

B.7 Application of monitoring methodology and description of monitoring plan

B.7.1 Data and parameters monitored

Data / Parameter:	EGy
Data unit:	MWh (Mega-watt hour)
Description:	Net electricity supplied to the grid by the Project
Source of data to be used:	Electricity supplied to the grid as per Joint Meter Readings (Energy to be billed in FormB) taken at 33kV metering point for each of the sub project included in the project activity.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Annual electricity supplied to the grid by the Project $= 73.6 \text{ MW (Capacity)} \times 26.5\% \text{ (PLF)} \times 8760 \text{ (hours)} \text{ MWh}$ $= 170855.04 \text{ MWh}$
Description of measurement methods and procedures to be applied:	<p>Metering system for the project activity consists of dedicated main and check meters for each of the sub project owner included in the project activity at 33 kV metering location. Additionally, another set of main and check meters (bulk meters) are installed at the substation to which the project activity's sub-project is connected with projects of other project developers.</p> <p>The subprojects included in the project activity are connected to respective Enercon substations as shown in Annex-4.</p> <p>The bulk meters installed at the substation are also connected to other sub project activities of the same project and to other project activities. Based on individual readings of each meter at the sub project activity site and of respective bulk meters at the substation, a factor known as Transmission Loss% is calculated and recorded by the by the statutory authority. The transmission loss% calculated by the state utility is endorsed / confirmed jointly by the representatives of Enercon (India) Ltd.(EIL). Each meter is also assigned a Multiplication Factor (MF) based on the CT ratio of the installation; this (MF) is displayed at the metering station and is also recorded in the JMR. The meter readings are multiplied with the MF to which the transmission loss is applied to arrive at the net export of power from the sub project activity. The import readings recorded at the sub project activity site are adjusted for a default factor of 15%. The difference of net export and 115% of import reading is recorded as net electricity supplied to the grid by the sub project activity and is shown as the net energy to be billed in the JMR. The aggregate sum of all such individual net electricity supplied by the bundle components is reckoned as the net electricity supplied to the grid by the project for calculation of Certified Emission Reductions.</p> <p>The Joint Meter Readings (JMR) issued in FORM B by the statutory authority contains recorded details of opening and closing meter readings of export and import as per the main and check meters of each sub project activity, the transmission losses apportioned and the net electricity supplied by the sub project activity. The JMR is recorded by the authorised representative of the power purchasing company in the presence of the authorised representative of the project and is duly signed by both in acceptance of the correctness of the entries.</p> <p>Frequency of recording data: Monthly</p> <p>Recording: The values of electricity supplied to the grid are sourced from JMR for the sub projects at 33 kV metering point.</p> <p>Responsibility: Joint responsibility of EIL and state utility.</p>

	Refer Annex – 4 for an illustration of the provisions for measurement methods.
QA/QC procedures to be applied:	QA/QC procedures will be as implemented by the state utility pursuant to the provisions of the power purchase agreement. Main and check meters are calibrated once in a year. Refer Annex – 4 for an illustration of the provisions for QA/QC procedures.
Any comment:	The data will be archived on electronic media as well as on paper. The archive will be kept for the period up to two years after the completion of the crediting period.

Data / Parameter:	EGexport
Data unit:	MWh (Mega-Watt hour)
Description:	Electricity Export recorded at the designated meter. All the subprojects included in the project activity have dedicated main and check meters at 33 kV metering point.
Source of data to be used:	Electricity export to the grid as per joint meter reading (FormB) for each of the sub project taken at 33kV metering point. The main meter reading is considered for all calculations. The purpose of the check meter is to serve as a check on the accuracy of measurement and its reading is used when main meter is not working properly.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This value will be taken from the JMR (Form B) taken at 33kV metering point.
Description of measurement methods and procedures to be applied:	Monitoring: Electricity export to the grid will be recorded by the meters (main and check meters) at 33kV point. Refer section B.7.2 and Annex – 4 for an illustration of the provisions for measurement methods. Frequency of recording data: Monthly Recording: The values of electricity exports to the grid are sourced from JMR for the sub projects at 33 kV metering point. Responsibility: Joint responsibility of EIL and state utility
QA/QC procedures to be applied:	QA/QC procedures will be as implemented by state utility. Refer Annex – 4 for an illustration of the provisions for QA/QC procedures.
Any comment:	The data will be archived on electronic media as well as on paper. The archive will be kept for the period up to two years after the completion of the crediting period.

Data / Parameter:	EGimport
Data unit:	MWh (Mega-Watt hour)
Description:	Electricity Import recorded at the meters (main and check meters). All the subprojects included in the project activity have dedicated main and check meters at 33 kV metering point.
Source of data to be used:	Electricity import from the grid as per joint meter reading for each of the sub project taken at 33kV metering point.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This value will be taken from the JMR (Form B) taken at 33 kV metering point and will be applied directly. The main meter reading is considered for all calculations. The purpose of the check meter is to serve as a check on the accuracy of measurement and its reading is used when main meter is not working properly.
Description of	Monitoring: Electricity import from the grid will be recorded by meters (main

measurement methods and procedures to be applied:	<p>and check meters) at 33kV metering point. Refer section B.7.2 and Annex – 4 for an illustration of the provisions for measurement methods.</p> <p>Frequency of recording data: Monthly</p> <p>Recording: The values of electricity import to the grid are sourced from JMR for the sub projects at 33 kV metering point.</p> <p>Responsibility: Joint responsibility of EIL and state utility</p>
QA/QC procedures to be applied:	QA/QC procedures will be as implemented by state utility and the PP except or otherwise explicitly stated in the PDD. Refer section B.7.2 Annex – 4 for an illustration of the provisions for QA/QC procedures.
Any comment:	The data will be archived on electronic media as well as on paper. The archive will be kept for the period up to two years after the completion of the crediting period.

Data / Parameter:	T_E
Data unit:	MWh (Mega-Watt hour)
Description:	Transmission loss for export between the metering location at 33 kV metering point and the high voltage side of the substation to which the subproject is connected.
Source of data to be used:	Transmission Loss for export will be sourced from the joint meter reading (Form B) taken at 33kV metering point for all the sub projects included in the project activity.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This value is certified by the State utility in the JMR (Form B). This value will be directly sourced from the JMR (Form B).
Description of measurement methods and procedures to be applied:	<p>Monitoring: Transmission loss between metering location at 33 kV and the metering location at receiving substation is applied to the meter reading taken at meters connected at 33 KV point for the project activity.</p> <p>The Substation is connected to the machines of the project activity and the machines commissioned by the other project owners. Therefore transmission loss is applied by the state utility as reflected in the JMR (Form B) taken at 33kV point for all the sub projects included in the project activity. The JMR is signed by the representatives of Enercon and the state utility. Refer section B.7.2 and Annex – 4 for an illustration of the provisions for measurement methods.</p> <p>Frequency of recording data: Monthly</p> <p>Recording: The value of transmission loss is sourced from JMR for all sub projects at 33 kV metering point.</p> <p>Responsibility: Joint responsibility of Enercon and state utility</p> <p>Refer section B.7.2 and Annex – 4 for an illustration of the provisions for measurement methods.</p>
QA/QC procedures to be applied:	QA/QC procedures will be as implemented by state utility and the PP. Refer section B.7.2 and Annex – 4 for an illustration of the provisions for QA/QC procedures.
Any comment:	The data will be archived on electronic media as well as on paper. The archive will be kept for the period up to two years after the completion of the crediting period.

The data will be stored in hard format and soft format by PP (EIL) at the project site office. Joint meter reading is taken in the presence of the persons representing EIL [Operation and Maintenance Contractor] and the state utility. The archived records will be kept for the period up to two years after the completion of the crediting period.

B.7.2 Description of the monitoring plan:

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Approved monitoring methodology ACM0002 / Version 06 Sectoral Scope: 1, “Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources”, by CDM - Meth Panel is proposed to be used to monitor the emission reductions.

This approved monitoring methodology requires monitoring of the following:

- Electricity generation from the project activity; and
- Operating margin emission factor and build margin emission factor of the grid, where *ex post* determination of grid emission factor has been chosen

Since the baseline methodology is based on *ex ante* determination of the baseline, the monitoring of operating margin emission factor and build margin emission factor is not required.

There is dedicated main and check meters for each of the sub projects included in the project activity at 33kV metering point. The feeders of 33 kV metering point are further connected to step up transformer at substation and subsequently to bulk meter at high voltage side of receiving substation. The bulk meters are connected to machines of the project activity and the machines commissioned by the other project developers.

The subprojects included in the project activity are connected to respective Enercon substations as shown in Annex-4, where the bulk meters are located:

Therefore in order to determine the net electricity supplied to the grid by the project at high voltage side of receiving substation, the state utility applies the transmission loss to the meter reading recorded at the 33 KV metering point. The transmission loss calculated by the state utility is endorsed / confirmed jointly by the representatives of EIL and the state utility.

The procedure for calculation of transmission loss as given in the PPA is set-out below:

$$Z = \frac{(X1+X2+X3...+Xn)-Y}{(X1+X2+X3...+Xn)} \times 100$$

Z = Percentage transmission loss for export incurred in transmission line between the meters located at 33 kV metering point (including the machines of the project activity and other project developers) and the meters located at high voltage side (bulk meter: main and check) of receiving sub-station.

Summation of meter readings at 33 kV metering points for all the project developers connected to receiving substation (including the machines of the project activity and other project developers)=
 $(X1 + X2 + X3 ... + Xn)$

X_i (where, i can vary from 1 to n)= Energy Export Reading (X_i) noted at energy meter installed at 33kV metering point and represents the meters connected to project activity and other project developers. $X_1, X_2, X_3, ... X_n$ are the meters that are installed at 33kV metering point (including the machines of the project activity and other project developers) and further connected to the receiving substation by internally connected lines.

Y = Energy Export Reading at bulk meter installed at high voltage side of transformer of the receiving sub-station

The Export Reading is adjusted for transmission loss that is determined by the state utility as above is applied directly to the JMR (Form B) for each sub project included in the project activity taken at 33 kV metering point.

Transmission Loss in Export (**TE**) = Transmission Loss% (Z) * Energy Export at 33kV metering point (EG_{Export})

This calculated value of transmission loss (expressed in MWh) is shown in the JMR and can be verified.

In case of Energy Import, the state utility conservatively applies adjustment of 15% to the import values noted at 33 kV metering point.

Therefore, Energy Supplied to Grid for each of the sub projects is calculated after adjustment of actually calculated transmission loss to the electricity exported from which 115% import is deducted. Thus,

EG_y (Sub project) = EG_{export} – 115%*EG_{import} – Transmission Loss (TE)

This is shown as the energy to be billed in the JMR recorded in FORM B.

The JMR in FORM B for each of the sub project noted at 33 KV metering location contains the following data:-

1. Present meter readings of main and check meters for export and import
2. Previous meter readings of the main and check meters for export and import
3. Multiplying constant
4. Energy exported / energy imported (difference of 1 and 2 multiplied by 3)
5. Transmission losses (calculated as above)
6. Energy to be billed (calculated as energy exported–transmission loss-115% import) (reckoned as net energy generated and used for calculation of CER)

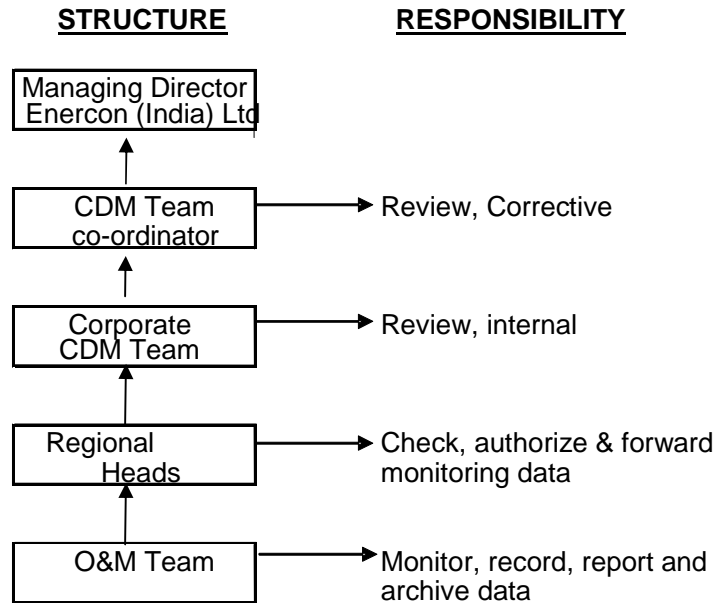
JMR is signed by the representatives of EIL and the state utility. The net electricity supplied to the grid can be cross checked from the invoices for each of the sub project raised on the state utility for supply of net electricity supplied to the grid.

In addition to the JMR (Form B) at 33kV metering location for each of the sub project included in the project activity as per details shown above, the following documents will also be provided to the DoE for verification:

1. JMR (Form B) at high voltage side of receiving sub-station (bulk meters: main and check).
2. Transmission loss calculation endorsed / confirmed jointly by the representatives of Enercon and the state utility.

Net electricity Supplied to Grid for the project activity is summation of Net electricity Supplied to Grid for each of the sub project included in the project activity.

The Project is operated and managed by Enercon (India) Ltd. The operational and management structure implemented by EIL is as follows:



Training and maintenance:

Training on the machine is an essential pre-requisite to ensure necessary safety of man and machine. Further, in order to maximize the output from the Wind Energy Converters (WECs), it is extremely essential that the engineers and technicians understand the machines and keep them in good health. In order to ensure that Enercon's service staff is deft at handling technical snags on top of the turbine, the necessity of ensuring that they are capable of climbing the tower with absolute ease and comfort has been established. The Enercon Training Academy provides need-based training to meet the training requirements of Enercon projects. The training is contemporary, which results in imparting focused knowledge leading to value addition to the attitude and skills of all trainees. This ultimately leads to creativity in problem solving. The site personnel of EIL are also provided training about monitoring aspects of wind turbine performance; they are fully qualified to carry out all site duties such as preventive maintenance, operation controls and all monitoring processes.

Annex 4

MONITORING INFORMATION

- **Metering:** Electricity supplied to the grid is metered jointly by state utility and Enercon through dedicated main and check meters at 33 kV metering point for each of the sub project included in the project activity.

In addition to this there are main and check meters (Bulk meters) at high voltage side of receiving sub-station covering sub projects of the project activity and machines of other project developers. There are four receiving stations to which the sub projects included in the project activity are connected. The sub projects and the respective sub stations to which they are connected is provided under section B.7.2.

The schematic diagram shows location of meters for the project activity is attached as Appendix 1.

- **Metering Equipment:** Metering system for the project activity consists of main and check meters at 33kV metering point for each of the sub project included in the project activity and set(s) of main and check meters at high voltage side of receiving substation. All the meters are **two-way tri vector meters capable of recording import and export of electricity**. The meters installed are capable of recording and storing half hourly readings of the electrical parameters for a minimum period of 35 days with digital output.
- **Meter Readings:** The electricity export and import to the grid is recorded by taking a Joint Meter Reading (JMR) in the presence of Officials from state Utility and Enercon India Limited at 33kV metering point for each of the sub project included in the project activity. The Joint meter reading contains the value of energy imported, exported, transmission loss and the net electricity exported to the grid during the recording period. This Joint meter reading is certified by the Executive engineer of the state utility and by Enercon Officials. These certified readings are then used by the state utility to prepare the tariff invoices. Thus net electricity supplied to the grid for each of the sub project included in the project activity can be crosschecked with the value mentioned in the invoices raised on the state utility by each of the sub project included in the project activity
- **Inspection of Energy Meters:** All main and check energy meters and all associated instruments, transformers installed at the Project are of 0.2% accuracy class. Each meter is jointly inspected and sealed on behalf of the Parties and is not to be interfered with by either Party except in the presence of the other Party or its accredited representatives.
- **Meter Test Checking:** All main and check meters are tested (and calibrated if found necessary) for accuracy on annual basis with reference to a portable standard meter. The portable standard meter is owned by KPTCL. The main and check meters shall be deemed to be working satisfactorily if the errors are within specifications for meters of 0.2 accuracy class. The consumption registered by the main meters alone will hold good for the purpose of metering electricity supplied to the grid as long as the error in the main meters is within the permissible limits. All the meters will be tested / calibrated for accuracy annually.

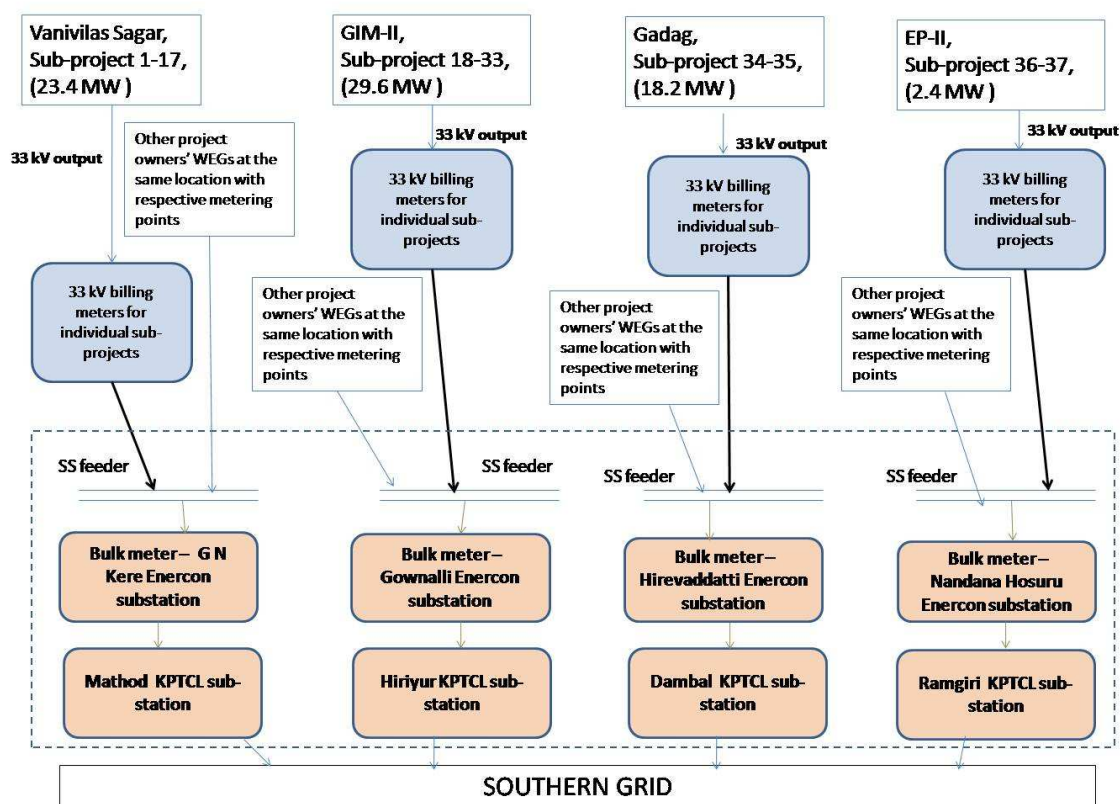
If during the meter test checking,

- The main meter is found to be within the permissible limit of error and the corresponding check meter is beyond the permissible limits, then the meter reading will be as per the main meter as usual. The check meter shall, however, be calibrated immediately.
- The main meter is found to be beyond permissible limits of error, but the corresponding check meter is found to be within permissible of error, then the meter reading for the month up to

the date and time of such test shall be as per the check meter. There will be a revision in the meter reading for the period from the previous calibration test up to the current test based on the readings of the check meter. The main meter shall be calibrated immediately and meter reading for the period thereafter till the next monthly meter reading shall be as per the calibrated main meter.

- Both the main meters and the corresponding check meters are found to be beyond the permissible limits of error, both the main meters shall be immediately calibrated and the correction applied to the reading registered by the main meter to arrive the correct reading of energy supplied for metering electricity supplied to the grid for the period from the last month's meter reading up to the current test. Meter reading for the period thereafter till the next monthly reading shall be as per the calibrated main meter.
- If during any of the monthly meter readings, the variation between the main meter and the check meter is more than the permissible limit for meters of 0.2% accuracy class; all the meters shall be re-tested and calibrated immediately.

Metering Arrangement for the Project Activity



NOTE: There are 37 installations of 33 kVA billing meters and 4 substation (ss) metering points, details of which are as provided below:

S. No	Name of Customers	Capacity (MW)	R.R. NO.	Site Name	Name of Enercon Substation	Meter Accuracy Class
1	Primetex Apparels India	0.6	VVS-24	Vanivilas Sagar	G N Kere sub-station	0.2S
2	Patel Shanti Steels P. Ltd.	0.6	VVS-21,	Vanivilas Sagar		0.2S
3	Patel Shanti Steels P. Ltd.	0.6	VVS-32	Vanivilas Sagar		0.2S
4	Laxmi Organics	1.2	VVS 25	Vanivilas Sagar		0.2S
5	Rohit Surfactants P.Ltd	6	VVS 27	Vanivilas Sagar		0.2S
6	Cooper foundry	2.4	VVS-26	Vanivilas Sagar		0.2S
7	I. G. E. (India)	0.6	VVS-40	Vanivilas Sagar		0.2S
8	International Conveyors Ltd	0.6	VVS-38	Vanivilas Sagar		0.2S

9	Jitendra D. Majetha	0.6	VVS-31	Vanivilas Sagar		0.2S
10	Swaraj PVC Pipes P. Ltd.	0.6	VVS-39	Vanivilas Sagar		0.2S
11	Shilpa Medicare Ltd.	1.2	VVS-41	Vanivilas Sagar		0.2S
12	Amrit Bottlers	1.2	VVS-42	Vanivilas Sagar		0.2S
13	Brindavan Agro	1.2	VVS-33	Vanivilas Sagar		0.2S
14	MK Agrotech Private Ltd	1.2	VVS-43	Vanivilas Sagar		0.2S
15	Unnathi Projects Ltd	0.6	VVS-30	Vanivilas Sagar		0.2S
16	Unnathi Projects Ltd	1.8	VVS-36	Vanivilas Sagar		0.2S
17	S.E.Investment	2.4	VVS-35	Vanivilas Sagar		0.2S
18	Jubilee Textiles	0.8	ELP-3	GIM-II	Gownalli sub-station	0.2S
19	Amrit Bottlers	0.8	ELP-13	GIM-II		0.2S
20	Srinivasa Cystine Ltd	1.6	ELP-5	GIM-II		0.2S
21	B.V.Finance and leasing	1.6	ELP-6	GIM-II		0.2S
22	Brindavan Agro	3.2	ELP-7	GIM-II		0.2S
23	Avanti Feeds Ltd	3.2	ELP-4	GIM-II		0.2S
24	Indian power corporation	2.4	ELP-15	GIM-II		0.2S
25	Indian power corporation	4.8	ELP-16	GIM-II		0.2S
26	Indian power corporation	3.2	ELP-26	GIM-II		0.2S
27	Neharaj Energy	0.8	ELP-2	GIM-II		0.2S
28	Vivek Trading Co.	0.8	ELP-11	GIM-II		0.2S
29	Unnathi Project Ltd	0.8	ELP-19	GIM-II		0.2S
30	Mumbai Stock Brokers Pvt. Ltd.	0.8	ELP-21	GIM-II		0.2S
31	Siddaganga Oil Extractions Ltd.	1.6	ELP-32	GIM-II		0.2S
32	Prasad Technology Park	1.6	ELP-18	GIM-II		0.2S
33	D. R. Container Terminal	1.6	ELP-22	GIM-II		0.2S
34	Enercon Wind Farms (Krishna)	15	HBL/TL&SS /	Gadag	Hirewadatti sub-station	0.2S

	Ltd		WF/EWKLH /6			
35	Enercon Wind Farms (Karnataka) Ltd	3.2	HBL/TL&SS / WF/EWKLH /07	Gadag		0.2S
36	Dinesh Pouches	0.8	EP2-26	EP-II	Nandana Hosuru sub-station	0.2S
37	Ush Dev International	1.6	EP2-24	EP-II		0.2S
	Total Capacity (MW)	73.60				

The details of meters installed at receiving station for the purpose of measuring and allotting transmission losses are provided below:

S. No	Name of Substation	RR. No	Meter accuracy class
1	EP-II Sub-station at Nandana Hosuru	EP2-01	0.2S
		EP2-02	0.2S
2	GIM-II Sub-station at Gownalli	ELP-17	0.2S
		ELP-41	0.2S
3	Gadag Sub-station at Hiredawatti	HBL/TL/&SS/WF/SP ML/5	0.2S
4	VVS Sub-station at G N Kere	VVS-01	0.2S
		VVS-02	0.2S