



**Monitoring report form for CDM project activity**  
**(Version 07.0)**

**MONITORING REPORT**

<b>Title of the project activity</b>	Up-gradation of Gas Turbine 1 (GT 1) and Gas Turbine 2 (GT 2) at co-generation plant of Hazira Gas Processing Complex (HGPC) of Oil and Natural Gas Corporation Limited (ONGC)	
<b>UNFCCC reference number of the project activity</b>	0847	
<b>Version number of the PDD applicable to this monitoring report</b>	06, 20/12/2011	
<b>Version number of this monitoring report</b>	01	
<b>Completion date of this monitoring report</b>	17/04/2020	
<b>Monitoring period number</b>	03	
<b>Duration of this monitoring period</b>	01/07/2012-31/03/2017 (First and Last days included)	
<b>Monitoring report number for this monitoring period</b>	01	
<b>Project participants</b>	Oil and Natural Gas Corporation Limited	
<b>Host Party</b>	India	
<b>Applied methodologies and standardized baselines</b>	Small scale methodology AMS-II. D – Version 08  Type II. Energy efficiency improvement projects.  Category D - Energy efficiency and fuel switching measures for industrial facilities. standardized baselines: N/A	
<b>Sectoral scopes</b>	1: Energy Industries (renewable-/non-renewable sources)	
<b>Amount of GHG emission reductions or net anthropogenic GHG removals achieved by the project activity in this monitoring period</b>	<b>Amount achieved before 1 January 2013</b>	<b>Amount achieved from 1 January 2013</b>
	(-2894) tCO <sub>2</sub> e	26457 tCO <sub>2</sub> e
<b>Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD</b>	37065 tCO <sub>2</sub> e	

## SECTION A. Description of project activity

### A.1. General description of project activity

>> ONGC's Hazira Gas-Processing Complex (HGPC) consists of facilities for receiving natural gas (NG) along with associated condensate from an off-shore. After separating the condensate, which is processed in condensate fractionation units, the gas is processed through various steps to recover lean sweet gas, LPG, natural gas liquids (NGL) and sulphur.

The HGPC receives economical, quality and uninterrupted supply of electrical power and steam from the cogeneration plant at ONGC, Hazira which was set up in the financial year (FY) 1987 - 1988. The cogeneration plant consists of three nos. of Gas Turbine Generators (GTG) to cater the power demand of Hazira Plant. GT-1 & GT 2, which are of General Electric (GE) make were commissioned in 1988 and fitted with standard technology components. GT-3 is of Bharat Heavy Electricals Limited (BHEL) make was commissioned in 1997 and fitted with up-rated parts.

Gas turbines are high-tech capital equipments and are vital for operations hence Original Equipment Manufacturers (OEM) continuously strives to augment the gas turbine's performance by improving the design/material of its components through research and development (R&D). Such developments are extensively tested and offered to customers in the form of new components commonly called up-rated parts. Aim of these up-rated parts, is to satisfy varied requirement of gas turbine owners, such as improvement in output, efficiency or reduction in maintenance intervals and related. New machines are traditionally supplied with up-rated parts. For older machines, these up-rated parts are available as retrofit and usually suggested for installation at the time of scheduled inspections, so that separate outage of gas turbine is not required for fitment of up-rated parts.

ONGC had decided to go for the up-rated components in order to achieve their objective of continuous thrust towards energy conservation and therefore reduction in greenhouse gas (GHG) emissions. The purpose of undertaking the project is to reduce the fossil fuel consumption (NG), and therefore reduce the CO<sub>2</sub> emissions that would otherwise have been released by burning of natural gas (NG) in the GTG. The project would result in reduction of heat rate by 3.3% which would result in saving of 3,926,673 Standard Cubic Meter (SCM) of NG annually.

A change was notified with respect to revising the baseline heat rate of the GTs (fixed ex-ante) from 3302 kCal/kWh as stated in the registered PDD to 3483 kCal/kWh due to the application of a conversion factor for the conversion of baseline Natural Gas (NG) consumption in GT1 and GT2 from Nm<sup>3</sup> to Sm<sup>3</sup>. The fuel consumption is measured in Nm<sup>3</sup> and converted to Sm<sup>3</sup>, using the conversion factor of 1.055. The application of conversion factor of 1.055 for the conversion of baseline NG consumption from Nm<sup>3</sup> to Sm<sup>3</sup> does not affect the overall operation of the project activity.

The application of conversion factor 1.055 of the fuel consumed which is being measured in Nm<sup>3</sup> being converted to Sm<sup>3</sup> was accepted by UNFCCC on 17/02/2012. However, there are no changes found in the implementation of the project activity from the registered PDD version 06 dated 20/12/2011.

In absence of the project activity, equivalent quantity of NG would have been burnt, thereby resulting in 23563 tCO<sub>2</sub> emission during monitoring period.

**Sustainable development because of the project activity:** The project would contribute to sustainable development of the host country India in the following ways:

**Economic sustainability:** The project activity saves NG for better applications and contributes to environmental protection.

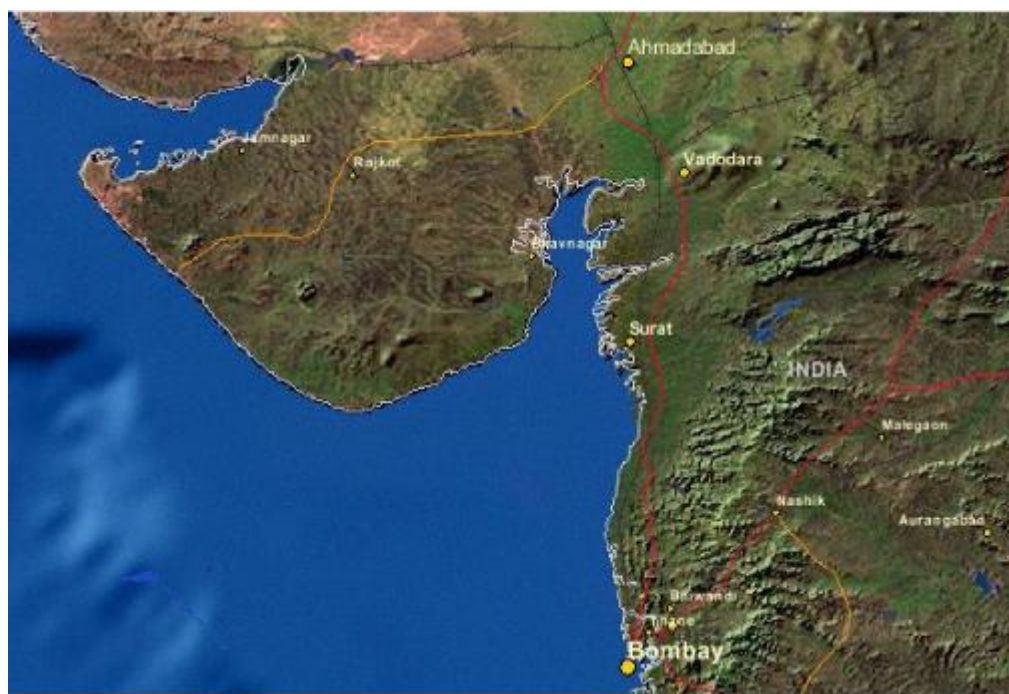
**Environmental sustainability:** The project activity would help in minimizing environmental pollution by reducing emissions of CO<sub>2</sub> and other air pollutants (SPM, SO<sub>2</sub>, NO<sub>x</sub>). This is because the NG saving will lead to less burning of NG thereby less emission of CO<sub>2</sub> and other associated air pollutants.

**Social Sustainability:** The project is based on the noble principle that 'energy saved is energy generated'. The project would contribute to enhancement of skills in employees and workers, and would provide benefits to equipment suppliers and technical consultants.

## A.2. Location of project activity

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<b>Place</b>	Hazira
<b>Post Office</b>	ONGC Nagar
<b>City</b>	Surat
<b>PIN</b>	394 518
<b>State</b>	Gujrat
<b>Country</b>	India



GPS Co-ordinates of ONGC, Hazira, Surat are 21°9'39"N 72°43'31"E

## A.3. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Government of India (host)	Oil and Natural Gas Corporation Limited (ONGC)	No

## A.4. References to applied methodologies and standardized baselines

>> Small scale methodology AMS-II. D – Version 08

Type II. Energy efficiency improvement projects.

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

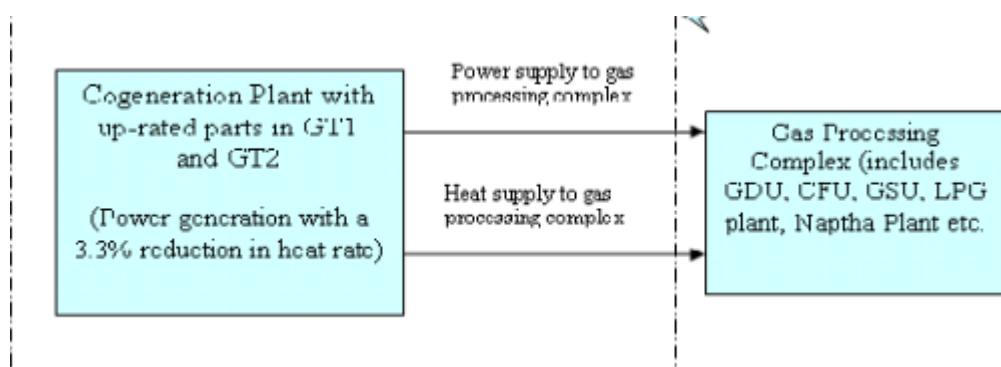
Reference: Paragraph '3 and 4' as provided in Type II.D of Appendix B of the simplified modalities and procedures for small-scale CDM project activities - Indicative Simplified Baseline and Monitoring Methodologies for Selected Small-Scale CDM Project Activity Categories.

**A.5. Crediting period type and duration**

&gt;&gt; 01/04/2007 – 31/03/2017 (10 Years)

**SECTION B. Implementation of project activity****B.1. Description of implemented project activity**

>> Gas turbines are high-tech capital equipments and are vital for operations hence Original Equipment Manufacturers (OEM) continuously strive to augment the gas turbine's performance by improving the design/ material of its components through research and development (R&D). ONGC has decided to go for the up-rated components in order to achieve their objective of continuous thrust towards energy conservation and therefore reduction in greenhouse gas (GHG) emissions. The purpose of undertaking the project is to reduce the fossil fuel consumption (NG), and therefore reduce the CO<sub>2</sub> emissions that would otherwise have been released by burning of natural gas (NG) in the GTG.



Up-gradation of GT#1 was completed and re commissioning was done on 05/04/2010. Up-gradation of GT#2 was completed and re commissioning was done on 03/07/2010.

The following are the details of the shut down for the monitoring period (01/07/2012-31/03/2017)

GT 1			GT 2		
Date	Running (hrs)	Down time (hrs)	Date	Running (hrs)	Down time (hrs)
09.07.2013	15.25	8.75	13.08.13	15.50	8.50
10.07.2013	12	12	14-15.08.13	0.00	48.00
24.09.2013	15.75	8.25	16.08.13	9.50	14.50
25.09.2013	12	12	03.01.13	14.50	9.50
13.04.2014	19	5	03.03.14	15.00	9.00
14.04.14	10	14	04-10.03.14	0.00	168.00
18.04.14	15	9	11.03.14	12.00	12.00
08.05.14	17	7	06.04.14	8.25	15.75
09.05.14-17.05.14	0	216	07-08.04.14	0.00	48.00
18.05.14	17	7	09.04.14	11.00	13.00
28.05.14	17.5	6.5	06.05.14	5.75	18.25
23.06.14	17	7	19.05.14	11	13.00
24.06.14	9.75	14.25	20-23.05.14	0	24.00
29.01.15	12.75	11.25	24.05.14	4	20.00

30.01.15	9	15	04.09.14	15.5	8.50
03.02.15	13.75	10.25	05-06.09.14	0	48.00
04.02.15	8	16	07.09.14	6	18.00
07.02.15	21.25	2.75	08.09.14	11.5	12.50
14.02.15	16	8	26.12.14	14	10.00
20.02.15	18.5	5.5	27.12.14	15.5	8.50
21.02.15	15.5	8.5	09.01.15	19.5	4.50
10.07.15	13	11	04.06.15	10.5	13.50
27.07.15	14	10	10-11.06.15	20.5	27.50
11.09.15 - 12.09.15	5.25	18.75	28.08.15	11	13.00
30.10.15	18.75	5.25	01.12.15	19.5	4.50
29.12.15	15.75	8.25	31.12.15	15.25	8.75
30.12.15	9.25	14.75	01-20.01.16	0	480
24.01.16	19	5	02.02.16	16	8.00
25.01.16	9.75	14.25	03.02.16	0	24.00
26.01.16	11	13	04.02.16	17.25	6.75
07.04.16	20.25	3.75	19.05.16 to 23.03.2017	0	7392
08.04.16	4.25	19.75			
09.04.16	10.75	13.25			
09.08.16- 10.08.16	8	16.00			
12.08.16	17.5	6.50			
16.09.2016	16.5	7.50			

GT	Downtime hours	Reasons
1	541	Repairs, tripped, maintenance and other operational requirements
2	9273	Repairs, tripped, maintenance and other operational requirements including GT#2 under Shutdown since 19.05.16 due to Gen Rotor Problem

## B.2. Post-registration changes

### B.2.1. Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents

>> There has been no deviation in monitoring plan from that of the registered PDD

### B.2.2. Corrections

>> There has been no correction from the registered PDD.

### B.2.3. Changes to the start date of the crediting period

>> There has been no change to start date of crediting period from that of the registered PDD.

**B.2.4. Inclusion of monitoring plan**

>> There has been no inclusion of monitoring plan

**B.2.5. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents**

>> There has been no change in the registered monitoring plan or permanent deviation of monitoring from the applied methodology, standard baseline or other methodological regulatory documents

**B.2.6. Changes to project design**

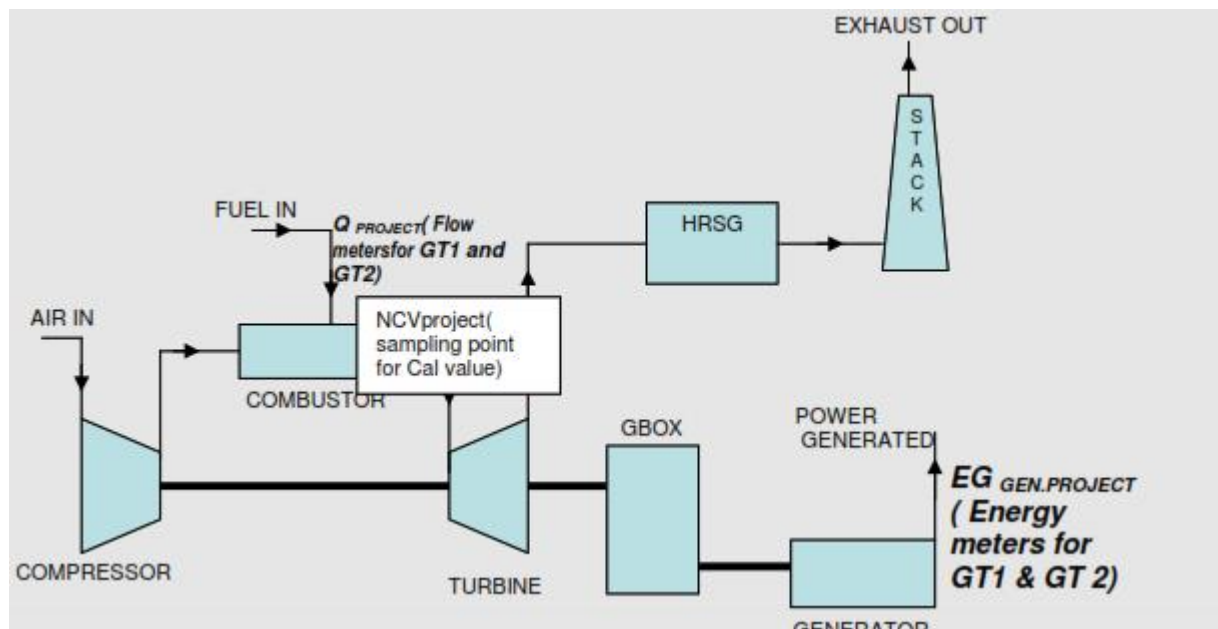
>> The notification of change is with respect to revising the baseline heat rate of the GTs (fixed ex-ante) from 3302 kCal/kWh as stated in the registered PDD to 3483 kCal/kWh due to the application of a conversion factor for the conversion of baseline Natural Gas (NG) consumption in GT1 and GT2 from Nm3 to Sm3. The fuel consumption is measured in Nm3 and converted to Sm3, using the conversion factor of 1.055. Notification for Changes in PDD for the CDM Project activity was uploaded and acknowledged by UNFCCC on 12/01/2012. Notification for changes in PDD for the CDM Project activity was approved on 17/02/2012 by UNFCCC.

**B.2.7. Changes specific to afforestation or reforestation project activity**

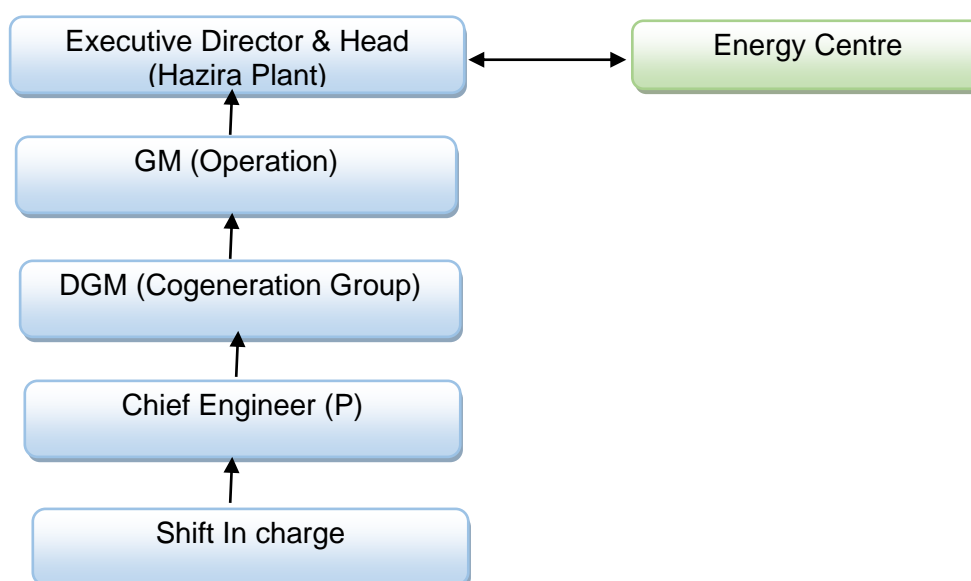
>> Not Applicable

**SECTION C. Description of monitoring system**

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**Roles & Responsibilities:**

The operational and management structure that will monitor the project activity is described in Fig D.1 below and the monitoring activities and responsibility is also listed in Table D.1 below:



**Organisation structure and responsibility for CDM data gathering and reporting**

### Monitoring Activities & Responsibilities

Monitoring activities	Procedure and responsibility
Data source and Collection	ONGC has state of the art computerised monitoring system installed in the plant. This ensures accurate and continuous monitoring of all the data.
Frequency	Monitoring frequency would be as per section D.3 of PDD
Review	All received data would be reviewed by the engineers in the CDM cell
Data Compilation	All the data would be compiled and stored in the CDM cell
Emission Calculation	Emission reduction calculations will be done annually based on the data collected and recorded. Engineers/Executives of CDM cell will do the calculations

### 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

Data/Parameter	$Q_{baseline}$
Unit	SCM/year
Description	Quantity of fuel used
Source of data	Plant Data maintained in the log book.
Value(s) applied	117755852
Choice of data or measurement methods and procedures	-
Purpose of data/parameter	Three-year average data before project is used for Base line calculations
Additional comments	Not Applicable

<b>Data/Parameter</b>	<b>NCV<sub>baseline</sub></b>
Unit	GJ/SCM
Description	Net Calorific value of fuel
Source of data	Plant Data maintained in the log book.
Value(s) applied	0.0376
Choice of data or measurement methods and procedures	-
Purpose of data/parameter	Three-year average data before project is used for Base line calculations
Additional comments	Not Applicable

<b>Data/Parameter</b>	<b>EG<sub>gen. baseline</sub></b>
Unit	kWh/year
Description	Gross quantity of electricity generated.
Source of data	Plant Data maintained in the log book.
Value(s) applied	303874667
Choice of data or measurement methods and procedures	-
Purpose of data/parameter	Three-year average data before project is used for Base line calculations
Additional comments	Not Applicable

<b>Data/Parameter</b>	<b>Heat Rate<sub>pre project</sub></b>
Unit	kcal/kWh
Description	Heat rate
Source of data	Plant Data maintained in the log book.
Value(s) applied	3483.75
Choice of data or measurement methods and procedures	-
Purpose of data/parameter	Three-year average data before project is used for Base line calculations
Additional comments	Not Applicable

## D.2. Data and parameters monitored

<b>Data/Parameter</b>	<b>Q<sub>project</sub></b>
Unit	SCM
Description	Quantity of fuel used (NG)
Measured/calculated/default	Measured
Source of data	Onsite measurements by online volumetric flow meters



Value(s) of monitored parameter	505521553
Monitoring equipment	Gas flow meter. Accuracy class: 0.025% Gas flow meter equipment tag no of GT1: 23FT541 (SI no 0610328) Gas flow meter equipment tag no of GT2 : 24FT541 ( SI no 0610334)
Measuring/reading/recording frequency	Continuous/Daily/Monthly
Calculation method (if applicable)	Not Applicable
QA/QC procedures	The parameter would be monitored continuously. The flow meters will be calibrated regularly as per the requirements specified by the Original Equipment Manufacturers (OEM) Validity: Each calibration is for one year interval. Calibration dates of 23FT541: 10/02/2012, 05/02/2013, 05/02/2014,05/02/2015, 11/09/2015, 09/09/2016  Calibration dates of 24 FT541: 20/09/2011, 19/09/2012, 16/09/2013,15/09/2014,11/09/2015, 09/09/2016
Purpose of data/parameter	The data will be used for project emission calculation
Additional comments	-

<b>Data/Parameter</b>	<b>NCV<sub>project</sub></b>
Unit	GJ/SCM
Description	Net Calorific value of fuel
Measured/calculated/default	Measured
Source of data	In house sampling and calculation

Value(s) of monitored parameter	Month	NCV <sub>project</sub> (Kcal/SCM)	NCV <sub>project</sub> (GJ/SCM)
	Jul-2012	8275.94	0.03464
	Aug-2012	8269.23	0.03461
	Sept-2012	8282.38	0.03467
	Oct-2012	8253.34	0.03455
	Nov-2012	8257.87	0.03457
	Dec-2012	8286.4	0.03469
	Jan-2013	8273.44	0.03463
	Feb-2013	8255.65	0.03456
	Mar-2013	8284.41	0.03468
	Apr-2013	8253.28	0.03455
	May-2013	8266.34	0.03460
	June-2013	8248.7	0.03453
	July-2013	8270	0.03462
	Aug-2013	8258.19	0.03457
	Sep-2013	8270.4	0.03462
	Oct-2013	8271.94	0.03463
	Nov-2013	8252.38	0.03454
	Dec-2013	8296.08	0.03473
	Jan-2014	8253.39	0.03455
	Feb-2014	8248.04	0.03453
	Mar-2014	8266.62	0.03460
	Apr-2014	8287.49	0.03469
	May-2014	8264.82	0.03460
	June-2014	8280.06	0.03466
	July-2014	8292.81	0.03471
	Aug-2014	8269.86	0.03462
	Sept-2014	8287.66	0.03469
	Oct-2014	8282.98	0.03467
	Nov-2014	8227.94	0.03444
	Dec-2014	8231.68	0.03446
	Jan-2015	8243.3	0.03451
	Feb-2015	8264.84	0.03460
	Mar-2015	8268.5	0.03461
	Apr-2015	8232.44	0.03446
	May-2015	8271.42	0.03462
	June-2015	8288.87	0.03470
	July-2015	8369.76	0.03504
	Aug-2015	8203.15	0.03434
	Sep-2015	8249.72	0.03453
	Oct-2015	8244.01	0.03451
	Nov-2015	8353.55	0.03497
	Dec-2015	8351.51	0.03496
	Jan-2016	8291.75	0.03471
	Feb-2016	8281.06	0.03466
	Mar-2016	8296.81	0.03473
	Apr-2016	8369.08	0.03503
	May-2016	8293.57	0.03472
	June-2016	8283.34	0.03467
	Jul-2016	8257.18	0.03456
	Aug-2016	8249.97	0.03453
	Sep-2016	8333.35	0.03488
	Oct-2016	8344.67	0.03493
	Nov-2016	8256.77	0.03456
	Dec-2016	8236.87	0.03448

	<table><tr><td>Jan2017</td><td>8293.12</td><td>0.03472</td></tr><tr><td>Feb-2017</td><td>8274.83</td><td>0.03464</td></tr><tr><td>Mar-2017</td><td>8256.96</td><td>0.03456</td></tr></table> <p>NCV were measured randomly in every month. However, for conservativeness, highest value of NCV (8370 Kcal/SCM) obtained during the Monitoring Period was considered 0.03504</p>	Jan2017	8293.12	0.03472	Feb-2017	8274.83	0.03464	Mar-2017	8256.96	0.03456
Jan2017	8293.12	0.03472								
Feb-2017	8274.83	0.03464								
Mar-2017	8256.96	0.03456								
Monitoring equipment	Gas Chromatograph (HZR/ISO/EQL071)									
Measuring/reading/recording frequency	Monthly									
Calculation method (if applicable)	Not Applicable									
QA/QC procedures	Calibration of the Chromatograph has been done annually. Calibration is done internally by ASTM D 4626-95 standard. Validity: Each calibration is for one year interval. Calibration dates: 26/04/2012, 24/04/2013, 03/01/2014,12/05/2015, 05/04/2016									
Purpose of data/parameter	The data will be used for project emission calculation									
Additional comments	-									

<b>Data/Parameter</b>	<b>EG</b> gen. project
Unit	KWh
Description	Gross quantity of electricity generated
Measured/calculated/default	Measured
Source of data	Onsite measurements by online energy meters. Plant Data is maintained in the log book.

Value(s) of monitored parameter	Month	Gross quantity of electricity generated in MWh (MWh =kWh/1000)		
		GT# 1	GT#2	GT#1+2
	Jul-2012	14350	8872	23222
	Aug-2012	13943	7954	21897
	Sept-2012	11195	8322	19517
	Oct-2012	9731	14098	23829
	Nov-2012	9550	10506	20056
	Dec-2012	12191	8572	20763
	Jan-2013	11010	11701	22711
	Feb-2013	9349	9832	19181
	Mar-2013	9538	10930	20468
	Apr-2013	11567	11849	23416
	May-2013	11469	13210	24679
	June-2013	9555	11540	21095
	July-2013	7518	12452	19970
	Aug-2013	15236	6898	22134
	Sep-2013	12304	13278	25582
	Oct-2013	11885	10750	22635
	Nov-2013	11555	11474	23029
	Dec-2013	13051	10887	23938
	Jan-2014	14265	11976	26241
	Feb-2014	12395	8586	20981
	Mar-2014	14100	6582	20682
	Apr-2014	8332	11964	20296
	May-2014	5852	11350	17202
	June-2014	9558	14620	24178
	July-2014	11366	14586	25952
	Aug-2014	12078	11962	24040
	Sept-2014	12368	9582	21950
	Oct-2014	12462	13690	26152
	Nov-2014	10606	12784	23390
	Dec-2014	10190	12730	22920
	Jan-2015	12540	11958	24498
	Feb-2015	9182	12949	22131
	Mar-2015	13638	13908	27546
	Apr-2015	12436	13170	25606
	May-2015	14544	13492	28036
	June-2015	9736	12224	21960
	July-2015	6804	13958	20762
	Aug-2015	14290	11496	25786
	Sep-2015	12646	11662	24308
	Oct-2015	13460	14290	27750
	Nov-2015	12796	13516	26312
	Dec-2015	14640	14168	28808
	Jan-2016	13718	5250	18968
	Feb-2016	13958	9822	23780
	Mar-2016	14374	10944	25318
	Apr-2016	13314	10958	24272
	May-2016	14440	4866	19306
	June-2016	14380	0	14380
	Jul-2016	14984	0	14984
	Aug-2016	14796	0	14796
	Sep-2016	14266	0	14266
	Oct-2016	15158	0	15158
	Nov-2016	15580	0	15580
	Dec-2016	15766	0	15766
	Jan2017	16672	0	16672
	Feb-2017	14768	0	14768
	Mar-2017	15736	3966	19702

Monitoring equipment	Energy Meters Accuracy class : 0.5s Equipment serial no of GT1: GJUO4103, GJU62065, SATEC 822247 Equipment serial no of GT2 : GJB03340, 1012195
Measuring/reading/recording frequency	Continuous recording and monthly reporting
Calculation method (if applicable)	Not Applicable
QA/QC procedures	The parameter would be monitored continuously. The energy meters will be calibrated regularly as per the requirements specified by the OEM and the Statutory Bodies. Calibration frequency for Energy Meter is 5 years Calibration Dates: GT1 : 28/09/2011, 20/03/2014 GT2 : 28/09/2011, 21/04/2017  Validity: Each calibration is for Five (5) years interval.
Purpose of data/parameter	The data will be used for project emission calculation
Additional comments	It is monitored in kWh and converted into MWh for the emission reduction calculations by using the standard conversion formula (MWh =kWh/1000)

<b>Data/Parameter</b>	<b>Heat</b> Rate project
Unit	Kcal/Kwh
Description	Heat rate
Measured/calculated/default	Calculated
Source of data	Plant Data maintained in the log book.

Month	Heat Rate project		
	GT# 1	GT#2	GT#1+2
Jul-2012	3284	3851	3501
Aug-2012	3280	4045	3558
Sept-2012	3518	3913	3686
Oct-2012	3538	3373	3440
Nov-2012	3736	3667	3700
Dec-2012	3437	3907	3631
Jan-2013	3572	3554	3563
Feb-2013	3553	3533	3543
Mar-2013	3764	3623	3689
April-2013	3431	3430	3431
May-2013	3499	3387	3439
Jun-2013	9555	3473	3573
July-2013	4093	3427	3677
Aug-2013	3187	4150	3487
Sep-2013	3320	3364	3343
Oct-2013	3431	3603	3512
Nov-2013	3438	3474	3456
Dec-2013	3327	3591	3447
Jan-2014	3233	3487	3349
Feb-2014	3259	3828	3492
Mar-2014	3253	3921	3466
Apr-2014	3732	3238	3441
May-2014	3609	3130	3293
June-2014	3429	3130	3248
July-2014	3445	3272	3348
Aug-2014	3424	3467	3445
Sept-2014	3387	3644	3499
Oct-2014	3417	3372	3393
Nov-2014	3570	3404	3479
Dec-2014	3675	3411	3528
Jan-2015	3348	3505	3425
Feb-2015	3519	3301	3391
Mar-2015	3292	3337	3315
Apr-2015	3368	3383	3376
May-2015	3260	3396	3326
June-2015	3690	3413	3536
July-2015	4343	3332	3663
Aug-2015	3263	3539	3386
Sep-2015	3345	3528	3433
Oct-2015	3329	3340	3335
Nov-2015	3312	3321	3316
Dec-2015	3143	3255	3198
Jan-2016	3205	3262	3220
Feb-2016	3176	3535	3324
Mar-2016	3215	3563	3366
Apr-2016	3215	3533	3359
May-2016	3248	3990	3435
June-2016	3194	0	3194
Jul-2016	3204	0	3204
Aug-2016	3190	0	3190
Sep-2016	3208	0	3208
Oct-2016	3219	0	3219
Nov-2016	3124	0	3124
Dec-2016	3099	0	3099
Jan-2017	3071	0	3071
Feb-2017	3030	0	3030
Mar-2017	3092	0	3128

Value(s) of monitored parameter

Monitoring equipment	Plant Data maintained in the log book.
Measuring/reading/recording frequency	Monthly
Calculation method (if applicable)	$\text{Heat Rate}_{\text{project}} = (Q_{\text{project}} * \text{NCV}_{\text{project}}) / \text{EG}_{\text{Gen. project}}$
QA/QC procedures	ISO 9001
Purpose of data/parameter	The data will be used for project emission calculation
Additional comments	-

Data/Parameter	Updated components identification number
Unit	Not Applicable
Description	Identification number of updated components
Measured/calculated/default	Not Applicable
Source of data	Plant
Value(s) of monitored parameter	Not Applicable
Monitoring equipment	Not Applicable
Measuring/reading/recording frequency	Yearly
Calculation method (if applicable)	Not Applicable
QA/QC procedures	Data will not be used directly for Baseline/ Project/ Leakage emission Calculations
Purpose of data/parameter	Data will be used to keep record of updated components
Additional comments	-

Detailed list is given below

<b><u>Specification of Replaced Equipment (GT )</u></b>				
Equipment is not Replaced But Up-rated				
	Before Up-rate		After Up-rate	
	GT#1	GT#2	GT#1	GT#2
Tag No	23 TG 001	24 TG 001	23 TG 001	24 TG 001
Sr No	295315	295316	295315	295316
Model	PG 5361 P		PG 5371 P N/T	
Rated Capacity	19.52 MW		21.54 MW	

<b>Sr. No.</b>	<b>Description</b>	<b>Part Number</b>	<b>Qty.</b>
1	Blade Kit Turbine Rotor Stage 1	314B7158G015	1
	The above kit consists of following items:		
	Blade, Mach, Turbine Rotor - Stage 1	948E0707P031	119
	Blade, Mach, Turbine Rotor - Stage 1	948E0707P032	1
	Bucket Seal Pin	312A6585P001	120
	Bucket Seal Pin	312A6586P001	120
	Bucket Twist	239B5791P003	120
2	Blade Kit Turbine Rotor Stage 1	314B7158G015	1
	The above kit consists of following items:		
	Blade, Mach, Turbine Rotor - Stage 1	948E0707P031	119
	Blade, Mach, Turbine Rotor - Stage 1	948E0707P032	1
	Bucket Seal Pin	312A6585P001	120
	Bucket Seal Pin	312A6586P001	120
	Bucket Twist	239B5791P003	120
3	Blade Kit, Turbine Rotor - Stage 2	361B6349G001	1
	The above kit consists of following items:		
	Blade Mach Turbine Rotor Stage 2	114E1989P001	90
	Bucket Seal Pin	211A8731P004	90
	Bucket Twist	239B5791P004	90
4	Blade Kit, Turbine Rotor - Stage 2	361B6349G001	1
	The above kit consists of following items:		



	Blade Mach Turbine Rotor Stage 2	114E1989P001	90
	Bucket Seal Pin	211A8731P004	90
	Bucket Twist	239B5791P004	90
5	Nozzle Arrangement, Turbien - Stage 1	230C3524G002	1
6	Nozzle Arrangement, Turbien - Stage 1	230C3524G002	1
7	2nd Stage Nozzle Kit	116E2280G020	1
8	2nd Stage Nozzle Kit	116E2280G020	1
9	Stage 1 Shroud With Abradable Coating:		
	Mod. Turbine Shroud Set	116E3618G003	1
	Seal, Cloth	116E1822P007	36
	Seal, Cloth	116E1822P008	36
	Seal, Cloth	116E1822P009	36
	Seal, Cloth	116E1822P010	36
	Seal, Cloth	116E1822P011	36
	Ext Pressurized E Seal	357A1837P003	1
	Pin Dowel	158A5457P006	36
10	Stage 1 Shroud With Abradable Coating:		
	Mod. Turbine Shroud Set	116E3618G003	1
	Seal, Cloth	116E1822P007	36
	Seal, Cloth	116E1822P008	36
	Seal, Cloth	116E1822P009	36
	Seal, Cloth	116E1822P010	36
	Seal, Cloth	116E1822P011	36
	Ext Pressurized E Seal	357A1837P003	1
	Pin Dowel	158A5457P006	36
11	Stage 2 Honey Comb Shroud:		
	Shroud & Seals Stage 2 (Consists of 30 Shroud Segments & Seals )	236C1641G005	1
	Pin Dowel	158A5457P014	30
	Pipe Plug	286A6290P002	30
12	Stage 2 Honey Comb Shroud:		
	Shroud & Seals Stage 2 (Consists of 30 Shroud Segments & Seals )	236C1641G005	1
	Pin Dowel	158A5457P014	30
	Pipe Plug	286A6290P002	30
13	Combustion Liners:		
	Cap and Liner, Combustion	353B4260G001	2
	Cap and Liner, Combustion	353B4260G002	1
	Cap and Liner, Combustion	353B4260G003	6
	Cap and Liner, Combustion	353B4260G004	1
14	Combustion Liners:		
	Cap and Liner, Combustion	353B4260G001	2
	Cap and Liner, Combustion	353B4260G002	1
	Cap and Liner, Combustion	353B4260G003	6
	Cap and Liner, Combustion	353B4260G004	1

	Screw, Set	227C9369P003	2	
22	High Pressure Packing Brush Seal:			
	Case, Inner Compressor Discharge	112E6976G001	1	
	Segment, Brush Seal HP	362A3468P014	1	
	Hex. Head Cap Screw & Bolt	N14TP35040	4	
	Pin, Dowel Hard & Grind	N507P04432	2	
	Screw Hex. Socket Head	128C7765P001	7	
	Wire Locking Insert	N926BP00329	7	
	Screw, Set	227C9369P003	2	
23	Miscellaneous Up-rate items			
	Plug 1St 5/1	248A4777P001	3	
	Plug Bores	192B2915P001	3	
	Case Turbine Hardware	186C1696G003	1	
	Case Turbine consisting of following items:			
a.	Stud Cont	114A8793P073	2	
b.	Stud Cont	114A8793P069	4	
c.	Stud	114A8793P035	8	
	Plug Bores	237B2115P001	3	
	Plug Bores	237B2115P002	1	
	Adapter	193B7194P002	4	
	Pin, Dowel Hard & Grd	N507P01336	4	
	Retainer, Plug	248A4849P001	4	
III	Modification Case Turbine	301C5095G001	1	
a.	Stud Cont	114A8793P075	1	
b.	T/C Arrangement Removable consisting of following Items:			
	Thermocouple, Type K, Type	351A3488P003	2	
	Tc, Type K, Extd	351A3488P022	4	
	Thermocouple	248A4123P092	2	
	Connector, Thermocouple	287A1399P021	4	
c.	Conduit Arrangement Wheelspace TC consisting of following Items:			
	Conduit Air, Wheelspace Tc	813L7880G002	1	
	Conduit Air, Wheelspace Tc	813L7880G003	1	
d.	Chamber Arrangement Combustion Consisting of following Items:			
	Xfire Ret	919B0310P001	20	
	Sealer, Spark Plug	158A5831P001	2	
	Bolt Hx Hd	N14P35028	8	
	Screw, Cap Hex Hd	N14P33032	80	
	Xfire Tube	306A4456G001	10	
	Gasket (Non-Asbestos)	324A9109P107	2	
	Gasket	324A9109P005	10	
	Lock Plate	318A9872P001	80	
e.	Instrument Arrangement Brg1 Consisting of following Items:-			
	Thermocouple	314A5945P002	4	

15	Transition Piece Assembly:		
	Transition Piece	943E0237G003	10
	TP Packing	158A3820P002	1
	TP Packing	158A3820P002	1
	Support Combustion Chamber	225A8425P001	20
	TP Bolt	225A8257P002	10
	TP Lock Plate	193B7869P003	10
	TP Bolt / Washer	225A8256P001	10
	TP End Seal	256A1893P001	10
	Lock Plate	294A0150P006	20
	Nut, Hex	N204P00035	20
16	Transition Piece Assembly:		
	Transition Piece	943E0237G003	10
	TP Packing	158A3820P002	1
	TP Packing	158A3820P002	1
	Support Combustion Chamber	225A8425P001	20
	TP Bolt	225A8257P002	10
	TP Lock Plate	193B7869P003	10
	TP Bolt / Washer	225A8256P001	10
	TP End Seal	256A1893P001	10
	Lock Plate	294A0150P006	20
	Nut, Hex	N204P00035	20
17	C450 Reduced Camber High Flow IGVs		
	51 N&P (Kit) IGV's (Rack & Ring)	324A3989G002	1
	The above kit consists of the following items:		
	C450 IGV Blades		64
	C450 IGV Ring & Rack, IGV Gear and associated hardware		1
18	C450 Reduced Camber High Flow IGVs		
	C450 Reduced Flow IGV - 2nd Set	324A3989G002	1
	The above kit consists of the following items:		
	C450 IGV Blades		64
	C450 IGV Ring & Rack, IGV Gear and associated hardware		1
19	Inactive Thrust Bearing - 1st Set	239B9746G001	1
20	Inactive Thrust Bearing - 2nd Set	239B9746G001	1
21	High Pressure Packing Brush Seal:		
	Case, Inner Compressor Discharge	112E6976G001	1
	Segment, Brush Seal HP	362A3468P014	1
	Hex. Head Cap Screw & Bolt	N14TP35040	4
	Pin, Dowel Hard & Grind	N507P04432	2
	Screw Hex. Socket Head	128C7765P001	7
	Wire Locking Insert	N926BP00329	7

	Screw, Set	227C9369P003	2	
22	High Pressure Packing Brush Seal:			
	Case, Inner Compressor Discharge	112E6976G001	1	
	Segment, Brush Seal HP	362A3468P014	1	
	Hex. Head Cap Screw & Bolt	N14TP35040	4	
	Pin, Dowel Hard & Grind	N507P04432	2	
	Screw Hex. Socket Head	128C7765P001	7	
	Wire Locking Insert	N926BP00329	7	
	Screw, Set	227C9369P003	2	
23	Miscellaneous Up-rate items			
	Plug 1St 5/1	248A4777P001	3	
	Plug Bores	192B2915P001	3	
	Case Turbine Hardware	186C1696G003	1	
	Case Turbine consisting of following items:			
a.	Stud Cont	114A8793P073	2	
b.	Stud Cont	114A8793P069	4	
c.	Stud	114A8793P035	8	
	Plug Bores	237B2115P001	3	
	Plug Bores	237B2115P002	1	
	Adapter	193B7194P002	4	
	Pin, Dowel Hard & Grd	N507P01336	4	
	Retainer, Plug	248A4849P001	4	
III	Modification Case Turbine	301C5095G001	1	
a.	Stud Cont	114A8793P075	1	
b.	T/C Arrangement Removable consisting of following Items:			
	Thermocouple, Type K, Type	351A3488P003	2	
	Tc, Type K, Extd	351A3488P022	4	
	Thermocouple	248A4123P092	2	
	Connector, Thermocouple	287A1399P021	4	
c.	Conduit Arrangement Wheelspace TC consisting of following Items:			
	Conduit Air, Wheelspace Tc	813L7880G002	1	
	Conduit Air, Wheelspace Tc	813L7880G003	1	
d.	Chamber Arrangement Combustion Consisting of following Items:			
	Xfire Ret	919B0310P001	20	
	Sealer, Spark Plug	158A5831P001	2	
	Bolt Hx Hd	N14P35028	8	
	Screw, Cap Hex Hd	N14P33032	80	
	Xfire Tube	306A4456G001	10	
	Gasket (Non-Asbestos)	324A9109P107	2	
	Gasket	324A9109P005	10	
	Lock Plate	318A9872P001	80	
e.	Instrument Arrangement Brg1 Consisting of following Items:-			
	Thermocouple	314A5945P002	4	

	B7A17B2 0.75D 0.04T	30120	2
	Tube	348A4081P001	2
	Cable Seal Low Pressure	348A4082P001	2
	Tube	286A6364P001	4
	Tubing Shrinkable	286A6364P007	4
	Epoxy Resin-Hz1	287A7052P001	1
	Junctn Box	302A4582P045	1
	Wire Marker	158A3046P003	1
	Wire Marker	158A3046P004	1
	Tube Clip 0.75 X 1	357A1627P007	4
	Bar	286A6328P010	4
	Tube Connector, Male	156A1075P015	4
	Tube Connector	156A1075P018	2
	Tube Connector	156A1075P014	2
	Tube Connector	156A1075P017	2
	Screw, Cap Hex Hd	N22P21008	4
f	Piping Arrangement Cooling and Sealing Consisting of following items:		
	Orifice	999A0512P084	2
	Gasket, Spiral Wound	N5606P04001G11	4
	Hex Head Cap Screw & Bolt	N14DP33056	16
	Galv. Steel Nut	N260P00035	16
g	Exhaust Thermocouple and Conduit Arrangement consisting of following items:		
	TC, Exhaust Type K,W/Studs	362A1102P022	13
	Cable Thermocouple	361A2327P022	13
	Fitting Tube	287A1399P023	13
	Wrench Torque, Drive End	361A2994P002	1
	Wrench Torque, Drive End	361A2994P003	1
	Wrench Torque	361A2994P007	1
	Shield Radation Assembly, Exhaust Thermocouple	362A1344P013	13
	Washer, Plain	N402P00023	13
	Conduit Arrangement, Exhaust Area	136E6520G002	1
	Haz Mat Conduit Arrangement Exhaust	136E6520G003	2
h	Name Plate, Unit Arrangement consisting of following items:		
	Name Plate, Unit Rating - Unit # 1	249A8115P001	1
	Screw	293A0670P014	4

**D.3. Implementation of sampling plan**

&gt;&gt; Not Applicable

**SECTION E. Calculation of emission reductions or net anthropogenic removals****E.1. Calculation of baseline emissions or baseline net removals**

&gt;&gt;

The baseline emissions have been calculated as explained below

The step by step procedure to compute BE (baseline emission) is shown below:



The step by step procedure to compute *BE* (baseline emission) is shown below:

$$\text{Heat Rate}_{\text{preproject}} = Q_{\text{baseline}} * \text{NCV}_{\text{baseline}} / \text{EG}_{\text{Gen, baseline}} \quad (1)$$

where:

$\text{Heat Rate}_{\text{preproject}}$	Heat rate in Kcal / Kwh
$Q_{\text{baseline}}$	Quantity of fuel consumed in baseline scenario (SCM) (NM <sup>3</sup> x1.055)
$\text{NCV}_{\text{baseline}}$	Net Calorific value of the fuel in baseline scenario (Kcal/SCM)
$\text{EG}_{\text{Gen, baseline}}$	Electrical energy generated in baseline (Kwh)

$$\text{TEC} = \text{Heat Rate}_{\text{preproject}} * \text{EG}_{\text{Gen Average}} * 4.186/10^9 \quad (2)$$

Where,

$\text{TEC}$	Total energy content of the fuel in TJ
$\text{Heat Rate}_{\text{preproject}}$	Heat rate in pre project scenario Kcal / Kwh
$\text{EG}_{\text{Gen Average}}$	Average Gross Electricity generated in baseline period in Kwh

$$\text{BE} = \text{TEC} * \text{EF} \quad (3)$$

Where,

$\text{BE}$	Baseline emission in tCO <sub>2</sub> e
$\text{TEC}$	Total energy content of the fuel in TJ
$\text{EF}$	IPCC emission factor of the gas in tCO <sub>2</sub> e/TJ

#### Baseline emission

Month	Heat Rate pre project (kCal/kWh)	EG <sub>Gen, baseline</sub> MWh	TEC TJ	EF tCO <sub>2</sub> e/TJ	BE tCO <sub>2</sub> e
Jul 2012	3483.75	23222	338.65	56.1	18998.04
Aug 2012	3483.75	21897	319.32	56.1	17914.05
Sep 2012	3483.75	19517	284.62	56.1	15966.96
Oct 2012	3483.75	23829	347.50	56.1	19494.62
Nov 2012	3483.75	20056	292.48	56.1	16407.91
Dec 2012	3483.75	20763	302.79	56.1	16986.31
Jan 2013	3483.75	22711	331.19	56.1	18579.98
Feb 2013	3483.75	19181	279.72	56.1	15692.07
Mar 2013	3483.75	20468	298.48	56.1	16744.97
Apr 2013	3483.75	23416	341.48	56.1	19156.75
May 2013	3483.75	24679	359.89	56.1	20190.01
Jun 2013	3483.75	21095	307.63	56.1	17257.93
Jul 2013	3483.75	19970	291.22	56.1	16337.56
Aug 2013	3483.75	22134	322.78	56.1	18107.94
Sep 2013	3483.75	25582	373.06	56.1	20928.76
Oct 2013	3483.75	22635	330.09	56.1	18517.81
Nov 2013	3483.75	23029	335.83	56.1	18840.14

Dec 2013	3483.75	23938	349.09	56.1	19583.80
Jan 2014	3483.75	26241	382.67	56.1	21467.89
Feb 2014	3483.75	20981	305.97	56.1	17164.66
Mar 2014	3483.75	20682	301.61	56.1	16920.05
Apr 2014	3483.75	20296	295.98	56.1	16604.26
May 2014	3483.75	17202	250.86	56.1	14073.04
Jun 2014	3483.75	24178	352.59	56.1	19780.14
Jul 2014	3483.75	25952	378.46	56.1	21231.46
Aug 2014	3483.75	24040	350.57	56.1	19667.25
Sep 2014	3483.75	21950	320.10	56.1	17957.41
Oct 2014	3483.75	26152	381.37	56.1	21395.08
Nov 2014	3483.75	23390	341.10	56.1	19135.48
Dec 2014	3483.75	22920	334.24	56.1	18750.97
Jan 2015	3483.75	24498	357.25	56.1	20041.94
Feb 2015	3483.75	22131	322.74	56.1	18105.48
Mar 2015	3483.75	27546	401.70	56.1	22535.52
Apr 2015	3483.75	25606	373.41	56.1	20948.40
May 2015	3483.75	28036	408.85	56.1	22936.39
Jun 2015	3483.75	21960	320.24	56.1	17965.59
Jul 2015	3483.75	20762	302.77	56.1	16985.50
Aug 2015	3483.75	25786	376.04	56.1	21095.66
Sep 2015	3483.75	24308	354.48	56.1	19886.50
Oct 2015	3483.75	27750	404.68	56.1	22702.41
Nov 2015	3483.75	26312	383.71	56.1	21525.98
Dec 2015	3483.75	28808	420.11	56.1	23567.97
Jan 2016	3483.75	18968	276.61	56.1	15517.82
Feb 2016	3483.75	23780	346.78	56.1	19454.54
Mar 2016	3483.75	25318	369.21	56.1	20712.78
Apr 2016	3483.75	24272	353.96	56.1	19857.05
May 2016	3483.75	19306	281.54	56.1	15794.34
Jun 2016	3483.75	14380	209.70	56.1	11764.35
Jul 2016	3483.75	14984	218.51	56.1	12258.49
Aug 2016	3483.75	14796	215.77	56.1	12104.68
Sep 2016	3483.75	14266	208.04	56.1	11671.09
Oct 2016	3483.75	15158	221.05	56.1	12400.84
Nov 2016	3483.75	15580	227.20	56.1	12746.08
Dec 2016	3483.75	15766	229.92	56.1	12898.24
Jan 2017	3483.75	16672	243.13	56.1	13639.45
Feb 2017	3483.75	14768	215.36	56.1	12081.78
Mar 2017	3483.75	19702	287.31	56.1	16118.31

## E.2. Calculation of project emissions or actual net removals

&gt;&gt;

$$\text{Heat Rate}_{\text{project}} = (Q_{\text{project}} * \text{NCV}_{\text{project}}) / \text{EG}_{\text{Gen,project}} \quad (1)$$

where:

 $\text{Heat Rate}_{\text{project}}$  Reduced heat rate in Kcal / Kwh $Q_{\text{project}}$  Quantity of fuel consumed in SCM ( $\text{NM}^3 \times 1.055$ ) $\text{NCV}_{\text{project}}$  Net Calorific value of the fuel in Kcal/SCM $\text{EG}_{\text{Gen,project}}$  Electrical energy generated in Kwh

$$\text{REI} = Q_{\text{project}} * \text{NCV}_{\text{project}} \quad (2)$$

Where,

 $\text{REI}$  Reduced energy input in Kcal $Q_{\text{project}}$  Quantity of fuel consumed in SCM ( $\text{NM}^3 \times 1.055$ ) $\text{NCV}_{\text{project}}$  Net Calorific value of the fuel in Kcal/SCM

$$\text{PE} = \text{REI} * \text{EF} \quad (3)$$

Where,

 $\text{PE}$  Project Emission in  $\text{tCO}_2$  $\text{REI}$  Reduced energy input in TJ $\text{EF}$  IPCC emission factor of the gas in  $\text{tCO}_2/\text{TJ}$ 

Project Emission:

Month	Quantity of fuel used(NG)	Net Calorific value of fuel	Gross quantity of electricity generated	Heat Rate Project	Reduced energy input	Emissions factor	Project Emission
Jul 2012	9712794	0.03504	23222	3501	340.30	56.1	19090.59
Aug 2012	9308703	0.03504	21897	3558	326.14	56.1	18296.34
Sep 2012	8595481	0.03504	19517	3686	301.15	56.1	16894.50
Oct 2012	9794256	0.03504	23829	3440	343.15	56.1	19250.70
Nov 2012	8865580	0.03504	20056	3700	310.61	56.1	17425.38
Dec 2012	9007690	0.03504	20763	3631	315.59	56.1	17704.70
Jan 2013	9667295	0.03504	22711	3563	338.70	56.1	19001.16
Feb 2013	8119364	0.03504	19181	3543	284.47	56.1	15958.69
Mar 2013	9020369	0.03504	20468	3689	316.04	56.1	17729.62
Apr 2013	9598593	0.03504	23416	3431	336.29	56.1	18866.12



May 2013	10140203	0.03504	24679	3439	355.27	56.1	19930.66
Jun 2013	9006385	0.03504	21095	3573	315.55	56.1	17702.13
Jul 2013	8774119	0.03504	19970	3677	307.41	56.1	17245.61
Aug 2013	9222388	0.03504	22134	3487	323.11	56.1	18126.69
Sep 2013	10218197	0.03504	25582	3343	358.00	56.1	20083.96
Oct 2013	9498867	0.03504	22635	3512	332.80	56.1	18670.11
Nov 2013	9508519	0.03504	23029	3456	333.14	56.1	18689.08
Dec 2013	9858645	0.03504	23938	3447	345.41	56.1	19377.26
Jan 2014	10499721	0.03504	26241	3349	367.87	56.1	20637.30
Feb 2014	8753837	0.03504	20981	3492	306.70	56.1	17205.75
Mar 2014	8564309	0.03504	20682	3466	300.06	56.1	16833.23
Apr 2014	8343375	0.03504	20296	3441	292.32	56.1	16398.98
May 2014	6768315	0.03504	17202	3293	237.13	56.1	13303.18
Jun 2014	9383408	0.03504	24178	3248	328.76	56.1	18443.18
Jul 2014	10379601	0.03504	25952	3348	363.66	56.1	20401.20
Aug 2014	9895179	0.03504	24040	3445	346.69	56.1	19449.07
Sep 2014	9176036	0.03504	21950	3499	321.49	56.1	18035.58
Oct 2014	10602940	0.03504	26152	3393	371.48	56.1	20840.18
Nov 2014	9723588	0.03504	23390	3479	340.67	56.1	19111.80
Dec 2014	9662167	0.03504	22920	3528	338.52	56.1	18991.08
Jan 2015	10023626	0.03504	24498	3425	351.19	56.1	19701.53
Feb 2015	8966738	0.03504	22131	3391	314.16	56.1	17624.21
Mar 2015	10909825	0.03504	27546	3315	382.23	56.1	21443.36
Apr 2015	10327326	0.03504	25606	3376	361.83	56.1	20298.46
May 2015	11139849	0.03504	28036	3326	390.29	56.1	21895.48
Jun 2015	9276781	0.03504	21960	3536	325.02	56.1	18233.60
Jul 2015	9086738	0.03504	20762	3663	318.36	56.1	17860.07
Aug 2015	10432266	0.03504	25786	3386	365.50	56.1	20504.72
Sep 2015	9969788	0.03504	24308	3433	349.30	56.1	19595.71
Oct 2015	11055904	0.03504	27750	3335	387.35	56.1	21730.48
Nov 2015	10425775	0.03504	26312	3316	365.28	56.1	20491.96
Dec 2015	11007466	0.03504	28808	3198	385.66	56.1	21635.28
Jan 2016	7298227	0.03504	18968	3220	255.70	56.1	14344.73
Feb 2016	9445091	0.03504	23780	3324	330.92	56.1	18564.41
Mar 2016	10180544	0.03504	25318	3366	356.68	56.1	20009.95
Apr 2016	9740283	0.03504	24272	3359	341.26	56.1	19144.62
May 2016	7923340	0.03504	19306	3435	277.60	56.1	15573.40
Jun 2016	5488264	0.03504	14380	3194	192.29	56.1	10787.23
Jul 2016	5735861	0.03504	14984	3204	200.96	56.1	11273.89
Aug 2016	5639996	0.03504	14796	3190	197.60	56.1	11085.46
Sep 2016	5467150	0.03504	14266	3208	191.55	56.1	10745.73
Oct 2016	5830239	0.03504	15158	3219	204.27	56.1	11459.39
Nov 2016	5815895	0.03504	15580	3124	203.76	56.1	11431.20
Dec 2016	5838408	0.03504	15766	3099	204.55	56.1	11475.44

Jan 2017	6116337	0.03504	16672	3071	214.29	56.1	12021.72
Feb 2017	5346205	0.03504	14768	3030	187.31	56.1	10508.02
Mar 2017	7363707	0.03504	19702	3128	258.00	56.1	14473.85

**E.3. Calculation of leakage emissions**

>> As mentioned in section B.6.1 of registered PDD, the leakage due to the project activity has been considered as zero.

LEy =0

**E.4. Calculation of emission reductions or net anthropogenic removals**

	Baseline GHG emissions or baseline net GHG removals (tCO <sub>2</sub> e)	Project GHG emissions or actual net GHG removals (tCO <sub>2</sub> e)	Leakage GHG emissions (t CO <sub>2</sub> e)	GHG emission reductions or net anthropogenic GHG removals (tCO <sub>2</sub> e)		
				Before 01/01/2013	From 01/01/2013	Total amount
<b>Total</b>	1017170	993607	0	(-2894)	26457	23563

**E.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the registered PDD**

Amount achieved during this monitoring period (tCO <sub>2</sub> e)	Amount estimated ex ante for this monitoring period in the PDD (tCO <sub>2</sub> e)
23563	37065

**E.5.1. Explanation of calculation of “amount estimated ex ante for this monitoring period in the PDD”**

>> Actual emission reduction achieved is lower than the estimated amount of the emission reduction

**E.6. Remarks on increase in achieved emission reductions**

>> Not applicable as actual emission reduction achieved is lower than the estimated amount of the emission reduction.

**E.7. Remarks on scale of small-scale project activity**

>> Not Applicable

# 1. Document information

Version	Date	Description
07.0	31 May 2019	Revision to: <ul style="list-style-type: none"> <li>• Ensure consistency with version 02.0 of the “CDM project standard for project activities” (CDM-EB93-A04-STAN);</li> <li>• Add a section on remarks on the observance of the scale limit of small-scale project activity during the crediting period;</li> <li>• Add "changes specific to afforestation or reforestation project activity" as a possible post-registration changes;</li> <li>• Clarify the reporting of net anthropogenic GHG removals for A/R project activities between two commitment periods;</li> <li>• Make editorial improvements.</li> </ul>
06.0	7 June 2017	Revision to: <ul style="list-style-type: none"> <li>• Ensure consistency with version 01.0 of the “CDM project standard for project activities” (CDM-EB93-A04-STAN);</li> <li>• Make editorial improvements.</li> </ul>
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: <ul style="list-style-type: none"> <li>• Include provisions related to delayed submission of a monitoring plan;</li> <li>• Provisions related to the Host Party;</li> <li>• Remove reference to programme of activities;</li> <li>• Overall editorial improvement.</li> </ul>
04.0	25 June 2014	Revisions to: <ul style="list-style-type: none"> <li>• Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0));</li> <li>• Include provisions related to standardized baselines;</li> <li>• Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1;</li> <li>• Change the reference number from <i>F-CDM-MR</i> to <i>CDM-MR-FORM</i>;</li> <li>• Editorial improvement.</li> </ul>
03.2	5 November 2013	Editorial revision to correct table in page 1.
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 GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB 70, 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).
01.0	28 May 2010	EB 54, Annex 34. Initial adoption.

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