SECTION D. Application of a monitoring methodology and plan:

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D.1. Name and reference of approved monitoring methodology applied to the small-scale project activity:

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AMS I D – Grid connected renewable electricity generation

"Monitoring shall consist of metering the electricity generated by the renewable technology. In the case of co-fired plants, the amount of biomass and fossil fuel input shall be monitored."

D.2. Justification of the choice of the methodology and why it is applicable to the small-scale project activity:

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The expansion of the bagasse cogeneration unit at the Shree Pandurang SSK factory will provide electricity to the Maharashtra grid. This electricity will displace existing grid generation capacity and future planned grid capacity additions.

The main variable in determining the volume of emission reductions is the sale of power to the grid. Project emissions will also be calculated annually, should they arise, through the monitoring of any fossil fuels that are combusted to generate electricity. Therefore the monitoring methodology outlined in the small scale rules and procedures is appropriate for the project activity.

Sales of power will be measured by automated sensors (current transformers) installed at the 132kV step up plant for exports to the grid. Monthly readings from the sensors at the step up plant are taken jointly by personnel from MSEB and the factory and form the basis for payments of power sold. This data will be the primary source for the monitoring plan.

In line with the guidance on leakage in small scale biomass project activities (EB28, Annex 35[1]) the monitoring of competing uses for biomass residues[2] is required to be undertaken to show whether leakage takes place. To test for leakage we are required to show that in the region (within 50km of the plant) the total quantity of biomass residues available ($B_{a,y}$) is at least 25% larger than biomass residues utilized ($B_{u,y}$) including the project activity. This may be achieved by means of either undertaking an annual survey of biomass availability within the region or by utilizing published literature, official reports, surveys etc.

$$B_{a,y} \Big/ B_{u,y} \geq 25\%$$

In case the leakage effects cannot be ruled out for biomass purchased within a particular year during the crediting period, the emissions occurring due to leakage would be calculated based on the formulas contained within the methodology ACM0006 (Consolidated methodology for electricity generation from biomass residues, version 6.).

$$L_y = EF_{CO2,LE} \cdot \sum_k BF_{PJ,k,y} \cdot NCV_k$$

Where:

L_y Leakage emissions during the year y (tCO_2/yr)

[1] http://cdm.unfccc.int/EB/028/eb28_repan35.pdf

[2] *Biomass residues* are defined as *biomass* that is a by-product, residue or waste stream from agriculture, forestry and related industries. The biomass residues included in the analysis will be those that can be used as fuel within the project activity boiler i.e. bagasse, cane trash and wheat trash..

$EF_{CO2,LE}$	CO_2 emission factor of the most carbon intensive fuel used in the country i.e. lignite (tCO_2/GJ)
$BF_{PJ,k,y}$	The quantity of biomass residue that gives rise to leakage (tons of dry matter or litre)
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)

The transport emissions occurring due to purchased biomass have also been incorporated based on the guidance and formulas contained within the methodology ACM0006 (Consolidated methodology for electricity generation from biomass residues, version 6.). This has been calculated through the monitoring of the number of trucks delivering biomass and the weighted average of return distance to the site from which biomass is collected.

$$PET_y = N_y \cdot AVD_y \cdot EF_{Km,CO2}$$

Where

PET_y = CO_2 emissions during the year y due to transport of the bagasse to the project plant (tCO_2/yr)

N_y = the number of truck trips during the period y.

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

$EF_{km, CO2}$ = Average CO_2 emission factor for the trucks measured during the year y (tCO_2/km)

D.3 Data to be monitored:

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ID number	Data type	Data variable	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	For how long is archived data to be kept?	Comment
1.	*Electrical power*	P_y	*MWh*	*m*	*Monthly*	*100%*	*Electronic*	*2 yrs after end of crediting period*	*Continuous recording but will be taken from MSEDCL sales receipts*
2.	*Mass*	Q_i	*T*	*m*	*Monthly*	*100%*	*Electronic*	*2 yrs after end of crediting period*	*Purchased fossil fuels*
3.	*Carbon emission factor*	$COEF_i$	*tC/TJ*	*m*	*Annually*	*100%*	*Electronic*	*2 yrs after end of crediting period*	*IPCC data*
4.	*Net calorific value*	NCV_i	*TJ/kt*	*m*	*Monthly*	*100%*	*Electronic*	*2 yrs after end of crediting period*	*Taken from sales contract, if not available from IPCC data*
5.	*Oxidation*	*OXID*	*%*	*m*	*Annually*	*100%*	*Electronic*	*2 yrs after end of crediting period*	*IPCC data*
6.	*Mass*	$BF_{k,y}$	*T*	*m*	*Monthly*	*100%*	*Electronic*	*2 yrs after end of crediting period*	*Biomass purchased from external sources*
7.	*Distance*	AVD_y	*Km*	*e*	*Annually*	*100%*	*Electronic*	*2 yrs after end of crediting period*	*Distances are estimated based on records obtained from the Public Works Department (PWD), a government body.*
8.	*Emission factor*	$EF_{km,CO2}$	tCO_2/Km	*c*	*Annually*	*100%*	*Electronic*	*2 yrs after end of crediting period*	*2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 3: Mobile combustion, Section 3.2.1.2*
9.	*Number of trips*	N_y	*Integer*	*m*	*Daily*	*100%*	*Electronic*	*2 yrs after end of crediting period*	*Taken from trucks across weighbridge and cross checked*

									with purchase orders for biomass and transport.
10.	*Total Biomass residues available in the region*	$B_{a,y}$	*T*	*e*	*Annually*	*100%*	*Electronic*	*2 yrs after end of crediting period*	*Based on annual surveys or published literature, official reports, etc. If annual surveys are undertaken it is likely to be estimated from sampling. Official reports may measure or calculate this variable.*
11.	*Total Biomass residues utilised in the region*	$B_{u,y}$	*T*	*e*	*Annually*	*100%*	*Electronic*	*2 yrs after end of crediting period*	*Based on annual surveys or published literature, official reports, etc. If annual surveys are undertaken it is likely to be estimated from sampling. Official reports may measure or calculate this variable.*
12.	*CO_2 emission coefficient for most carbon intensive fuel*	$EF_{CO2,LE}$	*tCO_2/GJ*	*c*	*Annually*	*100%*	*Electronic*	*2 yrs after end of crediting period*	*The calculation will be undertaken annually on the basis of values obtained from India's National Communication to the UNFCCC. If not available, IPCC default values may be used.*
13.	*Quantity of external biomass used for leakage estimation*	$BF_{PJ,k,y}$	*T(dry weight)*	*c*	*Annually*	*100%*	*Electronic*	*2 yrs after end of crediting period*	*This parameter represents the quantity of external biomass for which leakage effects cannot be ruled out.*
14.	*Net calorific value of biomass residues for leakage*	NCV_k	*TJ/kt*	*m*	*Every month*	*100%*	*Electronic*	*2 yrs after end of crediting period*	*The net calorific value will be measured separately for each biomass residue utilized based on tests undertaken by a reputed laboratory. The tests will be undertaken every month and values*

	estimation								*obtained will be checked against IPCC default values (if available) and if the latter are more conservative they will be used. .*
15.	*Moisture content of biomass residues for leakage estimation*	M_k	*% Water content*	*m*	*Every month*	*100%*	*Electronic*	*2 yrs after end of crediting period*	*Samples of the biomass residues will be weighed before and after drying to determine the moisture content. This will be carried out by the laboratory present on-site.*

D.4. Qualitative explanation of how quality control (QC) and quality assurance (QA) procedures are undertaken:

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Quality assurance for the data is high due to the commercial importance associated with electricity exports. The revenue associated with the sale of electricity will be recorded in financial statements and is therefore readily verifiable.

Any usage of fossil fuel will be monitored through purchase receipts and may be cross checked against financial statements, again resulting in strong QC and QA controls.

The monthly MSEB (now MSEDCL) records will form the basis of the invoices raised by the factory for the sale of electricity to the grid. These invoices will be generated by the accounts department of the factory and form a further QA/QC check.

The calculation of transport emissions will be made on the basis of records obtained from the Public Works Department (PWD), a government body for distances. The weighbridge at the site will be used for recording the number of trucks (all trucks in/out of the site are recorded).

Survey data or official reports will be used to calculate leakage. Survey methods will be presented in the annual monitoring report and the methods presented at verification.

The DOE used to verify the emission reductions from the project activity is required to ensure that the monitoring plan has been implemented correctly and is required to appraise the data according to accuracy, comparability, completeness and validity. In performing verification, the DOE should conduct regular on-site inspections that may comprise; interviews with managers and operators and observation of processes and controls. The project operator will make available all relevant data as outlined in the above table in a timely manner as and when requested by the verifier.

All data will be kept for a minimum of 2 years following issuance of certified emission reductions or the end of the crediting period, whichever is later, and the storage of this data will be the responsibility of the project developers.

D.5. Please describe briefly the operational and management structure that the project participant(s) will implement in order to monitor emission reductions and any leakage effects generated by the project activity:

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The CDM project data will be collected monthly and held on the attached spreadsheet tool which has been designed for the project activity. This will permit the monitoring and reporting of emission reductions on a monthly basis. Data input is required in the blue cells with resultant calculations of the emission reductions performed automatically. The leakage test will be undertaken annually and reported separately.

A detailed monitoring and verification report has been produced by the plant and this will form the basis of the roles and responsibilities and collection frequency of the data required to monitor the project activity.

More generally the generation data from the turbine will however be continuously recorded by current transformers and a manual hourly record will be made by the turbine operator. This data will be collated at the end of each day and reported in the daily operating report to the factory management, the

responsibility for which will be with the Head Electrical. This data will form the basis of the ongoing calculation which will then be tallied against the monthly recordings taken by the MSEB (now MSEDCL) and a representative of the factory.

The amount of biomass residues brought in by the plant will be monitored through transporter receipts and the weighbridges located at the plant. This data will be collected continuously and daily reports prepared. The overall responsibility for this data will be with the Manager Purchase (Power).

MVP - ***to be completed monthly***
Data in blue should be entered by project administrator in a timely manner, data in yellow is fixed.

Static data	
CEF, tonnes CO2e/MWh	1.013

		Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12	Total
2005/06	P_y, MWh													
	Pe_y, tCO_2e													
	PET_y, tCO_2e													
2006/07	P_y, MWh													
	Pe_y, tCO_2e													
	PET_y, tCO_2e													
2007/08	P_y, MWh													
	Pe_y, tCO_2e													
	PET_y, tCO_2e													
2008/09	P_y, MWh													
	Pe_y, tCO_2e													
	PET_y, tCO_2e													
2009/10	P_y, MWh													
	Pe_y, tCO_2e													
	PET_y, tCO_2e													
2010/11	P_y, MWh													
	Pe_y, tCO_2e													
	PET_y, tCO_2e													
2011/12	P_y, MWh													
	Pe_y, tCO_2e													
	PET_y, tCO_2e													
2012/13	P_y, MWh													
	Pe_y, tCO_2e													
	PET_y, tCO_2e													
2013/14	P_y, MWh													

	Pe_y, tCO_2e		
	PET_y, tCO_2e		
2014/15	P_y, MWh		
	Pe_y, tCO_2e		
	PET_y, tCO_2e		
2015/16	P_y, MWh		
	Pe_y, tCO_2e		
	PET_y, tCO_2e		

D.6. Name of person/entity determining the monitoring methodology:

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Robert Taylor, Agrinergy Ltd, contact information as listed in annex I.