		
Monitoring report form (Version 05.1)		
MONITORING REPORT		
Title of the project activity	SHYAM DRI WHR CPP	
UNFCCC reference number of the project activity	1642 ¹	
Version number of the monitoring report	03	
Completion date of the monitoring report	01/10/2016	
Monitoring period number and duration of this monitoring period	Monitoring period number – 03 Duration – 1/04/2012 to 29/02/2016	
Project participant(s)	Shyam Metalics & Energy Limited (Formerly known as SHYAM DRI Power Ltd.)	
Host Party	India	
Sectoral scope(s)	1 : Energy industries (renewable - / non-renewable sources)	
Selected methodology(ies)	ACM0004 ver. 2 - Consolidated methodology for waste gas and/or heat for power generation	
Selected standardized baseline(s)	Not Applicable	
Estimated amount of GHG emission reductions or net GHG removals by sinks for this monitoring period in the registered PDD	369,461	
Total amount of GHG emission reductions or net GHG removals by sinks achieved in this monitoring period	GHG emission reductions or net GHG removals by sinks reported up to 31 December 2012	GHG emission reductions or net GHG removals by sinks reported from 1 January 2013 onwards
	50,170	258,381

¹ <https://cdm.unfccc.int/Projects/DB/BVQ11204523116.65/view>

SECTION A. Description of project activity**A.1. Purpose and general description of project activity**

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 38 tph each) producing aggregate 76 tph (tonnes per hour) steam at 66 kg/cm² pressure and 490±5°C 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 equipment's were installed at the project activity:

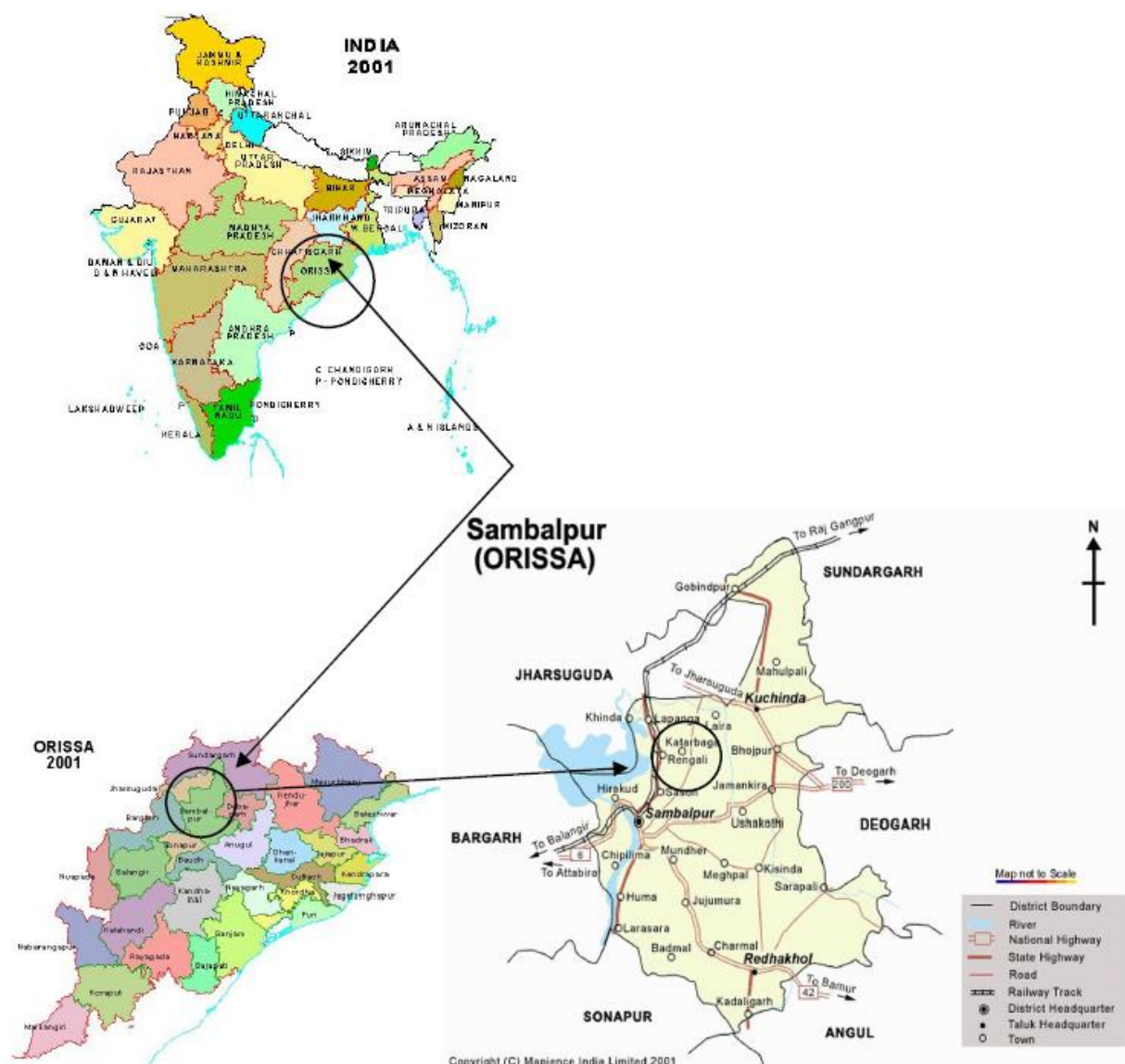
S.No.	Major equipments	Specification		Commissioning date
1.	Waste Heat Recovery Boiler #1	Steam Generation Capacity	38 tph	02/06/2007
		Steam Temp.	490±5°C	
		Steam Pressure	66 kg/cm ²	
2.	Waste Heat Recovery Boiler #2	Steam Generation Capacity	38 tph	20/06/2007
		Steam Temp.	490±5°C	
		Steam Pressure	66 kg/cm ²	
3.	Coal based AFBC (Atmospheric Fluidized Bed Combustion)	Steam Generation Capacity	54 tph	01/05/2007
		Steam Temp.	490±5°C	
		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°C	
		Steam Pressure	63.7 kg/cm ²	

The project started its commercial production on 12/07/2007 by synchronization with grid.

Total emission reductions for the monitoring period accounts to 308,551 tonnes of CO₂.

A.2. Location of project activity

The company is located at Village: Pandloi & Nishanbanga P.O. Lapanga/Rengali, Sambalpur District, Orissa State of INDIA, at Plot No. & Chaka No. 981/1293, 949/1295, 1231/1349, 986, 1001/1382 & 1231/1383 and Khatiar SI.No.116/192 of PS-Karabaga, about 35 KM from Sambalpur, Railway Station on State Highway No.10. Longitude= E 84°2'35" Latitude=N 21°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 whether the Party involved wishes to be considered as project participant (yes/no)
Ministry of Environment and Forests, Govt of India (Host Country)	Shyam Metalics & Energy Limited (Formerly known as SHYAM DRI Power Ltd. (Private entity)	No

A.4. Reference of applied methodology and standardized baseline

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

A.5. Crediting period of project activity

Type - Fixed (10 Years 0 Months)

Monitoring Period -03

Start date of crediting period: 25/03/2009

Length of Crediting period: 25/03/2009 to 24/03/2019

A.6. Contact information of responsible persons/entities

Mr. Ramkrishna Patil
GM- Operations
EKI Energy Services Limited
Plot 48, Scheme 79, Part- 2, Vijay Nagar, Indore- 452010, Madhya Pradesh (India)
Mob: +91 9096562065
Ph: +91 731 4289086
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Email: ramkrishna.patil@enkingint.org
W www.enkingint.org

The above person/entity is not Project Participant. Details of the project participant has been mentioned in the appendix 1.

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

WHRB based captive Power Plant at SHYAM DRI is proposed to utilise the heat content of flue gases coming out of ABC of sponge iron kiln.

The Exhausted flue gases from rotary kiln shall be received at ABC for further incineration where the waste gas temperature likely to reach upto 950-1000°C after ABC. No auxiliary fuel is fired in ABC. The generated quantity and the temperature of flue gases are influenced by a number of operating parameters of the sponge iron plant. At the best operating levels this waste heat shall produce producing aggregate 76 tph steam is generated at 66 kg/cm² pressure and 490°C temperature. The WHRBs will be of single drum water tube with radiant chamber, along with convective super heater, radiant super heater, economiser, de-super heater and hoppers for ash Collection as ash comes with flue gases.

The outlet boxes of the WHRB, leads to ESP to remove SPM from exhaust gases. The exhaust gas temperature shall be kept at 170°C. The feed water temperature will be maintained at the inlet to economiser 105°C. The high pressure steam from WHRB (76 tonnes/hr) will be used to operate high

efficiency extraction cum condensing multi stage STGs to generate 15 MW Electricity from WHRB. Ash collected from both WHRB hoppers & ESP will be conveyed pneumatically to ash silo. Other systems required are circulating water, Demineralised water plant, Instrument Air Compressor and Exhaust Steam Condenser. Steam from exhaust of STG rotor will be condensed in air cooled condenser. Only DM (De Mineralised) water will be used in boiler to avoid scale formation on boiler tubes. Total Waste water is recycled and reused after treatment. The generated power shall be used to meet the captive power requirement of the company. The technology is environmentally safe and abides all legal norms and standards for SPM, emissions.

Project activity was implemented at single site whose coordinates are given in section A-2

For schematic diagram of project activity, please refer section c of this MR. Project Activity is implemented in single phase and the major equipment's 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, applied methodology or applied standardized baseline

Not Applicable

B.2.2. Corrections

Not Applicable

B.2.3. Changes to start date of crediting period

Not Applicable

B.2.4. Inclusion of a monitoring plan to the registered PDD that was not included at registration

Not Applicable

B.2.5. Permanent changes from registered monitoring plan, applied methodology or applied standardized baseline

Not Applicable

B.2.6. Changes to project design of registered project activity

Not Applicable

B.2.7. Types of changes specific to afforestation or reforestation project activity

Not Applicable

SECTION C. Description of monitoring system

1.0	GHG Performance Parameter
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1.1	<p>The monitoring protocol requires PP to monitor the following GHG Performance parameters for estimating the emissions reductions from the waste heat based CPP:</p> <ul style="list-style-type: none"> • 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	<p>The metering system for the waste heat based CPP consist of</p> <ul style="list-style-type: none"> • 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.
	<p>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 PP. All these meters are cross calibrated from standard testing laboratory Govt of Orissa, Bhubaneshwar and sealed by DEI(G).</p>
2.2	<p>In house Metering System of SHYAM DRI</p> <p>PP has an in-house metering system, which monitors the overall performance of the waste heat based CPP. The metering system mainly comprises of below meters.</p> <ul style="list-style-type: none"> • 1 in-house generation meter- One for TG set. • In-house Auxiliary consumption meter. (one) <p>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 PP's CPP.</p> <p>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.</p>
3.0	Calibration of the Metering System
3.1	<p>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.</p>
4.0	Reporting of the Monitored Parameters/ Authority and Responsibility of monitoring and reporting

4.1	<p>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.</p> <p>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.</p>
4.2	<p>In-house Metering System of PP 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.</p> <p>The flow meter reading, temperature and pressure gauge and DCS measure the respective parameters and reporting is done shift wise by shift in-charge (operations) based on the online measurements.</p>
5.	Uncertainties and Adjustments:
5.1	<p>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.</p> <p>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.</p> <p>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.</p>
6.0	Experience and Training
6.1	<p>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.</p>

6.2	<p>Emergency Preparedness Plan</p> <p>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. PP CPP has a fire fighting system in place.</p> <p>In addition PP has standard procedures for tackling emergencies arising from</p> <ul style="list-style-type: none"> • 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
	<p>Project Design Document, maintenance manuals and standard OEM procedures. Records</p> <ol style="list-style-type: none"> 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 Manager (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 PP. 4. Monthly Report on net quantity of electricity generated at PP’s Captive Power Plant and Electricity Duty returns submitted by PP on generation archived at site with a copy being sent to the unit head of PP. 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 PP.

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).

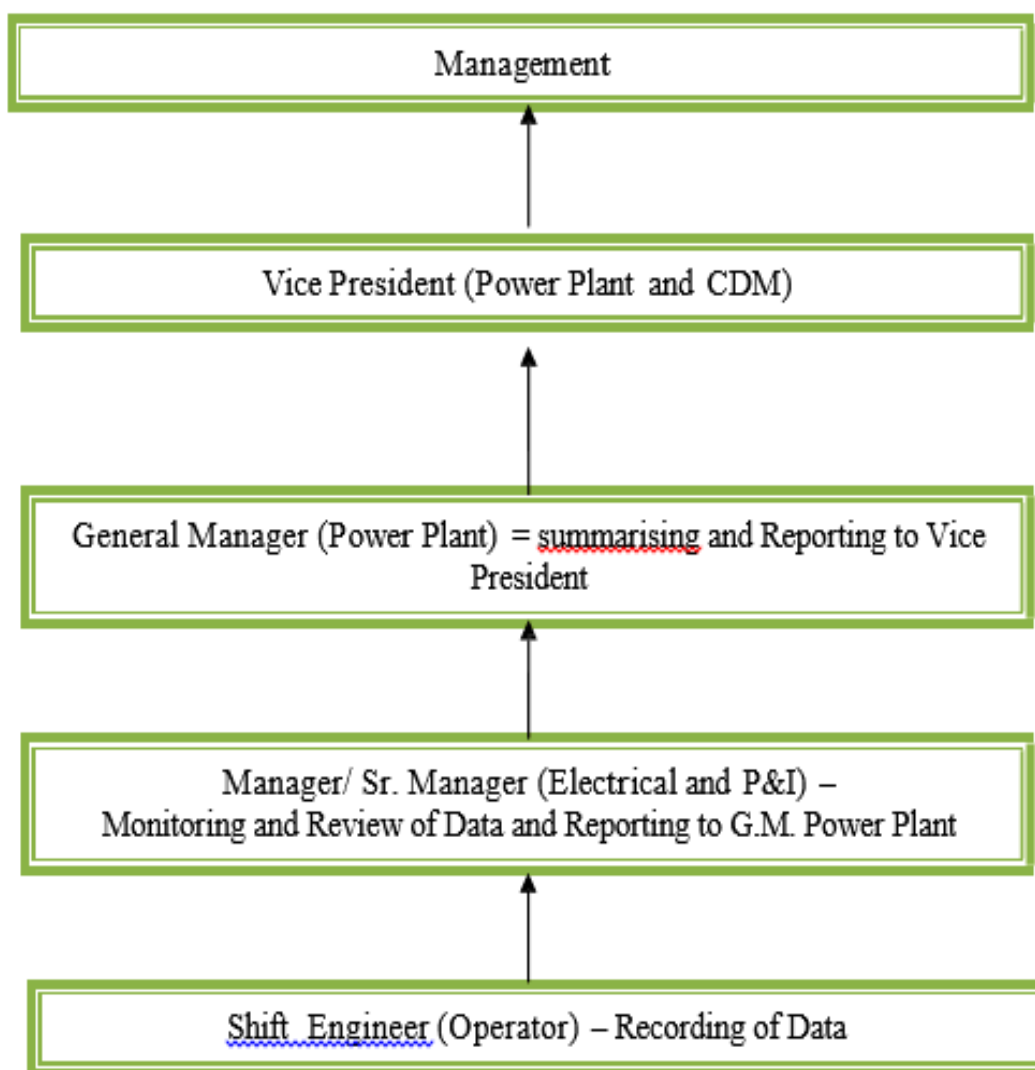
Shift Engineer (Electrical): Responsible for taking meter reading for electricity generation and wheeling shift-wise. The report is then sent to the Manager (E&I) for his review on a daily basis.

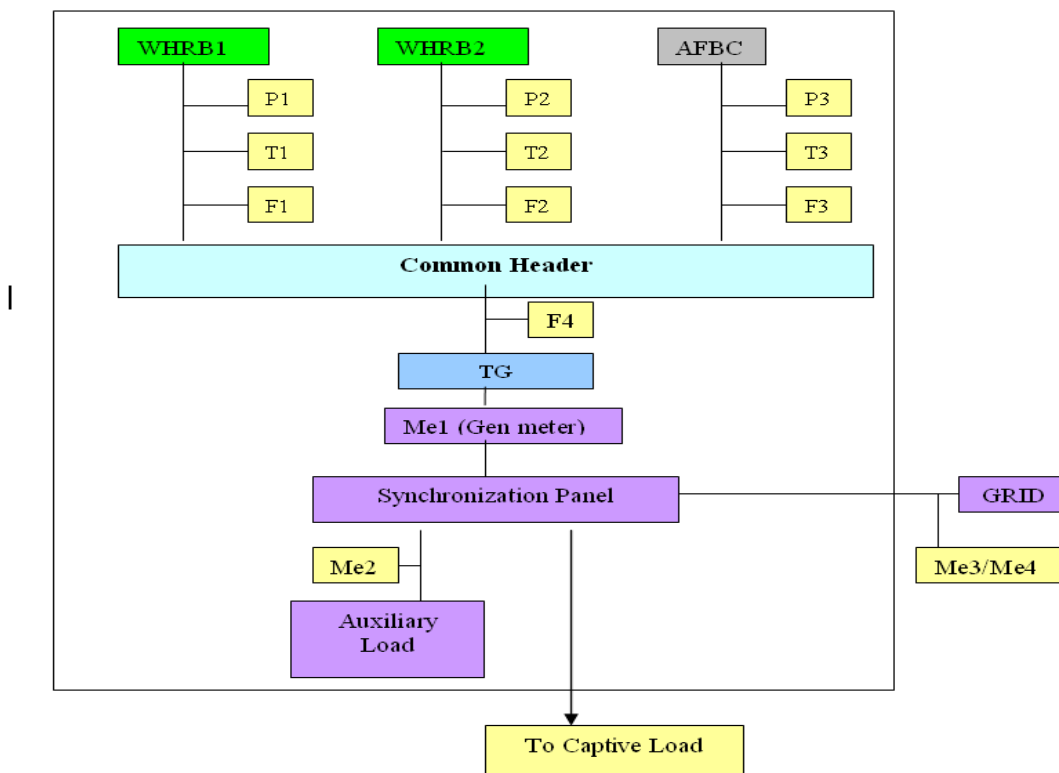
Manager/Sr. Manager (E&I): Responsible for reviewing the monitored parameters shift-wise and presenting a daily executive summary report, duly signed by himself, to the General Manager (Plant). Also responsible for the monthly joint meter reading for the import and or export of power from the facility 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 (PP) 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	P1
Pressure at Outlet of WHRB-2	P2
Pressure at Outlet of AFBC	P3
Temperature of Outlet of WHRB-1	T1
Temperature at Outlet of WHRB-2	T2
Temperature at Outlet of AFBC	T3
Flow of steam at Outlet of WHRB-1 (after vent)	F1
Flow of steam at Outlet of WHRB-2 (after vent)	F2
Flow of steam at Outlet of AFBC (after vent)	F3
Net of Flow of steam in to TG	F4

Electrical Parameter

Electrical Monitoring Parameter	
Gross Power Generation from TG	Me1
Auxiliary consumption meter	Me2
Gross quantity of Power Imported from the Grid (EG IMPORT)	Me3
Gross quantity of Power Exported to the Grid(EG _{EXPORT})	Me4

The calibration details for meters used for monitoring parameters are as below

Equipment	INSTRUMENTS NAME	TAG NO.	Serial Number	Make	Accuracy	Calibration dates	Validity
WHRB-1	STEAM PRESSURE	PT-12132	231388	Rosemount	0.1%	10/12/2011, 8/12/2012, 5/12/2013, 4/12/2014, 3/12/2015	02/12/2016
	STEAM TEMPERATURE	TT-12125	231360	Rosemount	0.1%		
	STEAM FLOW	FT-12129	231407	Rosemount	0.1%		
WHRB-2	STEAM PRESSURE	PT-22132	231391	Rosemount	0.1%		
	STEAM TEMPERATURE	TT-22125	231361	Rosemount	0.1%		
	STEAM FLOW	FT-22129	231408	Rosemount	0.1%		
AFBC-1	STEAM PRESSURE	PT-202	250454	Rosemount	0.1%		
	STEAM TEMPERATURE	TT-201	250462	Rosemount	0.1%		
	STEAM FLOW	FT-201	250457/3 664785*	Rosemount	0.1%		
TURBINE-1	STEAM PRESSURE	PT-001	4673691	Rosemount	0.1%		
	STEAM TEMPERATURE	TT-001	615566	Radix	0.1%		
	STEAM FLOW	FT-001	292898	Rosemount	0.1%		

*Note – The steam flow meter for AFBC 250457 was replaced by 3664785 on 04/12/2014.

The calibration details of energy meters are as below

Instruments Name	Serial no	Make	Accuracy	Calibration Dates	Validity
Gross Energy Generation Meter	6607878	L & T	0.5%	18/11/2011, 30/03/2012, 22/01/2013, 05/12/2013, 04/12/2014, 03/12/2015	02/12/2016
Auxiliary Meter	98001/3-2406	Conzerv	1 %	10/12/2011, 08/12/2012, 05/12/2013, 04/12/2014, 03/12/2015	02/12/2016
Auxiliary Meter	98001/2-2406	Conzerv	1 %		
Grid Export Meter	APM03642	Secure	0.2%	12/04/2011, 29/11/2012, 09/01/2014, 23/04/2015, 20/04/2016	19/04/2021
Grid Import Meter	WSC26713	Secure	0.2%	10/02/2011, 05/03/2012	04/03/2017

Note – For steam parameters (pressure, temperature and flow), Gross Energy meters and Auxiliary meters, the calibration frequency is considered as annual as per industry practice.

However the grid export and grid import meters are under custody of state electricity board and not under control of PP. As per registered PDD, these grid export and import meters will be calibrated at required interval as per prevailing law of grid, thus calibration frequency is considered as once in a five year as per Central Electricity Authority (CEA) notification dated 17/03/2006. Also monitored data from these grid export, grid import meters are not used for emission reduction calculations, thus there is no any impact of emission reductions ir-respective of calibration done or not.

SECTION D. Data and parameters

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

Data/Parameter	$EF_{CO_2 i}$
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 which is used for baseline emission
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

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	Refer Emission Reduction Excel Spreadsheet
Monitoring equipment	Energy Meter. Please refer section C for meter details like serial number, accuracy class, calibration dates and validity etc.
Measuring/reading/recording frequency:	The data is measured continuously through electronic energy meter, the data is recorded on eight hourly basis in logbook, Log book is signed by plant manager daily. The instantaneous generation from project facility is shown in DCS.

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Calculation method (if applicable):	Measured
QA/QC procedures:	Meters are calibrated regularly (once in year). 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 comments:	Nil

Data/parameter:	$EG_{AUX\ CPP}$
Unit	MWh
Description	Auxiliary electricity consumption by entire CPP (This meter is referred as Me2 in line diagram provided in Section C above)
Measured/calculated/default	Measured
Source of data	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.
Value(s) of monitored parameter	Refer Emission Reduction Excel Spreadsheet
Monitoring equipment	Energy Meter. Please refer section C for meter details like serial number, accuracy class, calibration dates and validity etc.
Measuring/reading/recording frequency:	The data is continuously recorded and logged in daily basis.
Calculation method (if applicable):	Measured
QA/QC procedures:	Meters are calibrated on regular basis (once in year).
Purpose of data:	To calculate baseline emission
Additional comments:	Nil

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	Refer Emission Reduction Excel Spreadsheet
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 comments:	Nil

Data/parameter:	E_{GEN}
Unit	MWh

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Description	Gross electricity generation due to WHRB
Measured/calculated/default	Calculated
Source of data	Calculated based on measured data
Value(s) of monitored parameter	Refer Emission Reduction Excel Spreadsheet
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_{GENCPP})”
QA/QC procedures:	Calculated based on measured data.
Purpose of data:	To calculate baseline emission
Additional comments:	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	Refer Emission Reduction Excel Spreadsheet
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_{AUXCPP})”
QA/QC procedures:	Calculated based on measured data.
Purpose of data:	To calculate baseline emission
Additional comments:	Nil

Data/parameter:	EG_y
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	Refer Emission Reduction Excel Spreadsheet
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 comments:	Nil

Data/parameter:	Steam Temp. (T1, T2 & T3)
Unit	°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	Refer Emission Reduction Excel Spreadsheet
Monitoring equipment	Temperature Transmitter. Please refer section C for monitoring equipment details like serial number, accuracy class, calibration dates and validity etc.
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 comments:	Nil

Data/parameter:	Steam Pressure (P1& P2)
Unit	Kg/cm ²
Description	Pressure of steam at outlet of WHRB-1 and WHRB-2 (Steam Pressure (P1, P2))
Measured/calculated/default	Measured
Source of data	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
Value(s) of monitored parameter	Refer Emission Reduction Excel Spreadsheet
Monitoring equipment	Pressure Gauge. Please refer section C for monitoring equipment details like serial number, accuracy class, calibration dates and validity etc.
Measuring/reading/recording frequency:	The data is measured continuously through pressure gauge, 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 comments:	Nil

Data/parameter:	Steam Pressure (P3)
Unit	Kg/cm ²
Description	Pressure of steam at outlet of AFBC (Steam Pressure (P3))
Measured/calculated/default	Measured

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Source of data	The steam pressure gauge are provided at the output 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
Value(s) of monitored parameter	Refer Emission Reduction Excel Spreadsheet
Monitoring equipment	Pressure Gauge. Please refer section C for monitoring equipment details like serial number, accuracy class, calibration dates and validity etc.
Measuring/reading/recording frequency:	The data is measured continuously through pressure gauge, reading is available at DCS, DCS data will be used in logbook.
Calculation method (if applicable):	Measured
QA/QC procedures:	Meters are calibrated regularly
Purpose of data:	To calculate baseline emission
Additional comments:	Nil

Data/parameter:	Steam Flow (F1, F2)
Unit	Tonnes
Description	Steam flow at outlet of WHRB-1 and WHRB-2 (Steam Flow (F1, F2))
Measured/calculated/default	Measured
Source of data	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.
Value(s) of monitored parameter	Refer Emission Reduction Excel Spreadsheet
Monitoring equipment	Steam flow meter. Please refer section C for monitoring equipment details like serial number, accuracy class, calibration dates and validity etc.
Measuring/reading/recording frequency:	The data is measured continuously through flow meter, reading is available at DCS, DCS data will be used in logbook.
Calculation method (if applicable):	Measured
QA/QC procedures:	Meters are calibrated regularly
Purpose of data:	To calculate baseline emission
Additional comments:	Nil

Data/parameter:	Steam Flow (F3)
Unit	Tonnes
Description	Steam flow at outlet of AFBC (Steam Flow (F3))
Measured/calculated/default	Measured
Source of data	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.
Value(s) of monitored parameter	Refer Emission Reduction Excel Spreadsheet

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Monitoring equipment	Steam flow Meter. Please refer section C for monitoring equipment details like serial number, accuracy class, calibration dates and validity etc.
Measuring/reading/recording frequency:	The data is measured continuously through flow meter, 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 comments:	Nil

Data/parameter:	Steam Flow (F4)
Unit	Tonnes per hour
Description	Steam flow at inlet of TG (Steam Flow (F4))
Measured/calculated/default	Measured
Source of data	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.
Value(s) of monitored parameter	Refer Emission Reduction Excel Spreadsheet
Monitoring equipment	Steam Flow Meter. Please refer section C for monitoring equipment details like serial number, accuracy class, calibration dates and validity etc.
Measuring/reading/recording frequency:	The data is measured continuously through flow meter, 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 comments:	Nil

Data/parameter:	EG _{IMPORT}
Unit	MWh
Description	Gross electricity imported from Grid
Measured/calculated/default	Measured
Source of data	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.
Value(s) of monitored parameter	Refer Emission Reduction Excel Spreadsheet
Monitoring equipment	Energy Meter. Please refer section C for monitoring equipment details like serial number, accuracy class, calibration dates and validity etc.
Measuring/reading/recording frequency:	Continuous measured
Calculation method (if applicable):	Measured
QA/QC procedures:	Meter is sealed by grid authority and calibrated at required interval as per prevailing law of grid.
Purpose of data:	To calculate baseline emission
Additional comments:	Nil

Data/parameter:	EG _{EXPORT}
Unit	MWh
Description	Gross electricity exported to Grid
Measured/calculated/default	Measured
Source of data	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.
Value(s) of monitored parameter	Refer Emission Reduction Excel Spreadsheet
Monitoring equipment	Energy Meter. Please refer section C for monitoring equipment details like serial number, accuracy class, calibration dates and validity etc.
Measuring/reading/recording frequency:	Continuous measured
Calculation method (if applicable):	Measured
QA/QC procedures:	Meter is sealed by grid authority and calibrated at required interval as per prevailing law of grid.
Purpose of data:	To calculate baseline emission
Additional comments:	Nil

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

As per approved baseline methodology ACM0004 and as mentioned in registered PDD, Emission factor for captive power generation (tCO₂/MWh) is determined fixed ex ante as 1.26 tCO₂/MWh.

Calculation of Net Power Generation:

Abbreviations	Particulars		Formula	Calculations	Unit
A	Calculation of Enthalpy of Steam fed from WHRB-1 (H ₁)	=	$E_{nt} \times F_1 = H_1$	1912724711407.29	KJ
B	Calculation of Enthalpy of Steam fed from WHRB-2 (H ₂)	=	$E_{nt} \times F_2 = H_2$	1928963494111.97	KJ
C	Total Enthalpy of Steam fed from WHRB-1 & 2 (H ₅)	=	$A + B = H_5$	3841688205519.26	KJ
D	Calculation of Enthalpy of Steam fed from AFBC (H ₃)	=	$E_{nt} \times F_3 = H_3$	4161493746813.75	KJ

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E	Calculation of Enthalpy of steam fed to TG (H ₄)	=	$E_{nt} \times F_4 = H_4$	7732274646937.74	KJ
F	Electricity Generated by TG (EG _{GEN CPP})	=	Me ₁	564284.90	MWh
G	Auxiliary Consumption by CPP(EG _{AUX CPP})	=	Me ₂	54135.10	MWh
H	Net Electricity generation by CPP (EG _{y CPP})	=	F-G	510149.80	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)	0.4968	
I'	Proportional Percentage Contribution in Enthalpy of Steam from WHRB-1 & 2 in total enthalpy of steam used for power generation at header = Enthalpy of Steam from [(WHRB 1 & 2 / Total Enthalpy of steam at header) X 100]	=	(C/(C+D))	0.4800	
J	Electricity Generation from WHRB = % Contribution of Enthalpy of Steam from WHRB X Gross Electricity Generated by TG(EGEN)	=	F X I	280358.00	MWh
J'	Electricity Generation from WHRB = % Contribution of Enthalpy of Steam from WHRB X Gross Electricity Generated by TG(EGEN)	=	F X I'	270868.00	
K	Auxiliary Electricity consumption by WHRB (E _{AUX})	=	G X I	26897.00	MWh
K'	Auxiliary Electricity consumption by WHRB (E _{AUX})	=	G X I'	25986.00	
L	Net Electricity generated by WHRB (EG _y)	=	J-K or (H x I)	253461.00	MWh
L'	Net Electricity generated by WHRB (EG _y)	=	J'-K' or (H x I')	244882.16	

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M	Emission Factor	=		1.26	tCO ₂ /MWh
	Emission Reduction	=	M X L	3,19,360.86	tCO ₂
	Total			3,19,360.00	tCO ₂
	Emission Reduction	=	M X L'	3,08,551.52	tCO ₂
				3,08,551.00	tCO ₂
			Emission Reduction (Minimum of two)	308,551	tCO₂

Note :

- (1) Steam enthalpy Ent 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.

$$BE_y \text{ in tCO}_2 = EF_{\text{captive},y} \times EG_y$$

Where,

EF _{captive,y}	Emission factor for the power generation (tCO ₂ /MWh)	1.26 tCO ₂ /MWh
EG _y	Net Electricity supplied by project activity (MWh)	244,882.16 MWh
BE _y	Baseline emission (tCO _{2e})	308,551 tCO ₂

In line with FAR raised during previous verification, PP has recorded the diesel consumption and electricity generation from DG set for the project activity. The electricity generation from DG set have been deducted to determine the net electricity generation from project activity. Also Diesel consumption by DG set are recorded and monthly data is mentioned in ER calculation excel spreadsheet.

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

There is no any project emissions involved in project activity.

E.3. Calculation of leakage

There is no leakage in the project activity.

$$LE_y = \text{Leakage is considered } 0 \text{ tCO}_2$$

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

Summary of calculation of emission reductions or net GHG removals by sinks

Item	Baseline emissions or baseline net GHG removals by sinks (t CO ₂ e)	Project emissions or actual net GHG removals by sinks (t CO ₂ e)	Leakage (t CO ₂ e)	GHG emission reductions or net GHG removals by sinks (t CO ₂ e) achieved in the monitoring period		
				Up to 31/12/2012	From 01/01/2013	Total amount
Total	308,551	0	0	50,170	258,381	308,551

E.5. Comparison of actual emission reductions or net 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 (t CO ₂ e)	369,461	308,551

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

CERs generated are low by 16.49%. This is due to low operational output. Since the actual emission reductions are less than estimated emission reduction, no further explanation is required.

Appendix 1. Contact information of project participants and responsible persons/entities

Project participant and/or responsible person/ entity	<input checked="" type="checkbox"/> Project participant <input type="checkbox"/> Person/entity responsible for completing the CDM-MR-FORM
Organization:	SHYAM DRI Power Ltd.
Street/P.O.Box:	-----
Building:	-----
City:	Village: Pandloi, P.O. Lapanga/ Rengali, distt: Sambalpur
State/Region:	Orissa
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Country:	India
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URL:	www.shyamgroup.com
Represented by:	
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Salutation:	Mr.
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Middle Name:	
First Name:	Sanjay
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Direct tel:	91-033-22852330 (extn.)116
Personal E-Mail:	sanjay@shyamgroup.com

Project participant and/or responsible person/ entity	<input type="checkbox"/> Project participant <input checked="" type="checkbox"/> Person/entity responsible for completing the CDM-MR-FORM
Organization name	EKI Energy Services Limited
Street/P.O. Box	Plot 48, Scheme 79, Part- 2, Vijay Nagar
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Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: <ul style="list-style-type: none"> • Include provisions related to delayed submission of a monitoring plan; • Provisions related to the Host Party; • Remove reference to programme of activities; • Overall editorial improvement.
04.0	25 June 2014	Revisions to: <ul style="list-style-type: none"> • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from <i>F-CDM-MR</i> to <i>CDM-MR-FORM</i>; • Editorial improvement.
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.
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 (EB70, 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	28 May 2010	EB 54, Annex 34. Initial adoption.
Decision Class: Regulatory Document Type: Form Business Function: Issuance Keywords: monitoring report		