MONITORING REPORT FORM (CDM-MR)
Version 01 - in effect as of: DD/MM/YYYY

MONITORING REPORT
Version No.02 and Date: 24/11/2010

"15 MW BIOMASS RESIDUE BASED POWER PROJECT AT GHAZIPUR, INDIA"
Reference No: 2708
Pre-registration period i.e from 14/02/2009 till 11/01/2010 (first and last days included)

SECTION A. General description of the project activity

A.1. Brief description of the project activity:

The registered CDM project is owned and managed by Sukhbir Agro Energy Limited (SAEL) of Ghazipur district, Uttar Pradesh state, India. The project activity involves the operation of a 15 MW biomass based cogeneration system that meets the in-house requirement for steam & electricity and exports the surplus power to the regional grid. By using rice husk, a by-product of paddy processing, as fuel the project activity reduces GHG emissions by displacing the fossil fuel dominated grid based electricity with biomass residue based renewable electricity.

The cogeneration system consists of a 70 tonnes per hour (TPH) capacity travelling grate boiler and a 15 MW extraction cum condensing turbine located within the premises of a 40 TPH capacity Rice Mill for paddy processing and a 500 TPD Solvent Extraction Plant. Project plant meets the captive heat and electricity demand of the rice mill and solvent extraction plant while exporting surplus electricity to the regional grid. Prior to the project activity, the heat demand of the facility was met by a 10 TPH rice husk fired boiler and the electricity demand through grid supply.

The boiler and turbine were commissioned in December 2008 & January 2009 respectively. Trial runs were conducted for a month each. The plant was synchronized with the regional grid on 14th Feb 2009.

The project was registered on 12/01/2010. Credits are being claimed under VCS for the pre-registration period i.e. from 14/02/2009 (date on which the project plant was synchronized with the regional grid) till 11/01/2010 (a day before registration). The total emission reductions achieved during this period were 65,347 tCO2e.

A.2. Project Participants

Name of Party involved (*) (host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (host)	**Private entity:** Sukhbir Agro Energy Ltd	No

A.3. Location of the project activity:

The project activity is located at Fatehullahpur Village, Ghazipur District, Uttar Pradesh State, India. The coordinates of Ghazipur are:

Latitude – between 25° 19' and 25° 54' North
Longitude – between 83° 4' and 83° 58' East

A.4. Technical description of the project

The cogeneration system consists of a 70 tonnes per hour (TPH) capacity travelling grate boiler and a 15 MW extraction cum condensing turbine located within the premises of a 40 TPH milling capacity Rice Mill for paddy processing and a 500 TPD Solvent Extraction Plant. Project plant meets the captive heat and electricity demand of the rice mill and solvent extraction plant while exporting surplus electricity to the regional grid. Prior to the project activity, the heat demand of the facility was met by a 10 TPH rice husk fired boiler and the electricity demand through grid supply.

The technical specifications of the key equipments are as follows:

Major Technical Parameters of Boiler

Description	Parameters
No of boilers	One (1)
Makers	ISGEC John Thomson (IJT)
Type	Bi-drum, natural circulation, balanced draft, bottom supported, outdoor water tube type travelling grate
Steam flow at main steam stop valve outlet (100% BMCR)	70 TPH
Steam pressure at main steam stop valve outlet	67 kg/cm^2 (g)
Steam temperature at main steam stop valve outlet	490 +/- 5 deg C.
Feed water temperature at the economizer inlet	126 deg C
Design code for pressure parts	IBR

The boiler is designed with following design codes:

- Pressure parts: IBR 1950 with latest amendments
- Piping: ANSI 31.1 & IBR 1950
- Boiler performance: ASME PTC 4.4 – Indirect Method

Major Technical Parameters of Steam Turbine generator

Description	Parameters
No of Turbine	One (1)
Makers	Qingdao Jieneng Power Station Engineering Co., Ltd (QJPS)
Type	Extraction cum condensing
Rated capacity of turbine	15 MW with 10TPH extraction at 2.5 ata
Steam conditions at turbine inlet pressure (abs)	64 kg/cm^2 (g)
Temperature	485 +/- 5 deg C.
Condenser operational pressure (ata)	0.106
Recommended temperature rise in the cooling	9.6

tower (deg C)	
Rating at the generator terminals (MW)	15
Electrical generator	One 11kV, 50Hz, 0.8 power factor

The turbine is designed and manufactured according to following standards:

- For turbine, it is GB/T5578-1985 "Technical specifications for stationery steam turbine" which is equivalent to IEC 34:
- For Generators, it is GB/T6064-2002, "General technical specification for turbo generator", which is equivalent to IEC-34

The power generated is at 11 kV and is stepped up to 132 kV at the plant before supplying it to the regional grid line.

A.5. Title, reference and version of the baseline and monitoring methodology applied to the project activity:

Approved combined baseline and monitoring methodology ACM0006 (version 6.2) "***Consolidated methodology for electricity generation from biomass residues"*** is applied to the project activity.

Approved combined baseline and monitoring methodology ACM0002 (version 8) "***Consolidated methodology for grid-connected electricity generation from renewable sources"*** is used to determine the baseline grid emission factor.

A.6. Registration date of the project activity:

The registration date of the project activity is 12/01/2010.

A.7. Crediting period of the project activity and related information (start date and choice of crediting period):

Credits are being claimed only for the pre-registration period i.e. from 14/02/2009 (date on which the project plant was synchronized with the regional grid) till 11/01/2010 (a day before registration).

A.8. Name of responsible person(s)/entity(ies):

Mr. M.L. Arora,
General Manager,
M/s. Sukhbir Agro Energy Ltd.

SECTION B. Implementation of the project activity

B.1. Implementation status of the project activity

Project plant was synchronized with the regional electricity grid on 14/02/2009. This date is thus considered as the starting date for the operation of the project activity.

During the period 14/02/2009 till 11/01/2010 no special events such as overhauls, equipment change, downtimes had occurred. There has also been no event or situation which may have impacted the applicability of the methodology.

Details on major & minor shutdowns, corresponding run time CUF & generation have been submitted to the DOE.

From		To		Total Duration	Remarks
Date	Time	Date	Time		
16-Feb-2009	1:40 AM	16-Feb-2009	2:15 PM	12:35:00	Vacuum Pressure Low
2-Mar-2009	9:15 AM	4-Mar-2009	2:45 AM	41:30:00	Stroker Problem
19-Mar-2009	9:35 AM	19-Mar-2009	10:57 PM	13:22:00	Steam Line Leakage
21-Mar-2009	11:58 AM	5-Apr-2009	5:25 PM	365:27:00	Stroker & Bearing Problem.
6-Apr-2009	12:45 PM	8-Apr-2009	6:35 AM	41:50:00	Problem in Back filter of Ash Handling Plant
9-Apr-2009	3:38 AM	10-Apr-2009	11:00 AM	31:22:00	Problem in Back filter of Ash Handling Plant
23-Apr-2009	12:42 AM	23-Apr-2009	11:00 PM	22:18:00	PLC Hang
3-May-2009	8:52 AM	5-May-2009	6:58 PM	58:06:00	Oil Cooler & Ejector Problem
9-May-2009	1:25 PM	11-May-2009	8:10 PM	54:45:00	Travelling Grate Problem
12-May-2009	4:33 PM	14-May-2009	10:55 AM	42:22:00	CEP, Oil Cooler, Condensor Problem
18-May-2009	1:58 AM	18-May-2009	9:45 PM	19:47:00	Travelling Grate Problem
1-Jun-2009	12:00 AM	1-Jun-2009	9:40 PM	21:40:00	Travelling Grate Problem
3-Jul-2009	10:11 AM	3-Jul-2009	8:25 PM	10:14:00	Problem at Talbal Sub Station
13-Jul-2009	9:06 PM	14-Jul-2009	6:25 PM	21:19:00	Travelling Grate Problem
22-Jul-2009	11:24 AM	22-Jul-2009	10:10 PM	10:46:00	Ejector Problem
25-Jul-2009	4:15 PM	26-Jul-2009	11:41 AM	19:26:00	Boiler Leakage
30-Jul-2009	11:50 PM	1-Aug-2009	12:30 PM	36:40:00	Ejector Problem
6-Aug-2009	6:49 AM	6-Aug-2009	6:20 PM	11:31:00	Turbine differential expansion problem
8-Aug-2009	7:10 PM	9-Aug-2009	4:24 AM	9:14:00	CEP Problem
9-Aug-2009	4:45 AM	9-Aug-2009	1:42 PM	8:57:00	CEP Gland leakage Problem
29-Aug-2009	8:33 PM	30-Aug-2009	5:42 PM	21:09:00	PLC Problem
5-Sep-2009	6:35 AM	5-Sep-2009	6:40 PM	12:05:00	CEP Bearing Jammed
8-Sep-2009	7:52 AM	8-Sep-2009	7:41 PM	11:49:00	Ejector Problem
17-Oct-2009	11:03 AM	18-Oct-2009	1:45 AM	14:42:00	Generator Protection Relay Defective
24-Oct-2009	11:53 PM	25-Oct-2009	12:35 PM	12:42:00	Traveling Grate Problem
7-Nov-2009	11:58 PM	8-Nov-2009	9:58 PM	22:00:00	Loss of Field due to Grid Disturbance
8-Nov-2009	11:12 PM	10-Nov-2009	12:13 AM	25:01:00	Loss of Field due to Grid Disturbance
10-Nov-2009	7:19 PM	12-Nov-2009	2:12 AM	30:53:00	BFP Gasket Leakage Problem
22-Nov-2009	7:21 PM	24-Nov-2009	12:26 AM	29:05:00	Traveling Grate Problem
29-Nov-2009	3:56 AM	30-Nov-2009	11:20 AM	31:24:00	Travelling Grate Problem

1-Dec-2009	10:37 PM	3-Dec-2009	12:23 PM	37:46:00	Travelling Grate Problem
6-Jan-2010	12:29 AM	6-Jan-2010	11:00 AM	10:31:00	Travelling Grate Problem
			Total	**1112:18:00**	

B.2. Revision of the monitoring plan

There has been no revision in the monitoring plan.

B.3. Request for deviation applied to this monitoring period

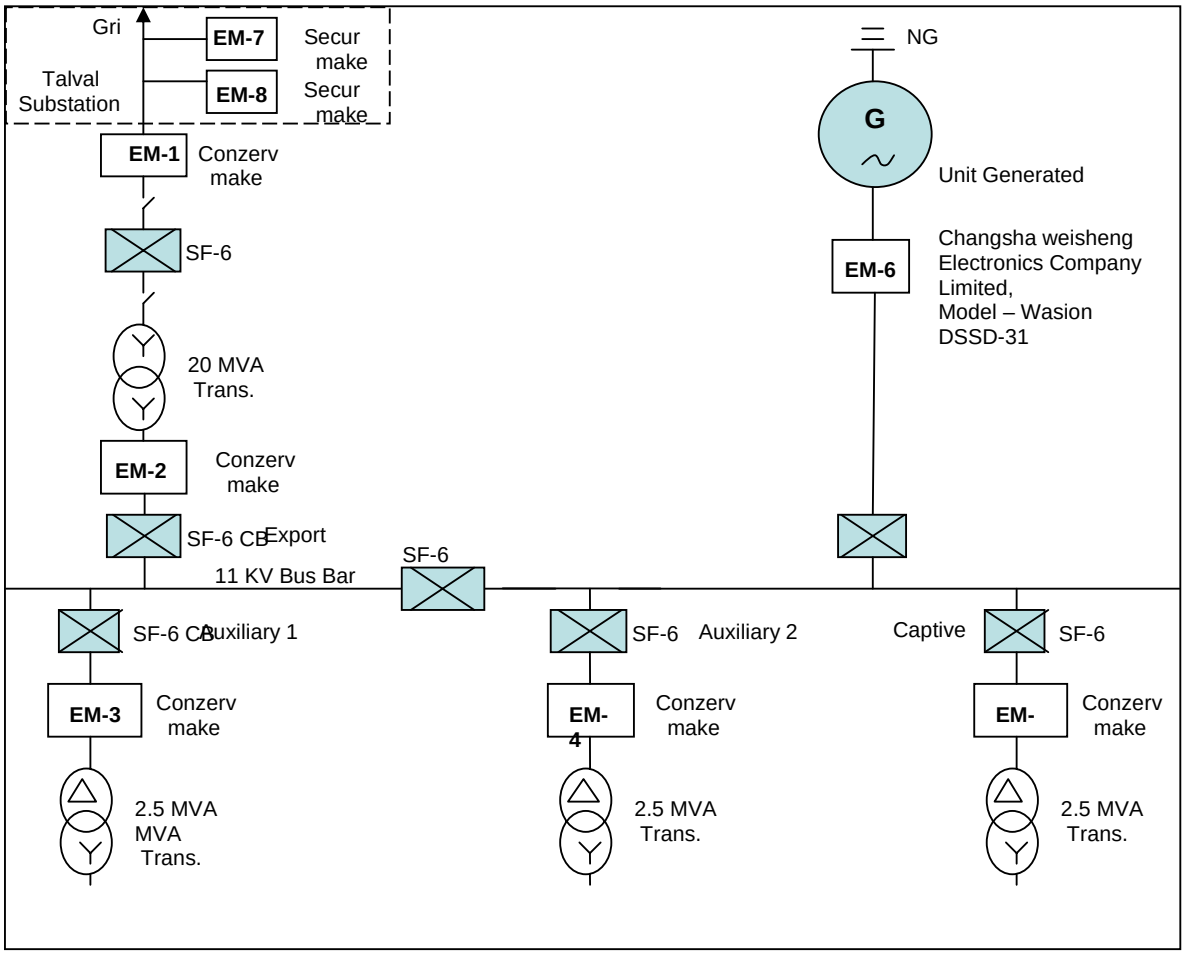
There has been no request for deviation applied to the period 14/02/2009 till 11/01/2010.

B.4. Notification or request of approval of changes

There has been no notification or request of approval of changes from the project activity as described in the registered CDM-PDD.

SECTION C. Description of the monitoring system

Approved baseline and monitoring methodology involves the monitoring of electricity as well as fuel. Monitoring of electricity data revolves around power generation from the turbine generators and auxiliary consumption of the project activity. While the main meter attached to the turbine generator meters the total (or gross) generation, there are two separate meters installed to meter the auxiliary consumption. The meters installed are calibrated once a year. Diagram below details the electricity metering system for the project.



Monitoring is based on electricity meters 3, 4 & 6. Gross electricity is measured by EM-6 and auxiliary consumption is measured by EMs 3 & 4 respectively. The difference between gross generation and auxiliary consumption qualifies as net electricity for determining the baseline emissions for the project activity. All electricity meters (EM 1 to 6) measuring power generation and consumption are calibrated once a year to ensure the accuracy of the readings. As a backup, baseline electricity reading can also be determined by adding captive consumption and export. This however is used only in exigency.

The amount of rice husk procured from outside is measured by 2 weigh bridges of capacity 40 ton & 100 ton respectively installed at the factory gate. Receipts of the same form the basis for monitoring the number of truck trips and the average return trip distance to determine project emissions.

The amount of rice husk from internal source is measured as a percentage of paddy processed by the rice mill where, the amount of paddy processed in turn is measured by the weigh bridges. The weigh bridges are calibrated once a year to ensure accurate readings.

Operational and Management structure:

The management of the plant has designated Mr. Alok Agrawal, Manager MIS to be responsible for the collection of data as per the monitoring methodology. The Manager MIS is entrusted to collect all data to be monitored as mentioned in the Project Design Document (PDD) and report to Mr. M. L. Arora, General Manager (GM) of the plant. The overall CDM project management responsibility remains with the GM. The GM is also responsible for entire CDM related activities and ensures quality assurance on the final data and facts recorded. The GM is authorized to revise the monitoring plan in line with the methodology and other futuristic requirements and assess the viability of the data at regular interval. The GM in turn reports to the Board Director on quarterly basis on the operational details of the project activity.

Mr. Prabhakar Thakur, Commercial Executive maintains daily records pertaining to procurement of rice husk from outside, generation of rice husk from in-house rice mill and their utilization as fuel for steam generation in project plant. Mr. Amit Srivastava, CDM Executive maintains daily records pertaining to steam and electricity generation.

The hourly recording of data is done by shift operators that are checked by the shift in-charge at the end of each shift and re-checked by the Commercial Executive or the CDM Executive accordingly at the end of the day. The data is compiled as a daily report by the Commercial Executive or the CDM Executive accordingly in the formats developed at the site by the Manager MIS. The daily reports are sent to the GM for verification and are used to prepare a monthly report. The monthly reports are prepared by the Manager MIS and are re-sent to the GM for verification. The reports after verification become a part of the Management Information System (MIS) and are reviewed by the management during the review meeting. It is these verified monthly reports that are used for estimating emission reductionsThe Manager MIS is also responsible for archiving the data.

SAEL has engaged its existing resources to manage, monitor and ensure quality control on the monitoring and recording of the desired data for the project activity. The CDM monitoring personnel maintain and review all related factory records and are familiar with the process of monitoring and documentation.

Uncertainties and adjustment: procedure for identifying and dealing with them

If errors are detected, error detection and disposal reports are submitted to the General Manager. If these errors occur as a result of inadequacy of QA and QC procedure, the GM after assessing historic data makes necessary adjustments and recommends the Manager MIS to implement the same. Any such observations are also documented in the daily report maintained by GM and can be found in the records along with its time of occurrence, duration and possible reasons behind such operational discrepancies.

Emergency preparedness plan

The project activity does not result in any unidentified activity that can lead to unpredicted and significant emissions. Hence, there is no need for emergency preparedness in data monitoring. Biomass storage is continuously monitored to ensure there is no decay of biomass that can lead to an increase in GHG emissions. Measures have been taken to maintain low moisture content of biomass residue at all times.

Training

The project was erected and commissioned under the guidance and supervision of technical experts of Indure (P) Ltd. In course of commissioning, under the supervision of Project In-charge Mr. Ram Singh Chandel, during the period from Dec 2008 to March 2009 their team members comprising of Engineers and Technical Experts have imparted on-site training on various aspects of project operation, maintenance, monitoring and record keeping to SAEL Plant Personnel.

SAEL has engaged FICCI Quality Forum (FQF), New Delhi as consultant for providing training to its CDM team. FQF helps in periodical review and GHG audit of the CDM project. It also trains the personnel responsible for monitoring in accordance to the approved methodology and details mentioned in the monitoring plan of the PDD at regular intervals.

The Head of FICCI Quality Forum Mr. K H Sharma and his team members have provided training to the CDM team of SAEL on the following dates: 20th Nov 2007, 3rd Apr 2008, 15th July 2008, 29th August 2008 and 1st Jan 2010.

Mr. Alok Agrawal, Manager MIS of SAEL has attended a seminar on CDM Projects organized by FICCI at Lucknow on 31st Oct 2008.

SECTION D. Data and parameters

D.1. Data and parameters determined at registration and not monitored during the monitoring period, including default values and factors

Data / Parameter:	**$EF_{electricity,y}$**
Data unit:	tCO_2 / MWh
Description:	The Combined Margin emission factor of the NEWNE grid
Source of data used:	Page No. 32 of the Registered PDD titled "15 MW Biomass Residue Based Power Project at Ghazipur, India" Version 05 dated 05/11/2009 with reference no. 2708
Value(s) :	0.80
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data is used to calculate Baseline emission.
Additional comment:	The value is fixed ex-ante for the entire crediting period.

D.2. Data and parameters monitored

Data / Parameter:	**$EG_{projectplant,y}$**
Data unit:	MWh/yr
Description:	Net quantity of electricity generated in the project plant during the year y
Measured /Calculated /Default:	Calculated
Source of data:	Electricity meters installed at generation & consumption points.
Value(s) of monitored parameter:	82,204
Indicate what the data are used for (Baseline/ Project/	The data is used to calculate Baseline emission.

Leakage emission calculations)	
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	The parameters gross generation ($EG_{Gross,y}$) and auxiliary consumption ($EG_{Aux,y}$ where, $EG_{Aux,y} = EG_{Aux1,y} + EG_{Aux2,y}$) are measured using energy meters EM-6, EM-3 & EM-4 respectively installed in the power plant. EM-6 is of accuracy class 0.5 while EM-3 & EM-4 are of class 1.0. The serial numbers of the meters measuring gross generation, auxiliary consumption-1 and auxiliary consumption-2 are 20070325010057, 44917/135263 -1008 and 144917/135265 -1008 respectively. The calibration frequency is once every year. The meters were calibrated at the time of installation. The date of last calibration was 25th August 2009 and the validity is till 24th August 2010.
Measuring/ Reading/ Recording frequency:	The parameters are measured and recorded on an hourly basis.
Calculation method (if applicable):	$EG_{projectplant,y} = EG_{Gross,y} - EG_{Aux,y}$ where, $EG_{Aux,y} = EG_{Aux1,y} + EG_{Aux2,y}$
QA/QC procedures applied:	The metered net electricity generation was cross checked against the quantity of biomass fired by dividing the former by the latter. The resultant efficiency arrived at was found to be consistent with that quoted by the manufacturer.

Data / Parameter:	**BF_y**
Data unit:	Tonnes of dry matter
Description:	Quantity of biomass residue (rice husk) combusted in the project activity during the year 'y'
Measured /Calculated /Default:	Calculated
Source of data:	Plant records
Value(s) of monitored parameter:	1,15,637
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data is not used in the determination of emission reduction.
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	The amount of rice husk procured from outside is measured by 2 weigh bridges of capacity 40 ton & 100 ton resp. which are installed at the factory gate. The amount of rice husk from internal source is measured as a percentage of paddy processed by the rice mill where, the amount of paddy processed is in turn measured by the weigh bridges. The weigh bridges are calibrated annually by an independent third party. The 40 ton weigh bridge was calibrated twice during the period 14/02/2009 to 11/01/2010 – on 30/04/2008 whose validity was till 29/04/2009; and on 29/04/2009 whose validity was till 29/04/2010. The 100 ton weigh bridge was also calibrated twice during the same period – on 27/11/2008 whose validity was till 26/11/2009; and on 16/12/2009 whose validity is till 16/12/2010. The date of last calibration for 40 ton weigh bridge is 19/05/2010 and the calibration is

	valid till 18/05/2011.
Measuring/ Reading/ Recording frequency:	The measurement frequency is daily. For the biomass procured from outside, the recording is done as and when it is arrives at the factory gate. The loaded truck is stationed on the weigh bridge and the weight is recorded as the gross weight. After unloading the biomass, the truck is stationed again on the weigh bridge and the tier weight is recorded. The difference in the gross and the tier weight gives the quantity of rice husk procured. The quantity of rice husk collected from internal sources is measured as a percent of paddy processed. The weights are later adjusted for moisture content by measuring the same in the in-house laboratory.
Calculation method (if applicable):	Quantity of rice husk combusted = Amount of rice husk procured from outside + Amount of rice husk from internal sources where, Amount of rice husk from internal sources = 20% of the paddy processed by the rice mill
QA/QC procedures applied:	The quantity of rice husk combusted was cross checked through an energy balance undertaken on 7th December 2009. The figure arrived at was found to be consistent with those reported in the study.

Data / Parameter:	**Moisture content of the biomass residue**
Data unit:	% Water content
Description:	Moisture content of biomass residue (rice husk)
Measured /Calculated /Default:	Measured
Source of data:	Lab reports
Value(s) of monitored parameter:	16.59
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data is not used in the determination of emission reduction.
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	The moisture content of rice husk is determined in an in-house laboratory. Standard testing procedure is followed.
Measuring/ Reading/ Recording frequency:	Monitored continuously. Daily records are maintained with mean values calculated annually.
Calculation method (if applicable):	--
QA/QC procedures applied:	The value is cross-checked for consistency by getting one sample analysed at a govt. approved laboratory at least once in six months. International Standard IS: 1350(P-1) 1970 R – 2002 is used in the determination of moisture content. A sample each was analysed for moisture content on the following dates: 31/03/2009, 09/05/2009, 14/08/2009, 17/09/2009, 14/10/2009, 21/12/2009 and 24/12/2007. The in-house lab results were found to be consistent with those of the govt. approved lab.

Data / Parameter:	AVDy
Data unit:	Km
Description:	Average round trip distance (from and to) between biomass fuel supply sites and the project site
Measured /Calculated /Default:	Calculated
Source of data:	Plant records
Value(s) of monitored parameter:	98
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data is used to calculate project emissions.
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Records are maintained at the factory gate. Recording is done as and when a truck loaded with biomass arrives at the factory gate.
Measuring/ Reading/ Recording frequency:	Monitored continuously. Daily records are maintained with mean values calculated annually.
Calculation method (if applicable):	Calculated as annual mean.
QA/QC procedures applied:	The records were cross-checked against the receipts of biomass residue received from various suppliers and were found to be consistent.

Data / Parameter:	Ny
Data unit:	-
Description:	Number of truck trips for the transportation of biomass.
Measured /Calculated /Default:	Measured
Source of data:	Plant records
Value(s) of monitored parameter:	9783
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data is used to calculate project emissions.
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Records are maintained at the factory gate. Recording is done as and when a truck loaded with biomass arrives at the factory gate.
Measuring/ Reading/ Recording frequency:	Monitored continuously. Daily records are maintained with mean values calculated annually.
Calculation method (if applicable):	--
QA/QC procedures applied:	The records were cross-checked against the receipts of biomass residue received from various suppliers and were found to be consistent.

Data / Parameter:	**$EF_{km,CO2,y}$**
Data unit:	tCO_2/km
Description:	Average CO_2 emission factor for the trucks during the year y
Measured /Calculated /Default:	Calculated
Source of data:	*Vehicle mileage* – Page No. 6 of the Registered PDD titled "15 MW Biomass Residue Based Power Project at Ghazipur, India" Version 05 dated 05/11/2009 with reference no. 2708 *Density of diesel* – http://www.siamindia.com/scripts/Diesel.aspx *Net Calorific Value (NCV) for diesel* - 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volme-2, Page 1.18 *CO_2 emission factor for diesel* - Report of "India's Initial National Communication to UNFCCC" (Page: 41, Table: 2.6)
Value(s) of monitored parameter:	0.00043
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data is used to calculate project emissions.
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	--
Measuring/ Reading/ Recording frequency:	Monitored annually
Calculation method (if applicable):	Average CO_2 emission factor for the trucks = Vehicle mileage x Density of diesel x NCV of diesel x CO_2 emission factor for diesel
QA/QC procedures applied:	Default values have been used.

Data / Parameter:	Quantity of rice husk utilized (e.g. for energy generation or as feedstock) in the defined geographical region
Data unit:	Tons
Description:	Quantity of rice husk utilized (e.g. for energy generation or as feedstock) in the defined geographical region
Measured /Calculated /Default:	Measured
Source of data:	Biomass Availability Report (July 2009), Page 45, Table - I
Value(s) of monitored parameter:	1,43,450
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data is used to determine leakage emissions, if any. Leakage emissions due to competing use of biomass was found to be insignificant and thus ignored.
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last	Monitoring is carried out in the form of a survey. The survey is conducted by an independent third party once every year. During the period 14/02/2009 to 11/01/2010, a survey was carried out

calibration, validity)	in July 2009 to determine the quantity of rice husk utilized and the quantity of rice husk available in the defined geographical region.
Measuring/ Reading/ Recording frequency:	Monitored annually.
Calculation method (if applicable):	--
QA/QC procedures applied:	Studies are carried out by an authorized third party.

Data / Parameter:	Quantity of available rice husk in the region
Data unit:	Tons
Description:	Quantity of available rice husk in the region
Measured /Calculated /Default:	Measured
Source of data:	Biomass Availability Report (July 2009), Page 46, Para 14.21
Value(s) of monitored parameter:	7,80,000
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data is used to determine leakage emissions, if any. Leakage emissions due to competing use of biomass was found to be insignificant and thus ignored.
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Monitoring is carried out in the form of a survey. The survey is conducted by an independent third party once every year. During the period 14/02/2009 to 11/01/2010, a survey was carried out in July 2009 to determine the quantity of rice husk utilized and the quantity of rice husk available in the defined geographical region.
Measuring/ Reading/ Recording frequency:	Monitored annually
Calculation method (if applicable):	--
QA/QC procedures applied:	Studies are carried out by an authorized third party.

Data / Parameter:	**$EF_{co2,LE}$**
Data unit:	tCO_2/GJ
Description:	CO_2 emission factor of the most carbon intensive fuel (Blast Furnace Gas) used in the country
Measured /Calculated /Default:	Default
Source of data:	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volme-2, Table 1.4, Page 1.23
Value(s) of monitored parameter:	260,000
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data is used to determine leakage emissions, if any. Leakage emissions due to competing use of biomass was found to be insignificant and thus ignored.

Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	--
Measuring/ Reading/ Recording frequency:	Monitored annually
Calculation method (if applicable):	--
QA/QC procedures applied:	Default values are used.

Data / Parameter:	**$Q_{project\ plant,\ y}$**
Data unit:	GJ
Description:	Net quantity of heat generated from firing biomass in the project plant
Measured /Calculated /Default:	Measured
Source of data:	Steam flow log
Value(s) of monitored parameter:	3,70,061
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data is not used in the determination of emission reduction.
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	The parameter is measured by a steam flow meter. Steam Flow Meter details are given below. **Make**: YOKOGAWA **Model**: EJA 110 A **Supply**: 10.5 – 42 VDC **Output**: 4 – 20 MADC **Cal Range**: 0-5000 mm H_2O **MWP**: 16 MPA The calibration frequency is once every year. The meter was calibrated at the time of installation. 25th August 2009 and the validity is till 24th August 2010.
Measuring/ Reading/ Recording frequency:	The measurement and recording frequency is hourly.
Calculation method (if applicable):	--
QA/QC procedures applied:	The metered net heat generation was cross checked against the quantity of biomass fired by dividing the former by the latter. The resultant efficiency arrived at was found to be consistent with that quoted by the manufacturer.

Data / Parameter:	**NCV_k**
Data unit:	GJ/ton of dry matter
Description:	Net Calorific value of biomass residue (rice husk)
Measured /Calculated	Measured

/Default:	
Source of data:	Lab reports
Value(s) of monitored parameter:	3,268
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data is not used in the determination of emission reduction.
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	NCV of rice husk is determined in an in-house laboratory. Standard testing procedure is followed.
Measuring/ Reading/ Recording frequency:	Monitored continuously. Daily records are maintained with mean values calculated annually.
Calculation method (if applicable):	--
QA/QC procedures applied:	The value is cross-checked for consistency by getting sample analysed at a govt. approved laboratory at least once in six months. International Standard IS: 1350 (P-2) 1970 R – 2005 is used in the determination of NCV. Samples were analysed for NCV on the following dates: 31/03/2009, 09/05/2009, 14/08/2009, 17/09/2009, 14/10/2009, 21/12/2009 and 24/12/2007. The in-house lab results were found to be consistent with those of the govt. approved lab.

Data / Parameter:	ε_{boiler}
Data unit:	%
Description:	Average net energy efficiency of heat generation in the boiler that would generate heat in the absence of the project activity. Under the project activity, this would be the 10 TPH boiler.
Measured /Calculated /Default:	--
Source of data:	Higher value among a) the measured value and b) manufacturer's information on the efficiency
Value(s) of monitored parameter:	80
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data is not used in the determination of emission reduction.
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	--
Measuring/ Reading/ Recording frequency:	As the 10 TPH boiler was retired at the start of the project activity, the parameter is determined once at the project start. The higher value of

<table>
<tr><td></td><td>the following must be considered:

a) Measured Efficiency (historic 3 years data)
b) Manufacturer specification

a) The thermal efficiency of 10 TPH Boiler for the last 3 years is given below:

<table>
<tr><th>Period</th><th>Boiler Efficiency (%)</th></tr>
<tr><td>15th Dec. 2007 to 31st March 2008</td><td>76.16%</td></tr>
<tr><td>1st Apr. 2008 to 31st March 2009</td><td>76.06%</td></tr>
<tr><td>1st Apr. 2009 to 12th January 2010</td><td>75.57%</td></tr>
<tr><td>Average of 3 years</td><td>75.93%</td></tr>
</table>

b) The designed efficiency as specified by the manufacturer is 80%

As the designed efficiency is greater than the measured efficiency, the efficiency of the 10 TPH boiler is 80%.</td></tr>
<tr><td>Calculation method (if applicable):</td><td>--</td></tr>
<tr><td>QA/QC procedures applied:</td><td>--</td></tr>
</table>

SECTION E. Emission reductions calculation

E.1. Baseline emissions calculation

As per page no. 9 of the registered PDD, the spatial extent of the project boundary encompasses the plant at the project site, transportation of biomass residues to the project site and the electricity/grid system that the project activity is connected to.

Page 28 & 29 of the registered PDD provides details on the baseline emissions of the project activity.

Baseline emissions of the project activity constitutes emission reductions from displacement of electricity ($ER_{electricity,y}$) alone and not emission reductions due to heat generation ($ER_{heat,y}$) and emissions reductions from biomass decay ($ER_{biomass,y}$). As $ER_{heat,y}$ and $ER_{biomass,y}$ are not been claimed, these are assumed as zero. Baseline emissions of the project activity are thus determined by the following equation:

$ER_{electricity,y} = EG_y \,.\, EF_{electricity,y}$

Where,
EG_y is the net quantity of electricity generation as a result of the project activity This is not incremental to the baseline generation as the baseline boiler (10 TPH) was a heat-only boiler and not a cogeneration boiler
$EF_{electricity,y}$ is the CO_2 emission factor for the electricity displaced due to the project activity during the year y in tons CO_2/MWh.

The CO_2 emission factor for the displacement of electricity corresponds to the grid emission factor ($EF_{electricity,y} = EF_{grid}$).

Uttar Pradesh state falls within the Northern Region. As the Northern Regional Grid was synchronized with the integrated North, East, West and Northern-Eastern (NEWNE) Grid, the grid emission coefficient for the Northern Regional Grid is now determined from the synchronous grid emission factor of the NEWNE Grid. The grid emission factor (EF_{grid}) has been fixed ex-ante for the project activity and the value as per page 32 of the registered PDD is 0.80 tCO_2/MWh.

Baseline emission calculation for the monitoring period is as follows:

Parameter	Description	Value	Source
$ER_{electricity,y} = EG_y \cdot EF_{electricity,y}$			
$ER_{,electricity,y}$	Emission reductions due to displacement of electricity during the year y (tCO_2/yr)	65764	Calculated
EG_y	Net quantity of electricity supplied to the NEWNE grid during the year y (MWh).	82,204	Calculated
$EF_{electricity.,y}$	CO_2 Combined Margin emission factor for the electricity displaced due to the project activity during the year y (tCO_2/MWh)	0.80	Page 32 of the registered PDD

Year	Gross Generation ($EG_{gross,y}$)	Auxiliary Consumption ($EG_{aux,y}$)	Net Generation (EGy)	Combined Margin Factor ($EF_{electricity,y}$)	Baseline Emissions ($ER_{electricity,y}$)
	MWh	MWh	MWh	tCO_2/MWh	tCO_2e
14/02/2009 - 11/01/2010	90788	8583	82204	0.8	65764

E.2. Project emissions calculation

Project emission calculations are detailed in Page 28 & 29 of the registered PDD.

The only emissions attributed to the operation of the project activity are those from the transport of biomass residue (rice husk) to the project plant i.e. $PE_y = PET_y$.

Rice husk procured are transported to the project site by trucks and the CO_2 emissions resulting from transportation of rice husk to the project plant are calculated as per Option-1 on the basis of distance and the number of trips as:

$PET_y = N_y * AVD_y * EF_{km,CO2}$

Where,
PET_y is CO_2 emissions during the year y due to transport of the biomass residues to the project plant (tCO2/yr);
N_y is the number of truck trips during the period y;
AVD_y is the average round trip distance (from and to) between the biomass residue fuel supply sites and the site of the project plant during the year y (km); and
$EF_{km,CO2}$ is the average CO_2 emission factor for the trucks measured during the year y in t (CO2/km)

Project emission calculation for the monitoring period is as follows:

Parameter	Value	Unit	Source
Number of truck trips (N_y)	9783	--	Calculated
Average round trip distance (AVD_y)	98	Ton	Calculated
Vehicle mileage	6.00	km/l	Page 6 of the registered PDD
Density of Diesel	845.00	kg/m^3	http://www.siamindia.com/scripts/Diesel.aspx
Default Value of Net calorific value for diesel	43.00	TJ/Gg	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volme-2, Page 1.18
Default value of National CO_2 Emission Factor for Diesel	71.40	tCO_2/TJ	Report of "India's Initial National Communication to UNFCCC" (Page: 41, Table: 2.6)
Emission factor of Diesel ($EF_{km,CO2}$)	0.00043	tCO_2/km	Calculated
Project Emissions due to transport of biomass residues to site (PET_y)	417	tCO_2/yr	Calculated

E.3. Leakage calculation

Project boundary has been defined within 200 km of radius and the target districts in the neighbouring states of Bihar and U.P. have been indicated in page 11 of the registered PDD.

Leakage emission calculations are detailed in page 31 of the registered PDD.

As per page 30, option L2 is chosen for addressing leakage. If the project activity causes any leakage effect, the estimated emissions will be deducted as per the following equation:

$$L_y = EF_{CO2,LE} * \sum BF_{PJ,k,y} * NCV_k$$

Where,
L_y - Leakage emissions during the year y (tCO_2/yr)
$EF_{CO2,LE}$ - CO_2 emission factor of the most carbon intensive fuel used in the country (tCO_2/GJ)
$BF_{PJ,k,y}$ - Incremental quantity of biomass residue type k used as a result of the project activity in the project plant during the year y (tons of dry matter)
k - Types of biomass residues for which leakage effects could not be ruled out
NCV_k - Net calorific value of the biomass residue type k (GJ/ton of dry matter)

Determination of $BF_{PJ,k,y}$:

$$BF_{PJ,k,y} = BF_{k,y} - \frac{Q_{project\ plant,y}}{\varepsilon_{boiler} \cdot NCV_k}$$

Where,
$BF_{PJ,k,y}$ - Incremental quantity of biomass residue (rice husk) used as a result of the project activity in the project plant during the year y (tons of dry matter)
$BF_{k,y}$ - Quantity of biomass residue (rice husk) combusted in the project plant during the year y (tons of dry matter)

$Q_{project\ plant,y}$ - Quantity of heat generated in the cogeneration project plant from firing biomass residues (rice husk) during the year *y* (GJ)
NCV_k - Net calorific value of the biomass residue type *k* (GJ/ton of dry matter)

ε_{boiler} - Energy efficiency of the boiler that would be used in the absence of the project activity

A detailed assessment was conducted by a third party to ensure the availability of biomass in the region during the monitoring period 14/02/2009 - 11/01/2010. The study titled "A Report on Biomass Residue Availability Survey for 15 MW Biomass Residue Based Power Plant at District Ghazipur, Uttar Pradesh" dated July 2009 was undertaken by U Bandyopadhyay Project & Management Consultant. A copy of the report has been submitted to the DOE. It was found out that there was surplus of biomass - much more than 25% of the total consumption of the biomass in the region (within 200 km radius of the project site) including the requirement of the project activity. Hence, leakage emissions due to competing use of biomass was insignificant and ignored.

E.4. Emission reductions calculation / table

From the above sections, the expression used to determine emission reductions is reduced to:

$\mathbf{ER_y = ER_{electricity,y} - PE_y}$

Monitoring Period	Baseline Emissions (tCO_2e)	Project Emissions (tCO_2e)	Emission Reductions (tCO_2e)
14/02/2009 - 11/01/2010	65,764	417	65,347

E.5. Comparison of actual emission reductions with estimates in the CDM-PDD

Item	Values applied in ex-ante calculation of the registered CDM-PDD	Actual values reached during the monitoring period
Emission Reductions (tCO_2e)	**67,259**	**65,347**

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

The actual emission reduction units achieved during the monitoring period from 14/02/2009 till 11/01/2010 are lower than the estimated figure in the registered PDD. This is due to shutdowns/outrages as indicated under Section B.1.

- - - - -

History of the document

Version	Date	Nature of revision
01	EB 54, Annex 34 28 May 2010	Initial adoption.
Decision Class: Regulatory **Document Type**: Guideline, Form **Business Function**: Issuance		