




## Verification and certification report form for CDM project activities

(Version 01.0)

## VERIFICATION AND CERTIFICATION REPORT

<b>Title of the project activity</b>	Biomass based power project of VPL
<b>Reference number of the project activity</b>	10233
<b>Version number of the verification and certification report</b>	03
<b>Completion date of the verification and certification report</b>	13/04/2017
<b>Monitoring period number and duration of this monitoring period</b>	1 <sup>st</sup> Monitoring Period 14/12/2015 to 31/12/2016 (including both days)
<b>Version number of monitoring report to which this report applies</b>	04
<b>Crediting period of the project activity corresponding to this monitoring period</b>	14/12/2015 – 13/12/2025 (Fixed)
<b>Project participant(s)</b>	Vayunandana Power Limited
<b>Host Party</b>	India
<b>Sectoral scope(s), selected methodology(ies), and where applicable, selected standardized baseline(s)</b>	Sectoral Scope 1, Energy industries (renewable-/non-renewable sources) Selected Methodology: AMS I.D “Grid connected Renewable electricity generation” (version 18)
<b>Estimated GHG emission reductions or net anthropogenic GHG removals for this monitoring period in the registered PDD</b>	41,498 tCO <sub>2</sub> e
<b>Certified GHG emission reductions or net anthropogenic GHG removals for this monitoring period</b>	43,916 tCO <sub>2</sub> e
<b>Name of DOE</b>	KBS Certification Services Pvt. Ltd
<b>Name, position and signature of the approver of the verification and certification report</b>	 Kaushal Goyal Managing Director

## SECTION A. Executive summary

KBS has been commissioned by "Vayunandana Power Limited" to perform an independent verification of its registered CDM project "Biomass based power project of VPL", UNFCCC Ref# 10233 for the reported GHG emission reductions for the given monitoring period 14/12/2015 to 31/12/2016 (both dates included). The CDM projects must undergo independent third party verification and certification of emission reductions as the basis for issuance of Certified Emission Reductions (CERs).

### Purpose:

The purpose of this verification exercise is, by review of objective evidence, to establish that:

- The project activity has been implemented and operated as per the registered PDD and that all physical features (technology, project equipment, and monitoring and metering equipment) of the project are in place;
- Monitoring report and other supporting documents are complete;
- The actual monitoring systems & procedures and monitoring report conforms with the requirements of the approved monitoring plan and the approved monitoring methodology;
- The data is recorded and stored as per the monitoring methodology and approved monitoring plan.

### Scope:

The scope of the verification is the independent and objective review and ex post determination of the monitored reductions in GHG emission by the project activity. The verification is based on review of monitoring report, supporting information and

- a) The registered PDD, including the monitoring plan and the corresponding validation opinion(s);
- b) Monitoring report for the monitoring period under verification including CER calculations sheets and all supporting documents;
- c) The applied monitoring methodology;
- d) The applied standardized baseline (if applicable);
- e) Relevant decisions, clarifications and guidance from the CMP and the CDM Executive Board;
- f) All information and references relevant to the project activity's resulting in emission reductions

The project is assessed against the requirements of the Kyoto Protocol, the CDM Modalities and Procedures and related rules and guidance.

KBS has, based on the recommendations in the latest version of CDM Validation and Verification Standard, employed a rule-based approach in the verification, focusing on the identification of significant reporting risks and the reliability of project monitoring.

### Description of project:

The project activity consists of installation of biomass based steam power plant at Chandrapur in Maharashtra, state of India. The project site location in terms of Latitude (20° 07' 59.57" N) and Longitude (=79° 56' 35.35" E) was cross-checked from the GPS meter during site visit and is deemed correct.

### Methodology:

KBS follows a rule based verification approach, wherein, as a first step, the contract review is undertaken as per latest version of CDM Accreditation Standard. Subsequently, after the contract is signed, the monitoring report of the project activity is made publicly available at UNFCCC website as per CDM procedures. A desk review of the project documentation is undertaken, which is followed by an onsite visit by the members of verification team in accordance with the latest version of CDM AS. The verification protocol is filled by the verification team that is based on standard auditing practices and version 9 of CDM VVS, to capture the assessment of applicable CDM requirements viz., version 9 of CDM Project Standard, registered PDD, applied methodology/ies, applied standardized baseline and/or tools and recent decisions. The verification protocol provides transparent means to record the observations and compliances by the verification team

members and the nonconformities, if any. The verification protocol is an internal document, and is available on request. Following are the major milestones for the verification under consideration.

Verification contract	30/12/2016
Publication of MR	10/01/2017
On site verification	02/02/2017 to 03/02/2017
Draft Verification Report	16/02/2017
Final Verification Report	13/04/2017

#### Conclusion:

From the verification assessment, it is confirmed that the project activity has been implemented and operated as per the registered PDD and that all physical features (technology, project equipment, and monitoring and metering equipment) of the project are in place. All the monitoring systems & procedures and monitoring report confirms the requirements of the approved monitoring plan and the approved monitoring methodology. Based on the information seen and evaluated we confirm that the implementation of the project has resulted in 43916 tCO<sub>2</sub>e emission reductions during period 14/12/2015 to 31/12/2016.

## SECTION B. Verification team, technical reviewer and approver

### B.1. Verification team member

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)	Involvement in			
						Desk review	On-site inspection	Interview(s)	Verification findings
1.	Team Leader	IR	Kandari	Sanjay	Central Office	x	x	x	X

### B.2. Technical reviewer and approver of the verification and certification report

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)
1.	Technical reviewer	IR	Sharma	Chetan Swaroop	Central office
2	Manager Technical & Certification	IR	Sharma	Chetan Swaroop	Central Office
3.	Authorizer	IR	Goyal	Kaushal	Central Office

## SECTION C. Application of materiality

### C.1. Consideration of materiality in planning the verification

No.	Risk that could lead to material errors, omissions or misstatements	Assessment of the risk		Response to the risk in the verification plan and/or sampling plan
		Risk level	Justification	
1.	Transfer of data from JMR to excel ER spreadsheet	Low	Possible human error during transfer of data to ER spread sheets and MR	Thorough cross-check required on the transfer of data to the ER spread sheet and MR.
2	Wrong data collection/misinterpretation	Low	It's not complicated monitoring process. Appropriate trainings are conducted for the	By means of site visit check of actual situation to sample number of households.

			monitoring personnel.	
--	--	--	-----------------------	--

## C.2. Consideration of materiality in conducting the verification

>>

The prescribed thresholds for materiality, as per §361 of VVS V9.

Prescribed range of ERs/annum	500,000+	300,000+ to 500,000	300,000	SSC PAs	MSC PAs
Prescribed Threshold	0.5%	1.0%	2.0%	5.0%	10.0%

The identified/selected materiality threshold for the project activity under current monitoring period is 5% as project activity is small scale project activity.

	MR Version (Draft)	MR Version (Final)
Emission reductions/annum	41,483 tCO <sub>2</sub> e	43,916 tCO <sub>2</sub> e
Identified Threshold	5.0%	5.0%

The impact of errors observed during verification for each monitoring parameter on the emission reduction calculation is provided below:

Parameter	Verification approach	Error identified	Corrected	Extrapolated error for population size (Qty and %)	Within Threshold
EG <sub>PJ,facility,y</sub>	Complete data check	Yes	Yes	100% data checked	Yes
EG <sub>Gross,y</sub>	Complete data check	No error identified	NA	100% data checked	Yes
FC <sub>biomass, PJ,y</sub>	Complete data check	No error identified	NA	100% data checked	Yes
FC <sub>FF,y</sub>	Complete data check	No error identified	NA	100% data checked	Yes
NCV <sub>FF,y</sub>	Complete data check	Yes	Yes	100% data checked	Yes
NCV <sub>Biomass,k</sub>	Complete data check	Yes	Yes	100% data checked	Yes
FF <sub>d,y</sub>	Complete data check	No error identified	NA	100% data checked	Yes
EG <sub>CAP</sub>	Complete data check	No error identified	NA	100% data checked	Yes

No error on the values of the monitoring parameters is found. The change in the emission reduction between draft and final MR is due to the correction in the ER calculation. Please refer the CARs & CLs raised in the Appendix 4

## SECTION D. Means of verification

### D.1. Desk review

>>

A desk review is undertaken, involving but not limited to,

- A review of the data and information presented to verify their completeness;
- A review of the monitoring plan and monitoring methodology, paying particular attention to the frequency of measurements, the quality of metering equipment including calibration requirements, and the quality assurance and quality control procedures;

- An evaluation of data management and the quality assurance and quality control system in the context of their influence on the generation and reporting of emission reductions.

The list of documents reviewed is included in the section 'Appendix 3' of this report.

## D.2. On-site inspection

Duration of on-site inspection: 02/02/2017 to 03/02/2017				
No.	Activity performed on-site	Site location	Date	Team member
1.	Opening Meeting, Office Inspection, Verification of monitoring records, interviews and database inspection	Garchiroli, Maharashtra (India) Plant location	02/02/2017	Sanjay Kandari
2	Implementation and operation of project activity (project boundary, technology, project equipment, monitoring and metering equipment) as per registered PDD.	Garchiroli, Maharashtra (India) Plant location	02/02/2017	Sanjay Kandari
3	Management and operational system: Documentation, allocation of responsibilities, qualification and training, data recording & archiving, internal audit and management review and emergency procedures.	Garchiroli, Maharashtra (India) Plant location	02/02/2017	Sanjay Kandari
4	Physical inspection of the project activity implementation: Verification of the technical specifications of turbines, boiler, generators and metering system. Site visit and interview of monitoring personnel.	Garchiroli, Maharashtra (India) Plant location	03/02/2017	Sanjay Kandari
5	Management and monitoring procedures followed at project site through desk review of logbooks, calibration certificates, review of ER sheet etc.	Garchiroli, Maharashtra (India) Plant location	03/02/2017	Sanjay Kandari

**D.3. Interviews**

No.	Interviewee			Date	Subject	Team member
	Last name	First name	Affiliation			
1.	Ohri	Yashpal	Director, Vayunandana Power Limited	02/02/2017 to 03/02/2017	<ul style="list-style-type: none"> <li>- General aspects of the project</li> <li>- Changes since validation</li> <li>- Remaining issues from validation</li> <li>- Quality management system</li> <li>- Involved personnel and responsibilities</li> <li>- Training and practice of the operational personnel</li> <li>- Implementation of the monitoring plan</li> <li>- Monitoring data management</li> <li>- Data uncertainty and residual risks</li> <li>- Procedural aspects of the Monitoring</li> <li>- Maintenance</li> <li>- Data analysis</li> <li>- Issues in the MR</li> <li>- ER calculation</li> </ul>	Sanjay Kandari
2	Venkat Rao	Ch	General Manager, Vayunandana Power Limited			
3	Roy	Nitin	Finance Head; Vayunandana Power Limited			
4	S	Ramchandran	Electrical HoD, Vayunandana Power Limited			
5	Rath	Rudra	Shift Incharge; Vayunandana Power Limited			
6	Raju	D Kumar	Instruments Engineer; Vayunandana Power Limited			
7	Chand	Phool	CDM Consultant, PA Research and Consultants			

**D.4. Sampling approach**

&gt;&gt;

Not applied

**D.5. Clarification requests, corrective action requests and forward action requests raised**

Areas of verification findings	No. of CL	No. of CAR	No. of FAR
Compliance of the monitoring report with the monitoring report form	-	-	-
Compliance of the project implementation with the registered PDD	1	-	1 (Remaining FAR from validation)
Post-registration changes	-	-	-
Compliance of the monitoring plan with the monitoring methodology including applicable tool and standardized baseline	-	3	-
Compliance of monitoring activities with the registered monitoring plan	-	-	-
Compliance with the calibration frequency requirements for measuring instruments	-	1	-
Assessment of data and calculation of emission reductions or net removals	-	2	-
<b>Total</b>	<b>1</b>	<b>6</b>	<b>1</b>

**SECTION E. Verification findings****E.1. Compliance of the monitoring report with the monitoring report form**

<b>Means of verification</b>	Verification team checked the monitoring report with latest version of MR available in the UNFCCC website (ie, version 5.1) and "Instructions for filling out the
------------------------------	---

	monitoring report form" mentioned as attachment to Monitoring report form (version 05.1)/18/.
<b>Findings</b>	No CAR/CL is raised
<b>Conclusion</b>	Verification team confirms that final monitoring report is completed using the latest valid version of the applicable monitoring report form.

## E.2. Remaining forward action requests from validation and/or previous verification

>>

The verification team has reviewed the validation report and observed that there the following forward Action Request (FAR) was raised during validation.

*The installed capacity of turbines was found to be as 12 MW in contradiction to the project capacity approved by state regulatory and capacity mentioned in PDD. The PP has included a cap on net electricity supplied to grid as 10 MW (monthly average), the same will be monitored. The verification DoE needs to check that the monthly generation should not breach the value of 10 MW @ 90% PLF.*

PP was asked to justify the same for this monitoring period under FAR#01 in table 1 of Appendix 4 below. As per the response from PP the following is confirmed that the CERs are claimed up to the cap fixed in the registered PDD/3/. Whenever the generation was higher than the cap value the cap value was used for the calculation of emission reductions/2/.

## E.3. Compliance of the project implementation with the registered project design document

<b>Means of verification</b>	The project activity involves installation of new biomass based power generation unit. The project equipment's consist of a 55 TPH chain grate boiler/07/ and a 12 MW bleed cum condensing turbine/7/ and approved for generating not more than 10 MW power on monthly average basis in accordance with signed PPA with grid authority. The steam pressure of 66 kg/cm <sup>2</sup> and the total power demand is approximately 10 MW in accordance with signed power purchase agreement. Project participant has also included the monitoring of monthly power generation and put an additional parameter as EGcap to reinsure that the net electricity cannot be exported more than 10 MWe on monthly average. The project implemented in accordance with registered PDD.
<b>Findings</b>	CL-01 was raised and closed successfully.
<b>Conclusion</b>	a) In opinion of the assessment team the implementation and operation of the project activity is fully in compliance with the description in the registered PDD. b) The actual emission reductions for the current monitoring period are 43,916 tCO <sub>2e</sub> which are higher than the estimated ERs in the registered PDD (41,498 tCO <sub>2e</sub> ) for the comparable period. The reason/justification of increased CERs is described in the further section of verification report.

## E.4. Post-registration changes

No PRC was requested during this monitoring period.

### E.4.1. Temporary deviations from the registered monitoring plan, monitoring methodology or standardized baseline

No temporary deviation is envisaged for this monitoring period.

### E.4.2. Corrections

No correction is sought during this monitoring period.

### E.4.3. Changes to the start date of the crediting period

NA

### E.4.4. Inclusion of a monitoring plan to a registered project activity

Not applicable as the monitoring plan is included in the registered PDD itself.

**E.4.5. Permanent changes from registered monitoring plan, monitoring methodology or standardized baseline**

Not applicable as the monitoring plan is unchanged from the registered PDD.

**E.4.6. Changes to the project design of a registered project activity**

Not applicable.

**E.4.7. Types of changes specific to afforestation and reforestation project activities**

Not applicable as it is not AR project.

**E.5. Compliance of monitoring plan with the monitoring methodology including applicable tool and standardized baseline**

<b>Means of verification</b>	The verification team checked compliance of project monitoring plan with the applied methodologies (AMS I.D, version 18)/6/ and including applicable tools.
<b>Findings</b>	No CAR/CL is raised
<b>Conclusion</b>	<p>All parameters stated in the monitoring plan and the applied methodology has been fulfilled in the current monitoring report. All baseline emission parameters has been verified and found satisfactory. The discussion regarding each parameter has been elaborated in the further sections of this report. The monitoring plan as mentioned in the registered PDD is in accordance with the applied methodology.</p> <p>In the opinion of the verification team the monitoring report complies with the requirement of the registered PDD/3/and applied methodologies (AMS I.D., version 18)/5/ in the context of the project activity. Thus, it conforms to the requirement of §386 of VVS V9/20/.</p>

**E.6. Compliance of monitoring activities with the registered monitoring plan****E.6.1. Data and parameters fixed ex ante or at renewal of crediting period**

<b>Means of verification</b>	<p>The verification team has checked the ex-ante parameters and data stated in Section D.1 of MR/1/ and compared with section B.6.2 of the registered PDD/3/ whether all parameters fixed ex-ante for the crediting period have been applied correctly.</p> <p><b>A) Data and parameters that are available at validation:</b></p> <p>Following are parameters fixed as ex-ante and would remain fixed for the entire crediting period;</p> <ul style="list-style-type: none"> <li>Operating Margin CO<sub>2</sub> emission factor for project electricity system in the year y (<math>EF_{grid,OM,y}</math>): Value taken is 0.9862 tCO<sub>2</sub>e/MWh, calculated as weighted average of the last three years of the Operating margin provided by Central Electricity Authority (CEA) Baseline Carbon Dioxide Emission database version 10.0. The team has verified the value taken from ER spread sheet/2/ and found to be acceptable and hence accepted.</li> <li>Build margin CO<sub>2</sub> emission factor for the project electricity system in year y (<math>EF_{grid,BM,y}</math>): Value taken is 0.9495 tCO<sub>2</sub>e/MWh, calculated as recent most Build margin provided by Central Electricity Authority (CEA) Baseline Carbon Dioxide Emission database version 10.0. The team has verified the value taken from ER spread sheet/2/ and found to be acceptable and hence accepted.</li> <li>Combined margin CO<sub>2</sub> emission factor for the project electricity system in year y (<math>EF_{grid,CM,y}</math>): Value taken is 0.9679 tCO<sub>2</sub>e/MWh, calculated as <math>0.50 * EF_{grid,OM,y} + 0.50 * EF_{grid,BM,y}</math>. The team has verified the value taken from ER spreadsheet/2/ and found to be acceptable and hence accepted.</li> <li>Net calorific value of the Diesel (<math>NCV_{i,y}</math>): Value taken as 43 (TJ/Gg) sourced</li> </ul>
------------------------------	---



	<p>from IPCC, crosschecked from from Table 5.2 of "India: Greenhouse Gas Emissions 2007 – Indian Network for Climate Change Assessment"<sup>1</sup>. The team has verified the value taken from sources and found to be acceptable and hence accepted.</p> <ul style="list-style-type: none"> <li>Density of Diesel (P): Value taken as 0.8439 (Kg /liter) sourced from Table A3.8 Page 181 of the Energy Statistics Manual of OECD/IEA, 2004<sup>2</sup>. The team has verified the value taken from source with CEA Database<sup>30/</sup> and found to be acceptable and hence accepted.</li> <li>CO<sub>2</sub> emission factor of Diesel in year y (EF<sub>CO<sub>2</sub>,i,y</sub>): Value taken as 74.8 (tCO<sub>2</sub>e/TJ), from IPCC database. The team has verified the value taken from sources and found to be acceptable and hence accepted.</li> <li>CO<sub>2</sub> emission factor of Coal (EF<sub>CO<sub>2</sub>,i,y</sub>): Value taken as 95.8 (tCO<sub>2</sub>e/GJ), from national data i.e. CEA database. The team has verified the value taken from sources and found to be acceptable and hence accepted.</li> </ul>
<b>Findings</b>	Nil
<b>Conclusion</b>	The values of ex ante fixed parameters have been verified from the registered PDD/3/. Same has been crosschecked with the source mentioned in the PDD and found to be consistent. The verification team confirms that the values used/applied are correct and justified. Also, the ex-ante values have been correctly applied in the calculation of emission reductions.

### E.6.2. Data and parameters monitored

<b>Means of verification</b>	<p>The verification team has determined whether the registered monitoring plan has been properly implemented and followed by the PP that the monitoring has been carried out in accordance with the registered monitoring plan; and determined whether all parameters including project emission parameters, baseline emission parameters and leakage parameters used for emission reduction calculation stated in the registered monitoring plan are monitored or used appropriately as per the registered PDD.</p> <p>During the verification all monitoring parameters listed in Section D.2 of MR were compared with section B.7.1 of the registered PDD/3/ have been verified with regard to the:</p> <ul style="list-style-type: none"> <li>(i) appropriateness of the applied measurement / determination method,</li> <li>(ii) the correctness of the values applied for ER calculation,</li> <li>(iii) the accuracy, and applied QA/QC measures.</li> </ul> <p>The monitored values are assessed as follows: The data required to be monitored <i>ex-post</i> include:</p> <ul style="list-style-type: none"> <li><b><u>Quantity of gross electricity generation by the project plant/unit in year y</u></b> <b><u>EG<sub>gross,y</sub></u></b>: The gross electricity produced is monitored through the energy meter installed at the TG set. The gross electricity is monitored continuously and recorded in the DCS system of the power plant. The parameter is used for crosscheck of 'Net electricity supplied to grid' and not used directly in the ER sheet. The monthly value of this parameter is verified from plant logs as provided in the final ER sheet/2/. Verified value of this parameter is <b>89,441 MWh</b> for current monitoring period.</li> <li><b><u>Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (EG<sub>PJ, facility,y</sub>)</u></b>: The net electricity supplied to grid is calculated as difference of total electricity exported to grid by the project activity (EG<sub>export</sub>) and total electricity imported from the grid by the project activity (EG<sub>import</sub>) through the ABT meters. The ABT meter automatically deducts import from export and display the 'Net Electricity supplied to grid'.</li> </ul>
------------------------------	---

<sup>1</sup> [http://www.moef.nic.in/downloads/public-information/Report\\_INCCA.pdf](http://www.moef.nic.in/downloads/public-information/Report_INCCA.pdf)

<sup>2</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)

The two sets of ABT bi-directional energy meters (main meter and check meter) are installed at switchyard of power plant; the electricity exported and imported by the project activity is being monitored continuously and recorded on monthly basis in form of 'Joint Meter Reading'. The electricity exported to grid is being monitored by the bidirectional energy meters installed at the 220 kV side of the switchyard, the monitoring results are in accordance with respect to the monitoring frequency defined in the monitoring plan of the MR/2/ and applied methodology/5/.

The reported values were crosschecked by the assessment team with the real time check during the site visit. The last cumulative readings of the last day of the monitoring period was compared with the instantaneous reading during the site visit and it was observed that the real time readings were higher in the comparable range of daily average generation; considering the gap between the site visit and last day of monitoring period.

The second crosscheck was conducted by the assessment team by comparing the gross generation at the turbine meters and the net electricity exported to grid at switchyard.

The third crosscheck was done though the invoices raised to grid authority and found the values between the 'JMR' and 'Invoices' consistent.

This parameter is directly used for the ER calculation.

Verified value of this parameter is 68157 **MWh (after considering the EGcap)** for current monitoring period.

Since the billing cycle starts on 1<sup>st</sup> date of every month, the net energy reading for the period from 14/12/2015 to 31/12/2016 is not available in the JMR as the monitoring period falls between the mid of billing cycle of December 2015. So, net energy values for these periods are apportioned from the JMR reading of the respective months. Also the electricity generation for the same period is determined based on the daily reading recorded at the 'Gross Energy Meter' and deducted the auxiliary consumption recorded at 'Auxiliary meter' installed at plant. The lower of these two values have been considered for the emission reduction and hence it is conservative. The same is verified and found to be correct and calculation is demonstrated in the ER sheet/2/ tab 'Apportioning'.

• **Quantity of biomass residue type k consumed in year y ( $FC_{\text{biomass}, PJ, y}$ ):**

The biomass consumption (rice husk and woody biomass) is monitored with the help of weigh bridge. Daily consumption of biomass (rice husk) and fossil fuel (coal) is recorded in the stock register. Monthly verified values are provided in Emission Reduction Sheet/2/.

As a cross check for the reported value of biomass, the energy mass balance calculation is submitted by the PP and in the opinion of sectoral scope expert, the boiler efficiency computed based on the biomass combusted and the enthalpy of steam is reasonable considering the technical specification of the project activity boiler and turbine.

The biomass invoices/11/ were also used by the verification team as crosscheck of total biomass combusted vs. biomass procured. The values were found consistent. Also the quantity of biomass combusted was submitted to government body, the reported values to government were also used as crosscheck by the assessment team.

The parameter used for crosscheck not in the direct ER calculation.  
Verified value of this parameter is as:

Rice husk on dry basis	Woody Biomass on dry basis
62947.6	18174.3

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. The woody biomass is procured within the 100 km radius of plant as specified in the

surplus biomass report during registration of project activity. The distance was verified from the invoices raised by the suppliers. Therefore it comply with the para 4 of Annex 18 of EB 23 report and falls under the category of renewable biomass. Moreover the availability of surplus woody biomass was demonstrated during the validation stage.

The quantity of biomass combusted during the monitoring period was cross checked through the energy balance as reported in ER sheet/2/. The energy balance calculation demonstrates the average efficiency of boiler during the monitoring period as 79.4% and overall efficiency of power plant as 27%. Both the efficiencies are reasonable in context of **Rankine cycle** power generation. Moreover in the ex-ante calculation of ERs the efficiency of boiler was considered as 77% and it is comparable with the actual efficiency.

• **Quantity of fossil fuel consumed in year y ( $FC_{FF,y}$ ):**

The fossil fuel (coal) consumption is monitored with the help of weigh bridge. Daily consumption of fossil fuel (coal) is recorded in the stock register. Monthly verified values are provided in Emission Reduction Sheet/2/.

As a cross check for the reported value of coal, the energy mass balance calculation is submitted by the PP and in the opinion of sectoral scope expert, such efficiency is reasonable considering the technical specification of the project activity boiler and turbine. The parameter used for crosscheck not in the direct ER calculation.

The coal invoices were also used by the verification team as crosscheck of total coal combusted vs. biomass procured. The values were found consistent. Also the quantity of coal combusted was submitted to government body, the reported values to government were also used as crosscheck by the assessment team. Verified value of this parameter is **13441.8 MT** for current monitoring period.

• **Net calorific value of fossil fuel combusted in the project activity during the year y ( $NCV_{FF}$ ):**

The calorific value of the fossil fuels is used for ER calculation from the NCV test results provided by the third party. The lab test reports were varied and found consistent with the results reported in ER sheet. PP has used the monthly average of NCV/22/ for the ER calculation/2/. The parameter used for crosscheck not in the direct ER calculation but in 'Energy' balance as crosscheck. The NCV is monitored on dry basis as verified from the lab test reports.

Verified value of this parameter is 0.01717 TJ/MT or 4103.77 Kcal/kg for current monitoring period.

• **Net calorific value of biomass residue type k combusted in the project activity during the year y ( $NCV_{Biomass,k}$ ):**

The calorific value of the biomass is used for 'Energy Mass' balance from the NCV test results provided by the third party/22/. The NCV is monitored on dry basis as verified from the lab test reports. The lab test reports were verified and found consistent with the results reported in ER sheet. PP has used the monthly average of NCV for the ER calculation. The parameter used for crosscheck not in the direct ER calculation.

Verified value of this parameter is for current monitoring period for two type of biomass combusted is:

Rice Husk (Kcal/kg) on dry basis	Woody biomass (Kcal/kg) on dry basis
2727.69	2979.54

The test were conducted by the third party lab and based on local and sectoral

	<p>expertise, validation team confirm that the values of NCV for both type of biomass is reasonable. The NCV is used as crosscheck of total electricity produced by the plant, the mass energy balance sheet was submitted by PP and verification team found it comparable with the electricity data reported in ER sheet.</p> <ul style="list-style-type: none"> <li>• <b><u>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 (<math>FF_{d,y}</math>):</u></b> The value is sourced from the log sheet/25/ maintained at the project site; verification team has reviewed the log sheet and found the values consistent. As a crosscheck the diesel issuance slip/24/ from to DG unit were verified and found the quantity of diesel comparable to the diesel consumed. Moreover as another crosscheck the diesel consumption/month was co-related with the total power generation/month and found that diesel consumption was higher whenever the power generation is low. Therefore it can be concluded that diesel is used only when the plant was under shutdown and there was no power available to import from the grid to run the necessary auxiliaries.</li> </ul> <p>Verified value of this parameter is <b>0.80 MT (950 Litre)</b> for current monitoring period. Diesel is monitored in liter and thereafter converted to MT by using the standard conversion methods. The calculation demonstrated in ER sheet was found adequate by the verification team.</p> <ul style="list-style-type: none"> <li>• <b><u>Moisture content of the biomass (wet basis) by type i for the year y (<math>M_{Biomass,i,y}</math>):</u></b> The moisture content of the biomass is used for 'Energy Mass' balance from the NCV test results provided by the third party. The lab test reports were varied and found consistent with the results reported in ER sheet. PP has used the monthly average of NCV for the ER calculation. The parameter used for crosscheck not in the direct ER calculation. Verified value of this parameter is <b>17.07% for woody biomass and 9.91% for rice husk</b> for current monitoring period from the third party NCV test reports/22/.</li> <li>• <b><u>Monthly average value of net electricity supplied to grid during any month of the crediting period (<math>EG_{CAP}</math>):</u></b> FAR#01 was raised during validation to ensure that PP cannot claim the ERs beyond the <math>EG_{CAP}</math> specified in registered PDD. PP has applied the value of <math>EG_{CAP}</math> (5464.83 MWh/Month) and demonstrated in the ER sheet/2/. The calculation was assessed appropriate by the verification team. PP has not claimed the CERs beyond the generation of <math>EG_{CAP}</math>.</li> </ul>
<b>Findings</b>	CAR-01, CAR-02, CAR-03 and CAR#06 were raised and closed successfully.
<b>Conclusion</b>	Corresponding to the §389 of VVS V9/12/, the team confirm that the monitoring has been carried out in accordance with the approved PDD/3/. The monitoring system is in compliance with the information flow for the parameters as mentioned in monitoring plan in approved PDD/3/. The monitored data for the parameters has been verified by checking the procedure for information flow and found to be complete and consistent.

### E.6.3. Implementation of sampling plan

<b>Means of verification</b>	Not applicable as sampling plan is not part of registered PDD/monitoring plan.
<b>Findings</b>	NA
<b>Conclusion</b>	NA

**E.7. Compliance with the calibration frequency requirements for measuring instruments**

Means of verification	<p>The calibration frequency as per the registered monitoring plan is once in three year, the verification team has interviewed Mr. Yashpa IOhri, Director, VPL and he confirms that in actual the monitoring equipment which are which are under control of PP are calibrated at annual interval, the same were also confirmed by reviewing the calibration certification issued by the NABL accredited agency. The energy meters which are beyond the control of PP are calibrated as per the schedule of state electricity board. No incidence of meter change observed during this monitoring period.</p> <p>Refer below table for the details of calibration of energy meters. The calibrations are valid for one year as per the details provided in the calibration certificates/14/15/16/ except for the energy meter Sr. No AP905398 (Gross electricity), which was calibrated on 06/08/2016 after delay of 1 day. Since this meter is used for the monitoring of 'Gross Electricity Generation' which is a crosscheck parameter of 'Net electricity supplied to grid', not the parameter used for direct ER calculation therefore the delay doesn't affect the ER calculation. The registered monitoring plan has the provision of calibration once in three year; the actual calibrations were carried out once in year. The errors found in the calibration were within the permissible errors of energy meters. It can be concluded by the assessment team that the calibration requirements have been met.</p>																																													
	<table><tr><th>Meter</th><th>Accuracy class</th><th>Serial No</th><th>Calibration frequency adopted during the monitoring period</th><th>Date of last calibrations</th><th>Validity</th></tr><tr><td rowspan="2">Energy meter for monitoring 'Gross Electricity Generation'.</td><td rowspan="2">0.5S</td><td rowspan="2">AP905398</td><td rowspan="2">Yearly</td><td>06/08/2016</td><td>One year</td></tr><tr><td>05/08/2015</td><td>One year</td></tr><tr><td rowspan="2">Energy meter at grid interconnection – Main Meter</td><td rowspan="2">0.5 S</td><td rowspan="2">HT01131083</td><td rowspan="2">Yearly</td><td>06/04/2016</td><td>One year</td></tr><tr><td>31/10/2015</td><td>One year</td></tr><tr><td rowspan="2">Check Meter</td><td rowspan="2">0.2 S</td><td rowspan="2">HT01131082</td><td rowspan="2">Yearly</td><td>06/04/2016</td><td>One year</td></tr><tr><td>31/10/2015</td><td>One year</td></tr><tr><td rowspan="3">Weigh-bridge</td><td rowspan="3">10Kg (Class III)</td><td rowspan="3">198</td><td rowspan="3">Yearly</td><td>22/12/2016</td><td>One year</td></tr><tr><td>23/12/2015</td><td>One year</td></tr><tr><td>24/12/2014</td><td>One year</td></tr></table>						Meter	Accuracy class	Serial No	Calibration frequency adopted during the monitoring period	Date of last calibrations	Validity	Energy meter for monitoring 'Gross Electricity Generation'.	0.5S	AP905398	Yearly	06/08/2016	One year	05/08/2015	One year	Energy meter at grid interconnection – Main Meter	0.5 S	HT01131083	Yearly	06/04/2016	One year	31/10/2015	One year	Check Meter	0.2 S	HT01131082	Yearly	06/04/2016	One year	31/10/2015	One year	Weigh-bridge	10Kg (Class III)	198	Yearly	22/12/2016	One year	23/12/2015	One year	24/12/2014	One year
	Meter	Accuracy class	Serial No	Calibration frequency adopted during the monitoring period	Date of last calibrations	Validity																																								
	Energy meter for monitoring 'Gross Electricity Generation'.	0.5S	AP905398	Yearly	06/08/2016	One year																																								
					05/08/2015	One year																																								
	Energy meter at grid interconnection – Main Meter	0.5 S	HT01131083	Yearly	06/04/2016	One year																																								
					31/10/2015	One year																																								
	Check Meter	0.2 S	HT01131082	Yearly	06/04/2016	One year																																								
					31/10/2015	One year																																								
	Weigh-bridge	10Kg (Class III)	198	Yearly	22/12/2016	One year																																								
23/12/2015					One year																																									
24/12/2014					One year																																									
Findings																																														
Conclusion																																														

**E.8. Assessment of data and calculation of emission reductions or net removals****E.8.1. Calculation of baseline GHG emissions or baseline net GHG removals by sinks**

<b>Means of verification</b>	<p>The GHG emissions reduction calculations are transparently documented and appropriate assumptions regarding the expected amount of electricity generated have been used to forecast emission reductions.</p> <p>According to the applied formulae in the PDD, the emission reductions (<math>ER_y</math>) by the project activity during the crediting period is the difference between the baseline emissions (<math>BE_y</math>) and project emissions (<math>PE_y</math>), which is expressed as follows:</p>
------------------------------	---

	<p><math>ER_y = BE_y - PE_y - LE_y</math> (section B.6.3 of PDD<sup>/P02/</sup> and equation (9) of the methodology<sup>/27/</sup>)</p> <p>According to the applied meth, the baseline emissions are demonstrated in Section B.6.1 of PDD and are calculated using methodology equations is as follows:</p> <p>Where,</p> <p><math>BE_y = EG_{PJ,y} * EF_{grid,y}</math></p> <p>Where,</p> <p><math>BE_y</math> = Baseline emissions in year y (tCO<sub>2</sub>/yr)</p> <p><math>EG_{PJ,y}</math> = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project activity in year y (MWh) = 68157 MWh/annum<sup>/7/</sup> Source: ER sheet<sup>/7/</sup></p> <p><math>EF_{grid,y}</math> = 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" (tCO<sub>2</sub>/MWh) = 0.9679 tCO<sub>2</sub>/MWh<sup>/3/</sup>.</p> <p><b>EG<sub>CAP</sub></b> specified in registered PDD is used to arrive at final value of <math>EG_{PJ,y}</math>. PP has applied the value of <math>EG_{CAP}</math> (5464.83 MWh/Month) and demonstrated in the ER sheet/2/. The calculation was assessed appropriate by the verification team. PP has not claimed the CERs beyond the generation of <b>EG<sub>CAP</sub></b>.</p> <p>Based on the above formula, the annual average baseline emission is estimated to <math>BE_y = 65,969</math> tCO<sub>2</sub>e (rounded down)</p>
<b>Findings</b>	CAR-01 was raised and closed satisfactorily.
<b>Conclusion</b>	<p>In accordance with §141-143 VVS V9 the validation team confirms that the project activity complies with the specified requirements of algorithms and/or formulae used to determine emission reductions and discussed above. The validation team confirms</p> <p>(a) All assumptions and data used by the project participants are listed in the PDD, including their references and sources;</p> <p>(b) All documentation used by project participants as the basis for assumptions and source of data is correctly quoted and interpreted in the PDD;</p> <p>(c) All values used in the PDD are considered reasonable in the context of the proposed project activity;</p> <p>(d) The baseline methodology and corresponding tool(s) have been applied correctly to calculate project emissions, baseline emissions, leakage and emission reductions;</p> <p>(e) All estimates of the baseline emissions can be replicated using the data and parameter values provided in the PDD.</p> <p>The validation team confirms that the project activity complies with the requirements of VVS, version 09</p>

### E.8.2. Calculation of project GHG emissions or actual net GHG removals by sinks

Means of verification	<b><u>Project Emissions:</u></b>				
	In accordance with applied methodology, CO <sub>2</sub> emissions from on-site consumption of fossil fuels due to the project activity shall be calculated using the latest version of the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion".				
	The proposed project activity envisages the use of Coal along with biomass for the electricity generation is used along with the minor quantity of diesel in DG set. Therefore, the project emission arising due to use of coal and diesel are calculated as mentioned below:				
	<b><u>Project Emissions due to coal:</u></b>				
	<table><tr><td colspan="2"><math>PE_{FC,j,y} = \sum FC_{i,j,y} \times CO_{EFi,y}</math></td></tr><tr><td><math>FC_{i,j,y}</math></td><td>13441.78 Tonnes of coal used in the project activity. Quantity of coal verified from the logbooks, crosschecked with coal stock register/23/, invoices raised by the coal</td></tr></table>		$PE_{FC,j,y} = \sum FC_{i,j,y} \times CO_{EFi,y}$		$FC_{i,j,y}$
$PE_{FC,j,y} = \sum FC_{i,j,y} \times CO_{EFi,y}$					
$FC_{i,j,y}$	13441.78 Tonnes of coal used in the project activity. Quantity of coal verified from the logbooks, crosschecked with coal stock register/23/, invoices raised by the coal				

	supplier/12/.
	$COEF_{i,y} = NCV_{i,y} \times EF_{CO_2,i,y}$
	$EF_{CO_2,i,y}$ 95.8 tCO <sub>2</sub> /GJ (Validated from the CEA data base ex-ante)
	$NCV_{i,y}$ 4103.77 Kcal/kg (average over current monitoring period provided by the third part labs)
	$PE_{FC,j,y}$ 22049.98 (calculated based on above verified parameters in accordance with, "Tool to calculate project emission" )and by using the conversion factor of Kcal/kg to KJ/kg.
<b>Project Emissions due to coal:</b>	
Diesel consumption= 950 liter verified from the log books and crosschecked with the diesel issuance slips/24/ and shutdown time recorded in plant log books/25/.	
Density of diesel= 0.8439 Kg/liter (validated ex-ante)	
NCV of Diesel= 0.043 TJ/tonne (validated ex-ante)	
Emission factor of Diesel= 74.8 tCO <sub>2</sub> e/TJ	
$PE_{FC,diesel,y} = 2.58 \text{ tCO}_2\text{e}.$	
<b>Hence total project emission is</b>	
$PE_{FC,y} = 22,049.99 + 2.58$	
$PE_{FC,y} = 22,053 \text{ tCO}_2\text{e}$ (rounded up)	
<b>Findings</b>	CAR-05 are raised and closed successfully.
<b>Conclusion</b>	<p>The verification team confirms the following:</p> <ul style="list-style-type: none"> <li>• The calculations of project GHG emissions have been carried out in accordance with the equations and methods described in the registered monitoring plan and applied methodology.</li> <li>• The emission factor applied is an ex-ante value valid for the fixed crediting period.</li> <li>• Any assumptions used in emission or removal calculations have been justified.</li> <li>• Appropriate emission factor and other reference values have been correctly applied. It can be confirmed that the project emission calculation is overall correct.</li> <li>• The ER calculation sheet provided is clear, transparent and the calculations provided in the sheet are reproducible.</li> <li>• Hence, the project emission reported in the monitoring report for the monitoring period (i.e, 22,053 tCO<sub>2</sub>e) is verified to be correct</li> </ul>

### E.8.3. Calculation of leakage GHG emissions

<b>Means of verification</b>	The project activity adopted the ex-ante demonstration of surplus availability of biomass i.e. rice husk in line with "Methodological tool, Leakage in biomass small-scale project activities". The surplus availability of rice husk and woody biomass is more than 25% as per biomass assessment survey report validated during the validation. therefore $LE_y = 0$
<b>Findings</b>	NA
<b>Conclusion</b>	No leakage emissions are associated with the project.

### E.8.4. Summary of calculation of GHG emission reductions or net anthropogenic GHG removals by sinks

<b>Means of verification</b>	<p>Section E.4 of MR demonstrate the summary of GHG emission reductions for the monitoring period and calculated according to the applied methodologies as follows:</p> $ER_y = BE_y - PE_y - L_y$ $= 65,969 - 22,053 - 0 = 43,916 \text{ tCO}_2\text{e}$
------------------------------	---

	The ER calculation sheet and monitoring report is verified to check the calculation.
<b>Findings</b>	No CAR/CL is raised
<b>Conclusion</b>	The verification team confirms the following: <ul style="list-style-type: none"> <li>The emission reduction value reported (i.e. 43,916 tCO<sub>2</sub>e)/2/ is verified to be correct.</li> <li>The summary table in the MR has been filled correctly and the values are in line with the related emissions reduction spread sheet/2/.</li> </ul>

#### E.8.5. Comparison of actual GHG emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

<b>Means of verification</b>	The verification team has checked whether the MR includes a comparison of actual values of the monitoring period with the estimations in the registered PDD/3/. Section E.5 of the MR includes a comparison of the calculated actual emission reductions with the ex-ante calculated values in the registered PDD	
	Emission reduction estimated as per the registered PDD/3/	Actual emission reduction achieved as per Monitoring report/1/
	41,498 tCO <sub>2</sub> e	43,916 tCO <sub>2</sub> e
<b>Findings</b>	No CAR/CL is raised	
<b>Conclusion</b>	The estimated emission reduction as per registered PDD and the actual emission reduction achieved for the monitoring period are correctly reported in the section E.5 of MR.	

#### E.8.6. Remarks on difference from estimated value in registered PDD

<b>Means of verification</b>	The actual emission reduction achieved during the monitoring period are 5.83 % higher than the estimation in the registered PDD due to lower project emissions from coal consumption as envisaged in the registered PDD. The NCV of coal used in the project activity was lower than the estimated NCV in the registered PDD; this led to less project emissions. The justification provided by the PP is accepted as it doesn't impact the scale, applicability and additionality of project activity.
<b>Findings</b>	No CAR/CL is raised.
<b>Conclusion</b>	The actual achieved emission reductions are higher than the PDD estimation.

#### E.8.7. Actual GHG emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards

<b>Means of verification</b>	The verification team has determined the CER achieved during the second commitment period.
<b>Findings</b>	No CAR/CL is raised
<b>Conclusion</b>	Since the monitoring period starts after 31/12/2012, the complete emission reductions are correctly reported under the respective column in the MR.

### SECTION F. Internal quality control

The draft verification report prepared by team leader is reviewed by an independent technical reviewer (having competence of relevant technical area himself/herself or through an independent technical area expert) to confirm the internal procedures established by KBS are duly followed and the verification report/opinion is reached in an objective manner and complies with the applicable CDM requirements.

The independent technical reviewer may approve or reject the draft verification report. The findings may be identified even at this stage, which needs to be satisfactorily resolved, before the request for issuance is submitted to UNFCCC. The final decision is taken by the Manager Technical and Certification. The technical reviewer and Manager (Technical & Certification) can be same person.

The final decision is authorized by Managing Director, KBS once the report is approved by the Manager (Technical & Certification).

### SECTION G. Verification opinion

The verification team confirms that the evidence is of sufficient quantity, appropriate quality and reliable. The reported values, notation, units and sources in the monitoring report for all the monitoring parameters have been cross checked with the emission reduction sheet and monitoring report. During the course of



verification and on site visit, the data submitted by PP was cross verified with the values mentioned in the emission reduction sheet/2/ and monitoring report/1/. The procedure for data monitoring, recording, transfer and compilation was also verified and found in compliance with the monitoring plan as mentioned in the approved revised PDD/3/.

Evidences (Documents/interview/site visit) referred for verification of individual monitoring parameter and fixed parameters are defined in section E.6 above. It is confirmed by the assessment team that the reported emission reductions have been conservatively calculated. A list of referred documents for verification is also included in Appendix 3 of this report.

Based on the information seen and evaluated we confirm that the implementation of the project has resulted in 43,916 tCO<sub>2</sub>e emission reductions during period 14/12/2015 to 31/12/2016.

## SECTION H. Certification statement

KBS Certification Services Pvt. Ltd. has been contracted by 'Vayunandana Power Limited' to undertake independent verification and certification for the greenhouse gas (GHG) emission reductions reported from the CDM Project activity "Biomass based power project of VPL" and UNFCCC Reference Number 10233 for the monitoring period 14/12/2015 to 31/12/2016 (including both dates) in the Monitoring Report Version 01 (first version) dated 07/01/2017.

The verification is based on the approved revised PDD and the monitoring report for this project. Our verification approach was based on the requirements as defined under the Kyoto Protocol, Marrakech accord, as well as those defined by the CDM Executive Board.

The management of the 'Vayunandana Power Limited' is responsible for the preparation of the GHG emissions data and the reported GHG emissions reductions on the basis set out within the project Final Monitoring Report Version 4 dated 11/04/2017. The calculation and determination of GHG emission reductions from the project is the responsibility of the management of the 'Vayunandana Power Limited'. The Climate Protection Partnership'. The development and maintenance of records and reporting procedures are in accordance with the Monitoring Report Version 4 dated 11/04/2017.

It is our responsibility to express an independent GHG verification opinion on the GHG emissions and on the calculation of GHG emission reductions from the project for the monitoring period 14/12/2015 to 31/12/2016 (including both dates) based on the reported emission reductions in the Final Monitoring Report Version 4 dated 11/04/2017 for the same period.

Based on an understanding of the risks associated with reporting GHG emissions data and the controls in place to mitigate these, KBS planned and performed our work to obtain the information and explanations that we considered necessary to provide sufficient evidence for us to give reasonable assurance that this reported amount of GHG emission reductions for the period is fairly stated.

KBS confirms the following;

**Reporting period:** 14/12/2015 to 31/12/2016 (including both dates)

**Verified and certified emission in the above reporting period:**

	Amount	Unit
Baseline emissions (BE)	65,969	tCO <sub>2</sub> e
Project emissions (PE)	22,053	tCO <sub>2</sub> e
Leakage emissions (LE)	0	tCO <sub>2</sub> e
Certified emission reductions (CERs)	43,916	tCO <sub>2</sub> e

## Appendix 1. Abbreviations

Abbreviations	Full texts
AMS	Approved Methodology for Small-scale
BE	Baseline Emissions
BM	Build Margin
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CM	Combined Margin
CER	Certified Emission Reduction
CL	Clarification request
COP	Conference of Parties
DOE	Designated Operational Entity
DNA	Designated National Authority
DR	Document Review
EB	Executive Board
EF	Emission Factor
ERs	Emission Reductions
FAR	Forward Action Request
GHG	Greenhouse gas(es)
GSC	Global Stakeholder Consultation
HCA	Host Country Approval
IPCC	Intergovernmental Panel on Climate Change
KBS	KBS Certification Services Pvt. Ltd.
KP	Kyoto Protocol
LSC	Local Stakeholder Consultation
LE	Leakage Emissions
LoA	Letter of Approval/Authorization
ISO	International Organization for Standardization
MEDA	Maharashtra Electricity Development Agency
MERC	Maharashtra State Regularly Commission
MSEDCL	Maharashtra State Electricity Distribution Co. Ltd
MOP	Meeting of Parties
MoC	Modalities of Communication
MoV	Means of Verification
MP	Monitoring Plan
OM	Operating Margin
NABL	National Accreditation Board for Testing and Calibration Laboratories.
PA	Project Activity
PDD	Project Design Document
PE	Project Emissions
PLF	Plant Load Factor
PP	Project Participant
PS	Project Standard
PO	Purchase Order
PCP	Project Cycle Procedure
QA/QC	Quality Assurance/Quality Control
RfR	Request for Registration
SD	Sustainable Development
T&C	Technical & Certification
UNFCCC	United Nations Framework Convention on Climate Change
VVS	Validation & Verification Standard
VPL	Vayunandana Power Limited

## Appendix 2. Competence of team members and technical reviewers

<b>Personnel Name:</b>		<b>Sanjay Kandari</b>	
<b>Qualified to work as:</b>			
Team Leader	<input checked="" type="checkbox"/>	Technical Expert	<input checked="" type="checkbox"/>
Validator/Verifier	<input checked="" type="checkbox"/>	Financial Expert	<input checked="" type="checkbox"/>
Technical Reviewer	<input checked="" type="checkbox"/>	Local Expert (India)	<input checked="" type="checkbox"/>
<b>Area(s) of Technical Expertise</b>			
<b>Sectoral Scope</b>	<b>Technical Area</b>		
Energy Industries (renewable/non-renewable sources)	TA 1.1: Thermal energy generation from fossil fuels and biomass including thermal electricity from solar		
Energy industries (renewable/non-renewable sources)	TA 1.2: Energy generation from renewable energy sources		
Waste Handling and Disposal	TA 13.1 Waste Handling and Disposal TA 13.2 Manure		
Approved by (Manager C & T)	Gagandeep Kakkar		
Approval date:	03/11/2015		

<b>Personnel Name:</b>		<b>Chetan Swaroop Sharma</b>	
<b>Qualified to work as:</b>			
Team Leader	<input checked="" type="checkbox"/>	Technical Expert	<input checked="" type="checkbox"/>
Validator/Verifier	<input checked="" type="checkbox"/>	Financial Expert	<input checked="" type="checkbox"/>
Technical Reviewer	<input checked="" type="checkbox"/>	Local Expert (India)	<input checked="" type="checkbox"/>
<b>Area(s) of Technical Expertise</b>			
<b>Sectoral Scope</b>	<b>Technical Area</b>		
Energy industries (renewable/non-renewable sources)	TA 1.2: Energy generation from renewable energy sources		
	TA 1.1: Thermal energy generation from fossil fuels and biomass including thermal electricity from solar		
Approved by (Manager C & T)	Gagandeep Kakkar		
Approval date:	09/10/2015		

## Appendix 3. Documents reviewed or referenced

No.	Author	Title	References to the document	Provider
1.	VPL	Monitoring Report,	Version 01, dated 07/01/2017	1. VPL
	VPL	Monitoring Report	Version 02, dated 10/02/2017  Version 03, dated 21/02/2017  Version 04, dated 11/04/2017	VPL
2.	VPL	ER Calculation Sheet	Version 01, dated 07/01/2017	VPL
	VPL	ER Calculation Sheet	Version 02, dated 10/02/2017  Version 03, dated 21/02/2017  Version 04, dated 11/04/2017	VPL
3.	VPL	Registered PDD	Version 03, 21/11/2015	Publically available
4.	KBS	Validation Report	Version 2.1 dated 02/12/2015	Publically available
5.	UNFCCC	CDM Methodologies: AMS.I.D	<a href="#">Version 18</a>	Publically available
6.	<ul style="list-style-type: none"> <li>Pollution Control Board Maharashtra</li> <li>MEDA</li> </ul>	Statuary clearances: <ul style="list-style-type: none"> <li>Pollution Control Board clearances</li> <li>Consent to Establish</li> <li>MEDA clarances</li> <li>Bolier Certificate</li> </ul>	BO/JD (APC)/EIC No.NG-12302/15/R/CC dated 01/12/2015	Project participant
7.	Technology supplier of equipment	Technical specifications of the project activity boilers and turbine	Purchase orders dated vide ref. no. VPL/TTPL/20/2007-08 dated 16/08/2007  Amended Purchase order turbines vide ref. no. VPL/TTPL/06/2007-08 dated 16/08/2007	Project participant
8.	MSEDCL and PP	Power Purchase Agreement dated between PP and MSEDCL for 13 years	Dated 22/09/2008	VPL
9.	MSEDCL	Commissioning certificate	dated 28/12/2010 stating date of commissioning as 09/12/2010	VPL
10.	VPL	Invoices raised to MSEDCL Joint meter readings (JMR) taken by the PP and representatives of MSEDCL.	Covering the monitoring period	VPL
11.	Biomass supplier	Invoices raised to VPL by various biomass suppliers	Covering the monitoring period	VPL

12.	Coal supplier	Invoices raised to VPL by various coal suppliers	Covering the monitoring period	VPL
13.	VPL	Copy of report submitted to MSEDCL for the fuel combusted	Covering the monitoring period	VPL
14.	MSEDCL	Calibration of main and check energy meter:  Sr. No. HT01131083 & HT01131082	dated 31/10/2015 & 06/04/2016	VPL
15.	VPL	Calibration of Gross energy meter sr. no AP905398	dated 05/08/2015 & 06/08/2016	VPL
16.	VPL	Calibration of 'Weigh Bridge'	22/12/2016, 23/12/2015 24/12/2014	VPL
17.	IPCC	1. 1996 IPCC Guidelines for National Greenhouse Gas Inventories: work book 2. 2006 IPCC Guidelines for National Greenhouse Gas Inventories: work book		Publically available
18.	UNFCCC	Monitoring Report Form (CDM-MRFORM), Version 05.1	<a href="#">Version 05.1</a>	Publically available
19.	UNFCCC	CDM Project Standard	<a href="#">Version 9.0</a>	Publically available
20.	UNFCCC	CDM Validation and Verification Standard	<a href="#">Version 09</a>	Publically available
21.	UNFCCC	Glossary "CDM terms"	<a href="#">Version 08</a>	Publically available
22.	DEENEE Chemicals Private Limited	NCV Test Reports (Biomass & Coal) provided by the third party to PP on Monthly basis covering the monitoring period.	Report No 164 dated 08/12/2015, 196 dated 24/01/2016, 228 dated 12/02/2016, 252 dated 18/03/2016 etc.	VPL
23.	VPL	Biomass and coal stock registers	For entire monitoring period	VPL
24.	VPL	Diesel Issue slips	For entire monitoring period	VPL
25.	VPL	Diesel log book	For entire monitoring period	VPL

## Appendix 4. Clarification requests, corrective action requests and forward action requests

**Table 1. Remaining FAR from validation and/or previous verification**

FAR ID	01	Section no.	E.2	Date: 04/02/2017
Description of FAR				
Evidence required to verify the following FAR raised during validation:				
<p>The installed capacity of turbines was found to be as 12 MW in contradiction to the project capacity approved by state regulatory and capacity mentioned in PDD. The PP has included a cap on net electricity supplied to grid as 10 MW (monthly average), the same will be monitored. The verification DoE needs to check that the monthly generation should not breach the value of 10 MW @ 90% PLF.</p>				

<b>Project participant response</b>	<b>Date:</b> 16/02/2017
As per PPA with DISCOM the PP is supplying 10MW equivalent on monthly basis, however given installed capacity is 12MW and no restriction on daily generation by DISCOM, the PP manages generation in a way to avoid additional time needed for operation and maintenance of the plant. The cap determined at the time of validation is used and as per annual cap set on net supply monthly values against same or actual supplied whichever minimum is used in emission reduction calculation. The same can be checked in ER sheet.	
<b>Documentation provided by project participant</b>	
ER sheet.	
<b>DOE assessment</b>	<b>Date:</b> 16/02/2017
PP has demonstrated in the ER sheet that the ERs are not claimed beyond the EGcap fixed during validation. The submitted ER sheet reviewed by assessment team and found that in the ER calculations EGcap is applied in accordance with registered monitoring plan. FAR is closed for this monitoring period.	

Table 2. CL from this verification

<b>CL ID</b>	01	<b>Section no.</b>	E.2	<b>Date:</b> 04/02/2017
<b>Description of CL</b>				
Following documents are to be submitted for verifying the various requirements:				
<ul style="list-style-type: none"> <li>a) The invoices of biomass and coal procured during the monitoring period to crosscheck the energy mass balance.</li> <li>b) Calibration certificates of energy meters and weigh bridge.</li> <li>c) NCV test reports of coal and biomass used.</li> <li>d) Copy of reported value of biomass and coal combusted to MSEDCL for the monitoring period</li> <li>e) Copies of JMR and invoices for the monitoring period.</li> </ul>				
Copy of statutory clearances which includes boiler inspector certificate, pollution consents etc.				
<b>Project participant response</b>				<b>Date:</b> 16/02/2017
All supportive have been provided along with this response.				
<b>Documentation provided by project participant</b>				
<ul style="list-style-type: none"> <li>a) Coal purchase invoice</li> <li>b) Biomass purchase invoice</li> <li>c) Calibration certificate for gross, main and check meter</li> <li>d) NCV report for coal and biomass</li> <li>e) Fuel consumption report submitted to MSDECL</li> <li>f) Joint Meter Reading report for current monitoring period</li> <li>g) All statutory clearances</li> </ul>				
<b>DOE assessment</b>				<b>Date:</b> 16/02/2017
All the supporting documents sought are submitted to verification team; the same were found adequate by the verification team and used as an audit trail. The documents are referred in the relevant sections of verification report. CL is closed.				

Table 3. CAR from this verification

<b>CAR ID</b>	01	<b>Section no.</b>	E.8.2	<b>Date:</b> 04/02/2017
<b>Description of CAR</b>				
The usage of diesel in the DG set in the project activity during the current monitoring period and subsequently the calculation of project emissions due to the usage of diesel are demonstrated neither in the submitted MR nor in ER sheet.				
<b>Project participant response</b>				<b>Date:</b> 16/02/2017
The diesel consumption is incorporated in revised MR and corresponding project emission is also calculated.				
<b>Documentation provided by project participant</b>				
MR version-02 Diesel consumption details				
<b>DOE assessment</b>				<b>Date:</b> 16/02/2017
The usage of diesel is now accounted for the calculation of project emissions and ER calculation. The calculation of project emission is in accordance with applied methodology and tool referred therein.				
<b>CAR ID</b>	02	<b>Section no.</b>	E.8.1	<b>Date:</b> 04/02/2017
<b>Description of CAR</b>				

The monitoring approach of for the month of December 2015 for the monitored parameter $EG_{P_{Jy}, facility}$ is not in accordance with the registered monitoring plan.	
<b>Project participant response</b>	<b>Date:</b> 16/02/2017
The meter reading report is taken from 1st to last day of the month, as current monitoring period start within the net export to grid has been calculated using conservative approach.	
<b>Documentation provided by project participant</b>	
Meter reading report MR version-02 ER version-02	
<b>DOE assessment</b>	<b>Date:</b> 16/02/2017
The calculation of $EG_{P_{Jy}, facility}$ is now revised and the conservative approach is applied for the calculation of ERs. The approach is verified conservative and explained in the main section of verification report. CAR is closed.	

CAR ID	03	Section no.	E.8.1	Date: 04/02/2017
Description of CAR				
The values of monitored parameter $EG_{P_{Jy}, facility}$ is not consistent in the ER spreadsheet with the JMR and invoices for the months of June 2016, July 2016, August 2016, September 2016, October 2016 & Nov 2016				
Project participant response				Date:16/02/2017
There was typo error in decimal values of one month which resulted the difference has been corrected in revised ER sheet and MR version-02.				
Documentation provided by project participant				
Revised MR and ER sheet				
DOE assessment				Date: 16/02/2017
The values of monitored parameter $EG_{P_{Jy}, facility}$ are now consistent in the ER spreadsheet with the JMR and invoices for the months of June 2016, July 2016, August 2016, September 2016, October 2016 & Nov 2016. CAR is closed.				

CAR ID	04	Section no.	E.8.1 & E.8.2	Date: 04/02/2017
Description of CAR				
The NCV values reported for the biomass and coal in the ER sheet are not consistent with the test reports provided by the third party lab as verified during the site visit.				
Project participant response				Date:16/02/2017
The NCV values are corrected in revised MR and ER sheet. Further the coal quantity has decreased from published MR as the earlier reported was for complete month, which has been corrected for 18 days usage which is from 14/12/2015 to 31/12/2015, thereby resulting in ER increase, the ER has also increased due to correction of monthly NCV and corresponding project emission.				
Documentation provided by project participant				
NCV report MR version-02 ER version-02				
DOE assessment				Date: 16/02/2017
The NCV values are now made consistent with the reports and revised ER sheet is submitted. Average NCV is considered for the 'Mass-Energy balance'. CAR is closed.				

CAR ID	05	Section no.	E.7	Date: 04/02/2017
Description of CAR				
Dates of calibration of energy meter Sr. No. HT01131082 is not consistent with the calibration reports verified during onsite assessment.				
Project participant response				Date:16/02/2017
The date of calibration of HT meter is corrected in revised MR.				
Documentation provided by project participant				
Calibration certificate MR version-02				
DOE assessment				Date: 16/02/2017
The revised MR is updated for the calibration details of energy meter Sr. No. HT01131082. The detail is now consistent with the corresponding calibration certificate. CAR is closed.				

<b>CAR ID</b>	06	<b>Section no.</b>	E.7	<b>Date:</b> 05/04/2017
---------------	----	--------------------	-----	-------------------------

<b>Description of CAR</b>	
The quantity of biomass (rice husk and woody biomass) combusted during the monitoring period reported in the ER sheet is not consistent with the logs. On critical review verification team found that the quantity of woody biomass is double counted i.e. it already included with the rice husk and reported individually in the ER sheet.	
<b>Project participant response</b>	<b>Date: 13/04/2017</b>
The quantity of rice husk reported in ER and MR earlier was erroneous as it was inclusive of woody biomass and also woody biomass alone was reported separately, in revised ER spread sheet and MR the value has been corrected and separately reported now.	
<b>Documentation provided by project participant</b>	
ER sheet version-04 MR Version-04	
<b>DOE assessment</b>	<b>Date: 13/04/2017</b>
The quantity of biomass is now corrected by the PP and the quantity of woody biomass is excluded from rice husk. The revised ER sheet which includes the energy balance is submitted to assessment team. The energy balance carried out demonstrates the average boiler efficiency as 79.4% and the average power generation efficiency of power plant as 27%. The efficiencies deems adequate based on the sectoral expertise of verification team. CAR is closed.	

Table 4. FAR from this verification

NA

<b>FAR ID</b>	00	<b>Section No.</b>		<b>Date: DD/MM/YYYY</b>
<b>Description of FAR</b>				
<b>Project participant response</b>				<b>Date: DD/MM/YYYY</b>
N/A				
<b>Documentation provided by project participant</b>				
N/A				
<b>DOE assessment</b>				<b>Date: DD/MM/YYYY</b>
NA				

- - - - -



## Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
01.0	23March 2015	Initial publication.
Decision Class: Regulatory Document Type: Form Business Function: Issuance Keywords: project activities, verifying and certifying		