



**Monitoring report form for CDM project activity**  
(Version 08.0)

**MONITORING REPORT**

<b>Title of the project activity</b>	Grid connected electricity generation using natural gas by Lanco Kondapalli Power Private Limited		
<b>UNFCCC reference number of the project activity</b>	5554		
<b>Version number of the PDD applicable to this monitoring report</b>	04		
<b>Version number of this monitoring report</b>	02		
<b>Completion date of this monitoring report</b>	12/05/2021		
<b>Monitoring period number</b>	03		
<b>Duration of this monitoring period</b>	01/11/2015 to 31/12/2016 (first and last date included)		
<b>Monitoring report number for this monitoring period</b>	Not Applicable		
<b>Project participants</b>	M/s Lanco Kondapalli Power Private Limited EKI Energy Services Limited		
<b>Host Party</b>	India		
<b>Applied methodologies and standardized baselines</b>	AM0029 ver. 3 - Baseline Methodology for Grid Connected Electricity Generation Plants using Natural Gas  Standardized baselines : Not Applicable		
<b>Sectoral scopes</b>	1 : Energy industries (renewable - / non-renewable sources)		
<b>Amount of GHG emission reductions or net anthropogenic GHG removals achieved by the project activity in this monitoring period</b>	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013 until 31 December 2020	Amount achieved from 1 January 2021
	0 tCO <sub>2</sub> e	74,009 tCO <sub>2</sub> e	0 tCO <sub>2</sub> e
<b>Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD</b>	971,142 tCO <sub>2</sub>		

## SECTION A. Description of project activity

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

The scope of the project activity involves implementation and operation of a new natural gas fired grid connected Combined Cycle Power Plant (CCPP) of 366 MW capacity at Kondapalli near Vijayawada Andhra Pradesh by Lanco Kondapalli Power Private Limited (LKPPL). The CCPP operates on Brayton Cycle (Compressor & Gas Turbine) at top and Rankine Cycle (Heat Recovery Steam Generator & Steam Turbine) at bottom. The power generated from the project activity is sold on merchant basis to the state utilities in Southern, Western & Northern India. The project employs state of the art technology with estimated project life of 20 years. The project comprises of the following major equipments

- One advanced F class, heavy duty, Gas turbine generator with a nominal output of about 234 MW at site condition and with Gas turbine Inlet air filter evaporative cooling system under operation.
- One Heat Recovery, natural circulation, three pressure vertical type Steam Generator
- One Steam Turbine Generator of around 132 MW (@ 30 deg C, 60% RH), multistage intermediate injection, condensing, type.

The project activity is designed to use natural gas as main fuel for power generation. Natural gas is sourced from the Krishna Godavari basin of Reliance Industries Limited (RIL). Gas Supply & Transportation Agreements have been executed with Reliance Industries Limited and Reliance Gas Transportation Infrastructure respectively, in this regard The power generated has been stepped up to 400 kV level by using 15/420 kV generator transformers. To enable the process a 400 kV Gas Insulated Switchgear (GIS) type substation is provided. A double circuit 400 kV transmission line has been proposed to export power to 400 kV receiving end substation of the Power Grid Corporation of India Limited (PGCIL) located at Nunna.

The project activity commenced operation on 01/08/2010.

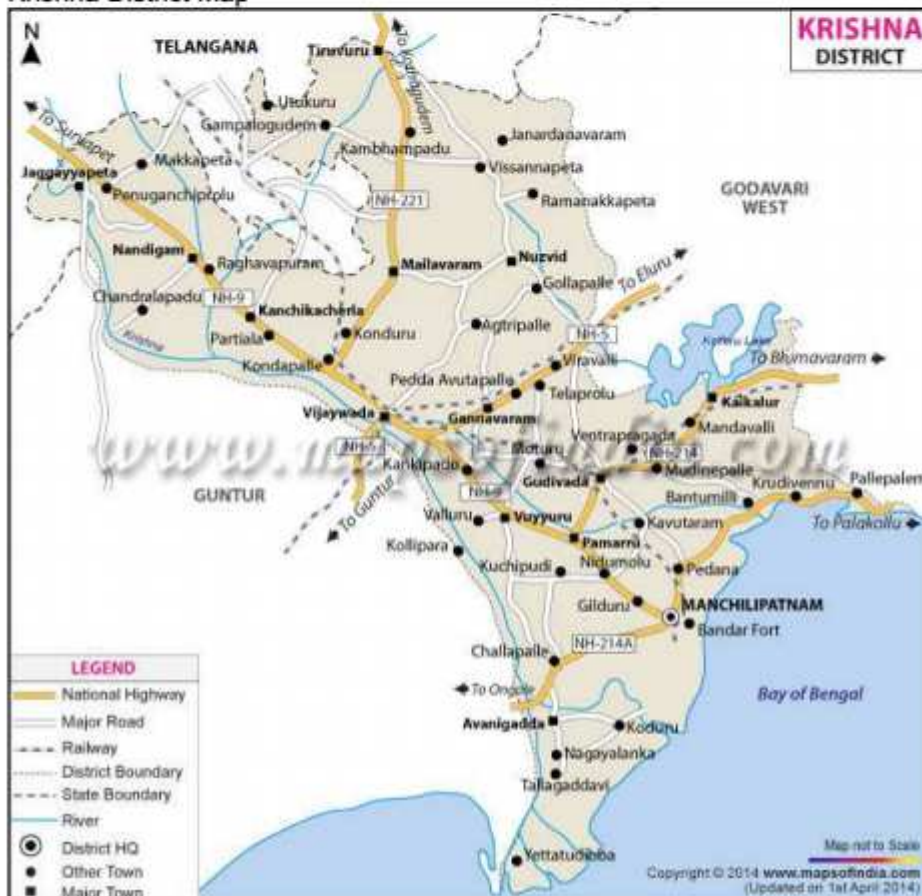
Total GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period: of 01/11/2015 to 31/12/2016 are 74,009 tCO<sub>2e</sub>.

### A.2. Location of project activity

- (a) Host Party: India
- (b) Region/ State/ Province etc; Andhra Pradesh State
- (c) City/ Town/ Community, etc: The project site is located at Village – Kondapalli, Krishna District of Andhra Pradesh
- (d) Physical/ Geographical location: latitude 16°38'30.10" N and longitude 80°33'05.33" E)



Krishna District Map



**A.3. Parties and project participants**

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
India	M/s Lanco Kondapalli Power Private Limited	No
Australia	EKI Energy Services Limited	No

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

The approved baseline and monitoring methodologies applied for the project activity are:  
AM0029 Version 03- Baseline Methodology for Grid Connected Electricity Generation Plants using Natural Gas (EB 39, Annex 3)<sup>1</sup>

Tools referenced by the methodology and applicable for the project activity:

- Tools to calculate the emission factor for an electricity system (Version 02.2.1, EB 63; Annex-19)
- Tool for the demonstration and assessment of additionality (Version 06.0.0, EB 65, Annex 21)

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

Type of crediting period: Fixed

Start date of Crediting period: 05/09/2012 to 04/09/2022

Length of the crediting period: 10 years

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

The project was commissioned on 01/08/2010.

The spatial extent of the project boundary includes the equipment that constitute the 366 MW CCPP at Kondapalli site of LKPPL as listed below and all power plants connected physically to the baseline grid as defined in "Tool to calculate the emission factor for an electricity system" The equipments that form part of the project boundary are:

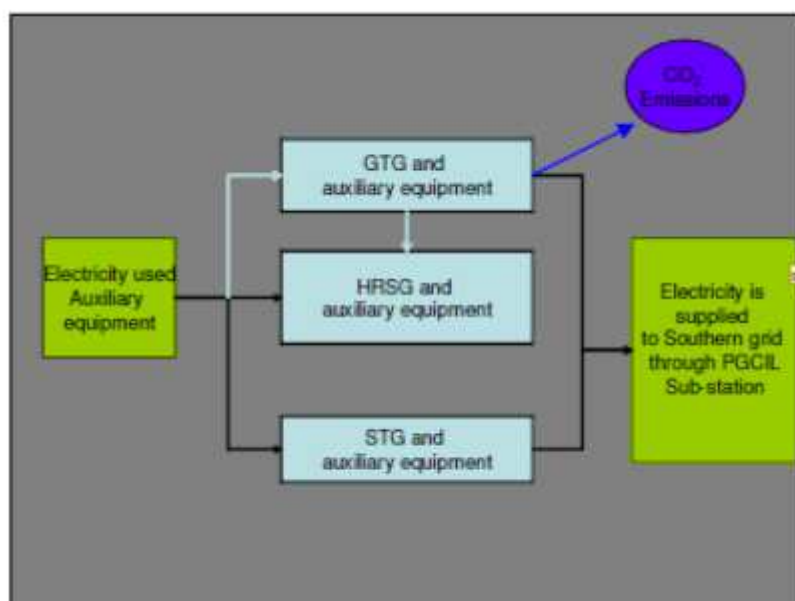
1. Gas Turbine Generator 234 MW capacity
2. Steam Turbine Generator 132 MW
3. GT/ST Generator & Unit aux. transformers
4. Auxiliary equipments of Gas Turbine & Generator - Lube oil system, Air intake system, Evaporative cooling system, Exhaust system, Heat Recovery Steam Generator Circulation Pumps, valves, HP/LP Bypass system, Piping etc.
5. Auxiliary equipments of Steam Turbine & Generator – Hydraulic and lube oil system condenser, Feed Pumps, Condensate extraction pumps.

Technical specification of equipments involved in the project activity is as below:

<sup>1</sup> <https://cdm.unfccc.int/methodologies/DB/WW4I82DG7LJUQE5E5YGT1NZE4PNS60>

S.No	Equipment	Specifications	Special Features
1.	GTG	Make : GE, USA GTG is of advanced class industrial heavy- duty type (Model 9FA) with dry low NO <sub>x</sub> technology capable of operating in combined cycle mode, Nominal output capacity: 234 MW at site conditions (Dry Bulb Temperature - 32 deg. C; Design Wet Bulb Temperature - 25 deg. C; Relative Humidity (RH) = 70%)	Low NO <sub>x</sub> technology along with state of the art cooling. Thermal efficiency close to 53 - 58% (LHV)
2.	STG	Make: Harbin, China One steam turbine generator of output capacity 132 MW at site condition (Dry Bulb Temperature - 32 deg. C; Design Wet Bulb Temperature - 25 deg. C; Relative Humidity (RH) = 70%)	<ul style="list-style-type: none"> <li>• Multistage, intermediate injection, condensing type steam turbine.</li> <li>• State of the art DCS control system</li> </ul>
3.	HRSG	Make: : Thermax , India Capacity: : HP/IP/LP Flow 282.79/ 42/34.26 TPH; temperature 567.3/567/286.6 DegC ; pressure 98.47/22.4/3.1 Bar	<ul style="list-style-type: none"> <li>• Horizontal flue gas flow and natural circulation.</li> <li>• HRSGs are designed with three pressure stages to improve thermal efficiency, against conventional two pressure stages for similar application.</li> <li>• State of the art DCS control system.</li> </ul>

The schematic diagram of project activity is as below:



There are no such any event or situation occurred during current monitoring period which impact the applicability of methodology.

**B.2. Post-registration changes****B.2.1. Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents**

There were no deviations from the registered monitoring plan or applied methodology during the monitoring period.

**B.2.2. Corrections**

There were no corrections in registered PDD during the monitoring period.

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

There has been no change in the start date of the monitoring period.

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

There has been no change in the monitoring plan

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

There are no any permanent changes from registered monitoring plan or applied methodology

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

There are no changes to project design of registered project activity.

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

Not applicable as this is not an afforestation or reforestation project activity.

**SECTION C. Description of monitoring system****Data Collection Procedures**

The Monitoring and Verification (M&V) procedures define a project specific standard against which the project's performance (i.e. GHG reductions) and conformance with all relevant criteria is monitored and verified. It includes developing suitable data collection methods and data interpretation techniques for monitoring and verification of GHG emission with specific focus on technical performance parameters. It also allows scope for review, scrutiny and benchmarking of all this information against reports pertaining to M & V protocols. The monitoring plan is prepared considering in following areas of Project Activity:

1. Establishing and maintaining the appropriate monitoring systems for consumption of NG and electricity generated by the proposed project.
2. Quality control at Project Activity and measurements.
3. Assigning monitoring responsibilities to personnel.
4. Data storage and filing system

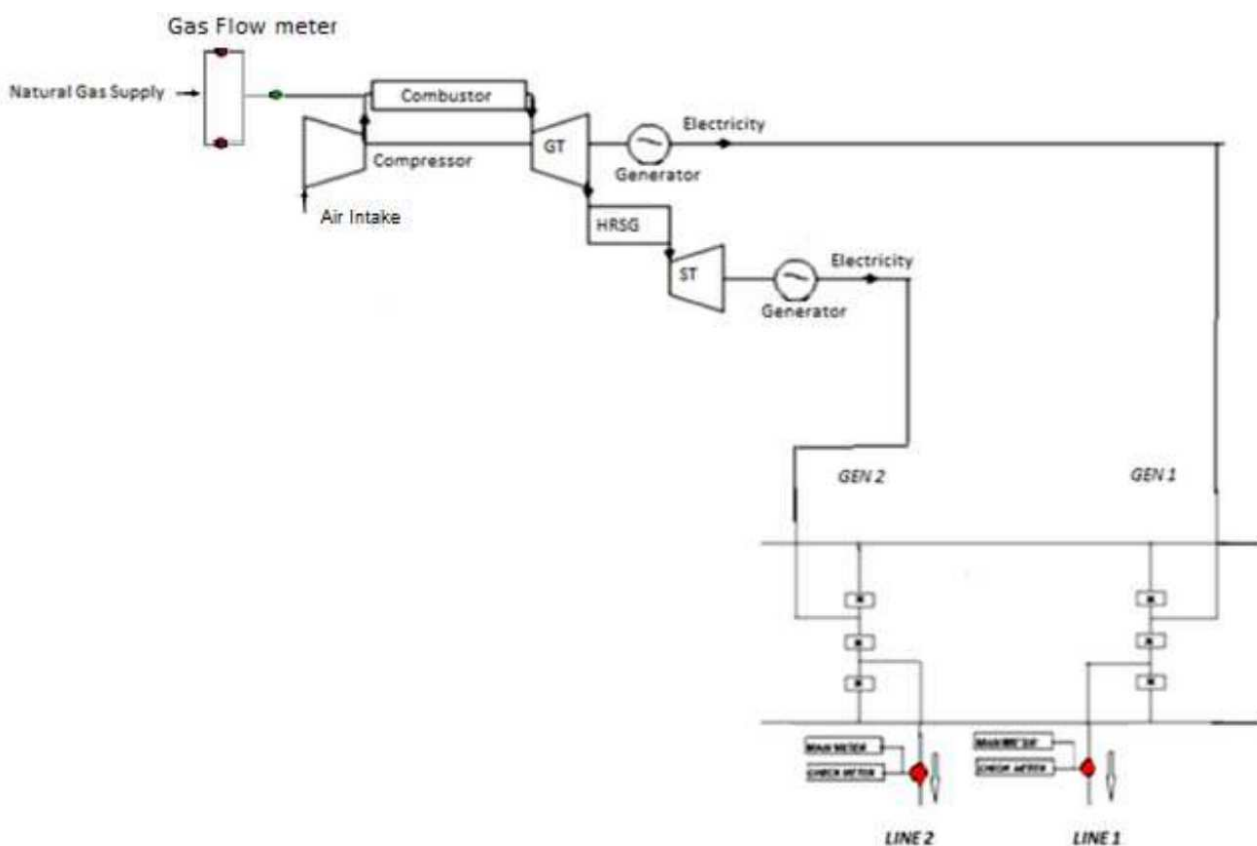
Project Management team structure follows below operations.

At the power plant level the project management team is basically engaged performing day to day activities related to operation and maintenance of the project. The team at the power plant level is primarily collecting the CDM data and maintaining all records related to CDM activities of the project.

The shift engineers is primarily responsible for primary data collection at the respective verticals & calibration. Shift engineer reports to Plant shift Manager (Operation). The Plant shift Manger (operation) review the data and reports to the Sr. Manager (operations). If the data reported by the shift engineers are found satisfactory the same is recorded in the Management Information System (MIS). In the event of any discrepancy, Sr. Manager (Operation) proposes the corrections in discussion with General Manager (O&M)-Plant. General Manager (O&M) reports to the Vice President (Operations).

The project management at the corporate level is basically engaged in overall project monitoring. The team at corporate level reviews power plant operations and also the data related to CDM activity of the project. General Manager-Finance (corporate is responsible for overall project coordination between the plant level and corporate office. Information pertaining to plant operation including CDM related data is reviewed by GM Finance. GM – Finance reports to whole time Director. In the event of any disconnect, GM – Finance suggest the corrective action to the plant officials in discussion with the whole time Director.

#### Schematic line diagram for metering locations:



The main meters involved in the project are 2 gas flow meter at supplier side, 1 check gas flow meter of PP, Gas chromatograph under supplier scope, electricity energy meters at substation.

The meter and calibration details involved in the project activity are as below:

#### Export/Import Energy Meter calibration details:

**Lanco Line 1**

Details	Main Meter	Check Meter
Serial No.	NP-5533 A	NP 5627 A
Make	L & T	L & T
Accuracy class	0.2s	0.2s
Calibration frequency	Once in 5 years	Once in 5 years
Last Calibration date	08/05/2012	09/05/2012
Calibration due date	08/05/2017	09/05/2017

**Lanco Line 2**

Details	Main Meter	Check Meter
Serial No.	NP-5543 A	NP 5489 A
Make	L & T	L & T
Accuracy class	0.2s	0.2s
Calibration frequency	Once in 5 years	Once in 5 years
Last Calibration date	09/05/2012	08/05/2012
Calibration due date	09/05/2017	08/05/2017

All the meters are located in the PGCIL substation meters and these are used for ER calculations and invoice is raised based on PGCIL substation meters. There is no any delay in calibration for energy meters and once in five years calibration frequency is followed during current monitoring period

**Gas flow Meter Calibration details:**

Location/Type	Meter Serial No.	Make	Accuracy Class	Last Calibration date	Valid till
Reliance Gas Flow Meter Stream 1	08-040024	Emerson Process	$\pm 0.23\%$	15/04/2015	14/04/2016
				27/01/2016	26/01/2017
Reliance Gas Flow Meter Stream 2	08-040025	Emerson Process	$\pm 0.23\%$	14/04/2015	13/04/2016
				27/01/2016	26/01/2017
PP side Check Meter	9090448	Daniel Measurement	$\pm 0.13\%$	17/04/2015	16/04/2016
				27/01/2016	26/01/2017

Considering the annual calibration frequency as mentioned in registered PDD, there is no delay in calibration in this monitoring period.

**Pressure Transmitter and Temperature Transmitter and Gas chromatograph calibration Details:**

Location/Type	Meter Serial No.	Make	Accuracy Class	Last Calibration date	Valid till

Pressure Transmitter for Reliance Gas Flow Meter Stream 1	1793074	Rosemount	+/-0.075%	26/10/2015	25/10/2016
				27/01/2016	26/01/2017
Pressure Transmitter for Reliance Gas Flow Meter Stream 2	1793066	Rosemount	+/-0.075%	26/10/2015	25/10/2016
				27/01/2016	26/01/2017
Temperature Transmitter Reliance Gas Flow Meter Stream 1	1793065	Rosemount	$\pm 0.1$ °C	26/10/2015	25/10/2016
				27/01/2016	26/01/2017
Temperature Transmitter Reliance Gas Flow Meter Stream 2	1793985	Rosemount	$\pm 0.1$ °C	26/10/2015	25/10/2016
				27/01/2016	26/01/2017

Location/Type	Meter Serial No.	Calibration date	Valid till
Gas Chromatograph	21482-1	26/10/2015	25/10/2016
		27/01/2016	26/01/2017

As per registered PDD, there is no any calibration frequency mentioned for Pressure Transmitter, Temperature Transmitter and Gas chromatograph. Thus, gas supplier follows calibration once in a month and for operational period only. The above calibration details are for project activity operational period only. Gas data and NCV of gas is taken directly from Gas Supplier. The NCV of gas is measured by using online gas chromatograph installed by gas supplier. As per OEM guidelines, the metering equipment's are installed and maintained. Since PDD does not mention any specific calibration frequency, The calibration is in supplier scope and PP do not have any control on it.

As explained above no any calibration delay is applicable for current monitoring period.

## SECTION D. Data and parameters

### D.1. Data and parameters fixed ex ante

Data/Parameter	EF <sub>BM,y</sub>
Unit	tCO <sub>2</sub> e/MWh
Description	Build Margin Emission factor of Southern Regional Electricity Grid
Source of data	CO <sub>2</sub> Baseline Database for Indian Power Sector" Version 5.0 dated 1st November 2009 published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO <sub>2</sub> Baseline Database for Indian Power Sector" is available at <a href="http://www.cea.nic.in">www.cea.nic.in</a>
Value(s) applied	0.818

Choice of data or measurement methods and procedures	Build Margin Emission Factor has been calculated by the Central Electricity Authority in accordance with "Tool to calculate the emission factor for an electricity system".
Purpose of data/parameter	To calculate baseline emissions
Additional comments	The data will be archived 2 years after the end of the crediting period or the last issuance of CERs.

<b>Data/Parameter</b>	EF <sub>OM,y</sub>						
Unit	tCO <sub>2</sub> e/MWh						
Description	Operating Margin Emission Factor of Southern Regional Electricity Grid						
Source of data	CO <sub>2</sub> Baseline Database for Indian Power Sector" Version 5.0 dated 1st November, 2009 published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO <sub>2</sub> Baseline Database for Indian Power Sector" is available at <a href="http://www.cea.nic.in">www.cea.nic.in</a>						
Value(s) applied	<table border="1"> <tr> <td>2006-07</td><td>0.999</td></tr> <tr> <td>2007-08</td><td>0.991</td></tr> <tr> <td>2008-09</td><td>0.973</td></tr> </table>	2006-07	0.999	2007-08	0.991	2008-09	0.973
2006-07	0.999						
2007-08	0.991						
2008-09	0.973						
Choice of data or measurement methods and procedures	Operating Margin Emission Factor has been calculated by the Central Electricity Authority using the simple OM approach in accordance with "Tool to calculate the emission factor for an electricity system".						
Purpose of data/parameter	To calculate baseline emissions						
Additional comments	The data will be archived 2 years after the end of the crediting period or the last issuance of CERs.						

<b>Data/Parameter</b>	<b>Carbon Emission Factor of Natural Gas (EF<sub>CO<sub>2</sub>,f,y</sub>)</b>
Unit	tCO <sub>2</sub> / GJ
Description	The CO <sub>2</sub> emission factor per unit of energy of natural gas in year 'y'
Source of data	IPCC default value has been applied (Source: Chapter-2 IPCC 2006 Guidelines for National Greenhouse Gas Inventories)
Value(s) applied	56.1 tCO <sub>2</sub> /TJ (=0.0561 tCO <sub>2</sub> /GJ)
Choice of data or measurement methods and procedures	As there are no national data available for the emission factor of the fuel used, default value based on Table 2.2 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories has been applied.
Purpose of data/parameter	To calculate project emissions
Additional comments	The data will be archived 2 years after the end of the crediting period or the last issuance of CERs.

<b>Data/Parameter</b>	<b>Oxidation Factor of Natural Gas</b>
Unit	--
Description	Oxidation factor of natural gas
Source of data	IPCC default value has been applied (Source: Chapter-2 IPCC 2006 Guidelines for National Greenhouse Gas Inventories)
Value(s) applied	1.0
Choice of data or measurement methods and procedures	As there are no national data available, IPCC default value based on is considered
Purpose of data/parameter	To calculate project emissions
Additional comments	

Data/Parameter	Station Heat Rate of the Project activity
Unit	kCal/kWh
Description	Station Heat Rate has been used to calculate the quantity of Natural Gas consumption associated with the expected electricity generations from the project activity. This data is used as an input for calculating Project Emissions.
Source of data	Detailed project report (DPR) The CERC tariff order dated 26th March, 2004 has also specified the SHR of combined cycle gas based power plant with advanced class machines 1850 kCal/ kWh. (Reference : <a href="http://www.cercind.gov.in/13042007/Terms_and_conditions_of_tariff.pdf">http://www.cercind.gov.in/13042007/Terms_and_conditions_of_tariff.pdf</a> )
Value(s) applied	1850
Choice of data or measurement methods and procedures	-
Purpose of data/parameter	To calculate project emissions
Additional comments	-

Data/Parameter	Carbon Emission Factor of Coal, Lignite, Diesel, Oil, Natural Gas
Unit	tCO <sub>2</sub> / TJ
Description	Emission factor of Coal, Lignite, Diesel, Oil, Natural Gas. This data is used as an input for calculating the fugitive CH <sub>4</sub> emissions occurring in the absence of the project activity
Source of data	Carbon Emission Factor for Coal, Lignite & Oil: Table 2.3 - India specific CO <sub>2</sub> emission coefficients, India's first National Communication to the United Nations Carbon Emission Factor for Diesel & Natural Gas: Table 1.4, 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 1, Volume 2, Energy
Value(s) applied	Refer to ER calculation sheet
Choice of data or measurement methods and procedures	As per AM0029, the fuel emission coefficient is to be determined based on national average fuel data if available. Accordingly we have used the data available in India's first national communication to the United Nations for our calculations where available, otherwise IPCC default values have been used.
Purpose of data/parameter	To calculate leakage emissions
Additional comments	-

Data/Parameter	Oxidation Factor of Coal, Lignite, Diesel, Oil, Natural Gas
Unit	--
Description	Oxidation factor of coal which has been identified as the baseline scenario fuel This data is used as an input for calculating the fugitive CH <sub>4</sub> emissions occurring in the absence of the project activity
Source of data	Table 1.4, 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 1, Volume 2, Energy
Value(s) applied	Refer to ER calculation sheet
Choice of data or measurement methods and procedures	Only IPCC values are available
Purpose of data/parameter	To calculate leakage emissions
Additional comments	--

Data/Parameter	Calorific values of Coal, Lignite, Diesel, Oil and Natural Gas Naphtha
Unit	kCal/kg or kCal/SCM
Description	This data is used as an input for calculating the Energy efficiency of coal fired power plants and the fugitive CH <sub>4</sub> emissions occurring in the absence of the project activity
Source of data	NCV of Coal – Table 6.3, CEA General Review 2006 NCV of Natural Gas, Diesel: CEA Data on Petroleum fuels used by various Gas Turbines and Diesel Engine Power Plants in India in 2003-04
Value(s) applied	Refer to ER calculation sheet
Choice of data or measurement methods and procedures	Central Electricity Authority, Government of India mandated to publish information on performance of power sector in India by the Electricity Act 2003.
Purpose of data/parameter	To calculate leakage emissions
Additional comments	--

Data/Parameter	$\eta_{BL}$ – Efficiency of coal fired power generating stations using sub-critical technology
Unit	--
Description	Energy efficiency of coal fired power plant using sub-critical technology which has been identified as the baseline scenario
Source of data	Calculated value based on fuel consumption, NCV of coal and electricity generation data of coal fired power stations published in the CEA carbon-dioxide emission database, version - 05
Value(s) applied	34.60%
Choice of data or measurement methods and procedures	Central Electricity Authority, Government of India mandated to publish information on performance of power sector in India by the Electricity Act 2003.
Purpose of data/parameter	-
Additional comments	-

Data/Parameter	Fuel consumption in coal fired power plants using sub-critical technology in the southern region																
Unit	Million Tonnes (MT)																
Description	This data is used as an input for calculating the Energy efficiency of coal fired power plants																
Source of data	CEA CO <sub>2</sub> Baseline database, version - 05																
Value(s) applied	<table border="1"> <thead> <tr> <th>Coal Based Power Station using sub-critical technology</th><th>Fuel Consumption Million Tonnes</th></tr> </thead> <tbody> <tr> <td>RAYAL SEEMA</td><td>1045.8</td></tr> <tr> <td>RAYAL SEEMA</td><td>1012.6</td></tr> <tr> <td>R_GUNDEM STPS</td><td>2574.4</td></tr> <tr> <td>SIMHADRI</td><td>2544.5</td></tr> <tr> <td>SIMHADRI</td><td>2774.7</td></tr> <tr> <td>RAICHUR</td><td>1115.0</td></tr> <tr> <td>BELLARY TPS</td><td>1016.3</td></tr> </tbody> </table>	Coal Based Power Station using sub-critical technology	Fuel Consumption Million Tonnes	RAYAL SEEMA	1045.8	RAYAL SEEMA	1012.6	R_GUNDEM STPS	2574.4	SIMHADRI	2544.5	SIMHADRI	2774.7	RAICHUR	1115.0	BELLARY TPS	1016.3
Coal Based Power Station using sub-critical technology	Fuel Consumption Million Tonnes																
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SIMHADRI	2774.7																
RAICHUR	1115.0																
BELLARY TPS	1016.3																

Choice of data or measurement methods and procedures	CEA CO <sub>2</sub> Baseline database, version – 05
Purpose of data/parameter	-
Additional comments	-.

Data/Parameter	Electricity Generation from coal-fired power plants using sub-critical technology in the Southern Region																				
Unit	GWh																				
Description	This data is used as an input for calculating the Energy efficiency of coal fired power plants																				
Source of data	CEA CO <sub>2</sub> baseline database, version -05																				
Value(s) applied		<table><tr><th>Coal Based Power Station usingsub-critical technology</th><th>Generation</th></tr><tr><td></td><th>GWh</th></tr><tr><td>RAYAL SEEMA</td><td>1,577</td></tr><tr><td>RAYAL SEEMA</td><td>1,527</td></tr><tr><td>R_GUNDEM STPS</td><td>3,919</td></tr><tr><td>SIMHADRI</td><td>3,865</td></tr><tr><td>SIMHADRI</td><td>4,215</td></tr><tr><td>RAICHUR</td><td>1,540</td></tr><tr><td>BELLARY TPS</td><td>1,106</td></tr></table>	Coal Based Power Station usingsub-critical technology	Generation		GWh	RAYAL SEEMA	1,577	RAYAL SEEMA	1,527	R_GUNDEM STPS	3,919	SIMHADRI	3,865	SIMHADRI	4,215	RAICHUR	1,540	BELLARY TPS	1,106	
Coal Based Power Station usingsub-critical technology	Generation																				
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BELLARY TPS	1,106																				
Choice of data or measurement methods and procedures	Central Electricity Authority, Government of India mandated to publish information on performance of power sector in India by the Electricity Act 2003. In order to facilitate baseline emissions relating to electricity generation activities, CEA has published a database of CO2 emission factors, version - 05 for all the regional grids in India. This database also contains information on electricity generation from all major thermal power stations in the country.																				
Purpose of data/parameter	--																				
Additional comments	--																				

Data/Parameter	CO <sub>2</sub> emissions from Build Margin Power plants in the southern region
Unit	tCO <sub>2</sub> e
Description	This data is used as an input for calculating the fugitive CH <sub>4</sub> emissions occurring in the absence of the project activity
Source of data	CEA CO <sub>2</sub> Baseline database, version 5,0
Value(s) applied	Refer to ER calculation sheet
Choice of data or measurement methods and procedures	Central Electricity Authority, Government of India mandated to publish information on performance of power sector in India by the Electricity Act 2003. In order to facilitate baseline emissions relating to electricity generation activities, CEA has published a database of CO <sub>2</sub> emission factors for all the regional grids in India. This database also contains information on CO <sub>2</sub> emissions of all major thermal power stations in the country.
Purpose of data/parameter	--
Additional comments	--

## D.2. Data and parameters monitored

Data/Parameter	FC <sub>t,y</sub>
Unit	Sm <sup>3</sup> (scum)
Description	Total volume of natural gas combusted in the project plant
Measured/calculated/default	Measured
Source of data	Fuel supplier data
Value(s) of monitored parameter	33226519.65
Monitoring equipment	Flow meters. Please refer the section C for meter details like make , serial number, accuracy class, calibration date and validity etc.
Measuring/reading/recording frequency	Measuring Frequency: continuously Recording Frequency: daily (refer the ER sheet)
Calculation method (if applicable)	Not applicable
QA/QC procedures	The value is taken from gas tickets received from RGTIL, fuel flow meter is installed at plant site (RGTIL) and readings are recorded daily. The values are correlated with fortnight joint ticket received from RGTIL fortnightly.  The meters are calibrated on annual basis.
Purpose of data/parameter	To calculate project and leakage emissions
Additional comments	100% data has been monitored

Data/Parameter	NCV <sub>t,y</sub>
Unit	kCal/scum
Description	The net calorific value (energy content) per volume unit of natural gas
Measured/calculated/default	Measured
Source of data	Fuel supplier data
Value(s) of monitored parameter	8804.538
Monitoring equipment	The average net calorific value of natural gas consumed has been provided by gas supplier and recorded by LKPPL for verification
Measuring/reading/recording frequency	Measuring Frequency: continuously Recording Frequency: Daily
Calculation method (if applicable)	Not applicable
QA/QC procedures	Since this parameter is supplied by gas supplier, no any QA/QC procedure is required.
Purpose of data/parameter	To calculate project and leakage emissions
Additional comments	The data will be archived electronically

Data/Parameter	EF <sub>CO<sub>2</sub>,f,y</sub>
Unit	tCO <sub>2</sub> /GJ
Description	CO <sub>2</sub> emission factor of natural gas
Measured/calculated/default	Default

Source of data	IPCC 2006 Default values for carbon emission factor
Value(s) of monitored parameter	0.0561
Monitoring equipment	<p>Default values for Carbon Emission Factor of Natural Gas as per Table 1.3 2006 IPCC Guidelines for National Greenhouse Gas Inventories, (Chapter 1, Volume 2, Energy) has been considered. This is also in conformity with the recommendations of the Initial National Communication (Chapter 2) where in it is mentioned that in the case of petroleum products and natural gas, the use of default emissions fairly accurate due to relatively low variation in quality of these fuels across the globe, as compared to coal. This data is recorded annually based on latest IPCC information available and is archived in electronic/paper form.</p> <p>Archived data will be kept up to two years from the end of crediting period or the last issuance, whichever occurs later.</p>
Measuring/reading/recording frequency	Annually
Calculation method (if applicable)	Not applicable
QA/QC procedures	No additional QA/QC procedures are required
Purpose of data/parameter	To calculate project emissions
Additional comments	Carbon Emission factor of natural gas updated as per the latest guidelines available from IPCC on national greenhouse gas inventory on year to year basis

<b>Data/Parameter</b>	<b>OXID<sub>f</sub></b>
Unit	--
Description	Oxidation factor of natural gas
Measured/calculated/default	Default
Source of data	IPCC
Value(s) of monitored parameter	1.0
Monitoring equipment	<p>Default values as per Table 1.4 Revised 2006 IPCC Guidelines National Greenhouse Gas Inventories: Reference Manual has been considered. This is also in conformity with the recommendations of the GHG inventory information report submitted by India's Initial National Communication (Chapter 2) where in it is mentioned that in the case of petroleum products and natural gas, the use of default emissions fairly accurate due to relatively low variation in quality of these fuels across the globe, as compared to coal. This data are recorded annually based on latest IPCC information available and is archived in electronic/paper form.</p> <p>Archived data will be kept up to two years from the end of crediting period or the last issuance, whichever occurs later.</p>
Measuring/reading/recording frequency	Annually
Calculation method (if applicable)	Not applicable
QA/QC procedures	No additional QA/QC procedures are required
Purpose of data/parameter	To calculate project and leakage emissions
Additional comments	Oxidation factor of natural gas updated as per the latest guidelines available from IPCC on national greenhouse gas inventory on year to year basis.

Data/Parameter	EG <sub>PJ,y</sub>
Unit	MWh
Description	Net electricity generation in the project plant during the year y
Measured/calculated/default	Measured
Source of data	The electronic meters installed at the grid inter connection point at 400 kV PGCIL Nunna sub-station
Value(s) of monitored parameter	171,215.73
Monitoring equipment	As per actual meter readings taken jointly by LKPPL and PGCIL. The daily readings are be archived electronically. Monthly joint meter readings are archived in paper form. Please refer the section C for meter details like make, serial number, accuracy class, calibration date and validity etc
Measuring/reading/recording frequency	Measuring and Recording Frequency: Monthly
Calculation method (if applicable)	Not applicable
QA/QC procedures	The meters are calibrated as per the standard procedures and documents for the same are maintained throughout. The accuracy of energy meter is 0.2 class
Purpose of data/parameter	To calculate baseline emissions
Additional comments	--

Data/Parameter	EF <sub>BM,y</sub>
Unit	tCO <sub>2</sub> /MWh
Description	Build margin emission factor of Southern grid
Measured/calculated/default	Default
Source of data	CO <sub>2</sub> Baseline Database for Indian Power Sector" published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO <sub>2</sub> Baseline Database for Indian Power Sector" version 13
Value(s) of monitored parameter	0.8723
Monitoring equipment	Build Margin Emission Factor is taken from the CO <sub>2</sub> Baseline database published by CEA. In case the CEA database is not updated, the project participant calculates the Build Margin number using the available CEA data.  This data is computed annually based on latest available information and is archived in electronic/paper form. Archived data is kept up to two years from the end of crediting period or the last issuance whichever occurs later
Measuring/reading/recording frequency	Annually
Calculation method (if applicable)	Not applicable
QA/QC procedures	No additional QA/QC procedures are required
Purpose of data/parameter	To calculate project emissions
Additional comments	--

Data/Parameter	EF <sub>BL,upstream, CH4</sub>
Unit	tCO <sub>2</sub> /MWh
Description	Emission factor for upstream fugitive methane emissions occurring in the absence of the project activity electricity generation

Measured/calculated/default	Calculated
Source of data	IPCC 2006 Default values for carbon emission factor
Value(s) of monitored parameter	0.0000569830
Monitoring equipment	EF <sub>BL,upstream,CH4</sub> is calculated for power plants included in the Build Margin in line with the baseline emission factor selection. Therefore in line with the AM0029 requirement of ex post determination of the Build Margin, the Emission factor for upstream fugitive methane emissions occurring in the absence of the project activity electricity generation (tCH <sub>4</sub> or tCO <sub>2</sub> e/ MWh) is also be determined ex post. This data is computed annually based on latest available information and is archived in electronic/paper form. Archived data is kept up to two years from the end of crediting period or the last issuance, which ever occurs later .
Measuring/reading/recording frequency	Annually
Calculation method (if applicable)	Not applicable
QA/QC procedures	No additional QA/QC procedures are required
Purpose of data/parameter	To calculate leakage emissions
Additional comments	

<b>Data/Parameter</b>	<b>COEF<sub>t,y</sub></b>
Unit	tCO <sub>2</sub> /m <sup>3</sup>
Description	CO <sub>2</sub> emission factor of natural gas – Quantity (COEF <sub>t,y</sub> )
Measured/calculated/default	Default
Source of data	Plant data and default value
Value(s) of monitored parameter	0.002051
Monitoring equipment	Not applicable
Measuring/reading/recording frequency	Annually
Calculation method (if applicable)	CO <sub>2</sub> emission factor of Natural Gas Quantity (COEF <sub>t,y</sub> ) is calculated using (i) calorific value of natural gas (ii) CO <sub>2</sub> Emission coefficient for natural gas in energy units as follows: COEF <sub>t,y</sub> : CO <sub>2</sub> emission factor of Natural Gas energy (tCO <sub>2</sub> e/TJ) * Calorific value of Natural Gas (KJ/SCM).
QA/QC procedures	No additional QA/QC procedures are required
Purpose of data/parameter	To calculate leakage emissions
Additional comments	--

### D.3. Implementation of sampling plan

Sampling is not required for this project activity

## SECTION E. Calculation of emission reductions or net anthropogenic removals

### E.1. Calculation of baseline emissions or baseline net removals

The baseline emissions are calculated as below

$$\begin{aligned}
 BE_y &= EG_{PJ,y} * EF_{BL,CO_2,y} \\
 &= 171,215.73 \text{ MWh} * 0.8723 \text{ tCO}_2 / \text{MWh} \\
 &= 149,351 \text{ tCO}_2 \text{ (round-down value)}
 \end{aligned}$$

**Total Baseline Emissions (BE<sub>y</sub>) = 149,351 tCO<sub>2</sub> (round-down value)**

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

As per registered PDD, the project emissions are calculated as below

$$\begin{aligned}
 COEF_{f,y} &= NCV_{f,y} * EF_{CO_2,f,y} * OXID_f \\
 &= 0.036865 \text{ GJ/sm}^3 * 0.0561 \text{ tCO}_2/\text{GJ} * 1 \\
 &= 0.0020681 \text{ tCO}_2/\text{sm}^3
 \end{aligned}$$

$$\begin{aligned}
 PE_y &= FC_{f,y} * COEF_{f,y} \\
 &= 33,226,519.65 \text{ sm}^3 * 0.0020681 \text{ tCO}_2/\text{sm}^3 \\
 &= 68,716 \text{ tCO}_2 \text{ (round-up value)}
 \end{aligned}$$

Therefore, **Project Emissions( PE<sub>y</sub>)= 68,716 tCO<sub>2</sub>e (round-up value)**

## E.3. Calculation of leakage emissions

As per registered PDD, The total leakage emissions are Leakage emissions due to fugitive upstream CH<sub>4</sub> emissions (LE<sub>CH<sub>4</sub>,y</sub>) and 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<sub>LNG,CO<sub>2</sub>,y</sub>) are calculated as below Thus, LE<sub>y</sub> = LE<sub>CH<sub>4</sub>,y</sub> + LE<sub>LNG,CO<sub>2</sub>,y</sub>

As per registered PDD, Leakage emissions due to fugitive upstream CH<sub>4</sub> emissions are calculated as below LE<sub>CH<sub>4</sub>,y</sub> = [FC<sub>f,y</sub> \* NCV<sub>f,y</sub> \* EF<sub>NG, upstream,CH<sub>4</sub></sub> - EG<sub>PJ,y</sub> \* EF<sub>BL, upstream, CH<sub>4</sub></sub>]\*GWP<sub>CH<sub>4</sub></sub> = [33,226,519.65 sm<sup>3</sup> \* 0.036865 GJ/m<sup>3</sup> \* 0.000296 tCH<sub>4</sub>/GJ - 171,215.73 MWh \* 0.000569830 tCH<sub>4</sub>/MWh] \* 25 = 6,625.03 tCO<sub>2</sub>

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<sub>LNG,CO<sub>2</sub>,y</sub>) is calculated as below:

$$\begin{aligned}
 LE_{LNG,CO_2,y} &= FC_{LNG,y} * EF_{CO_2, upstream,LNG} \\
 &= 0.00 \text{ TJ} * 6 \text{ t CO}_2/\text{TJ} = 0 \text{ tCO}_2
 \end{aligned}$$

$$\begin{aligned}
 LE_y &= LE_{CH_4,y} + LE_{LNG,CO_2,y} \\
 &= 6,625.03 \text{ tCO}_2 + 0 \text{ tCO}_2 = 6,626 \text{ tCO}_2 \text{ (round-up value)}
 \end{aligned}$$

Therefore,

**Leakage Emissions (LE<sub>y</sub>) = 6,626 tCO<sub>2</sub>e (round-up value)**

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

	Baseline GHG emissions or baseline net GHG removals (t CO <sub>2</sub> e)	Project GHG emissions or actual net GHG removals (t CO <sub>2</sub> e)	Leakage GHG emissions (t CO <sub>2</sub> e)	GHG emission reductions or net anthropogenic GHG removals (t CO <sub>2</sub> e)			
				Before 01/01/ 2013	From 01/01/ 2013 until 31/12/ 2020	From 01/01/ 2021	Total amount
<b>Total</b>	149,351	68,716	6,626	0	74,009	0	74,009

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

Amount achieved during this monitoring period (t CO <sub>2</sub> e)	Amount estimated ex ante for this monitoring period in the PDD (t CO <sub>2</sub> e)
74,009	971,142

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

Considering the annual average emission reductions as per the registered PDD which is 830,133 tCO<sub>2</sub>e per year, the number of days covered during the current monitoring period comes out to be 427 days, based upon which the estimated emission reductions attributed to this monitoring period comes out to be 971,142 tCO<sub>2</sub>e. The detailed calculation can be referred from the emission reduction sheet.

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

During this project activity, the actual emission reductions obtained is lower than the estimated value. This difference has occurred due to less availability of NG gas during monitoring period and hence the project activity couldn't generate the estimated power. Therefore, less amount of power has been exported to the grid which resulted in lower number of emission reductions from project activity.

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

Not applicable as this is a large-scale project activity.

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**Document information**

<i>Version</i>	<i>Date</i>	<i>Description</i>
08.0	6 April 2021	Revision to: <ul style="list-style-type: none"> <li>• Reflect the “Clarification: Regulatory requirements under temporary measures for post-2020 cases” (CDM-EB109-A01-CLAR).</li> </ul>
07.0	31 May 2019	Revision to: <ul style="list-style-type: none"> <li>• Ensure consistency with version 02.0 of the “CDM project standard for project activities” (CDM-EB93-A04-STAN);</li> <li>• Add a section on remarks on the observance of the scale limit of small-scale project activity during the crediting period;</li> <li>• Add "changes specific to afforestation or reforestation project activity" as a possible post-registration changes;</li> <li>• Clarify the reporting of net anthropogenic GHG removals for A/R project activities between two commitment periods;</li> <li>• Make editorial improvements.</li> </ul>
06.0	7 June 2017	Revision to: <ul style="list-style-type: none"> <li>• Ensure consistency with version 01.0 of the “CDM project standard for project activities” (CDM-EB93-A04-STAN);</li> <li>• Make editorial improvements.</li> </ul>
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: <ul style="list-style-type: none"> <li>• Include provisions related to delayed submission of a monitoring plan;</li> <li>• Provisions related to the Host Party;</li> <li>• Remove reference to programme of activities;</li> <li>• Overall editorial improvement.</li> </ul>
04.0	25 June 2014	Revisions to: <ul style="list-style-type: none"> <li>• Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0));</li> <li>• Include provisions related to standardized baselines;</li> <li>• Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1;</li> <li>• Change the reference number from <i>F-CDM-MR</i> to <i>CDM-MR-FORM</i>;</li> <li>• Editorial improvement.</li> </ul>
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.

<i>Version</i>	<i>Date</i>	<i>Description</i>
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB 70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01.0	28 May 2010	EB 54, Annex 34. Initial adoption.
Decision Class: Regulatory Document Type: Form Business Function: Issuance Keywords: monitoring report		