VCS VERIFICATION / CERTIFICATION REPORT

7.5 MW GRID-CONNECTED BIOMASS POWER PROJECT, BY RAVI KIRAN POWER PROJECTS PRIVATE LIMITED IN INDIA

Verification Period:

2005/06/01 to 2007/07/12

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DET NORSKE VERITAS

VCS VERIFICATION / CERTIFICATION REPORT

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Client: Ravikiran Power Projects Private Ltd.	Client ref.: Mahesh Kolli

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Summary:

Det Norske Veritas Certification AS (DNV) has performed a verification of the emission reductions reported for the CDM project "7.5 MW Grid-Connected Biomass Power Project, by Ravi Kiran Power Projects Private Limited" in India for the period 01 June 2005 to 12 July 2007 and hence prior to the start date of the CDM crediting period of the project starting on 13 July 2007. The CDM project activity is registered under UNFCCC with the Registration Ref. No. 0971.

In our opinion the GHG emissions reductions reported for the project in the monitoring report dated 17 February 2008 are fairly stated. The GHG emission reductions were calculated correctly on the basis of the baseline and monitoring plan provided in the PDD of 25 October 2007.

DNV is able to certify that the emission reductions from the "7.5 MW Grid-Connected Biomass Power Project, by Ravi Kiran Power Projects Private Limited" in Gangavathi, Karnataka state, India, during the period 01 June 2005 to 12 July 2007 amount to 36 339 t CO_2 equivalent. These emission reductions are not eligible as Certified Emission Reductions (CERs) under the CDM.

DNV does not take any responsibility towards the issuance and utilization of the emission reductions hereby verified and certified. Request for issuance of VCUs shall be made by the project proponent to an approved VCS Program Registry based on the requirements set out under the most recent version of the VCS Program Guidelines clause on VCS Registration.

The verification of reported emission reductions is based on the information made available to us and the engagement conditions detailed in this report. DNV can not guarantee the accuracy or correctness of this information. Hence, DNV cannot be held liable by any party for decisions made or not made based on this report.

Report No.: 2007-2078	Subject Group: Environment
Report title: 7.5 MW Grid-Connected Biomass Power Project, by Ravikiran Power Projects Private Limited in India	
Work carried out by: Astakala Vidyacharan, Kakaraparthi Venkta Raman, Michael Lehmann	
Work verified by: C.Kumaraswamy	
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Indexing terms

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Abbreviations

CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEA	Central Electricity Authority
CEF	Carbon Emission Factor
CER	Certified Emission Reduction(s)
CH_4	Methane
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
DNV	Det Norske Veritas
DNA	Designated National Authority
DOE	Designated Operational Entity
FAR	Forward Action Request
GHG	Greenhouse gas(es)
IPCC	Intergovernmental Panel on Climate Change
KREDL	Karnataka Renewable Energy Development Limited
MP	Monitoring Plan
MNES	Ministry of Non-conventional Energy Sources
N_2O	Nitrous oxide
NGO	Non-governmental Organisation
ODA	Official Development Assistance
PDD	Project Design Document
RPPPL	Ravikiran Power Projects Private Limited
UNFCCC	United Nations Framework Convention for Climate Change
VER	Voluntary Emission Reductions
VCS	Voluntary Carbon Standard
GWP	Global Warming Potential

1 INTRODUCTION

Ravikiran Power Projects Private Limited has in October 2007 commissioned Det Norske Veritas Certification AS (DNV) to carry out the verification of the emission reductions reported for the "7.5 MW Grid-Connected Biomass Power Project, by Ravi Kiran Power Projects Private Limited" in India for the period of 01 June 2005 to 12 July 2007. This verification and VCU certification statement report summarizes the findings of the verification and VCU certification of the project, performed on the basis of version 1 of the Voluntary Carbon Standard (VCS).

The project was registered as a CDM project activity (Registration reference no. 0971) with the CDM crediting period starting on 13 July 2007. This verification has verified emission reductions occurring prior to the start date of the CDM crediting period. These emission reductions are not eligible as Certified Emission Reductions (CERs) under the CDM.

The GHG emission reductions were calculated correctly on the basis of the baseline and monitoring plan provided in the registered CDM-PDD of 30 April 2007, the formulae given in the revised monitoring report dated 17 February 2008.

1.1 Objective

Verification of "pre-registration" emission reductions is the independent review and *ex-post* determination by a Verification Entity or Designated Operational Entity (DOE) of the monitored reductions in GHG emissions that have occurred as a result of the implementation of a already registered CDM project activity during the period from the date when the project started to operate until the date when the project was actually registered as a CDM project activity by the CDM Executive Board (EB).

According to the VCS, the verification also includes an independent third party assessment of the project design. In particular, the project baseline, monitoring plan and the project compliance with relevant applicable protocols and criteria (i.e. UNFCCC, VCS, host Party and others) are to be validated in order to confirm that the project design, as documented, is sound and reasonable and meets the applicable criteria. This seems as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of voluntary emission reductions.

It is important to note that the project activity has already been assessed by DNV in terms of the project design in particular, the project's baseline, the monitoring plan, and the project's compliance with relevant UNFCCC and host Party criteria as part of the CDM validation of the project /4/ and the project was registered as a CDM project activity by the CDM EB with the UNFCCC Registration Ref. No. 0971. This confirms that the project design as documented is sound, reasonable and meets the relevant UNFCCC and host Party criteria. Given the above, in terms of project design, this verification report only addresses VCS specific and unique criteria that have not been so far addressed in the validation report as per CDM requirements.

VCU certification is the written assurance by a Certification Entity that, during a specific period in time, a project activity achieved the emission reductions as verified.

According to the Verification Protocol and Criteria of the IETA's Voluntary Carbon Standard, the Certification Entity is defined as an entity which has been accredited as a Designated Operational Entity (DOE) by the CDM EB; where applicable, been accredited by the CDM Executive Board for the particular scope into which the project falls; or has been accredited as an

approved Certification Entity by the VCS Steering Committee. DNV is an accredited DOE for the particular scope into which the project falls.

The objective of this verification was to verify and certify emission reductions reported for the "7.5 MW Grid-Connected Biomass Power Project, by Ravi Kiran Power Projects Private Limited" for the period 01 June 2005 to 12 July 2007.

1.2 Scope

The Verification scope is:

- Verify whether the reductions generated by the project are in line with the Voluntary Carbon Standard Verification Protocol and contains all the necessary information to evidence the project's compliance with criteria in the Voluntary Carbon Standard Verification Criteria.
- Verify that the project was implemented as described in the project design document during the whole verification period.
- Confirm that the monitoring system was implemented and fully functional to generate voluntary emission reductions (VER / VCUs[*]) without any double counting during the whole verification period.
- By checking the monitoring records and the emissions reduction calculation, express a conclusion with a reasonable level of assurance whether reported data are accurate, complete, consistent, and transparent, and free of material error or misstatement.

The verification is meant to ensure that reported emission reductions are complete and accurate and is based on generation of renewable energy using renewable source like biomass as fuel for generation of electricity that replaces fossil-based electricity generation in the grid.

1.3 Description of the Project Activity

The project is a 7.5 MW (gross) capacity, grid connected biomass based power project. The project is located in the Karnataka state of India, and was commissioned in June 2005. The project utilises the surplus available renewable biomass, rice husk and other agricultural residues in the Koppal district of Karnataka region for generation of electricity and export to the state electricity board grid. It uses a condensing type steam turbo generator with a matching boiler of travelling grate type technology, capable of firing multiple fuels. The technology used is indigenous.

The project activity results in the reduction of GHG emissions through displacement of fossil fuel based southern region grid power by the 7.5 MW biomass based renewable power.

According to the project design document the emissions due to usage of permitted quantity of coal are monitored as project emissions and deducted from total emission reductions.

[*] As per VCS, Verified Emission Reductions (VERs) are considered to be VCUs only after successful registration in an approved VCU Registry.

Project Parties	India
Title of the project activity	7.5 MW Grid-Connected Biomass Power Project, by Ravi Kiran Power Projects Private Limited
Project Entity	Ravikiran Power Projects Private Limited
Location of the project activity	Gangavathi, Koppal District, Karnataka state, India
Verification period	01 June 2005 to 12 July 2007
Project's actual starting date	After trial operations, commercial power generation started on 01 June 2005.

The project's emission reductions are determined by multiplying the amount of net electricity generated by the project in a year with a grid emission factor calculated as the weighted average of current generation mix approach, determined ex-post for the southern regional grid. According to the project design, no leakage effects are associated with the project activity.

2 METHODOLOGY

The verification of the emission reductions has assessed all factors and issues that constitute the basis for emission reductions from the project. A risk-based verification approach has been employed, implying that emphasis was on the significant contributors to emission reduction. The team has during its preparations identified the key reporting risks and used the assessment to determine to which extent the project operator's control systems were adequate for mitigation of these key reporting risks. In addition, other areas that can have an impact on reported emission reductions have also undergone detailed audit testing.

Verification team

Astakala Vidyacharan	DNV India	Team Leader, GHG Auditor
K. Venkata Raman	DNV India	CDM Verifier
Michael Lehmann	DNV India	Sector Expert
C Kumaraswamy	DNV Norway	Technical Reviewer

Duration of verification

Preparations:	From 01 November 2007 to 10 November 2007
On-site verification:	From 14 & 15 November 2007
Reporting:	From 25 November 2007 to 10 March 2008

2.1 Review of Documentation

The monitoring reports / 1/ and the emission reduction calculations, provided in the form of spreadsheets submitted by RPPPL, were assessed as a part of the verification. In addition the Project Design Documents / 2/, in particular baseline estimations the monitoring plan contained in the PDD were also assessed. Other documents were also assessed as evidence.

2.2 Site Visits

On 14 and 15 November 2007, DNV carried out a site visit at Ravikiran Power Projects Private Limited. During the site visit, DNV verified the actual operation of the project as described in the PDD. The instruments used for monitoring electricity and biomass fuels were checked, including the calibration records for these instruments and these were found to be in order. Following people were interviewed or assisted the verification team during site visit.

Name	Position	Interview topics
1. Mr. BMK Murthy, 2. Mr. Tirumala Raju, 3. Mr.V.Vamsi Krishna,	General Manager DGM Projects Plant Incharge	• Detailed checking of the daily monitoring records and spreadsheets, as per monitoring plan and report • Assessment of calibration records • Environmental permits

2.3 Assessment

The data presented in the monitoring report were assessed in detail through a review of the detailed project documentation and production records, interviews with personnel at Ravikiran Power Projects Private Limited, observation of established monitoring and reporting practices and assessment of the reliability of monitoring equipment. This has enabled the verification team to assess the accuracy and completeness of the reported monitoring results and verify the correct application of the approved monitoring methodology. Data from other sources include the grid emission factor, which is based on CEA data and was calculated ex-post for the each year of the period, have been verified and assessed.

2.4 Reporting of Findings

Findings established during the verification may be that:

i) the verification is not able to obtain sufficient evidence for the reported emission reductions or part of the reported emission reductions. In this case these emission reductions shall not be verified and certified;

ii) the verification has identified material misstatements in the reported emission reductions. Emission reductions with material misstatements shall be discounted based on the verifiers' ex-post determination of the achieved emission reductions.

A forward action request (FAR) should be issued, where:

a. the actual project monitoring and reporting practices requires attention and /or adjustment for the next consecutive verification period, or
b. an adjustment of the MP is recommended.

In the context of FARs, risks have been identified, which may endanger the delivery of high quality emission reductions in the future, i.e. by deviations from standard procedures as defined by the monitoring plan. As a consequence, such aspects should receive a special focus during the

next consecutive verification. A FAR may originate from lack of data sustaining claimed emission reductions.

3 VERIFICATION FINDINGS

3.1 Project Implementation

The project was commissioned in June 2005. The project boundaries and all key equipment are in line with the submitted PDD. The project boundary covers source of biomass supply, electricity generation and the southern regional grid to which the generated electricity is exported. The following equipment is operational as mentioned in the PDD:

- 7.5 MW gross capacity steam turbine
- Travelling grate technology type boiler (capacity 33t/hr steam at 66kg/cm^2 and 485^{0}C temperature)
- Ash handling system for effective disposal of fly ash
- Demineralised water plant for boiler feed water supply
- Electro static precipitator
- Energy meters for monitoring electricity

The project has all statutory clearances like consent for establishment, valid consents for operation including air and water consents from the pollution control board, and clearance from KREDL a nodal agency for MNES for monitoring of renewable energy power projects. These facts have been verified by DNV during the site visit. In addition the verification of air and effluent reports confirm that relevant pollution parameters as specified in the consents are within the specified limits.

3.2 Project Baseline

The project's baseline has been assessed as part of the CDM validation of the project.

The approved CDM baseline methodology, AMS-I.D, version 10, "Renewable electricity generation for a grid" has been applied. The application of methodology is justified as the total installed capacity of the project is 7.5 MW which is well within the qualifying limit of 15 MW for type I small scale projects. The simplified baseline methodology AMS-I.D is applicable for grid connected renewable electricity generation projects and includes biomass projects. The application of AMS-I.D is justified as the project generates electricity using biomass and it displaces the grid electricity.

In accordance with AMS-I.D the biomass power plant may co-fire fossil fuels. As per the guidelines of the Karnataka Renewable Energy Development Limited (KREDL), the project can use coal up to 25% as support fuel. However the pollution control board of Karnataka did not permit the use of coal as a support fuel for such biomass projects in the Karnataka state. Hence project did not consume any coal during the chosen monitoring period. But provision to estimate the emissions resulting from use of coal is incorporated as project emissions and the capacity of the unit including coal and biomass fuel will be 7.5 MW.

As the project activity is feeding power to Karnataka state electricity grid which is a part of southern region electricity board, the baseline for this project activity is the function of the generation mix of thje southern region grid. The selection of the southern region grid as the grid system boundary for the project activity is in line with the EB guidance for large countries such as India. Using the methodology available for small-scale project activities as applicable for category I.D, the weighted average of current generation mix approach has been selected for determining the southern grid emission factor for each year and has been chosen from the CO_2 data base published on the Central Electricity Authority (CEA) website for years 2005-06 and 2006-07 and confirmed as 0.735 kg CO_2e / kWh and 0.717 kg CO_2e/kWh, respectively. For the period of 2007-08 the same factor as for 2007-08 has been used as it is the latest data available on CEA. All data has been sourced from data published by CEA.

In the absence of project activity, the same amount of power would have been generated by power plants connected to the southern regional grid. Currently, southern regional grid is energy deficit and fossil fuel power dominated. Hence, the selection of southern regional grid as baseline scenario is deemed reasonable.

3.3 Project Additionality

The project's additionality has been assessed as part of the CDM validation of the project.

The project activity was commissioned from June 2005. The project is not mandated by any laws or regulations of the country or state. The biomass power projects are developed voluntarily by the developers in the region and are not under any mandatory obligation.

The power generated is transmitted to the KPTCL grid attached to the southern regional electricity grid. The project activity is not the choice of least cost option for power provision by the regional load dispatch centre to the end-users hence project is not a baseline scenario.

As indicated in DNV's validation report the project activity has had to overcome financial barrier and barriers due to common practice. The choice of the IRR for the project financial analysis has been the *project IRR*. The IRR has been computed for the cash flow of the project, determined as profit after tax plus depreciation and interest on term loans. As reported in section 3.4 of DNV's validation report, we reiterate and confirm the following:

- The project activity had an IRR of 11.82% without considering any CDM benefits, which improved to 16.07% on considering CDM revenues.
- The weighted average cost of capital of the project has been used as the benchmark to compare the project IRR. This has been determined and verified to be 16.96%.

Uncertainty in the tariff was foreseen by the project proponent as one of the barriers since the time of conceptualisation of the activity in 2002. Moreover, DNV could verify from the Karnataka Renewable Energy Development Limited (KREDL) website, that the power generation using renewable biomass sources was not representing any prevailing practice at the time of project conceptualisation and that there was only one similar operating project of 4.5 MW capacity and one project (equivalent to 7.5 MW installed capacity) under implementation in the Karnataka region. This confirms that power generation using non-conventional sources was not a common practice in spite of governmental promotions like tax holidays, subsidies etc.

3.4 Completeness of Monitoring

The approved baseline methodology AMS-I.D (version 10) has been applied for the project activity. In accordance with AMS-I.D, the baseline for the project activity has been calculated ex-post every year by determining the CO_2 emissions from the electricity generation from the southern regional grid using the weighted average of current generation mix. It is confirmed that these emission factors indicated have been correctly chosen from the CEA website as reported in the monitoring report for estimating base line emissions.

Based on the validated emission factors and electricity generation, the emission reductions have been verified to be 36 339 tCO_2 equivalent for the period 01 June 2005 to 12 July 2007.

As required by the monitoring methodology AMS-I.D, version 10, monitoring of parameters essentially comprises:

- Electricity generation - net export to grid after deducting grid imports and auxiliary consumptions
- Biomass fuel used,
- Project emissions due to usage of coal when used, and diesel for emergency purposes in DG set

An annual assessment on surplus biomass availability has been conducted by the project proponent and presented for verification. The assessment is based on the data for 2005-06 which is the most recent data available. According to the assessment, it has been confirmed that the surplus biomass available in the region is around 50.54%.

The parameters reported, including source, frequency and review criteria as indicated in the monitoring plan were verified to be correct and in line with the validated monitoring plan of the PDD. Necessary management system procedures including responsibility and authority of monitoring activities have been verified to be consistent with the PDD. Knowledge of personnel associated with the project activity was also found to be satisfactory.

3.5 Accuracy of Emission Reduction Calculations

No significant reporting risks have been identified for the data reported. All the data required for emission reduction calculations are manually recorded in log sheets once in each shift i.e., after every 8 hours. These are then transferred to spreadsheets for emission reduction calculations. Fuel consumption particulars, such as biomass type, quantity and source are maintained at their point of entry and recorded on ‘weighing slips’. These have been verified by DNV.

All other data are culled out either from the log books or daily power generation and fuel consumption reports. The biomass consumption data is recorded on a daily basis. The log books also have provisions for recording coal consumption data. A CAR was raised on the grid emission factor as summarised below and this CAR resulted in a revision of the monitoring report:

CAR/FAR	Response	Conclusion
CAR1 As per the latest available CO_2 data base published on the CEA website for grid emission factors using weighted average of current generation mix approach are different from those used in initial monitoring report submitted.	The monitoring report has been revised accordingly and latest available emission factors for 2005-06 and 2006-07 are used. However for 2007-08 there is no data available, hence grid emission factor of 2006-07 has been used as a conservative measure as per guideline of EB.	Accepted.

The calibration of monitoring equipments is being maintained and same has been verified by DNV. The quantity of biomass received is weighed twice during entry and exit on duly calibrated and checked weigh bridges and subjected to quality check and rejection criteria of RPPPL. Daily power generation data (including total power and auxiliary power) is monitored and recorded from duly calibrated energy meters, and KPTCL officials monitor the export/import power meters on monthly basis. All the power generation, fuel receipts and consumption data are maintained daily in electronic as well as hard print form, and have been assessed for correctness.

3.6 Quality of Evidence to Determine Emission Reductions

The emission reductions reported during 01 June 2005 to 12 July 2007 was verified to be 36 339 tCO_2e.

Sufficient evidence was presented for the reported net emission reductions.

3.7 Management System and Quality Assurance

Ravikiran Power Projects Private Limited has established management procedures and implemented effectively to ensure that the process is consistent. The procedures cover management responsibilities, data monitoring procedures, training procedures, periodical internal audits, management reviews and corrective actions in case of any deviations effectively. Calibration process is followed as per defined procedures and carried out annually and the calibration certificates of the instruments used for data monitoring and recording were also verified during the site visit.

4 CERTIFICATION STATEMENT

Det Norske Veritas Certification AS (DNV) has performed a verification of the emission reductions reported for the "7.5 MW Grid-Connected Biomass Power Project, by Ravi Kiran Power Projects Private Limited" in India, managed by Ravikiran Power Projects Private Limited, for the period 01 June 2005 to 12 July 2007 and thus prior to the project's CDM crediting period starting on 13 July 2007. These emission reductions are thus not eligible as Certified Emission Reductions (CERs) under the CDM, and the emission reductions are thus claimed as Voluntary Emission Reductions (VER) under the Voluntary Carbon Standard (VCS).

Ravikiran Power Projects Private Limited is responsible for the collection of data in accordance with the validated monitoring plan and the reporting of GHG emissions reductions from the project.

It is DNV's responsibility to express an independent verification statement on the reported GHG emission reductions from the project.

In our opinion the GHG emissions reductions reported for the project in the revised monitoring report of version 02 dated 17 February 2008 are fairly stated.

The GHG emission reductions were calculated correctly on the basis of the monitoring plan provided in the PDD of 30 April 2007.

DNV is able to certify that the emission reductions from the "7.5 MW Grid-Connected Biomass Power Project, by Ravi Kiran Power Projects Private Limited" managed by Ravikiran Power Projects Private Limited during the period 01 June 2005 to 12 July 2007 amount to 36 339 tCO_2 equivalent.

DNV does not assume any responsibility towards the issuance and utilization of the VCUs hereby verified and certified. Request for issuance of VCUs shall be made by the project proponent to an approved VCS Program Registry based on the requirements set out under the most recent version of the VCS Program Guidelines clause on VCS Registration.

The verification of reported emission reductions is based on the information made available to us and the engagement conditions detailed in this report. DNV cannot guarantee the accuracy or correctness of this information. Hence, DNV cannot be held liable by any party for decisions made or not made based on this report.

Bangalore and Oslo, 29 April 2008

Kumaraswamy Chandrashekara
Manager (South Asia)

Michael Lehmann
Technical Director
Climate Change Services

5 REFERENCES

Documents provided by the Project Participants that relate directly to the GHG components of the project. These have been used as direct sources of evidence for the periodic verification conclusions, and are usually further checked through interviews with key personnel.

/ 1/ Ravikiran Power Projects Private Limited: Monitoring report for "7.5 MW Grid-Connected Biomass Power Project, by Ravi Kiran Power Projects Private Limited" for period 01 June 2005 to 12 July 2007, Version 01 23 October 2007 and version 2 dated 17 February 2008.

/ 2/ Ravikiran Power Projects Private Limited: CDM-PDD for "7.5 MW Grid-Connected Biomass Power Project, by Ravi Kiran Power Projects Private Limited", version 03 dated 30 April 2007.

/ 3/ The Voluntary Carbon Standard Version 1 March 2006

/ 4/ Det Norske Veritas Certification Ltd: Validation report for "7.5 MW Grid-Connected Biomass Power Project, by Ravi Kiran Power Projects Private Limited", DNV Report No. 2006-9131, revision 02 dated 12 July 2007

Background documents related to the design and/or methodologies employed in the design or other reference documents.

/ 5/ CDM Executive Board: Simpliefied baseline and monitoring methodology AMS-I.D - Grid connected renewable electricity generation, Version 10: 23 December 2006.

/ 6/ International Emission Trading Association (IETA) & the World Bank's Prototype Carbon Fund (PCF): *Validation and Verification Manual*. http://www.vvmanual.info

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