WIND POWER PROJECT IN GUJARAT

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Document Prepared by EKI Energy Services Limited

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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

Mytrah Energy (India) Limited (formerly Caparo Energy (India) Limited[1]) is entering into the renewable energy sector with an objective to build wind power assets in India. Mytrah Energy (India) Limited has completed 25.20 MW wind power project at in Rajkot District and Surendranagar District of Gujarat State. The project activity comprises of 12 Wind Electric Generators (WEGs) with a capacity of 2.1 MW each. The project activity involves WTGs having S88 model of make Suzlon Energy Limited (SEL). The objective of the VCS project activity is to generate electricity from environmentally benign sources of energy in the Indian state of Gujarat in order to use renewable and clean electricity to contribute towards combating global warming. The project reduces greenhouse gas emissions as it displaces electricity from the INDIAN Grid (earlier it was NEWNE grid) dominated by fossil fuel based electricity generation plants.

The project activity help to reduce the supply demand gap in the state and also helps in contributing to the sustainable development by using wind energy as the source of power generation and reduction of GHG Emissions. In the project site, there are other wind projects owned by other customers connected to the same substation. There is an apportioning procedure which is approved by the state nodal agency for apportioning the electricity to each and every customer. The project activity is a zero emissions wind based power generation project connected to INDIAN grid. The project is to export around 50,662.584 MWh to INDIAN Grid every year. Hence, the baseline for the project as per Version 12.3.0 of ACM0002 is defined as “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 harnesses renewable resources in the region, thereby displacing non-renewable natural resources and leading to sustainable economic development of the locality. Suzlon Energy Limited (SEL) is the WEG supplier and the operations and maintenance contractor for the project. The electricity generated from the wind farm is being supplied to Bhojapuri (Mahidad) substation through local transmission lines duly metered and measured by Gujarat Urja Vikas Nigam Limited (GUVNL) on a monthly basis at the substation of the wind farm.

The commissioning details of project implementation is mentioned section 3.1 of MR. The plant is running smoothly since commissioning with scheduled maintenance. The breakdown details are mentioned in Appendix II of Monitoring report.

[1] http://www.mytrah.com/

The total GHG emission reductions achieved during this monitoring period is 44,356 tCO_2e.

1.2 Sectoral Scope and Project Type

The project activity is a single project activity and falls under
Sectoral Scope: 01 - Energy industries (renewable / nonrenewable sources)
Project Type : I - Renewable Energy Projects
Title: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"
Methodology : The methodology applied for the project is ACM 0002 of version 12.3.0

1.3 Project Proponent

Organization name	Mytrah Energy (India) Limited
Contact person	Mr. Ravinder Kumar Rana
Title	Assistant Manager
Address	1st Floor, 8001, 8th Floor, Q-City, Nanakramguda, Gachibowli, Hyderabad 500032, Telangana, INDIA
Telephone	+91 88263 44338
Email	ravinderkumar.rana@mytrah.com

1.4 Other Entities Involved in the Project

Organization name	EKI Energy Services Limited
Role in the Project	Project Consultant
Contact person	Anjali Rao
Title	Project Manager
Address	Office No. 201, EnKing Embassy, Plot No. 48, Scheme No. 78, Part II, Vijay Nagar INDORE – 452010, India.
Telephone	+91 9109120940
Email	anjali@enkingint.org / registry@enkingint.org

1.5 Project Start Date

The start date considered for the project activity is 06-August-2011 which is the earliest commissioning date among project activity WTGs

1.6 Project Crediting Period

VCS crediting period is from 06-August-2011 to 05-August-2021 (10 years fixed) as the earliest date of commissioning of the WTG is from 06-August-2011.

1.7 Project Location

The wind power project is located in Rajkot and Surendranagar district, Gujarat, India. The geo-coordinates of the project location is as follows:

Sr. No	Location No.	Village and Tehsil	District	Latitude	Longitude	Model	H
1	JSD 038	Bhadlai	Rajkot	22° 11' 41.9"	71° 05' 44.4"	S88	80 m
2	JSD 041	Dahisra	Rajkot	22° 11' 41.4"	71° 08' 7.5"	S88	80 m
3	JSD 042	Dahisra	Rajkot	22° 11' 31.3"	71° 08' 28.3"	S88	80 m
4	MAH013	Bhojpari	Surendranagar	22° 17' 48.5"	71° 10' 15.8"	S88	80 m
5	MAH014	Bhojpari	Surendranagar	22° 17' 1.3"	71° 10' 19.1"	S88	80 m
6	MAH015	Bhojpari	Surendranagar	22° 16' 46.2"	71° 10' 21.3"	S88	80 m
7	MAH016	Chobari	Surendranagar	22° 15' 39.8"	71° 11' 42.3"	S88	80 m
8	MAH018	Chobari	Surendranagar	22° 15' 29.2"	71° 11' 27.5"	S88	80 m
9	MAH021	Tajpar	Surendranagar	22° 14' 53.6"	71° 10' 39.8"	S88	80 m
10	MAH022	Sakhpar	Surendranagar	22° 14' 56.6"	71° 11' 13"	S88	80 m
11	MAH041	Bhojpari	Surendranagar	22° 17' 27.5"	71° 10' 9.9"	S88	80 m
12	MDW 021	Kabran	Surendranagar	22° 17' 48.0"	71° 08' 24.1"	S88	80 m

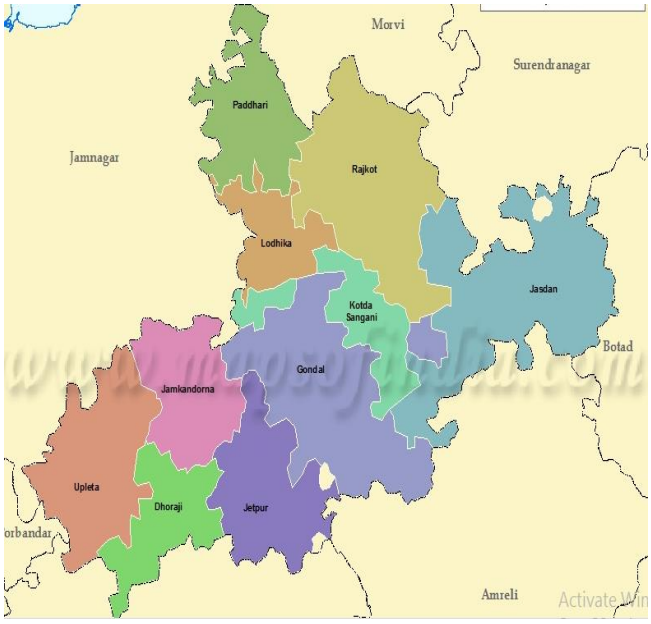


Figure 2. Map showing Rajkot and Surendranagar

Figure 3. Locations of WTGs

Figure 1. Map depicting Gujarat state of India

1.8 Title and Reference of Methodology

Title: Consolidated baseline methodology for grid-connected electricity generation from renewable sources.
Methodology: Version 12.3.0 of ACM 0002[2].

[2] http://cdm.unfccc.int/methodologies/DB/C505BVV9P8VSNNV3LTK1BP3OR24Y5L

The methodology also refers to the latest approved versions of the following tools:

- Tool to calculate the emission factor for an electricity system (Version 02.2.1, Approved in EB 63);
- Tool for the demonstration and assessment of additionality;
- Combined tool to identify the baseline scenario and demonstrate additionality;
- Tool to calculate project or leakage CO2 emissions from fossil fuel combustion

The tools used in the PDD are as follows:

"Tool to calculate emission factor for an electricity system" – Version 02.2.1, Approved in EB 63[3]

"Tool for the demonstration and assessment of additionality" – Version 6.0.0, Approved in EB 65[4].

"Guidance on assessment of investment analysis"- Version 5.0 approved in EB 62[5].

1.9 Participation under other GHG Programs

Participation under Other GHG Programs: The PP has participated under CDM mechanism of UNFCCC. The UN reference id 8823[6] of program with this project activity. The PP would not consider the credit from any other mechanism for the current monitoring plan. The undertaking is provided to confirm that there is no any double accounting for current monitoring period.

1.10 Other Forms of Credit

- Emission Trading Programs and Other Binding Limits: The PP has not applied this project in any Emission Trading Programs and other Binding Limits.
- Other Forms of Environmental Credit: The project is registered in CDM mechanism having ID 8823[7] and has claimed CDM benefits for monitoring period of 26-December-2012 to 01-January-2014. The project will not claim in any GHG benefits for the present monitoring period. PP not participating for REC benefits can be verified from this link- https://www.recregistryindia.nic.in/index.php/publics/accredited_regens

1.11 Sustainable Development

Contribution to sustainable development:

Ministry of Environment, Forest and Climate Change 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.

[3] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf

[4] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf

[5] http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf

[6] http://cdm.unfccc.int/Projects/DB/SGS-UKL1355741006.12/view

[7] https://cdm.unfccc.int/Projects/DB/SGS-UKL1355741006.12/view

- **Social well-being:** The project helped in generating employment opportunities during the construction and operation phases. The project activity leads to development in infrastructure in the region like development of roads, telecommunication 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 also helps to reduce the demand supply gap in the state. The project activity creates local employment generation which helps economic well-being of local people.
- **Technological well-being:** The successful operation of project activity leads to promotion of Wind based power generation and would encourage other entrepreneurs to participate in similar projects
- **Environmental well-being:** The project activity 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 does not involve any potential negative environmental and socio economic impacts and hence this criteria is not applicable to this project activity.

The report on "Developmental Impacts and Sustainable Governance Aspects of Renewable Energy Projects" prepared by MNRE dated September 2013. This report clearly mentioned that wind project activity operations do not result in direct air pollution, noise pollution. Please refer below web link for the same[8].

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 at 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. For the global stakeholders, the suggestion and the grievance can be submitted to mail@mytrah.com

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

Stakeholder meetings were organized during project activity registration under CDM in order to identify the major challenges around the area, stakeholders were 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 to support local stakeholder.

The stakeholders are also requested to share their experiences and grievances on continuous basis. Registers is used to records the grievances and feedback. During the current monitoring period, positive feedbacks had been received regarding site operation. No any grievances received during the current monitoring period, therefore, no any mitigation measures were required. In case of grievances, the nature of probable resolution is discussed with the plant head office and implemented by the site in charge. The grievance copies are submitted to DOE.

2.3 AFOLU-Specific Safeguards

This Section is not applicable here as the project activity is not an AFOLU project activity.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The project is of capacity 25.20 MW wind power and located at Rajkot District and Surendranagar District of Gujarat State. It comprises of 12 Wind Electric Generators (WEGs) with a capacity of 2.1 MW each. The S88 model WTGs installed as part of project activity and WTGs are of Suzlon Energy Limited (SEL) make. The technology of electricity generation from renewable wind resource is environment friendly as it does not use any fossil fuel. The power (electricity) thus produced by the project activity is transmitted to the state electricity grid, thereby displacing equivalent amount of power in the grid which is dominated by emission intensive thermal power plants.

The technical specification of the WTG is as follows:

MODEL	**S88 - 2.1MW**
Operating Data	
Rated power	2.1MW
Cut-in wind speed	4 m/s
Rated wind speed	14 m/s
Cut-out wind speed	25 m/s
50 years gust wind speed	59.5 m.s
Hub height	79m (Foundation top equal to ground level)
Wind Class	IEC – IIA
Rotational Speed	15 to 17.7 rpm
Rotor	
Pitch system	Pitch regulated, electrical
Diameter	88 m
Swept area	6082 m^2

Blade material type	Epoxy bounded fibre glass
Generator	
Type	Induction generator with slip rings, variable rotor
Rated power	2100 kW
Rated voltage	690/600 V
Frequency	50/60 Hz
Protection	IP 54, IP23 for slip ring unit
Cooling system	Air cooled
Insulation	Class H
Slip control	Unique Flexi-Slip providing slip up to 16.67%
Braking System	
Aerodynamic brake	3 independent systems with blade pitching
Mechanical brake	Hydraulic fail-safe disc brake system
Gearbox	
Type	3 stages (One planetary & Two helical)
Ratio	1:98.8 (±0.5%)
Nominal load	2,310 kW
Yaw System	
Type	Electric motors with brake, gearbox & pinion
Bearings	Friction bearing with gear rim
Tower	
Type	Tubular Tower (4 sections)
Corrosion protection	Epoxy/ PU coated

The project has been under operation since commissioning i.e. 06-August-2011 which is the start date of the project activity, without any major breakdowns. Though normal breakdowns (as referred in appendix II) due to O&M measures are continuously being worked upon by the dedicated O&M contractor for the projects WEGs. The plant is running smoothly since commissioning with scheduled maintenance. No events or situations occured during the reported monitoring period that can alter the applicability of the applied methodology.

The Commissioning dates of each WTGs are mentioned below:

Sr. No	Location No.	WTG No.	Village and Tehsil	Date of Commissioning
1	JSD 038	SEL/2100/11-12/2216	Bhadlai	01-October-2011
2	JSD 041	SEL/2100/11-12/2217	Dahisra	28-September-2011
3	JSD 042	SEL/2100/11-12/2218	Dahisra	28-September-2011
4	MAH013	SEL/2100/11-12/2211	Bhojpari	10-August-2011
5	MAH014	SEL/2100/11-12/2213	Bhojpari	06-August-2011
6	MAH015	SEL/2100/11-12/2214	Bhojpari	06-August-2011
7	MAH016	SEL/2100/11-12/2207	Chobari	12-August-2011
8	MAH018	SEL/2100/11-12/2208	Chobari	31-August-2011
9	MAH021	SEL/2100/11-12/2209	Tajpar	31-August-2011
10	MAH022	SEL/2100/11-12/2210	Sakhpar	31-August-2011
11	MAH041	SEL/2100/11-12/2212	Bhojpari	06-August-2011

12	MDW21	SEL/2100/11-12/2215	Kabran	06-August-2011

3.2 Deviations

2.3.1 Methodology Deviations

There is no request for deviation applied during this monitoring period

2.3.2 Project Description Deviations

Deviation 1-

The CDM registered PDD mentioned three monitoring parameters like net electricity supplied to grid ($EG_{PJ,y}$), electricity export ($E_{,exp}$) by project and electricity import ($E_{,imp}$) by project and net electricity is difference of export and import.

Since PP have only one parameter data available i.e data of net electricity supplied to grid through share certificate issued by state electricity board. Hence only single parameter of net electricity supplied to grid ($EG_{PJ,y}$) is considered for this project activity. The other 2 parameters of electricity export ($E_{,exp}$) and electricity import ($E_{,imp}$) are not considered as a part of monitoring parameters due to non-availability of data to PP.

This does not have any impact on emission reductions. This deviation which is of permanent nature is been pre-approved during the previous verification period of 02-January-2014 to 31-May-2018[9].

There is no change in the present verification for the project activity,

Deviation 2-

PP is requested for deviation regarding some minor changes in technical specifications of WTGs from the registered VCS PD. The details of the same is mentioned below

MODEL	**S88 - 2.1MW**
Operating Data	
Rotational Speed	15 to 17.7 rpm
Generator	
Type	Induction generator with slip rings, variable rotor
Gearbox	
Type	3 stages (One planetary & Two helical)
Ratio	1:98.8 (±0.5%)
Nominal load	2,310 kW
Yaw System	

[9] https://registry.verra.org/app/projectDetail/VCS/1190

Type	Electric motors with brake, gearbox & pinion
Bearings	Friction bearing with gear rim

The above change are checked from the technical document and therefore deviation is sought for the same from the registered PD.

3.3 Grouped Projects

This project activity is not a grouped project activity.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	$EF_{grid,OMsimple,y}$
Data unit	tCO_2/MWh
Description	Operating margin CO_2 emission factor of NEWNE grid
Source of data	Central Electricity Authority:CO_2 Emission Database CEA CO_2 Baseline database Version 07[10]
Value applied	0.9842
Justification of choice of data or description of measurement methods and procedures applied	The operating margin emission factor data has been deduced from CO_2 database. CEA CO_2 Baseline database Version 07
Purpose of Data	Calculation of baseline emissions
Comments	The operating margin emission factor is a 3-year generation-weighted average (2008-11). Data calculated to be 0.9842. The operating Margin is calculated ex ante and fixed during the crediting period.

Data / Parameter	$EF_{grid,BM,y}$
Data unit	tCO_2/MWh
Description	Build margin CO_2 emission factor of NEWNE grid
Source of data	Central Electricity Authority:CO_2 Emission Database CEA CO_2 Baseline database Version 07[11]
Value applied	0.8588

[10] http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

[11] http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

Justification of choice of data or description of measurement methods and procedures applied	The operating margin emission factor data has been deduced from CO_2 database. CEA CO_2 Baseline database Version 07
Purpose of Data	Calculation of baseline emissions
Comments	The build Margin would be calculated ex-ante and fixed during the crediting period. For ex-ante calculation the most recent data available has been used and the build margin thus calculated is 0.8588

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2/MWh
Description	Combined margin CO_2 emission factor of NEWNE grid
Source of data	Central Electricity Authority:CO2 Emission Database CEA CO_2 Baseline database Version 07[12]
Value applied	0.9528
Justification of choice of data or description of measurement methods and procedures applied	Calculated as per the procedures in "Tool to calculate the emission factor for an electricity system" based on CEA data.
Purpose of Data	Calculation of baseline emissions
Comments	The combined margin would be calculated ex-ante and fixed for the entire crediting period.

4.2 Data and Parameters Monitored

Data / Parameter	$EG_{PJ,y}$
Data unit	MWh
Description	Quantity of net electricity exported to the grid during the year y.
Source of data	Certificate for share of electricity generated by Wind Farm.
Description of measurement methods and procedures to be applied	Authorized state agency (GETCO) releases a monthly Share Certificate for the net energy exports. This certificate is used for determining the emission reductions and also for the billing and payment of net sale of electricity from the project. **Calibration Frequency:** Energy meters is calibrated atleast once in 3 years.

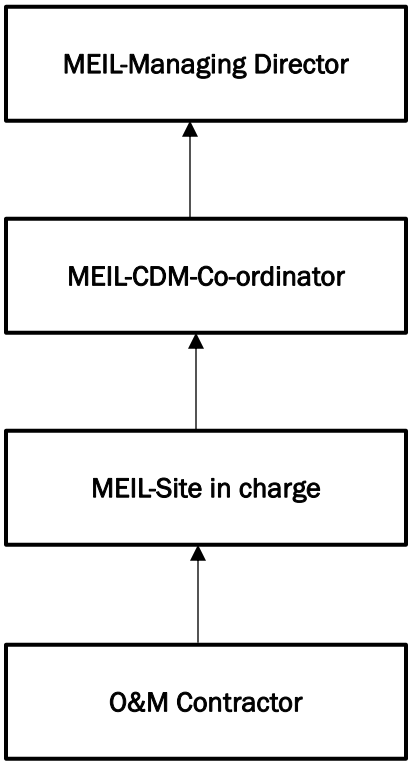
[12] http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

	Responsibility: Project Manager of MEIL will be responsible for maintain the records.
Frequency of monitoring/recording	Continuous measuring and at least monthly recording
Value monitored	46,554
Monitoring equipment	The machines of the project activity and machines of other project developers are connected to the Substation The common metering point comprises one main meter & check meter (jointly certified by "The Gujarat Urja Vikas Nigam Limited (GUVNL)" i.e. Gujarat Energy Transmission Corporation Limited (GETCO) and the service provider i.e. Suzlon/ its representative every month) and one ABT meter (ABT meter readings are not certified jointly, although GUVNL, Gujarat Energy Development Agency (GEDA) and GETCO consider this reading as the total energy for billing purpose and used for the calculation of sharing of the energy of the individual developers).
QA/QC procedures to be applied	All the meters of accuracy class 0.2s are under the purview of GETCO and will be calibrated by GETCO every 3 years as per section 7.2 (iv) of the PPA. The net electricity exported can be cross checked with the sales receipts. Also, the generation from each WEG in the wind farm is recorded by an energy meter installed near each machine. The energy meter provides monthly generation data from individual WEG and also records the power consumed by the individual WEG (as explained below). Thus, to cross check; the net electricity supplied to the grid by the project activity WEGs must be lesser than summation of net electricity generated by WEGs of project activity, as measured at the individual energy meter and controller (LCS) of each WEG due to the accounted transmission losses.
Purpose of the data	Calculation of baseline emissions
Calculation method	The ABT meter reading reflects the net electricity supplied by the wind farm (both export and import), including the project activity. The net electricity supplied by individual wind turbines is determined by a process of sharing the net electricity recorded at the ABT meter in proportion of the electricity generation recorded by the energy meters at the individual wind turbines. The Sharing of energy is done as per PPA by GETCO.
Comments	The data will be archived for two years after the end of the last crediting period or till the last issuance of CERs for the project activity, whichever is later. The ABT meter readings at the substation are recorded by GETCO representative every month. These ABT meters are fully under

	the jurisdiction of GETCO. The readings of net electricity supplied to the grid by each customer are made available on the website of SLDC-Gujarat (GETCO)

4.3 Monitoring Plan

The organizational structure of this project activity is as follows.



PP has assigned the responsibility of operation and maintenance of the plant to Suzlon Energy Limited.

Responsibilities of Head: Overall functioning and maintenance of the project activity.

Responsibilities of Plant In-charge: Responsibility to maintain the data records, ensures completeness of data, and reliability of data (calibration of equipments).

Responsibilities of Shift In-charge: Responsibility for day to day data collection and maintains day to day log book for monitored data.

QA/QC procedures

The energy meters at the feeders are maintained and owned by Discom. Neither the project proponent nor the site personnel have any control over it. The records are cross-checked with the records of sold electricity to Discom/third party. The meters are calibrated by Discom at-least once in three years

Data measurement

The Operation & Maintenance of the project is executed by Suzlon Energy Limited. The individual turbine electricity generation is recorded by the LCS meter (controller) at the individual wind turbine. Also, Every WEG has an individual energy meter connected to it. This meter can measure both import and export of electricity by the individual WEGs. This meter is under the purview of GETCO and is calibrated by GETCO officials at least once in 3 years. Every month officials from Suzlon measures the electricity export and import from each WEG and issue the monthly generation report to the project proponent, which is also endorsed by the GEDA. There are 2 feeders to which all the 12 WEGs of MEIL are connected. These two feeders also contain WEGs of other customers. The two feeder meters are connected to a single Main and Check Meter at the substation. The Main meter can measure both electricity import and electricity export. Every month Joint Meter Reading is taken at the Main Meter, by GETCO officials in the presence of officials from Suzlon. There is an Availability Based tariff meter installed at the substation. The reading of ABT meter are not certified jointly although GUVNL/GEDA, SLDC consider this reading as the total energy for billing purpose.

Working model for sharing of energy (considered by GETCO)

The model evolved by the state utility (GEDA) and the generating company and the steps involved in this are as follows.

1. Each WTG have separate metering point which is read jointly by the representative of the company and the state utility personnel (Gujarat Energy Development Agency).Both import and export of electricity by each WTG will be measured by these meters. This is certified by both the representatives.
2. Considering the total No of WTG in the Project by various investors and the energy recorded in the each WTG meter is consolidated and considered as net energy generated from the Wind farm.
3. For calculating the net electricity supplied by the project to the grid the following formula may be considered for understanding.

Share of PP's Net Electricity supplied to grid = (C×Y) / (C+C1+C2+...Cn)

Where:

C = Net generation by 12 WTGs owned by Mytrah Energy (India) Limited

C+C1+C2+C3.....Cn= Total energy generated from the Wind farm from different companies including Mytrah Energy (India) Limited.

Y = The Meter reading by GETCO at the S/s metering point (ABT)

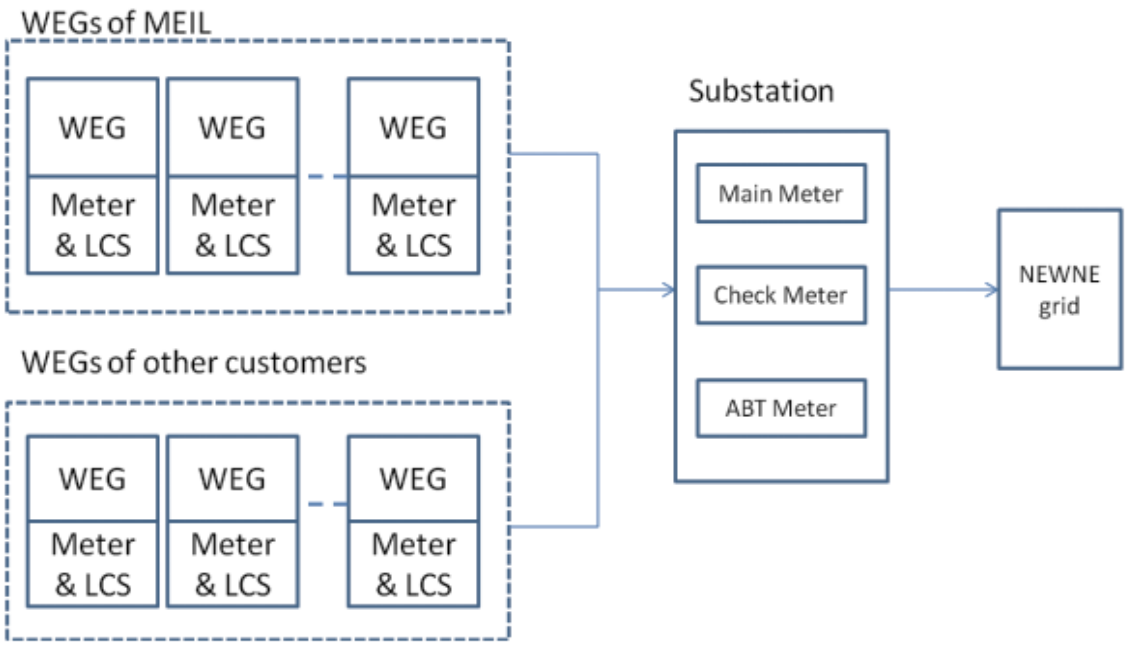
All the above calculations are in accordance with the PPA.

Using the above sharing approach, The SLDC-GETCO provides the certificate of generation through their web site. This is considered for raising invoice and accordingly payment is being received from GUVNL. This Certificate of Share forms the basis of billing and also emission reduction calculation. The value of net electricity delivered can be cross checked with the monthly invoices.

In case the ABT Meter is not functioning there is a Main and Check Meter located at the substation which also calculates electricity import and export by all customers (whole wind farm). In case the meter located at the individual WEGs fail, the controller readings (LCS) of each WEG that are recorded by the Central monitoring System of Suzlon, are used for measuring electricity generation by individual WEGs. No such emergency events occurred during current monitoring period. All the data items monitored under the monitoring plan will be kept for 2 years after the end of crediting period or till the last issuance of CERs for this project activity whichever occurs later.

NOTE: The net electricity supplied to the grid by the project activity is a calculated value which is arrived by using the value of electricity generation by project WEGs, non-project WEGs at individual energy meters and the cumulative value of electricity import and export of the entire number of WEGs connected to substation (i.e. including project and non-project WEGs) as measured at the pooling substation. Since the measurement of electricity generation of non-project WEGs at energy meter is non- feasible for PP and The main meter & check meter reading at the substation and ABT meter are under the jurisdiction of GETCO only and are not shared with the individual project developers, hence, these parameter have not been included as the monitoring parameters in section B.7.1 of the registered PDD.

The monitoring arrangement, metering system under project boundary has been illustrated in schematic diagram below:



5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

According to the approved methodology ACM0002 (Version 12.3.0) Emission Reductions are calculated as:

$$ER_y = BE_y - PE_y$$

Where,

ER_y = Emission reductions in year y (tCO_2e)
BE_y = Baseline emissions in year y (tCO_2e)
PE_y = Project emissions in year y (tCO_2e)

The baseline emissions are to be calculated as follows:

$$BE_y = EG_{PJ,y} * EF_{grid,CM,y}$$

Where,

BE_y = Baseline emissions in year y (tCO2)

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh)
$EF_{grid,CM,y}$ = Combined margin CO2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO_2/MWh)

$EG_{PJ,y} = EG_{facility,y}$

Where,

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr)
$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh)

As the project activity is wind power project, project emissions are zero and the resulting emission reduction is as follows.
$ER_y = BE_y$
Baseline emission factor (Combined Margin) is found to be 0.9528 tCO_2e.

$BEy = EG_{PJ,y} \times EF_{grid,CM,y}$
$BE_y = 46,554 \times 0.9528$
BE_y = 44,356 (Rounded down value) tCO_2e

5.2 Project Emissions

The project activity involves in harnessing wind power. So the emissions from the project are zero.

5.3 Leakage

The project activity is a Greenfield wind power project and there is no technology transfer with respect to this project activity. Hence the Leakage emissions for the project are zero.

5.4 Net GHG Emission Reductions and Removals

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-April-2020 to 31-December-	29,064	0	0	29,064

2020				
01-January-2021 to 31-May-2021	15,292	0	0	15,292
Total	44,356	0	0	44,356

The actual GHG avoided during the current monitoring plan is 44,356 tCO_2e. The estimated GHG for the current monitoring period is 56,338 tCO_2e. The actual VER is 21.27% lower than the estimated VER. This variation is due to low PLF i.e 18.07% achieved during the current monitoring period as compared to the PLF (22.95%) in the registered project description

APPENDIX 1: CALIBRATION DETAILS

Location No.	Name of Feeder	EB Meter No	Calibration date	Calibration due date
MDW-21	Feeder-1	GJU62221	23-May-2019	22-May-2022
MAH-13	Feeder-1	GJU62216	23-May-2019	22-May-2022
MAH-14	Feeder-1	GJU62223	23-May-2019	22-May-2022
MAH-15	Feeder-1	GJU62222	23-May-2019	22-May-2022
MAH-41	Feeder-1	GJU62220	23-May-2019	22-May-2022
MAH-16	Feeder-2	GJU62219	23-May-2019	22-May-2022
MAH-18	Feeder-2	GJU62225	23-May-2019	22-May-2022
MAH-22	Feeder-2	GJU62218	23-May-2019	22-May-2022
MAH-21	Feeder-2	GJU62217	23-May-2019	22-May-2022
JSD-41	Feeder-2	GJU62227	23-May-2019	22-May-2022
JSD-42	Feeder-2	GJU62226	23-May-2019	22-May-2022
JSD38	Feeder-2	MSP 11001	23-May-2019	22-May-2022

APPENDIX II: BREAKDOWN DETAILS

Date	Location No	Downtime (Hrs)	Breakdown Remarks
04-Apr-20	JSD38	7.30	Pitch Akku3Voltage LowStop
05-Apr-20	MAH15	5.80	Elec SafetyChainStop
07-Apr-20	MAH15	1.50	YawNorthSensorNotDetected
08-Apr-20	MAH15	3.40	YawNorthSensorNotDetected
12-Apr-20	MAH15	3.70	Pitch 2 Motor OverTemp
13-Apr-20	MAH15	3.70	Temp GeneratorBearing DE HighStop
14-Apr-20	MAH15	3.00	Temp GeneratorBearing DE HighStop
14-Apr-20	MAH22	3.70	Elec FB GearOilCooler Stop
17-Apr-20	MAH15	5.80	Pitch 2 ResolverError
18-Apr-20	JSD38	4.30	Pitch Akku3Voltage LowStop
20-Apr-20	MAH41	6.60	Elec_YawMonitoringDefect
21-Apr-20	MAH41	13.30	Elec_YawMonitoringDefect
23-Apr-20	MAH13	6.20	Elec SafetyChainStop
23-Apr-20	MAH15	5.10	Pitch EmergencyRun
23-Apr-20	MAH16	4.00	Elec YawSensor ErrStop
24-Apr-20	MAH13	10.10	Elec SafetyChainStop
24-Apr-20	MAH13	13.80	Elec SafetyChainStop
25-Apr-20	MAH13	24.00	Elec SafetyChainStop
26-Apr-20	MAH13	24.00	Elec SafetyChainStop
28-Apr-20	MAH13	1.60	Elec FB GearOilCooler Stop
29-Apr-20	JSD38	2.40	Pitch Akku3Voltage LowStop
29-Apr-20	JSD38	9.00	Pitch Akku3Voltage LowStop
29-Apr-20	MAH15	5.40	Pitch 1 Motor OverTemp
30-Apr-20	JSD38	7.40	Pitch Akku3Voltage LowStop

30-Apr-20	JSD38	10.40	Pitch Akku3Voltage LowStop
01-May-20	JSD38	24.00	Pitch Akku3Voltage LowStop
01-May-20	MAH15	0.30	Mech Generator OverSpeedStop
02-May-20	JSD38	24.00	Pitch Akku3Voltage LowStop
03-May-20	JSD38	24.00	Pitch Akku3Voltage LowStop
04-May-20	JSD38	24.00	Pitch Akku3Voltage LowStop
05-May-20	JSD38	24.00	Pitch Akku3Voltage LowStop
06-May-20	JSD38	24.00	Pitch Akku3Voltage LowStop
07-May-20	JSD38	24.00	Pitch Akku3Voltage LowStop
08-May-20	JSD38	24.00	Pitch Akku3Voltage LowStop
09-May-20	JSD38	24.00	Pitch Akku3Voltage LowStop
11-May-20	JSD38	24.00	Pitch Akku3Voltage LowStop
12-May-20	JSD38	24.00	Pitch Akku3Voltage LowStop
13-May-20	JSD38	24.00	Pitch Akku3Voltage LowStop
14-May-20	JSD38	24.00	Pitch Akku3Voltage LowStop
15-May-20	JSD38	24.00	Pitch Akku3Voltage LowStop
15-May-20	JSD42	10.60	Elec_YawMonitoringDefect
16-May-20	JSD38	24.00	Pitch Akku3Voltage LowStop
17-May-20	JSD38	24.00	Pitch Akku3Voltage LowStop
17-May-20	JSD42	1.60	Elec FB YawCW Error
18-May-20	JSD38	24.00	Pitch Akku3Voltage LowStop
19-May-20	JSD38	24.00	Pitch Akku3Voltage LowStop
20-May-20	JSD38	24.00	Pitch Akku3Voltage LowStop
20-May-20	MAH15	1.90	Elec FB YawCCW Err
20-May-20	MAH18	2.60	Elec_YawMonitoringDefect
21-May-20	JSD38	24.00	Pitch Akku3Voltage LowStop
22-May-20	JSD38	21.70	Pitch Akku3Voltage LowStop
23-May-20	MAH14	7.00	Elec FB GearOilCooler Stop
25-May-20	MAH41	11.30	YawNorthSensorNotDetected
26-May-20	JSD42	4.00	Pitch Akku3Voltage LowStop
26-May-20	MAH41	24.00	YawNorthSensorNotDetected
27-May-20	JSD38	2.70	Temp GeneratorBearing NDE HighStop
27-May-20	JSD42	12.70	Pitch Akku3Voltage LowStop
27-May-20	MAH41	24.00	YawNorthSensorNotDetected
30-May-20	MAH41	6.10	YawNorthSensorNotDetected
30-May-20	MAH41	17.80	YawNorthSensorNotDetected
31-May-20	MAH41	24.00	YawNorthSensorNotDetected
08-Jul-20	MAH14	15.40	Pitch EndSwitch 5GradNeg Conv3
09-Jul-20	MAH14	24.00	Pitch EndSwitch 5GradNeg Conv3
10-Jul-20	MAH14	24.00	Pitch EndSwitch 5GradNeg Conv3
11-Jul-20	MAH14	5.70	Pitch EndSwitch 5GradNeg Conv3
11-Jul-20	MAH14	18.10	Pitch EndSwitch 5GradNeg Conv3
12-Jul-20	MAH14	19.00	Pitch EndSwitch 5GradNeg Conv3
12-Jul-20	MAH14	4.60	Pitch EndSwitch 5GradNeg Conv3
13-Jul-20	MAH14	24.00	Pitch EndSwitch 5GradNeg Conv3
14-Jul-20	MAH14	8.10	Pitch EndSwitch 5GradNeg Conv3
14-Jul-20	MAH14	15.80	Pitch EndSwitch 5GradNeg Conv3
15-Jul-20	MAH14	16.00	Pitch EndSwitch 5GradNeg Conv3
15-Jul-20	MAH14	6.40	Elec_YawMonitoringDefect
23-Jul-20	MAH14	10.50	Pitch Akku3Voltage LowStop
31-Jul-20	JSD38	4.00	Hyd GearOilLevel LowStop
01-Aug-20	JSD38	14.10	Hyd GearOilLevel LowStop

01-Aug-20	MAH14	5.40	Pitch Akku2Voltage LowStop
05-Aug-20	MDW21	4.30	Elec FB YawCCW Err
06-Aug-20	MAH16	8.40	Mech RotorLockedStop
06-Aug-20	MAH21	3.20	Pitch BatterySurveillance1
06-Aug-20	MDW21	24.00	Elec FB YawCCW Err
07-Aug-20	MAH21	14.40	Pitch BatterySurveillance1
07-Aug-20	MDW21	24.00	Elec FB YawCCW Err
08-Aug-20	MDW21	18.40	Elec FB YawCCW Err
12-Aug-20	MAH18	6.30	YawNorthSensorNotDetected
13-Aug-20	MAH18	10.40	YawNorthSensorNotDetected
13-Aug-20	MAH18	13.20	YawNorthSensorNotDetected
14-Aug-20	MAH18	18.60	YawNorthSensorNotDetected
20-Aug-20	JSD38	11.10	YawNorthSensorNotDetected
20-Aug-20	MDW21	12.00	Hyd GearOilLevel LowStop
21-Aug-20	MDW21	24.00	Hyd GearOilLevel LowStop
22-Aug-20	MDW21	16.60	Hyd GearOilLevel LowStop
20-Sep-20	JSD42	5.30	Pitch Akku1Voltage LowStop
20-Sep-20	JSD42	5.00	Pitch Akku1Voltage LowStop
21-Sep-20	JSD42	8.40	Pitch Akku1Voltage LowStop
21-Sep-20	JSD42	6.40	Pitch Akku1Voltage LowStop
25-Sep-20	MAH41	6.30	Elec OilPressureLowInProdState
10-Oct-20	MAH13	12.10	Temp G1L3 HighStop
11-Oct-20	MAH13	23.40	Temp G1L3 HighStop
12-Oct-20	MAH13	24.00	Temp G1L3 HighStop
12-Oct-20	MAH14	4.30	Elec FB GearOilCooler Stop
14-Oct-20	MAH13	24.00	Temp G1L3 HighStop
15-Oct-20	JSD42	6.10	Elec FB YawCCW Err
15-Oct-20	JSD42	7.80	Elec FB YawCCW Err
15-Oct-20	MAH13	19.20	Temp G1L3 HighStop
16-Oct-20	JSD42	15.40	Elec FB YawCCW Err
25-Oct-20	MAH22	3.10	Pitch Akku1Voltage LowStop
26-Oct-20	JSD42	8.70	Elec FB YawCCW Err
27-Oct-20	JSD42	24.00	Elec FB YawCCW Err
28-Oct-20	JSD42	24.00	Elec FB YawCCW Err
29-Oct-20	JSD42	18.30	Elec FB YawCCW Err
07-Nov-20	JSD42	17.70	Elec_YawMonitoringDefect
07-Nov-20	MAH22	5.70	Elec SafetyChainStop
08-Nov-20	JSD42	16.90	Elec_YawMonitoringDefect
17-Nov-20	JSD42	5.60	Pitch Akku3Voltage LowStop
17-Nov-20	MAH16	22.80	Elec_PwrFluctuations
18-Nov-20	JSD42	24.00	Pitch Akku3Voltage LowStop
18-Nov-20	MAH15	13.60	Pitch Akku2Voltage LowStop
18-Nov-20	MAH16	24.00	Elec_PwrFluctuations
19-Nov-20	JSD42	24.00	Pitch Akku3Voltage LowStop
19-Nov-20	MAH15	24.00	Pitch Akku2Voltage LowStop
19-Nov-20	MAH16	24.00	Elec_PwrFluctuations
20-Nov-20	JSD42	18.80	Pitch Akku3Voltage LowStop
20-Nov-20	MAH15	15.00	Pitch Akku2Voltage LowStop
20-Nov-20	MAH16	24.00	Elec_PwrFluctuations
21-Nov-20	JSD42	11.60	Elec FB YawCCW Err
21-Nov-20	MAH16	24.00	Elec_PwrFluctuations

22-Nov-20	JSD42	12.20	Elec FB YawCCW Err
22-Nov-20	MAH16	24.00	Elec_PwrFluctuations
23-Nov-20	MAH16	24.00	Elec_PwrFluctuations
24-Nov-20	MAH16	24.00	Elec_PwrFluctuations
25-Nov-20	MAH16	24.00	Elec_PwrFluctuations
26-Nov-20	JSD41	14.00	Pitch Akku3Voltage LowStop
26-Nov-20	MAH16	24.00	Elec_PwrFluctuations
27-Nov-20	JSD41	21.50	Pitch Akku3Voltage LowStop
27-Nov-20	MAH16	24.00	Elec_PwrFluctuations
28-Nov-20	MAH16	24.00	Elec_PwrFluctuations
29-Nov-20	MAH16	24.00	Elec_PwrFluctuations
30-Nov-20	MAH16	24.00	Elec_PwrFluctuations
01-Dec-20	MAH16	24.00	Generator Failure
02-Dec-20	MAH16	24.00	Generator Failure
03-Dec-20	MAH16	19.30	Generator Failure
28-Dec-20	MAH22	10.30	Pitch Akku2Voltage LowStop
29-Dec-20	JSD42	3.30	Mech WindVane1 2 DefStop
29-Dec-20	MAH22	24.00	Pitch Akku2Voltage LowStop
30-Dec-20	MAH18	22.60	Pitch CAN2ComFail
30-Dec-20	MAH22	24.00	Pitch Akku2Voltage LowStop
31-Dec-20	MAH18	24.00	Pitch CAN2ComFail
31-Dec-20	MAH22	24.00	Pitch Akku2Voltage LowStop
01-Jan-21	MAH18	24.00	Pitch CAN2ComFail
01-Jan-21	MAH22	24.00	Pitch Akku2Voltage LowStop
02-Jan-21	MAH18	24.00	Pitch CAN2ComFail
02-Jan-21	MAH22	24.00	Pitch Akku2Voltage LowStop
03-Jan-21	MAH18	13.80	Pitch CAN2ComFail
03-Jan-21	MAH22	13.30	Pitch Akku2Voltage LowStop
16-Jan-21	MAH15	24.00	Pitch EmergencyRun
17-Jan-21	MAH15	24.00	Pitch EmergencyRun
18-Jan-21	MAH15	24.00	Pitch EmergencyRun
19-Jan-21	MAH15	24.00	Pitch EmergencyRun
20-Jan-21	MAH15	24.00	Pitch EmergencyRun
22-Jan-21	MAH15	24.00	Pitch EmergencyRun
22-Jan-21	MAH15	23.10	Pitch EmergencyRun
22-Jan-21	MDW21	7.00	Pitch Akku1Voltage LowStop
28-Jan-21	MAH16	9.50	Elec FB YawCCW Err
29-Jan-21	MAH16	0.80	Elec FB YawCCW Err
30-Jan-21	MAH21	8.70	Elec FB YawCCW Err
31-Jan-21	MAH21	24.00	Elec FB YawCCW Err
01-Feb-21	MAH21	15.70	Elec FB YawCCW Err
04-Feb-21	MAH15	12.30	Hyd GearOilLevel LowStop
05-Feb-21	MAH15	23.80	Hyd GearOilLevel LowStop
06-Feb-21	MAH15	12.40	Hyd GearOilLevel LowStop
27-Feb-21	MAH21	7.80	Elec FB YawCCW Err
28-Feb-21	MAH21	24.00	Elec FB YawCCW Err
01-Mar-21	MAH21	18.10	Elec FB YawCCW Err
02-Mar-21	MAH14	13.20	Elec FB YawCCW Err
03-Mar-21	MAH14	3.80	Elec FB YawCCW Err
15-Mar-21	MAH41	7.10	Pitch FreqConvPitch1 ErrStop
16-Mar-21	MAH41	24.00	Pitch FreqConvPitch1 ErrStop

17-Mar-21	MAH41	24.00	Pitch FreqConvPitch1 ErrStop
18-Mar-21	MAH41	24.00	Pitch FreqConvPitch1 ErrStop
19-Mar-21	MAH41	19.30	Pitch FreqConvPitch1 ErrStop
01-Apr-21	MAH22	9.40	Elec_PwrFluctuations
01-Apr-21	MAH22	12.30	Elec_PwrFluctuations
02-Apr-21	MAH22	24.00	Generator Failure
03-Apr-21	MAH22	24.00	Generator Failure
04-Apr-21	MAH22	24.00	Generator Failure
05-Apr-21	MAH22	24.00	Generator Failure
06-Apr-21	MAH22	24.00	Generator Failure
07-Apr-21	MAH22	24.00	Generator Failure
08-Apr-21	MAH22	24.00	Generator Failure
08-Apr-21	JSD42	23.20	Mech RpmFSS GenCnt DiffStop
08-Apr-21	MAH18	12.30	Pitch Akku2Voltage LowStop
09-Apr-21	MAH22	24.00	Generator Failure
09-Apr-21	JSD42	24.00	Mech RpmFSS GenCnt DiffStop
09-Apr-21	MAH18	24.00	Pitch Akku3Voltage LowStop
10-Apr-21	MAH22	24.00	Generator Failure
10-Apr-21	JSD42	24.00	Mech RpmFSS GenCnt DiffStop
10-Apr-21	MAH18	13.50	Pitch Akku2Voltage LowStop
11-Apr-21	MAH22	24.00	Generator Failure
11-Apr-21	JSD42	22.90	Mech RpmFSS GenCnt DiffStop
12-Apr-21	MAH22	24.00	Generator Failure
13-Apr-21	MAH22	11.20	Generator Failure
13-Apr-21	MAH22	12.30	Generator Failure
14-Apr-21	MAH22	7.50	Generator Failure
14-Apr-21	MAH22	13.00	Generator Failure
15-Apr-21	MAH22	24.00	Generator Failure
16-Apr-21	MAH22	24.00	Generator Failure
17-Apr-21	MAH22	18.90	Generator Failure
19-Apr-21	JSD42	9.80	Elec FB YawCCW Err
20-Apr-21	JSD42	24.00	Elec FB YawCCW Err
21-Apr-21	JSD42	16.80	Elec FB YawCCW Err
30-Apr-21	JSD41	4.80	Pitch ResolverEncoderDiff1Stop
01-May-21	JSD41	24.00	Pitch ResolverEncoderDiff1Stop
02-May-21	JSD41	24.00	Pitch ResolverEncoderDiff1Stop
03-May-21	JSD41	24.00	Pitch ResolverEncoderDiff1Stop
04-May-21	JSD41	24.00	Pitch ResolverEncoderDiff1Stop
05-May-21	JSD41	18.70	Pitch ResolverEncoderDiff1Stop