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# VALIDATION REPORT

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## “VAAYU INDIA WIND POWER PROJECT IN TAMILNADU” IN INDIA

REPORT No. 2010-0469

REVISION No. 02

DET NORSKE VERITAS



## VALIDATION REPORT

Date of first issue: 9 July 2010		ConCert Project No.: PRJC-224814-2010-CCS-IND
Recommended for approval Astakala Vidyacharan	Approved by Michael Lehmann	Organisational unit: DNV Climate Change and Environmental Services
Client: Vaayu (India) Power Corporation Private Limited		Client ref.: Mr.Yogesh Mehra

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### Summary:

**Project Name:** Vaayu India Wind Power Project in Tamilnadu

**Country:** India

**Methodology:** ACM0002

**Version:** 12.1.0

**GHG reducing Measure/Technology:** Energy generation from renewable energy sources.Sectoral Scope -1

**ER estimate:** 103 612 tCO<sub>2</sub>e per year (average) over a ten year fixed crediting period

### Size

☒ Large Scale

☐ Small Scale

### Validation Phases:

☒ Desk Review

☒ Follow up interviews

☒ Resolution of outstanding issues

### Validation Status

☐ Corrective Actions Requested

☐ Clarifications Requested

☒ Full Approval and submission for registration

☐ Rejected

In summary, it is DNV's opinion that the project activity "Vaayu India Wind Power Project in Tamilnadu" in India, as described in the PDD, version 04 of 15 March 2011, meets all relevant UNFCCC requirements for the CDM and correctly applies the baseline and monitoring methodology ACM0002, version 12.1.0. Hence DNV requests the registration of the project as a CDM project activity.

Report No.: 2010-0469	Subject Group: Environment	
Report title: Vaayu India Wind Power Project in Tamilnadu		
Work carried out by: Ravi Kumar Prabhu, G.Murali, P.Kannan		
Work verified by: Astakala Vidyacharan		
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### Indexing terms

Key words  
Climate Change  
Kyoto Protocol  
Validation  
Clean Development Mechanism

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## Abbreviations

BSE	Bombay Stock Exchange
CAPM	Capital Asset Pricing Model
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEA	Central Electricity Authority
CER	Certified Emission Reduction(s)
CH <sub>4</sub>	Methane
CL	Clarification request
CO <sub>2</sub>	Carbon dioxide
C-WET	Centre for Wind Energy Technology
CO <sub>2</sub> e	Carbon dioxide equivalent
DNV	Det Norske Veritas
DNA	Designated National Authority
EIL	Enercon India Limited
EIA	Environment Impact assessment
FAR	Forward Action Request
GBI	Generation Based Incentive
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IDFC	Infrastructure Development Finance Company Limited
IPCC	Intergovernmental Panel on Climate Change
IPP	Independent Power Producer
IREDA	Indian Renewable Energy Development Authority Limited
LoA	Letter of approval
MNES	Ministry of Non Conventional Energy Sources, Government of India
MoEF	Ministry of Environment & Forests, Government of India
NGO	Non-governmental Organisation
ODA	Official Development Assistance
PDD	Project Design Document
PLF	Plant Load Factor
RBI	Reserve Bank of India
tCO <sub>2</sub> e	Tonnes of CO <sub>2</sub> equivalents
TNEB	Tamil Nadu Electricity Board
TNERC	Tamil Nadu Electricity Regulatory Authority
UNFCCC	United Nations Framework Convention on Climate Change
WEG	Wind Energy Generator
VIPCPL	Vaayu (India) Power Corporation Private Limited



## 1 EXECUTIVE SUMMARY – VALIDATION OPINION

*DNV Climate Change Services AS (DNV) has performed a validation of the project activity “Vaayu India Wind Power Project in Tamilnadu” in India. The validation was performed on the basis of UNFCCC criteria for the Clean Development Mechanism 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 host Party is India and the project participant is Vaayu (India) Power Corporation Private Limited. The DNA from India confirmed that the project assists in achieving sustainable development. No Annex I Party has yet been identified.*

*The project correctly applies the baseline and monitoring methodology ACM0002, version 12.1.0 “Consolidated baseline methodology for grid-connected electricity generation from renewable sources”.*

*The project activity is intended to generate power from a 50.4 MW wind farm and the project results in reductions of CO<sub>2</sub> emissions that are real, measurable and gives long-term benefits to the mitigation of climate change. It is demonstrated that the project is not a likely baseline scenario. Emission reductions attributable to the project are hence additional to any that would occur in the absence of the project activity.*

*The total emission reductions from the project are estimated to be on the average 103 612 tCO<sub>2e</sub> per year over the selected 10 year fixed crediting period. The emission reduction forecast has been checked and it is deemed likely that the stated amount is achieved given that the underlying assumptions do not change.*

*The monitoring plan provides for the monitoring of the project’s emission reductions. The monitoring arrangements described in the monitoring plan are feasible within the project design and it is DNV’s opinion that the project participants are able to implement the monitoring plan.*

*In summary, it is DNV’s opinion that the project activity “Vaayu India Wind Power Project in Tamilnadu” in India, as described in the PDD, version 04 dated 15 March 2011, meets all relevant UNFCCC requirements for the CDM and correctly applies the baseline and monitoring methodology ACM0002, version 12.1.0. Hence, DNV requests the registration of the project as a CDM project activity.*

Bangalore and Oslo, 16 June 2011

Govindarajulu Murali  
CDM Validator  
DNV Bangalore, India

Michael Lehmann  
Director of Services and Technologies  
Det Norske Veritas Certification AS



## 2 INTRODUCTION

Vaayu (India) Power Corporation Private Limited has commissioned DNV Climate Change and Environmental Services (DNV) to perform a validation of the “Vaayu India Wind Power Project in Tamilnadu” 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 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 and the subsequent decisions by the CDM Executive Board.

### 2.1 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 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).

### 2.2 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 and the relevant decisions by the CDM Executive Board, including the approved baseline and monitoring methodology ACM0002. The validation was based on the recommendations in the Validation and Verification Manual /25/.

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.



### 3 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.

The following sections outline each step in more detail.

#### 3.1 Desk review of the project design documentation

The following tables list the documentation that was reviewed during the validation.

##### 3.1.1 Documentation provided by the project participants

- /1/ VIPCL: CDM-PDD for project activity “Vaayu India Wind Power Project in Tamilnadu” in India, initial version 01 dated 22 March 2010 and final PDD version 04 dated 15 March 2011.
- /2/ Enercon: Commercial offer for supply of 63 WEGs of 800 kW for the project activity, Ref:VIPCPL/2009-10/EIL-074, dated 20 November 2009.
- /3/ Enercon: Technical specification of E-53 model WEG of 800 kW capacity and its life expectancy.
- /4/ VIPCPL: Detailed Project Report, dated 25 November 2009.
- /5/ VIPCPL: Extracts of Board resolution to proceed with the project activity with CDM consideration, dated 28 November 2009.
- /6/ VIPCPL: Purchase order for 63 WEGs of 800 kW placed on Enercon, Ref: VIPCPL/EIL/09-10/04 dated 5 December 2009.
- /7/ VIPCPL: Letter authorizing EIL to manage CDM activities and transaction of CERs for the project activity, dated 8 December 2009.
- /8/ TNEB: Approval for power evacuation from the Enercon wind farm, dated 27 August 2010.
- /9/ C-WET: Report on site validation & generation estimate of proposed (70x800 kW) wind farm projects at Vagaikulam in Tirunelveli district in Tamil Nadu, Ref: CWET-WR-CF-05-2010-11, dated 20 January 2010.
- /10/ VIPCPL: E-mail on intimation on developing the project activity as CDM to UNFCCC, dated 3 March 2010 and confirmation from UNFCCC on receipt of the email dated 9 June 2010.
- /11/ VIPCPL: E-mail on intimation on developing the project activity as CDM to DNA of India, dated 3 March 2010 and confirmation from DNA of India on receipt of the email dated 15 March 2010.
- /12/ VIPCPL: Loan application submitted to IDFC, dated 18 March 2010
- /13/ IDFC: Loan sanction letter, dated 30 April 2010
- /14/ VIPCPL: Letter of undertaking for non usage of official development assistance, dated 7 June 2010



- /15/ VIPCPL: Letter of undertaking for no third party sale of electricity from the project activity, dated 8 June 2010.
- /16/ VIPCPL: PPAs signed with Central Power Distribution Company of Tamil Nadu, Wind Energy Purchase Agreement WFHTC No. 3376 dated 29 September 2010 for 4 WEGs, WFHTC No. 3461 dated 21 January 2011 for one WEG, WFHTC No. 3462 dated 21 January 2011 for one WEG, WFHTC No. 3463 dated 21 January 2011 for one WEG, WFHTC No. 3464 dated 21 January 2011 for one WEG, WFHTC No. 3465 dated 21 January 2011 for one WEG, WFHTC No. 3466 dated 21 January 2011 for one WEG, WFHTC No. 3467 dated 21 January 2011 for one WEG, WFHTC No. 3470 dated 21 January 2011 for 2 WEGs,
- /17/ VIPCPL: Investment analysis spreadsheet, Vaayu Tamilnadu\_Investment Analysis ver 3.0.xls
- /18/ VIPCPL: Benchmark calculation spreadsheet, Vaayu Tamilnadu\_Benchmark\_Cost of equity version 2.0.xls
- /19/ VIPCPL: Press advertisement in local news paper “*Daily Thanti*” dated 8 February 2010 on local stakeholder meeting.
- /20/ VIPCL: Attendance sheet and minutes of the meeting of stakeholder consultation, dated 23 February 2010.
- /21/ VIPCPL: Invitation letters dated 8 February 2010 sent out for local stakeholder meeting.
- /22/ VIPCPL: The cost details of seven other wind projects, for which purchase orders were placed on Enercon between 2 Nov 2009 and 15 May 2010.
- /23/ VIPCPL: The quotation received from United Insurance Company Limited, dated 27 October 2009.

### 3.1.2 Letters of approval

- /24/ DNA of India: *Letter of approval* dated 22 December 2010.

### 3.1.3 Methodologies, tools and other guidance by the CDM Executive Board

- /25/ CDM Executive Board: *Validation and Verification Manual*. version 1.2
- /26/ CDM Executive Board: Baseline and monitoring methodology ACM0002, version 12.1.0, “*Consolidated baseline methodology for grid-connected electricity generation from renewable sources*”
- /27/ CDM Executive Board: *Tool for demonstration and assessment of additionality*, version 5.2.
- /28/ CDM Executive Board: *Tool to calculate the emission factor for an electricity system*, version 2.
- /29/ CDM Executive Board: *Guidance on Assessment of Investment Analysis*, version 3.1
- /30/ CDM Executive Board: Guidelines on the demonstration and assessment of the prior consideration of CDM, version 3
- /31/ CDM Executive Board: Guidelines for the reporting and validation of plant load factors, version 1.





### 3.1.4 Documentation used by DNV to validate / cross-check the information provided by the project participants

- /32/ CEA: CO<sub>2</sub> Baseline Database for the Indian Power Sector dated 1 November 2009, version 5, [http://cea.nic.in/reports/planning/cdm\\_co2/cdm\\_co2.htm](http://cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm)
- /33/ CDM prior consideration : Intimation receipt at UNFCCC <http://cdm.unfccc.int/Projects/PriorCDM/notifications/index.html>
- /34/ MOEF notification with respect to EIA dated 14 September 2006. (<http://envfor.nic.in/legis/eia/so1533.pdf>)
- /35/ TNERC: Comprehensive tariff order on wind energy, dated 20 March 2009 <http://tnerc.tn.nic.in/order-20-03-2009.htm>  
Order no.3, dated 15 May 2006, which states the actual PLF at different locations <http://tnerc.tn.nic.in/orders/ncs%20order%20approved%20order%20host%20copy.pdf>
- /36/ Bloomberg: Historical Beta value snapshots of Tata Power Co Ltd, CESC Ltd, Reliance Infrastructure Ltd, Gujarat Indus Power Co Ltd and Energy Development Co for the period of 31 Oct 2004 to 25 Oct 2009
- /37/ Centre for Wind Energy Technology: Revised list of models and manufacturers of wind turbines, possessing valid approval, Ref. No.C-WET/S&C/RLMM/2010-11/06, dated 18 May 2010
- /38/ Indian Income Tax Act 1961, Section 32 (Rule 5) Appendix 1 and Section 80-1A, paragraph 2.0
- /39/ RBI: Weekly statement on cash reserve ratio and interest rates, dated November 2010 [http://rbidocs.rbi.org.in/rdocs/Wss/PDFs/wss301009\\_F.pdf](http://rbidocs.rbi.org.in/rdocs/Wss/PDFs/wss301009_F.pdf)
- /40/ Bombay stock exchange: <http://www.bseindia.com/about/abindices/bse30.asp> - list of companies taken for computing the beta value, <http://www.bseindia.com/stockinfo/indices.aspx> - historical data of BSE indices October 2009, and <http://www.bseindia.com/about/abindices/sectoralindices.asp> for data on BSE POWER Index.
- /41/ IRDEA: Operational guidelines for implementation of generation based incentive for grid connected wind power projects, dated 17 December 2009 and 26 May 2010 <http://www.ireda.gov.in/pdf/OPERATIONAL%20GUIDELINES%20for%20Wind%20GBI%20and%20AD%20as%20on%2026.05.2010.doc>
- /42/ Indian Wind Power Directory 9<sup>th</sup> edition, published in year 2009
- /43/ National CDM authority of India: Website for the approved projects, [http://cdmindia.in/project\\_details\\_view.php?id=330&oid=1&page=1&reporttype=1](http://cdmindia.in/project_details_view.php?id=330&oid=1&page=1&reporttype=1)
- /44/ Wind Power India: Year wise installed capacity of WEGs in India [http://www.windpowerindia.com/index.php?option=com\\_content&view=article&id=20&Itemid=25](http://www.windpowerindia.com/index.php?option=com_content&view=article&id=20&Itemid=25)
- /45/ UNEP Risoe: CDM Pipeline, <http://cdmpipeline.org/publications/CDMpipeline.xlsx>
- /46/ UNFCCC: Wind projects registered in Tamil Nadu in 2010: Wind power project at Tamilnadu by Powerica Limited (Registration no. 3327) <http://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1264590823.08/view>  
Grid connected wind energy project in Tamil Nadu by Super Wind Project Private Ltd. (Registration no. 3884), <http://cdm.unfccc.int/Projects/DB/DNV-CUK1280379317.22/view>



Grid connected wind energy project in Tamil Nadu by Simran Wind Project Private Ltd. (Registration no. 4209)

<http://cdm.unfccc.int/Projects/DB/DNV-CUK1291798550.29/view>

The main changes between the web hosted and registered PDDs are:

- 1) The methodology version changed from 11 to 12.1.0, due to expiry of version 11 on 17 May 2011.
- 2) The start date of crediting period has been revised from 1 April 2011 to 1 July 2011.
- 3) The monitoring plan has been updated on the basis of actual billing calculation used by the state utility.

### 3.2 Follow-up interviews with project stakeholders

This is a greenfield project, wherein the site activities were yet to be started at the start of validation. Since the project is in the preliminary stages and the hardware is yet to be installed at site, a site visit was not deemed necessary. On 10 June 2010, Ravi Kumar Prabhu, Project Manager, DNV visited the office of Enercon (India) Limited at Mumbai and performed interviews with project stakeholders.

	Date	Name	Organization	Topic
/47/	2010-06-10	Mr. Yogesh Mehra, Director	Vaayu India Power Corporation Limited	<ul style="list-style-type: none"> <li>➤ Proof of CDM consideration</li> <li>➤ Applicability of methodology</li> <li>➤ Review of project design and technology used</li> </ul>
		Mr. Puneet Katyal, Head, CDM	Enercon (India) Limited, Mumbai	<ul style="list-style-type: none"> <li>➤ Review of monitoring and verification procedure, management structure of the organization.</li> </ul>
		Mr. Himanshu Bhatnagar, Asst. Manager, CDM Corporate		<ul style="list-style-type: none"> <li>➤ Environmental consents and permits</li> </ul>
		Mr. Rohit Joshi, CDM Corporate		<ul style="list-style-type: none"> <li>➤ Review of the stakeholder consultation process.</li> </ul>
		Mr. Saujanya Kumar, CDM Corporate		<ul style="list-style-type: none"> <li>➤ Joint meter reading procedure</li> </ul>
		Ms. Anushree Mishra, CDM Corporate		<ul style="list-style-type: none"> <li>➤ Operation &amp; maintenance procedures.</li> <li>➤ Determination of baseline</li> </ul>
				Third party assessment of PLF
/48/	2010-06-10	Mr. Neeraj Gupta	Price Waterhouse Coopers, Gurgaon	<ul style="list-style-type: none"> <li>➤ Assessment of project additionality, benchmark determination, financial analysis</li> <li>➤ Emission reduction calculations and data used</li> <li>➤ Determination of baseline</li> </ul>



### 3.3 Resolution of outstanding issues

The objective of this phase of the validation is to resolve any outstanding issues which need be clarified prior to DNV's positive conclusion on the project design. In order to ensure transparency a validation protocol was customised for the project. The protocol shows in a transparent manner the 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 four tables. The different columns in these tables are described in the figure below. The completed validation protocol for the project activity "Vaayu India Wind Power Project in Tamilnadu" in India is enclosed in Appendix A to this report.

A corrective action request (CAR) is raised if one of the following occurs:

- (a) The project participants have made mistakes that will influence the ability of the project activity to achieve real, measurable additional emission reductions;
- (b) The CDM requirements have not been met;
- (c) There is a risk that emission reductions cannot be monitored or calculated.

A clarification request (CL) is raised if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met.

A forward action request (FAR) is raised during validation to highlight issues related to project implementation that require review during the first verification of the project activity. FARs shall not relate to the CDM requirements for registration.

**Validation Protocol Table 1: Mandatory Requirements for CDM Project Activities**

<b>Requirement</b>	<b>Reference</b>	<b>Conclusion</b>
<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) or a <b>corrective action request (CAR)</b> if a requirement is not met.</i>

**Validation Protocol Table 2: Requirement Checklist**

<b>Checklist question</b>	<b>Reference</b>	<b>Means of verification (MoV)</b>	<b>Assessment by DNV</b>	<b>Draft and/or Final Conclusion</b>
<i>The various requirements in Table 1 are linked to checklist questions the project should meet. The checklist is organised in different sections, following the logic of the CDM-PDD</i>	<i>Gives reference to documents where the answer to the checklist question or item is found.</i>	<i>Means of verification (MoV) are <b>document review (DR)</b>, <b>interview (I)</b> or any other follow-up actions (e.g., on site visit and telephone or email interviews) and <b>cross-checking (CC)</b> with available information relating to projects or technologies similar to the proposed CDM project activity under validation.</i>	<i>The discussion on how the conclusion is arrived at and the conclusion on the compliance with the checklist question so far.</i>	<i>OK is used if the information and evidence provided is adequate to demonstrate compliance with CDM requirements. A <b>corrective action request (CAR)</b> is raised when project participants have made mistakes, the CDM requirements have not been met or there is a risk that emission reductions cannot be monitored or calculated. A <b>clarification request (CL)</b> is raised if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met. A <b>forward action request (FAR)</b> during validation is raised to highlight issues related to project implementation that require review during the first verification of the project activity.</i>

**Validation Protocol Table 3: Resolution of Corrective Action and Clarification Requests**

<b>Corrective action and/or clarification requests</b>	<b>Ref. to checklist question in table 2</b>	<b>Response by project participants</b>	<b>Validation conclusion</b>
<i>The CARs and/or CLs raised in Table 2 are repeated here.</i>	<i>Reference to the checklist question number in Table 2 where the CAR or CL is explained.</i>	<i>The responses given by the project participants to address the CARs and/or CLs.</i>	<i>The validation team's assessment and final conclusions of the CARs and/or CLs.</i>

**Validation Protocol Table 4: Forward Action Requests**

<b>Forward action request</b>	<b>Ref. to checklist question in table 2</b>	<b>Response by project participants</b>
<i>The FARs raised in Table 2 are repeated here.</i>	<i>Reference to the checklist question number in Table 2 where the FAR is explained.</i>	<i>Response by project participants on how forward action request will be addressed prior to first verification.</i>

**Figure 1 Validation protocol tables**



### 3.4 Internal quality control

The final validation report has undergone a technical review performed by a technical reviewer qualified in accordance with DNV's qualification scheme for CDM validation and verification.

### 3.5 Validation team

<i><b>Role</b></i>	<i><b>Last Name</b></i>	<i><b>First Name</b></i>	<i><b>Country</b></i>	<i><b>Type of involvement</b></i>					
				Desk review	Site visit / Interviews	Reporting	Supervision of work	Technical review	TA1.2 competence
Technical team leader (CDM validator)	Govindarajulu	Murali	India	✓		✓	✓		✓
GHG auditor	Prabhu	Ravi Kumar	India	✓	✓	✓			
Person with sectoral competence	Parthasarathy	Kannan	India	✓		✓			✓
Technical reviewer	Astakala	Vidyacharan	India					✓	✓

The qualification of each individual validation team member is detailed in Appendix B to this report.



## 4 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 PDD, version 04 dated 15 March 2011.

### 4.1 Participation requirements

The project is being developed by Vaayu (India) Power Corporation Private Limited of host Party India and no other project participant from Annex I Party is identified yet. The host Party (India) meets all relevant participation requirements.

A letter of approval (LoA) /24/ was issued by DNA of India on 22 December 2010 authorizing Vaayu (India) Power Corporation Private Limited of India as project participant and confirming that the project assists in achieving sustainable development. The letter of approval was received from the project participant. DNV verified the approval of the project from the official web site of the national CDM Authority of India /43/.

The project participant has given an undertaking for non usage of overseas development assistance (ODA) /14/. The validation did not reveal any information that indicates that the project can be seen as a diversion of ODA.

The letter of approval was received from the project participant. DNV does not doubt the authenticity of the letter of approval. DNV considers the letter is in accordance with paragraphs 45- 48 of the VVM /25/.

### 4.2 Project design

The project activity consists of installation of 63 Wind Energy Generators (WEGs) of the Enercon E-53 make, with capacity of 800 kW each, with gearless horizontal axis, variable speed rotor and independent electromechanical pitch system for each blade. The project is spread across Vagaikulam, Kuruchikulam, Ettankulam, Kalakudi, Muthammalpuram and Ukkirankottai villages in Tirunelveli district in Indian State of Tamilnadu. The project area extends between latitude 8° 52' 12.368" and 8° 56' 6.77" North and longitude 77° 35' 0.824" and 77° 37' 9.822" East. The WEGs generate 3 phase power at 400V, which is stepped up to 33 KV. The project activity can operate in the frequency range of 47.5 to 51.5 Hz and in the voltage range of 400 V  $\pm$  12.5%. The average life time of the WEG is expected to be 20 years /3/. A fixed crediting period of 10 years has been chosen with the starting date of the crediting period as 1 July 2011 or the date of registration of the project activity whichever is later. The status of the project in May 2011 is that some of the WEGs have been commissioned and the remaining are under installation.

The entire power generated by the project is supplied to the local grid of TNEB, which is part of the southern regional grid of India. By the implementation of the project activity, energy generated using renewable energy will displace equivalent energy generation from the fossil fuel dominated southern grid of India. Therefore, the project activity results in an equivalent



amount of 103 612 tCO<sub>2</sub>e emission reduction per annum during the crediting period of 10 years.

The starting date of the project activity indicated in the PDD is 5 December 2009 which is the date on which the purchase order was placed on EIL for 63 number of WEGs /6/. This is the first as well as major financial commitment for the project activity, with the scope including installation of WEGs on engineering, procurement and commissioning (EPC) basis.

The installation, commissioning, operation and maintenance of the WEGs are under the scope of Enercon (India) Limited (EIL), during the crediting period. The technology used in the project activity is indigenously available in India and no transfer of technology is envisaged. The technology applied is deemed current good practice and is not expected to be replaced within the crediting period.

DNV considers the project description of the project contained in the PDD to be complete and accurate. The PDD complies with the relevant forms and guidance for completing the PDD.

### 4.3 Application of selected baseline and monitoring methodology

The project correctly applies the approved baseline methodology ACM0002, version 12.1.0 “*Consolidated baseline methodology for grid-connected electricity generation from renewable sources*” /26/. The applicability of this methodology is justified as:

- The project is a new installation of wind electricity generators at a site where no renewable energy power plant was operated prior to the implementation of the project activity. This has been verified from the TNEB approval for power evacuation from the Enercon wind farm /8/ that this is a green field project.
- No retrofit or capacity additions or replacements at the existing plants are involved. This has been verified from the purchase order for WEGs that new WEGs are to be installed. /6/.
- The project activity is connected to the southern grid of India, and the system boundaries are clearly identified and information on the characteristics of this grid is available on the web site central electricity authority (CEA), Government of India /32/.
- No hydro or biomass project is involved.
- The project does not involve an on-site switch from fossil fuels to a renewable source. This has been verified from the purchase order for WEGs /6/.

The assessment of the project’s compliance with the applicability criteria of ACM0002 (version 12.1.0) /26/ are documented in detail in section B.2 of Table 2 in the validation protocol in Appendix A to this report.

### 4.4 Project Boundary

The project system boundary consists of the WEGs at the project site, and the pooling sub-stations. The spatial boundary of the project includes the southern grid of India.





	GHGs involved	Description
Baseline emissions	CO <sub>2</sub>	Emissions equivalent to the amount of net electricity supplied by the project activity that would otherwise be generated by the power plants connected to the southern grid.
Project emissions	CO <sub>2</sub>	NA
Leakage	NA	NA

The identified boundary and selected sources and gases are justified for the project activity. The validation of the project activity did not reveal any other greenhouse gas emissions occurring within the proposed CDM project activity boundary as a result of the implementation of the proposed project activity which are expected to contribute more than 1% of the overall expected average annual emission reduction, which are not addressed by ACM0002 (version 12.1.0) /26/.

#### 4.5 Baseline identification

As this project installs a new grid connected renewable power plant and the project is additional, (Ref: Section 4.6) the baseline scenario is in accordance with ACM0002, version 12.1.0 /26/, the electricity delivered to the grid by the project activity that otherwise would have been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the *Tool to calculate the emission factor for an electricity system* /28/.

The approved baseline methodology has been correctly applied to identify realistic and credible baseline scenarios, and the identified baseline scenario most reasonably represents what would occur in the absence of the proposed CDM project activity.

All the assumptions and data used by the project participant are listed in the PDD and/or supporting documents. All documentation relevant for establishing the baseline scenario are correctly quoted and interpreted in the PDD. Assumptions and data used in the identification of the baseline scenario are justified appropriately, supported by evidence and can be deemed reasonable. Relevant national and/or sectoral policies and circumstances are considered and listed in the PDD.

#### 4.6 Additionality

The project's additionality is demonstrated using "Tool for the demonstration and assessment of additionality", version 5.2 /27/.

##### 4.6.1 Evidence for prior CDM consideration and continuous actions to secure CDM status

The starting date of the project activity has been selected as 5 December 2009 which is the date on which the purchase order was placed on EIL for 63 number of WEGs /6/. This is the first as well as major financial commitment for the project activity, with the scope including installation of WEGs on engineering, procurement and commissioning (EPC) basis.





Early consideration of CDM is evidenced from the e-mail notification to UNFCCC secretariat on 3 March 2010 /10/ regarding commencement of the project activity and the project participant's intention to seek CDM status for the project. DNV verified the notification from the UNFCCC website /33/ and the confirmation email from UNFCCC dated 9 June 2010 /10/. PP had also intimated the DNA of India by e-mail on 3 March 2010 regarding commencement of the project activity and received e-mail confirmation dated 15 March 2010 /11/.

Further, the Board of VIPCPL discussed the viability of the project and suggested to get the project registered under CDM, so that the additional revenues from the sale of emission reductions will help the project to be financially viable /5/. CDM was therefore seriously considered in the decision to proceed with the project activity. Enercon (India) Limited was authorized to manage the CDM activities and CERs /7/ of the project activity on behalf of VIPCPL.

DNV consider that the evidences to demonstrate CDM consideration for the project activity, since the start date of the project activity (5 December 2009) is after 2 August 2008 and that PP notified the UNFCCC secretariat and DNA of India within six months of the start date. Further, the PDD has been published for global stakeholder consultation on 15 April 2010, within 2 years from the initial notification to the UNFCCC and the DNA, thereby complying with the guidelines of EB 49 Annex 22 /30/.

It is DNV's opinion that the proposed CDM project activity complies with the requirements of the latest version of the guidance on prior consideration of CDM.

#### **4.6.2 Identification of alternatives to the project activity**

The applied methodology ACM0002 version 12.1.0 /26/ specifies that, for the grid connected new renewable power plants, the baseline scenario is that the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of the grid connected power plants and by the addition of new generation sources, as reflected by the combined margin.

The realistic and credible alternatives to the project activity are the project being undertaken without registering it as a CDM activity and equivalent amount of electricity being generated through operation of grid-connected power plants and addition of new generation sources. Both alternatives are in compliance with the laws and regulations of India and might be considered as baseline scenarios. However, as discussed below (in section 4.6.3), the project without CDM benefits faces barriers in implementation.

The approved baseline methodology has been correctly applied to identify a complete list of realistic and credible baseline scenarios, and the identified baseline scenario most reasonably represents what would occur in the absence of the proposed CDM project activity.

All the assumption and data used by the project participants are listed in the PDD and/or supporting documents. All documentation relevant for establishing the baseline scenario are correctly quoted and interpreted in the PDD. Assumptions and data used in the identification of the baseline scenario are justified appropriately, supported by evidence and can be deemed reasonable. Relevant national and/or sectoral policies and circumstances are considered and listed in the PDD.



### 4.6.3 Investment analysis

#### Choice of approach

As the project activity generates revenue without CDM and the alternative to the project does not involve investments, the selected benchmark analysis and financial indicator of post tax equity-IRR is deemed appropriate.

#### Benchmark selection

The project activity being an electricity generation project based on wind energy, which could also be developed by an entity other than the project participant, the benchmark should be based on publicly available data sources /27/. In line with this, the benchmark of expected return on equity derived from the Capital Asset Pricing Model (CAPM) considering beta values of power generating companies in India, that were listed at the time of the investment decision have been considered for arriving at the benchmark of 16.84% for the post tax equity-IRR /18/.

The risk free bond rate of 7.98 % per annum, the average rate for the period of June to September 2009 has been taken for arriving at the benchmark, which were the latest quarterly figures available at the time of decision. Since the bond rates were fluctuating from 7.78 to 8.19% during the quarter, the average quarterly values were applied by PP. The bond rates considered have been checked to be correct from the latest RBI published data available at the time when the proposal was considered /39/.

At the time of decision making, data on the listed companies having core business in wind power generation was not available. Hence, the data available from listed companies involving a wider sector of power generation, including renewable and non renewable energy was considered for beta value calculation.

The equity beta (coefficient reflecting the volatility of the stock relative to the market) is calculated using BSE 200 index since its inception. The 5 year BSE data (2004 to 2009) of Tata Power Company Ltd., Reliance Energy/Infrastructure Ltd, CESC and Gujarat Industrial Power Company Ltd., Energy Development Company Ltd. was considered for beta calculation. The beta value thus calculated works out to 1.17.

The market return of 15.55% is the compounded annual return of BSE 200 index since its inception, which is the least among the Bombay Stock Exchange indices - SENSEX, BSE 100, BSE 200 and BSE 500. The input values used for the computation of market return was verified from the official website of Bombay Stock Exchange /40/. Similarly the list of companies taken for computing the beta value was verified from the web site of Bombay stock exchange /40/. The beta values are sourced from Bloomberg web site and screenshots /36/ of the same are provided in the PDD /1/.

In India, power sector indices with long term data is not available. The stock exchanges have only recently started publishing index for power sector comprising of companies in the power sector business and one such index available is BSE POWER index /40/, launched in November 2007 with index data available from January 2005. Since this index had less than 5 year data available at the time of decision in November 2009, project participant did not consider it for benchmark determination. DNV verified that CAGR return of BSE Power index for 5 year period from January 2005 to November 2009 workouts to 26.1% against the 18.2% used in benchmark calculation (15.5% return of BSE200 \* beta of 1.17), hence the choice of the benchmark is conservative.



The worksheet for benchmark calculation /18/ has been evidenced and all input parameters and calculations have been verified by DNV to be correct. The benchmark identified to compare the financial attractiveness of the project activity has been verified and found to be appropriate.

### Input parameters

The investment analysis has been performed for 20 years, which is the expected life time of the project activity /3/ and the input parameters considered are investment cost, annual operation and maintenance costs, income tax and revenue from power generation.

The assumptions used in the investment analysis are deemed appropriate and the values were verified/cross-checked from the documents shown in the following table.

Inputs values	Value used for financial analysis	Documents verified/cross-checked
Total investment cost of 63 WEGs of 800 kW each	INR 2 990.61 million (INR 59.34 million/MW)	The investment cost was verified from the commercial offer of EIL /2/ and the loan sanction letter from IDFC, in which the total project cost is stated to be INR 2920 million /13/. The investment cost was also cross checked against the actual cost incurred from the orders placed on EIL for the supply, civil works, erection and commissioning of the WEGs /6/, aggregating to INR 2 872.8 million, which is 96% of the project cost. DNV cross checked the project cost from the recently registered projects in Tamilnadu – INR 56.75 million/MW for Grid connected wind energy project in Tamil Nadu by Super Wind Project Private Ltd. (3884), INR 61.33 million/MW for Grid connected wind energy project in Tamil Nadu by Simran Wind Project Private Ltd. (4209) and 66.1 million/MW for Wind power project at Tamilnadu by Powerica Limited (3327). Based on the above discussion DNV concludes that the investment cost is appropriate.
Electricity Tariff	fixed tariff of INR 3.39/kWh	The tariff was verified from the detailed project report /4/ and was cross-checked against the power purchase agreements /16/ and TNERC tariff order, applicable for the WEGs commissioned after 1 April 2009 /35/. As per the tariff order of TNERC, the calculated levelized tariff for 20 years is 3.39 INR/kWh for the WEGs commissioned from 1 April 2009 onwards. The commission accordingly approved a tariff of INR 3.39/kWh for 20 years /35/. Further, PP has given a letter of undertaking for no third party sale from the project activity /14/. Considering TNERC's cost plus approach for tariff and the levelized cost of generation estimated for the 20 years being 3.39 INR/kWh, the consideration of 3.39 INR/kWh for the financial



		<p>analysis for 20 years is justified.</p> <p>Generation based incentive (GBI) of 0.50 INR/kWh with cap of INR 6.2 Million per MW applicable for the independent power producers (IPPs) supplying to the grid was verified from the web site of IREDA /41/. Though GBI was not considered at the time of decision making, consideration of revenue from GBI in the financial analysis is deemed conservative.</p>
Plant load factor	24.83%	<p>The PLF of 24.83% was verified from the report of third party consultant M/s Centre for Wind Energy Technology(C-WET) /9/ and is in line with the <i>Guidance on reporting and validation of PLF</i> /31/. Since the PLF of the project determined by the third party at 24.83% is marginally higher than the 24.26% available to the PP at the time of decision making, the PP used PLF of 24.83% for financial analysis conservatively. DNV also verified from the TNERC order of 2006 /35/ that the estimated capacity utilization for the high capacity WEGs at the Shencotta Pass, under which the project activity falls is 24.96%.</p>
Operation and maintenance cost	1.3% of the project cost from 2 <sup>nd</sup> year with an annual escalation of 6%	<p>The O&amp;M cost is based on the EIL's proposal /2/, according to which no charges are payable for the 1<sup>st</sup> year, INR 0.617 million/WEG (1.3%) for the 2<sup>nd</sup> year and 6% yearly escalation up to the end of 10<sup>th</sup> year. Since the escalation in O&amp;M cost for 10<sup>th</sup> year onwards is not stated in EIL's proposal, PP has considered the same 6% for the remaining period as well. The O&amp;M cost was crosschecked against the TNERC tariff order dated 20 March 2009 /35/, which considered the normative O&amp;M cost of 1.1% with an annual escalation of 5%. The values considered by TNERC are marginally lower than the values considered for investment analysis, but have no material impact on investment analysis as discussed in sensitivity analysis.</p>
Insurance	0.12%	<p>The insurance cost of 0.12% of the capital cost was verified from the quotation from United India Insurance Co Ltd. /23/. The insurance cost was cross checked against the TNERC order of 2006 /35/, which provides an insurance cost of 0.75% with a annual reduction of 5% per annum.</p>
Debt: equity ratio	70:30	<p>The debt: equity ratio of 70:30 was verified from the detailed project report /4/ dated 25 November 2009 and the same was available with the investors at the time of decision to proceed with the project on 28 November 2009 /5/. The debt: equity ratio was cross checked</p>



		against the loan sanction letter from IDFC dated 30 April 2010 /13/ and the value was found to be same.
Interest rate on loan	11.5%	The interest rate on the term loan (11.5%) was verified from the detailed project report /4/. The interest rate was cross checked against the loan sanction letter from IDFC dated 30 April 2010 /13/, in which the interest rate was stated to be 11.11% (benchmark lending rate of IDFC, 8.8% + 3.3%). The marginal difference in the actual interest rate has no material impact on the additionality.
Loan tenure	10 years	The loan repayment period of 10 years was verified from the detailed project report /4/ dated 25 November 2009. The loan tenure was cross checked against the loan sanction letter from IDFC /13/, which provides a 12 year repayment period. The sensitivity analysis with a loan repayment period of 12 years shows that the equity-IRR comes down from 6.23% to 5.91%.
Depreciation & salvage value	Straight line depreciation was considered in line with the prevailing national regulation and the residual value (10%) is accounted during the 20 <sup>th</sup> year.	The straight line depreciation and salvage values are verified from the detailed project report /4/ and cross-checked against the Indian Income Tax Act 1961 /38/. The accelerated depreciation rate is not claimed by PP, since it proposes to claim generation based incentive (GBI) hence is not eligible for the accelerated depreciation /41/. 10 year tax holiday available for the power projects has been considered. Residual value (10% of the project cost) has been accounted during the 20 <sup>th</sup> year.
Taxes	The income tax @ 33.99% and minimum alternative tax @ 17% has been considered	The income tax rates were verified from the detailed project report /4/ and cross-checked against the Indian Income Tax Act 1961 /38/.

Furthermore, DNV cross-checked the project cost of INR 59.34 million/MW from the recently registered projects in Tamil Nadu: INR 56.75 million/MW for Grid connected wind energy project in Tamil Nadu by Super Wind Project Private Ltd. (Registration no. 3884), INR 61.33 million/MW for Grid connected wind energy project in Tamil Nadu by Simran Wind Project Private Ltd. (Registration no. 4209) and 66.1 million/MW for Wind power project at Tamilnadu by Powerica Limited (Registration no. 3327) /46/. DNV consider the project cost comparable with other similar projects.

In line with the Guideline on Investment Analysis, /29/, which states the “*Input values used in all investment analysis should be valid and applicable at the time of the investment decision taken by the project participant*”, DNV verified the input parameters to be valid at the time of decision making based on the above mentioned documents.



### Calculation and conclusion

Based on the input parameters stated above, the post tax equity-IRR without CDM revenues has been calculated to be 6.23%, which is lower than the applied benchmark of 16.84% (post tax). The IRR calculations were provided in a spreadsheet /17/. The calculation was verified by DNV and has been found to be correct.

### Sensitivity analysis

A sensitivity analysis has been performed in order to check the robustness of the financial analysis for reasonable variations in parameters contributing more than 20% to the project costs or project revenues. The values were varied till the benchmark was reached and the likelihood for that to happen was assessed. No significant positive correlations between the parameters are anticipated.

a) **Project cost:** The equity-IRR touches the benchmark with a 31.5% decrease in the project cost. Since the purchase order has already been placed on EIL and the actual investment cost verified from the purchase orders totals INR 2 872.8 million, (96.04% of the estimated cost), such reduction in investment cost is not possible.

b) **Plant load factor:** The equity-IRR touches the benchmark with a PLF of 37.42% (50.7% increase). The plant load factor of 24.83% considered in the financial analysis is based on the PLF determined by C-WET /9/, the third party consultant and marginally higher than the PLF of 24.26% used in detailed project report /4/. Further, as per the 2006 tariff order of TNERC, the highest PLF of 31.64% is recorded is at the Muppandal Pass /35/. Thus, 50.7% increase in plant load factor is deemed unlikely.

c) **Tariff:** The equity-IRR crosses the benchmark if the tariff increases by 50.7%. The tariff is fixed at INR 3.39/kWh for 20 years, as verified from the PPAs /16/ and TNERC tariff order /35/. Considering that TNERC fixed a tariff of INR 3.39/kWh for 20 years, based on the estimated levelized cost of generation, the tariff is unlikely to be higher than INR 3.39/kWh.

Based on the assessment of the above, it was DNV opinion that the increase in tariff by 50.7% increase is unlikely.

d) **Operation and maintenance cost:** The O&M costs are very small and have insignificant impact on the IRR. It has been verified that even with O&M cost of 0%, the equity-IRR improves only to 9.68%, which is lower than the benchmark. Since the operation and maintenance quality is essential to achieve the objectives of the project activity, reduction in O&M costs to 0% is not possible.

The spreadsheet for financial analysis including the assumptions for the sensitivity analysis /17/ has been verified by DNV and no material mistakes were found. The sensitivity analysis shows that even with likely variations of the key input parameters, the post tax equity-IRR of the proposed project is lower than the benchmark. In conclusion, the assessment of the arguments presented is deemed to sufficiently demonstrate that the project is not financially attractive.

#### 4.6.4 Common practice analysis

The generation of wind energy depends on local or region specific wind patterns and the tariff regime prevalent in the region/state. The wind tariff and other regulations concerning installations are governed by the respective state regulatory commissions in India. The project activity is located in the state of Tamil Nadu and exports power to the state grid. Hence the





wind mills in this region (Tamil Nadu) have been considered for common practice analysis. Since the policies and tariff regime is consistent throughout the state of Tamil Nadu, DNV considers the selection of the region is appropriate. Wind project capacity additions in the state of Tamil Nadu after September 2001 has been considered for the common practice analysis. In the state of Tamil Nadu, prior to September 2001 the installation of wind based power projects were governed by the Ministry of Non Conventional Energy Sources (MNES) guidelines for tariff fixation which provided for 5% escalation in tariff every year. After September 2001, TNERC is following a fixed tariff regime, that there is no automatic increase in tariff every year as was available earlier /35/. Hence it is deemed reasonable that wind power projects installed prior to September 2001 are not considered for common practice analysis.

The project activity falls under the category of large scale projects as per CDM methodology as the installed capacity is above the limit of 15 MW for small scale projects. So the activities similar to the project activity are considered as those with installed capacity more than 15 MW in Tamil Nadu. As per the Directory of Indian Windpower 2009 /44/, there are 44 wind projects of capacity 15 MW and above, in the state of Tamil Nadu, installed after September 2001. All these projects except one (a VCS project) have considered CDM while implementation. The details with CDM links of all these projects has been verified by DNV from the web site of UNFCCC and UNEP Risoe CDM Pipeline /45/.

In conclusion, it is DNV's opinion that it has been correctly demonstrated that the project activity does not represent a common practice and thus the emission reductions achieved by the project are additional to any would happen in absence of the project.

From the above discussion it can be concluded that the project is not a business-as-usual scenario and thus additional.

## 4.7 Monitoring

The project applies the approved monitoring methodology ACM0002 version 12.1.0, *Consolidated Baseline methodology for grid connected electricity generation from renewable sources* /26/. Given that the emission factor is calculated *ex-ante* and according to the monitoring methodology ACM0002 version 12.1.0, the data to be monitored is the net electricity supplied to the grid ( $EG_{PJ,y}$ ) by the project.

The net electricity supplied to the grid ( $EG_{PJ,y}$ ) is stated to be calculated from electricity exported by project activity to grid, after apportioning of transmission losses ( $T_E$ ) between the 33 kV and 110 kV metering points, electricity export recorded at 33kV cluster metering points ( $EG_{export}$ ), electricity import recorded at 33kV cluster metering points ( $EG_{import}$ ), electricity export recorded at 110 kV meters at Enercon pooling substation ( $Y$ ) and total percentage of transmission loss for export between the metering point at 33 kV metering points and the metering point at 110 kV at the Enercon pooling substation ( $Z$ ).

The PP will make clusters of WEGs at the project site for the purpose of metering. Each cluster will have a meter. All the clusters of the project activity will exclusively be connected to WEGs of the project activity - no WEGs of other project owners are connected to these clusters. The clusters of project activity and clusters of other customers are connected to the Enercon pooling sub-station at Pillayarkulam with a bulk metering point at 110 kV. State utility calculates the net electricity supplied to the grid at the 110 kV Enercon substation by apportioning of transmission loss to the meter reading recorded at the 33 KV. The total % of



transmission loss for export between 110 kV metering point at Enercon sub-station and all the WEGs connected to sub-station is calculated by the state utility is endorsed jointly by the representatives of Enercon and the state utility. The transmission loss applied to the project activity by the state utility is reflected in transmission loss calculation sheet signed by the representatives of Enercon and state utility.

The procedure for calculation of the transmission loss is as follows:

Each project developer has dedicated individual metering systems at 33 kV. Energy export ( $X_i$ ) is recorded for the individual developers at 33 KV metering point; where  $i$  is number of project developers connected to 110 kV metering point of the Enercon substation. Total % of line loss for export ( $Z$ ) is calculated as per following formula:

$$Z (\%) = \frac{\{(X_1 + X_2 + X_3 + X_4 + \dots + X_N) - Y\} * 100}{(X_1 + X_2 + X_3 + X_4 + \dots + X_N)}$$

**Line Loss ( $T_E$ )** = Percentage Line Loss \* Net Export recorded at 33kV metering point of project activity

$$T_E = Z * (EG_{export} - EG_{import})$$

The net electricity exported by project activity to the grid after apportioning transmission losses between 33 kV metering point (Cluster meter) & 110 kV metering point (Bulk meter)

$$EG_{PJ,y} = EG_{export,y} - EG_{import,y} - T_E$$

The electricity export and import by the project activity is recorded in the joint meter reading (by PP and state utility) report and can be cross checked from the invoices raised on the state utility for the supply of net electricity to the grid.

The monitoring plan stated in the PDD is feasible and the project participants have ability to implement it. The monitoring plan is in accordance with the monitoring methodology and will give opportunity for real measurements of achieved emission reductions. Since the project involves electricity generation from wind sources, no monitoring is required for project emissions or leakages due to the project activity.

The project monitoring plan is in compliance with the monitoring methodology ACM0002 (version 12.1.0).

It is DNV's opinion, that the project participant is able to implement the monitoring plan.

#### 4.7.1 Parameters determined ex-ante

Data available at the time of validation is the CO<sub>2</sub> emission factor of the southern grid, combined margin value, taken from version 5 of CEA published data in November 2009 /32/.

DNV has verified the value used against the sources and concluded that the data used are appropriate and conservative. This has been further described in section 4.8 of the report.





#### 4.7.2 Parameters monitored ex-post

The parameter that will be monitored *ex-post* is the net electricity exported to the grid by the project activity.

#### 4.7.3 Management system and quality assurance

The main and check electricity meters of 0.2S class accuracy will be used. Monthly Joint Meter Readings will be recorded at all the meters (cluster meters and at pooling substations) by state utility in the presence of VIPCL/Enercon. Maintenance and calibration of electricity meters will be calibrated once in a year, which has been verified from the PPAs /16/.

EIL is responsible for the complete operation and maintenance of the power plant. EIL is an ISO 9001:2000 certified quality management system from Germanischer Lloyd. The meter readings are noted in the form of joint meter report and are signed jointly by the representatives of Enercon and the state utility.

The accuracy of monitoring parameter is ensured by adhering to the calibration and testing of the metering equipment once each year. Enercon provides the daily generation report to the project proponent. The project proponent also maintains the records of daily generation report and joint meter report.

The responsibilities and authorities for project management, procedures for monitoring and reporting, and QA/QC procedures have been established and formalized. The data monitored under the monitoring plan would be kept for 2 years after the end of crediting period or till the last issuance of CERs for this project activity, whichever occurs later.

### 4.8 Algorithms and/or formulae used to determine emission reductions

The calculations and formulae as addressed in the approved baseline and monitoring methodology ACM0002 (version 12.1.0) have been applied. All aspects related to the direct and indirect GHG emissions as relevant to the project activity have been addressed and are presented in a transparent manner, in line with the approved methodology.

Baseline emission: The combined margin emission coefficient for the southern grid of India is 0.94515 tCO<sub>2</sub>e/MWh, has been derived from Central Electricity Authority data version 5 /32/. DNV verified that this is the latest version of CEA data available at the time of publishing the PDD for global stakeholder consultation. The CEA, Ministry of Power, Government of India has published a database of carbon dioxide emission factors from the power sector in India based on detailed authenticated information obtained from all operating power stations in the country. This database i.e. the CO<sub>2</sub> baseline database provides information about the OM and BM factors of all the regional electricity grids in India. DNV confirms that the database is an official publication of the Government of India for the purpose of CDM baselines. The OM of 0.98756 tCO<sub>2</sub>e/MWh is calculated *ex-ante* using the simple OM approach based on the generation-weighted average emissions per electricity unit of all fossil-fuelled generating sources serving the system over a three year period of 2006-2007, 2007-2008 and 2008-2009. BM of 0.81792 tCO<sub>2</sub>e/MWh is calculated *ex-ante* based on 20% most recent capacity additions in the grid based on net generation as described in ACM0002. Actual calorific values of coal and lignite have been used and their emission factors were based on the values provided in India's Initial National Communication under the UNFCCC. For all other fuels, default emission factors were derived from the IPCC 2006 guidelines. In line with the "Tool



to calculate the grid emission factor for an electricity system" /28/, the low end values of the 95% confidence intervals indicated by IPCC were used.

DNV was able to verify the value of combined margin from the OM and BM values for southern grid stated in the version 5 of Central Electricity Authority published data /32/.

The GHG emission reduction due to the project activity has been calculated as the product of net electricity exported to the grid and the combined margin grid emission factor. The electricity supplied to the grid will be measured by the main electricity meter and cross checked against check meter. DISCOM/state utility calculates the net electricity exported to the grid after accounting for the transmission and imports and issues a certified statement. The amount of net electricity supplied to the grid will be verified against the certified statement issued by the Discom/state utility.

The baseline emission estimate can be replicated using the data and parameter values referenced to in the PDD. The data sources mentioned have been verified by DNV. The emissions sources not foreseen by the methodology is unlikely to contribute more than 1% of the estimated emission reductions of the project.

Project emission: Project emissions are not applicable for the wind energy generators.

Leakage: It has been addressed and verified by DNV that no transfer of equipment has taken place in the project activity, thus leakage is not involved in the project activity as per the methodology.

Based on the calculations and results presented in the sections above the implementation of the project activity will result in an average *ex-ante* estimation of emission reduction conservatively calculated to be 103 612 tCO<sub>2</sub>e per year for the selected crediting period.

All assumptions and data used by the project participants are listed in the PDD and/or supporting documents, including their references and sources. All documentation used by the project participants as the basis for assumptions and source of data is correctly quoted and interpreted in the PDD. All values used in the PDD are considered reasonable in the context of the proposed CDM project activity. The baseline methodology has been applied correctly to calculate project emissions, baseline emissions, leakage and emission reductions. All estimates of the baseline, project and leakage emissions can be replicated using the data and parameter values provided in the PDD.

## 4.9 Environmental impacts

As per the Ministry of Environment and Forests (MoEF), notification S.O. 1533 dated 14 September 2006 /34/, wind power projects are not covered under any Schedule and thus EIA is not required for the project activity. Further, the proposed project being a wind energy generation, no adverse impact on the environment is envisaged from the project activity. Thus, the project activity is expected to have only beneficial impacts and no adverse impacts are foreseen. All the PPAs /16/, approval of TNEB for power evacuation /8/ etc. have been provided and verified by DNV.

## 4.10 Comments by local stakeholders

The project participants have conducted stakeholders meeting at the project site on 23 February 2010. The stakeholders were invited through an advertisement in the local newspaper



“Daily Thanti” /19/ and invitation letters /21/. The meeting was attended among others by project participant, employees of EIL, village panchayat members, representatives from TNEB and local residents. The copy of the minutes of the stakeholder meeting /20/ and photographs were made available for verification. There were no negative comments from the participants.

DNV considers the local stakeholder consultation carried out adequately.

#### **4.11 Comments by Parties, stakeholders and NGOs**

The PDD, version 01 dated 22 March 2010, was made publicly available on the CDM website <http://cdm.unfccc.int/Projects/Validation/DB/DLXOPS48VLRQTOQINA3FABCGMWXRM7/view.html> and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period from 15 April 2010 to 14 May 2010.

No comments were received.

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## APPENDIX A

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### CDM VALIDATION PROTOCOL

**Table 1 Mandatory requirements for Clean Development Mechanism (CDM) project activities**

Requirement	Reference	Conclusion
<b>About Parties</b>		
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	<del>CAR-1</del> OK
2. The project shall assist non-Annex I Parties in contributing to the ultimate objective of the UNFCCC.	Kyoto Protocol Art.12.2.	OK
3. The project shall have the written approval of voluntary participation from the designated national authority of each Party involved.	Kyoto Protocol Art. 12.5a, CDM Modalities and Procedures §40a	<del>CAR-1</del> OK
4. 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, CDM Modalities and Procedures §40a	OK
5. 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 result in a diversion of official development assistance and is separate from and is not counted towards the financial obligations of these Parties.	Decision 17/CP.7, CDM Modalities and Procedures Appendix B, § 2	OK
6. Parties participating in the CDM shall designate a national authority for the CDM.	CDM Modalities and Procedures §29	OK
7. The host Party and the participating Annex I Party shall be a Party to the Kyoto Protocol.	CDM Modalities §30/31a	OK
8. The participating Annex I Party's assigned amount shall have been calculated and recorded.	CDM Modalities and Procedures §31b	OK
9. 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	OK
<b>About additionality</b>		
10. Reduction in GHG emissions shall be additional to any that would occur in the 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	Kyoto Protocol Art. 12.5c, CDM Modalities and Procedures §43	OK

Requirement	Reference	Conclusion
that would have occurred in the absence of the registered CDM project activity.		
<b>About forecast emission reductions and environmental impacts</b>		
11. The emission reductions shall be real, measurable and give long-term benefits related to the mitigation of climate change.	Kyoto Protocol Art. 12.5b	OK
<b>For large-scale projects only</b>		
12. Documentation on the analysis of the environmental impacts of the project activity, including transboundary impacts, shall be submitted, and, if those impacts are considered significant by the project participants or the Host Party, an environmental impact assessment in accordance with procedures as required by the Host Party shall be carried out.	CDM Modalities and Procedures §37c	OK
<b>About stakeholder involvement</b>		
13. Comments by local stakeholders shall be invited, a summary of these provided and how due account was taken of any comments received.	CDM Modalities and Procedures §37b	OK
14. Parties, stakeholders and UNFCCC accredited NGOs shall have been invited to comment on the validation requirements for minimum 30 days, and the project design document and comments have been made publicly available.	CDM Modalities and Procedures §40	OK
<b>Other</b>		
15. The baseline and monitoring methodology shall be previously approved by the CDM Executive Board.	CDM Modalities and Procedures §37e	OK
16. A baseline shall be established on a project-specific basis, in a transparent manner and taking into account relevant national and/or sectoral policies and circumstances.	CDM Modalities and Procedures §45c,d	OK
17. The baseline methodology shall exclude to earn CERs for decreases in activity levels outside the project activity or due to force majeure.	CDM Modalities and Procedures §47	OK
18. Provisions for monitoring, verification and reporting shall be in accordance with the modalities described in the Marrakech Accords and relevant decisions of the COP/MOP.	CDM Modalities and Procedures §37f	OK

**Table 2 Requirements checklist**

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
<b>A General description of project activity</b>						
<b>A.1 Title of the project activity (VVM para 55-57)</b>						
A.1.1	Does section A.1 of the PDD include a clearly identifiable project title, version number of the PDD and date of the PDD?	/1/	DR	<input checked="" type="checkbox"/> Clearly identifiable title of the project activity <input checked="" type="checkbox"/> Version number of the PDD is included <input checked="" type="checkbox"/> Date of the PDD is included.		OK
A.1.2	Is the PDD is in accordance with the applicable requirements for completing PDDs?	/1/	DR	<input checked="" type="checkbox"/> Yes <i>If no, list where the PDD is not in accordance:</i>		OK
<b>A.2 Description of the project activity (VVM para 58-64)</b>						
A.2.1	How was the design of the project assessed?	/1/	DR	<i>What type is the project?</i> <input type="checkbox"/> Project in existing facility or utilizing existing equipment(s) <input checked="" type="checkbox"/> Large scale project <input type="checkbox"/> bundled small scale projects, each with emission reductions not exceeding 15 000 tCO <sub>2</sub> e per year <input type="checkbox"/> individual small scale project activity with emission reductions not exceeding 15 000 tCO <sub>2</sub> e per year <input checked="" type="checkbox"/> Greenfield project  <i>How was the design of the project assessed?</i> <input type="checkbox"/> Physical site inspection <input checked="" type="checkbox"/> Reviewing available designs and feasibility studies		OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				<p>The proposed CDM project activity entails installation of 63 numbers of Wind Energy Generators each of 800 kW capacities (E-53 model) totaling 50.4 MW. The WEGs to be installed under the project have been designed, installed and commissioned by Enercon India Limited. The electricity generated will be exported to the southern grid of India.</p> <p>This is a greenfield project, wherein, the site activities are yet to be started. Since the project is in the preliminary stages and the hardware is yet to be installed at site, the site visit was not deemed necessary.</p>		
A.2.2	If a greenfield project, describe the physical implementation of the project when the validation was commenced.	/1/	DR	At the time of commencement of the validation, the purchase orders were placed on EIL and the preparations are on for starting the civil works.		OK
A.2.3	If physical site visits were performed based on sampling (only applicable for bundled small scale projects, each with emission reductions not exceeding 15 000 tCO <sub>2</sub> e per year), justify the sampling through a statistical analysis:	/1/	DR	Not applicable since the project activity is not a bundled small scale project.		OK
A.2.4	Is the description of the proposed CDM project activity as contained in the PDD sufficiently covers all relevant elements, is accurate and that it provides the reader with a clear understanding of the nature of the proposed CDM project activity?	/1/	DR	<p>Yes. The proposed CDM project activity entails installation of 63 numbers of Wind Energy Generators each of 800 kW capacities (E-53 model) totaling 50.4 MW. The electricity generated will be exported to the southern grid of India.</p> <p>Unique identification number of WEGs and their geographical co-ordinates to be indicated in the PDD. Name of the substations to which the project activity are connected also to be indicated.</p>	<del>CL1</del>	OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
A.2.5	Does the project activity involve alteration of existing installations? If so, have the differences between pre-project and post-project activity been clearly described in the PDD?	/1/	DR	The project is a green field project activity and so this is not applicable		OK
A.2.6	Does the project design engineering reflect current good practices?	/1/	DR	The wind farm utilizes 63 machines of Enercon model E-53 WEG of 800 kW capacities which are approved by Centre for Wind Energy Technology, Government of India.		OK
A.2.7	Would the technology result in a significantly better performance than any commonly used technologies in the host country? Is any transfer of technology from any Annex-I Party involved?	/1/	DR	Yes. The equipment supply and erection are by suppliers and contractors who are experienced in the field. There is no technology transfer from Annex-I party.		OK
<b>A.3 Participation requirements (VVM para 51-54, 123-125)</b>						
A.3.1	Do all participating Parties fulfil the participation requirements as follows:  a) Party has ratified the Kyoto Protocol b) Party has designated a Designated National Authority c) The assigned amount has been determined	/1/ /24/	DR	Letter of Approval from the DNA of India need to presented for verification.  India (host)  <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No	<del>CAR-1</del>	OK
A.3.2	Do the letters of approval meet the following requirements?  a) LoA confirms that Party has ratified the Kyoto Protocol b) LoA confirms that participation is voluntary c) The LoA confirms that the project contributes to the sustainable development of the host country? d) The LoA refers to the precise project activity title in the PDD e) The LoA is unconditional with respect to (a) to (d) above	/1/ /24/	DR	Letter of Approval from the DNA of India need to presented for verification.  India (host)  <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No	<del>CAR-1</del>	OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
f) The LoA is issued by the respective Party's DNA g) The LoA was received directly by the DNA or the PP h) In case of doubt regarding the authenticity of the letter of approval, describe how it was verified that the letter of approval is authentic	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> DNA <input type="checkbox"/> PP				
A.3.3 Have all private/public project participants been authorized by an involved Party?	/1/	DR	Letter of Approval from the DNA of India need to presented for verification.	<del>CC-I</del>	OK
<b>A.4 Technical description of the project activity (VVM para 58-64)</b>					
A.4.1 Is the project's location clearly defined?	/1/	DR	Yes, the project's spatial boundaries are defined. The project activity is spread across Vagaikulam, Kuruchikulam, Marandi, Ettankulam, Kalakudi, Muthammalpuram and Ukkirankottai villages in Tirunelveli district in state of Tamil Nadu, India. Unique identification number of WEGs and their geographical co-ordinates to be indicated in the PDD. Name of the substations to which the project activity are connected also to be indicated.	<del>CC-I</del>	OK
<b>A.5 Public funding of the project activity</b>					
A.5.1 In case public funding from Parties included in Annex I is used for the project activity, have these Parties provided an affirmation that such funding does not result in a diversion of official development assistance and is separate from and is not counted towards the financial obligations of these Parties?	/1/ /14/	DR	The project does not involve any public funding and hence no diversion of funds from official development assistance is expected. VIPCPL has also given an undertaking on non usage of official development assistance for the project activity.		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
<b>B Application of a baseline and monitoring methodology</b>					
<b>B.1 Methodology applied (VVM para 65-76)</b>					
B.1.1 Does the project apply an approved methodology and the correct version thereof?	/1/ /26/	DR	The project correctly applies the approved baseline methodology "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" ACM0002, version 11 for large scale CDM projects. The version 11 of the applied methodology ACM0002 is expiring on 17 May 2011. Therefore PP is requested to update the PDD to the new version of the methodology.	CAR-4	OK
<b>B.2 Applicability of methodology (and tools) (VVM para 65-76)</b> <i>Insert a row for each applicability criteria of the applied methodology (and tools)</i>					
B.2.1 How was it validated that project complies with the following applicability criteria: The methodology is applicable to grid connected renewable power generation project activities that (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).	/1/ /26/	DR	The project activity is installation of WEG for generation of power from wind energy to supply to the grid and is a green field project.		OK
B.2.2 How was it validated that project complies with the following applicability criteria: The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power	/1/ /26/	DR	The project activity is a green field project that uses wind energy to generate electricity and so this clause is not applicable.		OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit;					
B.2.3	How was it validated that project complies with the following applicability criteria: In the case of capacity additions, retrofits, replacements: the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity.	/1/ /26/	DR	The project activity is a green field project that uses wind energy to generate electricity and so this clause is not applicable		OK
B.2.4	How was it validated that project complies with the following applicability criteria: The methodology is not applicable to the following a) Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site b) Biomass fired power plants c) Hydro power plants that result in new reservoir or increase in existing reservoirs where the power density of the power plant is less than 4 W/m <sup>2</sup> .	/1/ /26/	DR	The project activity is a green field project that uses wind energy to generate electricity and so this clause is not applicable		OK
B.2.5	Is the selected baseline on of the baseline(s) described in the methodology and this hence confirms the applicability of the methodology?	/1/ /26/	DR	Yes. The baseline selected is the equivalent addition of new generation capacity to the grid generating emissions in the absence of the project activity.		OK
<b>B.3 Project boundary (VVM para 77-79)</b>						
B.3.1	What are the project's system boundaries (components and facilities used to mitigate GHGs)? Are they clearly defined and in accordance with the methodology?	/1/	DR	Yes, the project's spatial boundaries are defined. The project activity is spread across Vagaikulam, Kuruchikulam, Marandi, Ettankulam, Kalakudi villages in Tirunelveli district in state of		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			Tamilnadu, India. The spatial boundary of the project also includes transmission network for the evacuation of electricity to the southern grid of India, to which the project activity is connected.		
B.3.2 Which GHG sources are identified for the project? Does the identified boundary cover all possible sources linked to the project activity? Give reference to documents considered to arrive at this conclusion.	/1/ /6/ /32/	DR/I	The project system boundaries are clearly defined and consist of the 63 machines of Enercon model E-53 WEG of 800 kW capacities each. The spatial boundary also includes the southern regional grid of India to which the project is connected. This is as per the version 5 of CEA data.  Since the power is being generated from wind energy there are no GHG emission sources in the project activity.		OK
B.3.3 Does the project involve other emissions sources not foreseen by the methodologies that may question the applicability of the methodology? Do these sources contribute with more than 1% of the estimated emission reductions of the project?	/1/	DR/I	No. The project activity is generation of electricity for supply to grid using wind energy and so does not involve any other emission source not foreseen by the methodology.		OK
<b>B.4 Baseline scenario determination (VVM para 80-87, 103-105)</b>					
B.4.1 Which baseline scenarios have been identified? Is the list of baseline scenarios complete?	/1/	DR/I	Yes the baseline alternatives identified are inline with applied methodology ACM0002 version 11 and tool to demonstrate additionality version 5.2. As per the tool to demonstrate additionality version 5.2 in context of approved consolidated methodology ACM0002, project proponent only need to identify that there is at least one credible and feasible alternative that would be more attractive than the proposed project activity. Inline with tool and methodology project proponent has identified following alternatives:		OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				<ul style="list-style-type: none"> <li>Project activity not taken up as CDM project he project.</li> <li>Equivalent amount of electricity being generated through operation of grid-connected power plants and addition of new generation sources.</li> </ul>		
B.4.2	How have the other baseline scenarios been eliminated in order to determine the baseline?	/1/	DR/I	According to the methodology, there is only one baseline scenario. Hence this is not applicable.		OK
B.4.3	What is the baseline scenario?	/1/ /32/	DR/I	<p>The baseline scenario identified is the emissions generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the “Tool to calculate the emission factor for an electricity system”.</p> <p>The combined margin emission factor for the southern regional grid of India has been sourced from CEA database version 05.</p>		OK
B.4.4	Is the determination of the baseline scenario in accordance with the guidance in the methodology?	/1/ /26/	DR/I	Yes the baseline scenario identified is inline with applied methodology ACM0002 version 11.		OK
B.4.5	Has the baseline scenario been determined using conservative assumptions where possible?	/1/ /26/	DR/I	Yes the baseline scenario identified is inline with applied methodology ACM0002 version 11.		OK
B.4.6	Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies, macro-economic trends and political aspirations?	/1/ /26/	DR/I	Yes, national and sectoral policies have been taken into consideration for selecting the baseline scenario.		OK
B.4.7	Is the baseline scenario determination compatible with the available data and are all literature and sources clearly referenced?	/1/ /26/ /32/	DR/I	The combined margin emission factor for the southern regional grid of India has been sourced from CEA database version 05 and the value applied is 0.94515 tCO <sub>2</sub> e/MWh.		OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.4.8	Is the baseline determination adequately documented in the PDD? <ul style="list-style-type: none"> <li>All assumptions and data used by the project participants are listed in the PDD and related document to be submitted for registration. The data are properly referenced.</li> <li>All documentation is relevant as well as correctly quoted and interpreted.</li> <li>Assumptions and data can be deemed reasonable</li> <li>Relevant national and/or sectoral policies and circumstances are considered and listed in the PDD.</li> <li>The methodology has been correctly applied to identify what would occurred in the absence of the proposed CDM project activity</li> </ul>	/1/ /26/ /32/	DR/I	Inline with the applied methodology ACM0002 version 11, the baseline scenario identified is electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the “Tool to calculate the emission factor for an electricity system”. The combined margin emission factor for the southern regional grid of India has been sourced from CEA database version 05 and the value applied is 0.94515 tCO <sub>2</sub> e/MWh.		OK
<b>B.5 Additionality determination (VVM para 93-119)</b>						
B.5.1	What approach/tool does the project use to assess additionality? Is this in line with the methodology?	/1/ /27/	DR	The tool for demonstration and assessment of additionality version 5.2 has been used. Yes this is in line with the methodology		OK
B.5.2	Have the regulatory requirements correctly been taken into account to evaluate the project activity and the alternatives?	/1/	DR/I	Yes the regulatory requirements have been taken into account to evaluate the alternatives to the project activity.		OK
B.5.3	Is sufficient evidence provided to support the relevance of the arguments made?	/1/	DR/I	Yes. The relevant approvals have been provided for verification and this has been verified and found to be in order by DNV.		OK
B.5.4	What is the project additionality mainly based on (Investment analysis or barrier analysis)?	/1/ /17/ /18/	DR/I	The project additionality has been mainly based on investment analysis.		OK
<b>Prior consideration of CDM (VVM para 96-102)</b>						
B.5.5	What is the evidence for serious consideration of CDM prior	/1/	DR/I	The start date of the project activity (5 December		OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
to the time of decision to proceed with the project activity?		/6/ /8/ /9/ /33/		2009) is after 2 August 2008 and on 3 March 2010, the PP has notified the DNA and UNFCCC of the intention to seek CDM status for the project activity. The confirmation email was received from UNFCCC and DNA on 9 June 2010 and 15 March 2010 respectively. This demonstrates prior consideration of CDM for the project activity.		
B.5.6	If the starting date is after 2 August 2008 and before the global stakeholder consultation, has the DNA and UNFCCC confirmed that the project participants have informed in writing of the project's intention to seek CDM status?	/1/ /6/ /8/ /9/ /33/	DR/I	The start date of the project is 5 December 2009, which is after 2 August 2008. On 3 March 2010, PP notified the DNA and UNFCCC of the intention to seek CDM status for the project activity. The confirmation email was received from UNFCCC and DNA on 9 June 2010 and 15 March 2010 respectively		OK
<b>Continuous efforts to secure CDM status (only to be completed if starting date is before 2 August 2008)</b>						
B.5.7	What initiatives were taken by the project participants from the starting date of the project activity to the start of validation in parallel with the physical implementation of the project activity?	/1/ /6/	DR/I	The start date of the project activity is 5 December 2009, which is after 2 August 2008 and so this is not applicable.		OK
B.5.8	When did the construction of the project activity start?	/1/ /6/	DR/I	The start date of the project activity is 5 December 2009, which is after 2 August 2008 and so this is not applicable.		OK
B.5.9	When was the project commissioned?	/1/	DR/I	The start date of the project activity is 5 December 2009, which is after 2 August 2008 and so this is not applicable.		OK
B.5.10	Does the timeline of the project confirm that continuous actions in parallel with the implementation were taken to secure CDM status?	/1/	DR/I	The start date of the project activity is 5 December 2009, which is after 2 August 2008 and so this is not applicable.		OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
<b>Investment analysis (VVM para 106-112)</b> <i>The list of questions below must be adjusted to the parameters in the investment analysis relevant to the project under validation.</i>						
B.5.11	Does the project activity or any of the remaining alternatives generate revenues apart from CDM? Is this reflected in the PDD?	/1/ /17/ /27/	DR/I	Yes. The project activity generates revenue from sale of power to the grid and the same is mentioned in the PDD.		OK
B.5.12	Do any of the alternatives to the project activity involve investment? Is this reflected in the PDD?	/1/	DR/I	Yes. The alternative to the project activity require investment and this is indicated in the PDD.		OK
B.5.13	Is the choice of benchmark analysis, investment comparison or simple cost analysis correct?	/1/ /18/ /27/	DR/I	Yes. The benchmark analysis has been chosen by PP to demonstrate the additionality of the project. However, PP requested to elaborate on sub-step 2a and 2b of the additionality tool in selecting the choice of investment analysis. The details of the benchmark calculation including the risk free rate, equity returns and beta values applied also need to be detailed in the PDD.	CAR-2	OK
B.5.14	Is the benchmark/discount rate the latest available at the time of decision?	/1/ /18/ /29/	DR/I	The cost of equity is stated to be used as benchmark for the project. The PLR and equity returns considered are that at the time of decision making.		OK
B.5.15	What is the financial indicator? Is it on equity/project basis? Before/after tax? Is the financial indicator in correspondence with the benchmark?	/1/ /17/	DR/I	The financial indicator selected by the PP for the investment analysis is the post tax equity-IRR. However, PP is requested to justify the use of post tax equity-IRR as the benchmark, since the equity portion is only 30%.	CAR-2	OK
B.5.16	Are the underlying assumptions appropriate, e.g. what is considered as waste in the baseline is considered to have zero value?	/1/	DR/I	This is not applicable as the project activity is electricity generation from wind energy.		OK
B.5.17	Does the income tax calculation take depreciation into	/1/	DR/I	Yes. Income tax calculation considers		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
account? Is the depreciation year in accordance with normal accounting practice in the host country?	/38/		depreciation as permissible under the income tax act. The depreciation considered is as per the accounting practice allowable for such type of projects as per the Income tax act.		
B.5.18 Is the time period of the investment analysis and operating time of the project realistic? Has salvage value been taken into account? Is working capital returned in the last year of operation?	/1/ /3/	DR/I	20 years operating life has been considered which is realistic for WEG. Enercon has given an undertaking on this. Salvage value has been added back during the 20 <sup>th</sup> year. The working capital has also been added back in the last year of operation.		OK
B.5.19 When a feasibility study report or similar approved by the government is used as the basis for the investment analysis: Can it be confirmed that the values used in the PDD are fully consistent with the FSR and is the period of time between finalization of the FSR and the investment decision adequate?	/1/ /4/ /5/	DR/I	The investment decision was made on the basis of the detailed project report (DPR). However, in India, the DPR does not require the approval of the government. The DPR for the project activity was prepared on 25 November 2009, whereas the purchase order was placed on 5 December 2009. Considering the short period of time between the DPR and the decision to proceed with the project activity, it is reasonable to assume that the DPR was the basis for the investment decision. The value of PLF indicated in the DPR (24.26%) and the PDD (24.83%) are different.	<del>CL-2</del>	OK
B.5.20 How was the amount of output (e.g. sales of electricity) assessed? Remember to include all the data sources used and list all the projects that have been used for cross-checking in accordance with VVM paragraph 95.	/1/	DR/I	<input type="checkbox"/> The plant load factor provided to banks and/or equity financiers while applying the project activity for project financing, or to the government while applying the project activity for implementation approval <input checked="" type="checkbox"/> The plant load factor determined by a third party contracted by the project participants (e.g. an engineering company) <input type="checkbox"/> Other approach. The PLF is determined by C-WET, the third party	<del>CL-2</del>	OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				engaged by the PP. Copy of the report of C-WET was provided for verification. However, PP is requested to clarify the reasons for the difference in the value of PLF indicated in the DPR (24.26%) and in the report of C-WET (24.83%) used in the investment analysis.		
B.5.21	How was the output price (e.g. electricity price) assessed? Were the data available and valid at the time of decision? Remember to include all the data sources used and list all the projects that have been used for cross-checking in accordance with VVM paragraph 95.	/1/ /39/	DR/I	<input type="checkbox"/> Cross-check against third-party or publicly available sources (e.g. invoices or price indices) <input type="checkbox"/> Review of feasibility reports, public announcements and annual financial reports related to the project and the project participants The electricity tariff considered is based on the latest tariff order of TNERC as at the time of decision making.		OK
B.5.22	How were the investment costs assessed? Were the data available and valid at the time of decision? Remember to include all the data sources used and list all the projects that have been used for cross-checking in accordance with VVM paragraph 95.	/1/ /2/ /4/ /6/	DR/I	<input type="checkbox"/> Cross-check against third-party or publicly available sources (e.g. invoices or price indices) <input checked="" type="checkbox"/> Review of feasibility reports, public announcements and annual financial reports related to the project and the project participants The investment costs were assessed based on the offer from Enercon for the supply of WEGs and the DPR. It was cross checked against the purchase order placed on Enercon. However, PP is requested to justify the reasonableness of the investment cost by comparing it with the order value of similar projects at that time.	<del>CL-3</del>	OK
B.5.23	How were the O&M costs assessed? Were the data available and valid at the time of decision? Remember to include all the data sources used and list all the projects that have been used for cross-checking in accordance with VVM paragraph	/1/ /2/ /4/	DR/I	<input type="checkbox"/> Cross-check against third-party or publicly available sources (e.g. invoices or price indices) <input checked="" type="checkbox"/> Review of feasibility reports, public announcements and annual financial reports	<del>CL-3</del>	OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
95.			<p>related to the project and the project participants</p> <p>The other input parameters were also sourced from DPR and are relevant at the time of decision. The references to the input parameters are indicated in the PDD and IRR spreadsheet.</p> <p>The O&amp;M costs were assessed based on the offer from Enercon for the same and with that considered in the DPR.</p> <p>However, the PP is requested to provide copies of the PPA and O&amp;M contract awarded for verification.</p>		
<p>B.5.24 Describe the assessment of the other input parameters. Were the data available and valid at the time of decision? Remember to include all the data sources used and list all the projects that have been used for cross-checking in accordance with VVM paragraph 95.</p>	<p>/1/ /4/ /13/</p>	DR/I	<p><input type="checkbox"/> Cross-check against third-party or publicly available sources (e.g. invoices or price indices)</p> <p><input checked="" type="checkbox"/> Review of feasibility reports, public announcements and annual financial reports related to the project and the project participants</p> <p>The other input parameters such as debt to equity ratio, interest on loan, depreciation and salvage value were also sourced from DPR and are relevant at the time of decision. The references to the input parameters are indicated in the PDD and IRR spreadsheet.</p> <p>However, the PP is requested to provide copy of supporting document for the insurance charges for verification. Further, PP is requested to clarify the mismatch in the loan re-payment period of 12 years stated in the loan sanction letter of IDFC and 10 years considered in the DPR and financial analysis.</p> <p>PP is also requested to clarify why the generation based subsidy of Rs. 0.50/kWh is not considered in the financial analysis.</p>	<del>CL-3</del>	OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.5.25	Was the financial calculation spreadsheet verified and found to be correct?	/1/ /17/	DR/I	The financial calculation spread sheet has been checked and clarifications raised.	<del>CL-3</del>	OK
B.5.26	Sensitivity analysis: Have the key parameters contributing to more than 20% of the revenue/costs during operating or implementation been identified? Has possible correlation between the parameters been considered?	/1/ /17/	DR/I	PP has carried a sensitivity analysis to analyse the effect of $\pm 10\%$ variation in electricity generation, debt equity ratio and capital cost of the project. However, in the PDD, it is stated that sensitivity analysis need not be done for tariff since TNEB has fixed the tariff for 20 years. PP is requested to perform the sensitivity analysis for tariff also considering that PPA is yet to be signed. Sensitivity analysis of the major identified parameters to be performed till the point at which they reach the benchmark and provide the justification on why such a scenario is unlikely.	<del>CL-3</del>	OK
B.5.27	Sensitivity analysis: Is the range of variations is reasonable in the project context?	/1/ /17/	DR	Please refer to B.5.26	<del>CL-3</del>	OK
B.5.28	Have the key parameters been varied to reach the benchmark and the likelihood of this to happen been justified to be small?	/1/ /17/	DR	Please refer to B.5.26	<del>CL-3</del>	OK
<b>Barrier analysis (VVM para 113-116)</b>						
B.5.29	Are the barriers identified complimentary to a potential investment analysis? Does the barrier have a clear impact on the financial returns so that it can be assessed in an investment analysis? Each barrier is discussed separately.	/1/	DR/I	PP has not identified other barriers for the project activity.		OK
B.5.30	How were the <u>investment barriers</u> assessed to be real? Are the investment barriers substantiated by a source independent of the project participants?	/1/	DR/I	The project does face barrier due to insufficient financial returns.		OK
B.5.31	How does CDM alleviate the investment barriers?	/1/	DR/I	Revenues from CDM help to improve the returns from the project activity and bridge the gap with	<del>CL-3</del>	OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	/17/		the benchmark. PP is requested to assess the IRR with CDM and compare the same with the bench mark in the PDD and excel sheet. Furthermore, justification for investing.		
B.5.32 Is the project activity prevented by the investment barriers and at least one of the possible alternatives to the project activity is feasible under the same circumstances?	/1/	DR/I	The project activity does face investment barrier and none of the possible alternatives to the project activity are feasible under the same circumstances.		OK
B.5.33 How were the <u>technological barriers</u> assessed to be real? Are the technological barriers substantiated by a source independent of the project participants?	/1/	DR/I	The project activity does not face any technological barrier and so this is not applicable.		OK
B.5.34 How does CDM alleviate the technological barriers?	/1/	DR/I	The project activity does not face any technological barrier and so this is not applicable.		OK
B.5.35 Is the project activity prevented by the technological barriers and at least one of the possible alternatives to the project activity is feasible under the same circumstances?	/1/	DR/I	The project activity does not face any technological barrier and so this is not applicable		OK
B.5.36 How were the <u>barriers due to prevailing practise</u> assessed to be real? Are the barriers due to prevailing practise substantiated by a source independent of the project participants?	/1/	DR/I	The project activity does not face any barrier due to prevailing practice and so this is not applicable.		OK
B.5.37 How does CDM alleviate the barriers due to prevailing practise?	/1/	DR/I	The project activity does not face any barrier due to prevailing practice and so this is not applicable.		OK
B.5.38 Is the project activity prevented by the barriers due to prevailing practise and at least one of the possible alternatives to the project activity is feasible under the same circumstances?	/1/	DR/I	The project activity does not face any barrier due to prevailing practice and so this is not applicable.		OK
B.5.39 How were the <u>other barriers</u> assessed to be real? Are the other barriers substantiated by a source independent of the project participants?	/1/	DR/I	The project activity does not face any barrier due to prevailing practice and so this is not applicable.		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.5.40 How does CDM alleviate the other barriers?	/1/	DR/I	The project activity does not face any barrier due to prevailing practice and so this is not applicable.		OK
B.5.41 Is the project activity prevented by the other barriers and at least one of the possible alternatives to the project activity is feasible under the same circumstances?	/1/	DR/I	The project activity does not face any barrier due to prevailing practice and so this is not applicable.		OK
<b>Common practice analysis (VVM para 117-119)</b>					
B.5.42 What is the geographical scope of the common practice analysis? Is this justified?	/1/	DR/I	The geographical scope considered is the wind mill project of above 15MW in the state of Tamil Nadu, under Regime 2 i.e. after September 2001. Prior to September 2001, the tariff was governed by the MNES policy with INR 3.6/kWh and 5% annual escalation. From 2001, the TNEB tariff regime came into force, with a fixed tariff of INR 2.7, which was revised to INR 2.9 in 2006. The selection of the region, regime and scale are appropriate.		OK
B.5.43 What is the scope of technology and size (e.g. capacity of power plant) for the common practice analysis and how has this been justified?	/1/	DR/I	The choice of the capacity is project having total wind mill capacity of 15 MW and above.		OK
B.5.44 What is the data source(s) used for the common practice analysis?	/1/	DR/I	The data for common practice analysis is sourced from the CDM pipeline. PP is requested to substantiate from other public data that there are no other projects implemented in the category without CDM benefits. Further, all the hyperlinks provided to the projects needs to be operational.	<del>CL</del> 4	OK
B.5.45 How many similar non-CDM-projects exist in the region within the scope?	/1/	DR/I	Refer to B.5.44	<del>CL</del> 4	OK
B.5.46 How were possible essential distinctions between the project activity and similar activities assessed?	/1/	DR/I	Refer to B.5.44	<del>CL</del> 4	OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.5.47 What is the conclusion of the common practice analysis?	/1/	DR/I	To conclude after receipt of the data and clarifications sought from the PP and its subsequent analysis.	<del>CL</del> 4	OK
<b>Conclusion</b>					
B.5.48 What is the conclusion with regard to the additionality of the project activity?	/1/	DR/I	To conclude after receipt of the data and clarifications sought from the PP and its subsequent analysis.	<del>CAR</del> 2 <del>CL</del> 3 <del>CL</del> 4	OK
<b>B.6 Calculations of GHG emission reductions</b>					
<b>Data and parameters that are available at validation and that are not monitored (VVM para 198-200)</b>					
B.6.1 How was the $EF_{OM,y}$ Operating Margin Emission Factor of southern Electricity Grid verified?	/1/	DR/I	The OM emission factor has been computed using the simple OM approach based on the generation-weighted average emissions per electricity unit over a three year period of 2006-2007, 2007-2008 and 2008-2009 available in the CEA database version 5, for the southern grid. The <i>ex-ante</i> value is 0.98756 t CO <sub>2</sub> /MWh. DNV verified the website of CEA and find the calculation to be in order.		OK
B.6.2 How was the $EF_{BM,y}$ Build Margin Emission Factor of the southern Electricity Grid verified?	/1/	DR/I	The BM emission factor using the simple OM approach in accordance with "Tool to calculate the emission factor for an electricity system from CEA database version 5. The <i>ex-ante</i> value for the southern electricity grid is 0.81792 t CO <sub>2</sub> /MWh. DNV verified the website of CEA and find the calculation to be in order.		OK
B.6.3 How was the $EF_y$ Emission Factor for the southern grid of India verified?	/1/	DR/I	The baseline emission factor for the project has been calculated as the weighted average of the operating margin (OM) and the build margin (BM) in the ratio of 75:25 as		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			applicable for wind projects. The CM thus arrived is 0.94515 t CO <sub>2</sub> /MWh. DNV verified the calculation and found it to be in order.		
B.6.4 Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR/I	<p>Baseline emissions have been estimated as the product of net electricity supplied to the southern regional grid by the project activity per year and grid emission factor of the southern regional grid, which has been obtained from the official website of the Central Electricity authority (CEA) <i>CO<sub>2</sub> Baseline Database for the Indian Power Sector User Guide - Version 5.0.</i></p> <p>Baseline emission factor for the southern regional grid is established ex-ante based on the approved methodology using a combined margin approach consisting 75% operating margin and 25% build margin approach.</p> <p>The baseline emission factor for the project has been calculated as the weighted average of the operating margin (OM) and the build margin (BM) in the ratio of 75:25 as applicable for wind projects. The CM thus arrived is 0.94515 t CO<sub>2</sub>/MWh.</p>		OK
<b>Baseline emissions (VVM para 88-92)</b>					
B.6.5 Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR/I	Yes. The baseline emission calculations is in accordance with the baseline methodology		OK
B.6.6 Have conservative assumptions been used when calculating the baseline emissions?	/1/	DR/I	Yes. Conservative assumptions have been used while calculating the baseline emissions.		OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.6.7	Are uncertainties in the baseline emission estimates properly addressed?	/1/	DR/I	There are no uncertainties in the baseline emissions.		OK
<b>Project emissions (VVM para 88-92)</b>						
B.6.8	Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR/I	Since the project activity is electricity generation from wind energy there is no project GHG emission and this complies with the methodology with respect to project emission computation.		OK
<b>Leakage (VVM para 88-92)</b>						
B.6.9	Are the leakage calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR/I	This is not applicable as the project activity is electricity generation from wind energy		OK
<b>Emission Reductions (VVM para 88-92)</b>						
B.6.10	Algorithms and/or formulae used to determine emission reductions: <ul style="list-style-type: none"> <li>All assumptions and data used by the project participants are listed in the PDD and related document submitted for registration. The data are properly referenced</li> <li>All documentation is correctly quoted and interpreted.</li> <li>All values used can be deemed reasonable in the context of the project activity</li> <li>The methodology has been correctly applied to calculate the emission reductions and this can be replicated by the data provided in the PDD and supporting files to be submitted for registration.</li> </ul>	/1/	DR/I	All the assumptions and data used by the project participants are listed in the PDD and the data are properly referenced.		OK
<b>B.7 Monitoring plan (VVM para 120-122)</b>						
<b>Data and parameters monitored</b>						
B.7.1	Do the means of monitoring described in the plan comply with the requirements of the methodology?	/1/	DR/I	Yes. The monitoring described meets the requirement of the methodology.		OK
B.7.2	Does the monitoring plan contains all necessary parameters,	/1/	DR/I	Yes. The monitoring plan contains all parameters		OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
and are they clearly described?				that are to be monitored and are clearly described.		
B.7.3	In case parameters are measured, is the measurement equipment described? Describe each relevant parameter.	/1/	DR/I	Yes. All energy meters (main and check meter) used for metering in the project activity are of 0.5%/0.2% accuracy class and are of electronic trivector type meters.  PP is requested to specify the accuracy class of the meters proposed to be used for monitoring, whether 0.2 or 0.5 class. Whether main and check meters are provided for the individual WEGs or a common meter for the 63 WEGs is provided needs to be clarified.	<del>CL-5</del>	OK
B.7.4	In case parameters are measured, is the measurement accuracy addressed and deemed appropriate? Describe each relevant parameter.	/1/	DR/I	The measurement accuracy is adequate for the measurement of electricity fed to the grid and is in keeping with the practice adopted for such measurements in the region.  PP is requested to specify the accuracy class of the meter proposed to be used, whether 0.2 or 0.5 class.	<del>CL-5</del>	OK
B.7.5	In case parameters are measured, are the requirements for maintenance and calibration of measurement equipment described and deemed appropriate? Describe each relevant parameter.	/1/	DR/I	It is mentioned that TNEB carries out the calibration and periodical testing of the meter. It is also stated that the frequency of meter testing is annual..		OK
B.7.6	Is the monitoring frequency adequate for all monitoring parameters? Describe each parameter.	/1/	DR/I	The electricity fed to the grid is measured continuously and this is adequate. The joint meter reading at sub station taken every month forms the basis for determining the quantity of electricity fed to the grid.		OK
B.7.7	Is the recording frequency adequate for all monitoring parameters? Describe each parameter.	/1/	DR/I	The electricity generation is measured and captured on real time basis and recorded monthly.		OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
<b>Ability of project participants to implement monitoring plan</b>						
B.7.8	How has it been assessed that the monitoring arrangements described in the monitoring plan are feasible within the project design?	/1/	DR/I	The monitoring arrangements detailed in the PDD are executable.		OK
B.7.9	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/I	Yes. For the operation and maintenance of the facility contract has been entered with Enercon (India) Limited. The QA/QC procedures indicated in Annex 4 need to be further formalized by including the roles and responsibilities of the officials of Enercon and PP, data archival, internal audits, procedures to correct erroneous readings etc.	<del>CAR-3</del>	OK
B.7.10	Are the data management and quality assurance and quality control procedures sufficient to ensure that the emission reductions achieved by/resulting from the project can be reported ex post and verified?	/1/	DR/I	Yes. The systems and procedures detailed are adequate to ensure the verification of emissions reductions from the project activity.		OK
B.7.11	Will all monitored data required for verification and issuance be kept for two years after the end of the crediting period or the last issuance of CERs, for this project activity, whichever occurs later?	/1/	DR/I	Please refer to B.7.9	<del>CAR-3</del>	OK
<b>Monitoring of sustainable development indicators/ environmental impacts</b>						
B.7.12	Is the monitoring of sustainable development indicators/ environmental impacts warranted by legislation in the host country?	/1/	DR/I	The recent DNA approvals for large scale CDM projects in India mentions that 2% of the revenue be spent for sustainable development, including society/community development. Accordingly, action plan for the same is required to be made and included in the PCN & PDD. PP is requested to provide the DNA approval and PCN for confirmation. The action plan needs to	<del>CL-6</del> <del>CAR-1</del>	OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			be included in the PDD.		
B.7.13 Does the monitoring plan provide for the collection and archiving of relevant data concerning environmental, social and economic impacts?	/1/	DR/I	The monitoring plan does not provide for the collection and archiving of relevant data concerning environmental, social and economic impacts and this is not warranted by the current legislation.  However PP is requested to detail the action plan for monitoring 2% of the CER revenue to be spent on sustainable development activities for the local population and provide a copy of the PCN.	<del>CL-6</del>	OK
B.7.14 Are the sustainable development indicators in line with stated national priorities in the host country?	/1/	DR/I	The Letter of approval from the DNA of India needs to be submitted for verification.	<del>CAR-1</del>	OK
<b>C Duration of the project activity / crediting period</b>					
<b>C.1.1 Start date of project activity (VVM para 96-97, 102)</b>					
C.1.2 How has the starting date of the project activity been determined? What are the dates of the first contracts for the project activity? When was the first construction activity?	/1/	DR/I	The start date of the project activity is stated to be 5 December 2009, which is the date of issue of work order for supply of WEGs.		OK
C.1.3 Is the stated expected operational lifetime of the project activity reasonable?	/1/ /3/	DR/I	Operational lifetime of the project has been mentioned as 20 years which is reasonable and has been verified by DNV from certificate provided by technology supplier.		OK
C.1.4 Is the start date, the type (renewable/fixed) and the length of the crediting period clearly defined and reasonable?	/1/	DR/I	The start date of the crediting period is 1 April 2011 or registration date whichever is later. PP has opted for a fixed crediting period of 10 years duration.		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
<b>D Environmental Impacts (VVM para 129-131)</b>					
D.1.1 Are there any host country requirements for an Environmental Impact Assessment (EIA), and if yes, is an EIA approved? Does the approval contain any conditions that need monitoring?	/1/	DR/I	Indian legislation in vogue does not warrant an EIA to be done for this type of project activity. PP is requested to provide the agreement for the land and other clearances.	<del>CL</del> 7	OK
D.1.2 Does the project comply with environmental legislation in the host country?	/1/ /34/	DR/I	As per the Ministry of Environment and Forests (MoEF), India Environment Impact Notification S.O. 1533 dated 14 September 2006, wind power projects are not covered under any schedule and thus environmental impact assessment is not required for the project activity.  As per the present statues no specific environmental clearances are required for wind energy based power generation projects in India		OK
D.1.3 Will the project create any adverse environmental effects?	/1/	DR/I	Being wind energy based power project, the project is not expected to have any significant impact on the environment		OK
D.1.4 Have identified environmental impacts been addressed in the project design?	/1/	DR/I	No negative impact has been identified.		OK
<b>E Stakeholder Comments (VVM para 126-128)</b>					
E.1.1 Have relevant stakeholders been consulted?	/1/ /19/ /20/ /21/	DR/I	Yes. Stake holders meeting was held at Tirunelveli on 23 February 2010.		OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
E.1.2	Have appropriate media been used to invite comments by local stakeholders?	/1/ /19/ /20/ /21/	DR/I	Yes. The invitation for the stake holder meeting was published in local language news paper Daily Thanti on 8 February 2010. Personal invitations were also sent to the local villagers.		OK
E.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/I	This is not specifically required for wind power projects as per current Indian legislation.		OK
E.1.4	Is a summary of the stakeholder comments received provided?	/1/	DR/I	A summary of the comments received has been provided in the PDD.		OK
E.1.5	Has due account been taken of any stakeholder comments received?	/1/	DR/I	No adverse comments have been received		OK

**Table 3 Resolution of corrective action requests and clarification requests**

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
<b>CAR 1</b> Letter of Approval from the DNA of India need to be presented for verification.	A.3.1 A.3.2 A.3.3 B.7.12 B.7.14	The copy of Host Country approval has been provided to DoE for verification.	OK Copy of the host country approval from DNA of India dated 22 December 2010 has been provided for verification /24/. DNV also verified the approval of the project from the official web site of the national CDM Authority of India /43/. CAR 1 is closed.
<b>CAR 2</b> PP is requested to elaborate on sub-step 2a and 2b of the additionality tool in selecting the choice of investment analysis. However, PP is requested to justify the use of post tax equity-IRR as the benchmark, since the equity portion is only 30%.	B.5.13 B.5.15 B.5.42	<p>The project activity generates revenue by selling electricity to TNEB, thus simple cost analysis (option I) cannot be applied to the proposed CDM project activity.</p> <p>The alternative to the project activity is continuation of current situation, i.e. no project activity and equivalent amount of energy would have been produced by the grid electricity system. This alternative will not require capital investment; hence investment comparison analysis (option II) cannot be applied.</p> <p>In this case the benchmark analysis (option III) is most appropriate.</p> <p>The same description has been incorporated in the PDD.</p>	OK. The revised PDD /1/ presents the elaboration of sub-step 2a and 2b in selection of investment analysis, in accordance with the additionality tool. PP has selected post tax equity-IRR as the benchmark for the investment analysis and the justification of its selection is detailed in the updated PDD /1/. The selection of the risk free rate, equity returns and beta values applied in the calculation of benchmark for investment analysis have been presented in the updated PDD /1/. The selection of benchmark and the input values used in its calculation are in line with the additionality tool and guidance on investment analysis /27/, /29/. CAR 2 is closed.



Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		<p>The project is envisaged with the mix of debt and equity. The decision to invest or not to invest is taken by the equity investor who then approaches for debt funding in the market. Considering the fact that the debt funding is less risky and have the first right on the revenues; the equity investor is the one who has to value the risk associated with the project and the expected returns after repayment of debt and expenses and the taxes. The decision will be made by the equity investor only in case the project meets its equity return. In accordance with investment guidance, <i>“If the alternative to the project activity is the supply of electricity from a grid this is not to be considered an investment and a benchmark approach is considered appropriate”</i>. Therefore in accordance with the investment guidance, the relevant parameter for project proponent is equity returns that can be compared against the benchmark cost of equity (Required/expected returns on equity).</p>	
<p><b>CAR 3</b></p> <p>The QA/QC procedures indicated in Annex 4 of the PDD need to be further formalized by including the roles and responsibilities of the officials of Enercon and PP, data archival, internal audits, procedures to correct erroneous readings etc.</p>	<p>B.7.9 B.7.11</p>	<p>The project proponent is Vaayu (India) Power Corporation Private Limited. The PP will be keeping and monitoring the data for electricity generation and calibration reports post project implementation. Enercon (India) Limited will be the O&amp;M</p>	<p>OK</p> <p>The annex 4 of the PDD has been updated /1/ to describe the roles and responsibilities of PP and Enercon with respect to data archiving, internal audits and procedures to address erroneous data.</p> <p>CAR 3 is closed.</p>

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		contractor who will be having the responsibility for activities such as maintaining electricity generation records, calibration records and maintenance of the WEGs (Wind Energy Generators). The QA/QC procedures has been revised to detail the responsibility of the PP and Enercon in respect of data archiving, internal audits and procedures to address data uncertainty in annex 4 of the PDD.	
<b>CAR 4</b> The version 11 of the applied methodology ACM0002 is expiring on 17 May 2011. Therefore PP is requested to update the PDD to the new version of the methodology.	B.1.1	The PDD has been updated to version 12.1.0 of ACM0002, considering expiry of version 11 on 17 May 2011.	OK. The PDD version 4 dated 15 March 2011 /1/, with applied methodology updation to version 12.1.0 has been provided for validation. CAR 4 is closed.
<b>CL 1</b> Unique identification number of WEGs and their geographical co-ordinates to be indicated in the PDD. Name of the substations to which the project activity are connected also to be indicated.	A.2.4 A.4.1	We have provided all 63 coordinates in the PDD (Appendix 1). The name of substation to which the project activity will be connected has been mentioned in Annex 4 of the PDD.	OK The coordinates of all the 63 WEGs are provided in the revised PDD /1/ as Appendix 1. The PDD /1/ is revised to include the name of Pillyarkulam.at 110 kV substation, to which the project activity will be connected. CL 1 is closed.
<b>CL 2</b> The PP is requested to clarify the difference in value of PLF used in the DPR (24.26%) and 24.83% used in the investment analysis.	B.5.19 B.5.20	The PLF of 24.26% was provided by the supplier which was used in the DPR for evaluation of the project. The feasibility study on PLF was also conducted by Centre for Wind Energy Technology (Independent third party), which has provided the	OK PP clarified that the PLF of 24.26% indicated in the DPR /4/ is based on the details provided by Enercon, the WEG supplier. Thereafter, PP engaged the third party consultant C-WET to undertake study on the PLF at the site. The PLF estimated

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Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		estimate of 24.83% at the selected project site. Further EB 48, annex 11 also states that PLF estimated by the third party shall be used for substantiating additionality. Therefore conservatively PLF of 24.83% is selected for investment analysis. .	by C-WET for the project activity - 22.28% /9/ has been used in the financial analysis /17/ and is conservative. CL 2 is closed.
<p><b>CL 3</b></p> <p>PP is requested to justify the reasonableness of the investment cost by comparing it with the order value of similar projects at that time.</p> <p>The PP is requested to provide copies of the PPA and O&amp;M contract awarded for verification.</p> <p>The PP is requested to provide copy of supporting document for the insurance charges for verification.</p> <p>Further, PP is requested to clarify the mismatch in the loan re-payment period of 12 years stated in the loan sanction letter of IDFC and 10 years considered in the DPR and financial analysis.</p>	<p>B.5.22 B.5.23 B.5.24 B.5.25 B.5.26 B.5.27 B.5.28 B.5.31</p>	<p>The comparison for project cost (Purchase Order Cost) is provided by the PP to the DoE for other similar projects that have placed orders during the same time as that of the project activity. If required, copies of Purchase Orders would be provided for cross verification.</p> <p>The copies of nine PPAs signed for the WEGs commissioned have been provided to DoE.</p> <p>The project is at its nascent stage and the O&amp;M contract will be signed during the implementation phase of the project activity. As these documents are presently not available, the PP will provide the documents to the DoE during the first verification.</p> <p>The insurance charges are based on the quotation of a major insurance company provided by the company to Enercon (India) Limited for its wind farms the Same cost is used in the DPR and the investment analysis. The quotation is provided to the DOE for verification.</p> <p>The loan repayment period was assumed as 10 years for the project activity. The loan repayment period of 10 years is accepted</p>	<p>OK</p> <p>PP has provided the cost details of seven wind projects, for which purchase orders were placed between 2 Nov 2009 and 15 May 2010 /22/. DNV verified that cost of the project activity is comparable with the other projects.</p> <p>The copies of the PPAs have been provided to DNV for verification /16/.</p> <p>PP clarified that O&amp;M contract is yet to be signed and the same will be made available during the 1<sup>st</sup> verification of the project activity.</p> <p>The insurance charges for the project activity have been verified from the copy of the offer received from the United Insurance Company Ltd. /23/.</p> <p>PP clarified that the loan sanction letter from IDFC /13/ provides for a loan repayment period of 12 years, though 10 year repayment period was considered in</p>

MoV = Means of Verification, DR= Document Review, I= Interview, CC= Cross-Checking

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
<p>PP needs to clarify why the generation based subsidy of Rs. 0.50/kWh is not considered in the financial analysis.</p> <p>PP is requested to perform the sensitivity analysis for tariff also considering that PPA is yet to be signed.</p>		<p>norm for power sector projects and is envisaged by Central Electricity regulatory commission and State Electricity Regulatory commission. However, in actual the PP was able to secure loan from IDFC for period of 12 years. To capture the deviation, the PP has included the sensitivity analysis at loan tenure of 12 years in the PDD.</p> <p>As per order on generation based incentive, the PP can get incentive of Rs. 0.50 per kWh which is capped to the extent of 6.2 Million per MW and maximum of 1.55 Million per MW each year.</p> <p>Further, generation based incentive does not allow for accelerated depreciation of 80% in case of which normal depreciation of 15% will apply.</p> <p>GBI is included in investment analysis in the revised spreadsheet.</p> <p>Tamilnadu state electricity commission has fixed the tariff for the period of 20 years (Lifetime) for the wind power projects and the order is upto 31 Mar 2011. The tariff for the entire life of the project activity is fixed a Rs. 3.39 per kWh as per current tariff order in force and all the projects that are commissioned up to 31 Mar 2011 are covered under the order. The PPA signed with state utility also confirms the tariff of INR 3.39/kWh for 20 years. The sensitivity analysis has been done for tariff also as suggested by DoE.</p>	<p>the DPR /4/. The sensitivity analysis shows that with 12 year loan repayment tenure, the IRR falls to 4.19% against 5.05% with 8 year repayment tenure /17/.</p> <p>The revised PDD /1/ and financial analysis spreadsheet takes into account GBI of INR 0.5/kWh /17/ capped to the extent of 6.2 Million per MW.</p> <p>PP revised the financial analysis to include the sensitivity analysis for capital cost, PLF, debt-equity ratio, O&amp;M cost and tariff.</p> <p>Further, PP has presented the IRR with CDM revenues in the revised financial spreadsheet.</p> <p>CL 3 is closed.</p>

MoV = Means of Verification, DR= Document Review, I= Interview, CC= Cross-Checking

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
Sensitivity analysis of the major identified parameters to be performed till the point at which they reach the benchmark and provide the justification on why such a scenario is unlikely PP to indicate the IRR with CDM and compare the same with the bench mark in the PDD and excel sheet. Furthermore, justification for investing in projects in unviable projects need to be provided.		The sensitivity analysis is extended to the point at which the equity IRR crosses the benchmark cost of equity. The justification of the reasonable variation that can be unexpected is also included in the PDD. As per the PDD guideline version 07, the IRR with CDM is not required to be presented in the PDD. However, for DOE's information we have presented below the IRR with carbon revenues. The Excel spreadsheet is also submitted to the DOE. IRR with Carbon revenues –19.00%	
<b>CL 4</b> PP is requested to substantiate from other public data that there are no other projects implemented in the category without CDM. Further, the all the hyperlinks provided in the PDD to the projects needs to be operational.	B.5.44 B.5.45 B.5.46 B.5.47 B.5.48	The candidate CDM project activity is a large scale project and hence an analysis of all private wind farm owners with an installed capacity of 15 MW or above in the state of Tamil Nadu and are implemented in similar investment regime has been presented in the PDD. The data has been selected from the Wind Power Directory which provides the details of wind farm owners in India. Hyperlinks for all such projects have been provided in the PDD.	OK The revised PDD identifies the web site of Wind Power India /42/ as the source of data used in the common practice analysis. Hyperlinks for all the projects referred in the common practice analysis have been provided in the revised PDD /1/. CL 4 is closed.
<b>CL 5</b> PP is requested to specify the accuracy class of the meter proposed to be used, whether 0.2 or 0.5 class. Whether main and check meters are provided for the individual WEGs or a common meter for the 63 WEGs is provided needs to be clarified.	B.7.3 B.7.4	The accuracy class of the meters will be 0.2 and same has been corrected in the PDD.  The PP will make clusters of WEGs at the project site for the purpose of metering. Each cluster will have main and the check meter. All the clusters will exclusively be connected to WEGs of the project activity	OK PP clarified that the electricity meters (main and check) used for the project activity will be of 0.2 class and the same has been stated in the revised PDD /1/ as well. PP further clarified that clusters will be formed for a group of WEGs and each cluster will have separate meters. PP modified the monitoring plan /1/ in line

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		i.e. there will be no WEGs of other project owners connected to these clusters. Summation of meter reading for all the clusters (connecting 63 machines) will provide total electricity generated by the project activity.	with the billing methodology adopted by the state utility. CL 5 is closed.
<b>CL 6</b> PP is requested to detail the action plan for monitoring 2% of the CER revenue to be spent on sustainable development activities for the local population and provide a copy of the PCN.	B.7.12 B.7.13	The action plan for monitoring the use of 2% CER revenue for sustainable development has been provided in the PDD. The copy of PCN is provided for reference of DoE.	OK The revised PDD /1/ details the proposal to spend 2% of the CER revenue on sustainable development activities for the local population. Copy of the PCN provided for verification. CL 6 is closed.
<b>CL 7</b> PP is requested to provide the agreement for power evacuation and other clearances for the project.	D.1.1	The copies of the power evacuation approval from TNEB and PPAs have been provided to DOE for verification.	OK The copies of the power evacuation approval from TNEB /8/ and PPAs /16/ have been provided for verification. CL 7 is closed.

**Table 4 Forward action requests**

Forward action request	Reference to Table 2	Response by project participants
<b>No FAR is raised</b>		

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## **APPENDIX B**

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### **CURRICULA VITAE OF THE VALIDATION TEAM MEMBERS**

**Mr. Murali Govindarajulu** holds a Bachelor's Degree in Chemical Engineering and has done a Short term diploma course in Management. Having an overall experience of around eleven years. Prior to joining DNV having around seven years experience in Chemical process industry covering production, energy efficiency improvement and equipment design erection and commissioning. His experience also covers the fields of environmental management and resource conservation including identification of alternative fuels. He has also been actively involved in implementation of Management Systems such as ISO 140001 and OHSAS 18001 standards in chemical process industry for more than three years.

He has experience of around 4 years in validation and verification of numerous CDM projects in DNV, both in India & abroad. His qualification, industrial experience and experience in CDM demonstrate his sufficient sectoral competence in energy generation from renewable energy sources.

**Mr. Ravi Kumar Prabhu** holds Bachelor's Degree in Chemical Engineering and has done Post Graduate Diploma course in Management and has an overall working experience of around twenty five years. Prior to joining DNV has around twenty three years experience in Chemical process industry (fertilizer & petrochemical manufacturing) covering production, technical services including energy audits and efficiency studies, waste heat recovery, efficiency studies of boilers, power plants, safety audits, pollution control activities and waste water treatment. With respect to the Thermal Power Plant, the job assignment included the monitoring of flue gas stack temperatures and excess air, efficiency of fuel additives, condition of boiler refractory and insulation of steam lines, residual life assessment of boilers etc. His experience also includes 7 years in the Process design of fertilizer & petrochemical plants, wherein he was involved in the development of process flow diagrams, development of P&IDs, equipment design, HAZOP studies, procurement and commissioning activities.

He has over two years experience in validation and verification of CDM projects in DNV and is also an EMS lead auditor.

His qualification, industrial experience and experience in CDM projects demonstrate sufficient sectoral competence in Chemical Process Industries, Thermal Energy Generation from fossil fuels, Heat distribution and Waste handling and disposal.

**Mr. Kannan Parthasarathy:**

Handled various projects on Wind Turbine requirements since 1993 onwards as on date in DNV. This includes the following:

- Wind Turbine Generator - various inspection and projects Covering WTG capacity 250KW to 1.5MW and various manufacturer (Various services provided to different manufacturer - Vestas RRB/AWT/NEG Micon/Vestas/Poioneer Wincon/Poioneer Asia/Gamesa/Suzlan/GE/Siva Electric/Wind Win etc)
- Vendor inspection of various items and component assessments. Castings Hub & Extender/ Tower/ Nacelle/ Gear box/Generator/Forging-Shaft/Yawing system etc
- safety Testing of Over speed machine and Breaking system
- Installation Commissioning of Machines and Power curve at specific site studies. Analysis of Plant Load factor (PLF) - actual Vs plant capacity



- Design services and Co-ordination with DNV Principle Denmark Office.
- CWET Centre for Wind Energy Testing - providing technical support in establishing the system & procedures. Also Wind Monitoring Mast installation and assessments at CWET Testing Location.
- Wind Turbine Array arrangement and studies; Conducted Micro-siting studies (Wind) and arrive at power curve (Theoretical) requirements.
- Type testing of 1 MW Gear Box and Generator and manufacturing assessments.
- Management                      System                      Certificate                      audits  
(Experience of above also performed during the work at NEPC-Micon)

**Astakala Vidyacharan** is a chemical engineer and prior to joining DNV in 2005, has had 11 years of direct work experience in various chemical industries. His work experience covers 4 years in project implementations in pesticide and fine chemical industries , including environment management activities; 7 years in process operations of of pesticide, natural products and fine chemical industries.

He has received extensive training in the CDM validation and verification process. He is an appointed validator for the CDM validation and verification program of DNV and has performed validation of several CDM projects. He is also a trained auditor for GHG accounting standards and involved audit of Corporate GHG accounting. He is a qualified ISO9001, ISO 14001 Lead auditor and OHSAS 18001 auditor who has performed several audits for various industrial sectors under these management systems.

His qualification, industrial experience and experience in CDM facilitate him to assess renewable energy based on Hydro and Biomass, Energy Efficiency sectors, in particular to sufficient degree.