COMBINED CYCLE NATURAL GAS BASED GRID CONNECTED POWER PLANT AT JEGURUPADU, INDIA

Document Prepared By: GVK Industries Limited, Hyderabad

Project Title	Combined cycle natural gas based grid connected power plant at Jegurupadu, India
Version	3.3
Report ID	*GVK- VCS-Ver-01*
Date of Issue	*19.06.2013*
Project ID	*Registry ID: VCSR496* *Project ID Database: VCSPD982*
Monitoring Period	14.04.2009 – 13.04.2011
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Table of Contents

1 PROJECT DETAILS

1.1 Summary Description of Project

The project comprises of one combustion turbine, one Heat recovery Steam Generators (HRSG) and one Steam Turbine Generator (STG). This configuration has been adopted due to (a) higher efficiency of Combustion Turbines of larger size and (b) shorter implementation period (compared to a coal based power plant) of the power project[1]. The Combustion Turbine and Steam turbine are designed as indoor equipments.

At the site ambient temperature of 29ºC and a frequency of 50 Hz, the combustion turbine generator with NG as fuel has an output of 148 MW while the output from the steam turbine generator would be 80 MW. The heat content of the exhaust gas from the combustion turbine is recovered in a triple pressure heat recovery steam generator. The steam generated is then be expanded in a condensing type non reheat steam turbine driving an electric generator.

The Combustion Turbine is a single shaft machine with the compressor and turbine installed in a single casting. Annular combustor of dry low NOx (DLN) type is being adopted. The combustion turbine drives the generator directly. The combustion turbine is started by operating the generator as a variable speed motor. The variable frequency power required for this purpose is supplied by the static frequency converter system.

The Heat Recovery Steam Generator (HRSG) is triple pressure natural circulation heat recovery steam generators for outdoor installation that would generate the steam for the steam turbine set, utilising the waste heat from the gas turbine (GT) exhaust. The Steam Turbine is of the triple-pressure single-casing design with an axial exhaust. The live steam supplied by the HRSG is admitted to the high pressure (HP) turbine through the main stop valve and the main control valve. Intermediate pressure (IP) and light pressure (LP) steam is admitted via one stop valve and one control valve for each pressure level. From the LP-turbine exhaust the expanded steam flows into the condenser.

1.2 Sectoral Scope and Project Type

Sectoral Scope: 01 Energy industries (renewable - / non-renewable sources)

Category*:* Approved baseline methodology AM0029

Title*:* “Baseline Methodology for Grid Connected Electricity Generation Plants using Natural Gas”

Version no*. 03*

Type: Low carbon electricity[2]

[1] Evidence provided to the DOE

[2] http://cdm.unfccc.int/methodologies/documentation/meth_booklet.pdf#AM0029

This is not a grouped project activity.

1.3 Project Proponent

The following table gives the contact information of the project proponent.

Organization:	GVK Industries Limited
Street/P.O.Box:	156-159, Sardar Patel Road
Building:	Paigah House
City:	Secunderabad
State/Region:	Andhra Pradesh
Postfix/ZIP:	500003
Country:	India
Telephone:	040-27902663
FAX:	040-27902665
E-Mail:	Issac@gvk.com
URL:	www.gvk.com
Represented by:	-
Title:	Director (Finance)
Salutation:	Mr.
Last Name:	George
Middle Name:	Issac
First Name:	A.
Department:	Finance
Mobile:	-
Direct FAX:	040-27902665
Direct tel:	040-66262103
Personal E-mail	-

Roles and Responsibility of Project Proponent:

GVK Industries Limited is the overall controller and responsible for the project activity. It is the individual owner of VER's which will be availed from the project activity. GVK Industrial Limited is responsible for providing the monitoring report and supporting documentation to facilitate verification of the project activity.

1.4 Other Entities Involved in the Project

No other parties are involved in this project

1.5 Project Start Date

As per the VCS Standard ver 3.3the project start date is the date on which the project began generating GHG emission reductions or removals (see VCS document AFOLU Requirements for further specification for AFOLU projects). The project got commissioned on 14.04.2009 and hence the project start date is 14.04.2009

1.6 Project Crediting Period

Start date of the Crediting Period: 14.04.2009

Last date of the Crediting Period: 14.04.2019

Total No. of Years: 10

As per the validated VCS-PD, the PP also has option of renewing crediting period once considering project life of 15 years.

This is not a grouped project activity.

1.7 Project Location

The proposed project activity is near Jegurupadu village south east of Rajahmundry in east Godavari district of Andhra Pradesh, India. The location is close to Krishna-Godavari pipeline of Gas Authority of India Limited.

Geographic location and accessibility:

Nearest village: Kondaguntur (1.5 km); Nearest town: Rajahmundry (15 km)

Nearest highway: NH-5 (5 km); Nearest railway station: Kadiyam (4 km)

Nearest airport: Rajahmundry (15 km); Nearest seaport: Kakinada (50 km)

The geographical coordinates of the project activity are 16º59’42” N and 81º53’12” E.

The location of the project activity is also depicted in the following map:

(Source: www.mapsofindia.com)

Figure 1: Map of (A) India and (B) East Godavari district showing the site of project activity

1.8 Title and Reference of Methodology

Title: Combined cycle natural gas based grid connected power plant at Jegurupadu, India

Reference: Approved baseline methodology AM0029 ("Baseline Methodology for Grid Connected Electricity Generation Plants using Natural Gas")

Version : 3.0, EB 39, 30 May 2008

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

The implementation and operational status of the project as of this monitoring period:

The project activity started commercial operation on – 14.04.2009

During this monitoring period, the plant was shut down temporarily on following dates due to

1. Maintenance

2. Natural gas supply disruption (shut down of gas wells for maintenance and other problems at suppliers' end)

The emission reduction is not claimed on all these days

Sr. No.	plant shut down period	Reason for shutdown
1	26-29.07.2009	Emergency shutdown availed for rectification of ST generator slip ring cooling system
2	04.10.2009	Gas supply disruption
3	04-08.03.2010	Scheduled hot gas path inspection of gas turbine
4	08-10.07.2010	Scheduled hot gas path inspection of gas turbine and heat recovery steam generator license renewal
5	15.12.2010	Gas supply disruption

During the shutdown period, electricity was imported from grid for routine work. Therefore, as a conservative approach negative values have also been considered in ER calculation for those particular days (please see ER calculation sheet).

2.2 Project Description Deviations

As per clause no. 3.6 of VCS Standard version no.3 following deviation in the monitoring plan which is in compliance with the applied methodology AM0029.

1. In the monitoring parameters following changes has been done:

Parameter	Description as per registered PD	Deviation mentioned in the MR	Compliance with methodology
$EF_{CO2,f,y}$ in tCO_2/GJ (CO_2 Emission factor per unit of energy of natural gas in year y)	EF_{NG} in $kgCO_2/TJ$	$EF_{CO2,NG}$ in tCO_2/GJ	This is in compliance with the methodology. PP has mentioned the complete notation of the parameter in the monitoring report with the appropriate unit.
$EF_{NG,upstream,CH4}$ in tCH_4/GJ (Emission factor for upstream fugitive emission)	PP has not mentioned this parameter in the PD as per table format.	PP has mentioned this parameter in MR under section 3.1 (Data and Parameter Available at Validation.)	This is in compliance with the methodology.

$EF_{CO2,upstream,LNG}$ in tCO_2/TJ (Emission factor for upstream CO_2 emissions due to fossil fuel combustion / electricity consumption associated with the liquefaction, transportation, re-gasification and compression of LNG into a natural gas transmission or distribution system)	PP has not mentioned this parameter in the PD as per table format.	PP has mentioned this parameter in MR under section 3.1 (Data and Parameter Available at Validation.)	This is in compliance with the methodology.
$FC_{F,y}$ in SCM (Annual quantity of fuel "f" consumed in project activity) Accuracy class of Gas flow meters is +/- 0.2S	PP has mentioned the following source for getting the gas consumption: **Main Source:** The daily readings are recorded manually and are stored in the power plant log book. **Cross Check Source:** Invoices from GAIL	PP has mentioned following source in the MR. **Main Source:** Fortnightly joint ticket readings received from GAIL **Cross Check Source:** The quantity of natural gas is cross checked with the check meter which is at PP's end. For calculating the emission reduction higher values in between main meter and check meters has been considered on a conservative basis.	This is in compliance with the methodology.
$NCV_{f,y}$ in GJ/m^3 (Net Calorific Value of fuel f) GCV is provided in fortnightly joint meter reading, NCV is calculated using 10% delta factor.	$NCV_{f,y}$ in kcal/SCM **Main Source:** Invoice from supplier **Cross Check Source: 1. Check meter is installed at PP's end, which will be used as check**	NCV_{NG} in GJ/SCM **Main Source:** Fortnightly joint meter reading which gives GCV and NCV will be calculated from GCV using delta factor **Cross Check Source: 1. PP has removed the check meter reference as crosscheck is not required for NCV as per**	This is in compliance with the methodology. PP has specified the fuel used in the notation and also given the appropriate unit as per the methodology.

	meter. **2.** The NCV of natural gas is crossed checked with the invoices that are obtained from GAIL.	**methodology.** **2.** Not applicable as it is a third party calculated value (gas supplier) in line with the monitoring methodology AM0029.	
$FC_{F,y}$ in SCM (Annual quantity of fuel "f" consumed in project activity)	$FCf_{,LNG,y}$ in SCM PP has mentioned the following source for getting the LNG consumption: **Main Source:** The daily readings are recorded manually and are stored in the power plant log book **Cross Check Source:** GAIL Invoice	PP has mentioned following source in the MR. **Main Source:** Fortnightly joint ticket readings received from GAIL **Cross Check Source:** The quantity of natural gas is cross checked with the check meter which is at PP's end. For calculating the emission reduction higher values in between main meter and check meters has been considered on a conservative basis.	This is in compliance with the methodology.
$NCV_{f,y}$ in GJ/m^3 (Net Calorific Value of fuel f)	This parameter was not mentioned in the registered PD.	NCV_{LNG} **Main Source:** Fortnightly joint meter reading which gives GCV and NCV will be calculated from GCV using delta factor **Cross Check Source:** Not applicable as it is a third party calculated value (gas supplier) in line with the monitoring methodology AM0029	This is in compliance with the methodology.

$COEF_{f,y}$ in tCO_2/m^3 (CO2 emission coefficient)	This parameter was not mentioned in the registered PD.	$COEF_{f,y}$ in tCO_2/m^3 (This is calculated parameter)	This is in compliance with the methodology.
$EG_{Export,y}$ in MWh (Gross electricity exported by the project plant in year y)	This parameter was not mentioned in the registered PD.	PP has given the overall description of how $EG_{PJ,y}$ (Net Electricity exported by the project plant) is arrived. Accordingly this parameter has been added in the section 3.2 of MR. **Main Source:** JMR as a primary source. **Cross Check Source:** Crosscheck of values will be done by invoices raised from GVK to APTRANSCO.	This is in compliance with the methodology.
$EG_{import,y}$ in MWh (Total electricity import from the grid by the project activity in year y)	This parameter was not mentioned in the registered PD.	PP has given the overall description of how $EG_{PJ,y}$ (Net Electricity exported by the project plant) is arrived. Accordingly this parameter has been added in the section 3.2 of MR. **Main Source:** JMR as a primary source. **Cross Check Source:** Crosscheck of values will be done by invoices raised from APTRANSCO to GVK.	This is in compliance with the methodology.
$EG_{PJ,y}$ in MWh (Net Electricity exported by the project plant)	PP has mentioned the following source for the net electricity **Main Source:** The readings taken from the export meter present in the tariff metering room present in the switch	PP has now mentioned the following source for the net electricity in the MR. **Main Source:** JMR as a primary source.	This is in compliance with the methodology.

	yard. The readings are stored in the power plant log book. **Cross Check Source:** Check meter installed by GVK	**Cross Check Source:** Crosscheck of values will be done by invoices raised from GVK to APTRANSCO.	
EF $_{BL,upstream,CH4}$ in tCO_2/MU (Emission factor for upstream fugitive methane emissions occurring in the absence of the project activity) & PE_y in tCO_2 (Project emission under project activity.)	This parameter was not mentioned in the registered PD.	EF $_{BL,upstream,CH4}$ in tCO_2/MU and & PE_y in tCO_2 (These are calculated parameter)	This is in compliance with the methodology.

2.3 Grouped Project

Not Applicable.

This is not a grouped project activity.

3 DATA AND PARAMETERS

3.1 Data and Parameters Available at Validation

Parameter 1:

Data Unit / Parameter:	$Oxid_{NG}$
Data unit:	Unit less factor
Description:	This is the default Carbon Oxidation Factor of Natural Gas.
Source of data:	Table 1.4, Chapter 1, Volume 2, 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	**1**
Purpose of the data:	Project emission calculations
Any comment:	--

Parameter 2:

Data Unit / Parameter:	$EF_{CO2,NG}$
Data unit:	tCO_2/GJ
Description:	This is the default value of Effective CO_2 emission factor for fuel "f" (Natural Gas in tonnes of carbon dioxide per Giga Joule.)
Source of data:	Table 1.4, Chapter 1, Volume 2, 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	0.0561
Purpose of the data:	Project emission calculations
Any comment:	--

Parameter 3:

Data Unit / Parameter:	$EF_{NG,upstream,CH4}$
Data unit:	tCH_4/GJ
Description:	Emission factor for upstream fugitive methane emissions of natural gas from production, transportation, distribution and in the case of LNG, liquefaction, transportation, re-gasification and compression into a transmission or distribution system, in tCH4 per GJ fuel supplied to final consumers
Source of data:	Table- 2 of AM 0029 Version 03
Value applied:	0.000296
Purpose of the data:	Leakage emission calculations
Any comment:	Nil

Parameter 4:

Data Unit / Parameter:	$EF_{CO2,upstream,LNG}$
Data unit:	tCO_2/TJ
Description:	Emission factor for upstream CO_2 emissions due to fossil fuel combustion / electricity consumption associated with the liquefaction, transportation, re-gasification and compression of LNG into a natural gas transmission or distribution system
Source of data:	Default factor from AM 0029 Version 03
Value applied:	6 tCO_2/TJ
Purpose of the data:	Leakage emission calculations
Any comment:	Nil

3.2 Data and Parameters Monitored

Parameter 1:

Data Unit / Parameter:	FC_{NG}
Data unit:	SCM
Description:	Quantity of NG consumed in the project activity
Source of data:	Fortnightly joint ticket readings received from GAIL
Description of measurement methods and procedures to be applied:	The quantity of Natural Gas is measured by the gas flow meter which would be installed by GAIL at their terminal
Frequency of monitoring/recording:	Monitoring Frequency: Continuously Recording Frequency: Daily recording with fortnightly JMR by GAIL.
Value monitored:	Year 2009 (From 14th April to 31st December) — 269,475,392.14 SCM Year 2010 (From 1st January to 31st December) — 350,846,483.50 SCM Year 2011 (From 1st January to 13th April) — 84,639,609.60 SCM Total — 704,961,485.24[3] SCM

[3] Higher values considered in between GAIL flow meter and PP's Flow meter after applying the correction factor which is a conservative approach to calculate Emission reduction for the entire monitoring period. GAIL meter reading is 690842956.50 SCM

Monitoring equipment:	At project site two gas flow meters are present. One is installed by GAIL at supplier end (Meter numbers 80695, 80671) and another one is installed by project proponent at PP (meter number 27D616149423 & CZD705229) end. Both the meters measures volume of fuel consumed. Main Meter (a) Meter 1 - having serial number 80695 having accuracy of +/- 0.23% and (b) Meter 2 - having serial number 80671 having accuracy of +/- 0.23% Check Meter (a) Pressure brf Main shut off valve having serial number 27D616149423 of accuracy class 0.25% (b) Temperature bfr Main shut off valve having serial number CZD705229 of accuracy class 0.1% Both the aforesaid meters simultaneously record the gas consumed in the project activity. Meter serial number 80695 & 80671 is treated as the **"Main meter"** and meter serial number 27D616149423 & CZD705229 is treated as **"Check meter"**. However readings from the Check meter are to be considered only when the Main meter is reading faulty or when Main meter is not available and also to cross check the invoices from GAIL. The daily readings are recorded manually and are stored in the power plant log book.
QA/QC procedures to be applied:	The quantity of natural gas is cross checked with the check meter which is at PP's end. For calculating the emission reduction higher values in between main meter and check meters has been considered on a conservative basis.
Calculation method:	Not Applicable
Any comment:	--PP has applied correction factor for the values from 14.04.2009 to 14.05.2009 because of non availability of the calibration report

Parameter 2:

Data Unit / Parameter:	NCV_{NG}
Data unit:	GJ/SCM
Description:	Net Calorific Value of Natural Gas
Source of data:	Fortnightly joint ticket readings from GAIL provides GCV (NCV is calculated from GCV using delta factor).
Description of measurement methods and procedures to be	The supplier provides GCV in fortnightly joint ticket readings. As only GCV is reported in the mentioned document, the the NCV is calculated using this GCV and delta factor of 10% (CEA CO_2

<table>
<tr><td>applied:</td><td>baseline database for Indian Power Sector, Version 8, Assumptions worksheet, Cell F8).</td></tr>
<tr><td>Frequency of monitoring/recording:</td><td>Monitoring frequency: Continuous
Recording frequency: Daily recording with fortnightly JMR by GAIL.</td></tr>
<tr><td>Value monitored:</td><td>For calculation purpose values are converted from kcal/SCM to GJ/SCM. Reference: Spreadsheet of monitoring report.
<table>
<tr><td>Year 2009 (From 14th April to 30th June)</td><td>0.034 GJ/SCM</td></tr>
<tr><td>Year2009 (From 1st July to 31st December)</td><td>0.034 GJ/SCM</td></tr>
<tr><td>Year 2010 (From 1st January to 30th June)</td><td>0.034GJ/SCM</td></tr>
<tr><td>Year 2010 (From 1st July to 31st December)</td><td>0.0347GJ/SCM</td></tr>
<tr><td>Year 2011 (1st January- 13th April)</td><td>0.0361GJ/SCM</td></tr>
</table></td></tr>
<tr><td>Monitoring equipment:</td><td>Calorific values of the gas in the project activity is provided by the supplier (GAIL). The GCV is measured by the Gas chromatograph that would be installed by GAIL at their terminal and NCV will be calculated from GCV using delta factor.</td></tr>
<tr><td>QA/QC procedures to be applied:</td><td>Not applicable as it is a third party calculated value (gas supplier) in line with the monitoring methodology AM0029. The meter is gas transporter’s (GAIL) terminal at the project activity location and in the project boundary. The meter (GC) is calibrated annually jointly by PP and GAIL.</td></tr>
<tr><td>Calculation method:</td><td>As mentioned above GCV is reported in GAIL’s fortnightly joint ticket readings and NCV is calculated using this GCV by applying the 10% delta factor as mentioned in the CEA database.</td></tr>
<tr><td>Any comment:</td><td>PP has applied correction factor for the values from 14.04.2009 to 09.08.2009, from 23.02.2011 to 13.04.2011. because of non availability of the calibration report</td></tr>
</table>

Parameter 3:

Data Unit / Parameter:	$FC_{LNG,y}$
Data unit:	SCM

Description:	Quantity of LNG consumed in the project activity
Source of data:	GAIL Invoice
Description of measurement methods and procedures to be applied:	The quantity of LNG is measured by the gas flow meter which is installed by GAIL at their terminal and there is no separate meter installed for LNG consumption. .
Frequency of monitoring/recording:	Monitoring Frequency: Continuously Recording Frequency: Daily recording with fortnightly JMR by GAIL.
Value monitored:	For calculation purpose the values are converted from SCM to TJ

Year 2009 (From 14th April to 31st December)	365.74TJ
Year 2010 (From 1st January to 31st December)	0 TJ
Year 2011 (From 1st January to 13th April)	233.04TJ
Total	598.78TJ

Monitoring equipment:	The quantity of Liquefied Natural Gas is measured by the gas flow meter which would be installed by GAIL at their terminal
QA/QC procedures to be applied:	The quantity of natural gas is cross checked with the check meter which is at PP's end. For calculating the emission reduction higher values in between main meter and check meters has been considered on a conservative basis
Calculation method:	
Any comment:	--

Parameter 4:

Data Unit / Parameter:	NCV_{LNG}
Data unit:	GJ/SCM
Description:	Net Calorific Value of Natural Gas
Source of data:	Fortnightly joint ticket readings from GAIL provides GCV (NCV is calculated from GCV using delta factor).
Description of measurement methods and procedures to be applied:	The supplier provides GCV in fortnightly joint ticket readings. As only GCV is reported in the mentioned document, the the NCV is calculated using this GCV and delta factor of 10% (CEA CO_2 baseline database for Indian Power Sector, Version 8, Assumptions worksheet, Cell F8).
Frequency of	Monitoring frequency: Continuous

monitoring/recording:	Recording frequency: Daily recording with fortnightly JMR by GAIL.
Value monitored:	For calculation purpose values are converted from kcal/SCM to GJ/SCM. Reference: Spreadsheet of monitoring report.
	Year 2009 (From 14th April to t 30th June) — 0.034 GJ/SCM
	Year 2009 (From 1st July to 31st December) — 0.034 GJ/SCM
	Year 2011 (1st January- 13th April) — 0.036 GJ/SCM
Monitoring equipment:	Calorific values of the gas in the project activity are provided by the supplier (GAIL). The GCV is measured by the Gas chromatograph that would be installed by GAIL at their terminal and NCV will be calculated from GCV using delta factor.
QA/QC procedures to be applied:	Not applicable as it is a third party calculated value (gas supplier) in line with the monitoring methodology AM0029. The meter installed by GAIL is calibrated annually.
Calculation method:	Not Applicable
Any comment:	--

Parameter 5:

Data Unit / Parameter:	$EF_{BM,y}$
Data unit:	tCO_2/MWh
Description:	The Build Margin emission factor of Southern grid
Source of data:	CEA CO_2 Baseline Database, version 08; Jan 2013
Description of measurement methods and procedures to be applied:	The value is taken from the database developed by Central Electricity Authority (CO_2 Baseline database for the Indian power sector, Version 8.0). The database is Government of India's official publication based on the 'Tool to calculate the emission factor for an electricity system'.
Frequency of monitoring/recording:	Annually
Value monitored:	For calculation purpose the value is converted from tCO_2/MWh to tCO_2/GWh. 852.19 tCO_2/GWh
Monitoring equipment:	Not Applicable
QA/QC procedures to be applied:	This is used for ex-ante estimation and as per methodology requirement, this will be monitored ex-post for ER calculation in the monitoring period (latest available database, most recent year BM will be used)
Calculation method:	Not Applicable

Any comment:	--

Parameter 6:

Data Unit / Parameter:	$COEF_{f,y}$
Data unit:	tCO_2/m^3
Description:	CO_2 emission coefficient of fuel (Natural gas)
Source of data:	Not Applicable
Description of measurement methods and procedures to be applied:	Calculated
Frequency of monitoring/recording:	Not Applicable
Value monitored:	Year 2009 (From 14th April to 31st December) — $0.003840610 tCO_2/m^3$ Year 2010 (From 1st January to 31st December) — $0.003878346 tCO_2/m^3$ Year 2011 (From 1st January to 13th April) — $0.002026330 tCO_2/m^3$ Total CO_2 emission Coefficient of Natural Gas for period from14-04-2009 to 13-04-2011 — $0.009745286 tCO_2/m^3$
Monitoring equipment:	Not Applicable
QA/QC procedures to be applied:	Nil
Calculation method:	$COEF_{f,y} = NCV_{f,y} * EF_{CO2,f,y} * OXID_f$ Where, NCV_{NG} is as per parameter 2 under section 3.2 "Data and Parameters monitored". $EF_{CO2,NG}$ is as per parameter 2 under section 3.1 "Data and parameters determined at registration and not monitored during the monitoring period, including default values and factors". $OXID_{NG}$ is as per parameter 1 under section 3.1 "Data and parameters determined at registration and not monitored during the monitoring period, including default values and factors"
Any comment:	--

Parameter 7:

Data Unit / Parameter:	$EG_{Export,y}$
Data unit:	MWh
Description:	Gross electricity exported by the project plant in year y
Source of data:	The readings taken from the energy meter present in the Tariff metering room and a JMR is signed by PP's representative with electricity buyer's representative. This monthly JMRs will be used a primary source of monitoring for this parameter.
Description of measurement methods and procedures to be applied:	The data represents the electricity measured by the electricity meters (main and check on line 1 and line 2). The meters are 3 phase 4 wire meters of standard make and of an accuracy of 0.2s class. The readings are taken by the shift engineers and are cross checked with check meter readings. The daily readings are stored in the power plant log book.Number of meters – 04 (2 main, 2 check on line 1 and 2 respectively) Accuracy class: 0.2s Calibration: In every 6 months for main meters (check meters are in APTrsnsco's possession and thus can not be calibrated/ controlled by PP).Recording frequency and responsible entities: continuous monitoring with monthly recording (JMR with PP and APTransco representative) Cross check mechanism: There is a main and a check meter on each of the two export lines.
Frequency of monitoring/recording:	Monitoring Frequency: Continuously Recording Frequency: Monthly (JMR with PP and APTransco)
Value monitored:	3364062.523[4]
Monitoring equipment:	The Main electricity meters installed at site are used for the measurement of net electricity generated from the project activity and delivered to the grid. PP has also installed check meter for both Line 1 and Line 2 at their end.) Calibration reports for all the meters are available
QA/QC procedures to be applied:	-- The calibration of the equipment are done by approved agencies and the instruments are calibrated in every 6 months Crosscheck of values will be done by invoices raised from GVK to APTRANSCO.
Calculation method:	Not applicable
Any comment:	--

Parameter 8:

[4] Lower values considered in between Main energy meter and Check energy meter after applying the correction factor which is a conservative approach to calculate Emission reduction for the entire monitoring period. Main Meter Export Reading for the monitoring period as per JMR without applying the correction factor is 3371964.830 MWh

Data Unit / Parameter:	**$EG_{import,y}$**
Data unit:	MWh
Description:	Total electricity import from the grid by the project activity in year y
Source of data:	The readings taken from the meter present in the Tariff metering room and a JMR is signed by PP's representative with electricity buyer's representative. This monthly JMRs will be used a primary source of monitoring for this parameter. These meters are trivector meters and same meters record and show values of export as well as import.
Description of measurement methods and procedures to be applied:	The data represents the electricity measured by the electricity meters (main and check on line 1 and line 2). The meters are 3 phase 4 wire meters of standard make. The readings are taken by the shift engineers and are cross checked with check meter readings. The daily readings are stored in the power plant log book.Number of meters – 04 (2 main, 2 check on line 1 and 2 respectively) Accuracy class: 0.2sCalibration: In every 6 months for main meters (check meters are in APTrsnsco's possession and thus cannot be calibrated/ controlled by PP).Recording frequency and responsible entities: continuous monitoring with monthly recording (JMR with PP and APTransco representative) Cross check mechanism: There is a main and a check meter on each of the two transmission lines
Frequency of monitoring/recording:	Monitoring Frequency: Continuously Recording Frequency: Monthly (JMR with PP and APTransco)
Value monitored:	851.640[5]
Monitoring equipment:	
QA/QC procedures to be applied:	--The calibration of the equipments will be done by approved agencies and the instruments would be recalibrated after every 6 months. Since both transmission lines have one main and one check meter (and readings of both these meters for each of the line are recorded in the JMR), Crosscheck of values will be done by invoices raised from GVK to APTRANSCO.
Calculation method:	Not applicable.
Any comment:	--

Parameter 9:

[5] Higher value considered in between Main energy meter and Check energy meter after applying the correction factor which is a conservative approach to calculate Emission reduction for the entire monitoring period. Main Meter Import Reading for the monitoring period as per JMR without applying the correction factor is 767.672 MWh

Data Unit / Parameter:	$EG_{PJ,y}$
Data unit:	Mega Watt hour (MWh)
Description:	Net Electricity exported by the project plant
Source of data:	Joint meter reading.
Description of measurement methods and procedures to be applied:	The data represents the electricity measured by the Energy Meter. The meter is a 3 phase 4 wire meter of standard make and of an accuracy of 0.2S class. The daily readings are stored in the power plant log book. The readings are taken by the shift engineers and are cross checked by the Electrical Engineer and are recorded in the log book.
Frequency of monitoring/recording:	Calculated[6]
Value monitored:	Year 2009 (From 14th April to 31st December) — 1337058.472 MWh Year 2010 (From 1st January to 31st December) — 1663904.769 MWh Year 2011 (From 1st January to 13th April) — 362247.640 MWh Total — 3363210.882 MWh
Monitoring equipment:	The Main electricity meters installed at site are used for the measurement of net electricity generated from the project activity and delivered to the grid.) • Calibration reports for all the meters is made available to DOE.
QA/QC procedures to be applied:	The calibration of the equipment was done by approved agencies and the instruments would be recalibrated after every 6 months. Crosscheck of values is done by invoices raised from GVK to APTRANSCO.
Calculation method:	Not Applicable
Any comment:	--

Parameter 10:

Data Unit / Parameter:	$EF_{BL,upstream,CH4}$
Data unit:	tCO_2/MU
Description:	Emission factor for upstream fugitive methane emissions occurring in the absence of the project activity.
Source of data:	Calculated under project activity

[6] Calculated from above Export and Import readings.

Description of measurement methods and procedures to be applied:	Calculated
Frequency of monitoring/recording:	Annually
Value monitored:	19.7
Monitoring equipment:	Not Applicable
QA/QC procedures to be applied:	The uncertainty level of this data is low. This is collected from official data sources. No additional QA/QC procedures are required.
Calculation method:	Calculated as; $\frac{\sum_j FF_{j,k} * EF_{k,upstream,CH4}}{\sum_J EG_j}$ Where: $\Sigma FF_{j,k}$: Quantity of fuel type combusted in power plant included in j build margin $EF_{k,upstream,CH4}$: Taken from Table 2 of AM 0029, version 03 ΣEG_j : Electricity generation in the plant included in the build j margin $EF_{BL,upstream,CH4}$ is calculated for power plants included in the Build Margin, in line with the baseline emission factor selection. This data is computed consistent with the Build Margin emission factor based on latest available information from (a) Central Electricity Authority, Ministry of Power, Government of India, Version 8, Jan 2013[7]. (b) AM 0029, version 03
Any comment:	--

Parameter 11:

Data Unit / Parameter:	PEy
Data unit:	tCO_2
Description:	Project emission under project activity.
Source of data:	Calculated under Project activity
Description of measurement methods and procedures to be	Calculated

[7] http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

applied:	
Frequency of monitoring/recording:	Annually
Value monitored:	1369282
Monitoring equipment:	Not Applicable
QA/QC procedures to be applied:	Not applicable
Calculation method:	Calculated as; $PE_y = \sum_f FC_{f,y} * COEF_{f,y}$ $FC_{f,y}$is as per parameter 1 under section 3.2 "Data and Parameters monitored". $COEF_{f,y}$is as per parameter 6 under section 3.2 "Data and Parameters monitored
Any comment:	--

3.3 Description of the Monitoring Plan

DATA COLLECTION:

The project was operated and managed by the project proponent. The individual plants record data related to their respective project activity. The natural gas based power project abides by all regulatory and statutory requirements as prescribed under the state and central laws and regulations.

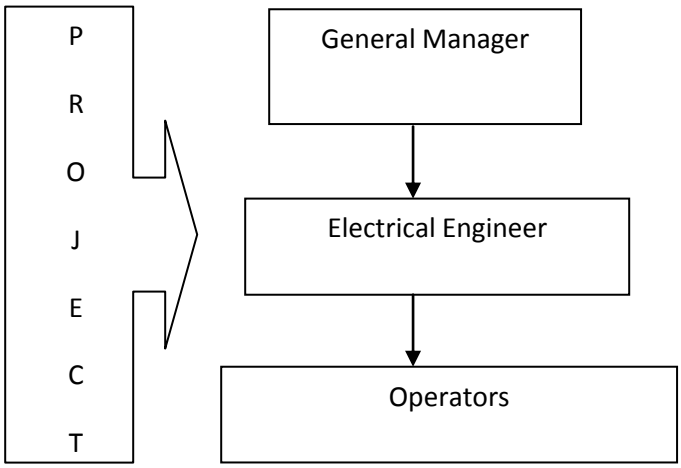
The project team has been entrusted with the responsibility of storing, recording the data related to the project activity. The project team is also responsible for calculation of actual creditable emission reduction in the most transparent and relevant manner. Installed meters are calibrated according to the maintenance schedule programmed at the start of the operation and recalibrated according the plants performance requirement.

All the monitoring data is stored, recorded and kept under safe custody of the Project Executor and Head (Power Plant and Utilities) at the plant site for a period of crediting period + 2 years. The data is achieved in both hard copies and electronic format (excel sheets). Also, any change within the project boundary, such as change in spare and or equipment is recorded and any change in the emission reduction due to such alteration is studied and recorded.

ROLES AND RESPONSIBILITY:

Designation	Responsibilities
General Manager	• Registration • Project Execution
Electrical Engineer	• Operation • Verification of data Inspection of data whenever necessary to independently check the authenticity of data and take corrective actions wherever required. • Storage/ Achieving of data Internal audit of monitored data and GHG reduction calculation
Operators	• Operation, Monitoring and Verification of Data • Data Recording • Storage of data
Operation and Maintenance Contractor	• Operation and Maintenance • Storage of data • Data Recording • Data Collection

ORGANIZATIONAL STRUCTURE:



QA & QC PROCEDURES:

The main meters were calibrated once in a six months by a Government Approved third party laboratory.

1) The electricity meters were calibrated against Traceable National Standards at ETDC (Electronic Test and Development Centre).
2) GAIL Gas flow meters are calibrated as per the standards of AGA-9/10.

Calibration summary of measuring instruments during the monitoring period

Sl. No	Meter	Calibration Frequency	Source
1	Gas Flow Main Meter A 80695	Yearly	Table- Parameter 1 in Section 3.2
2	Gas Flow Main Meter B 80671	Yearly	Table- Parameter 1 in Section 3.2
3	Gas Flow Check Meter	Yearly	Table- Parameter 1 in Section 3.2
4	Gas Chromatogram Main Meter 9007310/210830-3	Yearly	Table- Parameter 2 in Section 3.2
5	Gas Chromatogram Check Meter	Yearly	Table- Parameter 2 in Section 3.2
6	Energy Main Meter Line 1	Once in 6 months	Table- Parameter 9 in Section 3.2
7	Energy Main Meter Line 2	Once in 6 months	Table- Parameter 9 in Section 3.2
8	Energy Check Meter Line 1	Once in 6 months	Table- Parameter 9 in Section 3.2
9	Energy Check Meter Line 2	Once in 6 months	Table- Parameter 9 in Section 3.2

EMERGENCY PROCEDURE:

There were no emergency situations during this monitoring period.

An emergency plan was prepared to account for monitoring equipments failure and accidental release of GHGs in the project activity plant.

1) Both electricity meters (main and check) failure: As per PPA dt. June 2003, Article 4: Metering, clause 4.4 and 4.5, following provision are followed for the monitoring plan.
    (A) Errors in main meters – If main meter check indicates error beyond prescribed limit, but no such error is noticed in the check meter, billing for the month would have been done on the basis of check meter. Also, the main meter would be calibrated or replaced immediately.

(B) Errors in main meter and check meters: If both the main and check meter showed error during quarterly check, both meters would be sent for calibration and replaced immediately with new meters for further monitoring. The error found in the main meter calibration will be applied to the electricity measurement values for the period from last check.

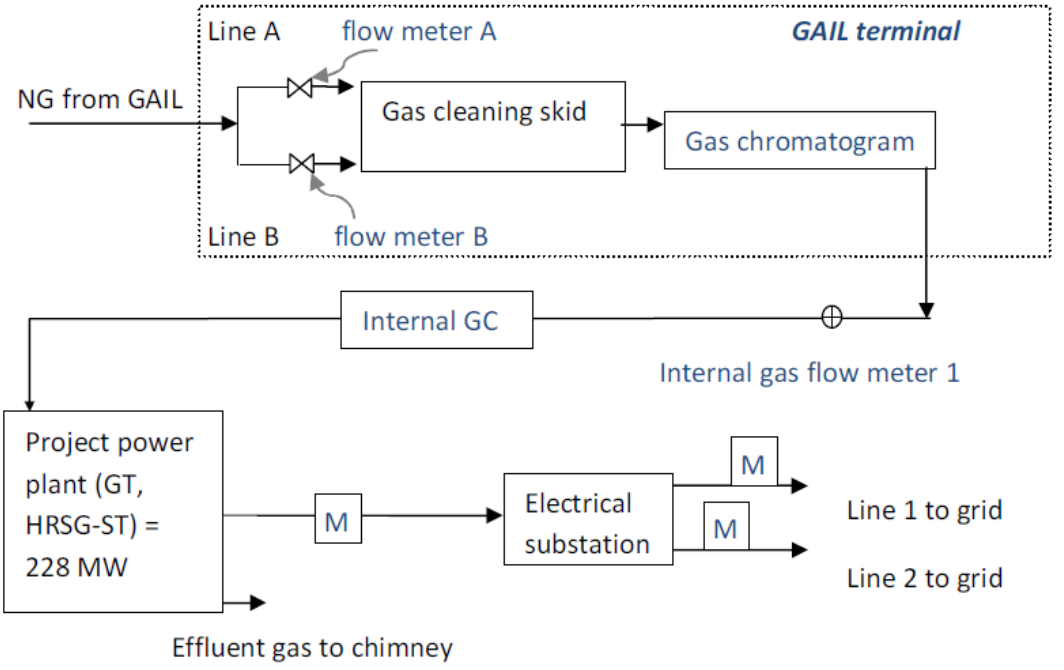
2) Failure of gas flow meter: In case gas flow meter of the supplier (GAIL) which is main meter is found to have error more than ±2% error margin or if the meter is out of service, the gas quantity will be computed using (a) using check meter of the PP if installed and accurately registering (b) main meter error factor to readings from last calibration was applied (c) estimated the volume of gas delivered by comparison with deliveries during the period under similar conditions when seller's meter was registering accurately (In same order of preference among a,b and c. Refer clause 8.04 of the gas supply agreement with GAIL).

3) Gas leakage detection: Emergency gas alarm system was installed at GAIL supply terminal near the project plant to detect gas in case of leakage.

4) Complete power failure scenario: In case of complete power failure, the GAIL terminal would get indication on the gas flow control panel and the gas flow valve would have been shut when the power plant would shut down. Thus, the accidental release of gas was avoided in any case.

INTERNAL AUDIT AND PERFORMANCE REVIEWS:

Monitoring diagram for GVK Industries Ltd. VCS project



M: electricity meter

Both line meters are substation are trivector meters (to monitor both import & export)

Figure: Single line diagram showing position of all monitoring points

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

Baseline emissions are calculated by multiplying the Net electricity supplied by the project activity to the grid ($EG_{PJ,y}$) with a baseline CO_2 emission factor ($EF_{BL,CO2,y}$)follows:

$$BE_y = EG_{PJ,y} \cdot EF_{BL,CO2,y}$$

Parameter	**Description**	**Year 2009 – 1st half** (14th April 2009 to 30th June)	**Year 2009- 2nd half** (1st July 2009 to 31st Dec, 2009)	**Year 2010- 1st half** (1st Jan, 2010 to 30th June 2010)	**Year 2010- 2nd half** (1st July 2010 to 31st Dec 2010)	**Year 2011-1st half** (1st Jan 2011 to 13th April 2011
$EG_{PJ,y}$	Electricity exported by the project plant	440779.621 MWh	896278.851 MWh	846535.440 MWh	817369.328 MWh	362247.640 MWh
$EF_{BM,y}$	The Build Margin emission factor of Southern grid	852.19 tCO_2/GWh	852.19 tCO_2/GWh	852.19 tCO_2/GWh	852.19 tCO_2/GWh	852.19 tCO_2/GWh
BE_y	Emissions in the Baseline Scenario	375628 tCO_2e	763800 tCO_2e	721409 tCO_2e	696554 tCO_2e	308704 tCO_2e

4.2 Project Emissions

The CO_2 emissions from electricity generation (PE_y) are calculated as follows:

$$PE_y = \sum_f FC_{f,y} * COEF_{f,y}$$

$FC_{f,y}$: is the total volume of natural gas combusted in the project plant

$COEF_{f,y}$: is the CO_2 emission coefficient (tCO_2/m^3 or similar) for fuel.

Parameter	**Description**	**Year 2009 – 1st half** (14th April 2009 to 30th June)	**Year 2009- 2nd half** (1st July 2009 to 31st Dec, 2009)	**Year 2010- 1st half** (1st Jan, 2010 to 30th June 2010)	**Year 2010- 2nd half** (1st July 2010 to 31st Dec 2010)	**Year 2011- 1st half** (1st Jan 2011 to 13th April 2011

$FC_{f,y}$	Quantity of NG consumed in the project activity	82310702.06SCM	187164690.08SCM	180026804.66SCM	170819678.84SCM	84639609.60SCM
$NCV_{f,y}$	Net Calorific Value of Natural Gas	0.0342GJ/SCM	0.0342GJ/SCM	0.0344GJ/SCM	0.0347GJ/SCM	0.0361GJ/SCM
$EF_{CO2,f,y}$	Emission Factor of Natural Gas	56100 $kgCO_{2e}$/TJ	56100 $kgCO_{2e}$/TJ	56100 $kgCO_{2e}$/TJ	56100 $kgCO_{2e}$/TJ	56100 $kgCO_{2e}$/TJ
$OXID_f$	Oxidation factor of natural gas	1	1	1	1	1
$COEF_{f,y}$	CO_2 Emission Co-efficient of natural gas	0.00191964 tCO_2/SCM	0.00192068 tCO_2/SCM	0.00192913 tCO_2/SCM	0.00194921 tCO_2/SCM	0.00202633 tCO_2/SCM
PE_y	Emissions in the Project Scenario	158030 tCO_2e	359485 tCO_2e	347296 tCO_2e	332964 tCO_2e	171508 tCO_2e

4.3 Leakage

Calculated as per equation number-4 of AM0029- version 3.0 as contained in part C of section 4 of the registered PD

$LE_y = LE_{CH4,y} + LE_{LNG,CO2,y}$

To calculate $LE_{CH4.y}$ = [FCy* NCV* $EF_{NG, upstream,CH4} - EG_{PJ,y} * EF_{BL,upstream,CH4}] * GWP_{CH4}$

Below are the parameters to calculate $LE_{CH4.y}$

Parameter	Description	Year 2009 – 1st half (14th April 2009 to 30th June)	Year 2009-2nd half (1st July 2009 to 31st Dec, 2009)	Year 2010-1st half (1st Jan, 2010 to 30th June 2010)	Year 2010-2nd half (1st July 2010 to 31st Dec 2010)	Year 2011-1st half (1st Jan 2011 to 13th April 2011
$FC_{f,y}$	Quantity of NG consumed in the project activity	82310702.06 SCM	187164690.0819 SCM	180026804.66 SCM	170819678.84 SCM	84639609.60 SCM

$NCV_{f,y}$	Net Calorific Value of Natural Gas	0.0342 GJ/SCM	0.0342 GJ/SCM	0.0344 GJ/SCM	0.0347 GJ/SCM	0.0361 GJ/SCM
$EF_{NG, upstream,CH4}$	Emission factor for upstream fugitive methane emissions of natural gas from production, transportation, distribution, and, in the case of LNG, liquefaction, transportation, regasification and compression into a transmission or distribution system, in tCH4 per GJ fuel supplied to final consumers	296 tCH_4/PJ	296 tCH_4/PJ	296 tCH_4/PJ	296 tCH_4/PJ	296 tCH_4/PJ
$EG_{PJ,y}$	Electricity exported by the project plant	440779.621 MWh	896278.851 MWh	846535.440 MWh	817369.328 MWh	362247.640 MWh
$EF_{BL,upstream,CH4}$	CO_2 Emission Co-efficient of natural gas	19.7 tCO_2/MU	19.7 tCO_2/MU	19.7 tCO_2/MU	19.7 tCO_2/MU	19.7 tCO_2/MU
GWP_{CH4}	Global warming potential of methane valid for the relevant commitment Period	21	21	21	21	21
$LE_{CH4,y}$	Leakage emissions due to fugitive upstream CH_4 emissions	8812.88 tCO_2e	22146.80 tCO_2e	21777.77 tCO_2e	20765.23 tCO_2e	11855.77 tCO_2e

LE $_{LNG,CO2,y}$

Parameter	Description	Year 2009 – 1st half (14th April 2009 to 30th June)	Year 2009-2nd half (1st July 2009 to 31st Dec, 2009)	Year 2010-1st half (1st Jan, 2010 to 30th June 2010)	Year 2010-2nd half (1st July 2010 to 31st Dec 2010)	Year 2011-1st half (1st Jan 2011 to 13th April 2011
$FC_{LNG,y}$	Quantity of LNG purchased by the project activity	365.74 TJ	0 TJ	0 TJ	0 TJ	233.04 TJ
$EF_{CO2, upstream,LNG}$	Emission factor for upstream CO_2 emissions due to fossil fuel combustion /electricity consumption associated with the liquefaction, transportation, regasification and compression of LNG into a natural gas transmission or distribution system	6 tCO_2/TJ	6 tCO_2/TJ	6 tCO_2/TJ	6 tCO_2/TJ	6 tCO_2/TJ
$LE_{LNG,CO2,y}$	Leakage emissions due to fossil fuel combustion /electricity consumption associated with the liquefaction, transportation, re-gasification and compression of LNG into a natural gas transmission or distribution system ($LE_{LNG,CO2,y}$)	2,194 tCO_2e	0.00 tCO_2e	0.00 tCO_2e	0.00 tCO_2e	1,398 tCO_2e

Calculation of total Leakages (LE_y)

Parameter	Description	Year 2009 – 1st half (14th April 2009 to 30th June) in tCO_2e	Year 2009-2nd half (1st July 2009 to 31st Dec, 2009) in tCO_2e	Year 2010-1st half (1st Jan, 2010 to 30th June 2010) in tCO_2e	Year 2010-2nd half (1st July 2010 to 31st Dec 2010) in tCO_2e	Year 2011-1st half (1st Jan 2011 to 13th April 2011) in tCO_2e
$LE_{CH4,y}$	Leakage emissions fugitive upstream CH_4 emissions	8812.88	22146.80	21777.77	20765.23	11855.77
$LE_{LNG,CO2,y}$	Leakage emissions due to fossil fuel combustion /electricity consumption associated with the liquefaction, transportation, re-gasification and compression of LNG into a natural gas transmission or distribution system ($LE_{LNG,CO2,y}$)	2194	0.00	0.00	0.00	1398
LE_y	Total Leakages	11007	22147	21778	20765	13254

4.4 Summary of GHG Emission Reductions and Removals

Emissions Reduction (ER y)

According to the approved Methodology AM0029 Version 3:

$$ERy = BEy - PEy - LEy$$

Where:

ERy : emissions reductions in year y (t CO_2e)

BEy : emissions in the baseline scenario in year y (t CO_2e)

PEy : emissions in the project scenario in year y (t CO_2e)

LEy : leakage in year y (t CO_2e)

Parameter	Description	Year 2009	Year 2010	Year 2011	Total Value for entire Monitoring Period (2009-2011)
BE_y	Emissions in the Baseline Scenario	1139428 tCO_2e	1417963 tCO_2e	308704 tCO_2e	2866095 tCO_2e
PE_y	Emissions in the Project Scenario	517515 tCO_2e	680260 tCO_2e	171508 tCO_2e	1369282.2 tCO_2e
LE_y	Leakages	33154 tCO_2e	42543 tCO_2e	13245 tCO_2e	88951 tCO_2e
ER_y	Emission Reductions	588758 tCO_2e	695160 tCO_2e	123942 tCO_2e	1407860 tCO_2e

5 ADDITIONAL INFORMATION

Comparison of actual PLF with PLF calculated ex-ante in validated PD

PLF	Year 2009-2010 (14th April 2009- 31st Dec 2009)	Year 2010-2011 (1st Jan 2010 – 31st Dec 2010)	Year 2011 (1st Jan 2011 – 13th April 2011)
Actual	93.62%	83.31%	64.90%

As per validated PD annual plant load factor considered in 85%. In above mentioned data PP has mentioned the actual PLF achieved till date. From 1st Jan 2010 to 31st Dec 2010 is the complete year and hence can be considered as a appropriate for comparing it with Plant load factor mentioned in the validated PD. As per values it can be seen that the actual PLF (for year 2010) achieved is less than the validated PLF mentioned in the PD. The lesser PLF may e because of the less supply of natural gas.

Annexure 1

Parameter	Type of meter	Serial number	Accuracy class	Calibration frequency	Dates of calibration	Validity from last calibration
1a) FC_{NGY}	Gas supplier's fuel flow meter	Loop A 080695 Loop B 080671	Flow +/- 0.23% PT +/- 0.075% TT +/- 0.2%	Annual	15.05.2009[8] 11.05.2010 09.05.2011	09.05.2012
1b)	PP's flow check meter	Pressure Valve: 27D616149423 Temperature Valve:CZD705229	0.25% of span 0.1% of span	Annual	05.07.2009 05.07.2010 11.04.2011	11.04.2012
2a)NCV_{NGY}	Online gas chromatogram of supplier – Main Meter (GAIL)	1. 9007310[9] 2. 9007310/210830-3 3. 9007310/210830-3	17 kcal/SCM	Annual	i.10.08.2009[10] ii.10.08.2010 iii.22.02.2011	22.02.2011
	Check Meter	719668	--	Annual	1. 09.07.2009 2. 08.10.2009 3. 07.01.2010 4. 07.04.2010 5. 07.07.2010 6. 07.10.2010 7. 05.01.2011	05.01.2012
3a) EG_{PJY}	Electricity meters	Main Line 1: 1. Meter no :08081471	0.2S	Once in 6 months	1. Meter no :08081471	

[8] Calibration error was applied from 13.04.2009 to 14.05.2009.

[9] The representation of serial number which is mentioned on the calibration report dated 10/08/2009 is different from the rest of the two calibration report and accordingly is mentioned in the MR. Also the same meter was functional for the entire monitoring period and there was no replacement of meter.

[10] Calibration error was applied from 14.04.2009 to 09.08.2009 and 23.02.2011 to 13.04.2011.

		(installed on 09.10.2010) 2 . Meter no :07615226 (installed on 18.12.2010[11])			(calibrated on 15.07.2010[12]) 2. Meter no :07615226 (calibrated on 26.05.2011)	26.11.2011
		Main Line 2: 1.Meter no 07615226 (installed on 05.08.2008) 2.Meter no. 08081471 (installed on 15.07.2010[13])	0.2S	Once in 6 months	1. Meter no. 07615226 (calibrated on 05.08.2008 17.04.2009[14] 15.07.2010) 2. Meter no 08081471 (calibrated on 26.05.2011)	26.11.2011
3b)	Check meter	Line 1: 07659747	0.2S	Once in 6 months	30.09.2010	
		Line 2: 07659748	0.2S	Once in 6 months	30.09.2010	
4)FCf_{LNG}	Gas supplier's fuel flow meter	Loop A 080695 Loop B 080671	PT +/- 0.075% TT +/- 0.2%	Annual	15.05.2009 11.05.2010 09.05.2011	08.08.2012
5) NCV_{LNG}	Online gas chromatogram	i. 9007310[15]	17 kcal/SCM	Annual	i.10.08.2009	22.02.2011

[11] There is only one main meter for Electricity record.Earlier installed Meter no. 08081471 was replaced by meter no. 07615226 on 18/12/2010.

[12] Main meter Line 1was commissioned on 09/10/2010. During this period Main meter line 2 was in operation and calibration error is applied for the same in ER sheet.

[13] There is only one main meter for Electricity record. Earlier installed Meter no 07615226 was replaced by Meter no. 08081471 on 15.07.2010

[14] Calibration error was applied from 14-04-2009 to 10-06-2009 and 10-10-2009 to 14-04-2011.

[15] The representation of serial number which is mentioned on the calibration report dated 10/08/2009 is different from the rest of the two calibration report and accordingly is mentioned in the MR. Also the same meter was functional for the entire monitoring period and there was no replacement of meter.

	of supplier (GAIL)	ii.9007310/210830-3 iii.9007310/210830-3			ii.10.08.2010 iii.22.02.2011	
5)$OXID_{NG}$	This is not a metered value. It is taken from 'IPCC Guidelines for National Greenhouse Gas Inventories					
6)$COEF_{NGY}$	This is not a metered value. It is calculated as $COEF_{f,y} = NCV_{f,y} * EF_{CO2,f,y} * OXID_f$					