



**Verified Carbon
Standard**

8MW BIOMASS BASED POWER PLANT AT PHAGWARA



India's Largest Carbon Credit Developer & Supplier

Document Prepared by EKI Energy Services Limited

Project Title	8MW biomass based power plant at Phagwara
Version	02
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Project ID	636 ¹
Monitoring Period	01-December-2012 to 30-September-2018 (first and last date included)
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¹ <https://registry.terra.org/app/projectDetail/VCS/636>

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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The project activity located at the JCT textile mills in the state of Punjab, India, involves the installation of a rice husk-based cogeneration plant for captive power generation.

The project activity involves the installation of a high-pressure boiler 50 TPH (66 kg/cm² (co-fire coal and rice husk) and an 8 MW condensing cum extraction type turbine generator. The electricity is generated at 11kV and stepped down to 440V for the adjacent textile plant.

The project activity was commissioned on 21-August--2008.

Brief description of the installed technology and equipment:

The project involves the installation of a new 8MW condensing cum extraction type turbine generator, along with a 50 TPH (66 kg/cm²) capacity boiler. The boiler is co-fired with coal and rice husk to generate steam, which in turn powers the turbine to generate power. The emission reductions claimed are for electricity generation from rice husk only.

The total GHG emission reductions or removals generated in this monitoring period.

The total emission reductions achieved in this monitoring period i.e. from 01-December-2012 to 30-September-2018 (first and last days included) is 227,187 tCO₂ e.

1.2 Sectoral Scope and Project Type

Title: AMC I.C: "Thermal Energy for the user with or without electricity" AMS I.C, " – Version 13².

Sectoral Scope: 1 Energy industries (renewable - / non-renewable sources)

Category: "Energy Industries (Renewable and non-renewable sources)"

Project is not grouped project activity as per VCS guidelines.

1.3 Project Proponent

Organization name	JCT Limited
Contact person	Ashwani Thapar
Title	General Manager
Address	G T Road, Phagwara, Punjab, India - 144401
Telephone	+ (91) 1824 521404
Email	athapar@jctltd.com

1.4 Other Entities Involved in the Project

Organization name	EKI Energy Services Limited
Role in the Project	Project Consultant

² <https://cdm.unfccc.int/methodologies/DB/VJWCB0FBX89L3K73D4S1QPUP0UBXGC>

Contact person	Sachin Nagarkar
Title	Dy. General Manager
Address	Office No 201, Plot No 48, Scheme 78, Vijay Nagar Part- II, Indore 452010, India
Telephone	9770900212
Email	sachin.nagarkar@enkingint.org / registry@enkingint.org

1.5 Project Start Date

Project start date: 21-August-2008 (Date of commissioning)

1.6 Project Crediting Period

Project Crediting Period Start date: 01-October-2008

Project Crediting Period End date: 30-September-2018

Total Crediting Period: 10 Years (Fixed)

1.7 Project Location

Geographical & Physical information of the Project activity

1. Host Party (ies): India
2. Region/ State/ Province, etc.: Punjab
3. City/ Town/ Community, etc.: Tehsil Phagwara of Kapurthala district,
4. Physical/ Geographical location: GPS coordinates 31.2055° N (31° 13'11" N) and 75.7752°E (75° 45'36"E)

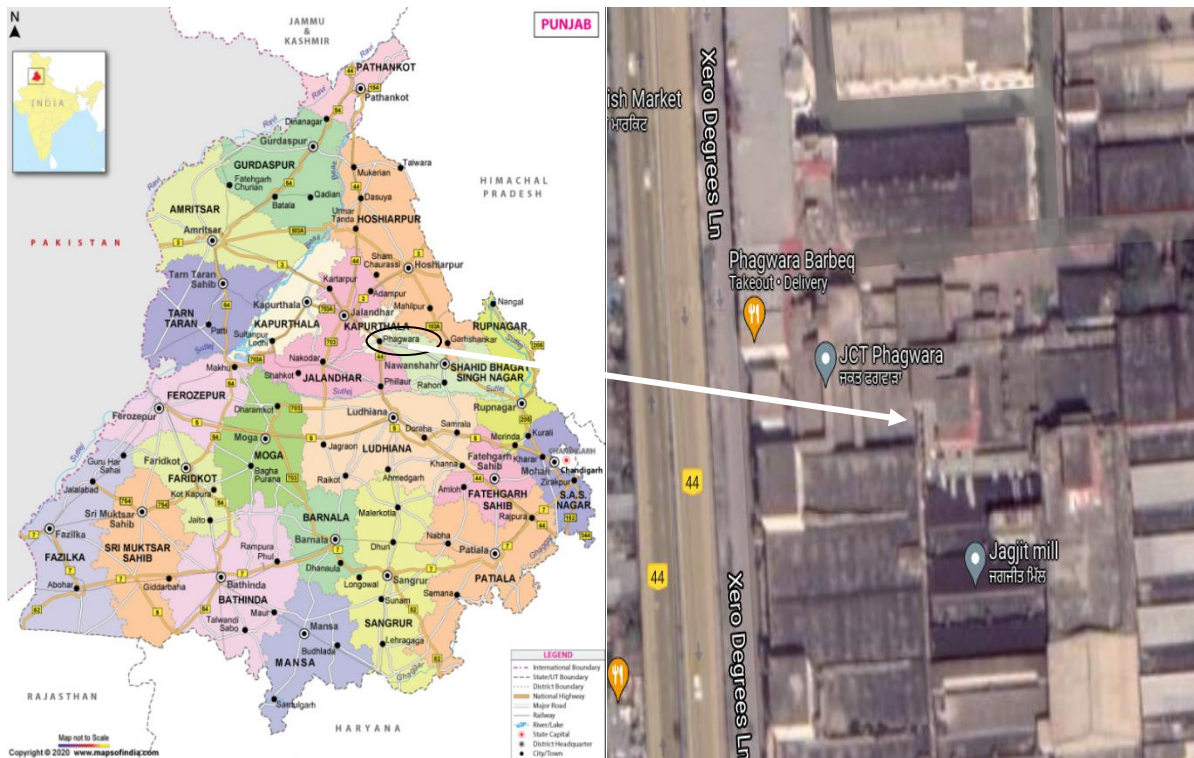


Figure 1 & 2. Map of Punjab showing Kapurthala district & Satellite Image of the project activity

1.8 Title and Reference of Methodology

Title: Thermal Energy for the user with or without electricity.

Reference: Approved small scale methodologies AMS I.C (Version 13, EB 38)³

Tool: Tool to calculate the emission factor for and electricity system, version 01.1”

1.9 Participation under other GHG Programs

The PP has participated under CDM mechanism of UNFCCC. The UN reference id 2998⁴ of program with this project activity and had claimed CDM benefits for the period of 17-February-2010 to 30-November-2012. The PP would not consider the credit from any other mechanism for the current monitoring period. The undertaking is provided to confirm that there is no any double accounting for current monitoring period.

1.10 Other Forms of Credit

Emission Trading Programs and Other Binding Limits: India is non-annex1country and there is no compliance with an emission trading program or to meet binding limits on GHG emissions for this project activity. The project is registered under CDM and UNFCCC (Registration ID 2998). The project proponent (PP) has submitted undertaking that they will not claim same GHG emission reductions of the project from CDM and VCS. PP would not use net GHG emission reductions by the projects for compliance with emission trading program to meet binding limits on GHG emissions. PP has also submitted undertaking for not availing other forms of environmental credit for the same crediting period under consideration.

Other Forms of Environmental Credit: The project “8MW biomass based power plant at Phagwara” developed by M/s JCT Ltd. VCS id 636 and CDM id 2998. The project has undergone following CDM/VCS verifications till date

- 1) 01-October 2008 to 16-February 2010 – VCS verification
- 2) 17-February 2010 to 30-September-2010 - CDM verification
- 3) 01 October 2010 to 30- November 2012 – CDM verification
- 4) 01 December 2012 to 30-September 2018 – MR webhosted on CDM website. PP will not claim the credits from CDM mechanism but from VCS mechanism.
- 5) 01 October 2018 to 16-February 2020 – CDM verification - this verification is under process.

Thereby we confirm that emission reduction will not be double accounted for monitoring period 01-December-2012 to 30-September-2018. M/s JCT Ltd. is claiming carbon credits for period 01-December-2012 to 30-September-2018 in VCS mechanism only.

1.11 Sustainable Development Contributions

Ministry of Environment and Forests (MoEF), Government of India, has stipulated the following indicators for sustainable development in the interim approval guidelines for CDM projects. . Thus the project’s contribution towards sustainable development has been addressed based on the following sustainable development aspects:

³ <https://cdm.unfccc.int/methodologies/DB/VJWCB0FBX89L3K73D4S1QPUP0UBXGC>

⁴ <https://cdm.unfccc.int/Projects/DB/DNV-CUK1253797520.52/view>

Social well being

- The project generates clean power without negative impacts on surroundings.
- No human displacement due to the project activity and hence no requirement of relocation.
- The local population has been employed during the installation, commissioning and operation of the project, thus proper training imparted to the people involved results in the skill development of the local inhabitants and also improvement in their economic condition.

Environmental well being

- The project activity displaces an equivalent quantum of power generated by the combustion of fossil fuels, the non-renewable energy sources at the grid connected thermal power plants, thus reducing GHG emissions and contributing to the overall cause of mitigation of global warming.
- The project activity by setting up biomass based project for power generation does not cause environmental disturbance or ecological imbalance to the surroundings.
- The project activity does also contribute to the reduction in the levels of SO_x, NO_x, and SPM associated with combustion of fossil fuels for generation of thermal power.

Economic well being

- The project activity is responsible for creating business opportunities for many local stakeholders.
- It is an effort on the part of the project proponent to contribute towards grid stability and abridging the demand supply gap in electricity in the regional grid and in turn in the national grid.
- The project activity conserves fossil-fuels and makes these non-renewable sources of energy available for other important purposes.
- It indirectly contributes towards industrial development of the region by creating a support in terms of supplying power for industries to come up in due course of time.

Technological well being

- The project activity generates clean power by use of biomass
- The project contributes towards the stability of grid power that is a major cause of concern in remote locations.

Table 1: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	7.2	7.2.1: Renewable energy share in the total final energy consumption	Implemented activities to increase	About 280,482.48 MWh renewable electricity has been used for captive consumption during the reported period	Overall 340,602.80 MWh (60,120.32+ 280,482.48) renewable electricity has supplied for captive consumption since project commissioning.
2)	13.0	13.2.2: Tonnes of greenhouse gas emissions avoided or removed	Implemented activities to increase	By supplying 280,482.48 MWh clean electricity (generated through biomass) for captive consumption, the project avoided release of 227,187 tCO ₂ e in to the atmosphere during the reporting period.	Overall prevented the release of 275,844 (48,697 +227,187) tCO ₂ e into the atmosphere since project commissioning.
3)	8.6	8.6.1 Proportion of youth (aged 15-24 years) not in education, employment or training	Implemented activities to increase	The Project organize 01 training/ year for the staff on the monitoring of the plant operation, and the emergency and safety procedures	Overall, 10 trainings are provided since project commissioning.

2 SAFEGUARDS

2.1 No Net Harm

An Environmental Impact Assessment was carried out to investigate, analyze and mitigate the effects caused by the project activity on the surrounding environment. In view of running the project activity as a sustainable one, the project proponent has taken care to follow the rules and regulations for conservation of environment. In relation to the baseline scenario no negative environmental impacts would arise as a result of the project activity. The positive environmental impacts arising from the project activity are:

- 1) A reduction in carbon dioxide emissions from the replacement of fossil fuels which would be generated under the baseline scenario
- 2) A reduction in the emissions of other harmful gases (NO_x and SO_x) that arise from the combustion of coal in power generation
- 3) A reduction in ash in comparison to the baseline scenario due to the lower ash content of rice husk relative to coal (10-12% versus 30-40% respectively).

The factory meets all environmental legislations as set out by the Punjab Pollution Control Board (PPCB) and there is on-going monitoring of the plant by this state body. A “Consent to Establish” the project activity has been issued and a “Consent to Operate” is obtained prior to commissioning of the plant and renewed every year. The plant has installed ESP at the exit of the boiler to limit suspended particulate matter in the flue gases to less than 150 mg/Nm³. There is also investment in wastewater systems to treat the water demineralization plant effluent and also the blow down water from the cooling tower and steam generator. Monitoring of air and water quality is undertaken on a regular basis as per Punjab Pollution Control Board guidelines since the plant commissioning. The testing of the environmental parameters is undertaken by an independent third party

No significant environmental impacts are likely to occur due to the implemented project activity. The project does not involve any potential negative environmental and socio-economic impacts and hence this criteria is not applicable to this project activity.

2.2 Local Stakeholder Consultation

A local stakeholder review which was undertaken through an invitation for comments from the local public. A notice was placed in the local newspaper, the “Phagwara-Kapurthala Kesari” on 29th February 2008 informing the public of the proposed CDM project and inviting comments to be forwarded to the plant. The local stakeholder’s consultation has been conducted as per the standard guidelines and requirements followed under CDM & VCS mechanism which was approved in the registered VCS-PD.

The Identified local stakeholders at the project site:

- Local villagers,
- Panchayat members
- Governmental and non-governmental parties
- equipment suppliers, contractors
- Employees

The stakeholders were made aware about the project activity and discussed about the various benefits arising out of the project activity. Attendance records, summary of comments received and photographs of the stakeholder meet were documented & provided to DOE during registration of project activity.

As a part of continuous feedback from stakeholders, there were no major comments or protest raised by the stakeholders and they were totally in support for setting up of these kinds of projects in the region.

For ongoing communications, the PP also placed a grievance register onsite in where the stakeholder can put down his/her complain and the same if found genuine will be addressed immediately. However, no major comments/grievances/suggestions have been received from the mentioned stakeholders during the current monitoring period.

2.3 AFOLU-Specific Safeguards

The project activity deals with generation of electricity using biomass and not from AFOLU projects. Hence not applicable.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The project activity was commissioned on 21-August-2008

The notification or request of approval of changes from the project activity as described in the registered CDM-PDD was approved on 09-October-2012. The design change was effective from 01-October-2010 onwards.

The design change is given below,

In the registered project activity, it was estimated that the project activity will be implemented as mentioned in the registered PDD. At the time of registration, it was envisaged that the project will utilize rice husk for 7 months and coal for 4 months in a year. During the first verification period which was of around 7.5 months, the PP had utilized rice husk as the only fuel source for the co-generation facility. The project is running fully on rice husk (without any coal) due to the availability of the same. Hence this project design change is requested because it is envisaged then that the project may run fully on rice husk even upto 11 months without usage of any coal depending on the availability of the rice husk.

Biomass based power plant is running satisfactorily during the reported monitoring period. There are no special events occur during the reported monitoring period. Hence, no impact occurs on the GHG emission reduction from the project activity. No major equipment has been replaced or exchanged during this period. There was no such event occurred that may impact the GHG emission reductions or removals and monitoring.

3.2 Deviations

3.2.1 Methodology Deviations

There is no request for methodology deviation applied during current monitoring period.

3.2.2 Project Description Deviations

There is no project description deviations applied for the previous monitoring period as well as during the current monitoring period.

3.3 Grouped Projects

This project activity is not a grouped project activity. Hence not applicable.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	$EF_{grid,y}$
Data unit	tCO ₂ /MWh
Description	CO ₂ emission factor of the grid
Source of data	Baseline Carbon Dioxide Emission Database version 03 https://cea.nic.in/cdm-co2-baseline-database/?lang=en
Value applied	0.81
Justification of choice of data or description of measurement methods and procedures applied	Central Electricity Authority is a government body which calculates the grid emission factors. https://cea.nic.in/cdm-co2-baseline-database/?lang=en
Purpose of Data	Baseline emissions
Comments	Specified <i>ex-ante</i>

Data / Parameter	$EF_{grid,BM,y}$
Data unit	tCO ₂ /MWh
Description	Build margin CO ₂ emission factor for grid connected power generation in year y
Source of data	Baseline Carbon Dioxide Emission Database version 03 https://cea.nic.in/cdm-co2-baseline-database/?lang=en
Value applied	0.63
Justification of choice of data or description of measurement methods and procedures applied	Central Electricity Authority is a government body which calculates the grid emission factors. https://cea.nic.in/cdm-co2-baseline-database/?lang=en
Purpose of Data	Baseline emissions
Comments	Specified <i>ex-ante</i>

Data / Parameter	$EF_{grid,OM,y}$
Data unit	tCO ₂ /MWh
Description	Operating margin CO ₂ emission factor for grid connected power generation in year y
Source of data	Baseline Carbon Dioxide Emission Database version 03 https://cea.nic.in/cdm-co2-baseline-database/?lang=en

Value applied	1.0
Justification of choice of data or description of measurement methods and procedures applied	Central Electricity Authority is a government body which calculates the grid emission factors. https://cea.nic.in/cdm-co2-baseline-database/?lang=en
Purpose of Data	Baseline emissions
Comments	Specified <i>ex-ante</i>

Data / Parameter	EF_{km,CO_2}
Data unit	tCO ₂ /km
Description	Emission factor for transport of biomass
Source of data	1996 IPCC, Chapter 1 Ref 4, Mobile combustion (1.5.3)
Value applied	0.0012065
Justification of choice of data or description of measurement methods and procedures applied	The data from the plausible options in Table 1-32 has been chosen most conservatively, i.e. we have chosen data that results in the highest emission factor which will result in the largest transport emissions.
Purpose of Data	Project emissions
Comments	Specified <i>ex-ante</i> . 1996 IPCC values are more conservative than 2006 values and hence give higher project emissions.

Data / Parameter	$SC_{biomass}$
Data unit	tonnes/MWh
Description	Specific fuel consumption of biomass
Source of data	Plant records and specification from manufacturers
Value applied	1.27
Justification of choice of data or description of measurement methods and procedures applied	The specific fuel consumption is calculated based on specifications for boiler and turbine.
Purpose of Data	Baseline emissions
Comments	Specified <i>ex-ante</i> .

Data / Parameter	SC_{coal}
Data unit	tonnes/MWh
Description	Specific fuel consumption of coal
Source of data	Plant records and specification from manufacturers
Value applied	0.77
Justification of choice of data or description of measurement methods and procedures applied	The specific fuel consumption is calculated based on specifications for boiler and turbine.

measurement methods and procedures applied	
Purpose of Data	Baseline emissions
Comments	Specified <i>ex-ante</i> .

4.2 Data and Parameters Monitored

Data / Parameter	EG_{total}
Data unit	MWh
Description	Net electricity generated from all the fuels in the project activity
Source of data	Plant records
Description of measurement methods and procedures to be applied	Calculated
Frequency of monitoring/recording	Daily
Value monitored	289217.36
Monitoring equipment	-Not applicable - The figure is arrived at by subtracting the auxiliary consumption from the generation of electricity
QA/QC procedures to be applied	The generation meter is calibrated once in 3 years and the auxiliary meter is calibrated annually.
Purpose of the data	Baseline emissions
Calculation method	The figure is arrived at by subtracting the auxiliary consumption from the generation of electricity
Comments	-

Data / Parameter	EG_{gen}				
Data unit	MWh				
Description	Gross electricity generated from all the fuels in the project activity				
Source of data	Plant records				
Description of measurement methods and procedures to be applied	Measured				
Frequency of monitoring/recording	Continuously measured and daily recorded				
Value monitored	331179.18				
Monitoring equipment	Energy Meter – calibration details are provided in appendix 2				
	<table> <tr> <th>Serial No</th><th>Accuracy class</th></tr> <tr> <td>07348782 - L & T</td><td>0.5s</td></tr> </table>	Serial No	Accuracy class	07348782 - L & T	0.5s
Serial No	Accuracy class				
07348782 - L & T	0.5s				

QA/QC procedures to be applied	This is crosschecked with annual energy balance based on the fuel type and quantity utilized in the project activity. The generation meter is calibrated once in 3 years.
Purpose of the data	Baseline emissions
Calculation method	The figure is arrived at by subtracting the auxiliary consumption from the generation of electricity
Comments	-

Data / Parameter	EG_{aux}				
Data unit	MWh				
Description	Auxiliary consumption of the project activity				
Source of data	Plant records				
Description of measurement methods and procedures to be applied	Measured				
Frequency of monitoring/recording	Continuously measured and daily recorded				
Value monitored	41961.82				
Monitoring equipment	Energy Meter - calibration details are provided in appendix 2 <table border="1"> <tr> <th>Serial No</th><th>Accuracy class</th></tr> <tr> <td>701/0507/PO 5138</td><td>1.0</td></tr> </table>	Serial No	Accuracy class	701/0507/PO 5138	1.0
Serial No	Accuracy class				
701/0507/PO 5138	1.0				
QA/QC procedures to be applied	The auxiliary meter is calibrated annually.				
Purpose of the data	Baseline emissions				
Calculation method	The figure is arrived at by subtracting the auxiliary consumption from the generation of electricity				
Comments	-				

Data / Parameter	M_{biomass,y}		
Data unit	Tonnes		
Description	Amount of biomass combusted in the project activity		
Source of data	Plant records		
Description of measurement methods and procedures to be applied	Measured		
Frequency of monitoring/recording	Continuously measured and daily recorded		
Value monitored	474280.0		
Monitoring equipment	Belt weigher - calibration details are provided in appendix 2 <table border="1"> <tr> <th>Serial No</th><th>Accuracy class</th></tr> </table>	Serial No	Accuracy class
Serial No	Accuracy class		

	BCW55LO SI. no.425/08	± 5%
QA/QC procedures to be applied	Crosschecked with the stores and purchase receipts of rice husk. Belt weigher is used to monitor the amount of biomass combusted in the project activity boiler ($M_{biomass,y}$) as mentioned in the monitoring plan of the registered PDD,. The same is cross checked with the weigh bridge reading. The belt weigher and weigh bridge readings are mentioned in the plant log book. The weighbridge gives reading on the higher side hence PP considers this value. So on conservative side the higher value has been reported.	
Purpose of the data	Baseline emissions	
Calculation method	-	
Comments	-	

Data / Parameter	$M_{coal,y}$				
Data unit	Tonnes				
Description	Amount of coal combusted in the project activity				
Source of data	Plant records (stores)				
Description of measurement methods and procedures to be applied	Measured				
Frequency of monitoring/recording	Daily				
Value monitored	10186.0				
Monitoring equipment	Weigh Bridge - calibration details are provided in appendix 2 <table> <tr> <th>Serial No</th><th>Accuracy class</th></tr> <tr> <td>EB2KW301</td><td>± 5Kg</td></tr> </table>	Serial No	Accuracy class	EB2KW301	± 5Kg
Serial No	Accuracy class				
EB2KW301	± 5Kg				
QA/QC procedures to be applied	Cross checked with the stores and purchase receipts of coal				
Purpose of the data	Baseline emissions				
Calculation method	-				
Comments	-				

Data / Parameter	N_y
Data unit	Integer
Description	Number of trips undertaken to transport biomass to the project site
Source of data	Plant records (stores)
Description of measurement methods and procedures to be applied	Calculated

Frequency of monitoring/recording	Monthly
Value monitored	30191.0
Monitoring equipment	-
QA/QC procedures to be applied	The weighbridge is calibrated at regular interval.
Purpose of the data	Project emissions
Calculation method	The rice husk usage is monitored through the parameter M_{biomass,y} . Each truck that enters the site is recorded at the weighbridge from which the truck capacity is established. The biomass usage is divided by the truck capacity to arrive at the number of trips.
Comments	-

Data / Parameter	AVD _y
Data unit	Km
Description	Average return distance
Source of data	Transporters receipts
Description of measurement methods and procedures to be applied	Calculated
Frequency of monitoring/recording	Monthly
Value monitored	125.10
Monitoring equipment	-
QA/QC procedures to be applied	The weighbridge is calibrated at regular interval.
Purpose of the data	Project emissions
Calculation method	https://distancecalculator.globefeed.com/India_Distance_Calculator.asp?state=23
Comments	-

4.3 Monitoring Plan

The project activity is implemented as mentioned in the registered PDD. No new technology measure or retrofits have been added during this verification period. The information regarding the shut down and the details of the interruption days is given in Appendix 1

The responsibility and reporting of the monitoring parameters follow the procedures set out in the monitoring plan. During each shift the electrical shift operator records the main energy meter reading. This data is collected at the end of each day and reported in the daily operating report to the Head (Commercial)

Each truck that enters the site is weighted at the weighbridge installed at the factory. Data on amount of rice husk used in project activity is continuously recorded by belt weigher. The incoming coal is initially weighed at the weigh bridge and then stocked in the yard

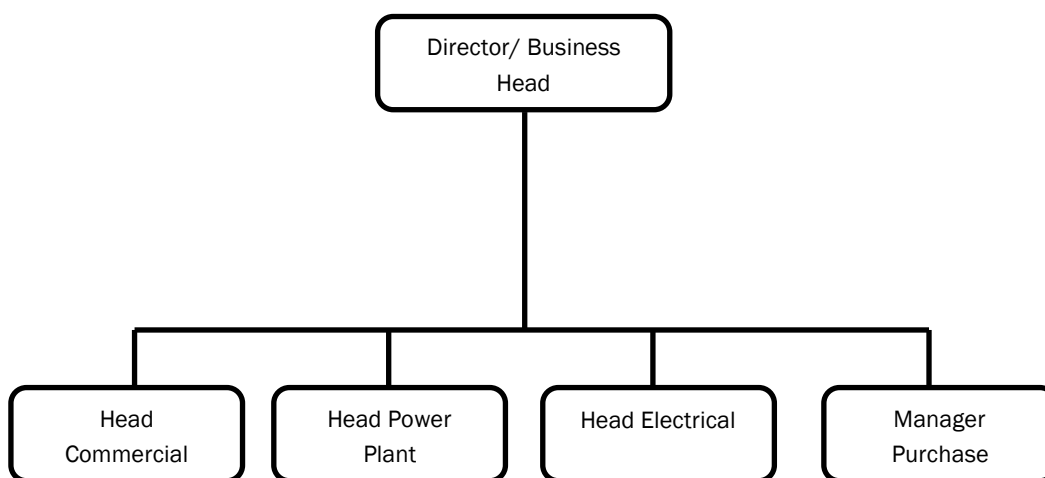
The plant implemented a Digital Control System (DCS) which is electronically monitoring the main performance and output variables of the power plant, the systems for monitoring the CDM aspect of the project are drawn extensively from the DCS system.

Data on transport emissions is monitored through the number of trucks delivering biomass and the annual biomass (rice husk) used in the project activity. The amount of biomass and coal used in the project activity is cross checked with the store and purchase receipts. Based on the source mentioned on the transport receipts, the average return distance is obtained from the website⁵ (2 x distance of biomass source to plant).

Emergency procedures

The plant maintains the data in both hard and soft copy formats. However, no emergencies occurred during the period under verification which could have given rise to emissions.

Organizational structure

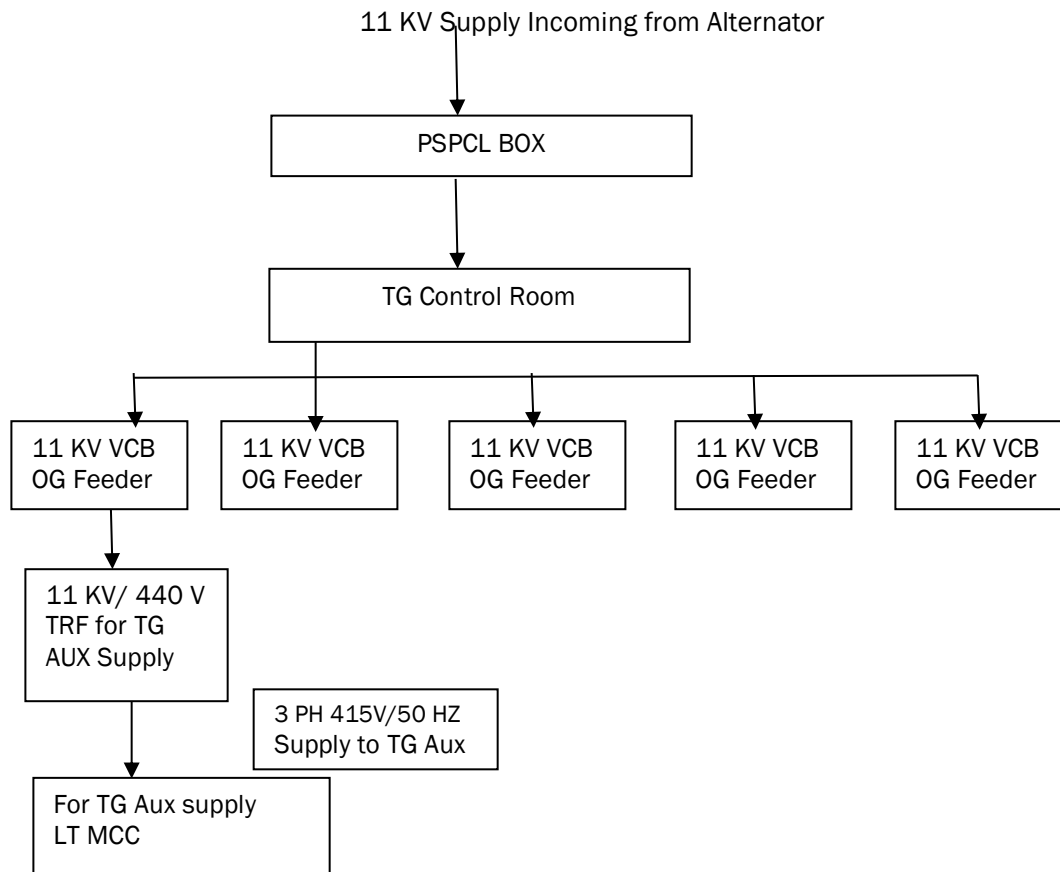


Roles and responsibilities

Designation	Responsibility
Director/ Business Head	Overall responsibility of CDM Project
Head – Commercial	Co-ordination of day-to-day CDM activities
Head – Power Plant	Monitoring of various operations at the power plant. Taking readings of power generation, auxiliary consumptions and fuel consumed.
Head - Electrical	Monitoring of various instruments used in measurements of various variables.
Manager - Purchase	Responsibility of Fuel purchase and keeping all related records.

⁵ http://distancecalculator.globefeed.com/India_Distance_Calculator.asp?state=23

The single line diagram showing all relevant electricity monitoring points is given below,



All the data items monitored under the monitoring plan are kept for 2 years after the end of crediting period or till the last issuance of VCU/VERs for this project activity whichever occurs later.

Procedures for internal audit of compliance with monitoring procedures

An internal audit team independently conduct internal audit of monitored data. The internal audit is conducted annually. The internal audit team reviews all the records pertaining to energy production, biomass consumption, coal consumption (if any) and auxiliary consumption. The team is also checking the monitoring equipment's for accuracy and whether calibration was performed. The Power Plant Manager in association with the Shift –in –charge is answering all the queries raised by the internal audit team.

The internal audit team has communicated to the Plant Manager and Shift-in-charge(s) about the non-compliances (if any) with the monitoring plan. The internal audit team also suggests corrective actions and indicate areas of improvement to the personnel involved in monitoring the data. Power Plant Manager closes the non-conformities prior to the verification by the DOE.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

The formulae used to calculate the baseline emissions are:

$$BE_{elec,y} = EG_y * EF_{grid,y}$$

$BE_{elec,y}$ Baseline emissions from electricity displaced by project during year y, tCO₂e

EG_y Net electricity produced with biomass during the year y, MWh

$EF_{grid,y}$ CO₂ emission factor of the grid, tCO₂e/MWh

Where:

$$EG_y = MIN \left[\left(\frac{M_{biomass,y}}{SC_{biomass}} \right) and \left(EG_{total,y} - \left(\frac{M_{coal,y}}{SC_{coal}} \right) \right) \right]$$

$M_{biomass,y}$ = Amount of biomass used, tonnes/ year

$SC_{biomass}$ = Specific fuel consumption for biomass, tonnes/MWh

$EG_{total,y}$ = Net electricity generated from all the fuels in the project activity, MWh

$M_{coal,y}$ = Amount of coal used, tonnes/ year

SC_{coal} = Specific fuel consumption for coal, tonnes/MWh

$$= MIN [(474,280/1.27) \text{ and } (289,217.36 - (10186/0.77))]$$

$$= MIN [(373,448.81) \text{ and } (280,482.48)]$$

$$= 280,482.48 \text{ MWh}$$

$$BE_{elec,y} = 280,482.48 * 0.81$$

$$= 2,27,187 \text{ tCO}_2\text{e (round down value)}$$

5.2 Project Emissions

$$PET_y = N_y \cdot AVD_y \cdot EF_{km,CO_2}$$

$$= 30191 * 125.1 * 0.0012065$$

$$= 4573.0 \text{ tCO}_2\text{e (round up value)}$$

Where:

PET_y = CO₂ emissions during the year y due to transport of the rice husk to the project plant (tCO₂/yr)

N_y = Number of truck trips during the year y

AVD_y = Average round trip distance (from and to) between the rice husk supply sites and the site of the project plant during the year y (km),

$EF_{km, CO_2,y}$ = Average CO₂ emission factor for the trucks measured during the year y (tCO₂/km)

It can be seen that $PET_y < 10\%$ of $BE_{elec,y}$ and therefore we do not need to consider project emissions due to transportation as indicated in the para 12 of the "General guidance on leakage in biomass project activities, EB 47, Annex 28.

PEy = 0 tCO₂e

5.3 Leakage

Energy generating equipment is not transferred from another activity therefore leakage is not considered.

Ly = 0 tCO₂e

5.4 Net GHG Emission Reductions and Removals

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
01-December-2012 to 31-December-2012	3639.0	0.0	0.0	3639.0
01-January-2013 to 31-December-2013	39,736.0	0.0	0.0	39,736.0
01-January-2014 to 31-December-2014	41,951.0	0.0	0.0	41,951.0
01-January-2015 to 31-December-2015	29,147.0	0.0	0.0	29,147.0
01-January-2016 to 31-December-2016	40,147.0	0.0	0.0	40,147.0
01-January-2017 to 31-December-2017	38,271.0	0.0	0.0	38,271.0
01-January-2018 to 30-September-2018	34,296.0	0.0	0.0	34,296.0
Total	227,187	0.0	0.0	227,187

During the current monitoring period, actual emission reductions achieved are 227,187 tCO₂e whereas estimated emission reductions was 269,541 tCO₂e. The project witnessed a decrease of 15.7% in emission reductions as compared to ex-ante estimation.

APPENDIX 1: BREAKDOWN DETAILS

Month	Interruption days/ hours	Reason for interruption
Dec-12	Nil	-
Jan-13	Nil	-
Feb-13	Nil	-
Mar-13	6.80 hrs	Boiler PA Fan coupling problem
Apr-13	0.43 days/10.25 hrs	Boiler Stopped due to Bed Coil Leakage
May-13	5.17days/124 hrs	Plant stopped due to Bed Coil Leakage/ Electrical problem in 8mw TG Set
Jun-13	Nil	-
Jul-13	16.26 days/390.25 hrs	Plant stopped due to Boiler Super Heater Tube leakage
Aug-13	2.18 days/52.42 hrs	Boiler stopped due to Super Heater Tube leakage
Sep-13	1.84 days/44.25 hrs	Boiler stopped due to Economiser Tube leakage & TG trip
Oct-13	Nil	-
Nov-13	Nil	-
Dec-13	Nil	-
Jan-14	Nil	-
Feb-14	3.94 days/94.66 hrs	Boiler stopped due to Shaft broken in Head pulley of BC#3 & clinker formation
Mar-14	Nil	-
Apr-14	0.32 days/7.58 hrs	Boiler stopped due to PA Fan bearing damaged
May-14	4 days/96.08 hrs	Boiler stopped due to Planned Shutdown
Jun-14	Nil	-
Jul-14	Nil	-
Aug-14	Nil	-
Sep-14	Nil	-
Oct-14	Nil	-
Nov-14	5.65 days/135.50 hrs	Boiler stopped due to Planned Shutdown
Dec-14	Nil	-
Jan-15	25.756 days/18 hrs	Boiler Stopped due to Major Shutdown (Pressure parts replacement)
Feb-15	Nil	-
Mar-15	Nil	-
Apr-15	2.93 days/70.40hrs	Boiler stopped due to planned shutdown
May-15	Nil	-

Jun-15	0.04 days/59 mint	Boiler stopped due to drag chain feeder jammed(Boiler Steam pressure dropped) and TG triped
Jul-15	Nil	-
Aug-15	4.9 days/117.58hrs	Boiler stopped due to planned shutdown
Sep-15	Nil	-
Oct-15	Nil	-
Nov-15	Nil	-
Dec-15	Nil	-
Jan-16	Nil	-
Feb-16	4.92 days/118.17 hrs	Boiler stopped due to planned shutdown
Mar-16	Nil	-
Apr-16	Nil	-
May-16	Nil	-
Jun-16	Nil	-
Jul-16	Nil	-
Aug-16	9.92 days/238.27 hrs	Boiler Stopped due to planned shutdown,clinkar formation, TG tripped, and coal trial
Sep-16	Nil	-
Oct-16	0.003 days/0.08 hrs	Boiler stopped due to Turbine Tripped
Nov-16	Nil	-
Dec-16	6.20 days /148.78 hrs	Boiler Stopped due to planned shutdown and TG tripped
Jan-17	7.65 days/183.5 hrs	Boiler stopped due to Turbine tripped (Electrical Fault) and TG stopped due to sheer pin broken
Feb-17	0.005days/0.13 hrs	Boiler Stopped due to Power Supply Failure
Mar-17	1.34 days/32.25 hrs	Boiler Stopped due to Super Heater & Roof Pannel Tube leakage
Apr-17	15.35days/368.5 hrs	Boiler Stopped due to Super Heater & Roof Pannel Tube leakage and super heater tube failure
May-17	0.145 days/3.50 hrs	Boiler Stopped due to Super Heater Tube leakage
Jun-17	24.5 days/588.33 hrs	Boiler stopped due to Turbine MOP Failure & APH Tube replacement
Jul-17	0.09days/2.17 hrs	Boiler stopped due to Attend Gland leakage in Isolating valve of H.P Header
Aug-17	Nil	-
Sep-17	4.06 days/97.42 hrs	Boiler stopped due to planned shutdown (Turbine pinion replacement)
Oct-17	Nil	-
Nov-17	Nil	-
Dec-17	6.28 days/150.67 hrs	Boiler stopped due to Tube Leakage (Boiler Bank Area)
Jan-18	Nil	-
Feb-18	Nil	-
Mar-18	Nil	-

Apr-18	Nil	-
May-18	5.06 days/121.53 hrs	Boiler stopped due to planned shutdown
Jun-18	0.032days/0.78 hrs	Boiler stopped due to Replace vent valve of Turbine and due to electrical problem
Jul-18	Nil	-
Aug-18	Nil	-
Sep-18	Nil	-

APPENDIX 2: CALIBRATION DETAILS

1. Gross Generation Meter - Calibration frequency: Once in three years

Serial No	Accuracy class	Calibration date	Valid till
07348782 L & T	0.5s	17-May-2011	16-May-2014
		06-May-2014	05-May-2017
		15-April-2017	14-April-2020

2. Auxiliary Meter: Calibration frequency: Annual

Serial No	Accuracy class	Calibration date	Valid till
701/0507/PO 5138	1.0	22-October-2012	21-October-2013
		15-October-2013	14-October-2014
		10-October-2014	09-October-2015
		08-October-2015	07-October-2016
		05-October-2016	04-October-2017
		02-October-2017	01-October-2018

3. Belt weigher: Calibration frequency: Annual

Serial No	Accuracy class	Calibration date	Valid till
BCW55LO SI. no.425/08	± 5%	20-April-2012	19-April-2013
		15-April-2013	14-April-2014
		10-April-2014	09-April-2015
		08-April-2015	07-April-2016
		05-April-2016	04-April-2017
		03-April-2017	02-April-2018
		02-April-2018	01-April-2019

4. Weighbridge: Calibration frequency: Annual

Serial No	Accuracy class	Calibration date	Valid till
EB2KW301	± 5Kg	13-December-2011	12-December-2012
		10-December-2012	09-December-2011
		05-December-2013	04-December-2014
		30-November-2014	29-November-2015
		15-November-2015	14-November-2016
		25-October-2016	24-October-2017
		25-September-2017	24-September-2018
		03-August-2018	02-August-2019