Revised Monitoring Plan

SSML – Simbhaoli Biomass Power Project
CDM Reference No: 1112
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Project Participants:

1. Simbhaoli Sugar Mills Ltd
2. DSCL Energy Services Co Ltd
3. Agrinergy Ltd

B.7 Application of the monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

Data / Parameter:	**$BF_{k,y}$**
Data unit:	tons of dry matter or liter
Description:	Quantity of biomass residue type *k* combusted in the project plant during the year *y*
Source of data to be used:	On-site measurement of cane, RT8C records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Quantity of biomass residue type *k* combusted in the project plant during the year *y*
Description of measurement methods and procedures to be applied:	Monthly
QA/QC procedures to be applied:	Crosscheck the measurements with an annual energy balance that is based on monitored steam values
Any comment:	

Data / Parameter:	**$Q_{project\ plant,y}$**
Data unit:	GJ
Description:	Net quantity of heat generated from firing biomass in the project plant
Source of data:	On-site measurements
Measurement procedures (if any):	Net heat generation is determined as the difference of the enthalpy of the steam generated by the project cogeneration plant minus the enthalpy of the feed-water and any condensate return. The respective enthalpies should be determined based on the mass (or volume) flows, the temperatures and, in case of superheated steam, the pressure. Steam tables or appropriate thermodynamic equations may be used to calculate the enthalpy as a function of temperature and pressure. The fraction of heat generated from firing biomass residues should be determined by dividing the quantity of biomass residues fired by the total quantity of all fuels fired, both expressed in energy quantities.
Monitoring frequency:	Continuously
QA/QC procedures:	The consistency of metered net heat generation should be cross-checked with receipts from sales (if available) and the quantity of fuels fired (e.g. check whether the net heat generation divided by the quantity of fuels fired results in a reasonable thermal efficiency that is comparable to previous years).
Any comment:	Only applicable to cogeneration project activities.

Data / Parameter:	**$Q_{total,y}$**
Data unit:	GJ
Description:	Net quantity of heat generated in all cogeneration units at the project site, generated from firing the same type(s) of biomass residues as in the project plant, including the cogeneration unit installed as part of the project activity and any previously existing units, during the year *y*
Source of data:	On-site measurements
Measurement	Net heat generation is determined as the difference of the enthalpy of the steam

procedures (if any):	generated by the cogeneration plants minus the enthalpy of the feed-water and any condensate return. The respective enthalpies should be determined based on the mass (or volume) flows, the temperatures and, in case of superheated steam, the pressure. Steam tables or appropriate thermodynamic equations may be used to calculate the enthalpy as a function of temperature and pressure. The fraction of heat generated from firing biomass residues should be determined by dividing the quantity of biomass residues fired by the total quantity of all fuels fired, both expressed in energy quantities.
Monitoring frequency:	Continuously
QA/QC procedures:	The consistency of metered net heat generation should be cross-checked with receipts from sales (if available) and the quantity of biomass fired (e.g. check whether the net heat generation divided by the quantity of biomass fired results in a reasonable thermal efficiency that is comparable to previous years).
Any comment:	Only applicable to cogeneration project activities.

Data / Parameter:	**Moisture content of biomass residues**
Data unit:	% water content
Description:	Moisture content of each biomass residue k
Source of data:	On-site measurements in laboratory
Measurement procedures (if any):	Samples of the biomass residues will be weighed before and after drying to determine the moisture content. This will be carried out by the on-site laboratory.
Monitoring frequency:	Monthly, mean values calculated at least annually
QA/QC procedures:	The weighing balance used for the measurement will be calibrated in line with the relevant national standards or supplier specifications.
Any comment:	

Data / Parameter:	**NCV_k**
Data unit:	GJ/ton
Description:	Net calorific value of biomass residue type *k*
Source of data:	On-site measurements in laboratory
Measurement procedures (if any):	Measurements shall be carried out at reputed laboratories and according to relevant international standards. NCV will be based on dry biomass.
Monitoring frequency:	At least every six months, taking at least three samples for each measurement
QA/QC procedures:	The consistency of the measurements by comparing the measurement results with measurements from previous years, relevant data sources (e.g. values in the literature, values used in the national GHG inventory) and default values by the IPCC will be checked. If the measurement results differ significantly from previous measurements or other relevant data sources, conduct additional measurements. Ensure that the NCV is determined on the basis of dry biomass.
Any comment:	

Data / Parameter:	**EF_y**
Data unit:	tCO_2/MWh
Description:	Emission factor
Source of data to be used:	Calculated from the weighted average of the Simple Operating Margin and Build Margin
Value of data applied for the purpose of calculating expected emission reductions in section B.5	As this will be determined *ex-post* we have used for the purposes of our calculations an EF value published by the CEA, 0.75 tCO_2e/MWh
Description of measurement methods	Calculated variable.

and procedures to be applied:	
QA/QC procedures to be applied:	Values will be taken from CEA website/published data
Any comment:	This variable will be calculated from the $EF_{OM,y}$ and $EF_{BM,y}$. Whilst the basis of the calculations have used the CEA published CEF we believe there are issues with the determination of this in terms of the transparency of its calculation, therefore calculated factors at the time of verification may differ from this and cause variations in the actual CERs relative to the expected CERs presented in the PDD. Data will be held throughout the crediting period and 2 years thereafter.

Data / Parameter:	**$EF_{OM,y}$**
Data unit:	tCO_2/MWh
Description:	Simple Operating Margin
Source of data to be used:	Calculated variable but may be taken from government or reputed published data for EFs in India if these are available and calculated on the most up to date data.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	See EF_y
Description of measurement methods and procedures to be applied:	This is calculated from the equations provided in ACM0002
QA/QC procedures to be applied:	Values will be taken from CEA website/published data
Any comment:	Given the data available in India it is expected that this will be a Simple Operating Margin. If data is not available for the year in which exports have occurred this variable will be calculated from the most recent data available. Data will be held throughout the crediting period and 2 years thereafter.

Data / Parameter:	**$EF_{BM,y}$**
Data unit:	tCO_2/MWh
Description:	Build Margin
Source of data to be used:	Calculated variable but may be taken from government or reputed published data for EFs in India if these are available and calculated on the most up to date data.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	See EF_y
Description of measurement methods and procedures to be applied:	This is calculated from the equations provided in ACM0002
QA/QC procedures to be applied:	Values will be taken from CEA website/published data
Any comment:	If data is not available for the year in which exports have occurred this variable will be calculated from the most recent data available. Data will be held throughout the crediting period and 2 years thereafter.

Data / Parameter:	$F_{i,y}$
Data unit:	Mass or volume
Description:	Amount of each fossil fuel consumed by each power source/plant
Source of data to be used:	Central Electricity Authority, most recent General Review or other publication that contains fossil fuel consumption by power plants.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	See EF_y
Description of measurement methods and procedures to be applied:	Measured by individual plants and reported to the CEA.
QA/QC procedures to be applied:	The external data will be rechecked to ensure correctness
Any comment:	Currently the most recent General Review published is for 2006, http://www.cea.nic.in/power_sec_reports/general_review/index_general_Review.html

Data / Parameter:	$COEF_i$
Data unit:	tCO_2/mass or volume unit
Description:	Emission factor
Source of data to be used:	India's Initial National Communication to the UNFCCC, http://natcomindia.org/pdfs/chapter2.pdf for the NCV and EF and IPCC data for OXID
Value of data applied for the purpose of calculating expected emission reductions in section B.5	See EF_y
Description of measurement methods and procedures to be applied:	Measured by relevant Indian ministries or agency on their behalf.
QA/QC procedures to be applied:	Check against IPCC values
Any comment:	Data will be held throughout the crediting period and 2 years thereafter.

Data / Parameter:	$GEN_{j/k/n,y}$
Data unit:	MWh
Description:	Electricity generation of each power source/plant j, k n
Source of data to be used:	Central Electricity Authority, most recent data is from the Monthly Generation Report
Value of data applied for the purpose of calculating expected emission reductions in section B.5	See EF_y
Description of measurement methods and procedures to be applied:	Measured by power plants and reported to CEA

QA/QC procedures to be applied:	The external data will be rechecked to ensure correctness
Any comment:	Currently the most recent generation data is published by the CEA on the following url http://www.cea.nic.in/god/opm/Monthly_Generation_Report/index_Monthly_Generation_Report.html Data will be held throughout the crediting period and 2 years thereafter.

Data / Parameter:	**Plant name**
Data unit:	Text
Description:	Identification of power source/plant for the calculation of the OM
Source of data to be used:	Central Electricity Authority, monthly generation reports
Value of data applied for the purpose of calculating expected emission reductions in section B.5	See EF_y
Description of measurement methods and procedures to be applied:	Determined from all plants operating on regional grid
QA/QC procedures to be applied:	The external data will be rechecked to ensure correctness
Any comment:	Currently the most recent generation data is published by the CEA on the following url http://www.cea.nic.in/god/opm/Monthly_Generation_Report/index_Monthly_Generation_Report.html Data will be held throughout the crediting period and 2 years thereafter.

Data / Parameter:	**Plant name**
Data unit:	Text
Description:	Identification of power source/plant for the calculation of the BM
Source of data to be used:	Central Electricity Authority, state electricity boards and NTPC websites.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	See EF_y
Description of measurement methods and procedures to be applied:	Determined from all plants operating on regional grid
QA/QC procedures to be applied:	The external data will be rechecked to ensure correctness
Any comment:	Data will be held during the crediting period and two years thereafter.

Data / Parameter:	**$GEN_{j/k/ll, y, IMPORTS}$**
Data unit:	kWh
Description:	Electricity imports to the project electricity system
Source of data to be used:	Central Electricity Authority

Value of data applied for the purpose of calculating expected emission reductions in section B.5	See EF_y
Description of measurement methods and procedures to be applied:	Reported by Central Electricity Authority
QA/QC procedures to be applied:	The external data will be rechecked to ensure correctness
Any comment:	http://cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm Data will be held throughout the crediting period and 2 years thereafter.

Data / Parameter:	**$COEF_{i,j,y,IMPORTS}$**
Data unit:	tCO_2/mass or volume unit
Description:	CO_2 emission coefficient of fuels used in connected electricity systems
Source of data to be used:	India's Initial National Communication to the UNFCCC, http://natcomindia.org/pdfs/chapter2.pdf for the NCV and EF and IPCC data for OXID
Value of data applied for the purpose of calculating expected emission reductions in section B.5	See EF_y
Description of measurement methods and procedures to be applied:	Measured by relevant Indian ministries or agency on their behalf.
QA/QC procedures to be applied:	The external data will be rechecked to ensure correctness
Any comment:	Data will be held throughout the crediting period and 2 years thereafter.

Data / Parameter:	***$EG_{project\ plant,\ y}$***
Data unit:	MWh
Description:	Net quantity of electricity generated in the project plant during the year *y*
Source of data to be used:	SSML-Simbhaoli Sugar factory records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This value will be determined annually from the records maintained at the factory. However, for estimation of emission reductions this value has been estimated as 62,073 MWh.
Description of measurement methods and procedures to be applied:	The hourly recordings of data will be taken from energy meters located at the project activity site. This data will be recorded hourly by the shift attendant and entered into logbooks on site. This hourly data will be signed off at the end of every shift by an engineer in charge of the shift and again at the end of each day and signed off by the power plant manager. The energy meters will be calibrated annually by an independent third party.
QA/QC procedures to be applied:	This parameter may be checked with the quantity of biomass fired, i.e. show that the electricity generation divided by the quantity of biomass fired results in

	a reasonable efficiency as compared with the previous year.
Any comment:	Data will be held for a period of 2 years after the end of the crediting period.

Data / Parameter:	$EG_{total,y}$
Data unit:	MWh
Description:	Net quantity of electricity generated in all power units at the project site, generated from firing the same type(s) of biomass residue as in the project plant, including the new power unit installed as part of the project activity and any previously existing units, during the year *y*
Source of data to be used:	SSML-Simbhaoli Sugar factory records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This value will be determined annually from the records maintained at the factory. However, for estimation of emission reductions this value has been estimated as 90,266 MWh.
Description of measurement methods and procedures to be applied:	The data from the project activity will be monitored as set out above, for the existing power plant hourly recordings of data will be taken from energy meters located at the site.
QA/QC procedures to be applied:	This parameter may be checked with the quantity of biomass fired, i.e. show that the electricity generation divided by the quantity of biomass fired results in a reasonable efficiency as compared with the previous year.
Any comment:	Data will be held for a period of 2 years after the end of the crediting period.

B.7.2 Description of the monitoring plan:

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The monitoring of electricity data revolves around the power generation from the turbine generators and the auxiliary consumption of the power plant. All auxiliary units at the power plant will be metered and there will also be main meters attached to each turbine generator to determine their total generation.

The monitoring of biomass residues of will be in line with page 48 of the approved methodology that mentions "*If the amount of biomass combusted is estimated from the amount of biomass delivered to the project site, a procedure should be established to undertake an energy balance for the verification period, considering the stocks of biomass at the beginning and end of each verification period.*"

The total amount of bagasse generated by the sugar plant is calculated from the amount of cane crushed in the season (monitored variable), which is obtained from the RT8C records. Therefore, bagasse has been calculated using the formula:

Bagasse = Cane + Added water – Juice

This will be cross-checked using an annual energy balance using the monitored steam values, using the formula:

The total heat generated as well as the heat generated by the project activity is monitored using the temperature and pressure values and calculating the enthalpies of the steam generated and the feed water using standard steam charts/tables.

The management of the plant will designate one person to be responsible for the collation of data as per the monitoring methodology. The designated person will collect all data to be monitored as mentioned in this project design document (PDD) and will report to the head of the plant. The overall CDM project management responsibility will remain with the Plant Head.

The electricity generation from turbines and auxiliary consumption will be recorded continuously on an hourly basis by the operators in the shift. At the end of the day this data will be collated by the engineer in charge and signed off by the power plant manager. The steam data is also manually recorded on an hourly basis from the meters. The data will be recorded in logbooks by the operators and the engineer in charge will collate the data from these log books and store them electronically. This data will be used by engineer in charge to prepare a monthly report and send it to Plant Head for verification. The monthly reports will become a part of the Management Information System (MIS) and will be reviewed by the management during the quarterly review meeting. The monthly reports will be sent to consultants for estimation of monthly emission reductions, which will also be included in the MIS. The monitoring personnel are familiar with the process of monitoring and documentation. They have been maintaining and reviewing the factory records pertaining to the sugar manufacturing; however, their training needs will be identified and attended. All the meters will be checked and calibrated each year by an independent agency and they will be maintained as per the instructions provided by their suppliers. Hence there will be no uncertainties or adjustments associated with data to be monitored.

An internal audit team, comprising of personnel from the factory but from a department other than utility, will review the daily reports, monthly reports, procedure for data recording and maintenance reports of the meters. This team will check whether all records are being maintained as per the details provided in the PDD. The audit team will also enlist the modifications/corrective actions required, if any, in more accurate monitoring and reporting. All the data and reports will be kept at the offices of the sugar mill until 2 years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later.

Emergency preparedness plans have been laid out to meet with situations leading to unintended emissions. These emergency situations have been identified as:

1. Fire in the fuel yard
2. Fuel spoilage due to water.

These emergency situations haven been taken care by putting up a fire safety system and a water drainage system in the fuel yard.

SSML-Simbhaoli is an ISO 9001, ISO 14001 and HACCP certified company. The proposed project activity will also be taken under the ISO on operation. The CDM monitoring process will also be covered under the ISO (Details provided in Annex 4).