



VALIDATION REPORT

“4.5 MW INDUSTRIAL WASTE BASED GRID- CONNECTED POWER PROJECT”

REPORT No. 2006-9013

REVISION No. 03

DET NORSKE VERITAS



VALIDATION REPORT

Date of first issue: 2006-08-14	Project No.: 4606 9013
Approved by: Einar Telnes Director	Organisational unit: DNV Certification, International Climate Change Services
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Summary:

Det Norske Veritas Certification Ltd. (DNV) has performed a validation of the “4.5 MW Industrial Waste based Grid-connected Power Project” in India on the basis of UNFCCC criteria for the CDM, as well as criteria given to provide for consistent project operations, monitoring and reporting. UNFCCC criteria refer to Article 12 of the Kyoto Protocol, the CDM modalities and procedures, the simplified modalities and procedures for small-scale CDM project activities and the subsequent decisions by the CDM Executive Board. This validation report summarizes the findings of the validation.

The validation consisted of the following three phases: i) a desk review of the project design documents, ii) follow-up interviews with project stakeholders and iii) the resolution of outstanding issues and the issuance of the final validation report and opinion.

In summary, it is DNV's opinion that the project, as described in the project design document of 29 May 2007, meets all relevant UNFCCC requirements for the CDM is eligible as category I.D small-scale CDM project activity and correctly applies the approved simplified baseline and monitoring methodology AMS-I.D. version 10. Hence, DNV requests the registration of the “4.5 MW Industrial Waste based Grid-connected Power Project” as a CDM project activity.

Report No.: 2006-9013	Subject Group: Environment	Indexing terms	
Report title: “4.5 MW Industrial Waste based Grid-connected Power Project”		Key words Climate Change Kyoto Protocol Validation Clean Development Mechanism	Service Area Validation.
			Market Sector Energy Industries.
Work carried out by: Astakala Vidyacharan, C. Kumaraswamy, Michael Lehmann		☒ No distribution without permission from the client or responsible organisational unit ☐ free distribution within DNV after 3 years ☐ Strictly confidential ☐ Unrestricted distribution	
Work verified by: K. Venkata Raman			
Date of this revision: 2007-05-30	Rev. No.: 03	Number of pages: 15	

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Abbreviations

AP	Andhra Pradesh
APERC	Andhra Pradesh Electricity Regulatory Commission
APPCB	Andhra Pradesh Pollution Control Board
APTRANSCO	Transmission Corporation of Andhra Pradesh Limited
ASCI	Administrative staff college of India, Hyderabad
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEA	Central Electrical Authority
CEF	Carbon Emission Factor
CER	Certified Emission Reduction
CH ₄	Methane
CL	Clarification request
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
DNV	Det Norske Veritas
DNA	Designated National Authority
EB	Executive Board
EIA	Environment Impact Assessment
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IRR	Internal Rate of Return
kWh	Kilo Watt hour
MW	Mega Watt
MNES	Ministry of Non-conventional energy sources
MoEF	Ministry of Environment and Forest
IREDA	Indian Renewable Energy Development Agency Limited
IPCC	Intergovernmental Panel on Climate Change
MP	Monitoring Plan
NEDCAP	The Non-Conventional Energy Development Corporation of Andhra Pradesh
N ₂ O	Nitrous oxide
NGO	Non-governmental Organisation
ODA	Official Development Assistance
PPA	Power Purchase Agreement
PDD	Project Design Document
UNFCCC	United Nations Framework Convention on Climate Change
WACC	Weighted Average Cost of Capital



1 INTRODUCTION

Sai Renewable Power Private Limited has commissioned Det Norske Veritas Certification Ltd. (DNV) to perform a validation of the “4.5 MW Industrial Waste based Grid-connected Power Project” in India (hereafter called “the project”). This report summarises the findings of the validation of the project, performed on the basis of UNFCCC criteria for small-scale CDM projects, as well as criteria given to provide for consistent project operations, monitoring and reporting.

The validation team consists of the following personnel:

Mr. Astakala Vidyacharan	DNV, India	Team Leader, GHG auditor
Mr. C. Kumaraswamy	DNV, India	CDM validator
Mr. K. Venkata Raman	DNV, India	Technical Reviewer
Mr. Michael Lehmann	DNV, Oslo	Sector Expert

1.1 Validation Objective

The purpose of a validation is to have an independent third party assess the project design. In particular, the project's baseline, monitoring plan, and the project's compliance with relevant UNFCCC and host Party criteria are validated in order to confirm that the project design, as documented, is sound and reasonable and meets the identified criteria. Validation is a requirement for all CDM projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of certified emission reductions (CERs).

1.2 Scope

The validation scope is defined as an independent and objective review of the project design document (PDD). The PDD is reviewed against the criteria stated in Article 12 of the Kyoto Protocol, the CDM modalities and procedures as agreed in the Marrakech Accords, the simplified modalities and procedures for small-scale CDM project activities and the relevant decisions by the CDM Executive Board, including the approved baseline and monitoring methodology AMS-I.D/ 5/. The validation team has, based on the recommendations in the Validation and Verification Manual / 4/ employed a risk-based approach, focusing on the identification of significant risks for project implementation and the generation of CERs.

The validation is not meant to provide any consulting towards the project participants. However, stated requests for clarifications and/or corrective actions may have provided input for improvement of the project design.

1.3 Description of Proposed CDM Project

The project is a 4.5 MW (gross) capacity, industrial waste and biomass waste based grid-connected power project located at Kamavarapukota village, West Godavari district, Andhra Pradesh, India. The electricity generated is exported to the Andhra Pradesh transmission corporation limited (APTRANSCO), which forms a part of the southern regional grid. The project activity uses palm oil industry wastes such as empty palm bunches, fibres and shells as the predominant fuel and also utilises agricultural waste such as rice husk as a support fuel (up to 30%). The project does not have permission to use any fossil fuel. It uses a condensing type



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steam turbine with a matching boiler of travelling grate technology capable of firing multiple fuels. The technology used in the project is indigenous.

The objective of the project is to reduce anthropogenic GHG emissions by displacing fossil fuel based electricity generation in the southern regional grid of India, with palm oil industrial waste based electricity. The palm oil industrial waste would otherwise, in the baseline scenario have been left to decay or burnt uncontrollably. The project thereby helps in reducing the power deficit in the state of Andhra Pradesh and also contributes towards conservation of natural resources like coal.

The project is likely to result in an average emission reduction of 20 049 tonnes of CO₂ per year during the ten year crediting period starting from 30 March 2004. The commissioning date of the project as 30 March 2004 has been confirmed from the letter of synchronisation from the transmission corporation of Andhra Pradesh Limited (APTRANSCO).

2 METHODOLOGY

The validation consists of the following three phases:

- I a desk review of the project design documents
- II follow-up interviews with project stakeholders
- III the resolution of outstanding issues and the issuance of the final validation report and opinion.

In order to ensure transparency, a validation protocol was customised for the project, according to the Validation and Verification Manual / 4/. The protocol shows in transparent manner criteria (requirements), means of verification and the results from validating the identified criteria. The validation protocol serves the following purposes:

- It organises, details and clarifies the requirements a CDM project is expected to meet;
- It ensures a transparent validation process where the validator will document how a particular requirement has been validated and the result of the validation.

The validation protocol consists of three tables. The different columns in these tables are described in Figure 1.

The completed validation protocol for the “4.5 MW Industrial Waste based Grid-connected Power Project” is enclosed in Appendix A to this report.

Findings established during the validation can either be seen as a non-fulfilment of validation protocol criteria or where a risk to the fulfilment of project objectives is identified. Corrective action requests (CAR) are issued, where:

- i) mistakes have been made with a direct influence on project results;
- ii) validation protocol requirements have not been met; or
- iii) there is a risk that the project would not be accepted as a CDM project or that emission reductions will not be certified.

The term Clarification may be used where additional information is needed to fully clarify an issue.



Validation Protocol Table 1: Mandatory Requirements for CDM Project Activities			
Requirement	Reference	Conclusion	Cross reference
<i>The requirements the project must meet.</i>	<i>Gives reference to the legislation or agreement where the requirement is found.</i>	<i>This is either acceptable based on evidence provided (OK), a Corrective Action Request (CAR) of risk or non-compliance with stated requirements or a request for Clarification (CL) where further clarifications are needed.</i>	<i>Used to refer to the relevant checklist questions in Table 2 to show how the specific requirement is validated. This is to ensure a transparent Validation process.</i>

Validation Protocol Table 2: Requirement Checklist				
Checklist Question	Reference	Means of verification (MoV)	Comment	Draft and/or Final Conclusion
<i>The various requirements in Table 1 are linked to checklist questions the project should meet. The checklist is organised in seven different sections. Each section is then further sub-divided. The lowest level constitutes a checklist question.</i>	<i>Gives reference to documents where the answer to the checklist question or item is found.</i>	<i>Explains how conformance with the checklist question is investigated. Examples of means of verification are document review (DR) or interview (I). N/A means not applicable.</i>	<i>The section is used to elaborate and discuss the checklist question and/or the conformance to the question. It is further used to explain the conclusions reached.</i>	<i>This is either acceptable based on evidence provided (OK), or a Corrective Action Request (CAR) due to non-compliance with the checklist question (See below). A request for Clarification (CL) is used when the validation team has identified a need for further clarification.</i>

Validation Protocol Table 3: Resolution of Corrective Action Requests and Requests for Clarification			
Draft report corrective action requests and requests for clarifications	Ref. to Table 2	Summary of project participants' response	Final conclusion
<i>If the conclusions from the draft Validation are either a Corrective Action Request or a Clarification Request, these should be listed in this section.</i>	<i>Reference to the checklist question number in Table 2 where the Corrective Action Request or Clarification Request is explained.</i>	<i>The responses given by the project participants during the communications with the validation team should be summarised in this section.</i>	<i>This section should summarise the validation team's responses and final conclusions. The conclusions should also be included in Table 2, under "Final Conclusion".</i>

Figure 1 Validation protocol tables



2.1 Review of Documents

The PDD / 1/ submitted by Sai Renewable Power Private Limited (version 01 dated 06 December 2005, version 02 dated 05 March 2007 and version 03 dated 29 May 2007) and additional background documents related to the project design and baseline such as baseline calculation data, local stakeholders comments and the monitoring plan were assessed during the validation.

2.2 Follow-up Interviews

On 23 March 2006, DNV performed interviews with representatives of Sai Renewable Power Private Limited and local stakeholders to confirm selected information and to resolve issues identified in the document review. The main topics of the interviews are summarised in Table 1.

Table 1 Interview topics

Interviewed organisation	Interview topics
Sai Renewable Power Private Limited	➤ Further clarifications that the project activity itself is not a likely baseline scenario due to the existence of one or more of the following barriers: investment barriers, barriers due to prevailing practice or other barriers. ➤ Clarifications on establishment of baseline, monitoring plan and emission reduction calculations. ➤ Resources, training needs and procedures for operation and maintenance. ➤ Benefits from CDM registration

2.3 Resolution of Clarification and Corrective Action Requests

The objective of this phase of the validation was to resolve any outstanding issues which needed to be clarified for DNV's positive conclusion on the project design. The initial validation identified one corrective action requests and twelve requests for clarifications. These requests were presented to the project participants in DNV's draft validation report of 14 August 2006 (rev. 01) and project participants were invited to provide a response to these requests. The project participant's response, which included the submission of revised PDD dated 29 May 2007 version 3, addressed the corrective action requests and requests for clarifications to DNV's satisfaction.

To guarantee the transparency of the validation process, the concerns raised and responses given are documented in the validation protocol in Appendix A.

2.4 Internal Quality Control

The draft validation report including the initial validation findings underwent a technical review before being submitted to the project participants. The final validation report underwent another technical review before requesting registration of the project activity. The technical review was performed by a technical reviewer qualified in accordance with DNV's qualification scheme for CDM validation and verification.



3 VALIDATION FINDINGS

The findings of the validation are stated in the following sections. The validation criteria (requirements), the means of verification and the results from validating the identified criteria are documented in more detail in the validation protocol in Appendix A.

The final validation findings relate to the project design as documented and described in the revised and resubmitted project design documentation dated 29 May 2007.

3.1 Participation Requirements

The project activity is being proposed as a unilateral project by Sai Renewable Power Private Limited, which is the only project participant. The host Party, India meets all participation requirements, and the DNA of India has approved the project with a letter of approval dated 3 March 2006 / 3/ and has provided confirmation that the project assists in achieving sustainable development.

3.2 Project Design

The project has a rated capacity of 4.5 MW and aims to export the power generated to the Andhra Pradesh state electricity grid (APTRANSCO) which forms part of southern regional grid of India. The project evacuates power to the APTRANSCO grid through a 33/11 kV substation situated about 1.5 km away from the project site.

The technology used is available in India and no transfer of technology is envisaged. The palm waste based power plant generates electricity utilizing predominantly available palm oil industry waste in the West Godavari region, such as palm empty bunches shells and fibres etc as the main fuel. The project is allowed to use renewable biomass such as rice husk up to 30% of the total fuel consumed as a support fuel. Consumption of fossil fuel is not allowed for generation of electricity. The project has fuel linkage agreements with major palm industries in the West Godavari district to meet the requirement. The availability of biomass in the region at the time of project validation was verified in a report on Socio-economic impact assessment of biomass power plants in India issued in June 2005 by the Administrative staff college of India (ASCI). The project activity thereby does not lead to leakage effects elsewhere (due to the usage of fossil fuel) by the diversion of palm waste and biomass to the project. Annual monitoring of surplus availability of biomass and industrial waste in the region with in 50 km radius would be carried out by project proponent, in accordance with requirement of SSC general guidance on leakages in biomass projects.

The project consists of a straight condensing type steam turbo generator coupled with matching boiler of travelling grate technology capable of firing multiple fuels. The capacity generation of the boiler is 20 tonne of steam per hour at a pressure of 63 kg/cm² and a temperature of 485°C equivalent to 20.9 MW_{thermal}.

The project results in reduction of GHG emissions by capacity addition to the grid, which is dominated by fossil fuel based power generators. The added advantage of the project is in terms of additional income generated for the farmers and palm oil industries from the sale of biomass residues, palm waste and also in terms of jobs generated by the project. The technology applied is deemed current good practice and is not expected to be replaced within the crediting period.



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The project was initiated on 1 October 2002 with the letter of intent for carrying out civil work issued to Samaikya Constructions, Vijayawada, India. The life time of the project is estimated to 25 years and a fixed crediting period of 10 years starting from 30 March 2004 has been chosen.

The validation did not reveal any information that indicates that the project can be seen as a diversion of official development assistance (ODA) funding towards India.

3.3 Baseline Determination

Since the installed capacity of the project is less than 15 MW, the project is eligible as type I small-scale CDM project activity and can apply the simplified baseline methodology. The project applies the baseline methodology stipulated for category I.D of the “simplified modalities and procedure for small scale CDM project activity” (AMS-I.D version 10), which is applicable to grid-connected renewable electricity generation projects. The application of AMS-I.D is justified as the project generates electricity using industrial waste (basically renewable biomass from palm oil industry) along with biomass and displaces grid electricity.

As the project activity is feeding power to Andhra Pradesh state electricity grid, which is a part of southern region electricity grid, the baseline for this project activity is the function of the generation mix of this grid. The selection of the southern region grid as the grid system boundary for the project activity is in line with the recent 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 emissions (in kg CO₂e/kWh) of the current generation mix” emission coefficient for southern grid of India has been calculated. The baseline emission factor for the years 2004-05 and 2005-06 is estimated at 0.795 and 0.739 kg CO₂e/kWh, respectively. The baseline emission factor for the rest of the crediting period will be calculated ex-post. The calculation worksheets for the years 2004-05 and 2005-06 have been verified.

While the actual heat rates of power plants have been used, IPCC default values have been used for the emission factors of fossil fuels such as diesel, naphtha and natural gas. The completeness of the set of power plants as well as the correctness of the reported heat rates and electricity generation data has been verified. All the above data have been sourced from data published by the central electricity authority (CEA).

3.4 Additionality

The project demonstrates additionality in accordance with the simplified modalities and procedures for small scale CDM project activities through the existence of the technological, prevailing practice and other barriers.

DNV was able to verify that CDM benefits were considered for the project prior to implementation, through the minutes of the organisation’s board of Directors meeting dated 26 November 2001, wherein possibilities of developing the project as a CDM activity and decision to identify a consultant for CDM activities were discussed.

DNV could verify from Non-Conventional Energy Development Corporation of Andhra Pradesh (NEDCAP) documents that the power generation using palm waste as a fuel was not a prevailing practice in the Andhra Pradesh region when the project was conceptualised. Only two operational projects of 0.5 MW and 1 MW capacity, and both dependent projects, existed at the time of project conceptualization, thereby confirming that the power generation using industrial biomass waste, such as palm waste, was not a common prevailing practice in the region.



The technology for firing of the palm bunches, fibers and husk itself has barriers due to the characteristics of the material. This was verified from the article on “Boiler design for palm waste firing” by Boon Khai Yook from Innowest IBAE Sdn Bhd and Azman Firdaus Shaffi of Harissons Malaysian Plantations Ltd, Malaysia, that the high moisture content, low fusion temperature, high residual oil content and the high potassium content in the palm waste pose a technological barrier for firing. The plant operational records on breakdowns and generation also confirm the existence of technological barrier.

The project also has institutional barriers because of uncertainty in the price for the exported electricity. It also turned out that even though it was considered an industrial waste-based project by the Ministry of non conventional energy sources (MNES), the Andhra Pradesh electricity regulation commission (APERC) judged it to be a conventional biomass project and allowed a tariff of only INR 2.88 per kWh through the revised order dated 20 March 2004. The tariff for industrial waste to energy projects is INR 3.37 per kWh. Initial PPA between APTRANSCO and Sai Renewable Power Project Limited is based on rate of INR 2.25 per kWh with 1994 as base year, which amounts to INR 3.37 per kWh as base price for the project by 30 March 2004, the date of commissioning of the project. The uncertainty in the PPA conditions was a barrier for the project activity.

It was verified that the project activity had an IRR of 14.23% without considering any CDM benefits, which improves to 19.08% considering CDM revenues. The lower IRR establishes that the project was not viable even with low raw material cost, 100% plant load factor and higher tariff prevailing at the power purchase agreement with APTRANSCO during project conceptualisation. The sensitivity analysis considering the scenarios of a) 10% decrease in power tariff and b) 10% increase in the fuel cost c) 5% increase in tariff also indicate a low IRR. It has also been demonstrated that the project IRR without CDM support in all scenarios is less than the weighted average of cost of capital (WACC) of 17.26% calculated for the project.

Based on the above, it is substantiated that the project faces barriers compared to normal generation sources and thus is deemed additional.

3.5 Monitoring Plan

The project applies the AMS-I.D baseline and monitoring methodology. The amount of palm industrial waste and biomass consumption are monitored in addition to the electricity generated and exported to the APTRANSCO grid.

In response to request for review from Executive Board of UNFCCC, and in accordance with SSC guidance on leakages in biomass projects version 02, the monitoring plan includes, the annual monitoring of surplus availability biomass/industrial waste based on public survey or an independent third party survey from project proponent. Leakages would be accounted for the shortfall from requirement of 25% surplus within 50 km radius in the region.

The baseline emission is being calculated as the product of the net electricity supplied to the grid and the grid emission factor of the southern regional grid, which is calculated ex-post each year using the data from the CEA official website.

Maintenance and calibration of electricity meters are carried out as per the internal procedures and in accordance with the power purchase agreement with APTRANSCO. All data will be archived in paper/electronic form until two years after the crediting period.



While board of directors is responsible for project management, the members of the company's CDM committee are responsible for data recording and archiving and reporting. Procedures for internal audits, performance reviews and corrective actions have also been established. The provided monitoring plan is adequate to provide the necessary information for the calculation of electricity generated, the fuel consumed and analysis of the calorific value of fuels used.

3.6 Calculation of GHG Emissions

Since any fossil fuel is not permitted to be used in the project, direct online emissions are restricted to emissions due to power imports from the grid, while plant is under maintenance. The emissions due to transportation of palm waste and biomass have been estimated as 271 tCO₂/year and constitute around 1.3% of the total annual emission reduction. It has been argued that the same types of GHG emissions occur during transportation of coal from coal mines for which transport distances are much longer. Hence, emissions due to transportation of biomass in comparison are considered negligible and therefore not considered.

The project will partly displace fossil fuel based electricity generation. The GHG emissions are calculated as the product of the net electricity generated and exported to the grid by the project activity and the grid emission factor. In line with the methodology, the weighted average emission of current generation mix for the southern regional grid is chosen. While the grid emission factor for the years 2004-05, 2005-06 have been calculated using data sourced from the central electricity authority (CEA) website, the emission factor for the rest of the crediting period will be calculated ex-post. The data for arriving at weighted average of current generation mix for each year through out the crediting period will be sourced directly from the official CEA website. The calculations are transparent. The weighted average of the current generation mix calculated is conservative when compared to the combined margin emission factor of 0.85 tCO₂/MWh (operating margin of 1.00 tCO₂/MWh and build margin of 0.71 t CO₂/MWh) for the year 2005-06. While project emissions are zero, emission reductions are equivalent to baseline emissions.

Since the energy generating equipment is not transferred from another activity and no existing equipment is transferred to another activity, no leakages are considered. **If available biomass in the region is less than 25% of total region consumption, equivalent emissions would deducted from total CERs, treating the shortage quantity equivalent to most carbon intensive coal available in the country during that year.**

As per the guidelines of the non-conventional energy development corporation of Andhra Pradesh (NEDCAP) the project cannot use coal as a support fuel.

The total emission reductions from the project are estimated to be on an average 20 049 tCO₂e per year over the selected 10 year crediting period.

3.7 Environmental Impacts

The environmental impacts of the project are sufficiently assessed. The project's environmental impacts relate to the emission of suspended particulate matter, nitrogen oxides, sulphur dioxide and the generation of fly ash. An electrostatic precipitator has been installed to control the emission of suspended particulate matter. It was verified from the records that the project adheres to the stipulations of the state pollution control board. Ash collected is disposed for



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manufacturing of bricks. Procedures for handling environment impacts due to post emergency scenarios like generation of effluent and debris are addressed as a part of emergency preparedness.

As per the local regulations, an EIA is not required for projects costing less than USD 22 million, which is the case for this project.

3.8 Comments by Local Stakeholders

The comments from local stakeholders like local village inhabitants, regional regulators were invited through personal communications. No adverse comments were received from local stakeholders.

4 COMMENTS BY PARTIES, STAKEHOLDERS AND NGOS

The PDD dated 4 December 2005 was made publicly available on DNV's climate change website (www.dnv.com/certification/climatechange) and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period from 6 December 2005 to 4 January 2006.

One comment was received on 4 January 2006. The comment received (in unedited form) is given in the below text box.

Comment by: perumal@carbonwatch.com

Inserted on: 2006-01-04

Subject: Debatable capacity of Installation

Comment: The project certainly does comply with most of the requirement and should be eligible for registration; certain broader issues remain unresolved namely:

A) Capacity of the Project:

The capacity of the project as per the PDD is 4.5 MW where as the sources on the recent annual report published has stated that 3.0 MW.

Source: http://mnes.nic.in/annualreport/2004_2005_english/ch9-Pg1.html section 9.3.5 "3.0 MW power project based on Palm Oil Industry Waste by M/s Sai Renewable Power Pvt. Ltd. Hyderabad, at Eluru, District West Godavari, A.P"

So clear explanation is required in this regard.

B) Investment barrier:

1. Mobilization of financial resources with difficulty:

It would be grateful if it would have explained the number of banks the PP has approached how many of them refused etc? It becomes quiet necessary because the available source looks different.

Source: http://mnes.nic.in/annualreport/2004_2005_english/ch9-Pg1.html section 9.3.5 "The total cost of the project is Rs.1376 lakh out of which 70% has been taken as soft loan from IREDA and the rest as promoter's equity. The Ministry has provided interest subsidy to IREDA on the loan provided to the promoters. The officials of MNES have visited the project and it has been working satisfactory to the capacity".



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The additional question that would arise is what the capacity was when the officials visited the site.

When the project is based on entirely waste the operating cost would be a better choice rather than capital cost bcoz when the fuel source is waste the cost incurred should be practically only transportation cost ,In case if the fuel source has some other uses then what would be the leakage bcoz of this project activity?

C) Technological Barriers:

In page no 12 of the document it is mentioned that "the project has suffered many unforeseen breakdowns during the operation due to various operational problems from the fuel front".

1. If so the whether the CER computation and the PLF has taken that into consideration?
2. The PLF considered is 80% which would as much as in comparison with the industrial standards for the Biomass projects, operating days considered is 8000 Hrs i.e 333 days.
3. What was margin of generation reduction taken into account with respect to the functional barrier?

D) Institutional Barrier:

It is being stated that the set back to the project is the tariff structure given by the APERC. To supplement this if

1. A financial analysis on how CDM revenue will help the promoter to make project viable with some indicators would be better.

E) Other Issues:

When it is clearly mentioned as waste to energy project by MNES why the APERC does is not paying the tariff of the same.

The normal questions that would arise in the mind of reader are as under.

What was the signed PPA CAPACITY?

Does the 30% applies only to the waste to energy project of 3.0 MW or 4.5 MW

Does the remaining 1.5 MW can run entirely on the basis of biomass?

1. If so 30% of the power being generated through biomass ideally on conservative basis if the calorific value of the both remains same even though it is so.
2. The PDD states that 30% biomass on the fuel front not on the energy generated; hence it becomes imperative to mention the CV of the fuel source, carbon content, ash, moisture etc in the PDD along with the quantity utilized rather than the percent split up
3. Basis: 100 TPD of palm oil waste to generate 3 MW power (Source: MNES report).
4. Thirty percent of power generated on biomass



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5. Sanctioned waste to energy 3 MW

If Remaining 1.5 MW is from Biomass source then the out of the total capacity of 4.5 MW, 2.4 MW would be from biomass and 1.9 from palm oil waste.i.e more than 50 % of power being from biomass not from waste.

F) Availability of raw material:

A report on UNDP initiatives in AP states that the availability of Raw material would not be a problem. Source :

www.undp.org.in/Programme/subpro/UNDP%2520Initiatives%2520in%2520andhra%2520pradesh.doc+waste+to+energy+projects+in+eluru+district+of+AP+India&hl=en

"Oil Seed Development – The Technology Mission for Oilseeds and Pulses & Maize is implementing this project in seven states including Andhra Pradesh. The objective is the dissemination of technology and practices to the community for increasing production of oilseeds and pulses. The farmers have started training on oil palm cultivation and the capacity building of agricultural officers to promote oil palm cultivation has started yielding results. The farmers are keen to promote oil palm cultivation and the area coverage is increasing. At present, the country is self sufficient in terms of supply of seeds for promotion of oil palm cultivation. The locations are Anantpur and Eluru in Andhra Pradesh"

It is also becoming necessary to explain whether the project has availed any benefits from UNEP- GEF project or UNDP CDM umbrella project.

Regards
Perumal.A.K

The Project Participant response

The project proponent has initially received permission from the state nodal agency (NEDCAP) to set up the 3 MW power plant based on industrial waste.

However, on discussions with the equipment suppliers who opined that the frame size for a 3.0 MW and 4.5 MW power plant is the same as far as the turbine is concerned and, as regards boiler, with addition of certain pressure parts the capacity of the boiler can be enhanced to suit a 4.5 MW power plant without addition of much capital expenditure. Based on these opinions the company approached NEDCAP for enhancing the license capacity from 3 MW to 4.5 MW which was accepted by NEDCAP and issued the necessary permission vide its letter dt.1st January, 2004. Copies of the permissions are furnished to DOE.

The project proponent has approached State Bank of India, Oriental Bank of Commerce and Union Bank of India to meet the additional project cost for the enhanced capacity of 4.5 MW. As the banks do not have exposure in this type of projects for project appraisal, they were reluctant to sanction additional loan and insisted for high collateral security by way of fixed assets. After providing collateral security of fixed assets, Union Bank of India has sanctioned additional loan. It may be noted that the project was originally appraised by IREDA and sanctioned the necessary loan. Only this information is available on the website of MNES and not the subsequent developments with regard to sanction of additional loan from Union Bank of India.



VALIDATION REPORT

However, the part of the project cost which Union Bank of India sanctioned shows that the commercial banks are insisting high collateral securities. A copy of the sanction letter dated 3-11-2003 is enclosed for ready reference.

The capacity enhancement from 3.0 MW to 4.5 MW was effected in 2003 and the plant was commissioned in March '2004. When the MNES officials visited the project site the capacity was 4.5MW. NEDCAP is the nodal agency of MNES, which has sanctioned the enhancement capacity vide its proceedings dated 1-1-2004, submitted under comment No.1

The project design is based on palm waste and agri residues in the ratio of 70:30. Though the empty palm bunches is the waste material, so far as the palm oil industry is concerned, but in view of the energy content in the fuel these industries expect a price for the waste material. The fuel cannot be used as it is and it requires pre treatment before it is fed into the boiler. The fuel is required to be washed / segregated, dried to make it suitable to fire in the boiler. Therefore on wet basis the average fuel cost goes about Rs.750 per tonne including transportation, segregation and cleaning etc., This cost could be increased gradually year after year. As for as other use is concerned the palm waste is also being sourced occasionally (being a difficult biomass with high moisture content) by biomass power plants and therefore it is not justified in stating that the palm waste is free.

The project proponent emphasized that palm waste as fuel was never tried out in any boiler and the boiler manufacturers had very little knowledge on the fuel preparation, feeding and burning characteristics of the above fuel in the boilers.

Based on the data supplied by us to the boiler manufacturers and the inherent moisture content in the fuel, the boiler was designed. The bunches, as available, are very large in size and fibrous in nature. They are chipped to small pieces and then fed into the boiler through conveyors and feed chutes. Bridging used to take place in the chutes on account of the fibrous nature of the fuels. Thus proper feeding of the fuel into the boiler was a perennial bottleneck.

The fuel contained more than 50% moisture and sustaining the fire in the boiler was really very difficult. Added to this, the ash contained 40% potash which resulted in the fouling of the bank and super heater coils. This resulted in the lower generation and also required frequent shut downs to clean the soot from the above tubes.

Though the PLF considered in the project was based on the assurance of suppliers of equipment. The CER calculation is based on the energy exported to the grid. The project proponent has not assumed any reduction to power generation on account of technical barriers as it is expected that the operations would get stabilized eventually.

The tariff was reduced subsequently by the regulatory commission substantially. This reduction affects R&D efforts and it is the opinion of the project proponent that CDM revenue will compensate the project till the technology is improved for reaching the maximum generation.

A financial analysis is presented to indicate how CDM revenues would support the project activity to make it more viable. The financial analysis has indicated an IRR of 14.23% with out CDM revenue and the same improves to 19.08% considering the income from sale of emission reductions.

VALIDATION REPORT

APERC has initiated the process for fixing tariff for the various non-conventional producers and came out with their tariff order on 20 March, 2004. Since the project activity is first of its kind, there were no operating parameters available with APERC or with the project developer for this type of project activity. APERC did not take up price fixation exercise as in the case of other projects. APERC came to an arbitrary opinion that this project is more identifiable with biomass projects ignoring the fact that this palm waste requires pre processing costs before the same is useful for combustion. APERC has authorised the licensee (APTRANSCO) to purchase the power from this project at the rates permitted to biomass projects. The other reasoning given by APERC is that it is the responsibility of respective industries to dispose of their waste and additional cost in the generation of electricity shall be borne out by the said industries which is also an erroneous opinion in the case of the project activity as this project is not a producer of waste but user of the waste.

When the state regulator has fixed the tariff, the developer has no say except preferring an appeal, which he has preferred.

The signed PPA capacity is 4.5 MW and 30% applies to total capacity of 4.5MWs. Copy of PPA is furnished to the validator.

The project proponent has considered total fuel consumption of 50817 tonnes based on requirement of empty palm fruit bunches at 38302 tonnes and biomass of 12515 tonnes. This indicates that calorific value of fuel has been kept in mind while estimating the fuel requirement, keeping in mind the ultimate restriction of usage of biomass to an extent of 30%.

No barrier is demonstrated in respect of availability of fuel since the company has existing arrangements for its supply. What has been envisaged is its seasonal availability as the crop is available over a season.

The project design document is prepared with support from UNDP CDM umbrella project. Environment Protection and Training Institute has been designated to prepare the project design document and the support is available for the preparation of PDD only and any other activity such as cost of validation or project registration with CDM Executive Board has to be born by the project proponent.

How DNV has considered the comment received in its validation:

DNV has verified that the project has initially obtained permission to setup 3.0 MW power plant based on palm industrial waste as predominant fuel. Subsequently during implementation, the project has received all necessary permissions for upgrading of capacity to 4.5 MW even before commissioning of the project. Relevant documents were presented to DNV's verification.

DNV has verified and confirmed that banks have insisted on collateral securities for the sanction of loans for the project. DNV has verified the detail financial analysis and confirmed that CDM benefits support the project.

It was confirmed that though the palm waste is an industrial waste, being used as a fuel by biomass plants also, it has commercial value and the project is also having a rate contract along with supply agreement with palm industries.

It was verified the technology required for the project is new and uncertain due to the characteristics like high moisture content and low fusion temperature of the palm waste fuel used. This was evident from the article on boiler design for palm waste firing by "Boon Khai



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Yook from Innowest IBAE Sdn Bhd and Azman Firdaus Shaffi of Harissons Malaysian Plantations Ltd”. Plant records on breakdowns and generation records confirm the existence of technological barriers.

DNV has verified that the signed PPA considers the capacity of 4.5 MW and 70% palm waste and 30% renewable biomass of total fuel requirement is applicable for the 4.5 MW capacity.

DNV has verified that the raw material requirement for the project is met from fuel linkage agreements with major palm industries in the West Godavari district and surrounding region.

DNV has confirmed during validation that the project design document for the project is prepared under UNDP umbrella support through Environment Protection and Training Institute (EPTRI), Hyderabad as a part of capacity building program. And all further expenditure like validation and registration fee are under the scope of project proponent.

5 VALIDATION OPINION

Det Norske Veritas Certification Ltd. (DNV) has performed a validation of the “4.5 MW Industrial Waste based Grid-connected Power Project” at Kamavarapukota, West Godavari District, Andhra Pradesh, India on the basis of UNFCCC criteria for the Clean Development Mechanism and host country criteria, as well as criteria given to provide for consistent project operations, monitoring and reporting.

The review of the project design documentation and the subsequent follow-up interviews have provided DNV with sufficient evidence to determine the fulfilment of stated criteria.

The project participant is Sai Renewable Power Private Limited. The host Party India meets all participation requirements. A Letter of Approval from the DNA of India, including authorization of the project participant and the Indian DNA’s confirmation that the project assists in achieving sustainable development in India, has been obtained.

The validation has confirmed that the project is eligible as category I.D small-scale CDM project activity and correctly applies the simplified baseline and monitoring methodology AMS-I.D version 10. The determination of the baseline is well elaborated, transparent and sufficiently supported with facts. The selected baseline scenario is reasonable for the selected 10 year crediting period. Moreover, an analysis of the barriers facing the project demonstrates that project is not a likely baseline scenario.

The project will contribute to sustainable development by generating renewable energy, providing benefits such as employment generation during construction and operation of the project, ensuring environmental well being and aid in bridging the gap between demand and supply of power.

The validation did not reveal any information indicating that the project can be seen as a diversion of ODA funding towards India.

The project results in the reduction of GHG emissions those are real, measurable and give long-term benefits and that are additional to what would have occurred in the absence of the project.

The total emission reductions from the project are estimated to be on the average 20 049 tCO₂e per year over the selected 10 year crediting period. The emission reduction forecast has been checked and is deemed likely that the stated amount is achieved given that the underlying assumptions do not change.



VALIDATION REPORT

The monitoring plan makes sufficient provision for monitoring relevant project and baseline emission indicators. Responsibilities and authorities for project management, monitoring and reporting and QA/QC procedures have also been addressed.

A local stakeholder consultation process has been carried out by the project participant. DNV published the PDD on the DNV Climate Change web site and comments by Parties, stakeholders and UNFCCC accredited NGOs were invited through the CDM web site. One comment was received and DNV has taken due account of this comment in its validation of the project.

In summary, it is DNV's opinion that the project, as described in the project design document of 29 May 2007, meets all relevant UNFCCC requirements for the CDM, is eligible as category I.D small-scale CDM project activity and correctly applies the approved simplified baseline and monitoring methodology AMS-I.D. Hence, DNV requests the registration of the "4.5 MW Industrial Waste based Grid-connected Power Project" as a CDM project activity.

REFERENCES

Documents provided by the project proponent that relate directly to the project:

- / 1/ Sai Renewable Power Private Limited: CDM PDD "4.5 MW Industrial Waste based Grid-connected Power Project" Version 01 dated 4 December 2005 and Version 02 dated 29 May 2007.
- / 2/ Sai Renewable Power Private Limited: Baseline Emission Calculations.
- / 3/ DNA of India: Host country approval letter dated 3 March 2006.

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

- / 4/ International Emission Trading Association (IETA) & the World Bank's Prototype Carbon Fund (PCF): *Validation and Verification Manual*. <http://www.vvmanual.info>
- / 5/ Appendix B of the simplified modalities and procedures for small-scale CDM project activities: *Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories*. Version 10: 23 December 2006.
- / 6/ Revised 1996 IPCC guidelines for national green house gas inventories – Reference manual (volume 3).

Persons interviewed during the validation, or persons who contributed with other information that are not included in the documents listed above:

- / 7/ Mr. M.Chandrashekhara Rao Managing Director, Sai Renewable Power Private Ltd
- Mr. M. Appayya Chairman, Sai Renewable Power Private Ltd.
- Mr. Mohan Reddy Director, Zenith Energy Services (P) Ltd.

APPENDIX A

VALIDATION PROTOCOL FOR SMALL-SCALE CDM PROJECT ACTIVITIES

Table 1 Mandatory Requirements for Small Scale Clean Development Mechanism (CDM) Project Activities

Requirement	Reference	Conclusion	Cross Reference/ Comment
1. The project shall assist Parties included in Annex I in achieving compliance with part of their emission reduction commitment under Art. 3	Kyoto Protocol Art. 12.2	The project has been proposed as a unilateral project	Table 2, Section E.4.1
2. The project shall assist non-Annex I Parties in achieving sustainable development and shall have obtained confirmation by the host country thereof	Kyoto Protocol Art. 12.2, Simplified Modalities and Procedures for Small Scale CDM Project Activities §23a	OK	Table 2, Section A.3
3. The project shall assist non-Annex I Parties in contributing to the ultimate objective of the UNFCCC	Kyoto Protocol Art. 12.2.	OK	Table 2, Section E.4.1
4. The project shall have the written approval of voluntary participation from the designated national authority of each party involved	Kyoto Protocol Art. 12.5a, Simplified Modalities and Procedures for Small Scale CDM Project Activities §23a	OK	Written approval from DNA of India has been obtained on 3 March 2006.
5. The emission reductions should be real, measurable and give long-term benefits related to the mitigation of climate change	Kyoto Protocol Art. 12.5b	OK	Table 2, Section E.1 to E.4
6. Reduction in GHG emissions must be additional to any that would occur in absence of the project activity, i.e. a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity	Kyoto Protocol Art. 12.5.c, Simplified Modalities and Procedures for Small Scale CDM Project Activities §26	OK	Table 2, Section B.2.1
7. In case public funding from Parties included in Annex I is used for the project activity, these Parties shall provide an affirmation that such funding does not	Decision 17/CP.7, CDM Modalities and Procedures Appendix B,	OK	The project is being proposed as a unilateral project.

Requirement	Reference	Conclusion	Cross Reference/ Comment
result in a diversion of official development assistance and is separate from and is not counted towards the financial obligations of these Parties.	§ 2		
8. Parties participating in the CDM shall designate a national authority for the CDM	CDM Modalities and Procedures § 29	OK	DNA of India: National Clean Development Mechanism Authority, Ministry of Environment and Forests
9. The host Party and the participating Annex I Party shall be a Party to the Kyoto Protocol	CDM Modalities and Procedures § 30, 31b	OK	India ratified Kyoto Protocol on 26 August 2002
10. The participating Annex I Party's assigned amount shall have been calculated and recorded	CDM Modalities and Procedures §31b	Annex I Party has not been identified yet	The project is being proposed as a unilateral project
11. The participating Annex I Party shall have in place a national system for estimating GHG emissions and a national registry in accordance with Kyoto Protocol Article 5 and 7	CDM Modalities and Procedures §31b	As Above	The project is being proposed as a unilateral project
12. The proposed project activity shall meet the eligibility criteria for small scale CDM project activities set out in § 6 (c) of the Marrakesh Accords and shall not be a debundled component of a larger project activity	Simplified Modalities and Procedures for Small Scale CDM Project Activities §12a,c	OK	Table 2, Section A.1 Local Stakeholders are consulted by the project proponent
13. The project design document shall conform with the Small Scale CDM Project Design Document format	Simplified Modalities and Procedures for Small Scale CDM Project Activities, Appendix A	OK	
14. The proposed project activity shall confirm to one of the project categories defined for small scale CDM project activities and uses the simplified baseline and	Simplified Modalities and Procedures for Small Scale CDM Project	OK	Table 2, Section A.1.3, B and D

Requirement	Reference	Conclusion	Cross Reference/ Comment
monitoring methodology for that project category	Activities §22e		
15. Comments by local stakeholders are invited, and a summary of these provided	Simplified Modalities and Procedures for Small Scale CDM Project Activities §22b	OK	Table 2, Section G
16. If required by the host country, an analysis of the environmental impacts of the project activity is carried out and documented	Simplified Modalities and Procedures for Small Scale CDM Project Activities §22c	OK	Table 2, Section F
17. Parties, stakeholders and UNFCCC accredited NGOs have been invited to comment on the validation requirements and comments have been made publicly available	Simplified Modalities and Procedures for Small Scale CDM Project Activities §23b,c,d	OK	The PDD was made publicly available on www.dnv.com/certification/climatechange and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 day period from 6 December 2005 to 4 January 2006. One comment was received, made publicly available and taking into account in DNV's validation of the project.

Table 2 Requirements Checklist

Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
A. Project Description The project design is assessed.					
A.1. Small scale project activity It is assess whether the project qualifies as small scale CDM project activity.					
A.1.1. Does the project qualify as a small scale CDM project activity as defined in paragraph 6 (c) of decision 17/CP.7 on the modalities and procedures for the CDM?	/ 1/ / 7/	DR I	The project comprises a 4.5 MW power generation unit using renewable energy as source of fuel such as palm oil industrial waste. The project qualifies as Type I, Category D small scale CDM project and as the generation capacity is below the stipulated limit of 15 MW.		OK
A.1.2. The small scale project activity is not a debundled component of a larger project activity?	/ 1/ / 7/	DR I	No, the project participant does not propose another biomass plant. The project participant has not registered any small scale CDM project in the last 2 years and the project boundary is not within 1 km radius of any other proposed small scale CDM project.		OK
A.1.3. Does proposed project activity confirm to one of the project categories defined for small scale CDM project activities?	/ 1/	DR	Yes the project conforms to the category I.D for small scale CDM projects. The project is a grid connected renewable electricity generation unit.		OK

* MoV = Means of Verification, DR= Document Review, I= Interview

Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
A.2. Project Design Validation of project design focuses on the choice of technology and the design documentation of the project.					
A.2.1. Are the project's spatial (geographical) boundaries clearly defined?	/ 1/ / 7/	DR I	Yes, it is clearly defined. The spatial boundary of the project includes the project site (auxiliary units consuming power and up to the evacuation point of electricity to state grid) and includes biomass collection and storage. The project is located at Kamavarapukota village, West Godavari District, Andhra Pradesh, India. It is not clear from PDD that, substation grid to which the evacuation is done.	CL1	OK
A.2.2. Are the project's system (components and facilities used to mitigate GHG's) boundaries clearly defined?	/ 1/	DR	Components including storage of raw material and the generation unit are included in the project boundary. For the calculation of the baseline emission factor the power plants generating and exporting to the southern electricity grid are included in the system boundary.		OK
A.2.3. Does the project design engineering reflect current good practices?	/ 1/	DR	As the project is claimed as first of its kind, it is not clearly described and, needs to be demonstrated that the used technology is the current good practice.	CL1	OK
A.2.4. Will the project result in technology transfer to the host country?	/ 1/	DR	The technology is available in the country and thus no technology transfer is envisaged in the project.		OK
A.2.5. Does the project require extensive initial	/ 1/	DR	Yes, the project will require trained and qualified		OK

* MoV = Means of Verification, DR= Document Review, I= Interview

Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
training and maintenance efforts in order to work as presumed during the project period? Does the project make provisions for meeting training and maintenance needs?			manpower in order to work as presumed during the project period. Qualified personnel as per statutory requirements in India should carry out the boiler operations. The certificate of qualification of the personnel involved in operations of the boiler is required to be provided as evidence.	CL-2	
A.3. Contribution to Sustainable Development The project's contribution to sustainable development is assessed					
A.3.1. Will the project create other environmental or social benefits than GHG emission reductions?	/ 1/ / 7/	DR I	Yes, The project has resulted in direct and in-direct employment opportunity to the local population. The project has also generated an additional revenue stream to palm oil industries on account of supply of industrial waste, and helps in avoiding environmental impact due to decomposition of waste.		OK
A.3.2. Will the project create any adverse environmental or social effects?	/ 1/ / 7/	DR I	Andhra Pradesh Pollution Control Board has issued the consent for establishment, and subsequent consents for operation. A clarification as how the issue is being dealt with and mechanism to ensure continual supply of permitted biomass material for the project needs further elaboration. Also the mechanism of monitoring consumption patterns of Palm waste and other biomass ratio of 70:30, so as to meet requirements of the conditions from NEDCAP.	CL-3	OK
A.3.3. Is the project in line with sustainable development policies of the host country?	/ 1/	DR	Written approval from DNA of India has been obtained on 3 March 2006.		OK

* MoV = Means of Verification, DR= Document Review, I= Interview

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Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
A.3.4. Is the project in line with relevant legislation and plans in the host country?	/ 1/	DR	Yes.		OK
B. Project Baseline The validation of the project baseline establishes whether the selected baseline methodology is appropriate and whether the selected baseline represents a likely baseline scenario.					
B.1. Baseline Methodology It is assessed whether the project applies an appropriate baseline methodology.					
B.1.1. Is the selected baseline methodology in line with the baseline methodologies provided for the relevant project category?	/ 1/ / 7/	DR I	Yes. The project applies one of the simplified baseline methodologies proposed for the small-scale project activity category I.D, i.e., for renewable energy that displaces electricity the simplified baseline is the electricity consumption times the relevant emission factor calculated as the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kgCO ₂ /kWh). The project uses palm bunches, that is an industrial waste from palm oil industries which otherwise would have burnt uncontrolled fashion or left to decay and supply electricity to the grid dominated by fossil fuel based generation units. Maximum of 30% of other biomass like rice husk cab be used along with main fuel i.e. palm waste. The usage of any type of fossil fuel is not permitted in the project. The baseline emission coefficient is calculated using the weighted average of current generation		OK

* MoV = Means of Verification, DR= Document Review, I= Interview

Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
			mix approach.		
B.1.2. Is the baseline methodology applicable to the project being considered?	/ 1/	DR	Simplified small scale CDM project category I.D is applicable since the project is a renewable energy based power plant.		OK
B.2. Baseline Determination It is assessed whether the project activity itself is not a likely baseline scenario and whether the selected baseline represents a likely baseline scenario.					
B.2.1. Is it demonstrated that the project activity itself is not a likely baseline scenario due to the existence of one or more of the following barriers: investment barriers, technology barriers, barriers due to prevailing practice or other barriers?	/ 1/ / 7/	DR I	The evidence for considering CDM revenues for sustainability of the project at the time of project conceptualisation is to be provided. To substantiate the financial barrier analysis a more detailed report on the IRR/NPV of the project is required to be evaluated for further clarity considering with and without CDM benefits. Institutional barrier identified is mainly based on the fluctuations in the price of electricity. A sensitivity analysis is required for supporting the data mentioned in PDD to show that even a positive fluctuation in electricity price in future would make the project non-viable. Generation of power using palm waste is not a common practice India. This is mainly, palm industry being a seasonal industry and also storage of palm waste not possible for longer periods.	CL4	OK
B.2.2. Is the application of the baseline methodology and the discussion and	/ 1/	DR	The baseline scenario considered is southern grid.	CL5	

* MoV = Means of Verification, DR= Document Review, I= Interview

Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
determination of the chosen baseline transparent and conservative?			Detail calculation sheet for emission factor need to be provided as evidence.		OK
B.2.3. Are relevant national and/or sectoral policies and circumstances taken into account?	/ 1/	DR	Yes, the selection of the weighted average of current generation mix approach is justifiable considering the generation pattern will not change significantly over the crediting period.		OK
B.2.4. Is the baseline selection compatible with the available data?	/ 1/	DR	Clarifications pending on B.2.2	GL5	OK
B.2.5. Does the selected baseline represent the most likely scenario describing what would have occurred in absence of the project activity?	/ 1/	DR	Clarifications pending on B.2.2	GL5	OK
C. Duration of the Project / Crediting Period It is assessed whether the temporary boundaries of the project are clearly defined.					
C.1.1. Are the project's starting date and operational lifetime clearly defined?	/ 1/ / 7/	DR I	Start date of the project is mentioned as 8 April 2004. Need to be changed and evidence for correct start date needs to be provided. The expected life time of the project is 25 years.	CL6	OK
C.1.2. Is the assumed crediting time clearly defined (renewable crediting period of seven years with two possible renewals or fixed crediting period of 10 years with no renewal)?	/ 1/	DR	Fixed crediting period of 10years has been chosen starting from 30 March 2004.		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
D. Monitoring Plan The monitoring plan review aims to establish whether all relevant project aspects deemed necessary to monitor and report reliable emission reductions are properly addressed.					
D.1. Monitoring Methodology It is assessed whether the project applies an appropriate monitoring methodology.					
D.1.1. Is the selected monitoring methodology in line with the monitoring methodologies provided for the relevant project category?	/ 1/	DR	The project falls under category I.D of appendix B of the simplified modalities and procedures for small scale CDM project activities and the monitoring methodology used is in line with the same.		OK
D.1.2. Is the monitoring methodology applicable to the project being considered?	/ 1/	DR	The project is a renewable energy generation project and thus the monitoring requirement under category I.D. is used in this project. Since the project co-fires biomass with palm waste, the amount of biomass along with palm waste is monitored apart from electricity generated, consumed for auxiliary consumptions and supplied to grid.		OK
D.1.3. Is the application of the monitoring methodology transparent?	/ 1/	DR	The monitoring methodology is not transparent, as it does not include the monitoring of avg. calorific value of fuels used. Also the monitoring including monitoring of fossil fuel that is not permitted to use. Also evidence for demonstrating periodic calibration of power meters and periodic analysis of fuel consumed is not found during site visit.	CL7	OK

* MoV = Means of Verification, DR= Document Review, I= Interview

Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
D.1.4. Will the monitoring methodology give opportunity for real measurements of achieved emission reductions?	/ 1/ / 7/	DR I	The Monitoring methodology is through metering and a separate GHG audit team/committee for periodic monitoring and also periodic analysis of fuel also plans recording. This is expected to give real time results. The implementation of effectiveness has to be checked, as evidence of GHG audit team is to be given.	CL-8	OK
D.2. Monitoring of Project Emissions It is established whether the monitoring plan provides for reliable and complete project emission data over time.					
D.2.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for estimation or measuring the greenhouse gas emissions within the project boundary during the crediting period?	/ 1/		As the project activity uses other biomass like rice husk as an alternative fuel, usage of which is restricted up to 30%, monitoring data includes consumption of this biomass in the monitoring plan.		OK
D.2.2. Are the choices of project GHG indicators reasonable?	/ 1/	DR	Yes.		OK
D.2.3. Will it be possible to monitor / measure the specified project GHG indicators?	/ 1/	DR	Yes.		OK
D.2.4. Will the indicators give opportunity for real measurements of project emissions?	/ 1/	DR	Yes.		OK
D.3. Monitoring of Leakage If applicable, it is assessed whether the monitoring plan provides for reliable and complete leakage data over time.					
D.3.1. Does the monitoring plan provide for the	/ 1/		Since the energy generating equipment is not		OK

* MoV = Means of Verification, DR= Document Review, I= Interview

Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
collection and archiving of all relevant data necessary for determining leakage?			transferred from another activity and no existing equipment is transferred to another activity, no leakage needs to be considered.		
D.4. Monitoring of Baseline Emissions It is established whether the monitoring plan provides for reliable and complete project emission data over time.					
D.4.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining baseline emissions during the crediting period?	/ 1/		Yes, the baseline indicators have been chosen in line with the small-scale methodologies approved by the CDM EB.		OK
D.4.2. Is the choice of baseline indicators, in particular for baseline emissions, reasonable?	/ 1/	DR	The choice of indicators is sufficient to monitor the CO ₂ emissions, the relevant GHG.		OK
D.4.3. Will it be possible to monitor / measure the specified baseline indicators?	/ 1/	DR	Yes, it is possible with the data being monitored.		OK
D.4.4. Will the indicators give opportunity for real measurements of baseline emissions?	/ 1/	DR	Yes.		OK
D.5. Project Management Planning It is checked that project implementation is properly prepared for and that critical arrangements are addressed.					
D.5.1. Is the authority and responsibility of project management clearly described?	/ 1/ / 7/	DR I	The authority and responsibility for project management has to be formally described.	CL9	OK
D.5.2. Is the authority and responsibility for registration monitoring measurement and reporting clearly described?	/ 1/	DR	Available but need to be formalised.	CL9	OK

* MoV = Means of Verification, DR= Document Review, I= Interview

Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
D.5.3. Are procedures identified for training of monitoring personnel?	/ 1/	DR	As in D.5.2	CL9	OK
D.5.4. Are procedures identified for emergency preparedness for cases where emergencies can cause unintended emissions?	/ 1/ / 7/	DR I	Emergencies like fire in storage area can cause unintended emission. The emergency preparedness in such situation needs to be elaborated.	CL10	OK
D.5.5. Are procedures identified for calibration of monitoring equipment?	/ 1/ / 7/	DR I	Calibration of instruments is being done but procedures need to be formalised.	CL9	OK
D.5.6. Are procedures identified for maintenance of monitoring equipment and installations?	/ 1/	DR	Available but need to be formalised.	CL9	OK
D.5.7. Are procedures identified for monitoring, measurements and reporting?	/ 1/	DR	Available but need to be formalised	CL9	OK
D.5.8. Are procedures identified for day-to-day records handling (including what records to keep, storage area of records and how to process performance documentation)	/ 1/	DR	Available but need to be formalised	CL9	OK
D.5.9. Are procedures identified for dealing with possible monitoring data adjustments and uncertainties?	/ 1/	DR	As in D.5.7	CL9	OK
D.5.10. Are procedures identified for internal audits of GHG project compliance with operational requirements as applicable?	/ 1/	DR	Procedures need to be formalized.	CL9	OK
D.5.11. Are procedures identified for project performance reviews?	/ 1/	DR	Procedures need to be formalized	CL9	OK
D.5.12. Are procedures identified for corrective actions?	/ 1/	DR	Procedures need to be formalised	CL9	OK

* MoV = Means of Verification, DR= Document Review, I= Interview

Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
E. Calculation of GHG emission It is assessed whether all material GHG emission sources are addressed and how sensitivities and data uncertainties have been addressed to arrive at conservative estimates of projected emission reductions.					
E.1. Project GHG Emissions The validation of ex-ante estimated project GHG emissions focuses on transparency and completeness of calculations.					
E.1.1. Are all aspects related to direct and indirect project emissions captured in the project design?	/ 1/	DR	The project participant identifies emissions from off-site transportation of fuels and considers it as negligible. However this needs to be demonstrated with facts and figures.	CL11	OK
E.1.2. Have all relevant greenhouse gases and sources been evaluated?	/ 1/	DR	The project only identifies CO ₂ as the relevant GHG as other GHGs like CH ₄ are considered as negligible.		OK
E.1.3. Do the methodologies for calculating project emissions comply with existing good practice?	/ 1/	DR	The calculations are in line with the methodology laid down as per approved methodologies for Renewable electricity generation for the grid and thus is complying with the good practices		OK
E.1.4. Are the calculations documented in a complete and transparent manner?	/ 1/	DR	Yes.		OK
E.1.5. Have conservative assumptions been used?	/ 1/	DR	The auxiliary power consumptions and internal efficiencies are taken care of as the calculations are on the actual amount of power exported. Thus the calculations are conservative in nature.		OK

* MoV = Means of Verification, DR= Document Review, I= Interview

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Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
E.1.6. Are uncertainties in the project emissions estimates properly addressed?	/ 1/	DR	The project proponent has to account for emissions due to non renewable biomass. (Refer also comments under A.3.2)	CL3	OK
E.2. Leakage It is assessed whether there leakage effects, i.e. change of emissions which occurs outside the project boundary and which are measurable and attributable to the project, have been properly assessed and estimated ex-ante.					
E.2.1. Are leakage calculation required for the selected project category and if yes, are the relevant leakage effects assessed?	/ 1/	DR	Since the energy generating equipment is not transferred from another activity and no existing equipment is transferred to another activity, no leakage needs to be considered.		OK
E.3. Baseline GHG Emissions The validation of ex-ante estimated baseline GHG emissions focuses on transparency and completeness of calculations.					
E.3.1. Are the baseline emission boundaries clearly defined and do they sufficiently cover sources for baseline emissions?	/ 1/	DR	Yes the baseline emission sources are clearly defined.		OK
E.3.2. Are all aspects related to direct and indirect baseline emissions captured in the project design?	/ 1/	DR	Yes, all aspects related to direct baseline emissions are captured. No significant indirect emissions, hence not captured.		OK
E.3.3. Have all relevant greenhouse gases and sources been evaluated?	/ 1/	DR	Yes, CO ₂ is the relevant greenhouse gas and the sources are evaluated.		OK

* MoV = Means of Verification, DR= Document Review, I= Interview

Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
E.3.4. Do the methodologies for calculating baseline emissions comply with existing good practice?	/ 1/	DR	Comments reserved till comment under B.2.2 is resolved.	CL5	OK
E.3.5. Are the calculations documented in a complete and transparent manner?	/ 1/	DR	Comments reserved till comment under B.2.2 is resolved.	CL5	OK
E.3.6. Have conservative assumptions been used?	/ 1/	DR	Comments reserved till comment under B.2.2 is resolved.	CL5	OK
E.3.7. Are uncertainties in the baseline emissions estimates properly addressed?	/ 1/	DR	Comments reserved till comment under B.2.2 is resolved.	CL5	OK
E.4. Emission Reductions Validation of ex-ante estimated emission reductions.					
E.4.1. Will the project result in fewer GHG emissions than the baseline case?	/ 1/	DR	Comments reserved till comments under B.2.2 and section E.3 are resolved.	CL5	OK
F. Environmental Impacts It is assessed whether environmental impacts of the project are sufficiently addressed.					
F.1.1. Does host country legislation require an analysis of the environmental impacts of the project activity?	/ 1/	DR	As per the MoEF, an EIA is not required for projects costing less than USD 22 Millions, as is the case with the proposed project.		OK
F.1.2. Does the project comply with environmental legislation in the host country?	/ 1/	DR	Yes. The project has a valid consent issued by Andhra Pradesh state pollution control board.		OK
F.1.3. Will the project create any adverse environmental effects?	/ 1/	DR	The PDD does not address the likely environmental impacts the project is likely to create, such as effects of suspended particulate matter, Nitrogen oxides and Sulphur dioxide apart for generation of	CL12	OK

* MoV = Means of Verification, DR= Document Review, I= Interview

Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
			fly ash. Whether the above are in line with the stipulations of the state pollution control also needs to be evidenced.		
F.1.4. Have environmental impacts been identified and addressed in the PDD?	/ 1/	DR	As per F.1.3	CL12	OK
G. Comments by Local Stakeholder Validation of the local stakeholder consultation process.					
G.1.1. Have relevant stakeholders been consulted?	/ 1/	DR	Yes the following relevant stakeholders have been consulted - Local community / administrative authorities comprising of Village Panchayat, District local administration and Biomass Suppliers; APTRANSCO and other Regulatory Authorities		OK
G.1.2. Have appropriate media been used to invite comments by local stakeholders?	/ 1/	DR	The comments from local stakeholders were invited through personal communication.		OK
G.1.3. If a stakeholder consultation process is required by regulations/laws in the host country, has the stakeholder consultation process been carried out in accordance with such regulations/laws?	/ 1/	DR	Not specifically required for such small scale biomass projects under the Indian legislation.		OK
G.1.4. Is a summary of the comments received provided?	/ 1/	DR	Summary of local stakeholder's comments is available.		OK
G.1.5. Has due account been taken of any comments received?	/ 1/	DR	No adverse comments have been received.		OK

* MoV = Means of Verification, DR= Document Review, I= Interview

Table 3 Resolution of Corrective Action and Clarification Requests

Draft report corrective action requests and requests for clarification	Ref. to Table 2	Summary of project participants' response	Final conclusion
CAR1 The spatial boundary of the project includes the project site (auxiliary units consuming power and up to the evacuation point of electricity to state grid) and includes biomass collection and storage. The project is located at Kamavarapukota village, West Godavari District, Andhra Pradesh, India. It is not clear from PDD that, what sub-station grid to which the evacuation is done.	A.2.1	The sub-station grid to which the power plant is connected for evacuation of power is located at 1.5 km from plant location at Kamavarapu Kota village in West Godavari District. The substation is of 33 KV owned by AP Transco.	The complementary information provided has been accepted. CAR closed.
CL1 As the project is claimed as first of its kind, it is not clearly described and, needs to be demonstrated that the used technology is the current good practice.	A.2.3	The project activity consists of utilisation of industrial waste and that too specifically palm waste for generation of power. The uniqueness of the project activity is the selection of palm waste as the fuel. The difficulty with Palm waste is that moisture content is high compared to regular biomass. Further the fuel also will have residual oil content. Therefore the difference between a biomass project and this project is the moisture content and oil content of the fuel used in the project activity. As proven technologies were not available for designing plant and equipment for this type of fuel and there were no similar plants in operation, the	The complementary information provided has been reviewed and accepted. CL closed.

Draft report corrective action requests and requests for clarification	Ref. to Table 2	Summary of project participants' response	Final conclusion
		project participants had to depend on the conventional type of plant and machinery consisting of travelling grate boiler and steam turbine. Based on the available technologies the project proponents have been advised that combustion technology is the only alternative and therefore presents best practice for operation of the project.	
CL-2 The project will require trained and qualified manpower in order to work as presumed during the project period. Qualified personnel as per statutory requirements in India should carry out the boiler operations. The certificate of qualification of the personnel involved in operations of the boiler is required to be provided as evidence.	A.2.5	Details of personnel operating the boiler along with certificate of qualification are enclosed.	The information provided has been reviewed and accepted. CL closed.
CL-3 A clarification as how the issue is being dealt with and mechanism to ensure continual supply of permitted biomass material for the project needs further elaboration. Also the mechanism of monitoring consumption patterns of Palm waste and other biomass ratio of 70:30, so as to meet requirements of the conditions from NEDCAP.	A.3.2 E.1.6	The project activity under the licensing arrangement is required to use palm waste to an extent of 70% and biomass to an extent of 30%. Therefore, it cannot use any other fuel available for the project activity. In order to ensure that palm waste is available on a continuous basis the company has entered into a long term arrangement with three oil companies viz., A.P.Oil Federation, SICAL and	Relevant agreements with palm industries for supply of palm waste have been reviewed and accepted. CL closed.

Draft report corrective action requests and requests for clarification	Ref. to Table 2	Summary of project participants' response	Final conclusion
		Godrej Agrovet who are the three palm oil mills in the region. These three oil mills have palm waste to an extent of 27000 tones every year. Apart from these companies there are number of small scale units producing palm oil waste in Andhra Pradesh and particularly in the districts of East Godavari, West Godavari, Srikakulam and Vizianagaram. Since 50% of the waste requirement is tied up, the company does not find difficult to procure the balance waste from other producers in the state. Andhra Pradesh is considered to be foremost in the production of palm oil seeds. The company is also planning to explore usage of large quantity of palm leaves and branches after trail runs. The project proponent has considered total fuel consumption of 50817 tonnes based on requirement of empty palm fruit bunches at 38302 tonnes and biomass of 12515 tonnes. This indicates that calorific value of fuel has been kept in mind while estimating the fuel requirement, keeping in mind the ultimate restriction of usage of biomass to an extent of 30%.	
CL4 The evidence for considering CDM revenues for sustainability of the project at the time of	B.2.1	The Board of Directors have passed a resolution in the month of November, 2001 agreeing to consider benefits from	The relevant information provided on additionality have been reviewed and accepted.

Draft report corrective action requests and requests for clarification	Ref. to Table 2	Summary of project participants' response	Final conclusion
project conceptualisation is to be provided. To substantiate the financial barrier analysis a more detailed report on the IRR/NPV of the project is required to be evaluated for further clarity considering with and without CDM benefits. Institutional barrier identified is mainly based on the fluctuations in the price of electricity. A sensitivity analysis is required for supporting the data mentioned in PDD to show that even a positive fluctuation in electricity price in future would make the project non-viable.		CDM for the project activity. Evidence in respect of the above is enclosed for verification of the validator. Additionality has been demonstrated through barrier analysis. The barriers perceived for the project are prevailing practice, technological barriers, financial barrier and institutional barrier. IRR analysis is worked out on the project activity with and with out CDM benefits. Further a sensitivity analysis has also been considered even considering positive fluctuation in electricity tariff. The analysis indicated that CDM revenues are significant for the project activity.	CL closed.
CL 5 The baseline scenario considered is southern grid. Detail calculation sheet for emission factor need to be provided as evidence.	B.2.2 B.2.3 B.2.4 B.2.5 E.3.4 E.3.5 E.3.6 E.3.7 E.4.1	Detailed calculation sheet for the emission factor is furnished in the PDD as attachment.	The revised PDD and the complementary information provided have been reviewed and accepted. CL closed.
CL 6	C.1.1	The start date of project is 1 st October,	The revised PDD has been reviewed

Draft report corrective action requests and requests for clarification	Ref. to Table 2	Summary of project participants' response	Final conclusion
Start date of the project is mentioned as 8 April 2004. Need to be changed and evidence for correct start date needs to be provided.		2002 when the company commenced construction activity at the plant location. The contract executed with the civil contractor is enclosed for verification.	and accepted. CL closed.
CL 7 The monitoring methodology is not transparent, as it does not include the monitoring of avg. calorific value of fuels used. Also the monitoring including monitoring of fossil fuel that is not permitted to use. Also evidence for demonstrating periodic calibration of power meters and periodic analysis of fuel consumed is not found during site visit.	D.1.3	The PDD has been revised incorporating the monitoring of the calorific value of biomass used by the project. By virtue of licensing procedures the project activity is prohibited using fossil fuel. Calibration of power meters is the responsibility of APTRANSCO. The fuel used consists of 70% palm waste and 30% agri residues. Analysis is being done of these fuels and copies of reports are enclosed. Copies of fuel analysis reports are submitted for verification.	The complementary information provided has been reviewed and accepted. CL closed.
CL 8 The Monitoring methodology is through metering and a separate GHG audit team/committee for periodic monitoring and also periodic analysis of fuel also plans recording. This is expected to give real time results. The implementation of effectiveness has to be checked, as evidence of GHG audit team is to be given.	D.1.4	Copies of annual GHG audit reports as furnished to the board of directors is enclosed to demonstrate maintenance of necessary records as required by the monitoring plan.	The reports and procedures provided have been accepted. CL closed.
CL 9 The authority and responsibility for project management has to be formally described. Procedures for project management covering	D.5.	Necessary corrections have been incorporated in the revised PDD. Organisation chart is furnished for verification. Relevant procedures have	The revised PDD has been reviewed and accepted.

Draft report corrective action requests and requests for clarification	Ref. to Table 2	Summary of project participants' response	Final conclusion
authority & responsibility, measurement, monitoring, reporting, calibration, maintenance & emergency preparedness to be formalised. Management system procedures related to documentation/record keeping, corrective actions, internal audits & performance reviews also to be formalised.		been furnished for validators review.	CL closed.
CL 10 Emergencies like fire in storage area can cause unintended emission. The emergency preparedness in such situation needs to be elaborated.	D.5.4	Emergency preparedness in emergency such as fire is elaborated in the PDD.	The complementary information provided has been accepted. CL closed.
CL 11 The project participant identifies emissions from off-site transportation of fuels and considers it as negligible. However this needs to be demonstrated with facts and figures.	E.1.1	Details of emissions from off-site transportation of fuels have been demonstrated in the PDD.	The revised PDD has been reviewed for the required information and accepted. CL closed.
CL 12 The PDD does not address the likely environmental impacts the project is likely to create, such as effects of suspended particulate matter, Nitrogen oxides and Sulphur dioxide apart for generation of fly ash. Whether the above are in line with the stipulations of the state pollution control also needs to be evidenced.	F.1.3 F.1.4	The project proponent has installed electrostatic precipitator to control suspended particulate matter below the designed levels (115mg / NM3) Further by providing adequate stack height of 40m, emissions from SO2 and NOx will be reduced to the minimum levels. The other steps considered by the project proponent are to utilise ash generation for brick manufacturing, development of green belt all round the factory	The revised PDD has been reviewed and accepted. CL closed.

Draft report corrective action requests and requests for clarification	Ref. to Table 2	Summary of project participants' response	Final conclusion
		premises and adequate fire protections in the factory as well as waste storage area. Necessary corrections have been made in the PDD. All the above measures are in line with the approval received by the project proponent from the AP Pollution Control Board.	

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APPENDIX B

CERTIFICATES OF COMPETENCE



CERTIFICATE OF COMPETENCE

Michael Lehmann

Qualification in accordance with DNV's Qualification scheme for CDM/JI (ICP-9-8-i1-CDMJ1-i1)

GHG Auditor:	Yes		
CDM Validator:	Yes	JI Validator:	Yes
CDM Verifier:	Yes	JI Verifier:	Yes
Industry Sector Expert for Sectoral Scope(s):	Sectoral scope 1,2,3 & 9		
Technical Reviewer for (group of) methodologies:			
ACM0001, AM0002, AM0003, AM0010, AM0011, AM0012, AMS-III.G	Yes	AM0021	Yes
ACM002, AMS-I.A-D, AM0019, AM0026, AM0029	Yes	AM0023	Yes
ACM003, ACM0005, AM0033, AM0040	Yes	AM0024	Yes
ACM0004	Yes	AM0027	Yes
ACM0006, AM0007, AM0015, AM0036, AM0042	Yes	AM0028, AM0034	Yes
ACM0007	Yes	AM0030	Yes
ACM0008	Yes	AM0031	Yes
ACM0009, AM0008, AMS-III.B	Yes	AM0032	Yes
AM0006, AM0016, AMS-III.D	Yes	AM0035	Yes
AM0009, AM0037	Yes	AM0038	Yes
AM0013, AM0022, AM0025, AM00379, AMS-III.H, AMS-III.I	Yes	AM0041	Yes
AM0014	Yes	AM0034	Yes
AM0017	Yes	AMS-II.A-F	Yes
AM0018	Yes	AMS-III.A	Yes
AM0020	Yes	AMS-III.E, AMS-III.F	Yes

Høvik, 6 November 2006

Einar Telnes
Director, International Climate Change Services

Michael Lehmann
Technical Director



CERTIFICATE OF COMPETENCE

Kumaraswamy Chandrashekara

Qualification in accordance with DNV's Qualification scheme for CDM/JI (ICP-9-8-i1-CDMJ1-i1)

GHG Auditor:	Yes		
CDM Validator:	Yes	JI Validator:	--
CDM Verifier:	Yes	JI Verifier:	--
Industry Sector Expert for Sectoral Scope(s):	Sectoral scope 4 & 5		
Technical Reviewer for (group of) methodologies:			
ACM0001, AM0002, AM0003, AM0010, AM0011, AM0012, AMS-III.G	Yes	AM0027	Yes
ACM002, AMS-I.A-D, AM0019, AM0026, AM0029, AM0045	Yes	AM0028, AM0034	Yes
ACM003, ACM0005, AM0033, AM0040	Yes	AM0030	Yes
ACM0004	Yes	AM0031	Yes
ACM0006, AM0007, AM0015, AM0036, AM0042	Yes	AM0032	Yes
ACM0007	Yes	AM0035	Yes
ACM0008	Yes	AM0038	Yes
ACM0009, AM0008, AMS-III.B	Yes	AM0041	Yes
AM0006, AM0016, AMS-III.D, ACM0010	Yes	AM0034	Yes
AM0009, AM0037	Yes	AM0043	
AM0013, AM0022, AM0025, AM00379, AMS-III.H, AMS-III.I	Yes	AM0046	
AM0014	Yes	AM0047	
AM0017	Yes	AMS-II.A-F, AM0044	Yes
AM0018	Yes	AMS-III.A	Yes
AM0020	Yes	AMS-III.E, AMS-III.F	Yes
AM0021	Yes		
AM0023	Yes		
AM0024	Yes		

Høvik, 5 February 2007

Einar Telnes
Director, International Climate Change Services

Michael Lehmann
Technical Director



CERTIFICATE OF COMPETENCE

Raman Venkata Kakaraparthi

Qualification in accordance with DNV's Qualification scheme for CDM/JI (ICP-9-8-i1-CDMJ1-i1

<i>GHG Auditor:</i>	Yes		
<i>CDM Validator:</i>	Yes	<i>JI Validator:</i>	--
<i>CDM Verifier:</i>	--	<i>JI Verifier:</i>	--
<i>Industry Sector Expert for Sectoral Scope(s):</i>	Sectoral scope 5		
<i>Technical Reviewer for (group of) methodologies:</i>			
<i>ACM002, AMS-IA-D, AM0019, AM0026, AM0029, AM0045</i>	Yes		

Høvik, 22 December 2006

Einar Telnes
Director, International Climate Change Services

Michael Lehmann
Technical Director



CERTIFICATE OF COMPETENCE

Astakala Vidyacharan

Qualification in accordance with DNV's Qualification scheme for CDM/JI (ICP-9-8-i1-CDMJ1-i1

<i>GHG Auditor:</i>	Yes		
<i>CDM Validator:</i>	--	<i>JI Validator:</i>	--
<i>CDM Verifier:</i>	--	<i>JI Verifier:</i>	--
<i>Industry Sector Expert for Sectoral Scope(s):</i>	--		

Høvik, 6 November 2006

Einar Telnes
Director, International Climate Change Services

Michael Lehmann
Technical Director