"Natural Gas Based Combined Cycle Power Generation, at Kothapeta, East Godavari, Andhra Pradesh, India"

Document Prepared By Konaseema Gas Power Limited

Project Title	**"Natural Gas Based Combined Cycle Power Generation, at Kothapeta, East Godavari, Andhra Pradesh, India"**
Version	**06**
Date of Issue	**18/12/12**
Project ID	**837**
Monitoring Period	**04/06/2009 to 30/06/2012 (Including both days)**
Prepared By	**Konaseema Gas Power Limited**
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1 PROJECT DETAILS

1.1 Summary Description of Project

The project activity is Phase-I grid connected 445 MW natural gas based Combined Cycle Power Plant (CCPP). The power plant comprises of 2 x 140 MW natural gas-run turbines, two heat recovery steam generators and a 165 MW steam turbine. It is a green field project developed by Konaseema Gas Power Ltd, hereinafter called KGPL, located at East Godavari district, Andhra Pradesh, India.

The generated power will be exported to the Andhra Pradesh power grid (part of the southern grid of India) and this is ensured by the Power Purchase Agreement (PPA) signed with State government owned Andhra Pradesh Transmission Corporation of India Ltd. (APTRANSCO). The project activity will meet the base load requirement of the southern grid.

In the absence of the project activity the same quantity of power would have been produced from Green House Gases (GHGs) intensive fossil fuel i.e. coal. Since natural gas is energy intensive fuel it emits less GHGs comparatively for the same quantity of power generated using coal. Thus the project activity would help in reducing GHGs emissions into the atmosphere by the combustion of relatively cleaner fuel.

1.2 Sectoral Scope and Project Type

Sectoral scope: Energy industries ((renewable - / non-renewable sources)

Scope Number: 01

Project Category: Grid connected natural gas based combined cycle power plant

1.3 Project Proponent

Organization:	Konaseema Gas Power Limited
Street/P.O.Box:	6-2-913/914, Khairatabad
Building:	2nd Floor, Progressive Towers
City:	Hyderabad
State/Region:	Andhra Pradesh
Postfix/ZIP:	500004
Country:	India
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URL:	www.konaseema.org
Represented by:	-
Title:	-
Salutation:	Mr.
Last Name:	SEN
Middle Name:	-
First Name:	N.C
Department:	Finance
Mobile:	-
Direct FAX:	-
Direct tel:	-
Personal E-mail	nimai_sen@rediffmail.com

1.4 Other Entities Involved in the Project

No other parties are involved in this project

1.5 Project Start Date

Starting date: 04/06/2009

1.6 Project Crediting Period

Crediting period has been chosen for 10 years starting from 04/06/2009 to 03/06/2019 The technical lifetimes of the project equipment are 20 years; hence the crediting period will be

renewed by one more time after the first ten year period.

1.7 Project Location

The project site is at Devarapalli village (Latitude: N17° 01' 60''; Longitude: E81° 32' 60'') which is located in Kothapeta Mandal at a distance of 4 km from Ravulapalem. The site is located adjacent to the highway connecting Rajahmundry and Amalapuram. The nearest town is Rajahmundry, which is at a distance of 35 km and is well connected with major cities like Hyderabad, Chennai, Calcutta, and Visakhapatnam by rail and road. Nearest Airport to the plant is Vijayawada, Andhra Pradesh.

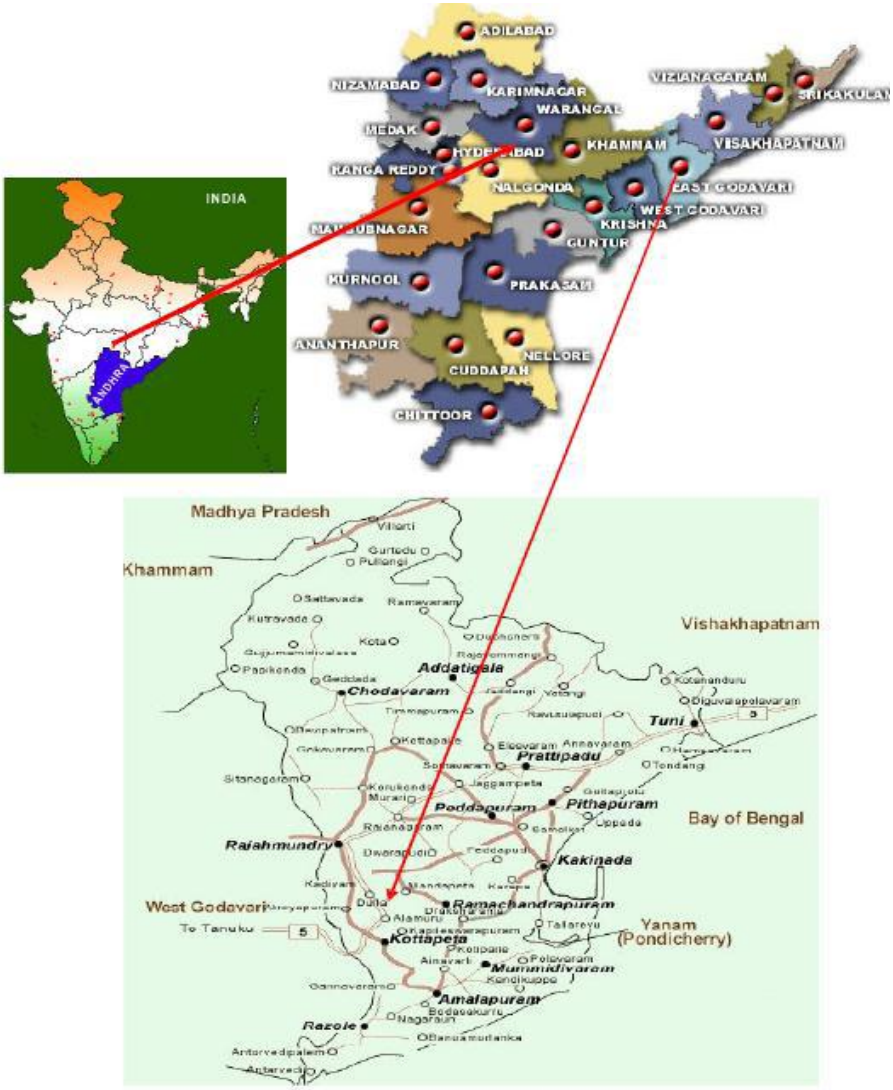


Figure 1 – Location Maps

1.8 Title and Reference of Methodology

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

Title: Grid Connected Electricity Generation Plants using Non-Renewable and Less GHG Intensive Fuel
Reference: Approved monitoring methodology AM0029

Version: 03
Sectoral Scope: 01, EB: 39

Methodology refers to the tool for calculating baseline CO2 emission factor.
Title: "Tool to calculate emission factor for an electricity system"
Version: 02

EB: 50, Annex 14

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

The Start date of project activity is 04/06/2009. During the monitoring period the project activity was operated and monitored in accordance with the applicable baseline and monitoring methodology AM0029 (ver.03) and registered PD.

2.2 Deviations from the Monitoring Plan

Not applicable

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:	$EF_{BM, y}$
Data unit:	tCO2/GWh
Description:	The Build Margin emission factor of Southern grid
Source of data:	CEA CO2 Baseline Database, version 05; November 2009, (http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver5.pdf)
Value applied:	820
Purpose of the data:	Tool to calculate the emission factor for an electricity system
Any comment:	-

Data Unit / Parameter:	$EF_{OM,Y}$
Data unit:	tCO2/GWh
Description:	The Operating Margin emission factor of Southern grid
Source of data:	CEA CO2 Baseline Database, version 05; November 2009, (http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver5.pdf)
Value applied:	986.7

Purpose of the data:	Tool to calculate the emission factor for an electricity system
Any comment:	-
Data Unit / Parameter:	NCV_{Coal}
Data unit:	kCal/ kg
Description:	Net Calorific Value of Coal
Source of data:	GCV and conversion factor (GCV to NCV) sourced from "CO2 Baseline Database for the Indian Power Sector, Version 5.0 issued by Central Electricity Authority, Ministry of Power, Government of India (GoI)" (http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver5.pdf)
Value applied:	3625
Purpose of the data:	Project emission calculations
Any comment:	-

Data Unit / Parameter:	EF_{Coal}
Data unit:	t CO2e/TJ
Description:	Emission Factor of Coal
Source of data:	CEA CO2 Baseline Database, version 05
Value applied:	95.8
Purpose of the data:	Project emission calculations
Any comment:	-

Data Unit / Parameter:	EF_{CM}
Data unit:	tCO2/GWh
Description:	The Combined Margin Emission factor of the Southern grid
Source of data:	Calculated as the weighted average of the build margin emission factor and operating margin emission factor (with 50/50 weights to OM and BM)
Value applied:	903.30

Purpose of the data:	Project emission calculations
Any comment:	-

Data Unit / Parameter:	$EF_{CO2, NG}$
Data unit:	tCO2/GJ
Description:	CO2 Emission Factor of Natural Gas
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:	-

Data Unit / Parameter:	$EF_{CO2, diesel}$
Data unit:	tCO2/TJ
Description:	CO2 emission factor of diesel
Source of data:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	74.1
Purpose of the data:	Project emission calculations
Any comment:	-

Data Unit / Parameter:	OXID NG
Data unit:	Unit less factor
Description:	Oxidation factor of natural gas
Source of data:	IPCC Default Value
Value applied:	1.00
Purpose of the data:	Project emission calculations
Any comment:	As IPCC emission factors are updated, conservative value will be chosen.

Data Unit / Parameter:	$OXID_{,Diesel}$

Data unit:	Unit less factor
Description:	Oxidation factor of diesel
Source of data:	IPCC Default Value
Value applied:	1.00
Purpose of the data:	Project emission calculations
Any comment:	As IPCC emission factors are updated, conservative value will be chosen.

Data Unit / Parameter:	$OXID_{Coal}$
Data unit:	Unit less factor
Description:	Oxidation factor of coal
Source of data:	IPCC Default Value
Value applied:	0.98
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

Data Unit / Parameter:	EGy
Data unit:	GWh
Description:	Electricity generation in the project plant
Source of data:	Common Tri-vector energy meter at the plant site present in the switch yard.
Description of measurement methods and procedures to be applied:	The digital readings will be monitored each hour and data will be recorded monthly. Accuracy of the measured data will be maintained as per PPA. Calibration of the meters will be done on an annual basis to the manufacturer's standards.
Frequency of monitoring/recording:	Monthly
Value monitored:	(4th June, 2009 to 30th June 2012 — **5127.49** GWh **Total** — **5127.49** GWh
Monitoring equipment:	Electricity supply to the grid will be monitored using Tri-

<table>
<tr><td></td><td>vector energy meter placed at the project boundary. The digital readings will be monitored each hour and data will be recorded monthly. 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.
<table>
<tr><td>Meter</td><td>Calibration date</td><td>Line 1 electricity meter</td><td>Line 2 electricity meter</td></tr>
<tr><td>Frequency</td><td></td><td>Annual</td><td>Annual</td></tr>
<tr><td>1st calibration</td><td>05/08/2008</td><td>83912780</td><td>-</td></tr>
<tr><td>2nd calibration</td><td>04/08/2009</td><td>08081480</td><td>-</td></tr>
<tr><td>3rd Calibration</td><td>10/11/2009</td><td>08081479</td><td>-</td></tr>
<tr><td>4th Calibration</td><td>24/03/2010</td><td>08081480</td><td>-</td></tr>
<tr><td>5th Calibration</td><td>15/07/2010</td><td>08081479</td><td>-</td></tr>
<tr><td>6th Calibration</td><td>20/01/2011</td><td>12196517</td><td>-</td></tr>
<tr><td>7th Calibration</td><td>10/06/2011</td><td>12196518</td><td>08018480</td></tr>
<tr><td>8th Calibration</td><td>28/01/2012</td><td>12196517</td><td>08081479</td></tr>
<tr><td>9th Calibration</td><td>14-08-2012</td><td>12196518</td><td>8081480</td></tr>
</table></td></tr>
<tr><td>QA/QC procedures to be applied:</td><td>The electricity output will be monitored and recorded by a computer system, at each turbine. Project participant will be responsible for this data.</td></tr>
<tr><td>Calculation method:</td><td>Not applicable</td></tr>
<tr><td>Any comment:</td><td>-</td></tr>
</table>

Data Unit / Parameter:	$FC_{NG,y}$
Data unit:	SCM or m3
Description:	Net quantity of natural gas consumption by the project plant during the year, y
Source of data:	Fuel flow meter reading at project boundary.
Description of measurement methods	A gas flow meter will continuously monitor the natural gas input to the power plant and the project participant will

<table>
<tr><td>and procedures to be applied:</td><td>record the data on a daily basis. The data will be archived both in electronic form and in paper format.</td></tr>
<tr><td>Frequency of monitoring/recording:</td><td>Daily</td></tr>
<tr><td>Value monitored:</td><td>1193138469.22

<table><tr><td>(4th June 2009 to 30th, June 2012)</td><td>1193138469.22 SCM</td></tr><tr><td>Total</td><td>1193138469.22 SCM</td></tr></table></td></tr>
<tr><td>Monitoring equipment:</td><td>The quantity of Natural Gas was measured by the gas flow meter
<table><tr><td>Meter</td><td>Calibration date</td><td>Gas flow meter GAIL SKID METER 1</td><td>Gas flow meter GAIL SKID METER 2</td></tr><tr><td>Frequency</td><td></td><td>As per GAIL standards</td><td>As per GAIL standards</td></tr><tr><td>1st calibration</td><td>02/06/2008</td><td>08- 060417</td><td>08-060421</td></tr></table>
<table><tr><td>Meter</td><td>Calibration</td><td>Gas flow meter at Konaseema SKID 2</td><td>Gas flow meter at Konaseema SKID 2</td></tr><tr><td>Frequency</td><td>Meter Nos</td><td colspan="2">3 years</td></tr><tr><td>Calibration(GT1)</td><td>31634</td><td>04/07/2009</td><td>08/08/2012</td></tr><tr><td>Calibration(GT2)</td><td>31635</td><td>22/08/2009</td><td>13/08/2012</td></tr></table></td></tr>
<tr><td>QA/QC procedures to be applied:</td><td>Quantity of natural gas consumed by the project activity will be cross-checked with the invoices raised by from the fuel supplier.</td></tr>
<tr><td>Calculation method:</td><td>Not applicable</td></tr>
<tr><td>Any comment:</td><td>-</td></tr>
</table>

Data Unit / Parameter:	FC $_{LNG,y}$
Data unit:	SCM or m3
Description:	Net quantity of LNG consumption by the project plant during the year, y
Source of data:	Fuel flow meter reading at project boundary.
Description of measurement methods and procedures to be applied:	The flow meter will continuously monitor the LNG input to the power plant and the project participant will record the data on usage. The data will be archived both in electronic form and in paper format. Calibration of the instrument will be as per manufacturer's standards.
Frequency of monitoring/recording:	Daily
Value monitored:	**0.00**
Monitoring equipment:	The quantity of Gas was measured by the gas flow meter
QA/QC procedures to be applied:	Quantity of LNG consumed by the project activity will be cross-checked with the invoices raised by from the fuel supplier.
Calculation method:	Not applicable
Any comment:	-

Data Unit / Parameter:	NCV $_{Natural\ Gas,y}$
Data unit:	kCal/SCM or m3
Description:	Net calorific value of natural gas
Source of data:	Data from fuel supplier will be used.
Description of measurement methods and procedures to be applied:	The value will be indicated in the invoices raised by the fuel supplier on the project proponent.
Frequency of monitoring/recording:	Daily
Value monitored:	8628.63
Monitoring equipment:	Gas calorimeter The Gas chromatogram/Calorimeter will be calibrated jointly by the PP and GAIL once in 2 months, the details of chromatogram is provided below.

	MAKE	MODEL NO.	SERIAL NO	FREQUENCY
	DANIEL	2350A	9007294	ONCE IN 2 MONTHS
QA/QC procedures to be applied:	No additional QA/QC procedures are to be applied.			
Calculation method:	Not applicable			
Any comment:	-			

Data Unit / Parameter:	$EF_{BL, upstream, CH4}$
Data unit:	tCH4/ MWh
Description:	Emission factor for upstream fugitive methane emissions occurring in the absence of the project activity in tCH4 per MWh electricity generation in the project plant
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	Not applicable
Frequency of monitoring/recording:	Annually
Value monitored:	0.000769
Monitoring equipment:	Not applicable
QA/QC procedures to be applied:	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, $EFBL_{,upstream,CH4}$ = Emission factor for upstream fugitive methane emissions occurring in the absence of the project activity in t CH4 per MWh electricity generation in the project plant j = Plants included in the build margin $FF_{j,k}$ = Quantity of fuel type k combusted in power plant j included in the build margin $EFk_{,upstream,CH4}$ = Emission factor for upstream fugitive methane emissions from production of the

	fuel type k in t CH4 per MJ fuel produced EG_j = Electricity generation in the plant j included in the build margin in MWh/a
Any comment:	-

3.3 Description of the Monitoring Plan

This document serves as the Monitoring Plan (MP) for the project activity. The document presents a plan to meet the monitoring requirement for the collection, processing and reporting of data required to fulfill the requirements in decision 7/CMP.17. It describes management systems and procedures to be implemented by KGPL upon project implementation in order to ensure consistent project operation as well as monitoring, processing and reporting of data required for the calculation of emission reductions (ERs; taking into account AM0029 and the guidance presented in the Validation and Verification Manual.

B. Obligations of KGPL's VCS Manager

It is the responsibility of KGPL"s VCS Manager to develop and implement a management and operational system that meets the requirements of this MP.

C. Description of Data required to be monitored

The MP foresees recording of the following parameters during project operation in order to enable calculation of emission reductions from the project activity. In tables 14.1 and 14.2 they are described in detail. The tables also show the recording frequency of each parameter as given in AM0029.

Parameters to be monitored for Calculation of Project Emissions

ID	Data variable	Source of data	Data Unit	Recording frequency
FC Natural gas,v	Fuel consumption	Flow meter	m3	Daily
NCV Natural gas,y	Net calorific value	Fuel supplier(s) / transporter(s)	Kcal/SCM	Daily

Parameters to be Monitored for Calculation of Baseline Emissions

ID	Data variable	Source of data	Data Unit	Recording frequency

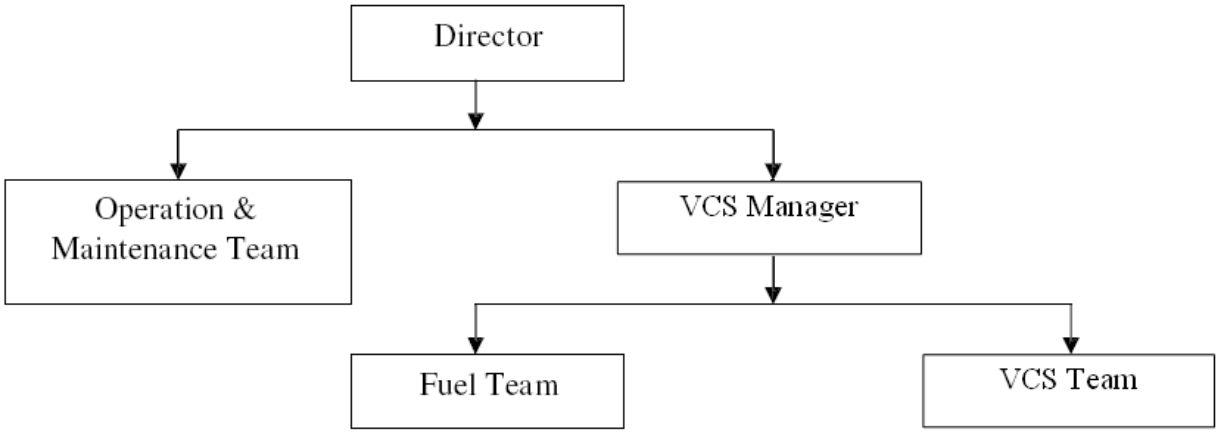
EGy	Electricity generation by project activity for supply	Electricity meter	MWh	Hourly measurement, monthly recording

D. Approach used in this monitoring plan

This MP has been designed to clearly separate data collection activities and ER calculation activities. Each activity follows its own organizational structures and procedures. ER calculation will be undertaken with a standalone Excel spreadsheet and Data collection activities have been designed to derive verifiable monthly and/or yearly values from the periodic measurements undertaken for each parameter that can be easily processed in a Workbook for ER calculation.

Description of organizational structures & procedures for collection, processing, review, storage and reporting of data.

E. The organization structure and responsibility matrix for this VCS project activity is as below: VCS Organization Structure:



The Director of KGPL has authorized the VCS Manager to develop the PD and the Monitoring Plan, delegating all powers in relation thereto, to the VCS Manager:

a) Provide all information/data required for this monitoring plan

b) Comply with all the requirements as per the Project Document and Monitoring Plan.

c) Adherence to the laid down protocols, procedures and processes, in relation to VCS project activity, by the aforesaid O & M team, fuel team and the VCS team

d) Refer all conflicts, discrepancies, mistakes, etc. in relation to the Monitoring Plan of the VCS project activity, to the VCS manager for resolution, which resolution in this regard shall be final

and binding on the aforesaid teams. The VCS team consists of VCS auditor and VCS compiler. The O&M team is headed by the Head, O & M and the Fuel team is headed by the Fuel Manager.

F. VCS Responsibility Matrix:

S. No.	Designation	Responsibilities
1	Director	Implement the organization structure. Issue office orders, authorizing the VCS Manager to implement the PD and the Monitoring plan and delegating to him all powers in relation thereto
2	VCS Manager	Direct the O& M team, fuel team, VCS team in relation to conformance with PD and monitoring plan Storage of aggregated data. Coordinate with DOE during verification process. Monitor raw data in relation to Build Margin, Oxidation factor and where national institutions / AM 0029 default data are involved. Randomly check data wherever necessary to independently check the authenticity of data and take corrective actions wherever required. Resolve all conflicts in relation to VCS project activity. Calculate ER and submit them to DOE. Implement the PD and the Monitoring Plan
3	O & M Team	Calibrate the monitoring instrument to industry standards and maintain data.
4	VCS Auditor	Data review, Process review, Monitoring plan Report, non-conformances with PD, and VCS manager's directions
5	VCS Compiler	Data processing and data aggregation
6	Fuel Team	Monitor raw data as per enclosed task

i) Data Monitoring

The data that will be monitored include:

a) Monitoring of electricity generated by the project: The electricity generated by the project will be through energy meter at the plant. The data can also be monitored and recorded at the on-site control center using a computer system.

There will be main metering system and backup metering system. The meter reading will be readily accessible for DOE. Calibration test records will be maintained for verification.

b) Monitoring of quantity of gas combusted: Quantity of gas combusted will be monitored through gas flow meters. Detailed monitoring procedure of quantity of gas combusted by the project will be established in accordance with the agreements with the gas suppliers and gas transporter. The meter reading will be readily accessible for DOE. Calibration test records will be maintained for verification.

c) Monitoring of NCV: The NCV of gas will be obtained from the fuel supplier.

ii) Calibration and Maintenance

The detailed calibration, testing and maintenance procedure shall be prepared by the VCS Manager as per equipment manufacturer's recommendations and the industry / national standards as applicable.

iii) Verification of Monitoring Results

The responsibilities for verification of the project are as follows:

- The VCS Manager will arrange for the verification and will prepare for the audit and verification process.
- The VCS Manager will facilitate the whole verification process by providing the DOE with all required necessary information, before, during and, in the event of queries, after verification.

Description of organizational structures & procedures for calculation of emission reductions as well as review, storage and reporting of the ER calculation results Calculation of ERs is carried out by the VCS Manager annually by utilization of an excel-based workbook whose functions are explained in detail below. The VCS Manager decides whether there is sufficient national data available to depart from the default values specified in AM0029 for the two parameters to be monitored for leakage.

The VCS Manager must retain a copy of every month's workbook. Each month's workbook must be saved on the plant server under a unique name reflecting the month for which monitoring has been carried out and hard copies of the workbook shall be printed out, signed by the VCS Manager in accordance with company procedures, and stored in the archive room. In addition, after each data entry and/or modification of the workbook, electronic copies of the workbook shall be saved under a new name, and hard copies shall be signed and stored safely. Yearly summaries are calculated based on the monthly results. The workbooks serve as a data base for the periodic reporting of ERs to the verifying DOE by the VCS Manager. After completion of the workbook, the ER results are reviewed according to the procedures laid out in the data review protocol.

Description of the workbook for emission reduction calculation

This section explains and illustrates the steps required to be performed by the VCS Manager to enable the GHG emission reductions to be calculated on an annual basis using the workbook. It

presents the worksheets contained in the workbook and explains their use. The section is intended as a user manual for the workbook. The relevant formulas are displayed in the relevant worksheets for easier orientation. The electronic workbook is an Annex to the MP and an integral part thereof.

The VCS Manager is responsible for ensuring the entry of the required data shown in tables below into the electronic workbook and completion of the workbook starting with November 2008, as required by the monitoring methodology and the data input templates in the electronic workbook.

The workbook is designed with 1; Data entry and aggregation screen, and 2; Data calculation screen. The data to be entered is keyed in the data entry screen and also aggregated in the same screen where necessary. The data calculation screen has all the formulas required for the calculation as per the approved methodology and is linked to the appropriate cell of data entry screen.

The screen shots of these screen along with formula used are given below:

Organizational structures & procedures during project implementation

Before the start of the crediting period the VCS Manager will develop the following protocols whose functions are described below, based upon the organizational structures & procedures described in this MP.

Data handling protocol

The establishment of a transparent system for the collection, computation and storage of data, including adequate record keeping and data monitoring systems is required. It is the VCS Manager's responsibility with the assistance of VCS Auditor to ensure implementation of a protocol that provides for these critical functions and processes. For electronic -based and paper-based data entry and recording systems, there will be clarity in terms of the procedures and protocols

for collection and entry of data, usage of the spreadsheets and any assumptions made, so that compliance with requirements can be assessed by the DOE. Stand-by processes and systems, e.g. paper-based systems, must be outlined and used in the event of, and to provide for, the possibility of systems failures.

Training protocol

It is the VCS Manager's responsibility to ensure that the required capacity and internal training is made available to assigned staff, to enable them to undertake the tasks required by this MP. All staff involved in any of the procedures will be trained before the start of the crediting period in order to perform the tasks specified in this MP. For this purpose a training protocol will be prepared.

Table 1. Dates on Training Conducted.

Training Conducted	Date	Periodicity	Next Calibration Due
1st Training Conducted	07/05/2009	2 Years	May 2013
2nd Training Conducted	01/05/2011		

Calibration and maintenance protocol

It is the VCS Manager's responsibility to ensure that the calibration and maintenance procedures for all measuring instruments relevant for monitoring the parameters included in this MP are followed. A calibration and maintenance protocol will be established for this purpose which will be prepared by the VCS manager based as described above.

Table 2. Actual dates of calibration for all Monitoring Equipment's.

Calibration details		**Main Meter No.**	**Periodicity of Calibration**	**Date of 1st Calibration**	**Due for next Calibration**
GAS CONSUMPTION					
Gas Flow meter at GAIL - LINE A		08-060417, 08-060421	As per GAIL Standards	**02-06-2008**	
Gas Flow meter at Konaseema SKID 1		NA	NA	NA	NA
Gas Flow meter at Konaseema SKID 2	FLOW METER AT GT1	**31634**	3 years	**04-07-2009**	**08-08-2012**
	FLOW METER AT GT2	**31635**	3 years	**22-08-2009**	**01/09/2012**
Gas Chromatogram at GAIL /PP		**MAKE**	**MODEL**	**SERIAL NO**	**FREQUENCY**
		DANIEL	2350A	9007294	Joint Calibration done once in 2 months
ELECTRICITY GENERATION (MAIN METERS)					

Electricity Generation LINE 1	83912780	Six months	05-08-2008	05-08-2009
	8081480	Six months	04-08-2009	04-08-2009
	8081479	Six months	10-11-2009	10-11-2010
	8081480	Six months	24-03-2010	22-03-2010
	8081479	Six months	15-07-2010	15-07-2011
	12196517	Six months	20-01-2011	17-01-2012
	12196518	Six months	10-06-2011	10-06-2012
Electricity Generation LINE 2	8081480	Six months	10-06-2011	10-06-2012
Electricity Generation LINE 1	12196517	Six months	28-01-2012	28-01-2013
Electricity Generation LINE 2	8081479	Six months	28-01-2012	28-01-2013
Electricity Generation LINE 1	12196518	Six months	14-08-2012	14-08-2013
Electricity Generation LINE 2	8081480	Six months	14-08-2012	14-08-2013

Data review protocol

It is the VCS Manager's responsibility to prepare a data review protocol that in case of failure of an instrument, or inconsistency of the data, enables staff to adjust the data according to the procedures outlined in this protocol. The data review protocol shall also include procedures for emergency preparedness for cases where emergencies can cause unintended emissions.

Fig1. Gas flow

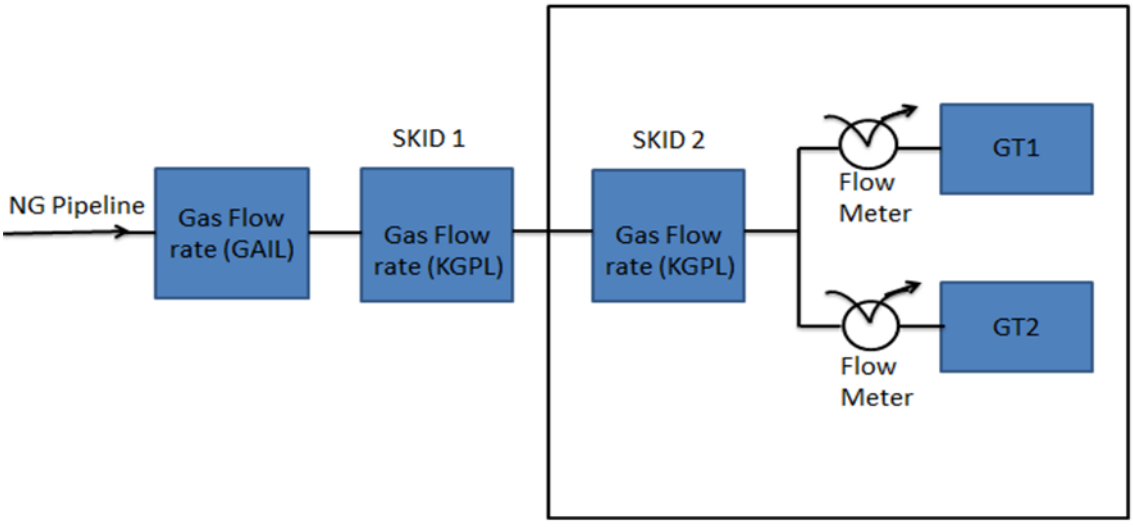
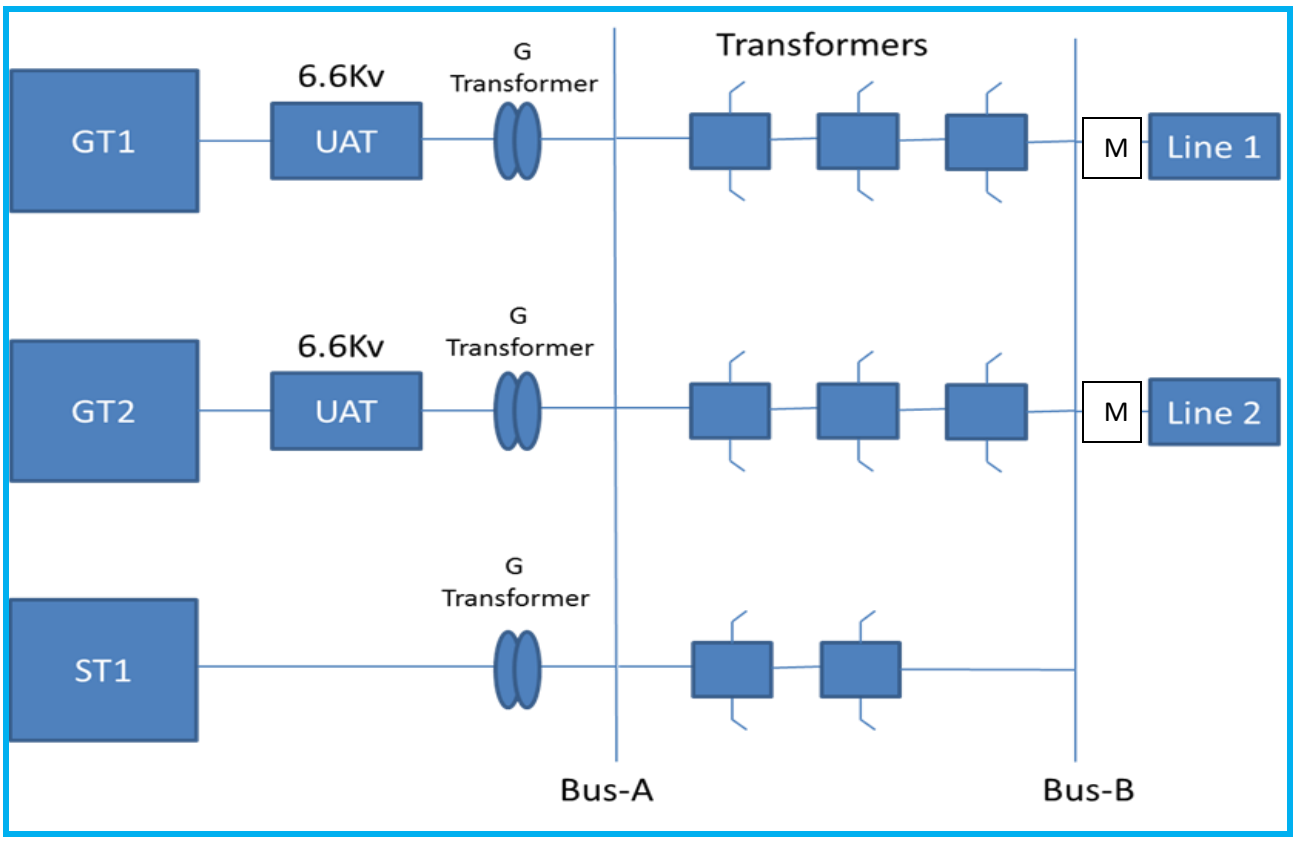


Fig 2. Schematic representation of Power generation



Note: The box M represents the location of Main meters in Line 1 and Line 2

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

Parameter	**Description**	**Source**	**Total Monitoring Period** (4^{th} June 2009 to 30^{th} June 2012)
EG_y	Electricity generation in the project plant	Refer to Data detailed under sec. 3.2 "Data and parameters monitored"	**5127.495** GWh
$EF_{BM,CO2,y}$	The Build Margin emission factor of	Refer to data detailed under sec. 3.1 "Data	820 tCO_2/GWh

	Southern grid	and parameters at validation	
BE_y	Emissions in the Baseline Scenario	Calculated as per equation number 2 of the AM0029 version 03 $BE_y = EG_{PJ,y} *$ $EF_{BL,CO2,y}$	**4204545.949** tCO2e

Based on the above the **BE_y (Emissions in the Baseline Scenario)** for the monitoring period is: **4204545.949 tCO_2e**

4.2 Project Emissions.

Parameter	**Description**	**Source**	**Total Monitoring Period** (4^{th} June 2009 to 30^{th} June 2012)
$FC_{NG,y}$	Quantity of NG consumed in the project activity	Refer to Data detailed under sec. 3.2 "Data and parameters monitored"	1193138469.22 SCM
$NCV_{Natural Gas,y}$	Net Calorific Value of Natural Gas	Refer to Data detailed under sec. 3.2 "Data and parameters monitored"	0.03610 GJ/SCM
$EF_{CO2,NG}$	Emission Factor of Natural Gas	Refer to Data detailed under sec. 3.1 "Data and parameters at validation.	0.0561 tCO_2/GJ
$OXID_{NG}$	Oxidation factor of natural gas	Refer to Data detailed under sec. 3.1 "Data and parameters at validation.	1

$COEF_{f,y}$	CO2 emission co-efficient of natural gas	Calculated as per equation no. 2a of AM 0029- version 3.0. Refer to Parameter 5 detailed under section D.2 "Data and Parameters monitored".	0.00202 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 sections D.2 "Data and Parameters monitored".	**2409784.839** tCO_2e

Based on the above the **PE_y (Emissions in the Project Scenario)** for the monitoring period is: **2409784.839 tCO2e**

4.3 Leakage

Parameter	**Description**	**Source**	**Total Monitoring Period** (4^{th} June 2009 to 30^{th} June 2012)
$FC_{NG,y}$	Quantity of NG consumed in the project activity	Refer to Parameter 1 detailed under section D.2 "Data and Parameters monitored".	1193138469.22 SCM
$NCV_{f,y}$	Net Calorific Value of Natural Gas	Refer to Parameter 2 detailed under section D.2 "Data and Parameters	0.03610 GJ/SCM

		Monitored".	
$EF_{NG, upstream,CH4}$	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	Refer to Parameter 1 detailed under section D.1	0.000296 tCH4/GJ
$EG_{PJ,y}$	Electricity exported by the project plant	Refer to Parameter 6 detailed under sec. D.2 "Data And Parameters monitored"	**5127.495** 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 in tCO_2/MU electricity generation in the project plant	0.000769 tCH4/MWh
GWP_{CH4}	Global warming potential of methane valid for the relevant commitment Period		1
$LE_{CH4,y}$	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	184205.40 tCO_2e

		emissions due to fugitive upstream CH_4 emissions ($LE_{CH4,y}$)	
$LE_{LNG,CO2,y}$	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 ($LE_{LNG,CO2,y}$)	Calculated as per the methodology, AM 0029- version 3.0 as contained in of section 4 of the registered PD 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 ($LE_{LNG,CO2,y}$) $LE_{LNG,CO2,y} = FC_{LNG,y} * EF_{CO2,upstream,LNG}$	0.00
LE_y	Total Leakages	Calculated as per equation number-5 of AM 0029- version 3.0 as contained in Section 4 of registered PD $LE_y = LE_{CH4,y} + LE_{LNG,CO2,y}$	184205.40 tCO_2e

4.4 Summary of GHG Emission Reductions and Removals

Calculated as: Calculated as per equation number-6 of AM 0029- version 03

$$ER_Y = BE_Y - PE_Y - LE_Y$$

Parameter	Description	Total Monitoring Period** (04/06/2009 to 30/06/2012)
BE_y	Emissions in the Baseline Scenario	**4204546 tCO_2e**
PE_y	Emissions in the Project Scenario	**2409785 tCO2e**
LE_y	Leakages	**184205 tCO_2e**
ER_y	Emission Reductions	**1610556 tCO_2e**

****Rounded values**

Year wise summary of GHG emission reductions and removals[1]

SL No.	Year	Emission Reductions (tCO_2e)
1	10th March 2010 – 31st December 2010	506478
2	1st January 2011 – 31st December 2011	813940
3	1st January 2012 – 30th June 2012	290138
Total		**1610556**

****Rounded values**

[1] Scheduled shut down and hot gas path inspection. Due to this activity, the plant did not operate from 04/06/2009 to 09/03/2010. Hence, there was no emission reduction during this period. The start date of operation from 10 March 2010 is the starting date for claiming emission reductions.

5 ADDITIONAL INFORMATION

Not Applicable