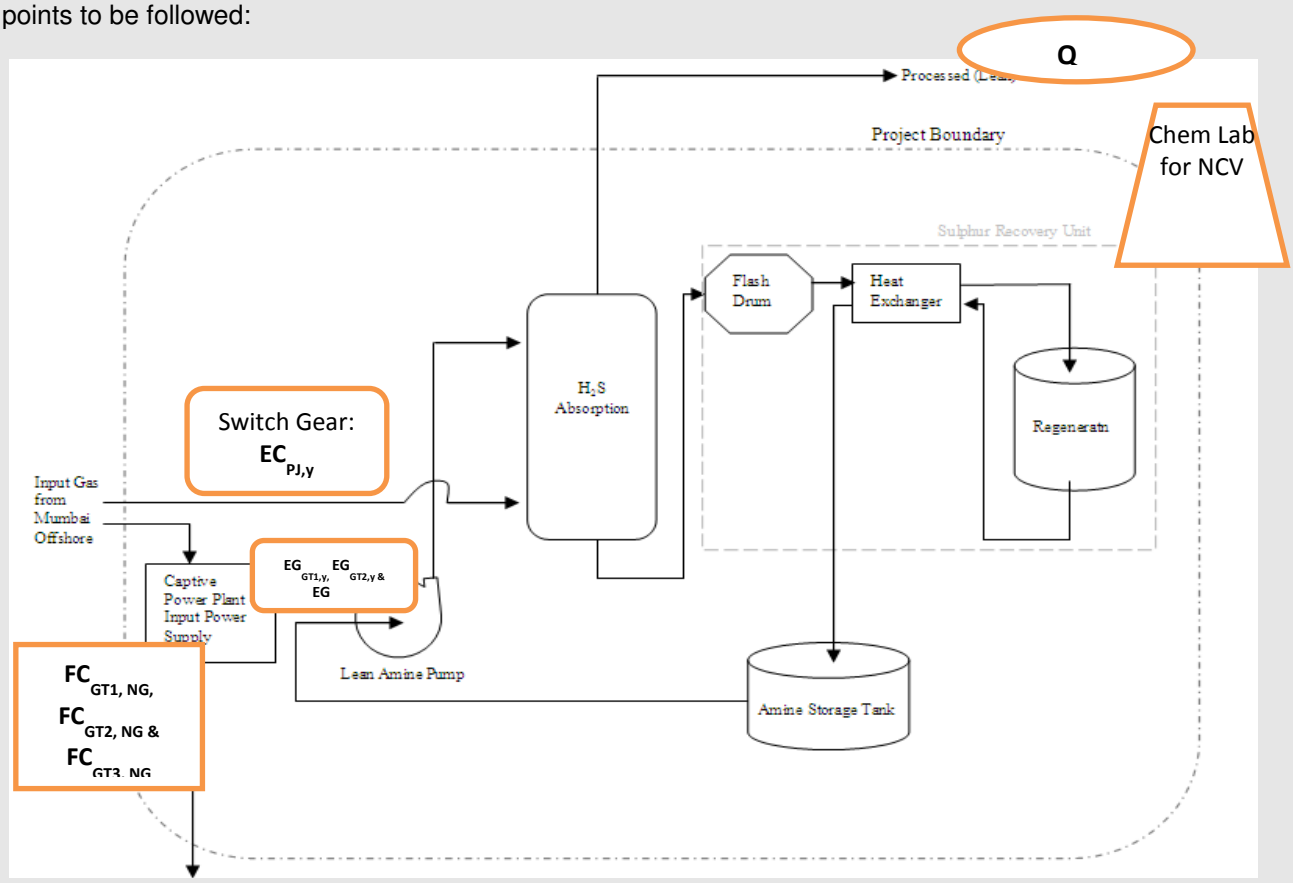
As mentioned in section B.7.2 of registered PDD, the monitoring plan adopted for project activity under consideration includes;

- Relevant data collection, compilation and archiving, consistent with the good practices prescribed/followed.
- Data interpretation and computation techniques for monitoring and verification of GHG Emissions.

With reference to the guidelines laid down in the applicable methodology AMS II D; Energy Efficiency and Fuel Switch Measures for Industrial Facility, in the specific case of replacement, modification and retrofit measures, the monitoring consists of –

- Documenting the specifications of the equipment replaced/modified – Accordingly the technical specifications and operating parameters of the 8 stage amine circulation pump recorded, documented and archived.
- Metering the energy use of the industrial or mining and mineral production facility, processes or equipment affected by the project activity – thus the metering of the energy consumption of the stage blanked pumps was carried in real time, and values recorded daily.
- Calculating the energy savings using the metered energy consumption data obtained.

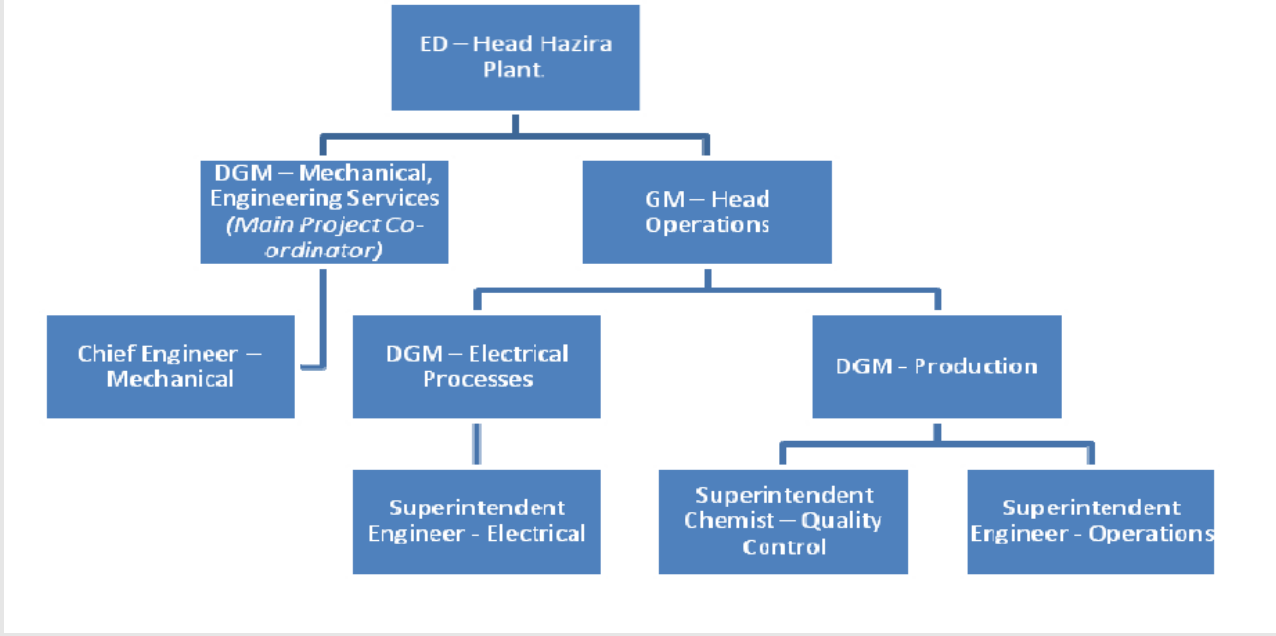
The figure below shows the line diagram of the project activity that consequently can show the monitoring points to be followed:



For the monitoring plan developed specifically for this project activity the following points are considered;

- Assignment of the monitoring and verification responsibilities, to the relevant in-house personnel, establishing their reporting relationships for the CDM activity, within the existing organizational structure/framework and responsibilities.
- Adaptation of existing reporting and Management Information Systems to incorporate the monitoring and verification plan of the CDM activity into ONGC's day-to-day operations.

ONGC has the following operational and management structure currently;



Monitoring Roles and Responsibilities;

- DGM – Mechanical, of the Engineering Services Department chose as the Main CDM project coordinator for the project activity under consideration. He ensures that, the monitoring plan is strictly adhered to, relevant data collected and archived, and forwarded to the Group General Manager of ONGC's Carbon Management Group, based in New Delhi.

- The Chief Engineer – Mechanical is responsible for documenting specifications of the equipment replaced. He also, closely works with the Superintendent Engineer – Operations for the monitoring and archiving of the quantity of gas fired in the generators; and with the Superintendent Engineer – Electrical for the monitoring and archiving of the quantity of energy consumed by the lean amine circulation pumps. He carry out all the necessary computations as described in the registered project design document computation of emission reductions taken place in each year of the crediting period, and update the same to the DGM – Mechanical of Engineering Services Department. The Chief Engineer, Mechanical is responsible for overlooking the pump switch over procedures from time to time, and ensuring periodic maintenance of the pumps. The periodic review is carried out once a month, with reference to the average rate of sour gas processed and the corresponding energy consumption in the project scenario by the Chief Engineer Mechanical, and any discrepancies or deviations are duly reported.

- The Superintendent Engineer – Operations is primarily responsible for the monitoring and archiving of the quantity of the gas fired in the in-house captive generators. He is also additionally responsible for timely and prompt update of the data to the DGM – Mechanical of the Engineering Services Department, and reports discrepancies immediately if any.

- The Superintendent Engineer – Electrical is responsible for monitoring and archiving of the quantity of energy consumed by the lean amine pumps. This monitoring of data is carried out by reviewing of the daily readings reported by the in-line energy meters installed for individual pumps. The energy meters calibrated suitably as per the standard statutory requirements. Superintendent Engineer – Electrical has responsibility to ensure the accuracy class, and calibration frequency is maintained as per standard Original equipment Manufacturer (OEM) guidelines.

- The Superintendent Engineer - Quality Control is responsible for obtaining the Net Calorific Value of each fuel delivery, i.e. the gas received to be fired in the generators. He also computes the annual weighted average figures for the same and update the data to DGM – Mechanical of the Engineering Services Department.

Additionally, the QA/QC Procedures followed for different monitoring parameters is as under:

Average Rate of Gas Processed by the Project Activity: The flow meters has calibrated regularly as per

the requirement specified by the OEM.

Weighted average net calorific value of the Natural Gas: The measurement of the calorific value is done on sample basis using the analytical instruments- gas chromatography system and said systems are appropriately calibrated as per the applicable standards.

Total quantity of Natural Gas fired in the Captive Generator GT – 1, Gt-2 and GT-3: The all flow meters has calibrated regularly as per the requirement specified by the OEM.
The Superintendent Engineer – Operations sends timely and prompt update of the data to the DGM – Mechanical of the Engineering Services Department, and report discrepancies immediately if any.

Total Quantity of Net Electricity Generated in the Captive Generator GT-1, GT-2 and GT-3: The parameter has monitored continuously. The energy meters were consistently checked for accuracy by periodic calibration as prescribed by the OEM of the metering equipment and the Statutory Bodies.

Quantity of Energy consumed by the project activity: Separate energy meters are installed for each of the Amine circulation pumps, within the Gas Sweetening Units. This monitoring of data is carried out by reviewing of the daily readings reported by the in-line energy meters installed for individual pumps. The parameter has monitored continuously with the help of said energy meters and these meters have been calibrated as per standard OEM requirements
It has been ensured that the accuracy class, and calibration frequency is maintained as per standard OEM guidelines. Superintendent Engineer sends timely and prompt update of the data to the DGM – Mechanical of the Engineering Services Department, and report
discrepancies immediately if any.

SECTION D. Data and parameters

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

Data / Parameter:	$EF_{CO_2,NG}$
Unit:	tCO_2/TJ
Description:	Emission factor for natural gas
Source of data:	IPCC default values at the upper limit of uncertainty at a 95% confidence level as provided in table 1.4 of the Chapter 1 of Volume 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.
Value(s) applied):	58.30
Purpose of data:	For computing project emission
Additional comment:	-

D.2. Data and parameters monitored

Data / Parameter:	$Q_{, y}$
Unit:	MMSCMD (Million Meter Standard Cubic Meter per Day)
Description:	Average Rate of Gas Processed by the Project Activity during the monitoring period dated 01/08/2011-31/07/2012 for each pump
Measured/ Calculated / Default:	Measured
Source of data:	Online measurement (use of in-line flow meters)

Value(s) of monitored parameter:	

Train 31P301 (Pump B)	4.98
Train 32P301 (Pump B)	3.87
Train 33P301 (Pump B)	4.08
Train 34P301 (Pump A)	5.46
Train 35P301 (Pump A)	5.93

Monitoring equipment: Separate online meter for each of the pump has been used to measure the rate of gas processed by the project activity. The meter provides readings in Thousand NM3 per hour for the gas processed, which is multiplied by 0.025 to compute the rate of gas processing in MMSCMD. Readings is noted every 2 hours. Details of the online gas flow meters are as follows:

Pump	Sl of the meter	Make	Accuracy class	Calibration Frequency	Date of last calibration	Due date for next calibration
Train-31 P301 (Pump A & B)	31FT1101	ROSEMOUNT	+/-0.025% fs	Annual	09/09/2010 01/09/2011	08/09/2011 31/08/2012
Train-32 P301 (Pump A &B)	32FT1101	ROSEMOUNT	+/-0.025% fs	Annual	09/09/2010 01/09/2011	08/09/2011 31/08/2012
Train-33 P301 (Pump A & B)	33FT1101	ROSEMOUNT	+/-0.025% fs	Annual	09/09/2010 01/09/2011	08/09/2011 31/08/2012
Train-34 P301 (Pump A & B)	34FT1101	ROSEMOUNT	+/-0.025% fs	Annual	10/09/2010 02/09/2011	09/09/2011 01/09/2012
Train-35 P301 (Pump A & B)	35FT1101	ROSEMOUNT	+/-0.025% fs	Annual	10/09/2010 02/09/2011	09/09/2011 01/09/2012

Measuring/ Reading/ Recording frequency:	Every two hours of operation
Calculation method (if applicable):	The average flow rate of the gas processed for the monitoring period under consideration is calculated by using weighted average of different readings of gas flow rate through a given train, as compared with the hours of operation.
QA/QC procedures:	The flow meters has calibrated regularly as per the requirement specified by the OEM.
Purpose of data:	For baseline emission calculations.
Additional comment:	

Data / Parameter:	$NCV_{NG,y}$
Unit:	Kcal/NM3
Description:	Weighted average net calorific value of the Natural Gas fired during the monitoring period (01/08/2011-31/07/2012)

Measured/ Calculated / Default:	Measured and calculated
Source of data:	In-house sampling and calculations
Value(s) of monitored parameter:	7928.11
Monitoring equipment:	Use of analytical instruments (gas chromatography system) in-line with national fuel standards. The NCV is obtained for each fuel delivery, from which the weighted average annual values have been calculated. Date of calibration: 29/04/2011, 26/04/2012 Calibration due on: 25/04/2013
Measuring/ Reading/ Recording frequency:	One sample every month
Calculation method (if applicable):	The NCV value is obtained for the fuel delivery, from which the weighted average annual value is calculated.
QA/QC procedures:	The measurement of the calorific value is done on sample basis using the analytical instruments and said systems are appropriately calibrated as per the applicable standards.
Purpose of data:	For project emission calculations and the baseline emission calculations.
Additional comment:	

Data / Parameter:	**$FC_{GT1,NG}$**
Unit:	NM^3
Description:	Total quantity of Natural Gas fired in the Captive Generator GT – 1, during the monitoring period from 01/08/2011-31/07/2012
Measured/ Calculated / Default:	Measured
Source of data:	Onsite Measurements by using online volumetric flow meters
Value(s) of monitored parameter:	58327699
Monitoring equipment:	The Hazira gas processing facility measures and monitors the volume of Natural gas fired at its in-house captive generation unit GT – 1. Suitable QMS and reporting procedure are followed for the measurement and upkeep of this data. The details of online volumetric flow meters are provided below: Meter Make: ABB (Model: 264DS) Serial No.: 0610328 (23FT541) Accuracy Class: +/-0.075% Calibration Frequency: Annual Date of Calibration: 08/03/2011 & 10/02/2012 Calibration Due on: 09/02/2013
Measuring/ Reading/ Recording frequency:	Continuously online
Calculation method (if applicable):	-
QA/QC procedures:	The flow meters has calibrated regularly as per the requirement specified by the OEM.
Purpose of data:	For project emission calculations and the baseline emission calculations.
Additional comment:	-

Data / Parameter:	$FC_{GT2,NG}$
Unit:	NM^3
Description:	Total quantity of Natural Gas fired in the Captive Generator GT – 2, during the monitoring period from 01/08/2011-31/07/2012
Measured/ Calculated / Default:	Measured
Source of data:	Onsite Measurements by using online volumetric flow meters
Value(s) of monitored parameter:	55618415
Monitoring equipment:	The Hazira gas processing facility measures and monitors the volume of Natural gas fired at its in-house captive generation unit GT – 2. Suitable QMS and reporting procedure are followed for the measurement and upkeep of this data. The details of online volumetric flow meters are provided below: Meter Make: ABB (Model:264DS) Serial No.: 0610334 (24FT541) Accuracy Class: +/-0.075% Calibration Frequency: Annual Date of Calibration: 23/09/2010 & 20/09/2011 Calibration Due on: 19/09/2012
Measuring/ Reading/ Recording frequency:	Continuously online
Calculation method (if applicable):	
QA/QC procedures:	The flow meters has calibrated regularly as per the requirement specified by the OEM.
Purpose of data:	For project emission calculations and the baseline emission calculations.
Additional comment:	-

Data / Parameter:	$FC_{GT3,NG}$
Unit:	NM^3
Description:	Total quantity of Natural Gas fired in the Captive Generator GT – 3, during the monitoring period from 01/08/2011-31/07/2012
Measured/ Calculated / Default:	Measured
Source of data:	Onsite Measurements by using online volumetric flow meters
Value(s) of monitored parameter:	47948127
Monitoring equipment:	Total quantity of Natural Gas fired in the Captive Generator GT – 3, is used both for project emission and baseline emission calculations.

Measuring/ Reading/ Recording frequency:	The Hazira gas processing facility measures and monitors the volume of Natural gas fired at its in-house captive generation unit GT – 3. Suitable QMS and reporting procedure are followed for the measurement and upkeep of this data. The details of online volumetric flow meters are provided below: Meter Make: Instrumentation Ltd. (Model: IIFC-34WB2-500Y) Serial No.: 960032 & 960027 (96FT-FF-1 & 96FT-FF-2) Accuracy Class: +/-0.2% Calibration Frequency: Annual Date of Calibration:21/09/2011 20/09/2012 Calibration due on: 19/09/2013
Calculation method (if applicable):	Continuously online
QA/QC procedures:	The flow meters has calibrated regularly as per the requirement specified by the OEM.
Purpose of data:	For project emission calculations and the baseline emission calculations.
Additional comment:	-

Data / Parameter:	**$EG_{GT1,y}$**
Unit:	MWh
Description:	Total Quantity of Net Electricity Generated in the Captive Generator GT-1, during the monitoring period from 01/08/2011-31/07/2012
Measured/ Calculated / Default:	Measured
Source of data:	Onsite Measurements by using in-line energy meters
Value(s) of monitored parameter:	156809
Monitoring equipment:	Hazira Gas processing facility uses in-line energy meters, to measure and monitor the net quantity of energy generated in the Captive Natural Gas based power generator. Suitable QMS and reporting procedures are followed for the measurement and upkeep of this data. The details of online volumetric flow meters are provided below: Meter Type: Secure Serial No.: GJU 04103 Accuracy Class: 0.5s Calibration Frequency: Five years Date of Calibration: 06/01/2007 & 28/09/2011 Calibration due on: 27/09/2014
Measuring/ Reading/ Recording frequency:	Continuously online
Calculation method (if applicable):	
QA/QC procedures:	The parameter has monitored continuously. The energy meters were consistently checked for accuracy by periodic calibration as prescribed by the OEM of the metering equipment and the Statutory Bodies.
Purpose of data:	For project emission calculations and the baseline emission calculations.
Additional comment:	-

Data / Parameter:	$EG_{GT2,y}$
Unit:	MWh
Description:	Total Quantity of Net Electricity Generated in the Captive Generator GT-2, during the monitoring period from 01/08/2011-31/07/2012
Measured/ Calculated / Default:	Measured
Source of data:	Onsite Measurements by using in-line energy meters
Value(s) of monitored parameter:	144201
Monitoring equipment:	Hazira Gas processing facility uses in-line energy meters, to measure and monitor the net quantity of energy generated in the Captive Natural Gas based power generator. Suitable QMS and reporting procedures are followed for the measurement and upkeep of this data. The details of online volumetric flow meters are provided below: Meter Make: Secure Serial No.: GJB 03340 Accuracy Class: 0.5s Calibration Frequency: Five years Date of Calibration: 06/01/2007 & 28/09/2011 Calibration due on: 27/09/2014
Measuring/ Reading/ Recording frequency:	Continuously online
Calculation method (if applicable):	
QA/QC procedures:	The parameter has monitored continuously. The energy meters were consistently checked for accuracy by periodic calibration as prescribed by the OEM of the metering equipment and the Statutory Bodies.
Purpose of data:	For project emission calculations and the baseline emission calculations.
Additional comment:	-

Data / Parameter:	$EG_{GT3,y}$
Unit:	MWh
Description:	Total Quantity of Net Electricity Generated in the Captive Generator GT-3, during the monitoring period from 01/08/2011-31/07/2012
Measured/ Calculated / Default:	Measured
Source of data:	Onsite Measurements by using in-line energy meters
Value(s) of monitored parameter:	118504

Monitoring equipment:	Hazira Gas processing facility uses in-line energy meters, to measure and monitor the net quantity of energy generated in the Captive Natural Gas based power generator. Suitable QMS and reporting procedures are followed for the measurement and upkeep of this data. The details of online volumetric flow meters are provided below: Meter Make: Secure Serial No.: GJU 04151 Accuracy Class: 0.5s Calibration Frequency: Five years Date of Calibration: 06/01/2007& 30/09/2011 Calibration due on: 29/09/2014
Measuring/ Reading/ Recording frequency:	Continuously online
Calculation method (if applicable):	-
QA/QC procedures:	The parameter has monitored continuously. The energy meters were consistently checked for accuracy by periodic calibration as prescribed by the OEM of the metering equipment and the Statutory Bodies.
Purpose of data:	For project emission calculations and the baseline emission calculations.
Additional comment:	-

Data / Parameter:	**$EC_{PJ,y}$**
Unit:	MWh
Description:	Quantity of Energy consumed by the project activity during the monitoring period from 01/08/2011-31/07/2012
Measured/ Calculated / Default:	Measured
Source of data:	Onsite Measurements by using in-line energy meters
Value(s) of monitored parameter:	

Train 31P301	Pump B	3542.78
Train 32P301	Pump B	2083.90
Train 33P301	Pump B	2279.90
Train 34P301	Pump A	2746.74
Train 35P301	Pump A	2613.08
Total		13266.40

Monitoring equipment:	Details of onsite integrator type meter used for measurement of energy consumed by project activity is given below:

Meter sl no	Make	Accuracy class	Calibration frequency	Date of calibration	Calibration due on
08890106	L&T	+/-1.0	Annual	30/10/2010 20/08/2011	19/08/2012
08890091	L&T	+/-1.0	Annual	20/08/2011	19/08/2012
07890523	L&T	+/-1.0	Annual	07/10/2010 20/08/2011	19/08/2012
08890081	L&T	+/-1.0	Annual	07/10/2010 20/08/2011	19/08/2012
08890104	L&T	+/-1.0	Annual	20/08/2011	19/08/2012
08890107	L&T	+/-1.0	Annual	30/10/2010 22/09/2011	21/09/2012
08883505	L&T	+/-1.0	Annual	22/09/2011	21/09/2012
08890080	L&T	+/-1.0	Annual	22/09/2011	21/09/2012
08890116	L&T	+/-1.0	Annual	22/09/2011	21/09/2012
08890092	L&T	+/-1.0	Annual	07/10/2010 22/09/2011	21/09/2012

Measuring/ Reading/ Recording frequency:	Continuously
Calculation method (if applicable):	
QA/QC procedures:	Separate energy meters are installed for each of the Amine circulation pumps, within the Gas Sweetening Units. The parameter has monitored continuously with the help of said energy meters and these meters have been calibrated as per standard OEM requirements.
Purpose of data:	For project emission calculations
Additional comment:	-

Data / Parameter:	**T_y**
Unit:	Thousand hours
Description:	Duration of operations of the pump during the monitoring period from 01/08/2011-31/07/2012
Measured/ Calculated / Default:	Recorded
Source of data:	Compiled from log Books
Value(s) of monitored parameter:	Train 31P301 (Pump B) 5.578 Train 32P301 (Pump B) 3.877 Train 33P301 (Pump B) 3.644 Train 34P301 (Pump A) 4.432 Train 35P301 (Pump A) 5.068
Monitoring equipment:	Duration of Pump operation are duly logged in the Operations Log

Measuring/ Reading/ Recording frequency:	Two hourly
Calculation method (if applicable):	NA
QA/QC procedures:	-
Purpose of data:	For baseline emission calculations.
Additional comment:	-

Data / Parameter:	Specifications of the Pumps Modified
Unit:	-
Description:	Technical specifications of the modified pumps
Measured/ Calculated / Default:	Measured
Source of data:	Specification sheet for the modified pump
Value(s) of monitored parameter:	MAKE: POMPES GUINARD, FRANCE TYPE: DVMX 4X6X10 C/E 8 STG NUMBER OF STAGES:7 CAPACITY: 269 M^3/HR HEAD: 705 METER RPM: 2980 MOTOR RATING: 840 KW
Monitoring equipment:	The specifications are based upon the specification sheet after modification in the pump has been carried out
Measuring/ Reading/ Recording frequency:	Once, at the time of modification of each pump
Calculation method (if applicable):	Since the specifications are monitored as per the specification sheet supplied by the Pump Modifier, who is an independent agency having suitable expertise in the field, adequate QA/QC is ensured.
QA/QC procedures:	-
Purpose of data:	Physical verification of the modified pumps
Additional comment:	-

D.3. Implementation of sampling plan

>>

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

>>

As mentioned in section B.6.1 of registered PDD, baseline Emissions that would have happened in the absence of the project activity, are computed by multiplication of estimated baseline energy consumption ($EC_{PJB,y}$) and the emission factor applicable for the source of power ($EF_{CP,y}$).

$$BE_{EC,y} = EC_{PJB,y} * EF_{CP,y}$$

Where;

$BE_{EC,y}$ = Baseline emissions that would have occurred in the baseline scenario, during the monitoring period 'y' (tCO2)

$EC_{PJB,y}$ = Energy consumption that would have occurred in the baseline scenario, during the monitoring period 'y' (MWh)

$EF_{CP,y}$ = Emission factor for the captive power plant during the monitoring period y (tCO2/MWh)

The energy consumption which would have occurred in the baseline scenario, has been determined by monitoring the actual rate of Sour Gas Processed ($FG_{PJ,y}$) and using the relationship given below to compute the corresponding values of Baseline Emissions.

$$L_{Base,y} = 8.12 * Q_y + 706.08$$

Where;

$L_{Base,y}$ = Average Load during the monitoring period 'y' (KW)

Q_y = Average Rate of Gas Processing during monitoring period 'y' in the tower connected to the pump (MMSCMD)

$$EC_{PJB,y} = T_y * L_{Base,y}$$

Where:

$EC_{PJB,y}$ = Energy consumption that would have occurred in the baseline scenario, during monitoring period 'y' (MWh)

T_y = Duration of operation of the pump during the monitoring period 'y' (Thousand Hours)

Emission factor for the captive power plant has been calculated as follows;

$$EF_{CP,y} = (\sum_k \sum_i FC_{k,i,y} * COEF_{i,y}) / (\sum_k EG_y)$$

Where;

$FC_{k,i,y}$ = Quantity of fossil fuel type *i* fired in the captive power plant *k* in the monitoring period y (mass or volume unit)

$COEF_{i,y}$ = CO2 emission coefficient for the fuel type *i* in the monitoring period *y* (tCO2 / mass or volume unit)

EG_y = Quantity of energy generated in the captive power plant k in the monitoring period y (MWh)

$COEF_{i,y}$, has been calculated according to the procedures provided in the latest approved version of the "tool to calculate project or leakage CO2 emissions from fossil fuel combustion"

$$COEF_{i,y} = NCV_{i,y} * EF_{CO_2,NG}$$

Where;

$COEF_{i,y}$ = CO2 emission coefficient of the fuel type *i* in the monitoring period *y* (tCO2 / mass or volume unit)

$NCV_{i,y}$ = Weighted average net calorific value of the fuel type *i* in the monitoring period y. (GJ/mass or volume unit)

$EF_{CO_2,NG}$ = Weighted average CO2 emission factor of fuel type *i* in the monitoring period *y* (tCO2 / GJ)

Based on the values of the monitored parameters the computation of the emission factor for captive power generation for the monitoring period is tabulated below:

Parameter	Description	Value	Unit
$\sum_k FC_{k,i,y}$	Quantity of fossil fuel (natural gas) fired in the captive power	161894241	NM^3
$\sum_k EG_y$	Quantity of energy generated in the captive power plant	419514	MWh
$NCV_{i,y}$	Weighted average net calorific value of the natural gas	7928.11	$Kcal/Nm^3$
$EF_{CO_2,NG}$	Weighted average CO_2 emission factor of the natural gas	58.3	tCO_2 / TJ
$COEF_{i,y}$	CO_2 emission coefficient for natural gas	0.001941276	tCO_2 / Nm^3
$EF_{CP,y}$	Emission factor for the captive power plant	0.749156	tCO_2 /MWh

The calculated baseline emissions based on the monitored data for monitoring period 01/08/2011-31/07/2012are tabulated below:

		Train 31P301 (Pump B)	Train 32P301 (Pump B)	Train 33P301 (Pump B)	Train 34P301 (Pump A)	Train 35P301 (Pump A)
Q_y	Average Rate of Gas Processing in MMSCMD	4.98	3.87	4.08	5.46	5.93
$L_{Base,y}$	Average Load during KW	746.51	737.48	739.22	750.44	754.26
T_y	Duration of operation of the pump in hrs.	5578	3877	3664	4432	5068
$EC_{PJB,y}$	Baseline Energy consumption in MWh	4164.03	2858.94	2708.50	3325.96	3822.58
$EF_{CP,y}$	Emission factor for the captive power plant (tCO2/MWh)	0.749156	0.749156	0.749156	0.749156	0.749156
$BE_{EC,y}$	Baseline emissions in ton CO2 equivalent	3120	2142	2029	2492	2864
Total Baseline Emissions for the Monitoring Period = 12646 ton CO_2 equivalent						

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

>>
Project Emissions due to the project activity are the emissions due to consumption of electricity from an off-grid captive power plant, the same are calculated as below:

$PE_{EC,y} = EC_{PJ,y} * EF_{CP,y}$

Where;

$PE_{EC,y}$	=	Project emissions during the monitoring period y (tCO2)
$EC_{PJ,y}$	=	Quantity of energy consumed by the project activity during the monitoring period y (MWh)
$EF_{CP,y}$	=	Emission factor for the captive power plant in the monitoring period y (tCO2/MWh)

The calculated project emissions based on the monitored data for monitoring period 01/08/2011-31/07/2012are tabulated below:

Parameter		Project Emissions
$EC_{PJ,y}$	$EF_{CP,y}$	$PE_{EC,y}$
13266.4 MWh	0.749156 ton CO_2 equivalent / MWh	**9939 (tCO_2e)**

E.3. Calculation of leakage

>>

Since, no energy efficiency technology equipment is transferred from another activity and no existing equipment is transferred to another activity, therein, leakage is considered zero.

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

Item	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
Total (01/08/2011-31/07/2012**)**	12646	9939	0	2707

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)	4043	2707

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

>>

The emission reductions actually achieved are of the same order as projected in the PDD.

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)	5903(3196+2707)	0

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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.

Version	*Date*	*Description*

Decision Class: Regulatory
Document Type: Form
Business Function: issuance
Keywords: monitoring report, performance monitoring

Annexure 1: Downtime Details

Downtime Details									
Downtime Details for Train 31		**Downtime Details for Train 32**		**Downtime Details for Train 33**		**Downtime Details for Train 34**		**Downtime Details for Train 35**	
Date	Details	Date	Details	Date	Details	Date	Details	Date	Details
30/08/2011	Train under safety check 1200 to 1400 Hr	01/08/2011 to 31/08/2011	Train under standby	28/08/0211	Standby 1000 to 2400 hrs	01/08/2011 to 31/08/2011	standby	01/08/2011 to 28/08/2011	standby
01/09/2011to 15/09/2011	standby	01/09/2011 to 30/09/2011	standby	29/08/2011	Standby 0000 to 1000 hrs	01/09/2011 to 02/09/2011	Standby	29/08/2011	Safety check 1000-1800 Hrs
16/09/2011	Safety check 1200 to 1600 hrs	01/10/2011 to 31/10/2011	Standby	30/08/2011	Safety check 1800 to 2000 hrs	12/09/2011	Shutdown 1000-1400 Hrs	12/09/2011	Standby 1000-1200 Hrs
19/09/2011 to 30/09/2011	standby	01/11/2011 to 23/11/2011	Standby	01/09/2011 to 27/09/2011	standby	20/09/2011	Shutdown 1000-1800 Hrs	22/09/2011	Shutdown 0600-2400 Hrs
01/10/2011 to 02/10/2011	Standby	28/12/2011	Shutdown1000-2400 Hrs	28/09/2011	Shutdown from 1200 to 2000 Hrs	22/09/2011	Shutdown 1400-2200 Hrs	23/09/2011	Shutdown 0000-1600 Hrs
07/10/2011	Standby 1400-2400 Hrs	29/12/2011	Shutdown	15/11/2011	Standby 2000-2400 Hrs	03/10/2011 to 31/10/2011	Standby	03/10/2011	Standby from 0400 to 2400 Hrs
11/10/2011	Shutdown 1200-2000 Hrs	30/12/2011	Shutdown 0000-1800 Hrs	16/11/2011	Standby 0000-0400 Hrs	01/11/2011	Standby	04/10/2011 to 31/10/2011	Standby
23/10/2011	Standby 0400-0600 Hrs and 1000 to 1600 Hrs	15/01/2012	Shutdown 2200-2400 Hrs	21/11/2011	Standby 0800-1000 Hrs	24/11/2011	Safety check 1000-1600 Hrs	07/11/2011 to 30/11/2011	Standby
09/12/2011	Standby 0200-1600 Hrs and 1800-2400 Hrs	16/01/2012	Shutdown 0000-0400 Hrs	22/11/2011	Standby 2000-2400 Hrs	02/12/2011 to 31/12/2011	Standby	01/12/2011	Standby 0000-1800 Hrs
10/12/2011	Standby	08/02/2012	Standby 1200-1400 Hrs	23/11/2011	Standby	01/01/2012	Standby	11/12/2011	Shutdown 2200-2400 Hrs
11/12/2011	Standby 0000- 2000 Hrs	16.02/2012	Shutdown 1000-2400 Hrs	24/11/2011	Standby 0000-0800 Hrs	27/01/2012	Shutdown 1000-1200 Hrs	12/12/2011	Shutdown 0000-1600 Hrs
14/12/2011	Standby from 1800-2400 Hrs	17/02/2012 to	Shutdown	01/12/2011	Standby 1800-2000 Hrs	15/02/2012 to	Standby	15/12/2011	Shutdown 1000-2400 Hrs

		19/02/2012				24/02/2012			
15/12/2011	Standby 0000-1000 Hrs	20/02/2012	Shutdown 0000-0600 Hrs	12/12/2011	Shutdown 1800-2400 Hrs	25/02/2012	Standby 1400-1800 Hrs	16/12/2011	Shutdown 0000-2000 Hrs
16/12/2011	Standby 2000-2400 Hrs	22/02/2012	Standby 1200-2200 Hrs	13/12/2011	Shutdown	27/02/2012 to 29/02/2012	Standby	19/12/2011	Shutdown 1400-2400 Hrs
17/12/2011	Standby 0000-1200 Hrs	29/02/2012	Standby 1600-2400 Hrs	14/12/2011	Shutdown 0000-1800 Hrs	01/03/2012	Standby	20/12/2011 to 25/12/2011	Shutdown
01/01/2012 to 11/01/2012	Standby	01/03/2012	Standby	03/01/2012	Shutdown 1600-2400 Hrs	09/03/2012	Standby 1200-1400 Hrs	26/12/2011	Shutdown 0000-1000 Hrs
14/01/2012 to 31/01/2012	Standby	03/03/2012	Standby 0200-2400 Hrs	04/01/2012 to 06/01/2012	Shutdown	11/03/2012	Standby 120-1400 Hrs and 1600-2200 Hrs	01/01/2012	Standby
01/03/2012 to 07/03/2012	Standby	04/03/2012	Standby 0400-1600 Hrs	07/01/2012	Shutdown 0000-0800 Hrs	21/03/2012	Standby 1000-2200 Hrs	27/01/2012	Shutdown 1000-1200 Hrs
08/03/2012	Standby 0000-0800 Hrs	05/03/2012	Standby 1400-1800 Hrs and 2200-2400 Hrs	07/01/2012	Standby 0800 to 2400 Hrs	02/04/2012 to 30/04/2012	Standby	06/02/2012	Standby 1800-2000 Hrs
10/03/2012	Standby 1000-2400 Hrs	06/03/2012	Standby 0000-0400 Hrs	08/01/2012 to 31/01/2012	Standby	01/05/2012 to 02/05/2012	Standby	13/02/2012 to 29/02/2012	Standby
11/03/2012	Standby 0000-1200 Hrs	07/03/2012 to 31/03/2012	Standby	01/02/2012 to 08/02/2012	Standby	03/05/2012	Standby 0000 to 0400 Hrs.	01/03/2012 to 02/03/2012	standby
13/03/2012to 31/03/2012	Standby	01/04/2012	Standby 14:00-18:00 hrs	10/02/2012	Standby 0000-0400 Hrs	07/05.2012	Standby1800 to 2400 Hrs.	09/03/2012	Standby 1000-1400 Hrs
01/04/2012 to 02/04/2012	Standby	08/04/2012	standby 00:00-10:00 hrs	10/02/2012	Standby 2000-2400 Hrs	08/05/2012	Standby	02/04/2012	safety check 10:00-18:00hrs and standby 20:00-24:00hrs
04/04/2012	Standby 2000-2400 Hrs	09/04/2012	standby 00:00-10:00 hrs and 22:00-24:00 hrs	11/02/2012 to 15/02/2012	Standby	09/05/2012	Standby:0000 to 0800 & 1800 to 2400 Hrs.	03/04/2012 to 18/04/2012	Standby
10/04/2012	Shutdown 10:00-12:00hrs. standby 12:00-18:00hrs	10/04/2012	standby 00:00-10:00 hrs	16/02/2012	Shutdown 0000-0200 Hrs	10/05/2012	Standby:0000 to 0800 & 1800 to 2400 Hrs.	19/04/2012	standby 18:00-24:00hrs
19/04/201	standby	19/04/2012	Standby	21/02/2012	Shutdown 1000-2400	11/05/2012	standby	20/04/2012	standby 00:00-08:00hrs

2 to 30/04/2012		to 30/04/2012			Hrs				
01/05/2012 to 11/05/2012	standby	01/05/2012 to 12/05/2012	Standby	22/02/2012	Shutdown 1000-2400 Hrs	12/05/2012	Standby:0000 to 0800 Hrs. & shutdown 0800 to 2400 Hrs.	30/05/2012 to 31/05/2012	standby
08/06/2012	Standby: 2200 to 2400 Hrs.	11/06/2012	safety check 1000 to 1800 Hrs. & Standby: 1800 to 2400 Hrs.	23/02/2012	Shutdown	13/05/2012 to 15/05/2012	shutdown	01/06/2012 to 04/06/2012	Standby
09/06/2012	Standby: 0000 to 0004 & 1200 to 1400 Hrs.	12/06/2012	Standby 0800 to 2400 Hrs.	24/02/2012	Shutdown 0000-0800 Hrs	16/05/2012	Standby:0600 to 1400 Hrs. & rest shutdown 0800 to 2400 Hrs.	01/07/2012	Standby 08:00-24:00hrs
10/06/2012	Standby: 1000 to 1600 Hrs.	26/06/2012	Standby: 2000 to 2400 Hrs.	24/02/2012	Standby 1600- 2400 Hrs	17/05/2012	Standby:0600 to 2400 Hrs. & shutdown 0000 to 0600 Hrs.	02/07/2012	Standby 00:00-12:00hrs SD from 12:00hrs-24:00hrs
12/06/2012	safety check 0800 to 2000 Hrs. & Standby: 2000 to 2400 Hrs.	27/06/2012	Standby	24/02/2012 to 29/02/2013	Standby	18/05/2012	Standby:0000 to 0800 Hrs.	03/07/2012	shutdown
13/06/2012	standby	28/06/2012	Standby: 0000 to 1200 Hrs.	01/03/2012 to 04/03/2012	Standby	02/06/2012 to 30/06/2012	Standby	04/07/2012	D from 00:00hrs-16:00hrs & standby 16:00-18:00hrs
14/06/2012	Standby except 1400-1600 Hrs	12/07/2012 to 31/07/2012	Standby	07/03/2012 to 31/03/2012	Standby	01/07/2012	Standby	17/07/2012 to 31/07/2012	Standby
15/06/2012 to 18/06/2012	Standby			01/04/2012 to 30/04/2012	standby				
19/06/2012	Standby: 0000 to 1400 Hrs.			01/05/2012 to 31/05/2012	Standby				
04/07/2013	standby 18:00hrs-24:00hrs			01/06/2012 to 30/06/2012	Standby				
05/07/2013	standby 00:00hrs-24:00hrs			01/07/2012 to 10/07/2012	Standby				
06/07/2012	standby 00:00-10:00hrs, 22:00-24:00hrs								
07/07/2012	standby 00:00hrs-24:00hrs								
08/07/201	standby								

2									
09/07/2012	standby 00:00-08:00 & 18:00hrs-24:00hrs								
10/07/2012	standby								
11/07/2012	standby 00:00hrs-06:00hrs								
12/07/2012	standby 00:00-08:00 & 18:00hrs-24:00hrs								
13/07/2012	standby								
14/07/2012	standby								
15/07/2012	standby 00:00hrs-10:00hrs								