

**MONITORING REPORT**  
**Version 05, 20/12/10**

FOR THE PERIOD  
28 March 2006 TO 31<sup>st</sup> July 2009  
(Both Days Included)

*Project*  
**“Aryan Coal 15 MW Wind Power Project in Maharashtra, India”**

*Project Site*  
**Village Ghatnandare, District Sangli,  
Maharashtra, India**

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## 1. General Description of the Project

### 1.1 Current Status of the Project

*Aryan Coal 15 MW Wind Power Project* at Village Ghatnandra in Sangli District of Maharashtra was commissioned during 29/09/2005 and 30/09/2005. The project activity entails generation of clean power by harnessing wind energy – a non-conventional renewable energy resource and export to the Maharashtra State Electricity Distribution Company Limited (MSEDCL).

The project activity involves commissioning and operation of Suzlon make 12 Wind Electric Generators (WEGs) of 1.25 MW capacities with a total installed capacity of 15 MW. The details of the WTGs have been tabulated as below:

Sr. No.	WTG No.	Capacity (MW)	Date of Commissioning	Location	Site Coordinates
1.	G 13	1.25	30/09/2005	Sangli, Maharashtra	17 <sup>0</sup> 10' 10.4"N 74 <sup>0</sup> 54' 23.8"E
2.	G 14	1.25	30/09/2005	Sangli, Maharashtra	17 <sup>0</sup> 10' 21.5"N 74 <sup>0</sup> 54' 22.1"E
3.	G 15	1.25	30/09/2005	Sangli, Maharashtra	17 <sup>0</sup> 10' 34.5"N 74 <sup>0</sup> 54' 12.7"E
4.	G 17	1.25	30/09/2005	Sangli, Maharashtra	17 <sup>0</sup> 10' 11.8"N 74 <sup>0</sup> 54' 04.7"E
5.	G 18	1.25	30/09/2005	Sangli, Maharashtra	17 <sup>0</sup> 10' 21.8"N 74 <sup>0</sup> 54' 59"E
6.	G 19	1.25	30/09/2005	Sangli, Maharashtra	17 <sup>0</sup> 10' 33.3"N 74 <sup>0</sup> 54' 56.1"E
7.	G 21	1.25	30/09/2005	Sangli, Maharashtra	17 <sup>0</sup> 10' 0.1"N 74 <sup>0</sup> 54' 49.4"E
8.	G 22	1.25	30/09/2005	Sangli, Maharashtra	17 <sup>0</sup> 10' 11.4"N 74 <sup>0</sup> 54' 44.2"E
9.	G 27	1.25	29/09/2005	Sangli, Maharashtra	17 <sup>0</sup> 10' 22.8"N 74 <sup>0</sup> 54' 24.3"E
10.	G 28	1.25	29/09/2005	Sangli, Maharashtra	17 <sup>0</sup> 10' 34.1"N 74 <sup>0</sup> 54' 15.0"E
11.	G 29	1.25	29/09/2005	Sangli, Maharashtra	17 <sup>0</sup> 10' 46.1"N 74 <sup>0</sup> 54' 09.6"E
12.	G 30	1.25	29/09/2005	Sangli, Maharashtra	17 <sup>0</sup> 10' 57.6"N 74 <sup>0</sup> 54' 07.3"E
	<b>Total</b>	<b>15 MW</b>			

## 1.2 Technical description of the project

The project installs 12 Suzlon make S-70 WEGs of individual capacity 1.25 MW. The Technical details of Suzlon S70 1.25MW WTG are as mentioned below:

Item	Description
Make	SUZLON
Model No.	S-70
Rating in Kw	1250
Rotor Diameter (m)	70
Highest hub height	75
Type of tower (Tubular/lattice)	Tubular
Number of blades	3
Power Regulation (pitch/stall)	Pitch
Type of generator (synchronous/asynchronous)	Asynchronous, Dual, Geared
Rated voltage (V)	690V(50M HZ), 600V(60 hz)
Cut-in wind speed (m/s)	3 m/s
Cut -out wind speed (m/s)	20 m/s
Rated wind speed (m/s)	12 m/s
Survival Wind speed (m/s)	67 m/s
Auxiliary Consumption (KWh)	Approx 1% of generation
Reactive energy requirement	Approx 10% of active energy

## 2. Statement to What Extent the Project has been implemented as Planned

The project was completed as planned and described in the Project Description (PD).

The plant is in operation continuously since it commissioning during 29<sup>th</sup> September 2005, with planned & forced outages.

### 2.1 Monitoring Period

#### *VCS Project start date:*

For the project activity, the project start date is the earliest date of the commissioning of any wind mill. As mentioned in table above, the earliest commissioning date for the WTG in the project activity is 29/09/2005. Therefore the start date for the project activity is 29/09/2005.

***Crediting period start date:***

The Crediting Period start date can be considered as either the start date of project activity or 28/03/2006, whichever is later. Accordingly, the Crediting Period start date for the project activity is 28/03/2006 and the length of first crediting period would be maximum of 10 years i.e up to 28/03/2016.

***Monitoring Period:***

The present monitoring period is chosen from 28<sup>th</sup> March 2006 to 31 July 2009 (Both days included)

**3. Sustainability –Economic and Social Well-being**

The contribution of the project activity to the sustainable development of the host country 'India' is evident from the following:

<b><i>Social Well Being</i></b>	<ul style="list-style-type: none"><li>• No human displacement due to the project activity and hence no requirement of relocation</li><li>• The local population has been employed during the installation, commissioning and operation of the wind mills, thus proper training imparted to the people involved results in the skill development of the local inhabitants and also improvement in their economic condition.</li><li>• Improvement in the infrastructure in the nearby areas such as development of road network, transportation facilities and other amenities</li></ul>
<b><i>Economic Well being</i></b>	<ul style="list-style-type: none"><li>• The project activity is responsible for creating business opportunities for many local stakeholders</li><li>• It will help in abridging the demand-supply gap in electricity in the regional grid and the national grid</li><li>• It will lead to conservation of fossil-fuels and makes these non-renewable sources of energy available for other important purposes.</li><li>• It indirectly contributes towards industrial development of the region by creating a support in terms of supplying power for industries to come up in due course of time</li></ul>
<b><i>Technological Well being</i></b>	<ul style="list-style-type: none"><li>• The project activity will promote clean power generation technology. The project contributes towards the stability of grid power that is a major cause of concern in remote locations</li><li>• It also helps in reducing the losses due to power transmission and distribution from the existing generating stations of the grid to remote areas</li></ul>
<b><i>Environmental Well being</i></b>	<ul style="list-style-type: none"><li>• The project activity will reduce GHG emissions and contributing to the overall cause of mitigation of global warming</li><li>• The project activity by setting up wind-farms for power generation does not cause environmental disturbance or ecological imbalance to the surroundings</li><li>• The project activity does also contribute to the reduction in the levels of SO<sub>x</sub>, NO<sub>x</sub>, and SPM associated with combustion of fossil fuels for generation of thermal power</li></ul>

#### 4. Monitoring Methodology and Plan

For the project, following parameters were monitored on a continuous basis:

##### 4.1 Net Power Export to Grid:

Power exported to the grid is monitored through the invoices raised by the company to Maharashtra State Electricity Distribution Company Ltd. against the net power exported to the grid for each month. The net power exported to the grid is calculated as a difference of 'Power Exported' to the Grid and the 'Power Imported' from the Grid. The export & import of power is recorded during the Joint Meter Reading by the representatives of MSEDCL in the presence of company representatives, at the Meters installed near the WTG during the start of every month. These meter readings are the basis of the invoices raised by the company after the deduction of transmission losses. Thus the net power export figures mentioned in the invoices are the most conservative values.

##### 4.2 Net Power Exported:

The month-wise net power exported to the grid from the project activity (including 12 WTGs of 1.25 MW each) during the monitoring period is given below. This is the difference of the gross power exported and the power imported by the WTG, as provided in Annexure-II.

Year	Month	Net Power Exported to Grid (in KWh)
<b>Jan 2009 to Jul 2009</b>	Jul-09	6,491,151
	Jun-09	3,079,642
	May-09	3,004,594
	Apr-09	1,404,634
	Mar-09	985,309
	Feb-09	547,678
	Jan-09	338,083
<b>Total for Jan 2009 to Aug 2009</b>		<b>15,851,091</b>
<b>Year 2008</b>	Dec-08	308,054
	Nov-08	749,711
	Oct-08	733,736
	Sep-08	2,487,442
	Aug-08	3,832,804
	Jul-08	4,044,068
	Jun-08	4,057,853
	May-08	2,360,355
	Apr-08	246,614
	Mar-08	146,328
	Feb-08	

Year	Month	Net Power Exported to Grid (in KWh)
	Jan-08	135,228
<b>Total for 2007</b>		<b>19,102,194</b>
<b>Year 2007</b>	Dec-07	276,001
	Nov-07	351,247
	Oct-07	465,408
	Sep-07	2,829,770
	Aug-07	4,313,909
	Jul-07	4,448,020
	Jun-07	4,480,486
	May-07	957,098
	Apr-07	661,975
	Mar-07	1,134,068
	Feb-07	869,720
	Jan-07	242,071
<b>Total for 2008</b>		<b>21,029,771</b>
<b>Apr 2006 to Dec 2006</b>	Dec-06	762,798
	Nov-06	434,445
	Oct-06	601,097
	Sep-06	2,163,877
	Aug-06	5,312,123
	Jul-06	6,849,533
	Jun-06	829,763
	May-06	802,282
Apr-06	955,505	
<b>Total for Apr 2006 to Dec 2006</b>		<b>18,711,422</b>
<b>Net power exported for the Monitoring Period</b>		<b>74,694,478</b>

#### 4.3 Data/parameter monitored with regard to emission reductions.

<b>Data / Parameter:</b>	EGy
<b>Data unit:</b>	MWh /Year
<b>Description:</b>	Net Electricity Exported by the all the WTGs to grid in the year y
<b>Source of data to be used:</b>	JMR Sheets
<b>Value of data applied for the purpose of calculating expected emission reductions</b>	Annual electricity generation delivered to grid (MWh)

<b>Description of measurement methods and procedures to be applied:</b>	<ul style="list-style-type: none"> <li>- Monthly joint meter is carried out at the metering point by the MSEDCL official and the representative of project proponent or the Operation and Maintenance contractor employed by the project proponent.</li> <li>- Net electricity supplied to the NEWNE grid will be calculated based on the difference between values of “export” and “import” on the MSEDCL meter.</li> <li>- The invoices raised by project proponent contain the net electricity exported to the Grid.</li> <li>- The data is archived electronically.</li> </ul>
<b>QA/QC procedures to be applied:</b>	<p>The main meter as well as check meter will be maintained and calibrated by the MSEDCL on a regular basis as per their internal calibration schedule as specified in the power purchase agreement. The manager in charge of the power plant will be responsible for verifying the quantum of electricity exported to the grid <i>vis-à-vis</i> the net electricity generated from the wind power generating unit within the same time period.</p>
<b>Any comment:</b>	<p>The relevant data will be recorded in electronic form and the same along with the electricity bills will be archived for two years beyond the crediting period.</p>

## 5. Monitoring Plan and Quality Control (QC) and Quality Assurance (QA).

### 5.1 Monitoring Plan Followed:

- Suzlon Windfarms Services Ltd. is responsible monitoring of the electricity generation at the wind mills. Suzlon has qualified site personals to ensure constant and reliable monitoring of the installed wind turbines.
- The gross electricity generated by the wind mill is measured instantaneously at the control panel installed below the wind mill. The reading from the control panel is recorded continuously and is maintained through MIS system.
- The electricity from the wind mill is transmitted to the substation maintained by Suzlon. Monthly joint metering of the main meter is carried out by the officials from MSEDCL and the project developer and the Joint Monthly Report (JMR) is generated. The electricity as recorded by this meter is measured as gross electricity produced by the wind mill.
- The combined electricity generated by different wind mill including, the project proponent wind mills, is collectively received at the substation. The collective electricity is again metered at the substation before it is exported to the grid maintained by MSEDCL.
- The difference in the net electricity exported to the grid and total of gross electricity generated by all the wind mills is measured as transmission loss which is estimated by

suzlon. This transmission loss is equally distributed to each of the wind mill associated to the grid based on the gross power generated by the each wind mill.

- Based on the above data, the net electricity exported to the grid by each of the wind mill is calculated and accordingly invoices are raised by the project proponent against the net electricity generated and exported by individual machines.
- The entire monitoring is done in very transparent manner. As an emergency preparedness plan, check meters are installed along with the main meters so that the data can be continuously monitored in case of malfunctioning of the main meter.
- To ensure the reliability & accuracy of the data, the energy meters are calibrated at least once in a year and the accuracy class of the energy meters is maintained.

*The roles and responsibilities of the relevant personnel involved in monitoring, reporting and verification of various GHG performance related parameters in the project activity are explained in Annex II.*

## **5.2 Measures to ensure the Results/Uncertainty:**

- All the metering instruments used on the sites are calibrated periodically and maintained in good working condition. Respective staff employed maintains records for all the monitored parameters. All the main and check meters installed at the project site are shall be of 0.2 % accuracy class. Each meter is jointly inspected and sealed on behalf of parties.
- As a regular practice, the representatives of state electricity boards were informed for conducting the annual calibration for the all the meters for the monitoring period, however, since calibration certificates for certain meters in certain years were not made available, therefore, as per the guideline “*Guidelines for assessing compliance with the calibration frequency requirements*” **EB 52, Annex-60; Para 4(a)** the net electricity exported by the WTGs for the same periods have been corrected with the percentage of error as obtained from the immediate subsequent testing report. The maximum permissible error of the instrument (0.2-class of accuracy) has been applied to the measured values.

**Table for Substation, Feeder No. and Energy meter details for all WTGs.**

<b>WTG No.</b>	<b>Substation</b>	<b>Feeder No</b>	<b>Main Meter No.</b>	<b>Check Meter No.</b>
G 13	Ghatnandre	05	4725792	4725787
G 14	Ghatnandre	05	4725792	4725787

G 15	Ghatnandre	05	4725792	4725787
G 17	Ghatnandre	05	4725792	4725787
G 18	Ghatnandre	05	4725792	4725787
G 19	Ghatnandre	05	4725792	4725787
G 21	Ghatnandre	05	4725792	4725787
G 22	Ghatnandre	05	4725792	4725787
G 27	Ghatnandre	06	4725802	4725800
G 28	Ghatnandre	06	4725802	4725800
G 29	Ghatnandre	06	4725802	4725800
G 30	Ghatnandre	06	4725802	4725800

**Chronology of meter numbers and availability of calibration certificates during period of monitoring.**

WTG No.	According the JMR		Calibration record Available		
	Period	Connected to Substation and Feeder No	Calibration Date	Main Meter No	Check Meter No
<b>YEAR 2006</b>					
G 13 G 14	01/04/06 till 27/06/ 06	kundlapur Feeder		NA	NA
G 15 G 17	27/06/ 06 till 13/09/06	F-2; Ghatnandre		NA	NA
G 18 G 19 G 21 G 22	13/09/06 till 01/02/07	F-5; Ghatnandre	Jun-06	4725792	NA
<b>YEAR 2007</b>					
G 13 G 14 G 15 G 17 G 18 G 19 G 21 G 22 G 27	01/02/07 till 01/11/ 07	F-5; Ghatnandre	Jun-07 Sep-07 Dec-07	4725792 NA NA	4725787 NA 4725787
G 28 G 29 G 27 G 30	02/01/07 till 01/01/08	F-6; Ghatnandre	Jun-07 Sep-07 Dec-07	4725802 4725802 4725802	4725800 4725800 4725800
<b>YEAR 2008</b>					
G 13 G 14 G 15 G 17 G 18 G 19 G 21 G 22	01/01/08 till 01/01/09	F-5; Ghatnandre	Jun-08 Sep-08 Dec-08	NA NA 4725792	4725787 NA 4725787
G 27 G 28 G 29 G 30	01/01/08 till 01/01/09	F-6; Ghatnandre	Jul-08 Sep-08 Dec-08	4725802 NA 4725802	4725800 NA 4725800
<b>YEAR 2009</b>					
G 13 G 14 G 15 G 17 G 18 G 19	01/01/09 till 01/01/10	F-5; Ghatnandre	Jul-09 Sep-09 Nov-09	NA NA 4725792	NA NA NA

WTG No.	According the JMR		Calibration record Available		
	Period	Connected to Substation and Feeder No	Calibration Date	Main Meter No	Check Meter No
G 21 G 22					
G 27 G 28 G 29 G 30	01/01/09 till 01/01/10	F-6; Ghatnandre	Jul-09 Sep-09 Nov-09	NA NA 4725802	NA NA NA

Details of WTG and the period for which correction factor have been applied as per the *Guidelines for assessing compliance with the calibration frequency requirements*” EB 52, Annex-60.

WTG NO.	Correction factor applied for the Period
G13 G14 G15 G17	From April 2006 till Sep 2006 and July 2009
G18 G19 G21 G22	From March 2006 till Sep 2006 and July 2009
G27 G28 G29 G30	From March 2006 till Sep 2006

Calibration certificate of the main meters have been provided to the verifier.

## 6. Emission Reductions

The emission reductions by the project activity during a given year y is the difference between Baseline emissions ( $BE_y$ ), project emissions ( $PE_y$ ) and emissions due to leakage ( $L_y$ ).

$$ER_y = BE_y - PE_y - L_y$$

Where

$ER_y$  = Emission reductin in year y ( $tCO_2$ )

$BE_y$  = Baseline emissions in year y ( $tCO_2$ )

$PE_y$  = Project emissions from the Project activity in year y ( $tCO_2$ ).

$L_y$  = Leakages from the Project activity in year y ( $tCO_2$ ).

### **Baseline emissions:**

The baseline emissions is calculated as the MWh produced by the renewable generating unit multiplied by an emission factor (measured in  $tCO_2/MWh$ ) calculated in a transparent and conservative manner, as below.

$$BE_y = EG_y * EF_{GRID}$$

Where

$BE_y$  = Baseline emissions in year  $y$  (tCO<sub>2</sub>).

$EG_y$  = Electricity generation by the project in year  $y$  (MWh).

$EF_{GRID}$  = Combined margin emissions factor (Baseline emission factor) for the year  $y$  (tCO<sub>2</sub>/MWh).

$EG_y$ (Net energy exported during the monitoring period)	74,694.478 MWh
$EF_{GRID}$ (Combined margin emissions factor as per the baseline adopted)	0.906 tCO <sub>2</sub> /MWh

Baseline emissions for the monitoring period

$$\begin{aligned} BE_y &= 74694.478 \times 0.906 \\ &= 67,673 \text{ tCO}_2 \end{aligned}$$

Further,

$$\text{Project emissions (PE}_y) = 0$$

$$\text{Leakages (L}_y) = 0$$

### **Emission reductions:**

Baseline emissions – Project emissions – Leakages

$$= 67,673 - 0 - 0$$

$$= 67,673 \text{ ton CO}_2$$

**Therefore, the Emission Reduction for the Monitoring Period are:**

$$= \mathbf{67,673 \text{ ton CO}_2}$$

*(Kindly refer Annexure-1 for Detailed Calculations)*

**Annexure-1**

**Calculation for Emission Reduction**

Year	Month	Net Power Exported to Grid (in KWh)	Grid Emission Factor (tCO2/MWh)	Baseline Emission (tCO2)	Project Emission (tCO2)	Leakages (tCO2)	Emission reduction (tCO2)
<b>Jan 2009 to Jul 2009</b>	Jul-09	6,491,151	0.906	5882.15	0	0	5882.15
	Jun-09	3,079,642	0.906	2790.71	0	0	2790.71
	May-09	3,004,594	0.906	2722.70	0	0	2722.70
	Apr-09	1,404,634	0.906	1272.85	0	0	1272.85
	Mar-09	985,309	0.906	892.87	0	0	892.87
	Feb-09	547,678	0.906	496.30	0	0	496.30
	Jan-09	338,083	0.906	306.36	0	0	306.36
<b>Total for Jan 09 to Jul 09</b>		<b>15,851,091</b>	<b>0.906</b>	<b>14,361</b>	<b>0</b>	<b>0</b>	<b>14,361</b>
<b>Year 2008</b>	Dec-08	308,054	0.906	279.15	0	0	279.15
	Nov-08	749,711	0.906	679.37	0	0	679.37
	Oct-08	733,736	0.906	664.90	0	0	664.90
	Sep-08	2,487,442	0.906	2254.07	0	0	2254.07
	Aug-08	3,832,804	0.906	3473.21	0	0	3473.21
	Jul-08	4,044,068	0.906	3664.65	0	0	3664.65
	Jun-08	4,057,853	0.906	3677.15	0	0	3677.15
	May-08	2,360,355	0.906	2138.91	0	0	2138.91
	Apr-08	246,614	0.906	223.48	0	0	223.48
	Mar-08	146,328	0.906	132.60	0	0	132.60
	Feb-08		0.906	0.00	0	0	0.00
Jan-08	135,228	0.906	122.54	0	0	122.54	
<b>Total for Jan 08 to Dec 08</b>		<b>19,102,194</b>	<b>0.906</b>	<b>17,307</b>	<b>0</b>	<b>0</b>	<b>17,306</b>
<b>Year 2007</b>	Dec-07	276,001	0.906	250.11	0	0	250.11
	Nov-07	351,247	0.906	318.29	0	0	318.29
	Oct-07	465,408	0.906	421.74	0	0	421.74
	Sep-07	2,829,770	0.906	2564.28	0	0	2564.28
	Aug-07	4,313,909	0.906	3909.18	0	0	3909.18
	Jul-07	4,448,020	0.906	4030.71	0	0	4030.71
	Jun-07	4,480,486	0.906	4060.13	0	0	4060.13
	May-07	957,098	0.906	867.30	0	0	867.30
	Apr-07	661,975	0.906	599.87	0	0	599.87
	Mar-07	1,134,068	0.906	1027.67	0	0	1027.67
	Feb-07	869,719	0.906	788.12	0	0	788.12
Jan-07	242,071	0.906	219.36	0	0	219.36	
<b>Total for Jan 07 to Dec 07</b>		<b>21,029,771</b>	<b>0.906</b>	<b>19,053</b>	<b>0</b>	<b>0</b>	<b>19,053</b>
<b>Apr 06 to Dec 06</b>	Dec-06	762,798	0.906	691.23	0	0	691.23
	Nov-06	434,445	0.906	393.69	0	0	393.69
	Oct-06	601,097	0.906	544.70	0	0	544.70
	Sep-06	2,163,877	0.906	1960.86	0	0	1960.86
	Aug-06	5,312,123	0.906	4813.74	0	0	4813.74
	Jul-06	6,849,533	0.906	6206.91	0	0	6206.91
	Jun-06	829,763	0.906	751.91	0	0	751.91
	May-06	802,282	0.906	727.01	0	0	727.01
Apr-06	955,505	0.906	865.86	0	0	865.86	
<b>Total for Apr 06 to Dec 06</b>		<b>18,711,422</b>	<b>0.906</b>	<b>16,953</b>	<b>0</b>	<b>0</b>	<b>16,953</b>
<b>Net power exported for the Monitoring Period</b>		<b>74,694,478</b>		<b>67,673</b>	<b>-</b>	<b>-</b>	<b>67,673.20</b>

**Annexure-II**

**The roles and responsibilities of the relevant personnel involved in monitoring, reporting and verification of various GHG performance related parameters in the project activity**

