

NATURAL GAS BASED GRID CONNECTED POWER PROJECT AT PEDDAPURAM, A.P. BY GAUTAMI POWER LIMITED

Document Prepared By GVK Gautami Power Limited

Project Title	Natural Gas based grid connected power project at Peddapuram, A.P. by Gautami Power Limited
Version	02
Date of Issue	29/03/2013
Project ID	VCSR465
Monitoring Period	05-06-2009 to 08-09-2011
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1 PROJECT DETAILS

1.1 Summary Description of Project

The proposed project activity is commissioning and operation of a new, green field 469 MW Natural Gas fired, gas turbine based combined cycle power plant. The proposed project activity is installed by GVK Gautami Power Ltd. (GGPL) at Industrial Development Area, Peddapuram, near Samalkot in East Godavari district, Andhra Pradesh, India. The project activity uses relatively cleaner fuel, natural gas instead of most common fuel in the grid i.e. coal for power generation. Thus, the project activity will avoid significant emission compared to the usual practice in coal dominated Indian power sector.

1.2 Sectoral Scope and Project Type

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

Type: This project activity plant is a grid connected, natural gas based combined cycle power plant and is lower carbon intensive compared to the south grid of India.

1.3 Project Proponent

GVK Gautami Power Limited (GGPL), Andhra Pradesh

This is the project proponent. They are responsible for completing the monitoring report form (VCS-MR).

Organization:	GVK Gautami Power Limited
Street/P.O.Box:	156-159, Sardar Patel Road
Building:	Paigah House
City:	Secunderabad
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Represented by:	
Title:	GM (Finance)
Salutation:	Mr.
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First Name:	Bhavani
Department:	Finance
Mobile:	-
Direct FAX:	040-27902665
Direct tel:	040-66262103
Personal E-mail	-

1.4 Other Entities Involved in the Project

No other parties are involved in this project

1.5 Project Start Date

Starting date: 05/06/2009

1.6 Project Crediting Period

10 years

05/06/2009 to 04/06/2019

PP has option of renewable of the crediting period once considering project life of 15 years, as per the registered VCS-PD.

1.7 Project Location

The 469 MW combined cycle power plant is located at Industrial Development Area, Samalkot, near the port town Kakinada, Andhra Pradesh. The site is 15 km from the sea port at Kakinada and 3 km from the Samalkot railway station. The geographical coordinates of the Samalkot are 17°03'03" N and 82°07'04" E.



1.8 Title and Reference of Methodology

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

Category : AM0029

("Baseline Methodology for Grid Connected electricity Generation Plants using Natural Gas")

Version No : 03, EB 39

Reference: <http://cdm.unfccc.int/methodologies/PAmethodologies/approved>

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

1. The starting date of operation of the project activity – 05/06/2009
2. The emission reduction is not claimed on all these days

Sr. No.	Plant shut down period
1	29/09/2009
2	28/02/2010 to 02/03/2010
3	24/07/2011 to 26/07/2011

Further, whenever electricity was imported from the grid during plant maintenance and shut down period, this is subtracted from the total electricity supplied to the grid.

3. There have not been any events and situations during this monitoring period which may impact the applicability of the methodology.

2.2 Deviations from the Monitoring Plan

Not applicable

Any deviation was not applied to this monitoring period.

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

Data Unit / Parameter:	EF _{NG,upstream,CH4}
Data unit:	tCH ₄ /PJ
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 tCH ₄ per GJ fuel supplied to final consumers
Source of data:	Table- 2 of AM 0029 Version 03
Value applied:	296
Purpose of the data:	Leakage emission calculations
Any comment:	--

Data Unit / Parameter:	OXID _{NG}
Data unit:	Unit less factor
Description:	Oxidation Factor of NG
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:	As IPCC emission factors are updated, conservative value will be chosen.

Data Unit / Parameter:	EF _{CO₂,f,y}
Data unit:	tCO ₂ /GJ
Description:	Emission factor for fuel “f” 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:	As IPCC emission factors are updated, conservative value will be chosen

3.2 Data and Parameters Monitored

Parameter 1

Data Unit / Parameter:	EG _{PJ,y}								
Data unit:	kWh								
Description:	Electricity exported by the project plant								
Source of data:	The readings were taken from the export meter present in the tariff metering room present in the switch yard. The readings were stored in power plant log book.								
Description of measurement methods and procedures to be applied:	The readings were taken manually every day at 00 hrs. The readings were stored in the power plant electricity generation log book. The readings were taken by the shift engineers and were cross checked by the site main controller and were recorded in the log book.								
Frequency of monitoring/recording:	Daily								
Value monitored:	<table border="1"> <tr> <td>Year 2009 (From 5th June to 31st December)</td><td>1,983,624,781 kWh</td></tr> <tr> <td>Year 2010 (From 1st January to 31st December)</td><td>3,501,820,511 kWh</td></tr> <tr> <td>Year 2011 (From 1st January to 8th September)</td><td>2,196,890,300 kWh</td></tr> <tr> <td>Total</td><td>7,682,335,592 kWh</td></tr> </table>	Year 2009 (From 5 th June to 31 st December)	1,983,624,781 kWh	Year 2010 (From 1 st January to 31 st December)	3,501,820,511 kWh	Year 2011 (From 1 st January to 8 th September)	2,196,890,300 kWh	Total	7,682,335,592 kWh
Year 2009 (From 5 th June to 31 st December)	1,983,624,781 kWh								
Year 2010 (From 1 st January to 31 st December)	3,501,820,511 kWh								
Year 2011 (From 1 st January to 8 th September)	2,196,890,300 kWh								
Total	7,682,335,592 kWh								
Monitoring equipment:	The data represents the electricity measured by the Cumulative Energy Meter. The meter is a 3 phase 4 wire meter and of an								

	accuracy of 0.2 class. This represents the summation of the readings measured by the energy meter line-1 and energy meter line-2. This energy meter is present in the Switch Yard, Tariff metering room.			
	Meter	Calibration date	Line 1 electricity meter	Line 2 electricity meter
	Frequency		Annual	Annual
	1 st calibration	17/04/2009	7615227	7615234
	2 nd calibration	6/11/2009	9451715	9451716
	3 rd Calibration	24/06/2010	7615227	7615234
	4 th Calibration	12/11/2010	11961773	9451716
	5 th Calibration	8/4/2011	9451715	7615227
QA/QC procedures to be applied:	The data measured by the cumulative meter was cross checked with the summation of the electricity measured by the energy meter line-1 and energy meter line-2. The calibration of the instruments was done as per standard procedures. The readings are taken by the shift engineers and are cross checked by the site main controller and are recorded in the log book.			
Calculation method:	Not applicable			
Any comment:	Please note that as per PPA, calibration frequency of six monthly is followed during this monitoring period. The calibration dates may not be seen within six months from the last calibration of individual meters, but it is replaced within six months by pre-calibrated rolling meter and serial number of respective number will be applicable from that date as meter in use.			

Parameter 2

Data Unit / Parameter:	Q _{NG}
Data unit:	SCM
Description:	Quantity of NG consumed in the project activity
Source of data:	The readings are recorded manually at 00 hrs and are stored in the power plant log book.
Description of measurement methods and procedures to be applied:	The quantity of Natural Gas was measured by the gas flow meter which is installed by GAIL at their terminal. The readings were recorded manually at 00 hrs

Frequency of monitoring/recording:	Daily		
Value monitored:			
	Year 2009 (From 5 th June to 31 st December)		399,006,903 SCM
	Year 2010 (From 1 st January to 31 st December)		689,481,086 SCM
	Year 2011 (From 1 st January to 8 th September)		431,053,382 SCM
	Total		1,519,541,371 SCM
Monitoring equipment:	The quantity of Natural Gas was measured by the gas flow meter which is installed by GAIL at their terminal		
	Meter	Gas flow meter at GAIL- Line A FB-S600/17418241	Gas flow meter at GAIL- Line B FB-S600/17418252
	Frequency	Annual	Annual
	1 st calibration	28/04/2009	28/04/2009
	2 nd calibration	25/01/2010	25/01/2010
	3 rd Calibration	26/10/2010	26/10/2010
	4 th Calibration	27/04/2011	27/04/2011
QA/QC procedures to be applied:	The quantity of natural gas was cross checked with the invoices that were obtained from the GAIL. There was no gas flow meter installed by project proponent for internal purposes as this is not required as per fuel supply agreement and PPA. The meter installed by GAIL was calibrated according to the standard procedures		
Calculation method:	Not applicable		
Any comment:	--		

Parameter 3

Data Unit / Parameter:	NCV_{NG}
Data unit:	kcal/SCM
Description:	Net Calorific Value of Natural Gas
Source of data:	Invoice from the supplier
Description of measurement	The Supplier provided the value of the NCV in the invoice that

methods and procedures to be applied:	was given to the project proponent..																							
Frequency of monitoring/recording:	Daily																							
Value monitored:	<table><tr><td>Year 2009 (From 5th June to 31st December)</td><td colspan="2">8378.64 kcal/SCM</td></tr><tr><td>Year 2010 (From 1st January to 31st December)</td><td colspan="2">8520.28 kcal/SCM</td></tr><tr><td>Year 2011 (From 1st January to 8th)</td><td colspan="2">8725.16 kcal/SCM</td></tr><tr><td>Total</td><td colspan="2">8541.36 kcal/SCM</td></tr></table>			Year 2009 (From 5 th June to 31 st December)	8378.64 kcal/SCM		Year 2010 (From 1 st January to 31 st December)	8520.28 kcal/SCM		Year 2011 (From 1 st January to 8 th)	8725.16 kcal/SCM		Total	8541.36 kcal/SCM										
Year 2009 (From 5 th June to 31 st December)	8378.64 kcal/SCM																							
Year 2010 (From 1 st January to 31 st December)	8520.28 kcal/SCM																							
Year 2011 (From 1 st January to 8 th)	8725.16 kcal/SCM																							
Total	8541.36 kcal/SCM																							
Monitoring equipment:	<table><tr><td>Meter</td><td>Gas Chromatogram at GAIL-</td><td>Gas Chromatogram at GGPL-</td></tr><tr><td></td><td>9007289</td><td>709668</td></tr><tr><td>Frequency</td><td>Annual</td><td>Annual</td></tr><tr><td>1st calibration</td><td>27/06/2009</td><td>-</td></tr><tr><td>2nd calibration</td><td>30/01/2010</td><td>-</td></tr><tr><td>3rd Calibration</td><td>28/08/2010</td><td>-</td></tr><tr><td>4th Calibration</td><td>19/05/2011</td><td>27/05/2011</td></tr></table>			Meter	Gas Chromatogram at GAIL-	Gas Chromatogram at GGPL-		9007289	709668	Frequency	Annual	Annual	1 st calibration	27/06/2009	-	2 nd calibration	30/01/2010	-	3 rd Calibration	28/08/2010	-	4 th Calibration	19/05/2011	27/05/2011
Meter	Gas Chromatogram at GAIL-	Gas Chromatogram at GGPL-																						
	9007289	709668																						
Frequency	Annual	Annual																						
1 st calibration	27/06/2009	-																						
2 nd calibration	30/01/2010	-																						
3 rd Calibration	28/08/2010	-																						
4 th Calibration	19/05/2011	27/05/2011																						
QA/QC procedures to be applied:	Gas chromatogram was not installed at GGPL terminal as it was not required as per fuel supply agreement. The invoices given to project proponent were used to monitor the NCV.																							
Calculation method:	Not applicable																							
Any comment:	--																							

Parameter 4

Data Unit / Parameter:	COEF _{t,y}
Data unit:	tCO ₂ / m ³
Description:	Calculation of CO ₂ Emission Co-efficient of natural gas
Source of data:	Calculated
Description of measurement methods and procedures to	Not Applicable

be applied:									
Frequency of monitoring/recording:	Not Applicable								
Value monitored:	<table> <tr> <td>Year 2009 (From 5th June to 31st December)</td><td>0.0020 tCO₂/SCM</td></tr> <tr> <td>Year 2010 (From 1st January to 31st December)</td><td>0.0020 tCO₂/SCM</td></tr> <tr> <td>Year 2011 (From 1st January to 8th September)</td><td>0.0020 tCO₂/SCM</td></tr> <tr> <td>Total</td><td>0.0020 tCO₂/SCM</td></tr> </table>	Year 2009 (From 5 th June to 31 st December)	0.0020 tCO ₂ /SCM	Year 2010 (From 1 st January to 31 st December)	0.0020 tCO ₂ /SCM	Year 2011 (From 1 st January to 8 th September)	0.0020 tCO ₂ /SCM	Total	0.0020 tCO ₂ /SCM
Year 2009 (From 5 th June to 31 st December)	0.0020 tCO ₂ /SCM								
Year 2010 (From 1 st January to 31 st December)	0.0020 tCO ₂ /SCM								
Year 2011 (From 1 st January to 8 th September)	0.0020 tCO ₂ /SCM								
Total	0.0020 tCO ₂ /SCM								
Monitoring equipment:	Not Applicable								
QA/QC procedures to be applied:	None as accepted under applicable methodology AM0029								
Calculation method:	$COEF_{f,y} = NCV_{f,y} * EF_{CO_2, f,y} * OXID_f$ Where, NCV_{f,y} is as per parameter 3 under section D.2 "Data and Parameters monitored". EF_{CO₂,f,y} is as per parameter 3 under section D.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 2 under section D.1 "Data and parameters determined at registration and not monitored during the monitoring period, including default values and factors"								
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 06; March 2011
Description of measurement methods and procedures to be applied:	Not Applicable
Frequency of monitoring/recording:	Annually
Value monitored:	For calculation purpose the value is converted from tCO ₂ /MWh to tCO ₂ /GWh. 763.4 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 is 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:	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
Description of measurement methods and procedures to be applied:	Not Applicable
Frequency of monitoring/recording:	Annually
Value monitored:	15.94
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; $\frac{\sum_j FF_{j,k} * EF_{k, upstream, CH4}}{\sum_j EG_j}$ Source: Where: $\sum FF_{j,k}$: 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 $\sum EG_j$: 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 will be 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 6, March 2011. (b) AM 0029, version 03
Any comment:	--

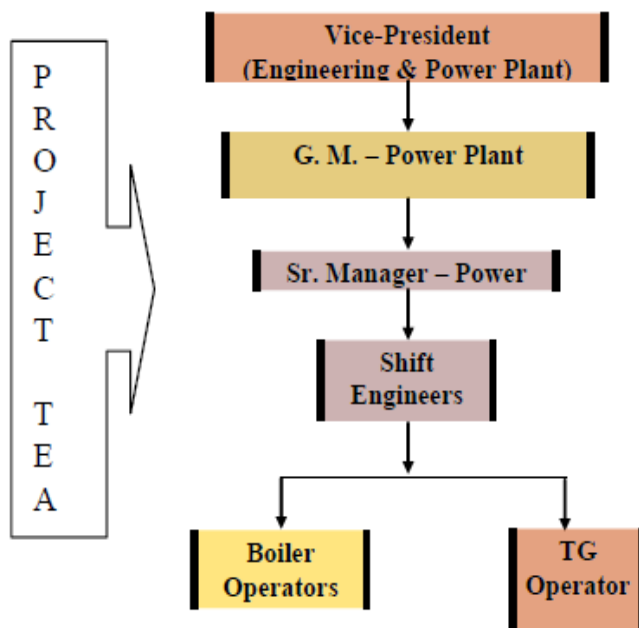
Parameter 7

Data Unit / Parameter:	Q _{LNG}																				
Data unit:	SCM																				
Description:	Quantity of LNG consumed in the project activity																				
Source of data:	The readings are recorded manually at 00 hrs and are stored in the power plant log book.																				
Description of measurement methods and procedures to be applied:	The quantity of LNG was measured by the gas flow meter which is installed by GAIL at their terminal. The readings were recorded manually at 00 hrs																				
Frequency of monitoring/recording:	Daily																				
Value monitored:	<table><tr><td>Year 2009 (From 5th June to 31st December)</td><td>0</td></tr><tr><td>Year 2010 (From 1st January to 31st December)</td><td>0</td></tr><tr><td>Year 2011 (From 1st January to 8th September)</td><td>963,543</td></tr><tr><td>Total</td><td>963,543</td></tr></table>			Year 2009 (From 5 th June to 31 st December)	0	Year 2010 (From 1 st January to 31 st December)	0	Year 2011 (From 1 st January to 8 th September)	963,543	Total	963,543										
Year 2009 (From 5 th June to 31 st December)	0																				
Year 2010 (From 1 st January to 31 st December)	0																				
Year 2011 (From 1 st January to 8 th September)	963,543																				
Total	963,543																				
Monitoring equipment:	The quantity of Natural Gas was measured by the gas flow meter which is installed by GAIL at their terminal <table><tr><td>Meter</td><td>Gas flow meter at GAIL- Line A FB-S600/17418241</td><td>Gas flow meter at GAIL- Line B FB-S600/17418252</td></tr><tr><td>Frequency</td><td>Annual</td><td>Annual</td></tr><tr><td>1st calibration</td><td>28/04/2009</td><td>28/04/2009</td></tr><tr><td>2nd calibration</td><td>25/01/2010</td><td>25/01/2010</td></tr><tr><td>3rd Calibration</td><td>26/10/2010</td><td>26/10/2010</td></tr><tr><td>4th Calibration</td><td>27/04/2011</td><td>27/04/2011</td></tr></table>			Meter	Gas flow meter at GAIL- Line A FB-S600/17418241	Gas flow meter at GAIL- Line B FB-S600/17418252	Frequency	Annual	Annual	1 st calibration	28/04/2009	28/04/2009	2 nd calibration	25/01/2010	25/01/2010	3 rd Calibration	26/10/2010	26/10/2010	4 th Calibration	27/04/2011	27/04/2011
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2 nd calibration	25/01/2010	25/01/2010																			
3 rd Calibration	26/10/2010	26/10/2010																			
4 th Calibration	27/04/2011	27/04/2011																			
QA/QC procedures to be applied:	The quantity of natural gas was cross checked with the invoices that were obtained from the GAIL. There was no gas flow meter installed by project proponent for internal purposes as this is not required as per fuel supply agreement and PPA. The meter installed by GAIL was calibrated according to the standard procedures																				

Calculation method:	Not applicable
Any comment:	--

3.3 Description of the Monitoring Plan

The project activity is operated and managed by the project proponent through GVK Gautami Power Limited. 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. A monitoring team has been established at the plant site. The project team is 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 to the plant's performance requirement. All the monitoring data is stored, recorded and will be kept under safe custody of the Project Executor and Head (Power Plant and Utilities) at the plant site for the full crediting period + 2 years. 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.



Designation	Responsibilities
Vice-President	Registration
(Engineering & Power Plant)	Project Execution
G. M. - Power Plant	Operation Verification of data Inspection of data whenever necessary to independently

	check the authenticity of data and take corrective actions wherever required. Storage of data
Sr. Manager – Power Plant	Operation, Monitoring and Verification of Data Data Recording Storage of data
Shift Engineers and Operators (Operation and Maintenance)	Operation and Maintenance Storage of data Data Recording Data Collection Archiving of data Observation, Monitoring

The net electricity export for this period will be monitored from the check meter/ DCS readings from the PP's monitoring system. The date of completion of the application of the methodology to the project activity study is 30/01/2010.

DATA BACK UP

The natural gas meter is tested for accuracy at least once in six months against an accepted laboratory standard meter in accordance with prescribed standards. The meters are deemed to be working satisfactory as long as the errors are within specifications for meters. The consumption registered by the main meter holds well as long as the error in the meters is within the permissible limits. In any case, the gas supplier data in the gas bills/ invoices is used for the emission reduction calculation.

QA & QC PROCEDURES

The calibration of the instruments is done every 6 months at CPRI, Hyderabad/ ETDC Chennai/ Bangalore. The meter installed by GAIL is calibrated according to the standard procedures.

EMERGENCY PLAN

An emergency plan is prepared to account for monitoring equipment 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 available and will be 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 will be done on the basis of check meter. Also, the main meter will be calibrated or replaced immediately.
- (B) Errors in main meter and check meters: If both the main and check meter show error during quarterly check, both meters will be sent for calibration and replaced 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 $\pm 2\%$ 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) applying main meter error factor to readings from last calibration (c) estimating the volume of gas

delivered by comparison with deliveries during the period under similar conditions when seller's meter was registering accurately.

3) Gas leakage detection: Emergency gas alarm system is 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 will get indication on the gas flow control panel and the gas flow valve will be shut when the power plant will have to be shut down. Thus, the accidental release of gas is avoided in any case.

INTERNAL AUDIT AND PERFORMANCE REVIEWS

An internal audit team is constituted for verifying and auditing of the data recorded and archived with respect to VCS monitoring plan. The audit team also verifies and audit the calibration plan and calibration record of the instruments with respect to the VCS monitoring plan. The audit team meets once in three months (quarterly) to verify and audit the data collected, the process followed and the quality control and assurance measures. They report any non-conformity to the Head – CCPP, PP and he shall take appropriate steps to rectify the non-conformity.

The internal audit team also certifies the annual consolidated data for the verification of VER. The team also certifies the calculations for arriving at actual VER.

Verification: The quantitative details indicating the net exported electrical energy, natural gas consumed and the net calorific value audited by the internal audit team constituted for the purpose is used, for verification of the VERs. Further, the joint energy meter reading jointly signed by PP and APTransco and the invoices raised by PP on APTransco is the base audit document for verification protocol.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

Parameter	Description	Source	Year 2009 (5 th June, 2009 to 31 st Dec, 2009)	Year 2010 (1 st Jan, 2010 to 31 st Dec, 2010)	Year 2011 (1 st Jan, 2010 to 8 th September, 2011)	Total Monitoring Period
EG _{PJ,y}	Electricity exported by the project plant	Refer to Parameter under "Data and parameters monitored"	1983.62478 GWh	3501.82051 GWh	2196.8903 GWh	7682.3355 GWh
EF _{BL,CO2,y}	The Build Margin emission factor of Southern grid		763 tCO ₂ /GWh	763 tCO ₂ /GWh	763 tCO ₂ /GWh	763 tCO ₂ /GWh

BE _y	Emissions in the Baseline Scenario	Calculated as per equation number 3 of the AM0029 version 03 $BE_y = EG_{PJ,y} * EF_{BL,CO2,y}$	1,514,299 tCO ₂ e	2,673,290 tCO ₂ e	1,677,106 tCO ₂ e	5,864,695 tCO ₂ e
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Based on the above the **BE_y (Emissions in the Baseline Scenario)** for the monitoring period is: **5,864,695 tCO₂e**

4.2 Project Emissions

Parameter	Description	Source	Year 2009 (5 th June, 2009 to 31 st Dec, 2009)	Year 2010 (1 st Jan, 2010 to 31 st Dec, 2010)	Year 2011 (1 st Jan, 2010 to 8 th September, 2011)	Total Monitoring Period
Q _{NG}	Quantity of NG and LNG consumed in the project activity	Refer to Parameters under section "Data and Parameters monitored".	399006903 SCM	689481086 SCM	432018925 SCM	152050491 43 SCM
NCV _{f,y}	Net Calorific Value of Natural Gas		0.03506 GJ/SCM	0.03565 GJ/SCM	0.03651 GJ/SCM	0.03574 GJ/SCM
EF _{CO2,f,y}	Emission Factor of Natural Gas		0.0561 tCO ₂ /GJ	0.0561 tCO ₂ /GJ	0.0561 tCO ₂ /GJ	0.0561 tCO ₂ /GJ
OXID _f	Oxidation factor of natural gas		1	1	1	1
COEF _{f,y}	CO2 emission co-efficient of	Calculated as per equation no. 2a of AM 0029- version	0.0019666 5	0.0019999 0	0.0020479 9	0.0020048 5

	natural gas	3.0. Refer to Parameter 5 detailed under section D.2 "Data and Parameters monitored".	tCO ₂ /SCM	tCO ₂ /SCM	tCO ₂ /SCM	tCO ₂ /SCM
PE _y	Emissions in the Project Scenario	Calculated as per equation no. 2 of AM 0029- version 3.0. Refer to parameter 8 detailed under section D.2 "Data and Parameters monitored".	784,709 tCO ₂ e	1,378,893 tCO ₂ e	884,766 tCO ₂ e	3,048,368 tCO ₂ e

Based on the above the **PE_y (Emissions in the Project Scenario)** for the monitoring period is:
3,048,368 tCO₂e

4.3 Leakage

Calculated as: Calculated as per equation number-4 of AM 0029- version 3.0

$$LE_y = LE_{CH_4,y} + LE_{LNG,CO_2,y}$$

Parameter	Description	Source	Year 2009 (5 th June, 2009 to 31 st Dec, 2009)	Year 2010 (1 st Jan, 2010 to 31 st Dec, 2010)	Year 2011 (1 st Jan, 2010 to 8 th September, 2011)	Total Monitoring Period
Q _{NG}	Quantity of NG consumed in the project activity	Refer to Parameter under section "Data and Parameters monitored".	39900690 3 SCM	68948108 6 SCM	4310533 82 SCM	152050491 4SCM
NCV _{f,y}	Net Calorific Value of Natural Gas		0.03506 GJ/SCM	0.03565 GJ/SCM	0.03650 GJ/SCM	0.03573 GJ/SCM
EF _{NG,}	Emission factor for upstream	Refer to Parameter under	0.000296	0.000296	0.000296	0.000296

upstream,CH ₄	fugitive methane emissions of natural gas	section 3.1	tCH ₄ /GJ	tCH ₄ /GJ	tCH ₄ /GJ	tCH ₄ /GJ
EG _{PJ,y}	Electricity exported by the project plant	Refer to Parameter under "Data And Parameters monitored"	1983.6247 8 GWh	3501.8205 1 GWh	2196.890 3GWh	7682.3355 GWh
EF _{BL,upstream,CH₄}	CO ₂ Emission Co-efficient of natural gas	Emission factor for upstream fugitive methane emissions occurring in the absence of the project activity	15.94 tCO ₂ /MU	15.94 tCO ₂ /MU	15.94 tCO ₂ /MU	15.94 tCO ₂ /MU
GWP _{CH₄}	Global warming potential of methane valid for the relevant commitment Period		21	21	21	21
LE _{CH₄,y}	Leakage emissions due to fugitive upstream CH ₄ emissions	Calculated as per equation number-5 of AM 0029-version 3.0 as contained in section 4 of the registered PD Leakage emissions due to fugitive upstream CH ₄ emissions (LE _{CH₄,y})	55,338 tCO ₂ e	96,982 tCO ₂ e	62,807 tCO ₂ e	215,133 tCO ₂ e
LE _{LNG,CO₂,y}	Leakage emissions due to fossil fuel combustion /electricity consumption associated with the liquefaction, transportation,	Calculated as per the methodology, AM 0029- version 3.0 as contained in of section 4 of the registered PD Leakage emissions due to	0 tCO ₂ e	0 tCO ₂ e	211 tCO ₂ e	211 tCO ₂ e

	re-gasification and compression of LNG into a natural gas transmission or distribution system $(LE_{LNG,CO_2,y})$	fossil fuel combustion / electricity consumption associated with the liquefaction, transportation, re-gasification and compression of LNG into a natural gas transmission or distribution system $(LE_{LNG,CO_2,y})$ $LE_{LNG,CO_2,y} = FC_{LNG,y} * EF_{CO_2,upstream,LNG}$				
LE_y	Total Leakages	Calculated as per equation number-5 of AM 0029-version 3.0 as contained in Section 4 of registered PD $LE_y = LE_{CH_4,y} + LE_{LNG,CO_2,y}$	55,338 tCO ₂ e	96,982 tCO ₂ e	63,018 tCO ₂ e	215,344 tCO ₂ e

Based on above the LE_y (Total Leakages) for the monitoring period is: **215,344 tCO₂e**

4.4 Summary of GHG Emission Reductions and Removals

Calculated as: Calculated as per equation number-8 of AM 0029- version 01.1

$$ER_y = BE_y - PE_y - LE_y$$

Parameter	Description	Year 2009 (5 th June, 2009 to 31 st Dec, 2009)	Year 2010 (1 st Jan, 2010 to 31 st Dec, 2010)	Year 2011 (1 st Jan, 2011 to 8 th September, 2011)	Total Monitoring Period
BE_y	Emissions in the Baseline Scenario	1,514,299 tCO ₂ e	2,673,290 tCO ₂ e	1,677,106 tCO ₂ e	5,864,695 tCO ₂ e
PE_y	Emissions in	784,709	1,378,893	884,766	3,048,368

	the Project Scenario	tCO ₂ e	tCO ₂ e	tCO ₂ e	tCO ₂ e
LE _y	Leakages	55,388 tCO ₂ e	96,982 tCO ₂ e	63,018 tCO ₂ e	215,344 tCO ₂ e
ER _y	Emission Reductions	674,253 tCO ₂ e	1,197,415 tCO ₂ e	729,322 tCO ₂ e	2,600,983 tCO ₂ e

5 ADDITIONAL INFORMATION

Not Applicable