8.35 MW WIND POWER PROJECT AT GUDDARANGAVANA HALLI, DISTRICT CHITRADURGA, STATE KARNATAKA IN INDIA

Document Prepared by EKI Energy Services Limited

Project Title	8.35 MW wind power project at Guddarangavana Halli, District Chitradurga, State Karnataka in India
Version	02
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Monitoring Period	01-October-2011 to 27-March-2016 (Inclusive of both days)
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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

MSPL Limited (MSPL) and Ramgad Minerals and Mining Limited (RMML) had put up 8.35 MW wind based power generation project located in the villages GuddadarangavanaHalli, ChikkappanaHalli and Gonur, in District Chitradurga in the state of Karnataka in India. Wind based power generation project has many environmental benefits including zero particulate matter emissions, no greenhouse gas emissions etc, and thereby subsequently contributes to the global efforts for the mitigation of climate change.

The project activity comprises of installation and operation of eight numbers of 950 kW Wind Electricity Generators (WEGs) and one number of 750 kW WEG having a combined wind power generation capacity of 8.35 MW. The annual estimated power generation for each of the 950 kW WEG is 22,05,330 kWh and for the 750 kW WEG, the same is 17,41,050 kWh as per 26.5% PLF recommended in the applicable Karnataka Electricity Regulatory Commission (KERC) Tariff Order dated 18th January 2005.

The WEGs which are part of the project activity are supplied by Vestas Wind Technology (Formerly NEG Micon), an ISO 9001 certified company. As per the Operation and Maintenance (O&M) Contract between MSPL, RMML and Vestas Wind Technology (Vestas), the monitoring of the WEG and furnishing of monthly report of electricity generation shall be the responsibility of Vestas.

Details of wind energy generators (WEGs), connected to the project activity are given in the Table below:

S. No.	Name of Investor	WEG Capacity (MW)	Unique Identification No. for WEG (Turbine ID.)	WEG Physical Locations	Date of Power Purchase Agreement	Commissioning Date
1	MSPL	0.95 (1x950 kW)	MSPL 1-67456	Guddadarangavana Halli, Chitradurga district	07-August-2003	21-March-2003
2	MSPL	4.75 (5x950 kW)	MSPL 2- 67903 MSPL 3- 67910 MSPL 4- 67907 MSPL 5- 67904 MSPL 6- 67906	Guddadarangavana Halli, Chitradurga district	11-February-2004	30.-September-2003

3	RMML	1.9 (2x950 kW)	Ramgad 1- 67902 Ramgad 2- 67905	Guddadarangavna Halli & Chikkappana Halli, Chitradurga district	11-February-2004	30-September-2003
4	RMML	0.75 (1x 750 kW)	Ramgad 3- 68751	Gonur village, Chitradurga district	05-March-2005	19-May-2004

The project activity is supplying power to Bangalore Electricity Supply Company Limited (BESCOM) under a long term power purchase agreement (PPA).

The project activity is installed in the state of Karnataka, which is under the coverage of the Southern grid, and therefore displaces the power which would have otherwise been generated from the grid, which is heavily reliant on fossil fuels. Thus, the project activity would displace the use of fossil fuels in an amount corresponding to the generation of power produced by the wind energy generators and thus subsequently reduce the GHG emission associated with the combustion of fossil fuels for the power generated from the grid.

The total GHG emission reductions or removals generated in the current monitoring period is 75,948 tCO_2e. The project is running smoothly since commissioning with regular schedule maintenance.

1.2 Sectoral Scope and Project Type

The project activity falls under the following Sectoral scope and Project Type:

Sectoral Scope : 01 - Energy industries (renewable / non-renewable sources)
Project Type : I - Renewable Energy Projects
Project Category Version 13[1] : Grid-connected electricity generation from renewable sources AMS-I.D-

The project is not a grouped project activity.

1.3 Project Proponent

Organization name	MSPL Limited
Contact person	Chidanand Narute

[1] https://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_PHPV5WESACMBTJ2YY54GAJYSIEI3HD

Title	Project Representative
Address	Baldota Enclave, Abheraj Baldota Road, Hosapete, 583203, Karnataka, India
Telephone	8394232002
Email	chidanand.n@rmml.in

Organization name	Ramgad Minerals and Mining Limited (RMML)
Contact person	Chidanand Narute
Title	Project Representative
Address	Baldota Enclave, Abheraj Baldota Road, Hosapete, 583203, Karnataka, India
Telephone	8394232002
Email	chidanand.n@rmml.in

MSPL Limited (MSPL) and Ramgad Minerals and Mining Limited (RMML) has set up 9 WEGs for generating power. MSPL is acting as a facilitator and Focal point for the proposed project activity.

1.4 Other Entities Involved in the Project

Organization name	EKI Energy Services Limited
Role in the Project	Project Consultant
Contact person	Manish Dabkara
Title	MD & CEO
Address	P48, Scheme 78 part 2, Vijay Nagar-452010, Indore, India
Telephone	+91-9589899649
Email	manish@enkingint.org / registry@enkingint.org

1.5 Project Start Date

According to the policy announcement dated 10th September 2008 from the VCS Association, the project start date will be considered as the date the project activity began reducing or removing

GHG emissions. The first WEG of the proposed VCS project activity was commissioned on 21-March-2003.

1.6 Project Crediting Period

Project crediting period – 01-April-2006 to 31-March-2016
Total No of Years – 10

1.7 Project Location

The project activity is located in the villages GuddadarangavanaHalli, ChikkappanaHalli and Gonur in District Chitradurga in the state of Karnataka in India. The nearest railway station is Chitradurga and there are two airports with Bangalore Airport about 400 km away and the nearest airport being at Bellary about 190 km away.

The geographical co-ordinates of all the WEGs associated to the project activity are provided in the table below:

WEG Location No.	WEG No.	North- Latitude	East-Longitude
MSPL-01	GR-11	14°18'04"	76° 23'39"
MSPL-02	GR-1	14°18'58"	76° 23'30"
MSPL-03	GR-2	14°18'53"	76° 23'33"
MSPL-04	GR-3	14°18'44"	76° 23'34"
MSPL-05	GR-4	14°18'42"	76° 23'34"
MSPL-06	GR-5	14°18'36"	76° 23'34"
Ramgad-01	GR-6	14°18'31"	76° 23'38"
Ramgad-02	GR-17	14°19'38"	76° 22'23"
Ramgad-03	GON-4	14°16'45"	76° 25'07"

Figure 1. Geographical location of the Project

1.8 Title and Reference of Methodology

Type – I.D

Title: "Grid Connected renewable electricity generation"

Version number: 13[2]

Scope: 1

Tools used in the project activity:

- "Tool to calculate the mission factor for an electricity system"[3], Version 01, EB 32

1.9 Participation under other GHG Programs

Not Applicable, as the project activity is not registered with any other program.

The undertaking from PP has been submitted for no any double accounting for current monitoring period and project activity is not participated any other GHG program other than VCS.

[2] https://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_PHPV5WESACMBTJ2YY54GAJYSIEI3HD

[3] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v1.pdf

1.10 Other Forms of Credit

This is confirm that this project activity is not a result of any binding limit of National/International bodies. The project is purely voluntary in nature. The project is also not participated in any other available emission trading programs.

The project activity is not availing any REC benefits and the same can be confirmed from publically available link of REC generators.

Web-link: https://www.recregistryindia.nic.in/index.php/general/publics/registered_regens *PP has also submitted undertaking for not availing other forms of environmental credit for the same crediting period under consideration.*

1.11 Sustainable Development

Contribution to sustainable development:

Ministry of Environment, Forests and Climate Change, GoI has stipulated economic, social, environment and technological well-being as the four indicators of sustainable development. The project contributes to sustainable development using the following ways.

- **Social well-being:** The project would help in generating employment opportunities during the construction and operation phases. The project activity will lead to development in infrastructure in the region like development of roads and also may promote business with improved power generation.

- **Economic well-being:** The project is a clean technology investment in the region, which would not have been taken place in the absence of the VCS benefits the project activity will also help to reduce the demand supply gap in the state.

  The project activity will generate power using zero emissions wind energy based power generation which helps to reduce GHG emissions and specific pollutants like SOx, NOx, and SPM associated with the conventional thermal power generation facilities.

- **Technological well-being:** The successful operation of project activity would lead to promotion of wind power generation and would encourage other entrepreneurs to participate in similar projects.

- **Environmental well-being:** Wind being a renewable source of energy, it reduces the dependence on fossil fuels and conserves natural resources which are on the verge of depletion. Due to its zero emission the Project activity also helps in avoiding significant amount of GHG emissions.

2 SAFEGUARDS

2.1 No Net Harm

The project activity does not involve any major construction activity. It primarily requires the installation of the WTGs, interfacing the generators with the State Electricity Board by setting up HT transmission lines and installation of other accessories.

The report on "Developmental Impacts and Sustainable Governance Aspects of Renewable Energy Projects" prepared by MNRE dated September 2013[4]. This report clearly mentioned that wind power project activity operations do not result in direct air pollution, noise pollution. Please refer below web link for the same.

Thus there are no any significant impacts due to implementation of project activity on air, water, soil quality and ambience are envisaged due to the project activity.

2.2 Local Stakeholder Consultation

As a part of continual improvement process, feedback from the associated stakeholders is vital, therefore a dedicated Visitor register cum grievance register has been placed at the project site which is accessible to stakeholders to provide their feedback on the project. It is appropriate publicly accessible location at which local stakeholders can provide their feedback on the project. This location is also conducive to continuous and regular checks for stakeholder comments.

At the time of project validation, a broad range of audiences (State Nodal Officers, Village Panchayat Members, District collector office and Local stakeholders) were invited by several means (Invitation, Calls, Notice pasted on common area). Various channels were used to reach maximum number of participants. At the validation stage stakeholder meeting, it was announced that the grievances register would be placed at the site for localities for their feedback and complaints.

Stakeholder meetings are organized on regular intervals in order to identify the major challenges around the area, stakeholders are invited well in advance through printed invitation, calls, meeting and a notice is placed around the local common areas. Various CSR activities around site are carried out with proper stakeholder requirements meeting. The stakeholder are also request to share their experiences and grievances on continuous basis. Registers is used to records the grievances and feedback. During the current monitoring period, positive feedback are received regarding site operation. No any grievances received during the current monitoring period,

[4] https://smartnet.niua.org/sites/default/files/resources/report-on-developmental-impacts-of-RE.pdf

therefore, no any mitigation measures are required. Incase of grievances, the nature of probable resolution is discussed with the plant head office and implemented by the site incharge

2.3 AFOLU-Specific Safeguards

Not applicable to this as this is not an AFOLU project activity.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The Project activity is a new facility (Greenfield) and the electricity generated by the project will be exported to the Indian electricity grid. The project will therefore displace an equivalent amount of electricity which would have otherwise been generated by fossil fuel dominant electricity grid. The Project Proponent plans to avail the VCS benefits for the project.

In the Pre- project scenario the entire 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.

The project activity has already been implemented and all the machines mentioned above have been commissioned and are in operation. There is no any other changes that could alter the design change of the project activity.

The project shall result in replacing anthropogenic emissions of greenhouse gases (GHG's) estimated to be approximately 17,068 tCO_2e per year, thereon displacing 170,680 tCO_2e over the 10 years crediting period.

S.No.	Parameter	WEG 750	WEG 950
Operational parameters			
1	Nominal Output (KW)	750	950
2	Power Regulation	Stall	Stall
3	Cut – in (m/s)	4	3.5
4	Cut – out (m/s)	25	25
Rotor			
5	Rotor diameter (m)	48.2	54.5
6	Rotor swept area (m2)	1824	2333
7	Number of blades	3	3
8	Rotor revolutions (rpm)	22/15	22/15
9	Rotor placing	Upwind Rotor	Upwind Rotor
Brake System			

10	Blade Tip air brake	Hydraulic, fail safe	Hydraulic, fail safe
	Disk Brake	Hydraulic, fail safe	1 pcs. Hydraulic, fail safe
Drive Train			
11	Gear Type	Planetary – parallel axle	Planetary – parallel axle
12	Ratio	1:67.5	1:67.5 (1:81.0 – 60 Hz)
13	Main shaft	Forged shaft and flange	Forged shaft and flange
14	Main bearing	Spherical roller bearing	Spherical roller bearing
15	Cooling	Heat exchanger with pump	Heat exchanger with pump
Generator			
16	Type	Asynchronous, 4/6 pole	Asynchronous, 4/6 pole
17	Nominal Voltage (V)	690	690
18	Nominal Frequence (Hz)	50	50
19	Name plate rating (kW)	750/200	950/200
20	Cooling	Liquid cooled with pump	Liquid cooled with pump
Yaw system			
21	Type	Ball bearing	Sliding bearing
22	Yaw brake	3 Friction brake/ motor brake	
23	Drive mechanism	4 electrical planetary gears	3 electrical planetary gears
Tower			
24	Type	Conical, steel, painted	Conical, steel, painted
25	Hub Height	According to type approvals	According to type approvals
Controller			
26	Type	Computer controlling	Computer controlling
27	Computer controlling	Soft by thyristors	Soft by thyristors
28	Capacitor bank	No – load compensated	Generator no load compensation

29	Remote Control	By modem	By modem
Sensors			
30	RPM sensors	Rotor, generator, yaw system	Rotor, generator, yaw system
31	Temperature sensors	Gear, generator, controller	Gear, generator, controller, ambient
32	Thermal sensors/ warning	Main switch, engine protection	
33	Vibration sensor	Nacelle, rotor	Nacelle, rotor
34	Meteorology	Anemometer, wind vanes, thermometer	Anemometer, wind vanes
35	Hydraulic systems	Pressure sensitive switches, pressure transducer	Pressure transducer
Lightning protection			
36	According to standard	IEC 1024	IEC 1024 Class 1
37	Blades	Receptor in the blade tips	Receptor in the blade tips
38	Nacelle	Arial	Air rod

Once the wind electricity is generated by the turbines described above, it is sent via transmission lines to the consumers via the existing grid transmission structure. The respective WTGs are working fine during the monitoring period with schedule maintenance at regular intervals. Please refer Appendix 3 for major maintenance activities during the current monitoring period. Apart from maintenance activities, there are no any such events that may impact the GHG emission reductions or removals and monitoring.

3.2 Deviations

3.2.1 Methodology Deviations

There is no methodology deviation during the current monitoring period.

3.2.2 Project Description Deviations

The below project description deviation requested during the current monitoring period.

1. The registered PDD mentioned start date of crediting period as 28-March-2006, however first verification monitoring is started from 01-April-2006 onwards only. Also second monitoring report clearly mentioned project crediting period as 01-April-2006 to 31-

March-2016. Thus deviation is requested to correct the project crediting period as 01-April-2006 to 31-March-2016. The deviation do not have any impact on the applicability of the methodology, additionality or the appropriateness of the baseline scenario.

The above deviation is not requested during first and second monitoring reports, though these two reports mentioned the crediting period as 01-April-2006 to 31-March-2016. There is not any impact of this deviation on previous verifications.

2. There is permanent change in the "Other Entities Involved in the Project", EKI Energy Services Limited is now included as Project Consultant. A *Declaration of Agency and Communication Agreement* by PP dated 04-March-2021 is being shared with VVB.

3.3 Grouped Projects

This is not a grouped project activity.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	W_{OM}
Data unit	Fraction
Description	Weight of Operating Margin Emission Factor used for the proposed project activity
Source of data	Tool to calculate emission factor for an electricity system, Version 02, as per the EB 50, Annex 14
Value applied	0.75
Justification of choice of data or description of measurement methods and procedures applied	Calculated as per "Tool to calculate the emission factor for an electricity system, version 04". The data are obtained from "CO2 Baseline Database for Indian Power Sector" version 4.0, published by the Central Electricity Authority, Ministry of Power, Government of India
Purpose of Data	Calculation of emissions factor
Comments	This is in accordance with the applicable methodology

Data / Parameter	W_{BM}
Data unit	Fraction
Description	Weight of Build Margin Emission Factor used for the proposed project

	activity
Source of data	Tool to calculate emission factor for an electricity system, Version 02, as per the EB 50, Annex 14
Value applied	0.25
Justification of choice of data or description of measurement methods and procedures applied	Calculated as per "Tool to calculate the emission factor for an electricity system, version 04". The data are obtained from "CO2 Baseline Database for Indian Power Sector" version 4.0, published by the Central Electricity Authority, Ministry of Power, Government of India
Purpose of Data	Calculation of emissions factor
Comments	This is in accordance with the applicable methodology

Data / Parameter	EF_{OM}
Data unit	tCO_2/MWh
Description	Operating Margin Emission Factor for southern grid in year
Source of data	Tool to calculate emission factor for an electricity system, Version 02, as per the EB 50, Annex 14
Value applied	0.999
Justification of choice of data or description of measurement methods and procedures applied	Calculated as per "Tool to calculate the emission factor for an electricity system, version 04". The data are obtained from "CO2 Baseline Database for Indian Power Sector" version 4.0, published by the Central Electricity Authority, Ministry of Power, Government of India
Purpose of Data	Calculation of emissions factor
Comments	This is in accordance with the applicable methodology

Data / Parameter	EF_{BM}
Data unit	tCO_2/MWh
Description	Operating Margin Emission Factor for southern grid in year
Source of data	Tool to calculate emission factor for an electricity system, Version 02, as per the EB 50, Annex 14
Value applied	0.713
Justification of choice of data or description of measurement methods and procedures applied	Calculated as per "Tool to calculate the emission factor for an electricity system, version 04". The data are obtained from "CO2 Baseline Database for Indian Power Sector" version 4.0, published by the Central Electricity Authority, Ministry of Power, Government of India
Purpose of Data	Calculation of emissions factor

Comments	This is in accordance with the applicable methodology

Data / Parameter	EF_y
Data unit	tCO_2/MWh
Description	Combined Margin CO_2 emission factor for the proposed project activity
Source of data	Computed using the following formula $EF_y = W_{OM} * EF_{OM} + W_{BM} * EF_{BM}$
Value applied	0.9269
Justification of choice of data or description of measurement methods and procedures applied	Calculated as per "Tool to calculate the emission factor for an electricity system, version 04". The data are obtained from "CO_2 Baseline Database for Indian Power Sector" version 4.0, published by the Central Electricity Authority, Ministry of Power, Government of India
Purpose of Data	Calculation of emissions factor
Comments	This is in accordance with the applicable methodology

4.2 Data and Parameters Monitored

Data / Parameter	EGy (Net Electricity supplied to the grid by the WEGs)
Data unit	kWh
Description	Net Electricity supplied to the grid by the project
Source of data	Share Certificate or Form B from BESCOM providing the monthly net electricity generated from project activity and uploaded to Southern grid.
Description of measurement methods and procedures to be applied	Net electricity supplied to grid will be calculated based on the measured values of "export" and "import" on the meter at the delivery point (at the project site), where joint meter reading is taken by project proponent representative and BESCOM/KPTCL officials. The meter at the final uploading point to grid (at the connected substation) is common to the project activity and other wind turbines in the wind farm that are not under this project activity. The meters at the connected substation records the electricity exported and imported by all wind turbines which are part and also not part of the project activity. The joint meter reading at the connected substation is used to estimate the transmission losses from the WEGs. Based on the joint meter reading taken at the project site and the connected substation, BESCOM prepares the Share Certificate or Form B, which indicates the net electricity supplied by the project activity. The reading recorded in this share certificate, issued by BESCOM, will be used to calculate actual GHG emission reductions by the

	project activity. The data relevant to establishing the net electricity generated from the project activity including the share certificate from BESCOM and the invoice to BESCOM shall be archived for entire crediting period plus two years.
Frequency of monitoring/recording	Monthly
Value monitored	81,953.00
Monitoring equipment	Main and check meters. The meter details are outlined in Appendix 1 of this document.
QA/QC procedures to be applied	The measurement of the electricity generated using an electronic meter as installed at the project site (i.e. nearby the WEG) and at the connected substation is considered to be a reliable method for measurement of electricity generated. The additional meters installed at the substation (i.e. grid interconnection point) will be used to measure the mentioned variable on a continuous basis and shall act as a cross check. Every month these meter readings will be recorded by site in-charge and the state utility personnel and the records will be archived for crosschecking yearly figures. The meters at the project site as well as at the connected substation will be tri-vector meters. The readings in these meters may be used to determine the net electricity supplied to the grid by the project activity and determine the extent of mitigation of GHG over a period of time. Calibration of the energy meters being used will be carried out annually as per the standard practice. Data archiving shall be carried out in electronic format during the crediting period and for a time period of two years greater than the total duration of the crediting period of the project activity to enable monitoring of the net electricity supplied to the grid.
Purpose of the data	Calculation of baseline emissions
Calculation method	-
Comments	The accuracy class of the metering equipment shall be 0.2% (both main and check meters) as also mentioned in the Power Purchase Agreement. Calibration frequency: Annually.

4.3 Monitoring Plan

As per the requirements of the methodology, monitoring shall consist of metering the electricity generated by the renewable technology. The project activity leads to mitigation of GHG due to the substitution of fossil fuel generated power in the baseline with zero GHG emitting wind based power project. The monitoring of the emission reduction will be carried out by measuring the net

electricity supplied to the grid by the project activity with the help of electronic tri-vector meters installed at project site for each/group of WEGs as well as at the connected substation.

The project activity has been implemented by MSPL Limited and RMML. The WEGs installed in the project activity have been supplied by M/s Vestas Wind Technology India Pvt. Ltd (earlier known as M/s NEG Micon India Pvt. Ltd.). The project activity is operated and managed by Vestas only. An Operations and Maintenance (O&M) Agreement has been signed with Vestas for that purpose. Vestas has adequate and technically qualified professional to ensure constant monitoring of the installed wind electricity generators.

The project activity will be looked after by the manager responsible for operation of the wind energy generating machines at the project site. Daily operations of the wind energy generating machines will be carried out by the staff responsible for the operation of the WEGs.

The meters used for recording the export and import of the electricity generated by each/group of WEGs associated to the project activity are electronic tri-vector meters. The electricity generated by the project activity is recorded on a daily basis. The data will be captured and stored electronically, wherever possible. As a separate measure, the same data will be entered in the log book on change of every shift in a day. Continuous monitoring, hourly measurement and monthly recording of data are carried out during the monitoring period. The electricity generation from the project activity would be monitored at four metering points with meter IDs: GRHP-02, GRHP-03, GRHP-04, and GRHP-13. Each of the four metering points consists of a main energy meter and a check energy meter. Metering equipments are electronic tri-vector meters with accuracy class of 0.2. The individual WEGs are connected to the metering points as follows:

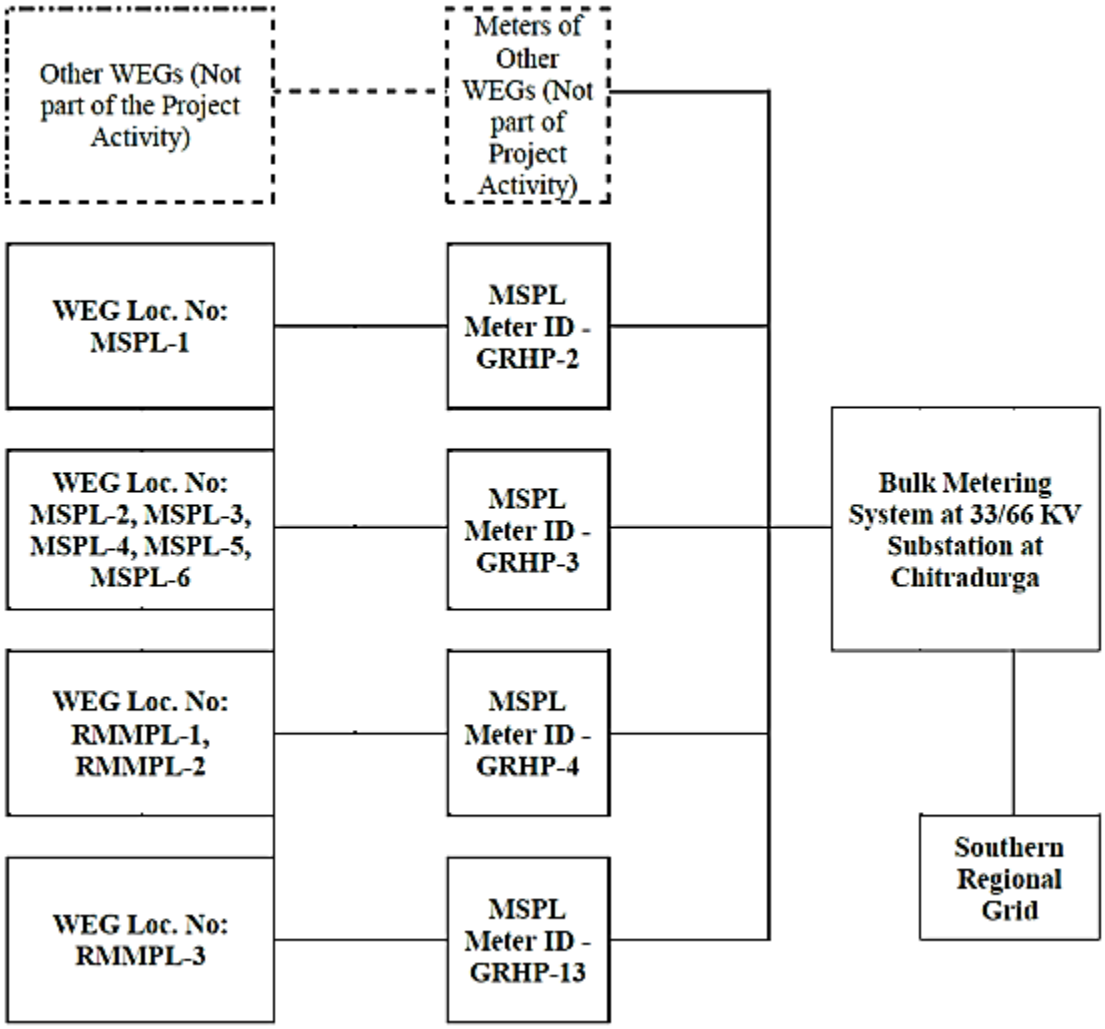
Project Promoter	**Meter ID / RR No.**	**WEG Location Number(s)**	**Feeder**
MSPL Limited (Phase 1)	GRHP-02	MSPL-1	Feeder 01
MSPL Limited (Phase 2)	GRHP-03	MSPL-2, MSPL-3, MSPL-4, MSPL-5 & MSPL-6	Feeder 02
RMM Limited (Phase 1)	GRHP-04	RMML-1 & RMML-2	Feeder 02
RMM Limited (Phase 2)	GRHP-13	RMML-3	Feeder 01

The net electricity supplied to grid will be calculated based on the measured values of "export" and "import" on the meter at the delivery point (i.e. at the project site), where joint reading is taken by project proponent representative and BESCOM/KPTCL officials. The meter at the final uploading point to grid (at the connected substation) is common to the project activity and other

wind turbines in the wind farm that are not under this project activity. The meters at the connected substation records the electricity exported and imported by all wind turbines which are part and also not part of the project activity. The joint meter reading at the connected substation is used to estimate the transmission losses from the WEGs. Based on the joint meter reading taken at the project site and the connected substation, BESCOM prepares the Share Certificate, which indicates the net electricity supplied by the project activity. It is to be noted that the apportioning procedure for arriving at the net electricity supplied by the project activity to the grid (as indicated in the Share Certificate issued by BESCOM) are under the control of BESCOM/KPTCL. The reading (i.e. net electricity supplied to grid) recorded in the said share certificate, issued by BESCOM, will be used to calculate actual GHG emission reductions by the project activity.

Metering Arrangement:

Schematic diagram of the metering arrangement at the project site as well as at the connected substation is provided below:



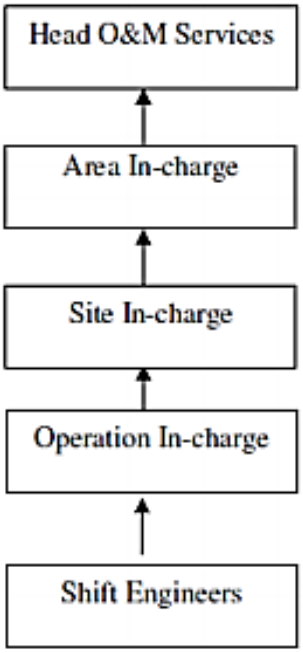
Quality control and Quality Assurance procedures / Calibration Procedures:

Four numbers of main meters and check meters are installed for monitoring the energy exported and imported by the project activity. Each meter is jointly inspected and sealed by both parties (project proponent or its authorized representative and BESCOM/KPTCL) and are not interfered with by either of the party except in the presence of the other party or its accredited representatives. The main and check meters shall be tested for accuracy every calendar year with reference to a portable standard meter. The meters shall be deemed to be working satisfactorily if the errors are within specifications for meters of 0.2% accuracy class. The data registered by the main meter alone will be adopted for the purpose of calculation as long as the error in the main meter is within permissible limits. If during the annual accuracy tests, the main meter is found to be within the permissible limit of error and the corresponding check meter is beyond the limits, the main meter reading shall be considered as usual. However, the check meter shall be calibrated immediately. If the main meter is found to be beyond the permissible limits of error, but

corresponding check meter is within limits, then the check meter leading shall be adopted for that period. The main meter shall be calibrated immediately.

The monitoring, measurement, reporting and training of monitoring personnel shall be conducted by Vestas Wind Technology as defined in the Operation and Maintenance agreement between MSPL & Vestas and RMML & Vestas and the metering records shall also be maintained by personnel of MSPL Limited and BESCOM as defined in the PPAs.

The structure of the Vestas O&M team is as follows:



The roles and responsibilities of the O&M personnel are as follows:

- Head O&M Services: He is in-charge of overall O&M activities of state/country. The responsibilities include formulation of procedures and decision-making for Operation & Maintenance team.
- Area in-charge: He is responsible for the defined areas with group of wind farms. He has to take timely corrective measures/action to ensure that overall performance of site is met and delivered.
- Site In-charge: He is responsible for daily monitoring of the performance of site operation and under any breakdown situation the WTG should be restored at earliest.
- Operation In-charge: He is responsible for attending the unscheduled breakdown of WTG and ensure that WTG should be restored at earliest. Daily monitoring of O & M team and performance of WTG.

Shift Engineers: He is directly responsible for carrying out the O & M activity of WTG and to attend the breakdowns on immediate basis and report problem to Operation in charge.

Emergency Preparedness

In case of failure of monitoring meter(s), the grid officials would immediately replace the meter with a calibrated meter.

The O&M service provider would be responsible for maintenance of the necessary spare parts and consumables for the maintenance of the WTGs such as anemometers, wind vanes and sensors, oil filters, batteries, auxiliary motors and pumps, WTG controllers, slip rings, limit switches and sensors, detergents & solvents etc. The service provider also be ensure the availability of major components such as main gearbox, blades, generator, towers, hub, main shaft & bearings, ground and top controller, cooling and hydraulic systems in the event of a breakdown occurring during the tenure of the O&M. The service provider would also ensure that occupational health and safety procedures are adhered to during the operation & maintenance activities. The main meter is primarily be used for recording generation. In case of its failure, the check meter will be used for the same purpose.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

As per the applicable methodology AMS I.D. (Version 13), the emission in the baseline scenario for the project activity will be determined using the following formula:

$BE_y = EG_y \times EF_{BL}$

Where

BE_y = Baseline emissions (in tCO_2e)

EF_{BL} = Baseline Emissions Factor in tCO_2/MWh

EG_y = Net electricity supplied by the project activity to the grid in MWh

Baseline emission factor (EF_{BL}):

The emission factor for the Southern grid has been calculated ex ante as 0.9269 tCO_2/MWh and does not require monitoring.

Therefore,

$BE_y = 81,953 \times 0.9269$

$= 75,948\ tCO_2e$ (round down values)

5.2 Project Emissions

Being a renewable and clean energy project, the project emissions (PE_y) during operation are considered zero.

5.3 Leakage

Leakage emissions due to project activity are zero.

5.4 Net GHG Emission Reductions and Removals

The emission reductions from the project activity are calculated as:

Emission Reductions (y) = BE_y-PE_y-LE_y

Where
PE_y = zero
LE_y = Project Leakage = Zero
and $BE_y = EG_y \times EF_{BL}$

Therefore,

$BE_y = EG_y \times EF_{BL}$

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
01-October-2011 to 31-December-2011	1,143	0	0	1,143
01-January-2012 to 31-December-2012	18,524	0	0	18,524
01-January-2013 to 31-December-2013	19,306	0	0	19,306
01-January-2014 to 31-December-2014	17,864	0	0	17,864
01-January-2015 to 31-December-2015	16,895	0	0	16,895
01-January-2016 to 27-March-2016	2,216	0	0	2,216
Total	**75,948**	**0**	**0**	**75,948**

The estimated VER generation during the current monitoring period is 76,644 and the actual VER is 75,948. A total 1.15 % lower VER generation is observed, this is due to lower wind flow patterns at the site which is conservative.

Further Vintage breakdown of the credits as SPV included are as:

Vintage Breakdown:							
	2011	2012	2,013	2,014	2,015	2016	Total
MSPL, 1*950	283	1,930	2,043	1,911	1,758	229	8,154
MSPL, 5*950	105	11,202	11,822	10,877	10,222	1,364	45,592
RMML, 2*950	472	3,566	3,642	3,470	3,363	466	14,979
RMML, 1*750	283	1,826	1,799	1,606	1,552	157	7,223
Total	1,143	18,524	19,306	17,864	16,895	2,216	**75,948**

APPENDIX 1: CALIBRATION DETAILS

Meter ID /RR No.	Name of Investor and capacity (MW)	Make	Accuracy Class	Main Meter		Check Meter		Next due date	Gap in Calibration
				Meter No	Calibration Date	Meter No	Calibration Date		
GRHP-02	MSPL (0.95 MW)	L&T	0.2s	09141531	11-February-2011	05390231	11-February-2011	10-February-2012	-
		L&T	0.2s		10-May-2012		10-May-2012	9-May-2013	February to May 2013
		L&T	0.2s		25-April-2013		25-April-2013	24-April-2014	-
		L&T	0.2s		13-January-2014		13-January-2014	12-January-2015	-
		L&T	0.2s		22-April-2015		22-April-2015	21-April-2016	January to April 2015
GRHP-03	MSPL (4.75 MW)	L&T	0.2s	02312419	7-February-2011	09142239	7-February-2011	6-February-2012	-
		L&T	0.2s	11071119	10-May-2012	12093143	10-May-2012	9-May-2013	February 2012 to May 2012
		L&T	0.2s		25-April-2013		25-April-2013	24-April-2014	-
		L&T	0.2s		13-January-2014		13-January-2014	12-January-2015	-
		L&T	0.2s		22-April-2015		22-April-2015	21-April-2016	January 2015 to April 2015
		L&T	0.2s		26-March-2016		26-March-2016	25-March-2017	-

		L&T	0.2s		10-March-2017		10-March-2017	9-March-2018	-
GRHP-04	RMML (1.9MW)	L&T	0.2s	02312418	11-February-2011	02312417	11-February-2011	10-February-2012	-
		L&T	0.2s		10-May-2012		10-May-2012	9-May-2013	February to May 2012
		L&T	0.2s	12093137	24-April-2013	12092905	24-April-2013	23-April-2014	-
		L&T	0.2s		13-January-2014		13-January-2014	12-January-2015	-
		L&T	0.2s		22-April-2015		22-April-2015	21-April-2016	January to April 2015
GRHP-13	RMML (0.75MW)	L&T	0.2s	04186295	8-February-2011	04186298	8-February-2011	7-February-2012	-
		L&T	0.2s		15-February-2012		15-February-2012	14-February-2013	Feb-12
		L&T	0.2s		18-April-2013		18-April-2013	17-April-2014	February to April 2013
		L&T	0.2s		13-January-2014		13-January-2014	12-January-2015	-
		L&T	0.2s		24-April-2015		24-April-2015	23-April-2016	January to April 2015

APPENDIX 2: MAJOR BREAKDOWN DETAILS

MSPL I		
Date	**Fault**	**Turbine**
05-January-2013	5.5	assymmetric voltage
06-January-2013	4.2	assymmetric voltage
08-January-2013	0.8	assymmetric voltage
09-January-2013	5.2	assymmetric voltage
10-January-2013	4.8	assymmetric voltage
11-January-2013	5.2	assymmetric voltage
12-January-2013	5.1	assymmetric voltage
13-January-2013	1.2	assymmetric voltage
14-January-2013	5.2	assymmetric voltage
15-January-2013	3.5	assymmetric voltage
16-January-2013	4.3	assymmetric voltage
18-January-2013	3.0	assymmetric voltage
23-January-2013	4.1	assymmetric voltage
25-January-2013	2.2	assymmetric voltage
26-January-2013	1.2	assymmetric voltage
27-January-2013	5.5	assymmetric voltage , Time shaft breake fault attnded
01-May-2015	24.0	Gear box and found HSS teeth got damage
02-May-2015	24.0	Gear box and found HSS teeth got damage
03-May-2015	24.0	Gear box and found HSS teeth got damage
04-May-2015	23.5	Gear box and found HSS teeth got damage
05-May-2015	24.0	Gear box and found HSS teeth got damage
06-May-2015	24.0	Gear box and found HSS teeth got damage
07-May-2015	23.3	Gear box and found HSS teeth got damage
08-May-2015	24.0	Gear box and found HSS teeth got damage
09-May-2015	24.0	Gear box and found HSS teeth got damage
10-May-2015	24.0	Gear box and found HSS teeth got damage
11-May-2015	16.8	Gear box and found HSS teeth got damage[Gear box replced wok done]
12-May-2015	15.5	Tip brake pressuretoo long[Lack of Material[SRB Not Avail]
14-May-2015	24.0	Tip brake pressuretoo long[Lack of Material[SRB Not Avail]
17-May-2015	9.5	Tip brake pressuretoo long (slipring replacement work done)
MSPL-2		
13-February-2014	8.4	"B" Service work done
25-August-2014	9.2	" C " Service work done
21-September-2014	18.2	Blade Repairing work done [Blade hair line crack]

22-September-2014	24.0	Blade Repairing work done [Blade hair line crack]
23-September-2014	13.2	Blade Repairing work done [Blade hair line crack]
06-October-2017	13.5	WTG Manually stopped for Soil erosion formed due to Rain water
07-October-2017	24.0	WTG Manually stopped for Soil erosion formed due to Rain water
08-October-2017	24.0	WTG Manually stopped for Soil erosion formed due to Rain water
09-October-2017	24.0	WTG Manually stopped for Soil erosion formed due to Rain water
10-October-2017	24.0	WTG Manually stopped for Soil erosion formed due to Rain water
11-October-2017	13.0	WTG Manually stopped for Soil erosion formed due to Rain water
12-October-2017	19.8	WTG Manually stopped for Soil erosion formed due to Rain water
13-October-2017	24.0	WTG Manually stopped for Soil erosion formed due to Rain water
14-October-2017	23.9	WTG Manually stopped for Soil erosion formed due to Rain water
15-October-2017	22.3	WTG Manually stopped for Soil erosion formed due to Rain water
16-October-2017	24.0	WTG Manually stopped for Soil erosion formed due to Rain water
17-October-2017	24.0	WTG Manually stopped for Soil erosion formed due to Rain water
MSPL 3		
12-January-2013	5.1	Assymmetric voltage.
18-January-2013	5.5	Assymmetric voltage.
19-January-2013	6.2	Assymmetric voltage.
20-January-2013	5.4	Assymmetric voltage.
22-January-2013	5.5	Assymmetric voltage.
26-January-2013	5.5	Assymmetric voltage.
03-February-2013	5.5	assymmetric voltage
14-February-2013	5.3	assymmetric voltage
17-February-2013	5.2	assymmetric voltage
19-February-2013	5.0	assymmetric voltage
27-February-2013	5.3	assymmetric voltage
14-September-2016	5.5	Group control CB tripped on EFR
08-January-2017	6.5	Phase -2 Group Control VCB tripped on EFR
23-January-2017	6.5	Phase -2 Group Control VCB tripped on EFR
MSPL 4		
19-January-2013	6.2	Assymmetric voltage.
01-March-2013	20.6	Tip mech. Work
07-March-2013	7.0	Pump time tip break tooo long
19-September-2013	7.4	CX1,CX3,CX5 Service done
26-June-2014	23.5	Transformer failure
27-June-2014	12.3	Transformer failure
11-September-2014	12.3	TOI number 2 Comm. Fault
12-September-2014	8.0	TOI number 2 Comm. Fault
03-February-2015	6.8	AB opened for pole [yard] painting work
27-February-2015	8.5	" B " Service work done

02-March-2015	8.0	B " service work done
29-April-2015	7.5	Tranformer failure (Grid spiks -01)
30-April-2015	24.0	Tranformer failure (Grid spiks -01)
09-July-2015	23.1	Fault grid voltage fault (Power panel flash over)
10-July-2015	24.0	Fault grid voltage fault (Power panel flash over)
11-July-2015	24.0	Fault grid voltage fault (Power panel flash over)
12-July-2015	20.8	Fault grid voltage fault (Power panel flash over)15:45 & Assymatric current fast[5:00]
13-July-2015	6.1	Assymatric current fast
08-September-2015	7.7	CX2 service work done
24-November-2015	7.0	Hub com,Fault [Hub com,panel replacement work done]
08-January-2017	6.5	Phase -2 Group Control VCB tripped on EFR
23-January-2017	7.8	Phase -2 Group Control VCB tripped on EFR [6:30] & Fuse failure [1:20]
MSPL 5		
12-January-2013	5.1	Assymmetric voltage.
18-January-2013	5.5	Assymmetric voltage.
19-January-2013	6.2	Assymmetric voltage.
20-January-2013	5.4	Assymmetric voltage.
22-January-2013	5.5	Assymmetric voltage.
26-January-2013	5.5	Assymmetric voltage.
27-January-2013	5.5	Assymmetric voltage.
14-February-2013	5.5	Assymmetric voltage.
17-February-2013	5.3	Assymmetric voltage.
19-February-2013	5.2	Assymmetric voltage.
14-September-2016	5.0	Group control CB tripped on EFR
03-October-2016	5.5	Group control CB tripped on EFR
04-October-2016	17.9	Group control CB tripped on EFR
08-January-2017	10.4	Group control CB tripped on EFR
23-January-2017	6.5	Phase -2 Group Control VCB tripped on EFR
MSPL 6		
08-September-2017	20.0	Transformer HV Winding "R" Phase was broken
09-September-2017	24.0	Transformer HV Winding "R" Phase was broken
10-September-2017	24.0	Transformer HV Winding "R" Phase was broken
11-September-2017	24.0	Transformer HV Winding "R" Phase was broken
12-September-2017	24.0	Transformer HV Winding "R" Phase was broken
13-September-2017	24.0	Transformer HV Winding "R" Phase was broken
14-September-2017	21.3	Transformer HV Winding "R" Phase was broken
15-September-2017	24.0	Transformer HV Winding "R" Phase was broken
16-September-2017	24.0	Transformer HV Winding "R" Phase was broken
17-September-2017	24.0	Transformer HV Winding "R" Phase was broken

18-September-2017	24.0	Transformer HV Winding "R" Phase was broken
19-September-2017	24.0	Transformer HV Winding "R" Phase was broken
20-September-2017	24.0	Transformer HV Winding "R" Phase was broken
21-September-2017	18.4	Transformer HV Winding "R" Phase was broken
22-September-2017	24.0	Transformer HV Winding "R" Phase was broken
23-September-2017	24.0	Transformer HV Winding "R" Phase was broken
24-September-2017	24.0	Transformer HV Winding "R" Phase was broken
25-September-2017	24.0	Transformer HV Winding "R" Phase was broken
26-September-2017	21.5	Transformer HV Winding "R" Phase was broken
27-September-2017	23.1	Transformer HV Winding "R" Phase was broken
28-September-2017	24.0	Transformer HV Winding "R" Phase was broken
29-September-2017	24.0	Transformer HV Winding "R" Phase was broken
30-September-2017	24.0	Transformer HV Winding "R" Phase was broken
01-October-2017	24.0	Transformer HV Winding "R" Phase was broken
02-October-2017	24.0	Transformer HV Winding "R" Phase was broken
03-October-2017	24.0	Transformer HV Winding "R" Phase was broken
04-October-2017	24.0	Transformer HV Winding "R" Phase was broken
05-October-2017	24.0	Transformer HV Winding "R" Phase was broken
06-October-2017	24.0	Transformer HV Winding "R" Phase was broken
07-October-2017	24.0	Transformer HV Winding "R" Phase was broken
08-October-2017	24.0	Transformer HV Winding "R" Phase was broken
09-October-2017	24.0	Transformer HV Winding "R" Phase was broken
10-October-2017	24.0	Transformer HV Winding "R" Phase was broken
11-October-2017	13.0	Transformer HV Winding "R" Phase was broken
12-October-2017	4.5	Transformer Replacement work done
Ramgad 3		
19-September-2017	24.0	Reading not upload from Vestas due to Vestas Issue
20-September-2017	24.0	WTG Stopped From19.09.17 and Vestas team fault not Attend & Reading not upload from Vestas due to Vestas Issue
21-September-2017	18.4	WTG Stopped From19.09.17 and Vestas team fault not Attend & Reading not upload from Vestas due to Vestas Issue
22-September-2017	24.0	WTG Stopped From19.09.17 and Vestas team fault not Attend & Reading not upload from Vestas due to Vestas Issue
23-September-2017	24.0	WTG Stopped From19.09.17 and Vestas team fault not Attend & Reading not upload from Vestas due to Vestas Issue
24-September-2017	24.0	WTG Stopped From19.09.17 and Vestas team fault not Attend & Reading not upload from Vestas due to Vestas Issue
25-September-2017	24.0	WTG Stopped From19.09.17 and Vestas team fault not Attend & Reading not upload from Vestas due to Vestas Issue
26-September-2017	21.5	WTG Stopped From19.09.17 and Vestas team fault not Attend &

		Reading not upload from Vestas due to Vestas Issue
27-September-2017	23.1	WTG Stopped From19.09.17 and Vestas team fault not Attend & Reading not upload from Vestas due to Vestas Issue
28-September-2017	6.7	MSPL & Victory Joint Audit Completion & WEG Restored At 16:20[12:00-16:20]

APPENDIX 3: MAJOR SCHEDULE MAINTENANCE ACTIVITY

Gen Date.	Site	Loc. No.	Remark	Hours
05-November-2011	Guddadarangavana Halli	MSPL 1-67456	WTG Preventive Maintenance	14.2
29-November-2011	Guddadarangavana Halli	MSPL 2- 67903	WTG Preventive Maintenance	11.2
12-December-2011	Guddadarangavana Halli	Ramgad 1- 67902	WTG Preventive Maintenance	12
14-February-2012	Gonur	Ramgad 3- 68751	Blade Maintenance	12.8
15-February-2012	Gonur	Ramgad 3- 68751	Blade Maintenance	24
16-February-2012	Gonur	Ramgad 3- 68751	Blade Maintenance	24
17-February-2012	Gonur	Ramgad 3- 68751	Blade Maintenance	24
18-February-2012	Gonur	Ramgad 3- 68751	Blade Maintenance	21.9
19-February-2012	Gonur	Ramgad 3- 68751	Blade Maintenance	13.5
20-April-2012	Guddadarangavana Halli	MSPL 4- 67907	Blade Maintenance	11.8
21-April-2012	Guddadarangavana Halli	MSPL 4- 67907	Blade Maintenance	24
22-April-2012	Guddadarangavana Halli	MSPL 4- 67907	Blade Maintenance	24
23-April-2012	Guddadarangavana Halli	MSPL 4- 67907	Blade Maintenance	19.4
18-October-2012	Guddadarangavana Halli	MSPL 6- 67906	WTG Preventive Maintenance	11.3
25-March-2013	Guddadarangavana Halli	MSPL 5- 67904	WTG Preventive Maintenance	12.7
11-October-2013	Guddadarangavana Halli	Ramgad 1- 67902	WTG Annual Maintenance	8.1
12-March-2014	Guddadarangavana Halli	Ramgad 2- 67905	WTG Annual Maintenance	9.1
16-October-2014	Guddadarangavana Halli	Ramgad 1- 67902	WTG Annual Maintenance	9.7

22-January-2015	Guddadarangavana Halli	MSPL 6- 67906	WTG Annual Maintenance	8.8
24-October-2015	Guddadarangavana Halli	MSPL 2- 67903	WTG Annual Maintenance	9.4
31-January-2016	Guddadarangavana Halli	Ramgad 1- 67902	WTG Half Yearly Maintenance	8.9
01-February-2016	Guddadarangavana Halli	Ramgad 2- 67905	WTG Half Yearly Maintenance	8.1
05-February-2016	Gonur	Ramgad 3- 68751	WTG Half Yearly Maintenance	8.2
09-February-2016	Guddadarangavana Halli	Ramgad 1- 67902	WTG Half Yearly Maintenance	10
09-February-2016	Guddadarangavana Halli	MSPL 4- 67907	WTG Half Yearly Maintenance	8.4
09-February-2016	Guddadarangavana Halli	MSPL 2- 67903	WTG Half Yearly Maintenance	8.8