



**Monitoring report form**  
**(Version 05.1)**

*Complete this form in accordance with the Attachment "Instructions for filling out the monitoring report form" at the end of this form.*

**MONITORING REPORT**

<b>Title of the project activity</b>	Biomass based power project of VPL	
<b>UNFCCC reference number of the project activity</b>	10233	
<b>Version number of the monitoring report</b>	04	
<b>Completion date of the monitoring report</b>	11/04/2017	
<b>Monitoring period number and duration of this monitoring period</b>	Monitoring period number-01 Monitoring period-14/12/2015 to 31/12/2016	
<b>Project participant(s)</b>	Vayunandana Power Limited	
<b>Host Party</b>	India	
<b>Sectoral scope(s)</b>	01	
<b>Selected methodology(ies)</b>	AMS I.D "Grid connected Renewable electricity generation" (version 18)	
<b>Selected standardized baseline(s)</b>	NA	
<b>Estimated amount of GHG emission reductions or net GHG removals by sinks for this monitoring period in the registered PDD</b>	41498 tCO <sub>2</sub> e	
<b>Total amount of GHG emission reductions or net GHG removals by sinks achieved in this monitoring period</b>	GHG emission reductions or net GHG removals by sinks reported up to 31 December 2012	GHG emission reductions or net GHG removals by sinks reported from 1 January 2013 onwards
	0 tCO <sub>2</sub> e	43916 tCO <sub>2</sub> e

## SECTION A. Description of project activity

### A.1. Purpose and general description of project activity

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The proposed project activity utilises renewable resources (biomass) to generate power. The proposed project activity has installed capacity of 12MW of electricity. The net generated electricity is being supplied to regional grid i.e. Maharashtra State Electricity Board, which is part of NEWNE grid of India, through power purchase agreement signed with Maharashtra State Electricity Distribution Company Limited (MSDECL). The project activity has employed 1x12MW bleed-cum condensing type turbine manufactured by Triveni and 1x55 TPH travelling grate type boiler manufactured by Thermodyne. Although, the installed capacity of the project activity is 12MW, it generates only 10MW monthly average in accordance with Biomass Energy Purchase Agreement and same has been included in monitoring plan. The proposed project activity signed Power Purchase Agreement for 10MW inline with detailed project report submitted to MEDA for approval, due to unavailability of desired capacity turbine and to avoid delay turbine with rated output 12MW has been installed, however, the gross generation is restricted to 10MW electricity on monthly average, hence the same has been considered in technical description and for justification of applicability criteria of methodology.

The net electricity from project is supplied to NEWNE grid, in absence of the proposed project activity the equivalent amount of electricity would have been generated by grid-connected power plant, which is dominated by fossil based thermal power plant, thereby resulting in GHG emission reduction.

The project activity started construction on 12/06/2007 and commissioned on 09/12/2010. The project activity was operational with normal maintenance during current monitoring period and there has been no change of equipment employed.

The total emission reduction achieved by project activity during current monitoring period i.e. 14/12/2015 – 31/12/2016 is 43,916 tCO<sub>2</sub>e.

### A.2. Location of project activity

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The proposed project is located at Kaneri village, dist-Gadchiroli, Maharashtra state of India, at a distance of 3 km from Gadchiroli town. Chandrapur, the nearest railway station is 80km away and Nagpur the nearest airport is 200 km away. Geo-coordinate of the project site is

20° 07' 59.57" N

79° 56' 35.35" E

### A.3. Parties and project participant(s)

Party involved (host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate whether the Party involved wishes to be considered as project participant (yes/no)
India (host)	Private entity- Vayunandana Power Limited	No

### A.4. Reference of applied methodology and standardized baseline

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Following approved baseline & monitoring methodology is applied;

**Title:** Type-I, Renewable Energy Project

**Methodology:** I.D. Grid Connected renewable electricity generation

**Version:** 18, valid from 28/11/2014. Scope: 01, EB 81

**Reference:** The approved baseline methodology has been referred from the “Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories.”

<http://cdm.unfccc.int/methodologies/DB/W3TINZ7KKWCK7L8WTFQQOFQQH4SBK>

The tools referenced in this methodology used for the proposed project includes:

- Tool to calculate the emission factor for an electricity system Version 04.0.0, Annex 15 of EB 75 Report
- [Tool to calculate project or leakage CO2 emissions from fossil fuel combustion](#) Version 02.0.0, Annex 11 of EB 41 Report
- Demonstration of additionality of small-scale Project activities” Version 10 EB 83 Annex 14

**Guidelines:**

- General guidelines for SSC CDM methodologies, Version 20, EB 76, Annex 11.
- Guidelines on the Assessment of Investment Analysis Version-05, Annex-5 of EB62 Report

#### **A.5. Crediting period of project activity**

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This project activity has considered fixed crediting period of 10 years. The start date of crediting period is 14 December 2015 and crediting period is from 14 December 2015 - 13 December 2025.

#### **A.6. Contact information of responsible persons/entities**

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E: [navinnirula@vayunandana.com](mailto:navinnirula@vayunandana.com)

The above entity is also a project proponent.

## **SECTION B. Implementation of project activity**

### **B.1. Description of implemented registered project activity**

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The project activity is implemented and operated as per registered PDD. The project activity power plant is based on Rankine Cycle. High-pressure super heated steam is expanded in a condensing turbine to generate 10 MW of electricity. The steam generator is designed to operate on rice husk; woody biomass and coal dust as supplementary fuel and any of their combination so that the plant may operate efficiently without interruption due to non-availability or shortage of any of the materials. There is no technology transfer involved in the project activity.

#### **Design details for the boiler**

- It is traveling grate technology, natural circulation and suitable for indoor installation
- It can be used for firing rice husk and coal
- Motorized long retractable soot blower (LRSB) is present in the superheater region for online cleaning of superheater elements
- It is provided with Electro Static Precipitators (ESP) to control the solid particulate emission levels to 100 mg/Nm<sup>3</sup>.

#### **Technical details**

Type	Traveling Grate
Make	Thermodyne, Chennai
Fuels	Rice husk, woody biomass and coal
Maximum Continuous Rating (MCR)	55 TPH of steam
Steam temp. at O/L	490 °C ± 5
Steam pressure at O/L	66 Kg/cm <sup>2</sup>
Feed water temp.	105 °C
Efficiency (thermal)	77% (min)

#### Design details of steam turbine

- The turbine is bleed cum condensing machine. The bleed is used for heating the feed water to 150° C at the inlet of economizer
- The condenser is water-cooled shell and tube type

#### Technical details

Type	Low speed, Multi stage, Bleed cum Condensing type
Make	Triveni
Rated capacity	12000 kW
Steam input at MCR	48 +/- 10% TPH at 480 °C and 62.76 Kg/cm <sup>2</sup>
Preferred speed	1500 rpm
Steam extraction	At 5.0 ata for deaeration
<b>Gear Box</b>	Make- Triveni
<b>Generator</b>	Make-BHEL Frame- G87210, 15000KVA, 12000 kW 3PH, 50Hz

#### Design details of electrical system

- The generation voltage in the power plant is 11 kV. The power plant's auxiliary power requirements are met by stepping down the 11 kV power in 11kV/433 V transformer.
- The plant is started up with grid power, by stepping down the grid power in the switchyard and 132/11kV transformer
- All electric equipments confirm to IS/IEC standards and recommendations of IEEE standards.
- All electrical installation confirm to CEIG regulations and Indian Electricity Rules.

#### Design details of control unit for power plant

- Boiler instrumentation comprises of single loop micro-processor based controls
- Turbine generator has its own dedicated local control panel
- All pumps have on/off based control.

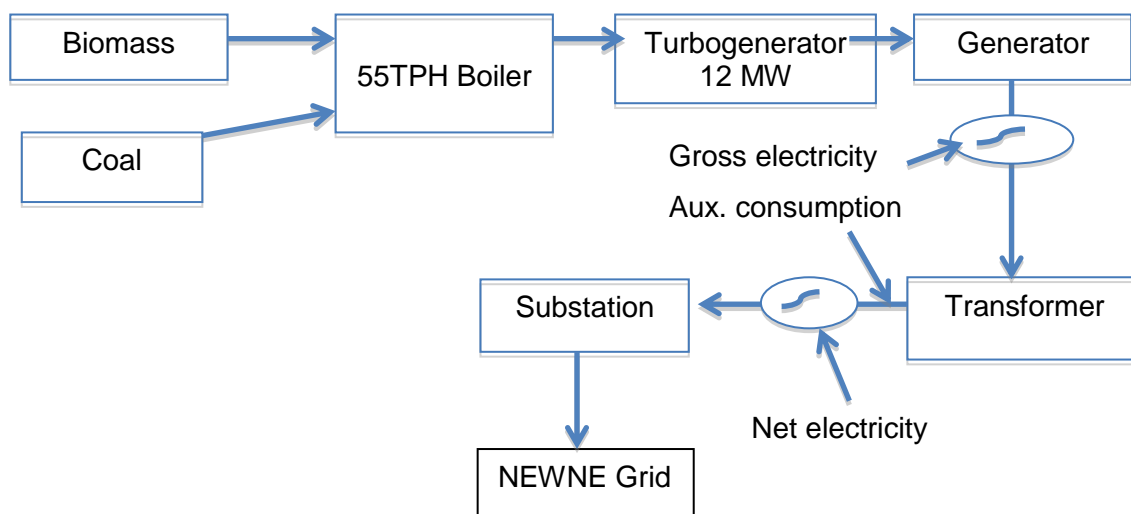
#### Fuel handling system

- Rice husk/woody biomass
- Inlet fuel hopper
- Belt conveyors
- Holding down bolts, structural
- Coal
- Inlet fuel hopper with grizzly
- Vibratory feeder
- Coal crusher
- Belt conveyor
- Holding down bolts, structural

#### Ash handling system

- Submerged ash conveyor for bed ash
- Ash silo for 8 hours holding capacity

- 1 number of screw connecting three discharge points of ESP and discharging at about 2m elevation suitable for dumping into trolleys



The schematic diagram of the project is provided above. The plant has been successfully commissioned on 09/12/2010. The plant has been in operation continuously since commissioning. No major equipment has been replaced or exchanged since commissioning. There was no downtime/shutdown during current monitoring period that is 14/12/2015 to 31/12/2016.

There are no changes that have happened in project activity, which may impact the applicability of the methodology.

## B.2. Post-registration changes

### B.2.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline

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No temporary deviation taken place from registered monitoring plan or applied approved methodology during current monitoring period.

### B.2.2. Corrections

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No correction applied in fixed parameter mentioned in registered PDD during current monitoring period.

### B.2.3. Changes to start date of crediting period

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No change in start date of crediting period.

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

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There is no inclusion of monitoring plan to the registered PDD that was not included at registration.

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

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There is no permanent change from registered monitoring plan or applied methodology.

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

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There is no change in project design of registered project activity during current monitoring period.

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

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Not applicable as the project activity is not an afforestation or reforestation project activity.

**SECTION C. Description of monitoring system**

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This monitoring plan is developed in accordance with the modalities and procedures for small-scale CDM project activities. The monitoring plan, which is implemented by the project proponent, describes about the monitoring organisation, parameters to be monitored, monitoring practices, quality assurance, quality control procedures, data storage and archiving.

***Project Management***

The authority and responsibility for registration, monitoring, measurement, reporting and reviewing of the data rests with the Managing Director. The Managing Director may delegate the same to a competent person identified for the purpose. The identified person will be the incharge of GHG monitoring activities and necessary reports will be submitted to the management i.e. Chairman or Director or its Committee for review.

The designated manager assisted by a team of experienced personnel in disciplines such as mechanical and electrical engineering, with experience in plant operation, measurements and management. The primary responsibility of the team is to measure, monitor, and record and report the information on various data items to the General Manager/Deputy General Manager, in accordance with the applicable standards. Periodic calibration of various instruments used in the monitoring of GHG related data and record keeping of the same also is being the responsibility of the team.

The responsibility of review, storage and archiving of information in good condition lies with the designated manager. The concerned manager undertakes periodic verifications and onsite inspections to ensure the quality of the data collected by the team and initiate steps in case of any abnormal conditions.

***Monitoring Requirements***

The monitoring plan includes monitoring of energy parameters such as Quantity of each type of biomass and fossil fuel consumption of the project activity, Calorific values of each type of fuel used, for both biomass and fossil fuels, Diesel consumption for power generation by DG set, Gross electricity generation, Electricity imported from the MSEDCL grid and Electricity exported to the MSEDCL grid. Emission reductions resulted from the project activity will be calculated in accordance with the calculations illustrated in Section B.6.3 of the PDD. Emission reductions generated by the project shall be monitored at regular intervals. The crediting period chosen for the project activity is 10 years.

Monitoring of equipment comprises of energy meters, which monitors the energy fed by the plant to MSEDCL grid system by the proposed project. In accordance with the EPA, project proponents has installed two energy meters one is main meter and the other is check meter. Both Main meter

and Check meter are identical in make, technical standards and are of 0.2s accuracy class with permissible error limit 0.2%, calibration is in comply with the requirements of Electricity Rules. Calibration procedures are adopted to maintain accuracy of equipments/instruments of the plant. The Calibration of Monitoring Equipment for CDM is conducted as per standard procedures, Project proponent assigns competent third party for calibration of both the meters according to the procedures laid down by Energy Purchase Agreement.

The weighbridge is of usually calibrated by the manufacturer themselves with pre-determined standard weights and then they are stamped by Weights and Measure Department of Government of Maharashtra. The weighbridge is of Class III with  $\pm 10$  kg. The calibration and stamping is carried out for every year. If there is any error during the periodic inspection, immediately the service engineers of manufacturing company will be called to set right the system.

### **Monitoring of Fuel quantity and quality:**

#### *Quantity:*

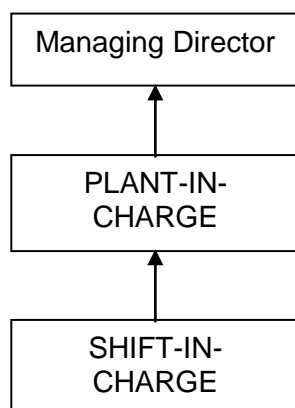
The quantity and types of fuels is being monitored before blending and other processing procedures, and feeding into the boiler. Monitoring is done by the followings:

- Entry record
  - Stock record
  - Consumption record
- Quality:* The quality of the fuels is monitored to track the chemical composition and calorific value of the fuels. The analysis of fuels is done in-house laboratory in the plant premises at regular intervals, although for cross checking purposes Govt. approved laboratory is also used for testing of the fuel samples. The records of all analysis is maintained both in paper and electronic format and the analysis is being carried out at a frequency of every six months.

*Uncertainties:* Any uncertainty like inconsistency/discrepancy of data parameters will be dealt with various corrective actions. These will be reported along with its time of occurrence, possible reasons and duration. Uncertainty with metering (if any difference between recording of main meter and check meter) will be dealt jointly both by the project proponent and MSEDCL representative. Corrective actions will be undertaken after identification of reason for such uncertainty.

The above document will be preserved for verification of emission reductions from the project, in safe storage. Supporting documents such as receipts of payments released by MSEDCL will also be preserved in for later verification by an independent third party. The period of storage will be 2 years after the end of crediting period or till the last issuance of CERs for the project activity whichever occurs later.

Project proponent has formed a CDM team comprising of people from relevant departments, who will be responsible for monitoring all the parameters. The structure of the CDM team is as given below:



The chairman of the VPL group is the overall in-charge of implementation of the monitoring protocol. At the project site, the plant in charge and the shift in charge will be responsible for the actual monitoring of the parameters. A detailed report on the same is provided to the chairman on

a monthly basis. The roles and responsibilities of the members in the CDM team of the project proponent are outlined below:

- Record and verify the total electricity generated
- Record the electricity exported and imported from the state electricity board
- Record and verify the quality and quantity of the fuel procured
- Calibration of the meters as per the state electricity board requirements and recording the data of the same
- Overall maintenance of the plant

## SECTION D. Data and parameters

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

<b>Data/parameter:</b>	<b>EF<sub>OM, y</sub></b>
Unit	tCO <sub>2</sub> /MWh
Description	Operating Margin CO <sub>2</sub> emission factor for the NEWNE Grid in year y
Source of data	CEA's "Baseline Carbon Dioxide Emission Database Version 10.0"
Value(s) applied)	0.9862
Choice of data or measurement methods and procedures	Calculated in line with "Tool to calculate the emission factor for an electricity system (Version 04.0.0)" using data from Central Electricity Authority of India's (CEA) "Baseline Carbon Dioxide Emission Database Version 10.0".  The value used is calculated ex-ante as generation based weighted average of last three years of the operating margin provided in the CEA database. Weighted average = $\sum_{i=1 \text{ to } n} (\text{Net generation in operating margin in year } i * \text{Simple operating margin in year } i) / \sum_{i=1 \text{ to } n} (\text{Net generation in operating margin of year } i)$
Purpose of data	Calculation of baseline emissions
Additional comments	The value is fixed ex-ante

<b>Data/parameter:</b>	<b>EF<sub>BM, y</sub></b>
Unit	tCO <sub>2</sub> /MWh
Description	Build Margin CO <sub>2</sub> emission factor for the NEWNE Grid in year y
Source of data	CEA's "Baseline Carbon Dioxide Emission Database Version 10.0" <a href="http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver10.pdf">http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver10.pdf</a>
Value(s) applied)	0.9495
Choice of data or measurement methods and procedures	Calculated in line with "Tool to calculate the emission factor for an electricity system (Version 04.0.0)" using data from Central Electricity Authority of India's (CEA) "Baseline Carbon Dioxide Emission Database Version 10.0".  The value is calculated ex-ante as most recent build margin provided by the CEA.
Purpose of data	Calculation of baseline emissions
Additional comments	The value is fixed ex-ante

<b>Data/parameter:</b>	<b>EF<sub>grid, y</sub></b>
Unit	tCO <sub>2</sub> /MWh
Description	Combined Margin CO <sub>2</sub> emission factor for the NEWNE Grid in year y



Source of data	Central Electricity Authority(CEA) of India Database <i>Version 10.0</i> <a href="http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver10.pdf">http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver10.pdf</a>
Value(s) applied)	0.9679
Choice of data or measurement methods and procedures	This has been calculated based on Operating Margin (OM) and Build Margin (BM) published by Central Electricity Authority (CEA) of India. Please refer section B.6.1 for details.
Purpose of data	<i>Calculation of baseline emissions</i>
Additional comments	The value is fixed ex-ante

<b>Data/parameter:</b>	<b>EF<sub>CO<sub>2</sub>,i,y</sub></b>
Unit	tCO <sub>2</sub> /GJ
Description	CO <sub>2</sub> emission factor of coal
Source of data	Central Electricity Authority(CEA) of India Database <i>Version 10.0</i> <a href="http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver10.pdf">http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver10.pdf</a>
Value(s) applied)	95.8
Choice of data or measurement methods and procedures	The project will utilise sub-bituminous coal during fuel shortage or exigency, hence the local value is applied.
Purpose of data	<i>Calculation of project emissions</i>
Additional comments	The value is fixed ex-ante

<b>Data/parameter:</b>	<b>NCV<sub>diesel</sub></b>
Unit	Tj/Gg
Description	Net calorific value of diesel
Source of data	IPCC default value (Source: IPCC 2006) <a href="http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf">http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf</a>
Value(s) applied)	43
Choice of data or measurement methods and procedures	IPCC values have been used for diesel since country specific data available i.e. 41.6 as per CO <sub>2</sub> baseline database is lower. Hence value used is conservative.
Purpose of data	<i>Calculation of project emissions</i>
Additional comments	The value is fixed ex-ante

<b>Data/parameter:</b>	<b>Density<sub>diesel</sub></b>
Unit	Kg/Liter
Description	Density of fuel (diesel) in year y
Source of data	Table A3.8 Page 181 of the Energy Statistics Manual of OECD/IEA, 2004 <sup>1</sup>
Value(s) applied)	0.8439
Choice of data or measurement methods and procedures	Default value has been considered as local value mentioned in CO <sub>2</sub> baseline database i.e. 0.83 kg/Liter is lower than value used for project emission, which is conservative.

<sup>1</sup> [http://ec.europa.eu/eurostat/ramon/statmanuals/files/Energy\\_statistics\\_manual\\_2004\\_EN.pdf](http://ec.europa.eu/eurostat/ramon/statmanuals/files/Energy_statistics_manual_2004_EN.pdf)

Purpose of data	Calculation of project emissions
Additional comments	The value is fixed ex-ante

<b>Data/parameter:</b>	<b>EF<sub>CO<sub>2</sub>,diesel</sub></b>
Unit	tCO <sub>2</sub> /TJ
Description	Weighted average of emission factor of fuel (diesel) in year y
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Table 1.2-Default Net Calorific Values (NCVs) and Upper limit of the 95% confidence intervals. <a href="http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html">http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html</a>
Value(s) applied)	74.8
Choice of data or measurement methods and procedures	Default value from IPCC has been considered as the local value provided in CO <sub>2</sub> baseline database is 72.6 tCO <sub>2</sub> /TJ, hence value used is conservative.
Purpose of data	<i>Calculation of project emissions</i>
Additional comments	The value is fixed ex-ante

## D.2. Data and parameters monitored

<b>Data/parameter:</b>	<b>EG<sub>PJ,facility,y</sub></b>
Unit	MWh
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y
Measured/calculated/default	Calculated
Source of data	Joint meter reading
Value(s) of monitored parameter	80550
Monitoring equipment	Energy meter Main Meter Make-Wallaby Type-MK6E Sr No.-HT01131083 Accuracy class-0.2s Date of calibration-31/10/2015 & 06/04/2016 Validity- 1 year Check Meter Make-Wallaby Type-MK6E Sr No.-HT01131082 Accuracy class-0.2s Date of calibration-31/10/2015 & 06/04/2016 Validity- 1 year
Measuring/reading/recording frequency:	Continuous monitoring, hourly measurement, monthly recording
Calculation method (if applicable):	Energy meter of accuracy class 0.2s installed by MSEDCL at project site will be used to monitor the net electricity supplied by the project activity. The energy meter is capable of monitoring import and export both, the joint meter reading will be taken by the MSEDCL personnel in presence of authorized personnel of PP, the net electricity is calculated from net export to the grid less net import from the grid.

QA/QC procedures:	The net electricity supplied to grid can be crosschecked with monthly invoices raised by project proponent. The energy meter is in control of state electricity board and PP has no authority on calibration or replacement of the same. The State Electricity Board calibrates the energy meter at minimum three years interval, however during current monitoring period is calibrated at less than a year.
Purpose of data:	To calculate baseline emission
Additional comments:	The data will be kept for crediting period + 2 years

<b>Data/parameter:</b>	$EG_{Gross,y}$
Unit	MWh
Description	Quantity of gross electricity generation by the project plant/unit in year y
Measured/calculated/default	Measured
Source of data	Energy meter at project site
Value(s) of monitored parameter	89441
Monitoring equipment	Energy meter Make-Secure Sr No.-AP905398 Accuracy class-0.5s Date of Calibration-05/08/2015 & 06/08/2016 <sup>2</sup> Validity- 1 years Calibration frequency- Annual
Measuring/reading/recording frequency:	Continuous monitoring, hourly measurement monthly recording
Calculation method (if applicable):	Tri-vector energy meter of accuracy class 0.5s installed at project site is used to monitor the gross electricity generated by the project activity.
QA/QC procedures:	The gross electricity generated less net electricity supplied to grid can be used to crosscheck auxiliary consumption. The energy meter is to be calibrated at minimum three years interval.
Purpose of data:	To crosscheck auxiliary consumption
Additional comments:	The data will be kept for crediting period + 2 years

<b>Data/parameter:</b>	$FC_{biomass, PJ,y}$				
Unit	Tonnes				
Description	Quantity of biomass residue type k consumed in year y				
Measured/calculated/default	Measured				
Source of data	Onsite measurement				
Value(s) of monitored parameter	<table border="1"> <tr> <td>Rice husk (on dry basis)</td><td>Woody Biomass (on dry basis)</td></tr> <tr> <td>62947.6</td><td>18174.3</td></tr> </table>	Rice husk (on dry basis)	Woody Biomass (on dry basis)	62947.6	18174.3
Rice husk (on dry basis)	Woody Biomass (on dry basis)				
62947.6	18174.3				

<sup>2</sup> Meter was recalibrated after one day delay, the delay doesn't affect the ER calculation as this parameter is used as crosscheck not in direct calculation of ERs.

Monitoring equipment	Weigh-bridge Make-Sriven Sr No.-198 Capacity-60MT Min-200kg Accuracy -10Kg Class-III Date of calibration-24/12/2014, 23/12/2015 & 22/12/2016 Validity- 1year
Measuring/reading/recording frequency:	On each delivery, aggregated monthly
Calculation method (if applicable):	<p>The biomass quantity is recorded on wet basis and is calculated on dry basis based on moisture content of biomass. The proposed boiler has fuel feeders. On receipt of biomass fuels at plant, the same is being weighed in the electronic weighbridge installed at the entry of the plant and unloaded in the fuel storage yard with in the plant premises. The unloaded fuels would be fed to the boiler through feeders as per the requirement and fuel consumption is recorded on daily basis.</p> <p>Day-wise fuel consumption for the Plant operations arrived on dumping quantities per type by the yard-staff and moisture content of each type of biomass. In addition, an energy balance is being analyzed to verify the credibility of the monitoring result. The total quantity of fuel procured for the project purpose will be completely combusted in the power plant.</p>
QA/QC procedures:	The weighbridge meter under goes calibration as per the industrial standards of India by weights & measures department of legal metrology of the state and the frequency of calibration is annually. The data recorded at weighbridge in logbooks and electronically can be crosschecked against the inventory data. These quantities are crosschecked in terms of heat by taking the no. of fuel feeders used & its speed, NCVs of those fuels and the fuel quantities recorded in inward fuel register as well. The weighbridge is type class III, with $\pm 10$ kg.
Purpose of data:	To check the mass energy balance
Additional comments:	<p>The data will be kept for crediting period + 2 years</p> <p>The biomass consumption under current monitoring period includes rice husk and woody biomass inline with details provided in registered PDD. The woody biomass sourced is consists of residue wood chips from furniture mills, residue from lumbers and pulp and paper. As the source of woody biomass is residue generated by other process e.g. furniture mills etc. and operation of project does not impact the volume of generation of such source of woody biomass and its being dumped in absence of the project activity. Hence in line with para 4 of Annex 18 of EB 23 report the sources of woody biomass are renewable in nature.</p>

<b>Data/parameter:</b>	$FC_{FF,y}$
Unit	Tonnes
Description	Quantity of fossil fuel consumed in year y
Measured/calculated/default	Measured
Source of data	Onsite measurement
Value(s) of monitored parameter	13441.78

Monitoring equipment	Weigh-bridge Make-Sriven Sr No.-198 Capacity-60MT Min-200kg Accuracy -10Kg Class-III Date of calibration-24/12/2014, 23/12/2015 & 22/12/2016 Validity- 1year
Measuring/reading/recording frequency:	On each delivery, aggregated monthly
Calculation method (if applicable):	The total quantity of fossil fuel procured for the project purpose is completely combusted in the power plant. Hence, the total quantity of fossil fuel procured and quantity of fossil fuel combusted is considered as same for the project activity.
QA/QC procedures:	The weighbridge meter is calibration/maintenance subject to appropriate industrial standards by weights & measures department of legal metrology of the state. The data recorded is crosschecked against the fuel purchase receipts. The weighbridge is of class III, with $\pm 10\text{kg}$ and calibrated yearly.
Purpose of data:	To calculate project emission
Additional comments:	The data will be kept for crediting period + 2 years

<b>Data/parameter:</b>	$\text{NCV}_{\text{FF},y}$
Unit	Kcal/Kg
Description	Net calorific value of fossil fuel combusted in the project activity during the year y
Measured/calculated/default	Measured
Source of data	Determined values from Lab analysis
Value(s) of monitored parameter	4103.77 (Average over monitoring period)
Monitoring equipment	NA
Measuring/reading/recording frequency:	On each delivery, average monthly recording
Calculation method (if applicable):	Samples of fossil fuel is collected from the plant according to the procedures of sample collection for analysis and sent for analysis to reputed Laboratories.
QA/QC procedures:	The PP analyzes the NCV at in-house laboratory and same is also checked with GCV value provided by fuel supplier. The NCV report is taken on monthly basis.
Purpose of data:	To calculate project emission
Additional comments:	The data will be kept for crediting period + 2 years

<b>Data/parameter:</b>	$\text{NCV}_{\text{Biomass},k}$				
Unit	Kcal/kg				
Description	Net calorific value of biomass residue type k combusted in the project activity during the year y				
Measured/calculated/default	Measured				
Source of data	Third party Lab test report				
Value(s) of monitored parameter	<table border="1"> <tr> <td>Rice Husk (on dry basis)</td><td>Woody biomass (on dry basis)</td></tr> <tr> <td>2727.69</td><td>2979.54</td></tr> </table> <p>The above value is average over current monitoring period</p>	Rice Husk (on dry basis)	Woody biomass (on dry basis)	2727.69	2979.54
Rice Husk (on dry basis)	Woody biomass (on dry basis)				
2727.69	2979.54				

Monitoring equipment	NA
Measuring/reading/recording frequency:	On each delivery, average monthly recording
Calculation method (if applicable):	Samples of biomass is being collected from the plant according to the procedures of sample collection for analysis and sent for analysis to inhouse laboratory on regular basis and to third party Laboratories at least once in a year.
QA/QC procedures:	The PP analyses the NCV at in-house laboratory on regular basis. The sample is also send to third party laboratory on yearly basis to cross-check the value.
Purpose of data:	To crosscheck mass energy balance
Additional comments:	The data will be kept for crediting period + 2 years

<b>Data/parameter:</b>	$FF_{d,y}$
Unit	Liter
Description	Quantity of diesel consumed in DG set for emergency purpose, the preparation of fuel, which are attributable to the project activity during the year, y.
Measured/calculated/default	Measured
Source of data	On-site measurements
Value(s) of monitored parameter	950
Monitoring equipment	Volume meter
Measuring/reading/recording frequency:	Continuous monitoring, daily recording, monthly reporting
Calculation method (if applicable):	The total quantity of diesel consumed will be measured as and when used using dip stick/ level gauge/rulers or store issues and records the quantity of the diesel used for the Diesel Generator in the diesel usage records at plant.
QA/QC procedures:	The quantity of diesel issuance would be maintained/recorded separately for the usage and aggregated monthly. The data recorded can be crosschecked against the fuel purchase receipts.
Purpose of data:	Project emission calculation
Additional comments:	The data will be kept for crediting period + 2 years

<b>Data/parameter:</b>	$EG_{CAP}$
Unit	MWh
Description	Monthly average value of net electricity supplied to grid during any month of the crediting period
Measured/calculated/default	Calculated
Source of data	On-site measurements
Value(s) of monitored parameter	5464.83 MWh (Calculated from the annual cap 65578 MWh)
Monitoring equipment	NA
Measuring/reading/recording frequency:	Continuous monitoring, daily recording, monthly reporting
Calculation method (if applicable):	Energy meter of accuracy class 0.2s installed by MSEDCL at project site is used to monitor the net electricity supplied by the project activity. As auxiliary is not monitored separately, the gross generation less net supplied to grid is also calculated to cross check auxiliary consumption.

QA/QC procedures:	The energy meter is to be calibrated at a minimum three years interval as per SSC guidelines. The PPA has been signed for the project activity, which mentions a maximum power of 10MW can be supplied to grid after deducting auxiliary consumption, hence in case exported net electricity supplied to grid on monthly basis is observed higher than value mentioned above, same shall be capped at specified limit for calculation of emission reduction.
Purpose of data:	To cross check the baseline emission
Additional comments:	The data will be kept for crediting period + 2 years

<b>Data/parameter:</b>	<b>Moisture<sub>biomass</sub></b>
Unit	%
Description	Moisture contained in biomass
Measured/calculated/default	Measured
Source of data	On-site measurements
Value(s) of monitored parameter	Rice Husk-9.91% (average over current monitoring period) Woody biomass-17.07% (average over current monitoring period)
Monitoring equipment	--
Measuring/reading/recording frequency:	Measured
Calculation method (if applicable):	The moisture content is measured using loss on drying method in house laboratory of the PP. Moisture content of biomass is tested on each delivery and yearly report is also be taken from an authorized laboratory. The PP is also having in-house lab for regular testing of moisture content.
QA/QC procedures:	Moisture % of biomass is measured in house laboratory and the records is maintained by the shift Incharge, which is also be cross checked with third party lab on yearly basis.
Purpose of data:	To cross check mass energy balance
Additional comments:	The data will be kept for crediting period + 2 years

### D.3. Implementation of sampling plan

>>

No sampling plan applied.

## SECTION E. Calculation of emission reductions or GHG removals by sinks

### E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

>>

As per para 22 of AMS-I.D. (Version 18), baseline emission are calculated as follows:

$$BE_y = EG_{PJ,y} \times EF_{grid,y}$$

Where,

$BE_y$  = Baseline Emissions in year y; t CO<sub>2</sub>

$EG_{PJ,y}$  = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh)

$EF_{grid,y}$  = Combined margin CO<sub>2</sub> emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (0.9679 t CO<sub>2</sub>/MWh)

Further

$$EG_{PJ,y} = EG_{PJ, facility,y}$$

Where,

$EG_{PJ, facility,y}$  = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh)

The net electricity supplied to grid is 80550 MWh, however as per  $EG_{cap}$ , based on the yearly limit set as 65578MWh the calculation is performed on minimum of cap and generation to calculate baseline emission. The value of net electricity supplied to grid has changed from published MR due to correction in values in line with JMR report.

$$EG_{PJ, facility,y} = 80550 \text{ MWh}$$

As per cap for current monitoring period the  $EG_{CAP} = 68157 \text{ MWh}$

Hence the baseline emission is

$$BE_y = 68157 \times 0.9679$$

$$BE_y = 65969.06 \text{ tCO}_2\text{e}$$

$$BE_y = 65969 \text{ tCO}_2\text{e (rounded down)}$$

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

>>

The project emission arising due to use of coal is calculated as mentioned below:

$$PE_{FC,i,y} = \sum FC_{i,j,y} \times CO_{EFi,y}$$

Where,

$PE_{FC,i,y}$  = Are the  $CO_2$  emission from fossil fuel combustion in process j during the year y ( $tCO_2/yr$ )

$FC_{i,j,y}$  = Is the quantity of fuel type i combusted in process j during the year y (13408MT)

$CO_{EFi,y}$  = Is the  $CO_2$  emission coefficient of fuel type i in year y ( $tCO_2/\text{mass or volume unit}$ )

i = Are the fuel types combusted in process j during the year y

Based on the available data, the  $CO_{EFi,y}$  is calculated as per Option B as mentioned below:

$$CO_{EFi,y} = NCV_{i,y} \times EF_{CO2,i,y}$$

Where,

$CO_{EFi,y}$  = Is the  $CO_2$  emission coefficient of fuel type i in year y ( $tCO_2/\text{mass or volume unit}$ )

$NCV_{i,y}$  = Is the weighted average net calorific value of the fuel type i in year y ( $GJ/\text{mass or volume unit}$ )

$EF_{CO2,i,y}$  = Is the weighted average  $CO_2$  emission factor of fuel type i in year y ( $tCO_2/GJ$ )

i = Are the fuel types combusted in process j during the year y

Project emission due to coal use is calculated as

Coal consumption from 14/12/2015 to 31/12/2016

$$FC_{i,j,y} = 13441.78 \text{ MT}$$

$$\text{Emission Factor of coal } EF_{CO2,i} = 95.8 \text{ tCO}_2\text{e/TJ}$$

$NCV$  of coal = 4103.77 Kcal/kg (average over current monitoring period)

$$PE_{FC,coal,y} = 22049.98 \text{ tCO}_2\text{e (Please refer ER sheet).}$$

The emission reduction due to Diesel consumption is calculated as

Diesel consumption = 950 liter



Density of diesel= 0.8439 Kg/liter

NCV of Diesel= 0.043 TJ/tonne

Emission factor of Diesel= 74.8 tCO<sub>2</sub>e/TJ

PE<sub>FC,diesel,y</sub> = 2.58 tCO<sub>2</sub>e (Please refer ER sheet).

Hence total project emission is

PE<sub>FC,y</sub> = 22049.99 + 2.58

PE<sub>FC,y</sub> = 22053 tCO<sub>2</sub>e (rounded up)

### **E.3. Calculation of leakage**

>>No leakage emission.

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

Item	Baseline emissions or baseline net GHG removals by sinks (t CO <sub>2</sub> e)	Project emissions or actual net GHG removals by sinks (t CO <sub>2</sub> e)	Leakage (t CO <sub>2</sub> e)	GHG emission reductions or net GHG removals by sinks (t CO <sub>2</sub> e) achieved in the monitoring period		
				Up to 31/12/2012	From 01/01/2013	Total amount
<b>Total</b>	65969	22053	0	0	43916	43916

**E.5. Comparison of actual emission reductions or net GHG removals by sinks with estimates in registered PDD**

Item	Values estimated in ex ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (t CO <sub>2</sub> e)	41498 <sup>3</sup>	43916

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

&gt;&gt;

There emission reduction in current monitoring period is 5.83% higher, which is due to lower NCV value and hence total share of coal for energy generation compared to registered PDD, where in for 365 days the coal usage shown as 13212 MT with NCV value 0.0189 GJ/tone with total project emission as 23922 tCO<sub>2</sub>e, where as in current monitoring period for 383 days the coal used is 13441 MT with average NCV value of 0.01717 GJ/tone, thereby resulting lower project emission i.e. 22050 tCO<sub>2</sub>e.

<sup>3</sup> Calculated for 383 days as  $39548 \times 383 / 365$ .

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

<b>Project participant and/or responsible person/ entity</b>	<input checked="" type="checkbox"/> Project participant <input checked="" type="checkbox"/> Person/entity responsible for completing the CDM-MR-FORM
<b>Organization name</b>	Vayunandana Power Limited
<b>Street/P.O. Box</b>	Sector-31
<b>Building</b>	953
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<b>Contact person</b>	
<b>Title</b>	Mr
<b>Salutation</b>	Managing Director
<b>Last name</b>	Nirula
<b>Middle name</b>	C
<b>First name</b>	Navin
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**Document information**

<i>Version</i>	<i>Date</i>	<i>Description</i>
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: <ul style="list-style-type: none"> <li>• Include provisions related to delayed submission of a monitoring plan;</li> <li>• Provisions related to the Host Party;</li> <li>• Remove reference to programme of activities;</li> <li>• Overall editorial improvement.</li> </ul>
04.0	25 June 2014	Revisions to: <ul style="list-style-type: none"> <li>• Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0));</li> <li>• Include provisions related to standardized baselines;</li> <li>• Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1;</li> <li>• Change the reference number from <i>F-CDM-MR</i> to <i>CDM-MR-FORM</i>;</li> <li>• Editorial improvement.</li> </ul>
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01	28 May 2010	EB 54, Annex 34. Initial adoption.
Decision Class: Regulatory Document Type: Form Business Function: Issuance Keywords: monitoring report		