UNFCCC Secretariat
Martin-Luther-King-Strasse 8
D-53153 Bonn
Germany

**Att:** CDM Executive Board

DET NORSKE VERITAS
CERTIFICATION AS
Veritasveien 1
1322 Høvik
Norway
Tel: +47 6757 9900
Fax: +47 6757 9911
http://www.dnv.com

| Your ref.: | Our ref.: | Date: |
|---|---|---|
| CDM Ref 1115 | KCHA/MLEH | 14 August 2007 |

# Response to request for review "75MW wind power project in Maharashtra by Essel Mining Industries Limited" (1115)

Dear Members of the CDM Executive Board,

We refer to the requests for review raised by three Board members concerning DNV's request for registration of the project activity 1115 titled "75MW wind power project in Maharashtra by Essel Mining Industries Limited" (1115) and would like to provide the following initial response to the issues raised by the requests for review.

***Comment 1:***

*A load factor of 19-20% has been used in the investment analysis based on wind farm performance in April 2005 to May 2006 after the project activity had commenced operation. As the sensitivity analysis shows that a load factor of 25% would make the project feasible, further substantiation of the load factor is required. This substantiation (e.g. wind monitoring stations measurements of the site, wind data certification, reports supplied to the equipment supplier, load factors from other wind farms) should be from before the implementation of the project activity when the investment decision was made and should include measurements made over a longer duration based on official data where possible.*

**DNV Response:**

DNV would like to clarify that a plant load factor (PLF) of 20% has been used in the investment analysis. The 20% PLF considered for the investment analysis had been based on a tariff order dated 24 November 2003[1] issued by the Maharashtra Electricity regulatory Commission (MERC) whereby the average capacity utilization factor (CUF) in Maharashtra has been established from wind characteristics of 10 different sites considering reasonable good machines and grid availability. Relevant extracts from the order have been attached as **Annex-I**. This information was available before the implementation of the project activity was the basis for the investment decision.

The load factor of 18-19% as mentioned in the validation report and the PDD is based on actual monitored data post implementation. It has been stated to substantiate that the assumption of 20%

[1] http://www.mercindia.org.in/pdf/Annexures.pdf

PLF, as used in investment analysis, is reasonable and actual PLF of the wind farm is observed to be lower than the assumed PLF.

In India, the official wind monitoring is carried out by MNES (Ministry of Non-conventional Energy Sources) and C-WET (Centre for Wind Energy Technology). C-WET has provided the mean annual wind speed for some locations in the Dhule and Nandurbar district based on wind monitoring data from 1999-2001. The highest mean annual wind speed[2] reported for the Chakla wind monitoring station in Nandurbar district, which is closest to the project location, is 6.58 m/s. The list of the four wind monitoring stations in the Dhule and Nandurbar district as reported by C-WET is attached as **Annex-II**. As obtained from the power curve of the S-70 machines **(Annex-III)** installed in the project, the average power generation from each WEG with the highest wind speed of 6.58 m/s comes to 240 kW corresponding to a PLF of 19.2%. Thus the assumption of a 20% PLF for the project is justified as demonstrated based on the C-WET data and the technical specifications of the wind turbines installed in the project.

The project is situated in Dhule district of Maharashtra and this project was the one of the first projects in that region. A total of 6.25 MW of wind installations of similar technology (1.25 MW) was implemented prior to the EMIL project in Dhule district in March 2004. Thus data from other wind farms in that specific region over a longer duration was not available to the project proponent prior to implementation of project. However, the yearly wind power generation capacity addition and annual power generation from wind in the state of Maharashtra is available from the annual reports of MNES. The average PLF calculated from the MNES data for wind power projects in Maharashtra from 1999 to 2004 is 18.04%, 20.55%, 20.01%, 19.06% and 19.45% respectively **(Annex-IV)**. Thus the 20% PLF assumed by the project proponent also reflects the actual PLF achieved by other wind power producers in the state of Maharashtra.

On the basis of the above documents and data, the assumption of a 20% PLF for the investment analysis was deemed appropriate by DNV.

We sincerely hope that the Board accepts our aforementioned explanations.

Yours faithfully
for DET NORSKE VERITAS CERTIFICATION AS

Michael Lehmann
*Technical Director*
International Climate Change Services

C Kumaraswamy
*Manager – South Asia*
Climate Change Services

[2] http://www.cwet.tn.nic.in/Docu/ListofWMS.pdf

# ANNEX – I



## BASIC ASSUMPTIONS FOR DETERMINATION OF THE TARIFF PROPOSED FOR NEW PROJECTS TO BE COMMISSIONED FROM 01.04.2003 (NEW PORJECTS WITHOUT SALES TAX INCENTIVE)

| | | | |
|---|---|---|---|
| 1) | Project Cost | : | Rs. 4.0 Crore per MW<br>(Reasonable average cost with machines of larger capacity and better efficiency, reduced cost of infrastructure and larger volume of business) |
| 2) | Capacity Utilization Factor | : | 20% p.a.<br>(Based on wind characteristics of 10 different sites in Maharashtra considering reasonably good machine and grid availability) |
| 3) | Annual Generation | : | 17.52 lacs units/year/MW derated by 5% after 10 years |
| 4) | Cost of O&M | : | 2% of project cost with 5% annual escalation<br>(National and International experience indicates validity of this assumption) |
| 5) | Debt Equity Ratio | : | 70:30<br>(As per norms followed by major financial institutions including IREDA for infrastructure projects) |
| 6) | Interest Rate on Debt | : | 13%<br>(Subsidized interest rate charged by major financial institutions including IREDA for infrastructure projects varies between 12 – 14%) |
| 7) | Loan repayment period | : | 10 years<br>(As per policy of major financial institutions including IREDA for infrastructure projects) |
| *8)* | Rate of depreciation | : | *@5.28% as per straight line method for calculation of MAT as per I.T.Act for the life of the project..* |
| 9) | Return on Equity (ROE) | : | @16% p.a.<br>(As per GOI policy for private sector participation in power sector) |

# ANNEX – II

| LIST OF WIND MONITORING STATIONS IN MAHARASHTRA WITH MAWS* (TOTAL 31 STATIONS) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Station** | **District** | **Latitude** | | **Longitude** | | **Date of Commencement** | **Date of Closing** | **Mean Annual Wind speed at 20/25/30/ 50 m (m/s)** |
| | | | **N** | | **E** | | | | |
| | | | **Deg** | **Min** | **Deg** | **Min** | | | |
| 5 | Brahmanvel | Dhule | 21 | 10 | 74 | 12 | 30/03/99 | 13/06/01 | 6.42 |
| 6 | Chakla | Nandurbar | 21 | 19 | 74 | 19 | 1/4/1999 | 14/06/01 | 6.58 |
| 23 | Raipur | Dhule | 21 | 2 | 74 | 22 | 29/03/99 | 14/06/01 | 5.25 |
| 26 | Takarmauli | Dhule | 21 | 5 | 74 | 3 | 29/03/99 | 13/06/01 | 5.78 |

* *Mean Annual Wind Speed*

# ANNEX – III

| Suzlon Energy Ltd, Engineering, PUNE | POWER CURVE S70_1.25MW_50Hz | Page 12 of 13 |
|---|---|---|

| | | |
|---|---|---|
| 1 | Power Curve Data at air density 1.225 Kg/m3 | |
| | Turbine | S 70 |
| | Rated Power | 1250 kW |
| | Cut-in wind Speed | 3 m/s |
| | Rated Speed | 14 m/s |
| | Cut-off wind Speed | 18 m/s |
| | | |
| 2 | Power Curve data | |
| | *Wind speed -m/sec* | *Power kW* |
| | 3 | 14 |
| | 4 | 41 |
| | 5 | 92 |
| | 6 | 160 |
| | 7 | 307 |
| | 8 | 492 |
| | 9 | 686 |
| | 10 | 899 |
| | 11 | 1074 |
| | 12 | 1184 |
| | 13 | 1222 |
| | 14 | 1250 |
| | 15 | 1250 |
| | 16 | 1250 |
| | 17 | 1250 |
| | 18 | 1250 |

Document code :-

| Revision | Prepared | Validated by | Verified by | Approved by | File name Main Specifications :- |
|---|---|---|---|---|---|
| 0.0 | RRK | NS | FJA | TPK | S70_1.25MW_50Hz_72m_STV_TT |
| 9-Dec-2006 | | | | | (For Indian Market only) |

# ANNEX – IV

## Annual generation from wind sources in Maharashtra and installed capacities

| Year | 1999-00 | 2000-01 | 2001-02 | 2002-03 | 2003-04 |
|---|---|---|---|---|---|
| Installed Capacity* (MW) | 28.9 | 79.2 | 189.8 | 399.2 | 401.2 |
| Annual Generation (MWh) | 45695.88 | 142575.9 | 332747.9 | 666629.86 | 683657.09 |
| Plant Load Factor (%) | 18.04991 | 20.55023 | 20.01313 | 19.062951 | 19.452405 |

** Capacity addition during the year has been considered in installed capacity of the next year since power generation from the capacity additions contribute to the generation of the next year only*

***Data Sources:*** *MNES Annual report 2002-2003: Chapter 5*

Table-5.3

**State-wise & Year-wise Wind Power Installed Capacity (MW)**

*(as on 31.12.2002)*

| State | Upto Mar. '92 | 1992 -93 | 1993 -94 | 1994 -95 | 1995 -96 | 1996 -97 | 1997 -98 | 1998 -99 | 1999 -00 | 2000 -01 | 2001 -02 | 2002 -03 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Andhra Pradesh | 0.6 | 0.0 | 0.0 | 5.4 | 38.9 | 9.4 | 1.5 | 6.0 | 26.3 | 3.8 | 0.7 | 0.0 | 92.6 |
| Gujarat | 14.5 | 1.6 | 10.6 | 37.7 | 51.2 | 31.1 | 20.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 166.9 |
| Karnataka | 0.6 | 0.0 | 0.0 | 0.0 | 2.0 | 3.3 | 11.2 | 2.6 | 14.6 | 10.4 | 24.0 | 27.6 | 96.3 |
| Kerala | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 |
| Madhya Pradesh | 0.6 | 0.0 | 0.0 | 0.0 | 6.3 | 2.7 | 2.7 | 6.2 | 4.1 | 0.0 | 0.0 | 0.0 | 22.6 |
| Maharshtra | 1.1 | 0.0 | 0.0 | 1.5 | 0.0 | 2.8 | 0.2 | 23.3 | 50.3 | 110.6 | 209.4 | 0.0 | 399.2 |
| Orissa | 1.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.1 |
| Rajasthan | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 5.3 | 8.8 | 9.0 | 25.1 |
| Tamil Nadu | 22.3 | 11.1 | 50.5 | 190.9 | 281.7 | 119.8 | 31.1 | 17.8 | 45.6 | 41.9 | 44.9 | 37.5 | 895.1 |
| West Bengal | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 0.6 | 0.0 | 1.1 |
| Others | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 |
| **Total** | **41.3** | **12.7** | **61.1** | **235.5** | **382.1** | **169.1** | **66.8** | **55.9** | **142.9** | **172.5** | **288.4** | **74.1** | **1702.3** |

Table-5.4

**State-wise/Year-wise Generation from Wind Power Projects (Kwh)**

*(as on 31.12.2002)*

| States | Upto March '92 | 1992-93 | 1993-94 | 1994-95 | 1995-96 | 1996-97 | 1997-98 | 1998-99 | 1999-2000 | 2000-2001 | 2001-02 | 2002-03 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Andhra Pradesh | 1,120,745 | 63,349 | 161,525 | 619,748 | 7,676,741 | 39,979,632 | 51,925,399 | 38,598,264 | 57,061,984 | 87,032,475 | 114,988,086 | 88,382,232 | 487,610,180 |
| Gujarat | 42,188,099 | 18,793,320 | 21,673,823 | 37,833,399 | 58,230,856 | 117,856,316 | 132,409,292 | 91,317,221 | 122,357,515 | 142,227,142 | 134,759,803 | 112,546,895 | 1,032,193,681 |
| Karnataka | — | — | — | — | 315,603 | 7,250,605 | 11,715,975 | 26,620,334 | 39,465,981 | 72,263,609 | 92,859,341 | 145,321,292 | 395,812,740 |
| Kerala | — | — | — | 59,146 | 2,041,468 | 2,565,150 | 1,867,326 | 1,584,744 | 1,930,689 | 2,582,228 | 2,476,390 | 755,359 | 15,862,500 |
| Madhya Pradesh | 1,080,146 | 406,900 | 336,059 | 250,906 | 813,273 | 5,977,195 | 7,426,841 | 10,508,979 | 23,447,157 | 28,859,874 | 28,238,283 | 27,352,652 | 134,698,265 |
| Maharashtra | 3,429,901 | 518,610 | 208,620 | 1,138,350 | 1,162,914 | 2,577,778 | 3,308,835 | 9,803,957 | 45,695,877 | 142,575,869 | 332,747,859 | 594,552,478 | 1,137,721,849 |
| Orissa | 1,174,856 | — | — | — | — | — | — | — | — | — | — | — | 1,174,856 |
| Tamil Nadu | 63,911,415 | 68,674,598 | 72,389,409 | 151,374,106 | 426,198,886 | 702,169,655 | 779,801,751 | 894,925,358 | 1,155,083,718 | 1,095,839,373 | 1,245,763,198 | 1,139,966,471 | 7,796,097,938 |
| Rajasthan | — | — | — | — | — | — | — | — | 766,650 | 5,649,422 | 18,578,126 | 19,661,664 | 44,655,863 |
| West Bengal | — | — | — | — | — | — | — | — | — | — | 264,801 | — | 264,801 |
| Total | 112,905,162 | 88,456,777 | 94,769,436 | 191,275,655 | 496,439,741 | 878,376,331 | 988,455,419 | 1,073,358,857 | 1,445,809,571 | 1,577,029,992 | 1,970,675,888 | 2,128,539,044 | 11,046,091,873 |

*MNES Annual Report 2003-2004*

**STATE-WISE & YEAR-WISE WIND POWER INSTALLED CAPACITY AS ON 31.03.2004**

*(MW)*

| State | Upto 2001-02 | 2002-03 | 2003-04 | Total |
|---|---|---|---|---|
| Andhra Pradesh | 92.6 | 0.0 | 6.2 | 98.8 |
| Gujarat | 166.8 | 6.2 | 29.0 | 202.0 |
| Karnataka | 68.7 | 55.6 | 84.9 | 209.2 |
| Kerala | 2.0 | 0.0 | 0.0 | 2.0 |
| Madhya Pradesh | 22.6 | 0.0 | 0.0 | 22.6 |
| Maharashtra | 399.2 | 2.0 | 6.2 | 407.4 |
| Rajasthan | 16.1 | 44.6 | 117.8 | 178.5 |
| Tamil Nadu | 857.6 | 132.8 | 371.2 | 1361.6 |
| West Bengal | 1.1 | 0.0 | 0.0 | 1.1 |
| **Total** | **1626.7** | **241.2** | **615.3** | **2483.2** |

*MNES Annual Report 2004-2005*

**Table 6.4**

**STATE-WISE UNIT GENERATION DATA (kwh) (AS ON 31.12.2004)**

| States | Upto March'2002 | 2002-03 | 2003-04 | 2004-05 | Total |
|---|---|---|---|---|---|
| Andhra Pradesh | 399227948 | 95942644 | 95089428 | 32080116 | 622340136 |
| Gujarat | 919646786 | 147340555 | 150656888 | 86539222 | 1304183451 |
| Karnataka | 250491448 | 175108542 | 306675709 | 454170000 | 1186445699 |
| Kerala | 15107141 | 755359 | 0 | 0 | 15862500 |
| Madhya Pradesh | 107345613 | 32631462 | 20744214 | 11031650 | 171752939 |
| Maharashtra | 543168570 | 666629856 | 683657094 | 502023901 | 2395479421 |
| Orissa | 1174856 | 0 | 0 | 0 | 1174856 |
| Tamil Nadu | 6656131467 | 1305501417 | 1653914774 | 784423650 | 10399971308 |
| Rajasthan | 24994198 | 22394806 | 17193349 | 8721064 | 73303417 |
| West Bengal | 317139 | 509588 | 612325 | 212710 | 1651762 |
| **Total** | **8917605166** | **2446814229** | **2928543781** | **1879202313** | **16172165489** |