SECTION D. Application of a monitoring methodology and plan:

D.1 Name and reference of approved <u>monitoring methodology</u> applied to the <u>small-scale project</u> <u>activity</u>:

Title:"Grid connected renewable electricity generation" AMS-I.D.Reference:Latest amended version 10 of Appendix B to the simplified M&P for Small-scale CDM
project activities.

D.2 Justification of the choice of the methodology and why it is applicable to the <u>small-scale</u> <u>project activity</u>:

The project category is renewable electricity generation (wind) for a grid system having installed capacity less than 15 MW and hence as per Appendix B – '*indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories*', Version– 10 of the simplified modalities and procedures for small scale CDM project activities (FCCC/KP/2005/8/ADD.1), the proposed CDM project falls under category I.D – *Grid connected renewable electricity generation*. The applicability of the project activity as small scale as per approved methodology AMS- I.D has been demonstrated in section B.2.

Monitoring methodology for project category I.D is detailed in paragraph 13 of the approved small-scale methodology AMS- I.D. (Version- 10, date: 23 December 2006), which states that:

'Monitoring shall consist of metering the electricity generated by the renewable technology. Where cofiring is done, the amount of biomass and fossil fuel input shall be monitored'.

ID Number (Please us numbers to ease cross- referencin g to table D.4)	Data Type	Data variable	Data Unit	Measured (m), Calculate d (c) or Estimated (e)	Recording Frequency	Proportio n of Data to be Monitore d	How will the Data be Archiv ed? (Electr onic/ Paper)	For How Long is Archived Data to be Kept?	<u>Comment</u>
D.3.1	Energ y	Net electricity supplied to the western region electricity grid.	KW h	m & c	Continuou sly	100%	Electro	For a period of 2 years from the end of crediting period or after last issuance of CERs	Joint meter reading will be taken by MSEDCL and promoter by applying logic of apportioning. The project revenue is based on the net units displaced as measured by metering system involving common bulk meter and the individual WTG controller meter. Every month these meter readings will be recorded by plant personnel, these records will be archived for crosschecking yearly figures

D.3 Data to be monitored:

D.3.2	Energ y	Total net electricity supplied to the grid (by all WTGs connected to the substation) measured at the substation	kWh	m & c	Continuou sly	100%	Electro nic	For a period of 2 years from the end of crediting period or after last issuance of CERs	This parameter will be monitored at the substation bulk meter (main & check meter) by representative of MSEDCL in presence of the representative of the O & M contractor. This will be calculated by subtracting the total export from total import recorded at the substation meter. The data will be recorded both at CMS & substation. This will be further useful in calculating the net electricity supplied by PPL to the grid by multiplying it with the multiplication factor.
D.3.3	Energ y	Total electricity generation by WTGs owned by PPL	kWh	m & c	Continuou sly	100%	Electro nic	For a period of 2 years from the end of crediting period or after last issuance of CERs	The electricity generated by all four WTGs will be monitored at the inbuilt control panel meters of all these WTGs. It will be recorded at the CMS on continuous basis. The electricity generation by the individual WTG will be recorded in the monthly Joint Meter Reading Report issued by MSEDCL to PPL. The sum of all these readings will give the total electricity generated by all the WTGs by PPL.
D.3.4	Energ y	Total electricity generation by all other WTG connected to the substation feeder	kWh	m & c	Continuou sly	100%	Electro nic	For a period of 2 years from the end of crediting period or	The electricity generated by any individual WTG will be recorded at the inbuilt control panel meter at the WTG. This will be further connected to the CMS. The sum of all these readings will give the total electricity generated by all other connected WTGs at the wind farm.
D.3.5	Emiss ion Factor	CEA/WRE B	tCO ₂ /GW h	c	Annually (Data of the year in which project generation occurs)	100%	Electro nic	For a period of 2 years from the end of crediting period or after last issuance of CERs	Data for emission factor calculation was taken from CEA General Review, which is an official publication of Ministry of Power, Government of India. Refer: http://www.cea.nic.in/planning/c %20and%20e/Government%20o f%20India%20website.htm

D.4 Qualitative explanation of how quality control (QC) and quality assurance (QA) procedures are undertaken:

ID No.	Uncertainty level of data (Medium/Hig h/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
D.3.1	L	The data can be very accurately measured. The meters installed on sub stations (grid interconnection point) and the integrated electronic meter will be used to measure mentioned variables on a continuous basis. Every month these meter readings will be recorded by plant personnel, these records will be archived for crosschecking yearly figures. The meters at the sub station will be two-way meters and will be in custody of State Electricity Utility. SEB officials will take the readings (joint meter reading) in these meters in presence of O & M contractor and apply the procedure of apportioning to arrive at the net electricity exported by the PP which may be used to determine the net power wheeled to the user and determine the extent of mitigation of GHG over a period of time.
D.3.2	L	The data can be very accurately measured. The parameter will be derived from total export & total import recorded at the bulk (main & check) meter. Above two parameters will be measure on a continuous basis. The meters at the sub station will be two-way tri-vector energy meters and will be in the custody of State Electricity Utility.

		SEB officials will take the readings (joint meter reading) in these meters in presence of O & M contractor. The parameter will obtained by subtracting total export from total import recorded at the substation bulk meter. The main meter can be cross check with the check meter. To ensure accuracy & reliability of the meters, they will be calibrated on annual basis or as per the UNFCCC guidelines (at least once in three year, paragraph 12.c, EB- 41, Annex- 20).
D.3.3	L	The data can be very accurately measured. The electricity generated by all four WTGs will be monitored at the inbuilt control panel meters of all these WTGs. This will be connected further to CMS & is recorded at the CMS on continuous basis. The sum of all these readings will give the total electricity generated by all the WTGs by PPL. The data will be monitored by the representatives of the O & M contractor for PPL.
D.3.4	L	The data can be very accurately measured. The electricity generated by any individual WTG will be recorded at the inbuilt control panel meter at the WTG. This will be further connected to CMS & will be recorded at the CMS on continuous basis. The sum of all these readings will give the total electricity generated by all other connected WTGs at the wind farm.
D.3.5	L	Data provided by CEA

D.5 Please describe briefly the operational and management structure that the <u>project</u> <u>participant(s)</u> will implement in order to monitor emission reductions and any <u>leakage</u> effects generated by the project activity:

The project activity essentially involves generation of electricity from wind, the employed WTG can only convert wind energy into electrical energy and cannot use any other input fuel for electricity generation. Thus no special ways and means are required to monitor leakage from the project activity.

- The proposed project activity requires evacuation facilities for sale to grid and the evacuation facility is essentially maintained by the state power utility.
- The electricity generation measurements are required by the utility and the investors to assess electricity sales revenue.
- The project activity has therefore envisaged two independent measurements of generated electricity from the wind turbines.
- The primary recording of the electricity fed to the state utility grid will be carried out jointly at the incoming feeder of the state power utility. Machines for sale to utility will be connected to the feeder.
- The joint measurement will be carried out once in a month in presence of both parties (the developer's representative and officials of the state power utility). Both parties will sign the recorded reading.
- The secondary monitoring, which will provide a backup (fail-safe measure) in case the primary monitoring is not carried out, would be done at the individual WTGs. Each WTG is equipped with an integrated electronic meter. These meters will be connected to the Central Monitoring Station (CMS) of the entire wind farm. The generation data of individual machine can be monitored as a real-time entity at CMS. The snapshot of generation on the last day of every calendar month will be kept as a record in electronic form.

Monitoring & Reporting of Parameters:

The monitoring parameters D.3.1, D.3.2, D.3.3, and D.3.4 will be monitored in accordance to the procedure laid down by O & M contractor and state power utility, MSEDCL, jointly. As this is a bundled project activity, the monitoring & reporting for the project activity will be done at two locations.

Sub-bundle I:

The project activity for sub-bundle- I (2 Nos. \times 1.25 MW) will be monitored at 220/33kV Walve- I substation, Taluka: Sakri, District: Dhulia & Suzlon Central Monitoring Station (CMS) at Aamkhel, Taluka: Sakri, District: Dhulia.

Sub-bundle II:

The project activity for sub-bundle II (2 Nos. \times 0.6 MW) will be monitored at 220/33kV Ghat Nandre sub-station (3 & 4), Taluka: Kavtemahankal, District: Sangli & Suzlon Central Monitoring Station (CMS) at Wagholi, Taluka: Kavtemahankal, District: Sangli.

Location	Dhulia		Sangli		
Sub-bundle	Ι		II		
WTG	K248	K277	W57	W67	
Capacity	1.25 MW	1.25 MW	0.6 MW	0.6 MW	
Sub-station	Walve- I	Walve- I	Ghat Nandre- 4	Ghat Nandre- 3	
Suzlon CMS	Aamkhel	Aamkhel	Wagholi	Wagholi	

The monitoring locations are tabulated as below:

The project activity is monitored by the O & M team at above locations. The monitoring is reported to the PPL project coordinator and O&M coordinator on daily basis.

Involvement of O& M Contractor for JMR issuance with the MSEDCL

The monitoring parameters like D.3.1, D.3.2, D.3.3, and D.3.4 are obtained from following two measurements:

- The electricity generated by WTG's of all the project promoters (including PPL) with the help of integrated electronic meter at the CMS in line with the PPA.
- The import, export and net electricity exported to the MSEDCL will be measured by the main and check meters for all the connected WTG's which will be recorded by representative of MSEDCL in presence of O & M contractor

Apportioning Logic for JMR Issuance:

The apportioning for the both the bundle is as follows.

Nomenclature:

Parameter	Description	Source
EG PPL, MSEDCL	Net electricity supplied to the western	Calculated from measured values (refer
(id: D.3.1)	region electricity grid.	Calculation of "Net electricity supplied
		to the western region grid.")
EG NET, MSEDCL	Total net generation at MSEDCL	Monthly measurements undertaken by
(id: D.3.2)	substation obtained from main and check	Representative of MSEDCL in presence
	meter readings	of representative of O & M contractor
EG wtg,ppl	Electricity generated by WTGs owned	Wind Mill's Break-up Energy Report
(id: D.3.3)	by PPL measured by integrated	provided by O & M contractor
	electronic meter	
EG wtg,others	Gross generation of all the WTGs	Monitoring of all wind turbines is done
(id: D.3.4)	connected to substation, excluding PPL	at CMS
	(i.e D.3.3).	

$\frac{\frac{EG}{_{\text{WT3, PPL}}}}{\sum_{0}^{x} EG}$	Multiplying Factor (MF_x) for the respective WTG(s) per project proponent X of the wind farm.	Calculated (refer Calculation of Multiplication Factor)
$\sum_{0}^{\mathbf{X}} EG$	Sum of D.3.3 and D.3.4	

Calculation of Multiplication Factor

The multiplying factor will be calculated as the ratio of electricity generated by installed WTG's of PPL (measured by integrated electronic meter and recorded, aggregated and maintained at CMS) to the total generation by all the connected WTGs (measured by integrated electronic meter and recorded, aggregated and maintained at CMS) in the given feeder at the substation. Thus,



Calculation of "Net electricity supplied to the western region grid."

The Main and Check meter at the feeder display the electricity exported, imported and the net electricity exported to the grid. The net generation by PPL will be calculated in the following manner:

EG _{PPL,MSEDCL} = $MF_x X EG_{NET,MSEDCL}$

The above mentioned logic (with corresponding values of import and export) will also be applicable to evaluate the import, export values appearing on the JMR issued by the MSEDCL.

The project proponents have signed an "Operation and Maintenance" agreement with the supplier of the wind turbines for the operation of the wind turbines. The O & M management structure is as follows:

Routine Maintenance Services:

Routine Maintenance Labour Work involves making available suitable manpower for operation and maintenance of the equipment and covers periodic preventive maintenance, cleaning and upkeep of the equipment including –

- a) Tower Torquing
- b) Blade Cleaning
- c) Nacelle Torquing and Cleaning
- d) Transformer Oil Filtration
- e) Control Panel & LT Panel Maintenance
- f) Site and Transformer Yard Maintenance

Security Services:

This service includes watch and ward and security of the wind turbines and the equipment.

Management Services:

- a) Data logging in for power generation, grid availability, machine availability.
- b) Preparation and submission of monthly performance report in agreed format.
- c) Monitoring the electricity generated by WTG's of all the project promoters with the help of integrated electronic meter and taking monthly meter reading jointly with utility and involved in apportioning the same to obtain power generated at PPL's wind turbines and supplied to grid from the meter/s maintained by utility for the purpose and co-ordinate to obtain necessary power credit report/ certificate.

Technical Services:

- a) Visual inspection of the WTGs and all parts thereof.
- b) Technical assistance including checking of various technical, safety and operational parameters of the equipment, trouble shooting and relevant technical services.

D.6 Name of person/entity determining the monitoring methodology:

Name of person/entity determining the baseline: MITCON Consultancy Services Ltd.

Organization:	M/s MITCON Consultancy Services Ltd.			
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Note: MITCON Consultancy Services Ltd. is not a project participant as meant in Annex 1.				