MONITORING REPORT FORM (F-CDM-MR)
Version 02.0

MONITORING REPORT

Title of the project activity	SHYAM DRI WHR CPP
Reference number of the project activity	1642
Version number of the monitoring report	01
Completion date of the monitoring report	28/09/2012
Registration date of the project activity	25/03/2009
Monitoring period number and duration of this monitoring period	Monitoring Period-02 01/04/2010 -31/03/2012 (First and Last days included)
Project participant(s)	Shyam Metalics And Energy Limited (Formerly known as SHYAM DRI Power Ltd.)
Host Party(ies)	INDIA
Sectoral scope(s) and applied methodology(ies)	Sectoral Scope :- 01 Methodology :- "Consolidated baseline methodology for waste gas and/or heat and/or pressure for power Generation" ACM0004/ Version 02
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	188606 tCO_2
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	183617 tCO_2

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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The purpose of the proposed project activity is to generate electricity by generating steam using waste heat contained in the waste flue gases released from 2 numbers of ABC (After Burning Chamber) from two numbers of DRI (Direct Reduced Iron) sponge iron kiln having 350 TPD (Tonnes per day) X 2 Nos. The heat contained in waste gases will be transferred to water which converts water in to steam in two numbers of WHRBs (Waste Heat Recovery Boilers 38tph each) producing aggregate 76 tph (tonnes per hour) steam at 66 kg/cm2 pressure and 490±50C temperature to generate total 15 MW electricity from Waste Heat.

The purpose of the project activity is to achieve better energy efficiency, achieve sustainable development in the industry and improve the working environment of Sponge Iron-making process. The power so generated shall mainly be used to meet the captive power requirement of Shyam DRI Plant itself.

The net result is reduction in the demand of electricity from coal based captive power generation and resultant reduction in GHG emission

The following equipments were installed at the project activity:

S.No.	Major equipments	Specification		Commissioning date
1.	Waste Heat Recovery Boiler #1	Steam Generation Capacity	38 tph	02/06/2007
		Steam Temp.	490 ± 5^0C	
		Steam Pressure	66 kg/cm^2	
2.	Waste Heat Recovery Boiler #2	Steam Generation Capacity	38 tph	20/06/2007
		Steam Temp.	490 ± 5^0C	
		Steam Pressure	66 kg/cm^2	
3.	Coal based AFBC (Atmospheric Fluidized Bed Combustion)	Steam Generation Capacity	54 tph	01/05/2007
		Steam Temp.	490 ± 5^0C	
		Steam Pressure	67 kg/cm^2	
4.	STG (Steam Turbo Generator)	Power generation capacity	30 MW	28/02/2007
		Inlet steam flow	117 tph	
		Steam Temp.	485 ± 5^0C	

		Steam Pressure	63.7 kg/cm^2	

The project started it's commercial production on 12/07/2007 by synchronization with grid.

This monitoring report includes the period 01/04/2010 to 31/03/2012, in this period project activity reduced about 183617 tCO_2.

A.2. Location of project activity

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The company is located at Village:Pandloi & Nishanbanga P.O. Lapanga/Rengali, Sambalpur District, Orrisa State of INDIA, at Plot No. & Chaka No. 981/1293, 949/1295, 1231/1349, 986, 1001/1382 & 1231/1383 and Khatiar Sl.No.116/192 of PS-Kararbaga, about 35 KM from Sambalpur, Railway Station on State Highway No.10. Longitude= E 84^0 2'35" Latitude=N 21^0 40'50''

A.3. Parties and project participant(s)

Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (host) **Ministry of Environment and Forest**	Shyam Metalics And Energy Limited (Formerly known as **SHYAM DRI Power Ltd.** (Private entity)	No

A.4. Reference of applied methodology

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Consolidated baseline methodology for waste gas and/or heat and/or pressure for power generation.ACM0004/ Version 02, Sectoral scope : 01, 3rd March 2006 and ACM0002 Sectoral scope : 01 of EB-36.

A.5. Crediting period of project activity

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Type - Fixed
Monitoring Period -02
Start date of crediting period: 25/03/2009
Length of Crediting period: 25/03/2009 to 24/03/2019

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

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Project activity was implemented at single site whose coordinates are given in section A-3.

Project Activity is implemented in single phase and the major equipments commissioning dates are as given section A.1.

The commercial power generation is started on 12/07/2007 by synchronization with grid.

B.2. Post registration changes

B.2.1. Temporary deviations from registered monitoring plan or applied methodology

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There is no change in registered monitoring plan or applied methodology.

B.2.2. Corrections

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There is no correction.

B.2.3. Permanent changes from registered monitoring plan or applied methodology

>>

Not applicable

B.2.4. Changes to project design of registered project activity

>>

Not applicable.

B.2.5. Changes to start date of crediting period

>> Not applicable.

B.2.6. Types of changes specific to afforestation or reforestation project activity

>> Not applicable.

SECTION C. Description of monitoring system

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1.0	**GHG Performance Parameter**
1.1	The monitoring protocol requires SHYAM DRI to monitor the following GHG Performance parameters for estimating the emissions reductions from the waste heat based CPP: • Gross generation of electricity by the CPP • Auxiliary consumption • Net quantity of steam available from the waste heat recovery boiler (WHRB-1&2) for electricity generation in CPP. • Total Steam availability to and consumed in TG sets. • Temperature and pressure of steam from WHRB boiler. • Net electricity generation from waste heat recovery. • Gross quantity of power imported and or exported from and to the grid.
2.0	**Metering System**
2.1	The metering system for the waste heat based CPP consist of • Internal metering system calibrated and sealed by Deputy Electrical Inspector Generation for metering total generation from each TG Set. • In house metering system of SHYAM DRI for metering the generation of power, auxiliary consumption, • Steam Flow meters for monitoring net steam flow from WHRB-1 & 2 after the vent before the common header at entry port. • Flow meter for steam inlet to turbine TG. • Temperature gauge for WHRB-1&2, boiler.

	• Pressure gauge for WHRB-1 & 2 boiler.
	The two numbers TG meters are located in the TG room itself. They are used to monitor SHYAM DRI's net electricity and total generation from the CPP. These meters are maintained and calibrated by SHYAM DRI. All these meters are cross calibrated from standard testing laboratory Govt of Orissa, Bhubaneshwar and sealed by DEI(G).
2.2	**In house Metering System of SHYAM DRI** SHYAM DRI has an in-house metering system, which monitors the overall performance of the waste heat based CPP. The metering system mainly comprises of three meters. • 1 in-house generation meter- One for TG set. • In-house Auxiliary consumption meter. (one) The in-house generation meters (or the Energy Meter) and consumption meters are micro-processor based metering device which monitor the net unit of Energy generated and auxiliary electricity consumed by SHYAM DRI's CPP. In-house captive auxiliary power consumption meters (or the Kilowatt Hour meter) are mainly micro-processor based metering device. In case or requirement the SHYAM DRI may also install the normal energy meters at various location. The number and place of metering can be changed to suit the actual field requirement. Installation of all such meters will be well documented. All the meters will be calibrated from the reputed agencies.
3.0	**Calibration of the Metering System**
3.1	All the metering devices are calibrated at regular intervals so that the accuracy of measurement is ensured all the time. The meters recording total generation is calibrated by standard testing laboratory Govt of Orissa, Bhubaneshwar and sealed by DEI(G). The other meters are calibrated internally as per suppliers calibration schedule following the standard procedures for calibration.
4.0	**Reporting of the Monitored Parameters/ Authority and Responsibility of monitoring and reporting**
4.1	**Metering System** The SHYAM DRI personnel read the power generation from metering system for recording the net electricity and the total generation from the CPP on the last day of every month or First day of the subsequent month and keep the complete and accurate records for proper administration. In case of requirement the accuracy of the main meter reading may be substantiated by the check meter reading. In the event that the main meter is not at service, then the check meter shall be used. A monthly report is prepared based on the meter readings, which is sent to the Electrical Inspector as monthly legal return. The Shift Engineer (Electrical) takes daily reading (at 6.00 AM) of the Main meters of the metering system and keeps the complete and accurate records in the reading book (maintained at the plant) for proper administration. The reading are verified by the Manager (Electrical and Instrumentation) on a daily basis and sent to the General Manager (Plant) at the Administrative Building in the plant for his review and for preparing the daily report. The import & export of power shall be monitored on monthly basis by the Grid authorities and the PP.
4.2	**In-house Metering System of SHYAM DRI** The Shift Engineer (Electrical) monitors shift wise and eight hourly data on total generation, auxiliary consumption, net electricity available. The shift data or eight hourly data are recorded in the log book. The complete and accurate records in the

	log book are signed by the Shift Engineer (Electrical). Both of these reports are sent to the Manager (Electrical & Instrumentation) for his review on a daily basis. On the basis of the reported parameters, a complete and accurate executive daily summary report is prepared and signed by the General Manager (Electrical & Instrumentation) and sent to the unit head for proper administration. The flow meter reading, temperature and pressure gauge and DCS will measure the respective parameters and reporting is done shift wise by shift in-charge (operations) based on the online measurements.
5.	**Uncertainties and Adjustments:**
5.1	The shift wise or eight hourly, daily and monthly data are recorded at various points as stated above. Any observations (like inconsistencies of reported parameters) and/or discrepancies in the operation of the power plant will be documented as "History" in the daily report prepared by the General Manager (Plant) along with its time of occurrence, duration and possible reasons behind such operational disruptions. Necessary corrective actions will be undertaken at the earliest. Any discrepancies in the Main reading for example, difference between main meter and check meter reading or extreme deviation in the net generation figure, if identified, will immediately be brought to the notice of General Manager, as well as Electrical Inspector. Corrective actions to be undertaken at the earliest after identification of reason of such discrepancy. Furthermore, as a safety measure, the total power generating system is equipped with an Automatic Alarming System which gives a prior indication of any fluctuations in the operating parameters of the power plant thereby enabling the operators to take necessary preventive measures. These measures will be undertaken in order to detect and minimize the uncertainty levels in data monitoring.
6.0	**Experience and Training**
6.1	All the Shift Engineers (Electrical and Instrumentation, Operations) are qualified engineers/ technologists. All the operators of the boiler power plant are IBR certified and NPTI certified engineers, and they also undergo an exhaustive on-the-job training program including plant operations, data monitoring and report preparation.
6.2	**Emergency Preparedness Plan** The total power generating system of the waste heat based CPP is equipped with an "Automatic Alarming System" which helps the operators to take necessary preventive actions before any kind of non-functioning of the power plant results in. SHYAM DRI. CPP has a fire fighting system in place. In addition SHYAM DRI has standard procedures for tackling emergencies arising from • Blackout • Low boiler drum level/ low feed water level • High flue gas temperature from sponge iron kiln. • Load throw off • Boiler Tube leakage. • Boiler tripping at alarm systems.
(f)	**Reference**

	Project Design Document, maintenance manuals and standard OEM procedures.
	Records 1. Log Book, maintained by electrical & instrumentation department at site, containing daily data for all the in-house metering system. 2. Daily Executive Summary submitted to the Vice president/General Manger (Plant), prepared by electrical & instrumentation department at site containing daily data for all the in-house metering system and record of any history with details. 3. Daily report containing the performance parameters of the power plant and record of any history with details, maintained at site with a copy being sent to the unit head of the SHYAM DRI . 4. Monthly Report on net quantity of electricity generated at SHYAM DRI's Captive Power Plant and Electricity Duty returns submitted by SHYAM DRI on generation archived at site with a copy being sent to the unit head of SHYAM DRI. Monthly report shall contain the gross quantity of power imported and/or exported by the facility 5. Calibration certificate of the meters maintained at site.

(A) Purpose

To define the procedures and responsibilities for GHG Performance, Project Management , Registration, Monitoring, Measurement and Reporting of data and dealing with uncertainties.

(B) Scope

This procedure is applicable to 15 MW waste heat based i.e. WHRB power project of SHYAM DRI, India.

(C) Authorities and Responsibilities of Project Management, Registration, Monitoring, Measurement and Reporting:

Shift Engineer (Operations): Responsible for reporting shift wise or eight hourly data of the steam generated from boilers, steam fed to turbines, parameters of steam and flow meter reading of the Captive Power Plant. The report is then sent to the Manager (O & M) for his review.

Manager/Sr. Manager (O&M) : Responsible for reviewing the monitored parameters on an eight hourly or shift based and presenting a daily executive summary report, duly signed by himself, to the General Manager (Plant).

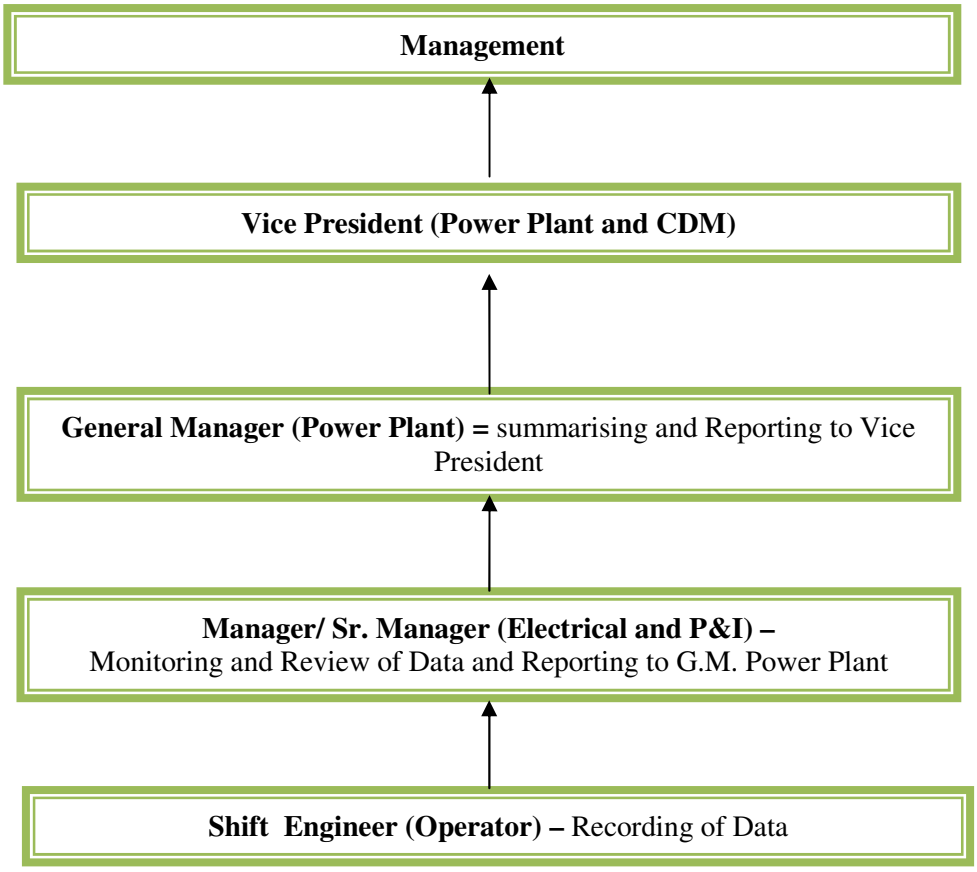
Shift Engineer (Electrical): Responsible for taking meter reading for electricity generation and wheeling shift-wise. The report is then sent to the Manager (E&I) for his review on a daily basis.

Manager/Sr. Manager (E&I): Responsible for reviewing the monitored parameters shift-wise and presenting a daily executive summary report, duly signed by himself, to the General Manager (Plant). Also responsible for the monthly joint meter reading for the import and or export of power from the facility from and to the grid.

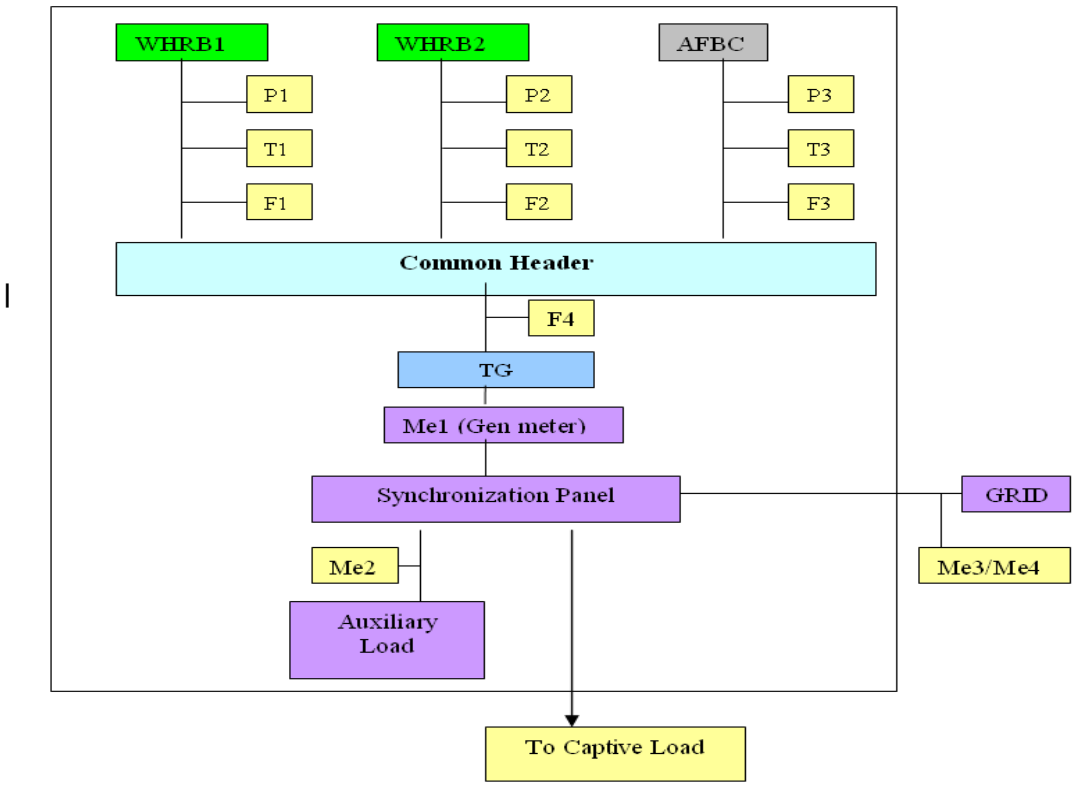
General Manager / Vice President (Plant): Responsible for summarizing data of Electrical, Mechanical, Process (/operation) Departments and report the same to the Vice President (Power) and CMD (SHYAM DRI) on a daily basis.

Institutional arrangement for recording and record keeping

Organisation Chart



Schematic Drawing and Details of Monitoring Plan and Metering Points :



Steam Monitoring Parameter	**Metering Point**
Pressure at Outlet of WHRB-1	P_1
Pressure at Outlet of WHRB-2	P_2
Pressure at Outlet of AFBC	P_3
Temperature of Outlet of WHRB-1	T_1
Temperature at Outlet of WHRB-2	T_2
Temperature at Outlet of AFBC	T_3
Flow of steam at Outlet of WHRB-1 (after vent)	F_1
Flow of steam at Outlet of WHRB-2 (after vent)	F_2
Flow of steam at Outlet of AFBC (after vent)	F_3
Net of Flow of steam in to TG	F_4

Electrical Parameter

Electrical Monitoring Parameter	
Gross Power Generation from TG	Me_1
Auxiliary consumption meter	Me_2
Gross quantity of Power Imported from the Grid(EG_{IMPORT}[1])	Me3
Gross quantity of Power Exported to the Grid(EG_{EXPORT})[6]	Me4

[1] Me3 and Me4 data will be recorded normally by a single meter having facility to record import of power and export of power.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante or at renewal of crediting period

(Copy this table for each piece of data and parameter.)

Data/Parameter	$EFCO_2 i$
Unit	tC/TJ
Description	CO_2 emission factor of fuel used in captive power generation
Source of data	IPCC guidelines
Value(s) applied	26.2
Purpose of data	To calculate emission factor
Additional comment	Nil

Data/Parameter	$EF_{captive,y}$
Unit	tCO_2 eq./MWh
Description	Emission factor for captive power generation
Source of data	Calculated
Value(s) applied	1.26
Purpose of data	To calculate baseline emission
Additional comment	Nil

D.2. Data and parameters monitored

(Copy this table for each piece of data and parameter.)

Data/Parameter	$EG_{GEN\ CPP}$
Unit	MWh
Description	Gross electricity generated by entire CPP
Measured/Calculated /Default	Measured
Source of data	Data is measured through the electronic meter provided at the output of TG. (This meter is referred as Me1 in line diagram provided in Section C above)
Value(s) of monitored parameter	373552
Monitoring equipment	

Type	Accu-racy class	Serial Number	Calib-ration frequency	Date of last calibration	Validity
Electronic Energy Metter	0.5	6607878	Yearly	30/03/2012	29/03/2013
Electronic Energy Metter	0.5	6607878	Yearly	25/03/2011	24/03/2012
Electronic Energy Metter	0.5	6607878	Yearly	26/03/2010	25/03/2011

Measuring/Reading/ Recording frequency	The data is measured continuously through electronic energy meter, the data is recorded on eight hourly basis in logbook, Logbook is signed by plant manager daily. The instantaneous generation from project facility is shown in DCS.
Calculation method (if applicable)	Measured
QA/QC procedures	Meters are calibrated regularly. The meters are regularly under QC/QA procedure for any variation. If variation noticed the recalibration is done immediately.
Purpose of data	To calculate baseline emission
Additional comment	Nil

<table>
<tr><td>Data/Parameter</td><td>$EG_{AUX\ CPP}$</td></tr>
<tr><td>Unit</td><td>MWh</td></tr>
<tr><td>Description</td><td>Auxiliary electricity consumption by entire CPP
(This meter is referred as Me2 in line diagram provided in Section C above)</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Measured</td></tr>
<tr><td>Source of data</td><td>Data is measured through the electronic meters provided at the feed to each auxiliary consumption source. The meters readings is summed up to arrive total auxiliary consumption. This data is transferred to log book to be maintained by shift engineer, approved by shift in charge as the daily report.</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>35868.45[2]</td></tr>
<tr><td>Monitoring equipment</td><td>
<table>
<tr><th>S. No.</th><th>Type</th><th>Accu-racy class</th><th>Serial Number</th><th>Calibration frequency</th><th>Date of last calibration</th><th>Validity</th></tr>
<tr><td>1</td><td>Electronic Energy Metter#1</td><td>1</td><td>98001/2-2406</td><td>Yearly</td><td>18/11/2011</td><td>17/11/2012</td></tr>
<tr><td>2</td><td>Electronic Energy Metter#1</td><td>1</td><td>98001/2-2406</td><td>Yearly</td><td>19/11/2010</td><td>18/11/2011</td></tr>
<tr><td>3</td><td>Electronic Energy Metter#1</td><td>1</td><td>98001/2-2406</td><td>Yearly</td><td>25/11/2009</td><td>24/11/2010</td></tr>
<tr><td>4</td><td>Electronic Energy Metter#2</td><td>1</td><td>98001/3-2406</td><td>Yearly</td><td>18/11/2011</td><td>17/11/2012</td></tr>
<tr><td>5</td><td>Electronic Energy Metter#2</td><td>1</td><td>98001/3-2406</td><td>Yearly</td><td>19/11/2010</td><td>18/11/2011</td></tr>
<tr><td>6</td><td>Electronic Energy Metter#2</td><td>1</td><td>98001/3-2406</td><td>Yearly</td><td>25/11/2009</td><td>24/11/2010</td></tr>
</table>
</td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>The data is continuously recorded and logged in daily basis.</td></tr>
<tr><td>Calculation method (if applicable)</td><td>Measured</td></tr>
<tr><td>QA/QC procedures</td><td>Meters are calibrated on regular basis (once in year).</td></tr>
<tr><td>Purpose of data</td><td>To calculate baseline emission</td></tr>
<tr><td>Additional comment</td><td>Nil</td></tr>
</table>

[2] In this emergency power supplied from DG sets are included.

Data/Parameter	$EG_{y, CPP}$
Unit	MWh
Description	Net electricity generated by entire CPP
Measured/Calculated /Default	Calculated
Source of data	Calculation
Value(s) of monitored parameter	337683.54
Monitoring equipment	Calculated
Measuring/Reading/ Recording frequency	Calculated based on measured data on daily basis, and aggregated once of the period "y"
Calculation method (if applicable)	calculated based on formulae: $EG_{y, CPP} = EG_{GEN\ CPP} - EG_{AUX\ CPP}$
QA/QC procedures	Calculated based on measured data.
Purpose of data	To calculate baseline emission
Additional comment	Nil

Data/Parameter	E_{GEN}
Unit	MWh
Description	Gross electricity generation due to WHRB
Measured/Calculated /Default	Calculated
Source of data	Calculated based on measured data
Value(s) of monitored parameter	161208
Monitoring equipment	Calculated
Measuring/Reading/ Recording frequency	Calculated once of the period "y"
Calculation method (if applicable)	Calculated by multiply the "% Contribution of Enthalpy of Steam from WHRB" to "Gross Electricity Generated by TG(E_{GEN})"
QA/QC procedures	Calculated based on measured data.
Purpose of data	To calculate baseline emission
Additional comment	Nil

Data/Parameter	E_{AUX}
Unit	MWh
Description	Auxiliary electricity consumption for WHRB electricity generation
Measured/Calculated /Default	Calculated
Source of data	Calculated based on measured data
Value(s) of monitored parameter	15480
Monitoring equipment	Calculated
Measuring/Reading/ Recording frequency	Calculated once of the period "y"
Calculation method (if applicable)	Calculated by multiply the "% Contribution of Enthalpy of Steam from WHRB" to "Auxiliary Electricity consumption by entire CPP(E_{AUX})"
QA/QC procedures	Calculated based on measured data.
Purpose of data	To calculate baseline emission
Additional comment	Nil

Data/Parameter	EGy
Unit	MWh
Description	Net electricity generated due to WHRB
Measured/Calculated /Default	Calculated
Source of data	Calculated based on measured data
Value(s) of monitored parameter	145728
Monitoring equipment	Calculated
Measuring/Reading/ Recording frequency	Calculated once of the period "y"
Calculation method (if applicable)	Calculated based on formulae: $EG\ y = E_{GEN} - E_{AUX}$
QA/QC procedures	Calculated based on measured data.
Purpose of data	To calculate baseline emission
Additional comment	Nil

Data/Parameter	Steam Temp. (T1, TG2 & T3)
Unit	^{0}C
Description	Temperature of steam at outlet of WHRB-1, WHRB-2 and AFBC (Steam Temp.(T1, T2 & T3)
Measured/Calculated /Default	Measured
Source of data	The temperature meters are provided at the output of WHRB-1, WHRB-2 and AFBC. The meter readings are available on DCS continuously and same is transferred to log book to be maintained by shift engineer, approved by shift in charge as the daily report

Value(s) of monitored parameter

Tag No.	Minimum for monitoring period.	Maximum for monitoring period	Average for the monitoring period
T1	476.3	493.1	485.5
T2	472.3	491.7	488.8
T3	474.5	493.5	483.9

Monitoring equipment

Type	Accu-racy class	Serial Number	Calibra-tion frequ-ency	Date of last calibration	Validity
Temperature meter of WHRB-1					
Temp. Transmitter Make "Rosemount"	0.1%	231360	Yearly	10/12/2011	09/12/2012
Temp. Transmitter Make "Rosemount"	0.1%	231360	Yearly	20/12/2010	19/12/2011
Temp. Transmitter Make "Rosemount"	0.1%	231360	Yearly	27/12/2009	26/12/2010
Temperature meter of WHRB-2					
Temp. Transmitter Make "Rosemount"	0.1%	231361	Yearly	10/12/2011	09/12/2012
Temp. Transmitter Make "Rosemount"	0.1%	231361	Yearly	20/12/2010	19/12/2011
Temp. Transmitter Make "Rosemount"	0.1%	231361	Yearly	27/12/2009	26/12/2010
Temperature meter of AFBC					
Temp.	0.1%	250462	Yearly	10/12/2011	09/12/2012

	Transmitter Make "Rosemount"					
	Temp. Transmitter Make "Rosemount"	0.1%	250462	Yearly	20/12/2010	19/12/2011
	Temp. Transmitter Make "Rosemount"	0.1%	250462	Yearly	27/12/2009	26/12/2010

Measuring/Reading/ Recording frequency	The data is measured continuously through temperature transmitter, reading is available at DCS, DCS data will used in logbook.
Calculation method (if applicable)	Measured
QA/QC procedures	Meters are calibrated regularly
Purpose of data	To calculate baseline emission
Additional comment	Nil

<table>
<tr><td>Data/Parameter</td><td>Steam Pressure (P1& P2)</td></tr>
<tr><td>Unit</td><td>Kg/cm^2</td></tr>
<tr><td>Description</td><td>Pressure of steam at outlet of WHRB-1 and WHRB-2 (Steam Pressure (P1, P2))</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Measured</td></tr>
<tr><td>Source of data</td><td>The steam pressure gauge are provided at the output of WHRB-1, WHRB-2. The meter readings are available on DCS continuously and same is transferred to log book to be maintained by shift engineer, approved by shift in charge as the daily report</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>
<table>
<tr><td>Tag No.</td><td>Minimum for monitoring period.</td><td>Maximum for monitoring period</td><td>Average for the monitoring period</td></tr>
<tr><td>P1</td><td>62.2</td><td>66.3</td><td>64.7</td></tr>
<tr><td>P2</td><td>62.1</td><td>65.8</td><td>64.5</td></tr>
</table>
</td></tr>
<tr><td>Monitoring equipment</td><td>
<table>
<tr><td>Type</td><td>Accu-racy class</td><td>Serial Number</td><td>Calibr-ation frequ-ency</td><td>Date of last calibration</td><td>Validity</td></tr>
<tr><td colspan="6">Pressure gauge of WHRB-1</td></tr>
<tr><td>Pressure Gauge Make “Rosemount”</td><td>0.1%</td><td>231388</td><td>Yearly</td><td>10/12/2011</td><td>09/12/2012</td></tr>
<tr><td>Pressure Gauge Make “Rosemount”</td><td>0.1%</td><td>231388</td><td>Yearly</td><td>20/12/2010</td><td>19/12/2011</td></tr>
<tr><td>Pressure Gauge Make “Rosemount”</td><td>0.1%</td><td>231388</td><td>Yearly</td><td>28/12/2009</td><td>27/12/2010</td></tr>
<tr><td colspan="6">Temperature meter of WHRB-2</td></tr>
<tr><td>Pressure Gauge Make “Rosemount”</td><td>0.1%</td><td>231391</td><td>Yearly</td><td>10/12/2011</td><td>09/12/2012</td></tr>
<tr><td>Pressure Gauge Make “Rosemount”</td><td>0.1%</td><td>231391</td><td>Yearly</td><td>20/12/2010</td><td>19/12/2011</td></tr>
<tr><td>Pressure Gauge Make “Rosemount”</td><td>0.1%</td><td>231391</td><td>Yearly</td><td>28/12/2009</td><td>27/12/2010</td></tr>
</table>
</td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>The data is measured continuously through pressure gauge, reading is available at DCS, DCS data will used in logbook.</td></tr>
<tr><td>Calculation method (if applicable)</td><td>Measured</td></tr>
<tr><td>QA/QC procedures</td><td>Meters are calibrated regularly</td></tr>
<tr><td>Purpose of data</td><td>To calculate baseline emission</td></tr>
<tr><td>Additional comment</td><td>Nil</td></tr>
</table>

<table>
<tr><td>Data/Parameter</td><td>Steam Pressure (P3)</td></tr>
<tr><td>Unit</td><td>Kg/cm^2</td></tr>
<tr><td>Description</td><td>Pressure of steam at outlet at oulet of AFBC (Steam Pressure (P3))</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Measured</td></tr>
<tr><td>Source of data</td><td>The steam pressure gauge are provided at the ouput of AFBC. The meter readings are available on DCS continuously and same is transferred to log book to be maintained by shift engineer, approved by shift in charge as the daily report</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>
<table>
<tr><td>Tag No.</td><td>Minimum for monitoring period.</td><td>Maximum for monitoring period</td><td>Average for the monitoring period</td></tr>
<tr><td>P3</td><td>62.4</td><td>67.8</td><td>65.2</td></tr>
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<tr><td>Monitoring equipment</td><td>
<table>
<tr><td>Type</td><td>Accu-racy class</td><td>Serial Number</td><td>Calibr-ation frequ-ency</td><td>Date of last calibration</td><td>Validity</td></tr>
<tr><td>Pressure Gauge Make “Rosemount”</td><td>0.1%</td><td>250454</td><td>Yearly</td><td>10/12/2011</td><td>09/12/2012</td></tr>
<tr><td>Pressure Gauge Make “Rosemount”</td><td>0.1%</td><td>250454</td><td>Yearly</td><td>20/12/2010</td><td>19/12/2011</td></tr>
<tr><td>Pressure Gauge Make “Rosemount”</td><td>0.1%</td><td>250454</td><td>Yearly</td><td>28/12/2009</td><td>27/12/2010</td></tr>
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<tr><td>Measuring/Reading/ Recording frequency</td><td>The data is measured continuously through pressure gauge, reading is available at DCS, DCS data will used in logbook.</td></tr>
<tr><td>Calculation method (if applicable)</td><td>Measured</td></tr>
<tr><td>QA/QC procedures</td><td>Meters are calibrated regularly</td></tr>
<tr><td>Purpose of data</td><td>To calculate baseline emission</td></tr>
<tr><td>Additional comment</td><td>Nil</td></tr>
</table>

<table>
<tr><td>Data/Parameter</td><td>Steam Flow (F1, F2)</td></tr>
<tr><td>Unit</td><td>Tonnes per hour</td></tr>
<tr><td>Description</td><td>Steam flow at outlet of WHRB-1 and WHRB-2 (Steam Flow (F1, F2))</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Measured</td></tr>
<tr><td>Source of data</td><td>The steam flow meters are provided at the output of WHRB-1, WHRB-2. The meter readings are available on DCS continuously and same is transferred to log book to be maintained by shift engineer, approved by shift in charge as the daily report.</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>361945.24,290291.27</td></tr>
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<tr><td colspan="6">Steam Flow meter of WHRB-1</td></tr>
<tr><td>Flow Transmitter Make “Rosemount”</td><td>0.1%</td><td>231407</td><td>Yearly</td><td>10/12/2011</td><td>09/12/2012</td></tr>
<tr><td>Flow Transmitter Make “Rosemount”</td><td>0.1%</td><td>231407</td><td>Yearly</td><td>20/12/2010</td><td>19/12/2011</td></tr>
<tr><td>Flow Transmitter Make “Rosemount”</td><td>0.1%</td><td>231407</td><td>Yearly</td><td>29/12/2009</td><td>28/12/2010</td></tr>
<tr><td colspan="6">Steam Flow meter of WHRB -2</td></tr>
<tr><td>Flow Transmitter Make “Rosemount”</td><td>0.1%</td><td>231408</td><td>Yearly</td><td>10/12/2011</td><td>09/12/2012</td></tr>
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<tr><td>Flow Transmitter Make “Rosemount”</td><td>0.1%</td><td>231407</td><td>Yearly</td><td>29/12/2009</td><td>28/12/2010</td></tr>
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</td></tr>
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<tr><td>Calculation method (if applicable)</td><td>Measured</td></tr>
<tr><td>QA/QC procedures</td><td>Meters are calibrated regularly</td></tr>
<tr><td>Purpose of data</td><td>To calculate baseline emission</td></tr>
<tr><td>Additional comment</td><td>Nil</td></tr>
</table>

<table>
<tr><td>Data/Parameter</td><td>Steam Flow (F3)</td></tr>
<tr><td>Unit</td><td>Tonnes per hour</td></tr>
<tr><td>Description</td><td>Steam flow at outlet of AFBC (Steam Flow (F3))</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Measured</td></tr>
<tr><td>Source of data</td><td>The steam flow meter is provided at the output of AFBC. The meter reading is available on DCS continuously and same is transferred to log book to be maintained by shift engineer, approved by shift in charge as the daily report.</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>874154.5</td></tr>
<tr><td>Monitoring equipment</td><td>
<table>
<tr><td>Type</td><td>Accu-racy class</td><td>Serial Number</td><td>Calibr-ation frequ-ency</td><td>Date of last calibre-ation</td><td>Validity</td></tr>
<tr><td>Flow Transmitter Make “Rosemount”</td><td>0.1%</td><td>250457</td><td>Yearly</td><td>10/12/2011</td><td>09/12/2012</td></tr>
<tr><td>Flow Transmitter Make “Rosemount”</td><td>0.1%</td><td>250457</td><td>Yearly</td><td>20/12/2010</td><td>19/12/2011</td></tr>
<tr><td>Flow Transmitter Make “Rosemount”</td><td>0.1%</td><td>250457</td><td>Yearly</td><td>29/12/2009</td><td>28/12/2010</td></tr>
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</td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>The data is measured continuously through flow meter, reading is available at DCS, DCS data will used in logbook.</td></tr>
<tr><td>Calculation method (if applicable)</td><td>Measured</td></tr>
<tr><td>QA/QC procedures</td><td>Meters are calibrated regularly</td></tr>
<tr><td>Purpose of data</td><td>To calculate baseline emission</td></tr>
<tr><td>Additional comment</td><td>Nil</td></tr>
</table>

<table>
<tr><td>Data/Parameter</td><td>Steam Flow (F4)</td></tr>
<tr><td>Unit</td><td>Tonnes per hour</td></tr>
<tr><td>Description</td><td>Steam flow at inlet of TG (Steam Flow (F4))</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Measured</td></tr>
<tr><td>Source of data</td><td>The steam flow meter is provided at the input of TG. The reading is available on DCS continuously and same is transferred to log book to be maintained by shift engineer, approved by shift in charge as the daily report.</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>1512833.66</td></tr>
<tr><td>Monitoring equipment</td><td>
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<tr><td>Flow Transmitter Make “Rosemount”</td><td>0.1%</td><td>292898</td><td>Yearly</td><td>10/12/2011</td><td>09/12/2012</td></tr>
<tr><td>Flow Transmitter Make “Rosemount”</td><td>0.1%</td><td>292898</td><td>Yearly</td><td>24/12/2010</td><td>23/12/2011</td></tr>
<tr><td>Flow Transmitter Make “Rosemount”</td><td>0.1%</td><td>292898</td><td>Yearly</td><td>29/12/2009</td><td>28/12/2010</td></tr>
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<tr><td>Measuring/Reading/ Recording frequency</td><td>The data is measured continuously through flow meter, reading is available at DCS, DCS data will used in logbook.</td></tr>
<tr><td>Calculation method (if applicable)</td><td>Measured</td></tr>
<tr><td>QA/QC procedures</td><td>Meters are calibrated regularly</td></tr>
<tr><td>Purpose of data</td><td>To calculate baseline emission</td></tr>
<tr><td>Additional comment</td><td>Nil</td></tr>
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<table>
<tr><td>Data/Parameter</td><td>EG_{IMPORT}</td></tr>
<tr><td>Unit</td><td>MWh</td></tr>
<tr><td>Description</td><td>Gross electricity imported from Grid</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Measured</td></tr>
<tr><td>Source of data</td><td>Data is measured through the electronic meter provided at the substation of the facility where the interface with the grid is established. The monthly Joint Meter Reading is available at plant. The meter is regularly calibrated by approved agencies.</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>2389.38</td></tr>
<tr><td>Monitoring equipment</td><td>
<table>
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<tr><td>Electronic Energy meter Make “Secure”</td><td>0.2%</td><td>WSC 26713</td><td>Yearly</td><td>10/02/2011</td><td>09/02/2012</td></tr>
<tr><td>Electronic Energy meter Make “Secure”</td><td>0.2%</td><td>WSC 26713</td><td>Yearly</td><td>10/12/2009</td><td>09/12/2010</td></tr>
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</td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>Continuous measured</td></tr>
<tr><td>Calculation method (if applicable)</td><td>Measured</td></tr>
<tr><td>QA/QC procedures</td><td>Meter is sealed by grid authority and calibrated at required interval as per prevailing law of grid.</td></tr>
<tr><td>Purpose of data</td><td>To calculate baseline emission</td></tr>
<tr><td>Additional comment</td><td>Nil</td></tr>
</table>

<table>
<tr><td>Data/Parameter</td><td>EG_{EXPORT}</td></tr>
<tr><td>Unit</td><td>MWh</td></tr>
<tr><td>Description</td><td>Gross electricity exported from Grid</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Measured</td></tr>
<tr><td>Source of data</td><td>Data is measured through the electronic meter provided at the substation of the facility where the interface with the grid is established. The monthly Joint Meter Reading is available at plant. The meter is regularly calibrated by approved agencies.</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>154995.63</td></tr>
<tr><td>Monitoring equipment</td><td>
<table>
<tr><td>Type</td><td>Accu-racy class</td><td>Serial Number</td><td>Calibr-ation frequ-ency</td><td>Date of last calibration</td><td>Validity</td></tr>
<tr><td>Electronic Energy meter Make “Secure”</td><td>0.2%</td><td>APM03642</td><td>Yearly</td><td>12/04/2011</td><td>11/04/2012</td></tr>
<tr><td>Electronic Energy meter Make “Secure”</td><td>0.2%</td><td>APM03642</td><td>Yearly</td><td>02/04/2010</td><td>01/04/2011</td></tr>
<tr><td>Electronic Energy meter Make “Secure”</td><td>0.2%</td><td>APM03642</td><td>Yearly</td><td>22/01/2010</td><td>21/01/2011</td></tr>
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</td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>Continuous measured</td></tr>
<tr><td>Calculation method (if applicable)</td><td>Measured</td></tr>
<tr><td>QA/QC procedures</td><td>Meter is sealed by grid authority and calibrated at required interval as per prevailing law of grid.</td></tr>
<tr><td>Purpose of data</td><td>To calculate baseline emission</td></tr>
<tr><td>Additional comment</td><td>Nil</td></tr>
</table>

D.3. Implementation of sampling plan

>> Not applicable.

SECTION E. Calculation of emission reductions or GHG removals by sinks

E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

>>

We have followed the approved baseline methodology ACM0004 for formulas used is estimating base line emissions:

If the baseline scenario is determined to be captive power generation either (existing or new), the Emissions factor for displaced electricity is calculated as follows;

Calculation of emission factor for captive power baseline:

$EF_{captive, y} = EFCO_2,i / Eff_{captive}$ X 44/12 X 3.6 TJ/1000 MWh

Where.

$EF_{captive ,y}$	Emission factor for captive power generation (tCO_2/MWh)	26.2 / 27.289028% X 44/12 X 3.6/ 1000 = 1.2673 tCO_2/MWh or Say 1.2673 tCO_2/MWh
$EF_{CO2,i}$	CO_2 emission factor of fuel used in captive power generation tC/TJ	26.2 tC/TJ
$Eff_{captive}$	Efficiency of captive power generation (%)	27.289028%
44/12	Carbon to Carbon Dioxide conversion factor	44/12
3.6/1000	TJ to MWh conversion factor	3.6/1000

To estimate boiler efficiency, project participants may chose between the following two options

Option A
1. Measured efficiency prior to project implementation
2. Measured efficiency during monitoring.
3 Manufacturers nameplate data for efficiency of existing boilers

Option B
Assume a boiler efficiency of 100% based on the net calorific values as a conservative approach

We have selected Option B

Calculation of Net Power Generation:

A	Calculation of Enthalpy of Steam fed from WHRB-1 (H1)	=	Ent X F1 = H1	1224296224411.46	KJ
B	Calculation of Enthalpy of Steam fed from WHRB-2 (H2)	=	Ent X F2 = H2	981481482854.82	KJ
C	Total Enthalpy of Steam fed from WHRB-1 & 2 (H5)	=	A + B = H5	2205777707266.28	KJ
D	Calculation of Enthalpy of Steam fed from AFBC (H3)	=	Ent X F3 = H3	2953075403343.56	KJ
E	Calculation of Enthalpy of steam fed to TG (H4)	=	Ent X F4 = H4	5111238242979.96	KJ
F	Electricity Generated by TG (EG GEN CPP)	=	Me1	373552.00	MWh
G	Auxiliary Consumption by CPP(EGAUX CPP)	=	Me2	35868.46	MWh
H	Net Electricity generation by CPP (EG y CPP)	=	F-G	337683.54	MWh

I	Proportional Percentage Contribution in Enthalpy of Steam from WHRB-1 & 2 in total enthalpy of steam used for power generation by TG = Enthalpy of Steam from [(WHRB 1 &2 / Total Enthalpy of steam fed into TG) X 100]	=	(C/E) X 100	0.4316	
J	Electricity Generation from WHRB = % Contribution of Enthalpy of Steam from WHRB X Gross Electricity Generated by TG(EGEN) = F X I	=	F X I	161208.00	MWh
K	Auxiliary Electricity consumption by WHRB (E_{AUX})	=	G X I	15480.00	MWh
L	Net Electricity generated by WHRB (EGy)	=	J-K or (H x I)	145728.00	MWh

Note :

(1) Steam enthalpy E_{nt} in K Cal/Kg is arrived by using thermodynamic steam tables, Based on the pressure and temperature readings.

(2) Since the temperature and pressure at TG inlet are maintained at same level as that of WHRB-1& 2 outlet, hence separate monitoring of temperature and pressure at TG inlet is not required.

BE y in tCO2 = $EF_{captive}$, y X EG y
Where,

$EF_{captive,y}$	Emission factor for the power generation (tCO_2/MWh)	1.26 tCO_2/MWh
EGy	Net Electricity supplied by project activity (MWh)	145728.00 MWh
BEy	Baseline emission (tCO_{2e})	183617.28 tCO_2 Or say : 183617 tCO_2

The total emission reduction for the project activity for the period of 01/04/2010 to 31/03/2012 is 183617 tCO_2.

E.2. Calculation of project emissions or actual net GHG removals by sinks

>> Project Emission (PEy)

PE y = No Project Emission is considered
= 0 tCO_2/annum

E.3. Calculation of leakage

>> This There is no leakage in the project activity

LE y = Leakage is considered
= 0 tCO_2/annum

Calculation of Emission Reductions:
Emission Reduction Calculations:

Project activity mainly reduces CO_2 through substitution of coal based captive electricity generation

The emission reduction ERy by the project activity during a given year y is the difference between the baseline emissions through substitution of electricity generation with fossil fuels (BEy) and project emissions (PEy), as follows:

ER y = BE y – PE y

Where,

ER y = are the emission reductions of the project activity during the year y in tons of CO_2

BE y = are the baseline emissions due to displacement of electricity during the year y in tons of CO_2.

PE y = are the project emission during the year y in tons of CO_2.

Baseline Emissions

BE y in tCO2 = $EF_{captive}$, y X EG y

EG y = E_{GEN} - E_{AUX} = Net Electricity supplied by project activity

= 161208 MWh - 15480 MWh
= **145728 MWh**

EF y = Emission factor for the power generation (tCO_2/MWh)
= 1.26 tCO_2/MWh

BE y = EG y X EF y
= 145728 MWh X 1.26 tCO_2/MWh
= 183617.28 tCO2 **Or Say 183617 tCO2**

Project Emission (PEy)

PE y = No Project Emission is considered and no leakage is considered,
= 0 tCO_2/annum.

Net Emission Reduction (ER y)

ER y = BEy - PEy
= 183617 tCO_2 - 0 tCO_2

= **183617 tCO_2/annum**

E.4. Summary of calculation of emission reductions or net anthropogenic GHG removals by sinks

Time Period	Baseline emissions or baseline net GHG removals by sinks (tCO_2e)	Project emissions or actual net GHG removals by sinks (tCO_{2e})	Leakage (tCO_2e)	Emission reductions or net anthropogenic GHG removals by sinks (tCO_2e)
Total	183617	0	0	183617

E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (tCO_2e)	94303.00 tCO_2/ annum (total monitoring period is 01/04/2010 to 31/03/2012 i.e. two years hence CER estimated as per registered PDD is estimated to 188606 tCO_2/MWh)	183617[3]

E.6. Remarks on difference from estimated value in registered PDD

>>

In the PDD annual estimated emission reductions are based on one calendar year (365 days), whereas in this monitoring period the time period is extended to two years (730 days), in registered PDD 94303.00 tCO_2 was estimated, whereas for this monitoring period i.e. for two years this will works out to 188606 tCO_2, where at actual 183617 tCO_2 is calculated based monitored parameters. The lower emission reduction is due to fluctuating nature of steam and due to frequent shutdowns which results in lower PLF.
The effective emission reduction which is at actual taken place is in accordance to the estimates of PDD. Hence this clause is actually not applicable, as there is no increase in actual emission reduction during the year/ during monitoring period.

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History of the document

Version	Date	Nature of revision
02.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01	EB 54, Annex 34 28 May 2010	Initial adoption.
Decision Class: Regulatory **Document Type**: Form **Business Function**: Issuance		

[3] The estimate emission reduction in PDD is calculated for 1 year, whereas the emission reduction claimed is for 2 years.