MAHARASHTRA STATE ELECTRICITY TRANSMISSION CO.LTD.
CIN NO. U40109MH2005SGC153646

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CIN NO. U40109MH2005SGC153646
Maharashtra State Load Dispatch Center
Office of the Chief Engineer
Maharashtra State Load Dispatch Center, Thane-Belapur Road, P.O. Airoli, Navi Mumbai Pin – 400 708.
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Ref: MSLDC/TECH/Procedure/Guidlines/43 **Date: 06/01/2022**

NOTICE

Inviting Comments / Suggestions on the Draft Guidelines on "Interfacing Requirements" to MSLDC as per clause 65.1(a) of MEGC 2020.

Hon'ble MERC has issued, the MERC (State Grid Code) Regulations, 2020, notified on dated 02.09.2020. The Regulation No. 65.1(a) of the said Regulations is reproduced below:

Regulation No. 65.1(a):- *"SLDC, shall prepared Draft Guidelines on "Interfacing Requirements" in respect of terminal equipment, RTUs, SCADA, PMUs, Automatic Generation Control (AGC), Automatic Meter Reading (AMR) Advanced Metering Infrastructure (AMI), etc. and for data communication from the User's point to the respective control center (s) based on technical standards issued by CEA:"*

Based on the above directives, MSLDC has formulated draft guidelines in accordance with the said regulations and is hereby published on dated 06.01.2022 on MSLDC's Website: www.mahasldc.in, for seeking comments / suggestions, if any, from various Stake holders.

In view of above, it is requested to offer valuable comments/suggestions on the said draft guidelines on or before **28th Jan 2022** to make these guidelines more accurate and error free, for smooth implementation of the said regulations in the State. After receipt of the comments / suggestions from various stake holders, the same shall be scrutinized and final procedures/ guidelines shall be submitted to Commission for approval.

The timelines for submission of comments / suggestions are as follows:

Inviting Comments / Suggestions on the Draft Guidelines on "Interfacing Requirements" to MSLDC as per clause 65.1(a) of MEGC 2020

Last date of submission	**: 28.01.2022 by 12:00 Hrs.**
Mode of submission	**: Soft copy in '.xls' form in the attached format along with 'PDF' copy through e-Mail. No hard copy is required.**
Mail Id	**: scada.sldc@mahasldc.in**

Please make a note that any submission after the mentioned date & time and comments/ submission shall be invariably submitted on above mentioned e-mail ID. Submission on any other e-mail-ids' of MSLDC shall not be considered.

Encl:

1) *Draft Guidlines*
2) *Format for Comments*

Sd/-
(Juelee Wagh)
Chief Engineer
SLDC, Kalwa

Place: Airoli, Navi Mumbai
Date: 06.01.2022

Inviting Comments / Suggestions on the Draft Guidelines on "Interfacing Requirements" to MSLDC as per clause 65.1(a) of MEGC 2020

Format for submission of Comments/Suggestions

Name of Stake holder:			
r. No.	**Draft Procedure Clause No.**	**Comments of the Stakeholder**	**Suggestion of the Stakeholder**

Note:
Suggestions on any additional points which are not covered in the Draft Procedure shall be added separately with Clause No. as "Additional".

Above format is to be submitted in "excel" form through e-mail for ease of consolidation of comments of all the Stakeholders.

Guidelines on Interfacing Requirements prepared by Maharashtra SLDC

Guidelines on “Interfacing Requirements" in respect of terminal equipment, RTUs, SCADA, PMUs, Automatic Generation Control (AGC), Automatic Meter Reading (AMR) Advanced Metering Infrastructure (AMI), etc. and for data communication from the User's point to the respective control center (s) based on technical standards issued by CEA are prepared in compliance of 65.1(a) and the relevant clause of MEGC 2020 is given below:

65. Guidelines or Procedures to be issued by different Entities

65.1 Following entities shall be responsible for preparation, consultation and finalisation of the Guidelines/Procedures required under these Regulations which shall be in line with the Central Electricity Authority (Technical Standards for Communication System in Power System Operations) Regulations, 2020 and Central Electricity Regulatory Commission (Communication System for inter-State transmission of electricity) Regulations, 2017 and amended from time to time.

a. SLDC shall prepare Guidelines on “Interfacing Requirements" in respect of terminal equipment, RTUs, SCADA, PMUs, Automatic Generation Control (AGC), Automatic Meter Reading (AMR) Advanced Metering Infrastructure (AMI), etc. and for data communication from the User's point to the respective control center (s) based on technical standards issued by CEA ;

b. STU shall prepare Procedure on “Centralized supervision for quick fault detection and restoration” as per the Regulation 63.3 and “Testing and Maintenance of communication system” as per the Regulations 59.2;

c. STU shall prepare Guidelines on “Availability of Communication System” in consultation with SLDC and other stakeholders and submit to GCC.

Contents

Section I
SCADA & EMS

1) OPERATIONAL DATA REQUIREMENT OF MSLDC

1.1 Operational data required in MSLDC is obtained through SCADA System, in which the operational data of Generation and Transmission Substations is Telemetered and made visible at SLDC, Kalwa.

The Operational data include:

a. Measurands (Analog Data):
   - Active Power (MW)
   - Reactive Power (MVAR)
   - Bus Voltage (kV)
   - Currents (A)
   - Frequency (Hz)

b. Status Indications (Digital Data):
   - Breakers Status – Open/Close
   - Isolator Status – Open/Close

c. Transformer Tap Position (In both ICT & GT)

d. Meter Data

   Meter data is required at the State periphery drawal points where SCADA data is also acquired to compute ACE. Meter data is not acquired through SCADA system at present. Meter data required for Energy Accounting is acquired through a Separate system. A query for making report is prepared in PWC software of EA- DSM Software for ACE comparison with SCADA data report to fine tune the transducers.

Telemetry of Angles & Voltages at synchronizing Locations

- During recovery of the grid, following partial grid disturbances / Total grid collapse, part systems recovered need to be synchronized at pre-designated locations. Telemetered data to be made available at SLDC/ALDC for additional monitoring. At these locations, synchronization is performed using:
  - Synchroscope with synchro- check relay
  - Using Synchro-Phasor data and Breaker closing command from SLDC/ALDC/WAMPAC
  - Using Angle Transducer to measure the SPA (Standing Phase Angle) across the Breaker and Voltages and integrating angles data in SCADA so that synchronization can be monitored.

1.2 Operational data Volume

1) From all Transmission sub-stations up to 100kV owned by all grid users in the state
2) From all generating stations owned by state owned utilities/private utilities (TPC/AEML/BEST) All IPPs/CPPs and MSPGCL. The data from RE Generators is reported at REMC/SCADA.
3) At present, several substations are yet to be Telemetered.
4) Typical data volume for each S/s and generating stations are three Analog measurands (Voltage, Frequency, MW, MVAR & Current) per bay and four/ five Digital Points (CB, Iso) per bay.

1.3 For grid operation, important requirements of EMS functions are:

1) Visualization of the entire grid
2) Situational Awareness
3) Supervisory Control (Presently Not done)
4) Generation Control Applications of EMS (AGC, Hydro-Thermal Coordination, Reserve management, unit commitment, Economic despatch)
5) Demand Forecasting (part of EMS)
6) Network Applications (EMS) include SE (State Estimation), hybrid SE combining with Synchro-phasor data, CA (Contingency Analysis), OPF (Optimal Power Flow), Voltage Var Scheduling DPF (Despatcher Power Flow), Remedial Action Schemes (RAS)
7) The Additional requirement of EMS functions for ensuring operational Planning with grid security in focus along with economy are:
   - SCUC (Security Constrained unit Commitment)
   - SCED (Security Constrained Economic Dispatch)
   - Transfer Capability assessment (TCA) for determination of TTC/ATC of Flow gates, Corridors and Control Areas (Offline study case and in real-time for revisions).
8) Area Control Error (ACE) calculations done in real-time and displayed in the Control Room. The data requirements include real-time demand of the State for computation of Frequency Bias and deviation of Maharashtra

drawal from WR with respect to State schedule from WR .A typical display is enclosed.

A note on the implementation of EMS functions with SCUC/SCED/TCA is prepared and being pursued. The concept paper is enclosed

1.4 DSA Tools

1. In the above section, the requirement of EMS functions described takes care of static security requirements. However, due to increasing complexity and interconnection of grids, reliability and security requirements are increasing and need is arising for DSA tools (Dynamic Security Assessment Tools) for online stability determination and to assess dynamic performances of the System.

2. Actions for procurement of DSA Tools need to be initiated

1.5 Voltage Stability Requirements:

1. Monitoring voltage stability margins is an important requirement of the modern power system operation & control. The following displays are required in the Control Rooms – SLDC/ ALDC/ TPC/ AEML to monitor voltage stability margins (computed every 15 minutes). The voltage stability margins for all the 400/ 220/ 132/ 110/ 100 kV buses can be displayed using VCPI (Voltage Collapse Proximity Index), L-Index, Line Voltage Stability Index (LVSI) etc along with P-V & Q-V Curves.

2. Action for meeting these requirements, is yet to be initiated.

1.6 Hybrid SE:

1. Due to non-availability of SCADA data from several Substations, it would not be possible to run SE (due to visibility issues). The SE can however be performed on a smaller Power System model for an equivalent System at 400/220 KV level with limited number of buses from few substations where SCADA data is available and can be acquired in near future. A Project for the same is initiated (details in concept paper).

2. The SCADA data Configuration can be supplemented with Synchro-Phasor data (Voltage Magnitudes & Angles directly available) to increase the Possibility of SE Convergence. Initiative for Hybrid SE is already initiated (details in concept paper)

1.7 Replacement of SCADA/EMS at MSLDC:

MOU signed with POSOCO for replacement the system SCADA/EMS under upcoming ULDC Scheme.

1.8 Backup Control Centre

ALDC, Ambazari functions as both Area Load Dispatch Centre and Backup Control Centre with full functionality.

1.9 Maintenance

Quarterly Maintenance (Preventive) performed at both main and backup control centres. It involves cleaning the equipment, taking backups of servers and removal of any discrepancies. Daily routine checks are also performed by the OEM so as to maintain 100% availability of SCADA system.

1.10 SCADA network of MSLDC (Communication from RTU to Control Centres)

The details are explained through Fig-I. Also communication for synchro-phasor data is also shown in Fig-1.

1.11 Overview of SCADA & EMS at MSLDC

1.12 1. SCADA system Architecture shown in **Annexure 1.2**

2. Interfacing with other control centres (WRLDC, MSEDCL, TPCL, AEML, ALDC) is also depicted in the Fig-2

3. HMI overview depicted in Fig-3

4. Hierarchy of control centres in western Region (WR) shown in Fig-4

1.13 Cyber Security Requirements

- Section 5 of CCMP Document

- Section 6 of CCMP Document

1.14 DTS (Dispatcher Training Simulator)

It required to train the system operators using snapshot of the real-time data of the Power System already available at SLDC.

1.15 Development System

The Development system is required to allow the SCADA & EMS group of MSLDC.

1. To develop Application Software.
2. Build Database & Configuration of new substations & generating Stations.
3. To build SCADA displays.
4. To build display in PDS.
5. To build Energy Management System (EMS) such as AGC, UC, ED etc.

1.16 Test System:

The test system (PDS) provides an independent test Environment to validate changes developed on the Development System (1.15) prior to installing them on the Real-Time SCADA/EMS.

1.17 Data Historian:

1. Data Historian system serves as a data archive for operational data. It provides visualization tools for presenting data to operators and provides a permanent archive of data for post-mortem study and analysis.

2. Can export SCADA data to other systems like BMS (Business Management system)/ DMS/ Scheduling database of PWC for display in the SCADA/EMS environment.

3. Can also Import data from Historian of synchro-phasor system to SCADA System.

1.18 Visualizations in MSLDC Control Room

1.18.1 (A) Power Map of Maharashtra State Power System

(B) Single Line Diagram (400kV Network/ Zonal/ Utility Diagrams)

(C) Substation Diagram

1.18.2 Tabular Displays

(A) State Summary Display

(B) Generation data of all generators MW MVAR

(C) State AGC

(D) Schedule vs Actual of all generators

(E) Schedule vs Actual of all DISCOMs

(F) Display of Tie-Line flows between control areas within Maharashtra.

(G) Tie-Line flow data between ISTS & InSTS.

(H) Deviation charge

(I) Bus Reactors, FACT Devices, ICT flows

1.18.3 Alarm Displays:

(A) Limit Checking Alarms

(B) Device Status Alarms

1.18.4 Trend Displays

1.18.5 Load Curves

1.18.6 Wind & Solar Forecast Display

1.19 EMS Displays

- Display of Angles from SE & Display of Angles from WAMS
- Other EMS Displays

1.20 Frequency Data for Post- Mortem Analysis

- The sources are WAMS of SEL/URTDSM for frequency (40 milliseconds) and df/dt with high granularity.
- One second frequency from generation SCADA-from Trombay, Dahanu, Nashik, Chandrapur, JSW-Jaigad.
- One report and display depicting frequencies from all substations to identify the areas of blackout/system splitting/Islanding etc.

1.21 Post-Mortem Analysis

(A) DRs to be triggered to dump measurand files containing important data for post mortem analysis-Voltages/Frequency/MW/MVAR etc. DRs to be triggered based on breaker status change of important lines, Extreme frequency and voltages, tripping of HVDC bipole etc.

(B) Re-play Facility.

(C) Data Dumps of SE saved cases.

(D) Facilities for storage of all SCADA data for seven years.

1.22 Monitoring Spinning Reserves:

1. Three sets of data for verifying whether the spinning reserve -Secondary Response (AGC) & Tertiary Response provided in generators has been despatched as per the directions of SLDC & Automatically in case of Primary response /FGMO/RGMO and the data required for monitoring:

a. One-minute integrated values of generators MW, MVAR, Freq
b. One/ Five Second frequency (data source can be PMU/ Gen SCADA/ Local RTU at SLDC/ PLC)
c. PMUs at generating stations to verify despatch of Spinning Reserve.
d. FRC (Frequency Response Characteristic) and ACE calculations.

2. Second set of data from SEMs which can store 1 min. integrated values of Freq, MW, MVAR, etc. (to be installed)

3. Getting 1-minute data from Generation SCADA.

All the three sets of data should be displayed & used for Reports to evaluate the performance.

<u>System Availability:</u>

The SCADA System H/W and S/W of MSLDC, Kalwa & backup Control Centre at Ambazari shall achieve a long-term availability of 99.95% for those critical functions directly affecting grid operators. As such, it is required that all those State level control centres in the hierarchy should also maintain 99.95% availability. This can be done for all control

centres through redundant H/W configurations with Automatic/ Rapid manual Failover schemes to achieve this level of availability.

Data Backup & Archive:

Implemented on daily basis to minimize the loss of critical data upon the recurrence of any H/W failure or a catastrophic system loss. It is recommended to implement:

1.The HDD storage in RAID configuration for historical data.

2. SSD for OS/Application software for faster processing/Memory access (to increase overall system efficiency).

Computer system security:

All control centres at the State level require rigorous computer system security provisions to prevent unauthorised access and unintentional operations. Data sensitive nature of both operational & financial data, cyber security standards as per CCMP/ CERT-In/ CERT-Go/ CERT-Trans/NERC-SIP standards/ CIP standards/Cyber swachata Kendra need to be complied with. Preferably all control centres in the state shall Certify for ISO Certification 270001. At the minimum ,password with two factor authentication login for internal users like administrative and operation user groups, H/W & S/W controls for external users through webservers using internal and external firewalls , on-line Malware detection, Telecommunication connected to any control centre computer system-FEP (PDC in case of synchro phasor systems-SEL/URTDSM) to prevent unauthorised access of external users, VPN & DMZ where ever connecting to public network (Internet) are ensured. In case of data access from BMS (PWC software) data will be taken to webserver. The periodicity of VAPT at least once in every six months needs to be ensured and mitigation of vulnerabilities shall be done in time bound manner (before next VAPT) and management intervention is required wherever necessary.

Long Term Service Agreement for System Maintenance (LTSA)

For SLDC/Backup control centres at Ambazari and at other state level control centre shall have maintenance agreements (LTSA) with OEMs with onsite staff & call centre contact with experts on 24/7 to ensure level of system Availability, implement data base changes, to modify user interface displays etc. as per response time specifications (Penalties for delayed response).

Expansion Capability

Required to accommodate growth in the power system and operations. System design shall provide for orderly addition of computer H/W, S/W, Application S/W, network through adherence to accepted system standards and good utility practices. For integrating third party applications, API should be supported by the OEM.For H/W expansion, facility for additional slots to be provided by the OEM.

Data Integrity

Quality codes

Good/manually substituted/ telemetry failure/suspect/noncurrent/Limit violation/Invalid flags are required.

Communication Requirements

1. Reliable speech and data communication.
2. Mobile Phones of different service providers. Viz BSNL , MTNL, JIO, Airtel, Vodafone,

Power supply & conditioning done Through :

1.UPS (battery Charger, Battery, Inverter)

2. DG backup

3. Smoke and fire Protection

4. Area access security

Backup Recovery Procedures

- Backup recovery plans to cover various contingencies including an off-site storage location for updated copies of all S/W and data files necessary to restore critical functions.
- Cloud storage /Data centre

SECTION II

SYNCHRO-PHASOR DATA REQUIREMENTS

2.0 Synchrophasor Data Interfacing requirements:

2.1 WAMS Technology is implemented in the state of Maharashtra under two different projects:

(A) SEL system with 15 PMUs and one PDC at SLDC, Kalwa. The Location of PMUs are at **Annexure 2.1**

(B) URTDSM system implemented by PowerGrid with 21 PMU Installed at following Sub-stations of MSETCL PDC at SLDC, Kalwa. The Location of PMUs are at **Annexure 2.1**

The Synchrophasor data of URTDSM is further transmitted to PDC at WRLDC, through PDC-PDC Communication.

MSLDC also has two data historians to store the PMU data for off-Line applications.

(C) the data flow diagram of SEL system and URTDSM System given at **Annexure 2.2.** In both the systems, PMU to PDC Data communication is based on C37.118 protocol.

2.2.1 The key advantages of the synchrophasor system for grid operators includes:

(A) sub-second information logging and the access of grid parameters to understand the dynamic performance.

(B) Monitoring Power System oscillations and damping – analysis

(C) Dynamic line Rating (DLR)

(D) Alerting system operators on trippings, change in critical parameters

(E) Fault detection

(F) Detection and analysis of low frequency oscillations.

(G) Synchronization and Islanding monitoring.

(H) validation of dynamic models

(I) Inputs for PSS tuning.

(J) Monitoring system during natural disasters.

(K) State determination / Hybrid SE

(L) CT/PT calibration.

The above monitoring facilities and applications provided by WAMS technology enables system operators to have faster access to sub-second information and better situational Awareness.

2.2.3 Integration of PMU data with SCADA data

A concept paper prepared is enclosed.

2.2.4 WAMS penetration in Maharashtra state and especially in Mumbai MMR region

Based on the HLC committee recommendations (report on Mumbai grid disturbance), PMUs shall be provided in Mumbai MMR region. The location of the PMUs in MMR is being worked out through a committee constituted. After the installation of additional PMUs in MMR, the data will be made available at control centres to be developed at ALDC, TPC, AEML as well. The SEL system data can be integrated with the new upgraded system proposed in two ways.SEL PMUs can report directly to new PDC to be procured. Alternatively, the data can be sent to new PDC through PDC to PDC communication. The former is preferred as the SEL PDC is of old generation and has already completed its useful life. URTDSM system will be used standalone and no additional PMUs installed by the state utilities shall be reporting to urtdsm PDC however if any PMUs are installed in ISTS by PGCIL/POSOCO (within Maharashtra) shall be reporting to URTDSM system. Presently available design margins in URTDSM system can be left for further expansion by PGCIL in the upcoming Phases (31 PMUs proposed in Phase-II)and for application to be developed by IIT/PGCIL.

Additional PMU locations in the state including MMR/Mumbai for phase-I could be worked out based on critical monitoring requirements and some specific application conceived for implementation.Howerver,for achieving complete visibility and to get state determination more number of PMUs will be required based on optimal PMU placement algorithm and the size of power system model.Since,Phase I of the project is to achieve better monitoring and handful of applications for critical assets, the placement of PMUs determined accordingly. Some of the critical applications conceived:

- For dynamic line rating (DLR/DLL) on critically loaded lines like 400Kv Talegaon - Kalwa s/c, 400 Kv Talegaon Kharghar s/c etc. for this application, PMUs required at both the ends.
- PMU placement from perspective of the applications to monitor inter area/intra plant oscillation modes on certain lines.
- PMUs for Critical parameter monitoring required at generating stations to verify despatch of spinning reserve (RGMO/FGMO/AGC etc.).
- For ACE/AGC monitoring at ISTS drawl points, the data from URTDSM system would be fetched to the new PDC and some more PMUs may have to be installed in new system to compute state drawl calculation from ISTS.
- Additional data required by state power system model can also be fetched from URTDSM.
- Based on above criteria additional requirement of PMUs worked out and enclosed at **annexure 2.4.**

2.2.5 Synchro-Phasor data Displays at SLDC

(A) Frequency

(B) Df /DT (ROCOF)

(C) Phase Angles

Displays of the above WAMS application is at **Annexure 2.3**

Section - III Interfacing Requirements of REMC

This Section covers the interfacing requirements of REMC SCADA, Integration of RE-Generators into State grid- responsibilities of STU, Responsibilities of SLDC and requirements for Energy Accounting of RE generators and RE-DSM accounting.

Interfacing Details of REMC SCADA System

3.1 Data Requirements from RE Generators

a. For SCADA Integration

Data Points taken for SCADA Integration are Analog (P, Q, I, V, Frequency), Digital Status (CB, ISO) and Alarms (CB Trip, OC/EF Alarms, Distance Main and Back-up, etc.)

- 1. Typical example of Data Points interfaced from Solar Generator Pooling Station of T S Wind (Malumbra) Solar Generator is attached for reference at **Annexure 3.1**.
- 2. Data points of Siemens Gamesa (Lohara) Wind Generator depicted in **Annexure 3.2**

b. For Forecasting & Scheduling Application, the Static data Furnished by RE-Generators is enclosed in **Annexure 3.3** .

Format of static information:-

No. of RE Pooling Substations = 143 out of which 118 are registered Most of the RE generators are registered and their Data is Integrated in REMC SCADA. Few of the Pooling Stations are yet to be integrated in REMC SCADA. Efforts are being made for providing better visualization by integrating by all RE pooing stations in REMC SCADA . The details are given in **Annexure 3.4**

c. No. of RTU = 143. RTUs installed at All the pooling stations as indicated in **Annexure 3.4.**

3.2 REMC SCADA Architecture

REMC systems are specialized SCADA systems deployed to cater to the

requirement of integration and operation of Renewable Energy (RE) sources

exclusively, which includes real time data acquisition, scheduling and forecasting of RE generation sources. In REMC system data from various Renewable generating station is integrated. All the data pertaining to the generating station (generation,voltage,

switching status of circuit breaker and isolator) is transmitted. REMC SCADA system has all the standard functionalities of generic SCADA system with additional facility of Forecast Service. Forecasting and Scheduling repository server is used for the purpose of Forecast services. REMC system receives forecasting data from Forecasting service providers (FSP) through internet.

Schematic of REMC SCADA Architecture is attached in **Annexure-3.5**

3.3 DISPLAYS

The Displays which are required and available for the control room operator for monitoring and controlling the RE-generators are enclosed in **Annexure 3.6**

1. Solar Generation Display
2. Wind Generation Display
3. Summary Display
4. Network Display

3.4 REMC & SCADA Data Exchange

All the Data from RE pooling Substations is received via. Data Concentrator to Main SCADA (Spectrum -4) and transmitted to REMC SCADA (spectrum -7) Through ICCP link. At present no Data is transmitted from Spectrum 7 to Spectrum -4. However, the facility exists over ICCP link. The REMC and Main SCADA data exchange and Data flow from Pooling stations is depicted in **Annexure 3.7**

3.5 REMC Important Applications

At REMC, Schedules of RE generators are provided by QCA (Qualified Coordinating Agency) in day ahead / week ahead / Intra Day basis. The Forecasting services are available from outside agencies who are Forecast Service Providers (FSPs) - REC, ALEASOFT, ENERCAST and weather forecast is provided by M/s Siemens for internal forecasting to be done at MSLDC by Internal Forecasting tool (IFT) provided by ReConnect, which uses weather data and historical data. The weighted average value of all the forecasting agencies and IFT is taken for reference for real time operation in

control room. The forecast graphs of forecast vs Actual of FSPs and IFT and Combined forecast of solar generators and wind generators are depicted at **Annexure 3.8**. Comparative analysis of forecast from different FSPs done based on RMSE/MSE are to be done to evaluate the performance of FSPs. Further RAMP Forecasting ability of different FSPs also need to be carried out.(Presently not done by FSPs)

3.6 Data Points per Substation

No. of data points per substation varies from approx. 10 to 200 based on installed capacity and size of substation. The typical format of data points is enclosed in **Annexures 3.1 and 3.2**.

3.7 REMC -Procedure for Forecasting, Scheduling and RE-DSM

MSLDC prepared Procedure for Forecasting, Scheduling and deviation Settlement of Solar and Wind generation in accordance with The MERC (regulation2018) and same is available on MSLDC website for reference.

3.8 Metering Interface Facility

The RE-DSM meter data for Deviation Settlement is fetched from the field Transmission Substations through AMR (Automatic meter Reading) facility in MSETCL substations / RE-generator:

3.8.1 No. of Pooling Substations (PSS) – 118

a. 34 PSS are 33 kV (MSEDCL)

b. 84 PSS are 110 kV/132 kV/220 kV (MSETCL)

(List of PSS attached at **Annexure 3.9**)

3.8.2 Meters:

a. L & T Meters installed by STU : 413 (209 Main & 204 Check)

b. DISCOM Meters: 69 (38 Main & 32 Check)

3.9 Data Processing & Accounting:

The Data Processing and Accounting is being carried out through RE-DSM software developed by Siemens. (Designed by RE Connect Energy) Data for STU S/S:

1.Data For STU Substations:- Decrypted meter data collected from web portal automatically (AMR) and manually fetched through DCD /Data collecting Device and uploaded in Web portal.

2. Data for MSEDCL Substations: Encrypted meter data is received through respective QCA to SLDC. The received data is decrypted at SLDC and used for Data processing and accounting.

3.10 The Grid Connectivity to Re generators is granted by STU in accordance with the procedure based on the guidelines by GoM. The procedure is enclosed at **Annexure 3.10**. After commissioning of the plant, STU accords approval after supervision and commissioning Checks. There after SLDC/REMC ensures that the RE generators / Pooling stations is telemetered and data made available as per the interfacing requirements of SLDC/REMC, Approval for Synchronization with the Grid is accorded by SLDC.

Section IV

Metering, Data Processing, Accounting and Deviation settlement

Introduction

4.1 Effective Power system operation and market operation requires scheduling methodology, despatch mechanism, deviation settlement mechanism and ancillary services. The important data Interface for market operations is supported by meter data from the energy meters and accounting system. **Flow Chart for Procedure for Grant of Grid Connectivity to Wind/Solar Projects as per Methodology of GoM is at Annexure 4.1**

4.1.1 Automatic meter reading infrastructure includes installation of meters at interface locations, data collation, data processing, energy accounting and accounting of deviations.

4.1.2 For deviation settlement of RE generators, the meter data from MDAS is transferred to RE-DSM software for accounting of deviations on weekly basis carried out by REMC while RE Energy accounting done on monthly basis by state energy accounting centre.

4.1.3 As per DSM regulations 2019, STU shall install special energy meters including Automated Meter Reading (AMR) facilities on all G<>T and T<>D interface points for recording of actual MWh and MVArh interchanges. Installation, operation and maintenance of special energy meters shall be in accordance with Central Electricity Authority (Installation and Operation of Meters) Regulations, 2006 and State Metering Code as amended from time to time.

4.1.4 State Transmission Utility (STU) shall make necessary arrangements for putting up suitable meters, capable of recording energy flows at 15-minute intervals or any other time interval as specified by the Commission, at the points of injection and drawal.

4.2 Interface Points

Presently, 3039 are the total interface points used for Deviation Settlement Mechanism of Maharashtra state. The list of interface location is available at STU has installed Main and Check meters at these interface points. The Standby meters are yet to be installed.

Out of 3039 interface points, 2860 interface points are covered under AMR scope and balance 179 nos. are not in the scope of AMR. The data for interface points covered under AMR scope is received to MSLDC. The data from 152 Interface locations is manually collected through DCD and uploaded on the web portal.

4.3 The Synchronization of SEMs

The synchronization of all the meters is presently done through transmission of time pulses (GPS time) from State Energy Accounting centre at MSLDC. Presently the time pulses sent from ACI. In case of time drift, the correction has to be done at sites for which the procedure is being formulated by ACI.

4.4 Responsibility of STU in Meter data collection & meter data processing

4.4.1 STU shall install Special Energy Meters (SEM) at all G<>T and T<>D interface points of Intra-State Transmission System (InSTS) and interconnection with Inter-State Transmission System (ISTS) for recording of actual MWh and MVARh interchanges and shall be owned by STU.

4.4.2 The Interface Energy Meters shall be placed by STU at the interface points identified as per metering code.

4.4.3 Installation, operation and maintenance of SEMs shall be in accordance with Central Electricity Authority (Installation and Operation of Meters) Regulations, 2006 and Central Electricity Authority (Installation of Operation of meters) Amendment Regulation 2010 and Maharashtra State Grid Code including Metering Code as amended from time to time.

4.4.4 Type of meters to be installed, metering scheme, metering capability, testing and calibration requirements and scheme for collection and dissemination of meter data shall be in accordance with Indian Electricity Grid Code and Maharashtra State Grid Code.

4.4.5 All concerned entities having SEMs installed in their premises shall fully cooperate and extend necessary assistance for collecting the meter data for the purpose of Deviation Accounting as specified in this Procedure.

4.4.6 Any SEM addition, replacement, testing and/or change in meter location shall be done with prior intimation to MSLDC and MSLDC shall maintain the record of all such changes on its website.

4.4.7 Any Change/correction in CT/PT ratios to be informed immediately to MSLDC and MSLDC shall maintain the record of all such changes on its website.

4.4.8 STU shall carry out necessary time synchronisation of metering system through Global Positioning System with counter check from the State Energy Accounting Centre at MSLDC as per the procedure already in vogue/advice of MSLDC.

4.4.9 In the event of SEM meter not synchronised with MDAS, necessary time drift correction shall be made by STU in the meter within 24 hours.

4.4.10 STU shall register all the interface points and interface meters in the MDAS software and share the meter data with MSLDC registry for DSM computation.

4.4.11 STU shall ensure the availability of each interface meter data in the MDAS software at the State Energy Accounting Centre of MSLDC.

4.4.12 STU shall ensure upkeep, accuracy & completeness of metering data available in MDAS software.

4.4.13 For the purpose of Meter Data processing, STU shall in consultation with MSLDC, develop, install and maintain the Meter Data Acquisition System (MDAS) software at State Energy Accounting Centre at MSLDC.

4.4.14 STU shall ensure that, all the interface points and interface meters are reporting in the MDAS software and share the meter data with MSLDC for DSM computation.

4.4.15 Any change in the interface metering infrastructure shall be carried out by STU with prior intimation to MSLDC.

4.4.16 STU shall ensure the availability of each interface meter data in the MDAS software at the State Energy Accounting Centre of MSLDC.

4.4.17 STU shall ensure that, new generator/power transformer/distribution feeder shall not be charged unless its metered data is registered and reported to MDAS software. Such new charging shall be done only after written approval from MSLDC in prescribed format.

4.4.18 Any SEM addition, replacement, testing and/or change in meter location shall be done with prior intimation to MSLDC.

4.5 Meter Problems

4.5.1 If there exists a problem in any SEMs installed in State Entity's premises, the matter shall be taken up with STU for necessary action with intimation to MSLDC.

4.5.2 In the event of not recording of correct data by SEM meter due to any technical problem, the assessment of block wise energy data shall be submitted by STU to MSLDC separately within two (2) days from the end of billing week and shall publish amendments in case of non-recording of data by Main meter.

4.5.3 Any new G<>T and T<>D interface points of Intra-State Transmission System (InSTS) and interconnection with Inter-State Transmission System (ISTS) must confirm the installation of Special Energy Meters (SEMs) at interface points at least 7 days before charging of the new element.

4.5.4 Metered data will be made available on the Web based DSM application along with DSM Bill and it will be accessible to State Entities with login in to the system using authorised User ID and Password.

4.6 Alternative arrangements for making availability of Meter Data

4.6.1 In the absence of Automated Meter Reading (AMR) facility, STU and MSLDC shall jointly explore the options available for availability of meter data at MSLDC for DSM accounting.

4.6.2 The STU shall maintain the Meter Reading Interface (MRI) facility in the absence of or failure of AMR facility as the case may be.

4.6.3 The MSLDC shall develop and maintain the web-based application to upload the meter data of all interface points downloaded by sub-station in-charge through MRI facility.

4.6.4 The Sub-Station in-charge shall download the meter data of interface points and verify the data as per the detailed procedure prepared by MSLDC and upload the encrypted file on the Web based Application maintained by MSLDC.

4.6.5 The MSLDC shall integrate the web-based application with the Meter Data Management (MDM) module to be developed by MSLDC under DSM Software.

4.6.6 The Meter Data processed in the MDM module shall be further considered for DSM computation in the DSM Software to be developed by MSLDC.

4.6.7 The alternate arrangement specified as above shall be maintained after development of AMR facility as back up option to facilitate the meter data availability in case of failure of AMR facility.

4.6.8 In case of delay in availability of Meter Data through MRI facility on weekly basis, the MSLDC may approach the Commission to change the DSM Billing Cycle to Monthly basis during the absence of AMR facility.

4.7 Meter Data Processing

4.7.1 Every Monday or by latest 00:00 Hrs every Tuesday, all SEM data of the previous week starting Monday 00:00 Hrs to Sunday 24:00 Hrs would reach to MSLDC through AMR facility in MDAS Software for data processing. In case of any problem, MSLDC could request STU to provide the SEM data by manually

downloading using DCD and uploading in MDAS. MSLDC would fetch from MDAS. Each entity would therefore have necessary backup of downloaded meter data at their local PC level.

4.7.2 The computation of the net injection of each Seller and actual drawl of each Buyer shall be carried out in line with provisions of MERC DSM Regulations based on the above meter readings received at MSLDC.

4.7.3 For the purpose of Meter Data processing, STU has developed and installed the Meter Data Acquisition System (MDAS) software at the State Energy Accounting Centre at MSLDC.

4.7.4 The preparation of Deviation accounts and monthly State Energy Account shall be prepared by MSLDC on the basis of meter data made available by STU and implemented schedule. There is being done w.e.f October 2021 onwards.

4.7.5 In the event of failure/bad data from the Main meter, its reading will be substituted by the data from Check/Standby Meter using transmission loss approved by the Commission. In case, data from check/standby is also not available, then any case of totally or partially missing data is found, the affected interface point shall have its entire month/week/day data substituted using the Profiled Data Substitution Module.

4.8 Reactive Energy Accounting

Data related to the reactive energy between State Entities at the Interface Points shall be metered and maintained in the MDAS software. The Data of Reactive Energy

exchange shall be considered for Reactive Energy Accounting as and when directed by the Commission.

4.9 Energy Accounting

4.9.1 MSLDC shall prepare statement of State Energy Account for each time block for the Buyers and Sellers on monthly basis (From Oct, 2021 onwards).

4.9.2 Data required for the billing of partial open access consumers shall be passed on to the billing centre of the Distribution Licensee by MSLDC. The billing centre of the distribution licensee shall be responsible for energy accounting, raising and settlement of bills with partial open access consumers.

4.9.3 Payments of capacity and energy charges by the Buyers to the Sellers shall be as per the provisions in the respective Power Purchase Agreements or Agreement(s) with respect to transactions through power exchange and through Short Term Open Access, as the case may be.

4.9.4 Energy Account Statement for Deviation Settlement of Partial Open Access Consumers connected to the InSTS and all open access consumers connected to the Distribution network shall be in accordance with the provisions of MERC (Transmission Open Access) Regulations, 2016 and its amendments thereof and MERC (Distribution Open Access) Regulations, 2016 and its amendment thereof.

4.9.5 For the purpose of Energy Accounting, MSLDC shall consider the Metered Data made available by STU in MDAS software and the Data for Inter-State Energy Exchange shared by WRPC/WRLDC.

4.9.6 MSLDC shall consider the Energy injected by Wind and Solar Generators as per the 'State RE Deviation Pool Account' maintained by MSLDC for deviations by Wind and/or Solar Energy Generators.

4.9.7 State Energy Account would contain the following reports:

a) Energy Drawal at State periphery as per the WRPC DSM bill.

b) Net Energy injected by Generators.

c) Net Energy injected by Wind and Solar Generators.

d) Net Energy drawn by buyers

e) Net Energy drawn by EHV consumers.

f) Scheduled energy of Intrastate & Interstate Bilateral & Power exchange Transactions.

g) RE Generation Buyer & Seller Wise energy (including OA transactions)

h) Declared Capacity or Availability of Generator within State

i) Intra-State Transmission Loss based on total energy injected and total energy drawal.

j) Account of actions initiated by SLDC in the interest of grid operation or in compliance of WRLDC instructions. - Ref Reg. 6(B)(v)

k) Report of exchange of power capacity, if any, amongst the State Entities resulting on account of SLDC interventions in the interest of grid operation or in compliance of WRLDC instructions. Ref Reg. 6(B)(v).

l) Report of the incidences of violating the provision of Zero Crossing/Sign Change by the State Entities.

Section V :

Automatic Metering Infrastructure to meet futuristic requirements of the Grid Operators

AMI (Automatic Metering Infrastructure)

AMI with Smart Meters required for consumer metering, control, analysis of consumption profiles, DISCOMS, benefit due to AMI as they can make better planning of power purchases, better control of (Remote) consumer load (Appliance wise) and for implementing demand response. DISCOMS also benefit as their consumers respond to real time prices. At SLDC level, some of the benefits that can be harnessed are

5.1 Effective implementation of ADMS program from MSETCL substations using smart meters on 11/22/33 kV feeders to program and disconnect selected loads on these feeders for load curtailment execution as required by SLDC in alert/emergency conditions.

5.2 Smart Meter data on select feeders can be used to develop analytics at SLDC to shed consumer load selectively.

5.3 For emergency load shedding under emergency in Mumbai city, loads have been categorized as Critical / Supercritical / Non Critical. For enhanced load shedding requirement, Smart Meters with Critical / Super Critical consumers can help in providing demand response by shedding of Non essential loads of these consumers DISCOM control center.

5.4 AMI helps in efficient forecasting of DISCOM load (using load profiles) and help in grid operation.

5.5 At present, only whole sale power markets are functioning in the Country. When retail power markets start functioning, then Real time prices are used to regulate the consumer demand and pass on the price volatility to consumers. In future SLDC can manipulate real time prices as per power system security requirements to get the load relief.

SECTION VI

Communication interface requirements

The Communication Interface requirements are developed in accordance with Central Electricity Regulatory Commission (Communication System for inter-State transmission of electricity) Regulations, 2017.

6.1 COMMUNICATION SYSTEM AVAILABILITY:

All users of CTU, NLDC, RLDCs, SLDCs, STUs shall maintain the communication channel availability at 99.9% annually: Provided that with back up communication system, the availability of communication system should be 100%.

6.2 Role of Users:

i. The Users including renewable energy generators shall be responsible for provision of compatible equipment along with appropriate interface for un-interrupted communication with the concerned control centres and shall be responsible for successful integration with the communication system provided by CTU or STU for data communication as per guidelines issued by NLDC.

ii. (ii) Users may utilize the available transmission infrastructure for establishing communication up to nearest wideband node for meeting communication requirements from their stations to concerned control centres.

iii. (iii) The Users shall also be responsible for expansion /up-gradation as well as operation and maintenance of communication equipment owned by them.

6.3 Role of SLDC:

(i) The State Load Despatch Centre shall be nodal agency for integration of Communication System in the intra-State network, distribution system and generating stations at SLDC end for monitoring, supervision and control of Power System and adequate data availability in real time.

(ii) SLDC shall provide operational feedback to CTU and STU.

6.4 Role of STU:

(i) The STU shall be responsible for planning, coordination and development of reliable communication system for data communication within a State including

appropriate protection path among State Load Dispatch Centre, Area LDC, Sub-LDC and DISCOM LDC including Main and backup as applicable along with STU Substations, intra-State Generating Stations.

(ii) The STU shall also plan redundant communication system up to the nearest Inter-State Transmission System wideband communication node for integration with the inter-State communication system at appropriate nodes.

(iii) The STU shall discharge all functions of planning related to the State backbone communication system in consultation with Central Transmission Utility, State Government, generating companies and distribution companies in the State.

(iv) The STU shall also provide access to its wideband Network for grid management by all users.

(v) The STU shall extend the required support to Control Centers for integration of communication system at respective ends.

Concept paper describing activities for implementation of control center logistics.

The various activities as listed out in the HLC report are enclosed and the action plan along with conceptual back ground

1. Implementation of State Estimation (SE) and other EMS functions (Item A-10-iv)

   In the existing SCADA/EMS (Siemens), power system model considered for SE is upto 132kV comprising large no. of analog and digital points. Due to issues with telemetry and telecommunication, considerable amount of data is not available at SLDC level due to which SE fails to converge. In case of analog data, pseudo measurements can be used and redundancy can be leveraged to some extent but non availability of status indications (Breaker/isolator) would seriously affect convergence of SE. Since SE is the gateway to all other network functions of EMS, converged solution of SE is critical. The way out is to consider a smaller power system model representing network upto 400kV level in full and lower voltage network wherever generating stations are connected. Implementation of the reduced model would lead to successful convergence as the data quality can be easily ensured. Implementing reduced model on the existing EMS requires one more EMS server and data base building and some issues with the EMS software version presently available. The SCADA/EMS procured under REMC has advanced version of EMS and pose no problems. It is required to build the reduced power system model on REMC-EMS server and transfer the data from control center SCADA to EMS server of REMC through ICCP link. The SE can be implemented on EMS server of REMC and other EMS functions like DPF (Dispatcher Power Flow), CA (Contingency Analysis), OPF(Optimal Power Flow), SCOPF(Security Constrained Optimal Power Flow), SCED(Security Constrained Economic Dispatch), SCUC(Security Constrained Unit Commitment) can be implemented following successful implementation of SE on reduced model. SLDC has not procured SCOPF, SCED, SCUC in the existing EMS and M/s Siemens can supply these as these software modules form part of EMS procured nowadays. Other option could be to implement a smaller version of SCED and SCUC. The main activities required are data base building on REMC system, working out reduced model for Maharashtra system by simulating on PSS/E (equivalencing) that can faithfully represent the full power system model, implementing SE on EMS server of REMC, implementing other EMS functions. Discussions are being held with M/s Siemens to work out the logistics.

   Another alternative being pursued for implementing SCED and SCUC is by combining the presently followed Systems at MSLDC viz. MOD based scheduling considering seamless transfer capability from rest of Maharashtra (Area1) to Mumbai (Area 2) and then to restrict transfer capability to ATC (presently MSLDC estimating ATC for this corridor corresponding to various generation levels of embedded Generation within Mumbai), embedded Generation in Mumbai is increased. This method is followed using MOD determination using PWC Software and ATC estimation using PSS/E and with manual intervention for second iteration. It is also envisaged to procure SCED, SCUC through upcoming ULDC SCADA project being implemented at MSLDC.

2. Installation of synchro phasor-based systems. (Item A-8)

   a. Identification of optimal locations of PMUs in TPC and AEML areas as well as in MMR and other locations close to Mumbai area can be done by heuristics as important locations in these areas are known. Optimal placement of PMUs can also be done by running the

optimal placement algorithm available at VJTI (developed by Pentayya Polagani). This can be done by scheduled target date of 15.09.2021.

b. In Maharashtra, STU/SLDC has commissioned 15 nos. of PMUs (SEL make), out of which data from 8 nos. PMUs is received by PDC (Phasor Data Concentrator) of M/s SEL at SLDC. Efforts are also made to get the data from remaining 7 PMUs. In case of delays in making dedicated communication available, data can be transmitted using third party public network (each PMU required 2 mbps bandwidth). 5 nos PMUs are provided under URTDSM (Power Grid project) and these are reporting to URTDSM-PDC at SLDC. It is proposed to bring the data to SEL PDC using PDC-PDC communication from URTDSM-PDC. The main PDC for data collection from the proposed PMUs in TPC /AEML/ MMR would be SEL PDC. It is also proposed to procure PDCs for TPC /AEML/ ALDC, Ambazari for making synchro phasor data available at these control centers.

c. The first step for utilizing synchro phasor data would be to display the data at all the control centers in Maharashtra for visualization and situational awareness with suitable GUI.

d. The synchro phasor data has to be transferred from SEL PDC to REMC EMS through DNP3 protocol where the synchro phasor data can be used to supplement the SCADA data as well as to use as pseudo measurements to accomplish Hybrid SE.

e. Development of some applications using synchro phasor data can be done- Oscillation Monitoring System (OMS), Model Validation, Dynamic Line Rating (DLR). These applications are proven and available with vendors and can also be developed in-house. For advanced applications using synchro phasor data, SLDC can tie up with VJTI or IIT B or with vendors.

f. DLR on 400kV lines bringing power to MMR/Mumbai city and some critical 220 kV lines hitting thermal limits/ over current trip settings, PMU based DLR can be easily implemented as computing resistance (R) of conductors can be calculated 25 times in 1 second which implicitly can give information on conductor temperature. Alternative way of implementing DLR where PMUs are not available is to install sensors that measure temperature and sag on several spans of a transmission line and send the data to a server located at SLDC to display the dynamic margins available in thermal loading of the conductor (using temperature and sag). Such a system is already in service on 220 kV Wardha- Yavatmal S/C line and the operating experience is satisfactory. Similar systems provided on critical lines would help in permitting emergency loadings and to use full capacity of the critical lines.

g. Dedicated personnel to be made available (atleast 2 persons) to ensure data availability and for application development.

3. Decision support tools for assessing contingencies, reliability in real time (EMS) should be explored (Item A-9).

   a. As explained in item A-8, some of the decision support tools of EMS are proposed for implementation using the existing SCADA/EMS and REMC- SCADA/EMS. This would give experience to SLDC in implementing and using the EMS functions on a reduced model. This could be a stop gap solution that can be implemented in about 6 to 9 months and can be used for 3 years till the proposed ULDC scheme is implemented by POSOCO for which MoU was already signed. In the power industry, utilization for 3 years is good enough to recover the benefits vis-à-vis investments made. Therefore the implementation of EMS functions on reduced model shall be taken up.

b. SLDC should make/modify functional requirements of upcoming ULDC SCADA/EMS to include specific requirements of the state and in particular to including applications to ensure reliability of Mumbai area, integrating synchro phasor data from SEL PDC to ULDC EMS, building full power system model as well as reduced model for implementation of SE, building layered power system models on one or multiple EMS servers etc.
c. The ULDC scheme has not considered DSA (Dynamic Security Analysis) tools. Discussions with vendors to separately procure DSA tools or to include in ULDC scheme and to ensure inter-operability between ULDC SCADA/EMS and third party supplied DSA tools.
d. Since the project is implemented by POSOCO, a team of SLDC personnel to be associated (5 persons) with the project from the beginning (concept to commissioning to operation) for dealing with activities of data base building, hardware & networking, software (Operating System and Application Software, ICCP), EMS, telemetry and communication and these personnel will be trained by the OEM and would in-turn impart training to others at SLDC.

50.000 HZ 03.01.22 18:45

Maharashtra State Electricity Transmission Co. Ltd.

State Load Dispach Centre , Kalwa

THERMAL

NASIK	U3	160	
	U4	165	
	U5	0	
			325
KORDY	U6	153	
	U8	544	
	U9	556	
	U10	490	
			1744
KHPKD	U1	102	
	U2	0	
	U3	189	
	U4	151	
	U5	325	
			767
PARAS	U3	233	
	U4	217	
			450
PARLY	U6	136	
	U7	128	
	U8	135	
			399
CHDPR	U3	166	
	U4	149	
	U5	269	
	U6	335	
	U7	329	
	U8	430	
	U9	404	
			2082
BHSWL	U3	141	
	U4	412	
	U5	381	
			934

THERMAL (Ex-Bus)	6701
THERMAL (GROSS)	7237
GAS URAN	235
COAL+GAS	7479

HYDRO

KOYNA 1&2	452
KOYNA 3	79
KOYNA 4	452
KDPH	18
VTRNA	0
TILLARY	0
BHIRATR	40
GHATGAR	0
OTHERS	0
HYDRO	1041
SAKRI MEGHA	-0
SAKRI LANCO	-0
SHIRSUPHAL SLR	0
SOLAR TTL	-0
MAHAGENCO GENERATION	8519
GHATGR PUMP	0

Major IPP / CPP

JINDAL (SW)	553
ADANI	3191
IDEAL ENR	0
RATTAN_IND-AMT	1318
RATTAN_IND-NSK	0
BUTIBORI-REL	1
SWPGL	112
DHARIWAL	277
PIONEER	0

RE

MS WIND	180
MS SOLAR	16
COGEN (SSK)	1451
OTHR+SMHYD	228
TTL	1873

TTL(IPP/CPP+RE)	7326
STATE GEN (Excl Mumbai)	15845

MAHAGENCO TOTAL GEN	8519
IPP/CPP TTL.	7326
CS EXCH	4944
MUM EXCH	-910
MAHADISCOM TOTAL DEMD	19879

MUMBAI

TPC HYD.	399
TPC THM.	647
TPC TTL.	1046
AEML GEN.	490
MUM GEN.	1536
MUM EXCH	910
MUM DEMD	2447

STATE GEN	17382
STATE DEMAND	22326

CENTRAL SECTOR

	SHARE	SHR+1	SHR+2	DRAWL	DIFF
MAH.	4859	4864	4634	4944	85
MP.	7534			7766	232
GUJ.	9281			8895	-386
CGARH	1644			1619	-25
GOA	492			514	22

TIME BLOCK 76

UTILITY	(Actual) (DRAWL)
MSEDCL	18660
TPC_D	630
AEML_D	1142
BEST	553

Area Control Error (ACE): 85

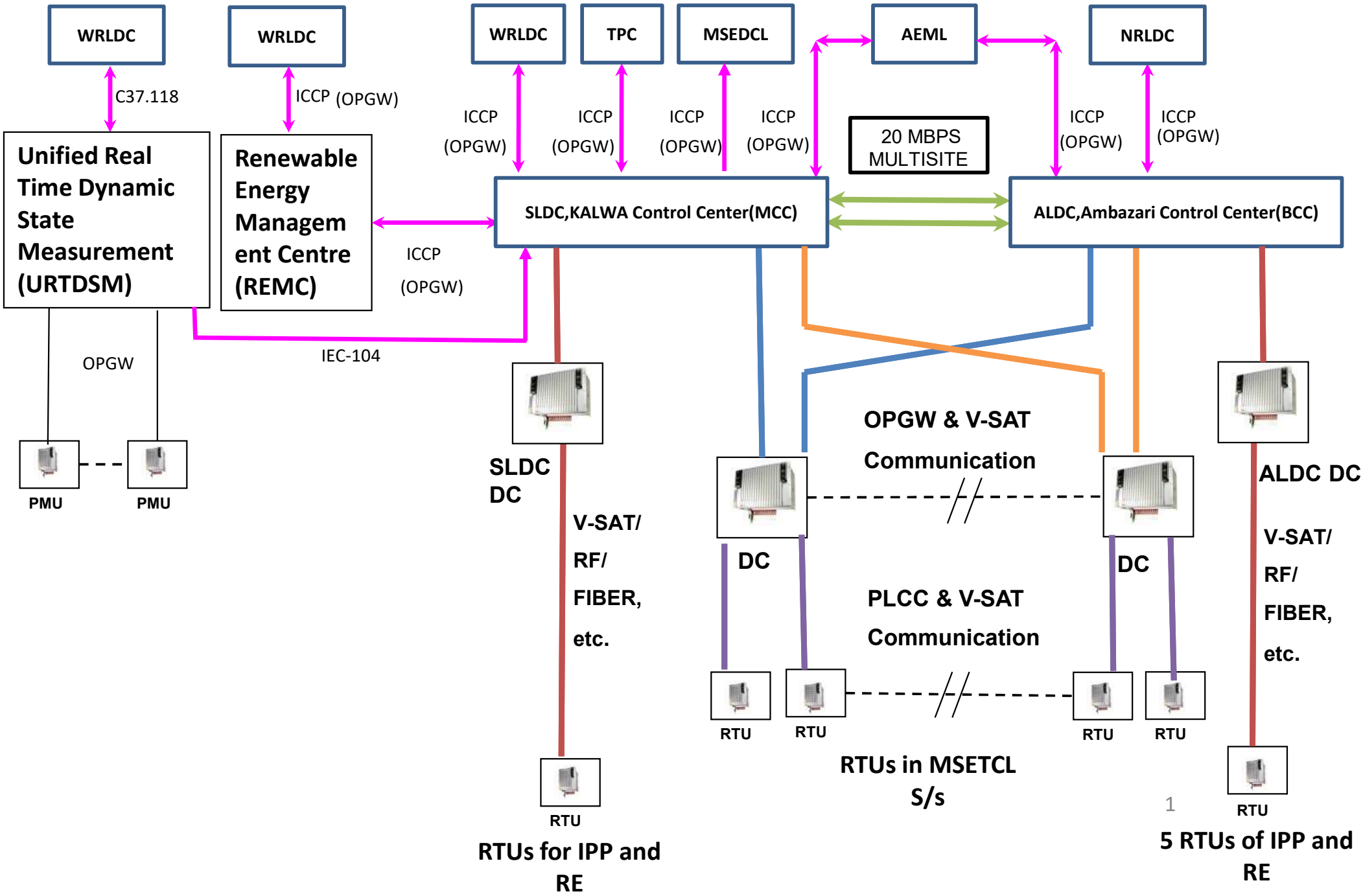
DSM RATE (PAISE): 336

C. S. GENERATION

KORBAN	2320
VINCHAL	2979
GANDHAR	0
KAWAS	-3
KK' PARA	421
TARPR PH-I	-2
TARPR PH-II	544
SIPAT	2225
SSP	-1
RGPPL	226
MAUDA STG-I	839
MAUDA STG-II	1220
CGPL MUNDRA	1790
SOLPRN	619
GADARWARA	0
LARA	806
CS GEN. TTL.	13983

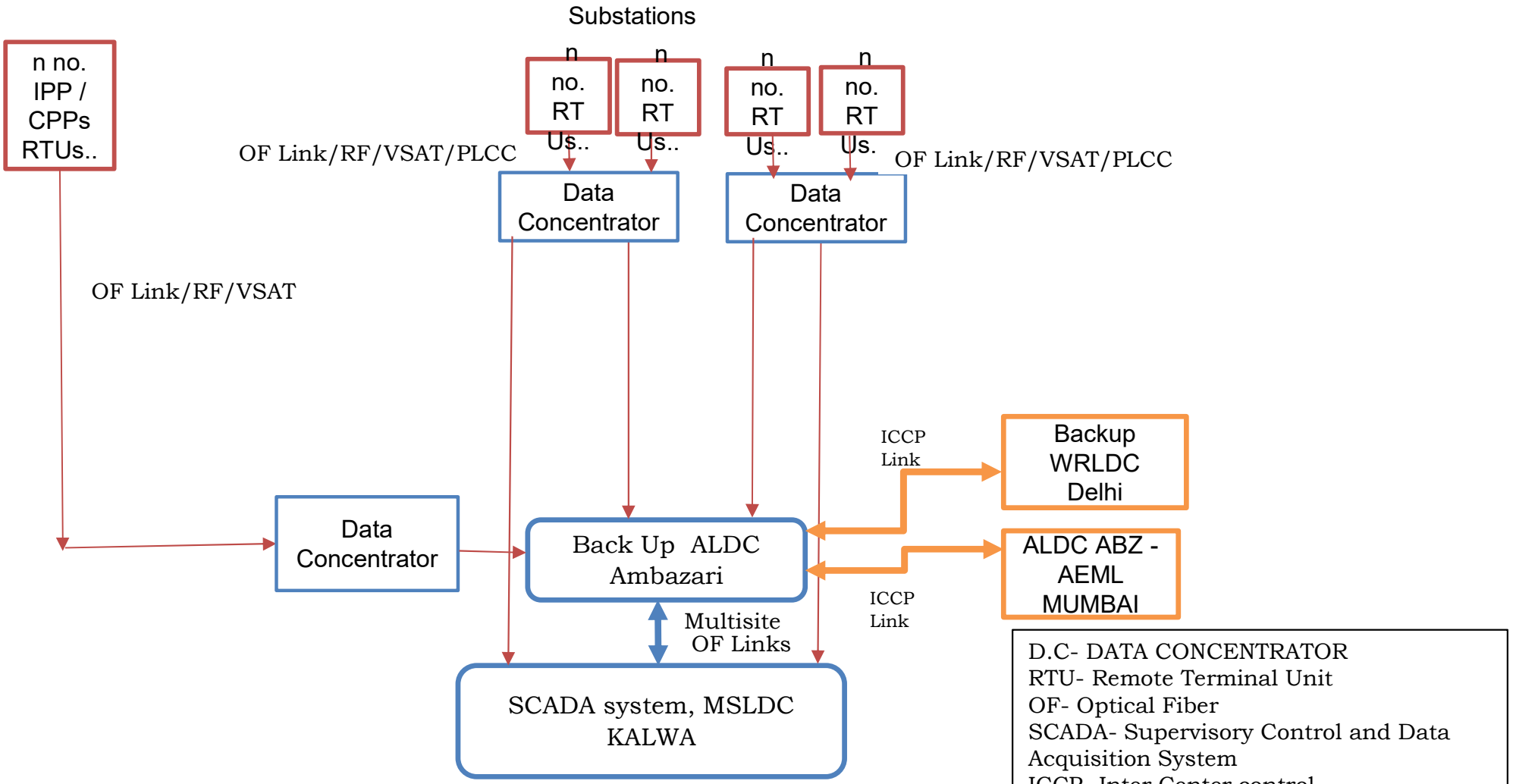
REGIONAL EXCHANGES

	SCH.	ACT.
WR-NR	-7321.41	-5022.46
WR-SR	-2384	-461
WR-ER	3340	-985



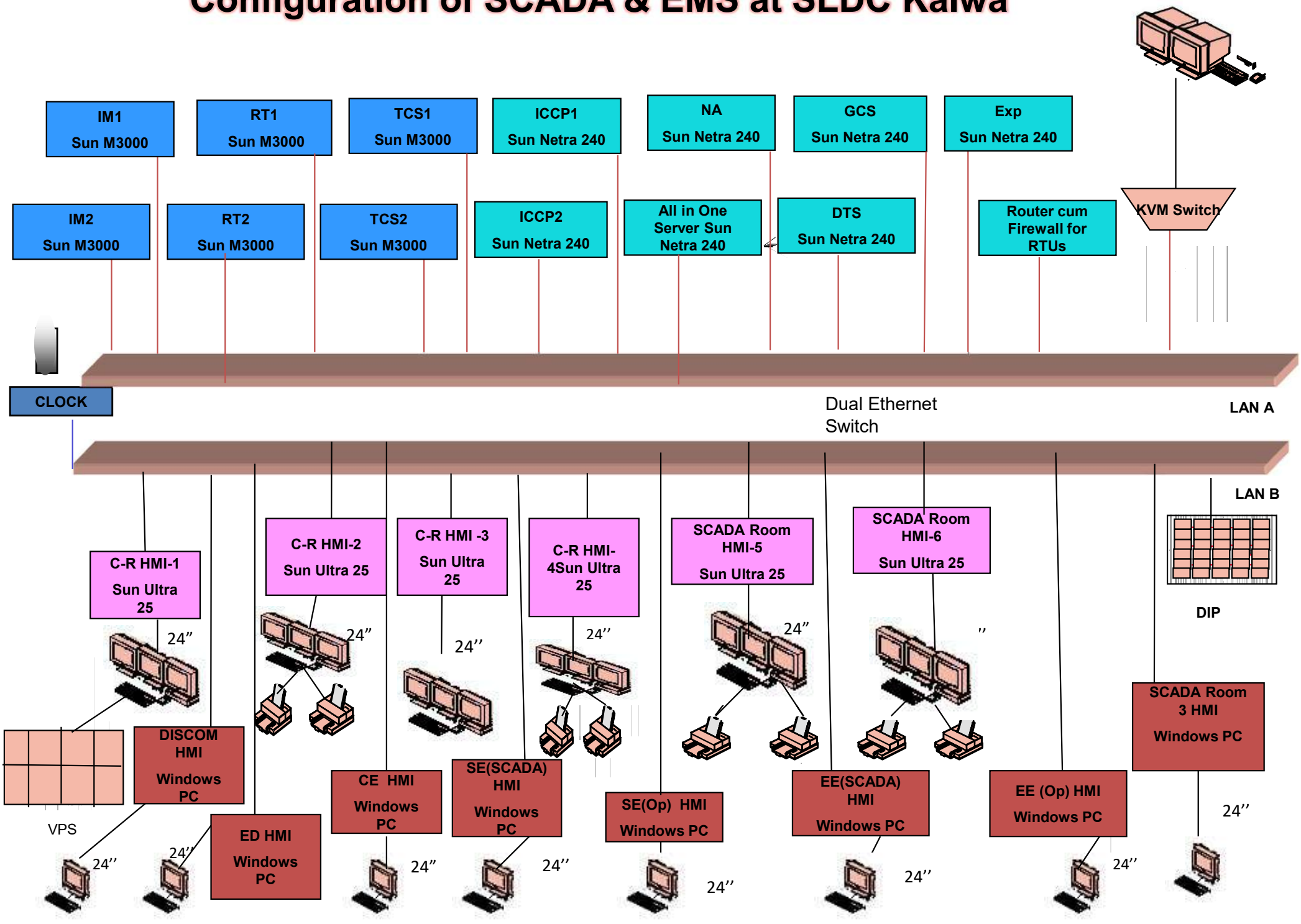
SCADA Network of MSLDC / ALDC

SCADA Network at ALDC,Ambazari.

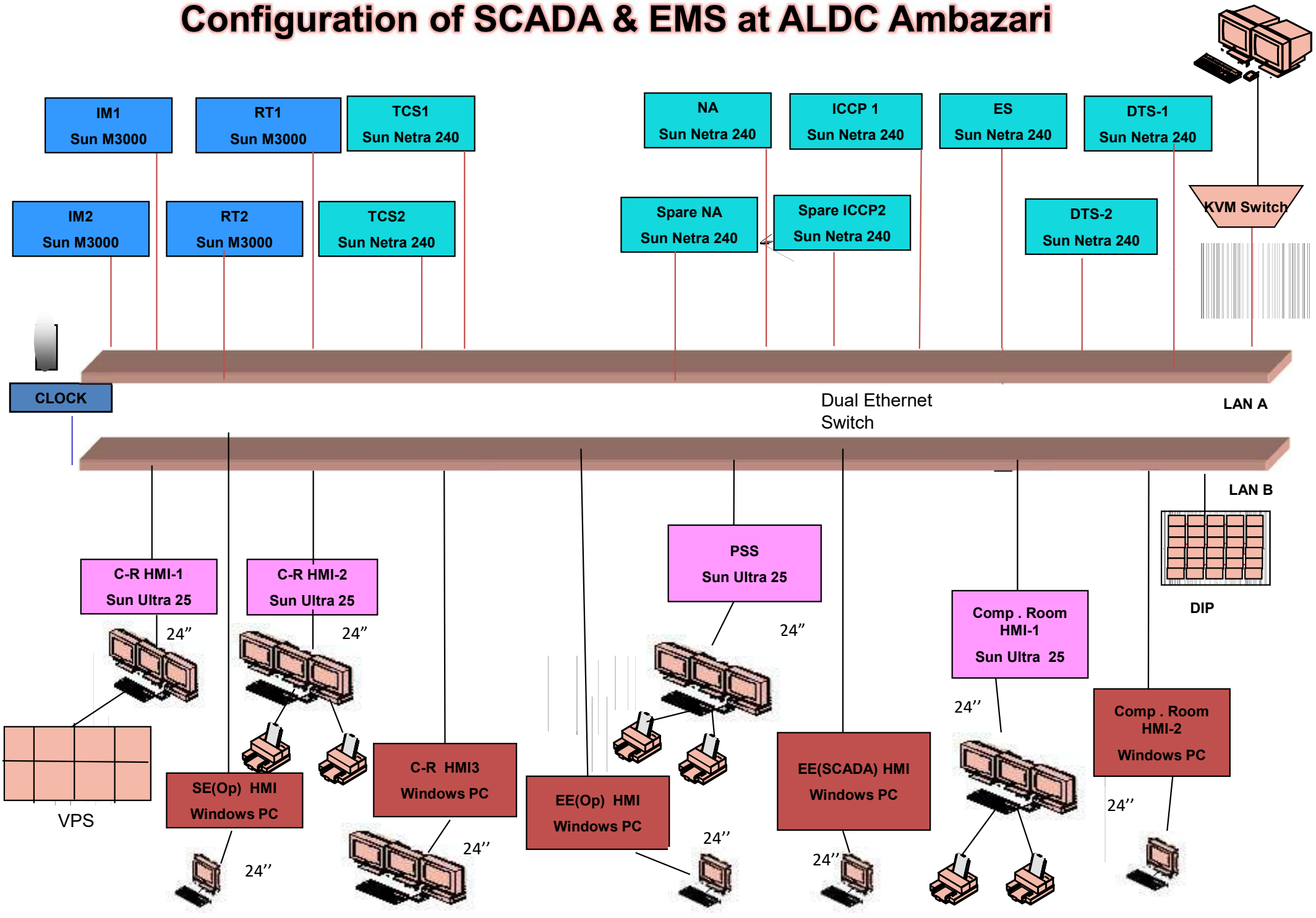


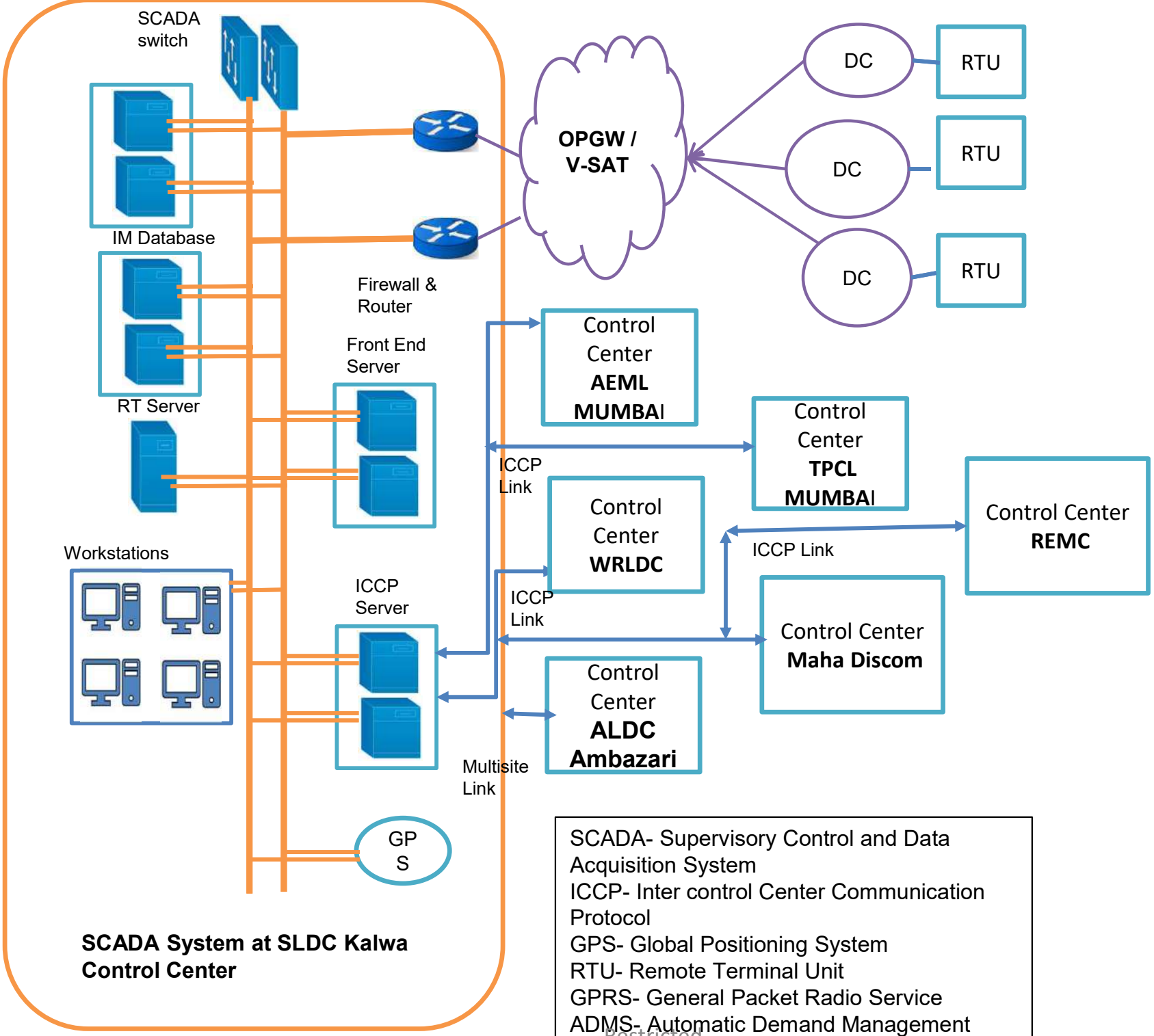
D.C- DATA CONCENTRATOR
RTU- Remote Terminal Unit
OF- Optical Fiber
SCADA- Supervisory Control and Data Acquisition System
ICCP- Inter Center control communication protocol
ISD- Inter Site Data
SLDC- State Load Dispatch Center
LAN- Local Area Network
VSAT-Very Small Aperture Terminal

Configuration of SCADA & EMS at SLDC Kalwa

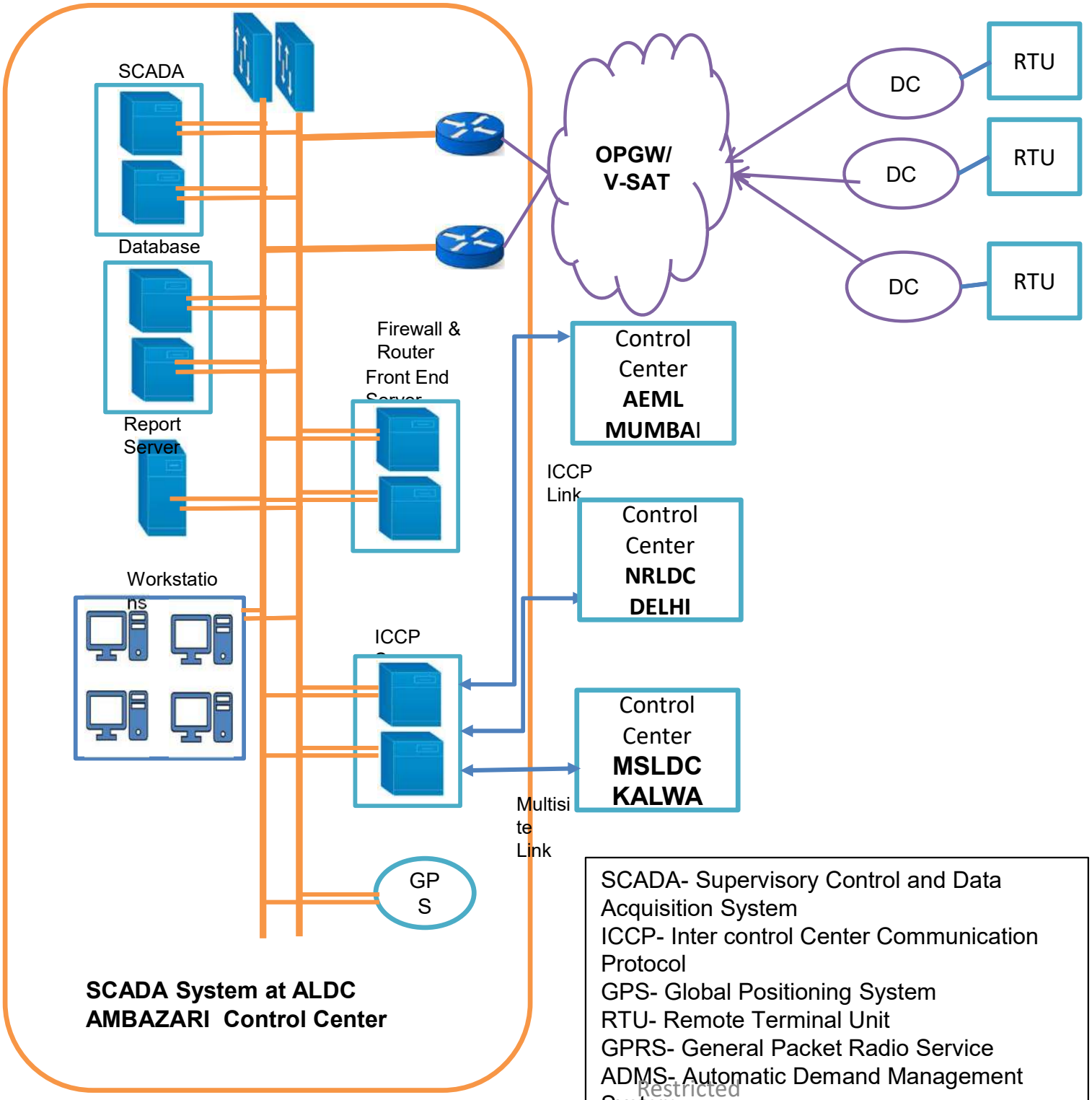


Configuration of SCADA & EMS at ALDC Ambazari





SCADA- Supervisory Control and Data Acquisition System
ICCP- Inter control Center Communication Protocol
GPS- Global Positioning System
RTU- Remote Terminal Unit
GPRS- General Packet Radio Service
ADMS- Automatic Demand Management System



SCADA- Supervisory Control and Data Acquisition System
ICCP- Inter control Center Communication Protocol
GPS- Global Positioning System
RTU- Remote Terminal Unit
GPRS- General Packet Radio Service
ADMS- Automatic Demand Management System

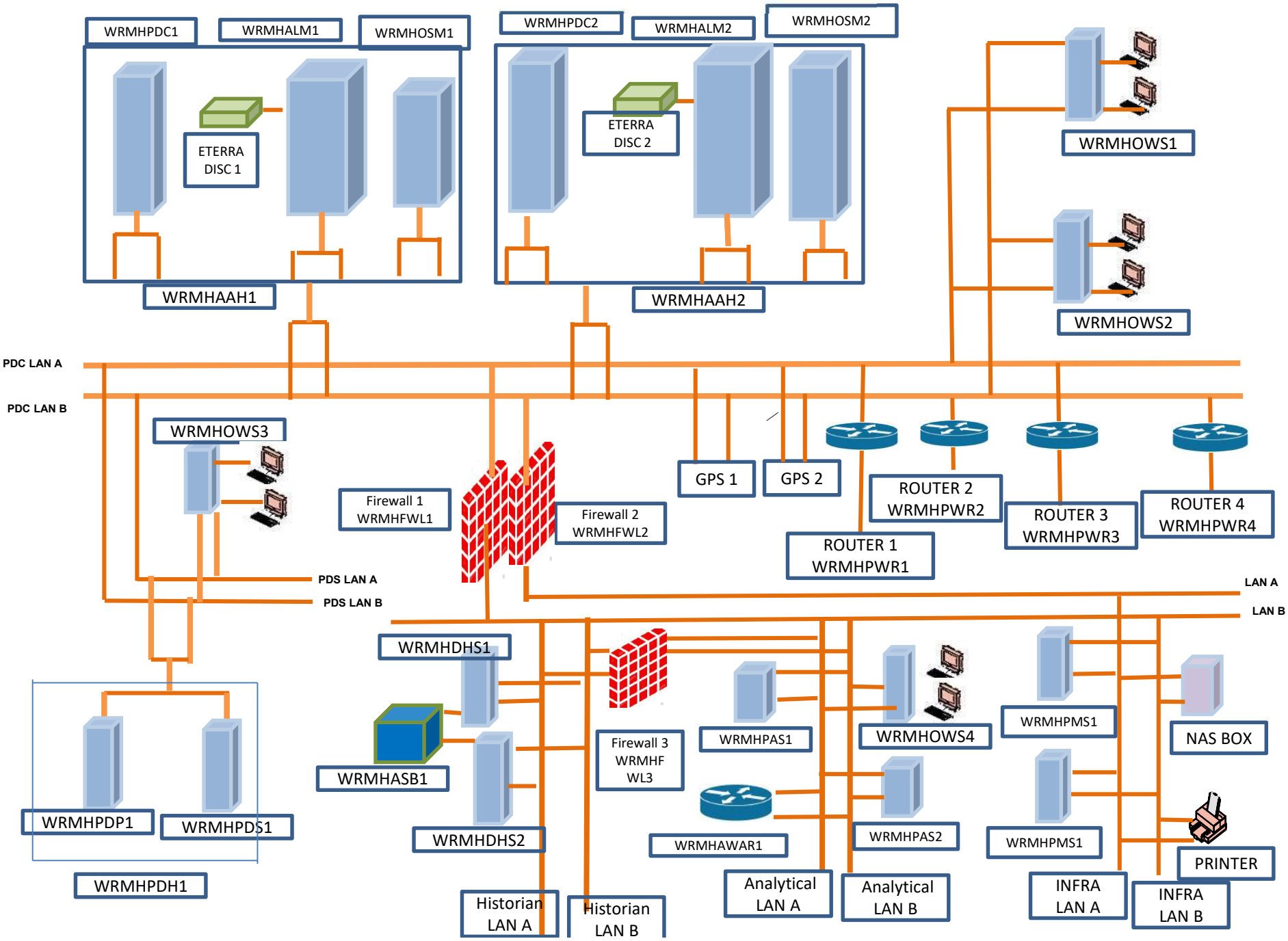
WAMS / PMU / URTDSM Daily Sysytem Check Report at SLDC Airoli

Date :- 01.09.2021

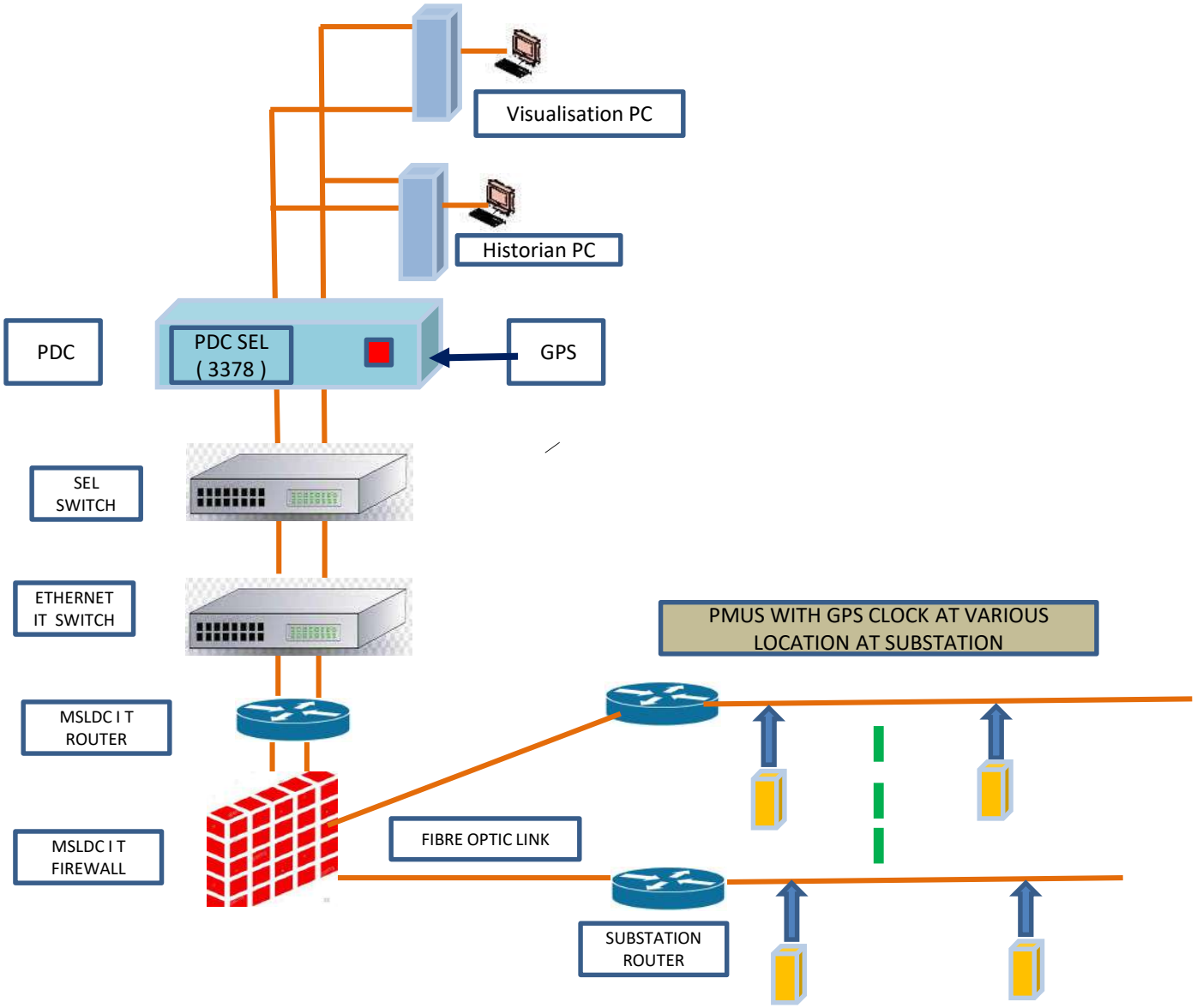
Sr. No.	PMU Location	Location /	Real Time Data	REMARKS
A.	**Power Grid**			
1	400 KV Chandrapur stn	400 KV Chandrapur stn	Data Not Available	Data Not Available
2	400 KV Padgha stn	400 KV Padgha stn	Data Available	OK
3	400 KV Kalwa Stn.	400 KV Kalwa Stn.	Data Available	OK
4	400 KV Lonikand Stn	400 KV Lonikand Stn	Data Available	OK
5	400 KV Kolhapur Stn	400 KV Kolhapur Stn	Data Available	OK
B	**MSETCL Pilot Project SEL**			
1	400 KV Kolhapur stn		Receiving Data	Normal
2	400 KV New Koyna stn		Receiving Data	Normal
3	400 KV Padghe stn		Receiving Data	Normal
4	400 KV Lonikand stn		Receiving Data	Normal
5	400 KV Girwali stn		Receiving Data	Normal
6	400 KV Kalwa stn		Receiving Data	Normal
7	400 KV Eklahare stn		Receiving Data	Normal
8	400 KV Dhule stn		Not Connected	
9	400 KV Lamboti stn		Receiving Data	Normal
10	400 KV Bhusawal stn		Receiving Data	Time Quality Faulty
11	400 KV Boisar stn		Not Connected	
12	400 KV Chandrapur stn		Not Connected	
13	220 KV Trombay stn		Receiving Data	Time Quality Faulty
14	220 KV Koradi stn		Receiving Data	Normal
15	220 KV Aurangabad stn		Receiving Data	Normal

	Total Sub- Stations	Real Time Data Available	Real Time Data Not
SEL Project -	**15**	**10**	**5**
PGCIL Project -	**5**	**4**	**1**
Total MSETCL	20	14	6

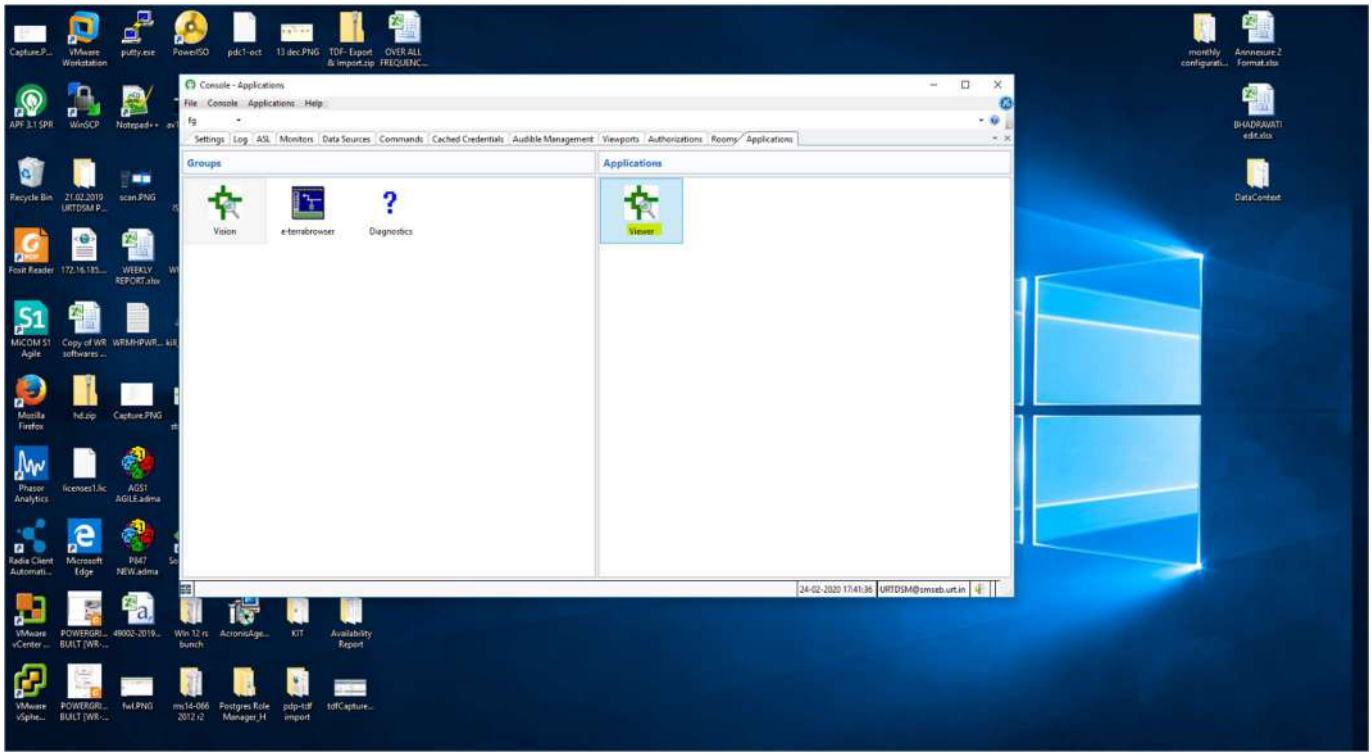
Typical Architecture of URTDSM system

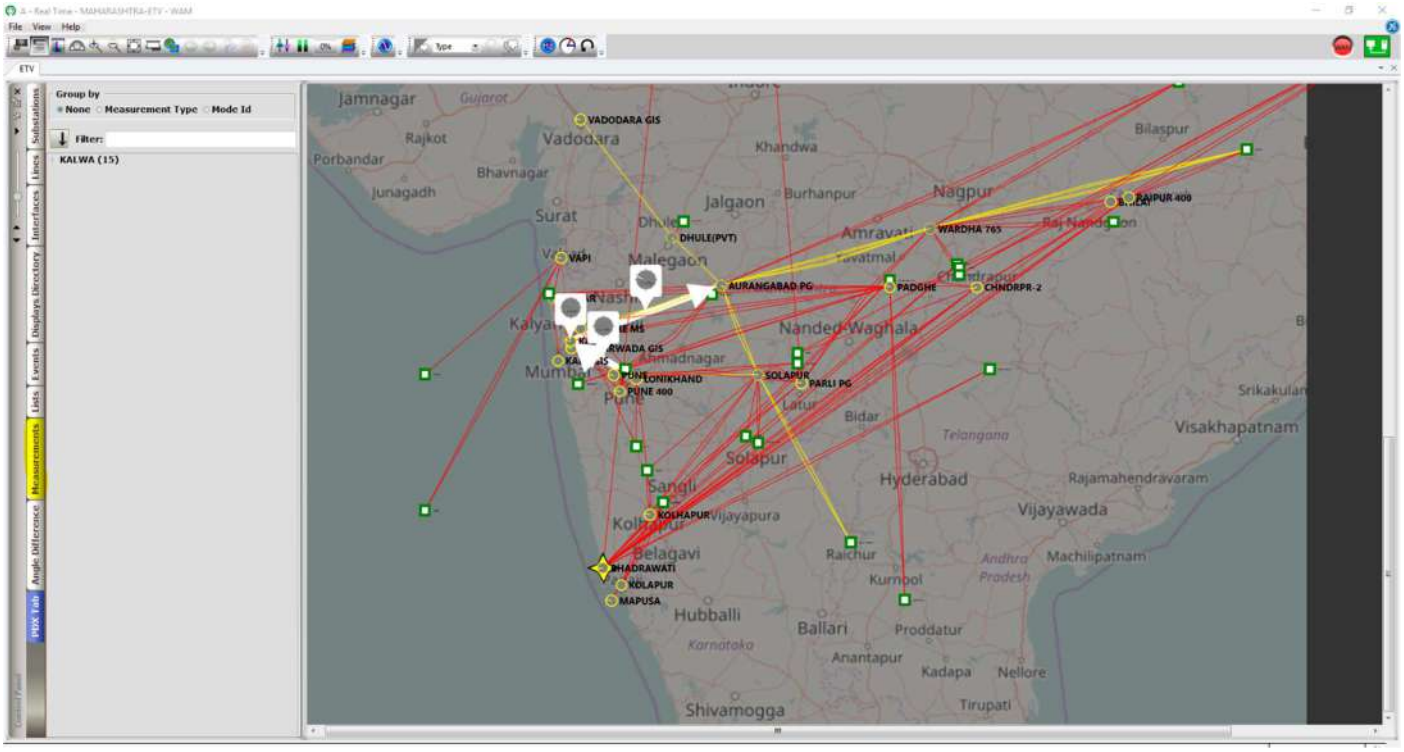


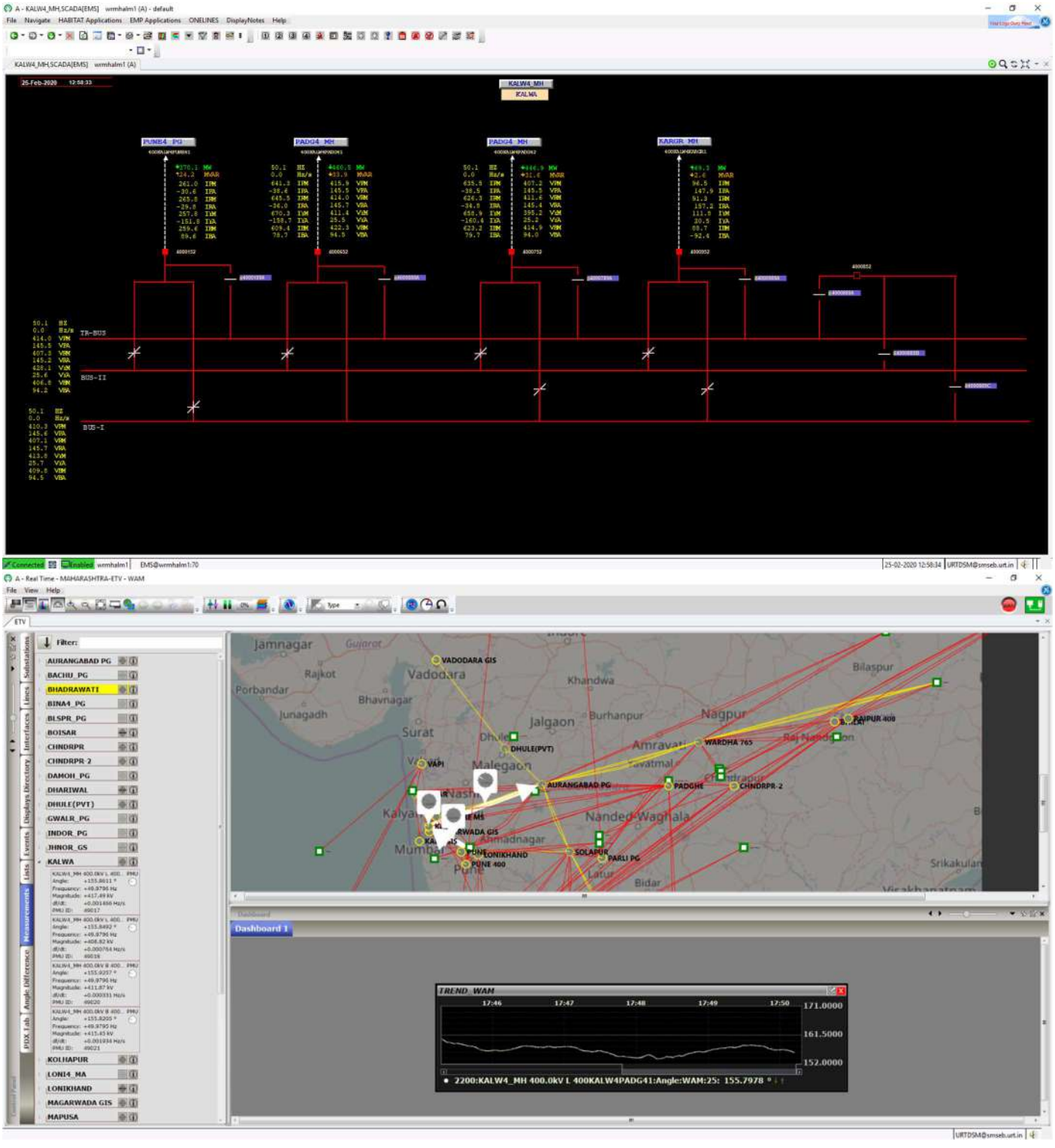
Typical Architecture of SEL PMU system



WAMS Display






A - KALW4_MH,SCADA[EMS] wrmhalm1 (A) - default
File Navigate HABITAT Applications EMP Applications ONELINES DisplayNotes Help
KALW4_MH,SCADA[EMS] wrmhalm1 (A)
26-Feb-2020 12:58:33
KALW4_MH
KALWA
PUNE4_PG
PADG4_MH
PADG4_MH
KARGR_MH
TR-BUS
BUS-II
BUS-I
Connected Enabled wrmhalm1 EMS@wrmhalm1:70
25-02-2020 12:58:34 URTDSM@srnseb.urt.in
A - Real Time - MAHARASHTRA-ETV - WAM
File View Help
ETV
Filter:
AURANGABAD PG
BACHU_PG
BHADRAWATI
BINA4_PG
BLSPR_PG
BOISAR
CHNDRPR
CHNDRPR_2
DAMOH_PG
DHARIWAL
DHULE(PVT)
GWALR_PG
INDOR_PG
JHNOR_GS
KALWA
KOLHAPUR
LONI4_MA
LONIKHAND
MAGARWADA GIS
MAPUSA
Substations
Lines
Interfaces
Displays Directory
Events
Lists
Measurements
Angle Difference
PDX Tab
VADODARA GIS
DHULE(PVT)
VAPI
AURANGABAD PG
PADGHE
CHNDRPR-2
WARDHA 765
RAIPUR 400
RWADA GIS
LONIKHAND
SOLAPUR
PARLI PG
PUNE 400
Dashboard 1
TREND WAM
17:46
17:47
17:48
17:49
17:50
171.0000
161.5000
152.0000
2200:KALW4_MH 400.0kV L 400KALW4PADG41:Angle:WAM:25: 155.7978 °
URTDSM@srnseb.urt.in

Requirement of PMUs

Sr	Utility	Substation Location	Name of Feeder	umber of PMU	Remarks
1	MAHARASHTRA	400 Kv Talegaon PG	Talegaon-Kalwa	1	DLR application
			Talegaon-Kharghar		
		400 Kv Kalwa SS	Kalwa-Talegaon	2	DLR application
			Kalwa-Padghe 1		
			Kalwa-Padghe 2		
		400 Kv Padghe	Padghe-Kalwa 1	1	DLR application
			Padghe-Kalwa 2		
			Padghe-Bableshwar 1		
			Padghe-Bableshwar 2		
		400 Kv Bableshwar SS	Bableshwar Padghe- 1		
			Bableshwar Padghe-2		
		400 Kv Koradi 1	Koradi-Bhusawal	1	DLR application
		400 Kv Bhusawal (Khadka)	Bhusawal- Koradi	1	
		400 Kv Kharghar	Kharghar-Talegaon	1	
		220 Kv Boisar SS	Boisar-Ghodbhander	1	Islanding monitoring
			Boisar-Versova		
		220 Kv Trombay	MSETCL Trombay- Tata Trombay 1	1	
			MSETCL Trombay- Tata Trombay 2		
		110 Kv Trombay	MSETCL Trombay- Tata Trombay 1	1	
			MSETCL Trombay- Tata Trombay 2		
		220 Kv Borivali SS	Borivali-Gorai1	6	Islanding
			Borivali-Gorai2		
			Borivali-AEML 1		
			Borivali-AEML 2		
			Borivali-Aarey 1		
			Borivali-Aarey 2		
			Borivali-Tata Borivli-1		
			Borivali-Tata Borivli-2		
			110 Kv Borivali-Tata borivali-1		
			110Kv Borivali-Tata borivali-2		
			Borivali-Aarey 7		
			Borivali-Aarey 8		
		110 Kv Kalwa SS	110 Kv Kalwa-Salsette 1	1	Islanding
			111 Kv Kalwa-Salsette 2		
		220 Kv Kalwa SS	220 Kv Kalwa-Salsette 1	1	
			220 Kv Kalwa-Salsette 2		
		220 KV Khaperkheda / 400 Khaperkheda	GT-1	2	Nagpur Islanding
			GT-2		
			GT-3		
			GT-4		
			GT-5		
		220 Kv Butibori 1 S/S	220 Kv Khaperkheda-Butibori 1	1	Nagpur Islanding
		220 Kv Butibori 3 S/S	220 Kv Khaperkheda-Butibori 3	1	Nagpur Islanding
		220 Kv Suryalaxmi S/S	220 Kv Khaperkheda - Suryalaxmi	1	Nagpur Islanding
		220 Kv Kalmeshwar S/S	220 Kv Khaperkheda-Kalmeshwar	1	Nagpur Islanding

		220 Kv Ambazari S/S	220 Kv Khaperkheda-Ambazari	1	Nagpur Islanding
		132 Kv Pardi S/S	132 Kv Pardi-Ambazari	1	Nagpur Islanding
		132 Kv Mankapur S/S	132 Kv Mankapur - Ambazari	1	Nagpur Islanding
		400 Chandrapur SS	400 Kv Chandrapur-Parli 1	1	DLR
		400 Parli GCR	400 Kv Parli - Chandrapur 1	2	DLR
			400 Kv Parli - Lonikand 1		
			400 Kv Parli - Lonikand 2		
		400 Kv Lonikand SS	400 Kv Lonikand - Parli - 1	1	DLR
			400 Kv Lonikand - Parli -2		
		Chandrapur TPCL	GT-5	3	Spinning Reserve
			GT-6		
			GT-7		
			GT-8		
			GT-9		
		Bhusawal TPCL	GT-3	2	Spinning Reserve
			GT-4		
			GT-5		
		Parli TPCL	GT-6	2	Spinning Reserve
			GT-7		
			GT-8		
		Paras TPCL	GT-3	1	Spinning Reserve
			GT-4		
		Koradi TPCL	GT-6	2	Spinning Reserve
			GT-8		
			GT-9		
			GT-10		
		Nasik TPCL	GT-3	2	Spinning Reserve
			GT-4		
			GT-5		
		Jindal TPCL	GT-1	2	Spinning Reserve
			GT-2		
			GT-3		
		Uran Gas Plant	Uran-ONGC	1	Islanding
			Uran-JNPT		
			220 Kv Uran-Nerul	1	Islanding
			220 Kv Uran-Sonkhar		
	ADANI TPCL	ADANI TPCL/ Tiroda	GT-1	3	Spinning Reserve
			GT-2		
			GT-3		
			GT-4		
			GT-5		
	Rattan India TPCL	Rattan India TPCL AMRAVATI	GT-1	3	Spinning Reserve
			GT-2		
			GT-3		
			GT-4		
			GT-5		
			400 Kv Rattan India- Akola MSETCL		Monitoring
			GT-1		

		Rattan India TPCL SINNER	GT-2	3	Spinning Reserve
			GT-3		
			GT-4		
			GT-5		
			400 Kv Sinner - Bableshwar		
	SWPGL TPCL	SWPGL TPCL	GT-1	1	Spinning Reserve
			GT-2		
			GT-3		
			GT-4		
	DHARIWAL TPCL	DHARIWAL TPCL	GT-1	1	Spinning Reserve
			400 Kv Dhariwal-Chandrapur -2		
			GT-5		

	TATA TPCL	Trombay TPCL	GT-7A	2	Spinning Reserve
			GT-7B		
			GT-8		
		Uran Gas Plant	Uran-ONGC	1	Uran Islanding
			Uran-JNPT		
		Bhira Hydro Gen.	GT-4	1	Black start / OMS
			Bhira-Khopoli		
		Bhivpuri Hydro Gen.	GT-	1	Black start / OMS
			Bhivpuri-Nerul		
		Khopoli Hydro Gen.	GT- 9	1	Black start / OMS
			Khopoli-Bhivpuri		
	AEML	400 Kv Koradi 3 S/S			
		765 Kv Koradi -3 S/S			
		765 Kv Akola S/S			
2		220 Kv Versova SS	Versova(AEML)-Versova(TATA) 1	2	Islanding
			Versova(AEML)-Versova(TATA) 2		
			Versova-Boisar		
		220 Kv Borivli	AEML Borivali-Tata Borivli	3	Islanding
			Borivali AEML - borivli MSETCL 1		
			Borivali AEML - borivli MSETCL 2		
		220 Kv Ghodbhander SS	Ghodbhander- Boisar	1	Islanding
			Ghodbhander- Borivli		
		220 Kv Aarey	Aarey-Tata Borivli	2	Islanding
			Aarey-MSETCL Borivli I		
			Aarey-MSETCL Borivli II		
		220 Kv Saki SS	AEML Saki-Tata Saki 1	1	islanding
			AEML Saki-Tata Saki 2		
		220 Kv Dahanu	Dhanu-Viraj	1	Islanding
			GT-1	1	Spinning Reserve
			GT-2		
		220 Kv Gorai SS	Gorai- Borivali (MSETCL)1	1	Islanding
			Gorai- Borivali (MSETCL)2		
	JINDAL	Jaigad TPCL	GT-1	2	Spinning Reserve
			GT-2		
			GT-3		
			GT-4		
3	**TATA**	220 Kv Borivali SS		1	Islanding
			Tata Borivli- MSETCL Borivali 2		
		110 Kv Borivali SS	110 Kv Tata Borivali-Borivali MSETCL 1	1	Islanding
			110 Kv Tata Borivali-Borivali MSETCL 2		
		110 Kv Salsette SS	110 Kv Salsette - Kalwa- 1	1	Islanding
			110 Kv Salsette - Kalwa- 2		
		220 Kv Salsette SS	220 Kv Salsette- Kalwa-1	1	Islanding
			220 Kv Salsette- Kalwa-2		
		220 kv Trombay SS	Tata Trombay- MSETCL Trombay 1	1	Islanding
			Tata Trombay- MSETCL Trombay 2		
		110 Kv Trombay	Tata Trombay- MSETCL Trombay 1	1	Islanding
			Tata Trombay- MSETCL Trombay 2		
		400 Kv Bableshwar S/S		1	Monitoring
		400 Kv Koradi-2 S/S		1	Monitoring
		400 Kv Bhusawal S/S		1	Monitoring

	Maharashtra Real time visibility	400 Negothane S/S		1	Monitoring
		400 Kv Koyna Stage -4 S/S		1	Monitoring
		400 Kv Kolhapur S/S		1	Monitoring
		400 Kv Karad S/S		1	Monitoring
		400 Kv Chakan S/S		1	Monitoring
		400 Kv Akola S/S		1	Monitoring
		400 Kv Koradi-1 S/S		1	Monitoring
		400 Kv Khaperkheda S/S		1	Monitoring
		400 Kv Warora S/S		1	Monitoring
		400 Kv Nanded S/S		1	Monitoring
		400 Kv Parli S/S		1	Monitoring
		400 Kv Solapur S/S		1	Monitoring
		400 Kv Aurangabad S/S		1	Monitoring
		400 Kv Jejury S/S		1	Monitoring
		765 Kv Ektuni S/S		1	Monitoring
		765 Kv Taptitanda S/S		1	Monitoring

Annexure 3.1

List of data points to be transmitted from 0.8/33 KV M/s TS Wind Power Developers Malumbra, Tal: Tuljapur, Dist Osmanbad (20 MW, Solar) to SLDC Kalwa.

A- Analog Data Point

Sr .No.	Analog Data Point	No. of values
1	0.8/33Kv 5 MVA Transformer-1 P,Q,I (33 KV Side)	3
2	0.8/33kV 5 MVA Transformer-2 P,Q,I (33 KV Side)	3
3	33kV Tuljapur P, Q, I	3
4	33KV Mnbs Bus Voltage (KV), Frequency(Hz)	2
	Total	**11**

B- Digital Data Point

Sr .No.	Digital Data Point	No. of Statuses
1	0.8/33kV 5 MVA Transformer-1 CB Status (33 KV Side)	1
2	0.8/33kV 5 MVA Transformer-2 CB Status (33 KV Side)	1
3	0.8/33kV 5 MVA Transformer-1 ISO Status (33 KV Side)	1
4	0.8/33kV 5 MVA Transformer-2 ISO Status (33 KV Side)	1
5	33kV Tuljapur CB Status	1
6	33kV Tuljapur ISO Status	1
	Total	**6**

C. Trip Alarms

Sr .No.	Digital Data Point	No. of Alarms
1	0.8/33kV 5 MVA Transformer-1 CB trip (HV) Alarm	1
2	0.8/33kV 5 MVA Transformer-2 CB trip (HV) Alarm	1
3	33kV Tuljapur CB trip, OC/EF Alarms	2
	Total	**4**

Total Data Points (A+B+C) = (11+6+4) = 21

Annexure 3.2

List of data points to be transmitted from 132/33KV M/s Siemens Gamesa Renewable Power Pvt. Ltd., At Village: Lohara, Tal: Tuljapur, Dist: Osmanabad (100MW, Wind) to SLDC Kalwa.

A- Analog Data Point

Sr .No.	Analog Data Point	No.of values
1	33 KV Line-1 P,Q,I	3
2	33 KV Line-2 P,Q,I	3
3	33 KV Line-3 P,Q,I	3
4	33 KV Line-4 P,Q,I	3
5	132/33 KV Transformer-1 P,Q,I (132 KV Side)	3
6	132/33 KV Transformer-1 P,Q,I (33 KV Side)	3
7	132/33 KV Transformer-2 P,Q,I (132 KV Side)	3
8	132/33 KV Transformer-2 P,Q,I (33 KV Side)	3
9	132KV Tuljapur Line P,Q,I	3
10	132 KV Main Bus Voltage (KV),Frequency(Hz)	2
11	33 KV Main Bus Voltage (KV),Frequency(Hz)	2
	Total	**31**

B- Digital Data Point

Sr .No.	Digital Data Point	No. of Statuses
1	33 KV Line-1CB Status	1
2	33 KV Line-1 ISO Status	1
3	33 KV Line-2 CB Status	1
4	33 KV Line-2 ISO Status	1
5	33 KV Line-3 CB Status	1
6	33 KV Line-3 ISO Status	1
7	33 KV Line-4 CB Status	1
8	33 KV Line-4 ISO Status	1
9	132/33 KV Transformer-1 CB Status (132KV Side)	1
10	132/33 KV Transformer-1 ISO-1, ISO-2 Status (132KV Side)	2
11	132/33 KV Transformer-1 CB Status (33KV Side)	1
12	132/33 KV Transformer-1 ISO Status (33KV Side)	1
13	132/33 KV Transformer-2 CB Status (132KV Side)	1
14	132/33 KV Transformer-2 ISO-1, ISO-2 Status (132KV Side)	2
15	132/33 KV Transformer-2 CB Status (33KV Side)	1
16	132/33 KV Transformer-2 ISO Status (33KV Side)	1
17	33 KV Bus Section-1 CB Status	1
18	33 KV Bus Section-1 ISO-1, ISO-2 Status	2
19	132 KV Bus Section-1 CB Status	1
20	132 KV Bus Section-1 ISO-1, ISO-2 Status	2
21	132 KV Bus Coupler-1 CB Status	1
22	132 KV Bus Coupler-1 ISO-1, ISO-2 Status	2
23	132 KV Tuljapur CB Status	1
24	132 KV Tuljapur ISO-1, ISO-2 Status	2
	Total	**30**

C. Trip Alarms

Sr .No.	Digital Data Point	No.of Alarms
1	33 KV Line-1 CB Trip, OC/EF Alarms	2
2	33 KV Line-2 CB Trip, OC/EF Alarms	2
3	33 KV Line-3 CB Trip, OC/EF Alarms	2
4	33 KV Line-4 CB Trip, OC/EF Alarms	2
5	132/33 KV Transformer-1 CB trip (HV, LV) Alarms	2
6	132/33 KV Transformer-2 CB trip (HV, LV) Alarms	2
7	33 KV Bus Section-1 CB Trip	1
8	132 KV Bus Section-1 CB Trip	1
9	132 KV Bus Coupler-1 CB Trip	1
10	132 Tuljapur CB Trip, Dist Main-1, OC/EF Alarms	3
	Total	**18**

Total Data Points (A+B+C) = (31+30+18) =79

ANNEXTURE 2

STATIC DETAILS OF SOLAR GENERATOR

DO NOT MERGE THE CELL WHILE FILLING DETAILS. PLEASE ENETR DETAILS SEPERATLY IN THE CELL EVEN FOR REPETATIVE INFORMATION. ALSO DON'T CLUBED THE 2-3 DETAILS IN ONE CELL**. MAKE SEPARATE ROW FOR SEPARATE INFORMATION

*V= LVRT feature Enabled W= LVRT not possible, X = LVRT design supported and fitted to be enabled, Y = LVRT design supported but to be fitted, Z = LVRT feature to be retrofitted

in case of ambiguity, date of commissioning of last commissioned turbine of plant is to be considered

S.NO.	NAME OF GENERATOR	NAME OF DEVELOPER	NO OF PV PANELS	MAKE	MODEL	PV PANEL MATERIAL	CAPACITY OF EACH MODULE (WATT PEAK)	TOTAL DC CAPACITY (WATT PEAK)	TOTAL AC CAPACITY	PERFORMANCE RATIO OF THE PV PLANT IN %	AC/DC RATIO	ORIENTATION IN DEGREES	MOUNTING TYPE (FIXED/SINGLE AXIS TRACTING/ETC.)	TILT ANGLE OF PANELS (MONTH WISE FOR CASE(S) OF VARIABLE TILT)*(CLUBED INFORMATION IS ALLOWED)	ALBEDO	LATITUDE OF PV PANEL (IN DECIMAL FORMAT UPTO 5 DECMAL- DON'T ADD 'N' THERAFTER)	LONGITUDE OF PV PANEL (IN DECIMAL FORMAT UPTO 5 DECMAL-DON'T ADD 'E' THERAFTER)	DATE OF COMMISSIONING(DD/MM/YYYY)#	NO.OF INVERTERS	NO. OF SOLAR MODULES PER INVERTER	TYPE OF CSP	HEAT TRANSFER FLUID (WATER/MOLTEN SALT/ETC.)	SOLAR FIELD APERTURE	DATE OF COMMISSIONING(DD/MM/YYYY)#	USEFUL LIFE BEYOND 04.01.2021 IN YEARS	LVRT COMPLIANT (V/W/X/Y/Z)*	HVRT COMPLIANT (YES/NO)	CAPTIVE (YES/NO)	POWER CURVE (THEORETICAL)	POWER CURVE (MANUFACTURER TESTED)	POOLING SUBSTATION NAME	LATITUDE OF PSS (IN DECIMAL FORMAT UPTO 5 DECMAL- DON'T ADD 'N' THERAFTER)	LONGITUDE OF PSS (IN DECIMAL FORMAT UPTO 5 DECMAL- DON'T ADD 'E' THERAFTER)	VOLTAGE LEVEL OF PSS (KV)	INTERCONNECTION POINT VOLTAGE (KV)	FEEDER NUMBER	FEEDER NAME (AS PER APPROVED SINGLE LINE DIAGRAM OF POOLING SS)	METER NUMBER

ABSTRACT

SOLAR GEN. REPORTING TO F&S SOFTWARE	
TOTAL SOLAR Integrated in SLDC SCADA	**90**
TOTAL No. of Solar Gen. Registered in F&S	60
(-) NOT INTEGRATED in SLDC SCADA	2
Solar Generator Reporting to F&S	**57**

* 58 out of 90 Solar Generators data is included in F&S

* 20 Solar Generator under MSKVY

* 12 Solar Generator less than 5MW

WIND GEN. REPORTING TO F&S SOFTWARE	
TOTAL WIND Integrated in SLDC SCADA	**81**
TOTAL No. of Wind Gen. Registered in F&S	91
(-) NOT INTEGRATED in SLDC SCADA	6
Wind Generator Reporting F&S	**85**
TOTAL SOLAR+WIND Generators Integrated in SCADA SLDC	**171**

* 81 out of 81 Wind Generators data is included in F&S

** 4 Wind Generator sharing data to multiple PSS*

PSS REPORTING TO F&S SOFTWARE	
PSS Registered in F&S Software (Total IC Greater than or Equal to 5MW)	123
Purely Solar PSS	38
Purely Wind PSS	76
Hybrid (Solar+Wind) PSS	4
TOTAL No. of PSS Registered in Forecasting & Scheduling Software	**118**
TOTAL GENERATORS covered in Forecasting & Scheduling Software	151
(-) NOT INTEGRATED in SLDC SCADA	8
TOTAL No. of Generators Covered in Forecasting & Scheduling Software	**143**

*4 Nos. of hybrid generators are registered as PSS Solar & PSS Wind that is twice in F&S and Naldurg Inter & Intra is also registered seperately

SOLAR (DSR & SCADA Comparison)	
TOTAL SOLAR GENERATORS	**90**
Included in DSR Meter Data by Op.Dept.	41
Not included in DSR by Op.Dept.	49
WIND (DSR & SCADA Comparison)	
TOTAL WIND GENERATORS	**81**
Included in DSR Meter Data by Op.Dept.	63
Not included in DSR by Op.Dept.	18
TOTAL SOLAR+WIND Generators Integrated in SCADA SLDC	**171**

50.04 Hz 23.11.21 17:21:49

Maharashtra State Electricity Transmission Co. Ltd.

Satate Load Despatch Center, Airoli

SOLAR GENERATION

SN.	STATION	IC	MW
	JNNSM PH-I		
1	FIRE STONE	5	1.33
2	ESSEL MP	20	4.64
	JNNSM PH-II , B-I		
1	VISHWAJ ENERGY	10	0.48
	JNNSM PH-II , B-III		
1	BHAGERIA IND.	30	1.69
2	TALETTUTAYI SOLAR	50	2.40
3	ORANGE RENEWABLES	100	3.32
4	SEPSET SOLAR	40	19.03
5	KRISHNA WINDFRAM	10	-0.02
6	NVR MAHASOLAR	50	2.64
7	GALE SALTEK	50	1.00
8	TORNADO SALTEK	20	0.42
9	TATA PALASWADI- II	30	0.65
10	PARAMPUIIYA SOLAR	20	-0.80
11	WELSPUN (GIRIRAJ)	100	0.94
	JNNSM PH-II , B-IV		
1	SOLAR EDGE MAHTARGAON	80	0.00
2	SOLAR EDGE MUKTAINAGAR	50	1.36
3	LREHL RENEWABLES	50	1.38
4	JBM SOLAR	100	3.49
5	SUKHBIR AGRO & VIJAY PRINTING PRESS	30	1.07
6	FERMI SOLAR	80	2.81

SN.	STATION	IC	MW
	OTHERS		
1	ALKYL AMINES CHEMICALS	2	0.00
2	ENRICH KARASGI	47.235	0.93
3	ENRICH MANDRUP	47.75	1.12
4	FOURTH DIMN.	30	0.27
5	JAIN IRRIGATION	8.5	0.13
6	JINDAL POLYFILMS	2.5	0.13
7	KIRAN RENEW	4.6	0.13
8	KIRLOSKAR OIL (KAGAL)	5.5	2.32
9	MORRIES ENERGY	10	0.07
10	RYB SOLAR	10	0.23
11	SAKRI SOLAR	125	1.19
12	SHARDA CONST.	10	5.88
13	SHIRSUPHAL SOLAR	50.33	1.98
14	SUNBLESS SOLAR	13.4	0.17
15	TATA PALASWADI-I	25	0.39
16	VAIBHAV SOLAR	2	0.01
17	VARROC ENGG.	5	0.00
18	WELSPUN ENEGRY	20	0.58
19	DHUMKETU SOLAR LLP	10	0.26
20	MH PARBHANI	40	0.86
21	UJAAS ENERGY MOIL	5	-0.00
22	SHAHANE SOLAR	2.5	0.05
23	FLEXIRURAL URJA	20	0.53
24	T.S. WIND (WADALA)	10	0.13
25	CLOVER SOLAR	2	0.03
26	UJAAS ENERGY HAL	15	0.00
27	UJAAS MANTHA	15	0.00
28	PANAMA SOLAR	10	0.00
29	SEPSET SOLAR	2	0.38
30	CITRA SOLAR	2	0.53
31	MH TECHNIQUE SOLAR	20	0.00
32	DR AMBEDKAR SOLAR	1	0.01
33	BHAGERIA INDUSTRIES	20	0.28
34	HATTURE S ENERGY	5	0.00
35	TS WIND SAWARGAON	10	0.51
36	TS WIND MALUMBRA	15	0.88
37	ASHOKA INSTITUTE	5	0.00

SN.	STATION	IC	MW
	OTHERS		
38	HOTEL MEHFIL INN	1	0.01
39	ENRICH TULJAPUR	100	13.50
40	VIDHI SPECIALITY FOOD	2	0.00
41	ITC SHREE SWAMI SAMARTH	15	0.67
42	TATA POWER (TPREL-PWL)	120	5.28
43	SOLOPTCI (SORIANO SOLAR)	20	0.00
44	AELIUS RENE. INFRA SERVICES	20	0.11
45	CLEAN SCIENCE & TECH.	04	-0.01
46	SOLAR POWER PLANT CSTPS CHANDRAPUR	05	0.01
47	VIRAJ SOLAR KHAMGAON	100	1.88
48	TS WIND (JALKOT)	80	-10.1
48	TS WIND MALUMBRA - 2	20	3.25
48	RENEW POWER KHANDKE	26.5	0.00

SN.	STATION	IC	MW
	MSKVY		
1	NISAGRA (CHHAIL)	10	0.17
2	NISAGRA (TEMBHE/BAHIRANE)	10	0.23
3	NISAGRA (INDAVE)	10	0.39
4	NISAGRA (VARUL)	10	0.40
5	NISAGRA (DAHIDI/TINGRI)	10	0.37
6	NISAGRA (MUKTI)	10	0.36
7	NISAGRA (VICHKHEDE)	10	0.40
8	JUNIPER (VEHELGAON)	10	0.38
9	JUNIPER (RAJAPUR)	10	0.47
10	JUNIPER (DAHIWAD)	10	0.42
11	ATNU SOLAR (JAMKHED)	10	0.38
12	ATNU SOLAR (MANTHA)	10	0.00
13	ATNU SOLAR (MOHOL)	10	0.41
14	ATNU SOLAR (PALASHI)	10	0.34
15	ATNU SOLAR (PIMPARPHODI)	10	0.00
16	ATNU SOLAR (KANNAD)	10	0.00
17	ATNU SOLAR (WADHWANI)	10	0.31
18	AURINKO SOLAR	10	0.00
19	WAACOX	16	1.08
20	GRO SOLAR ENERGY Pvt Ltd	07	0.27
	SP 7 TOTAL		87.19

INCLUDED FS		80.31
EXCLUDED FS		6.73
TOTAL GENERATION (MW)	1934.49	87.04

50.04 Hz 23.11.21 17:22:25

Maharashtra State Electricity Transmission Co. Ltd.

Satate Load Despatch Center, Airoli

WIND GENERATION

SN	WIND DEVELOPERS	MSETCL PSS	IC	MW
1	ADITYA ENGG (BHUD)	220 KV WAYPHALE	30	1.27
2	AMRIK (KHAPRALE,SUZLON)	132 KV KHAPRALE	87.9	0.32
3	BOTHE WINDFARM	220 KV BOTHE	199.7	0.00
4	GAMESA (BHENDEWADI)	132 KV BHAMBAVDE	24.65	0.25
5	GAMESA (KIRVERE)	132 KV KOMBALNE	47.6	0.00
6	GAMESA (MENDIGIRI)	220 KV JATH & 110 KV JATH	39.1	0.00
7	GAMESA (VASPETH)	132 KV VASPETH	198.7	-1.23
8	GAMESA (AMBHERI)	33 KV KOREGAON	14.4	7.08
9	GAMESA (BHUD)	132 KV DAHIWADI	22.1	0.00
10	GIRIRAJ (AMBHERI)	132 KV AMBHERI	16	0.19
11	GIRIRAJ (KADEGAON)	220 KV KADEGAON	14.8	0.14
12	GIRIRAJ (SANMADI)	110 KV JATH	10	0.00
13	ITC (BHUD) SANGLI	220 KV VITA-KARVE (33KV LENGRE)	7.5	0.00
14	ITC (CHAKLA) NANDURBAR	132 KV NANDURBAR	6.3	-0.05
15	KRISHNA POWER (AUNDH)	132 KV AUNDH	8.4	0.03
16	MALPANI (NIGDE)	220 KV NIGDE	94.8	0.15
17	MARUTI WIND (BHUD)	220 KV KHANAPUR	94	-0.05
18	MARUTI WIND (SHEDYAL)	220 KV SHEDYAL	217.7	0.07
19	PANAMA (NERLE)	220 KV NERLE	72	0.27
20	PANAMA-2 (BEED)	132 KV RAJPIMPARI	80	-0.14
21	REGEN (HIWARWADI)	220 KV HIWARWADI	187.5	3.66
22	REGEN (MAYANI)	110 KV MAYANI	99	0.71
23	REGEN PWR (SAWARGAON)	220 KV PUSAD (33 KV SAWARGAON)	30	0.00
24	RENEW PWR (KHANDKE)	132 KV ARHANVIHIRA	73.5	-0.32
25	RENEW WIND (AUNDH)	132 KV AUNDH	28	-0.05
26	RWPPL (PALASI)	220 KV DASGAON	97.6	-0.04
27	SANJANA POWER (SATARA)	132 KV AUNDH	6	0.00
28	SERUM INST (JATH)	110 KV JATH	37.5	-0.10
29	SERUM INST (SAKRI)	132 KV SAKRI	33.6	-0.13
30	SHAH DEVP (KHANDKE)	132 KV KHANDKE	108	-0.13
31	SHAH DEVP (KOREGAON)	132 KV SATARA ROAD	12	0.05
32	SIVA RENEWABLES (JATH)	110 KV JATH	14	0.00
33	SHRIRAM (KOKRALE)	220 KV PATODA	18.375	0.00
34	SUYOG URJA (ANJANWADI)	132 KV PISHOR	16.8	-2.69
35	SUZLON (BHOYRE PATHAR)	220 KV SONEWADI	7.5	-0.02
36	SUZLON (GANGAPUR)	220 KV GANGAPUR	236.25	-0.44
37	SUZLON (GHATNANDRE)	220 KV GHATNANDRE	226.15	-0.51
38	SUZLON (JAMDE)	220 KV JAMDE	328	-0.47
39	SUZLON (MENDIGIRI)	220 KV MENDHEGIRI	121.8	-0.36
40	SUZLON (KEDGAON)	132 KV KEDGAON	22	0.04
41	SUZLON (KUNDALAPUR)	110 KV SAVLAJ	8.7	0.00
42	SUZLON (MALHARPETH)	220 KV MALHARPETH	99.85	16.97
43	SUZLON (NANDURBAR)	132 KV NANDURBAR	50	0.05
44	SUZLON (PANDURLI)	220 KV EKLAHARE OCR	9	-0.04
45	SUZLON (PARALI)		11.41	0.00
46	SUZLON (RANALA)	132 KV DHONDAICHA	11.25	0.00
47	SUZLON (SADAWAGHPUR)	220 KV SADAWAGHPUR	117.9	0.37
48	SUZLON (SAVLAJ)	110 KV SAVLAJ	23.75	0.04
49	SUZLON (SHIRSHI)	132 KV SHIRALA	8.4	0.07
50	SUZLON (SUPA)	132 KV SUPA	35	0.08

SN	WIND DEVELOPERS	MSETCL PSS	IC (MW)	MW
51	SUZLON (UNDALE)	110 KV KALE	6	-0.01
52	SUZLON (VANKUSWADE)	220 KV VANKUSWADE	203.24	0.35
53	SUZLON (VITA)	220 KV VITA-KARVE	10.5	0.04
54	SUZLON (WALVE)	220 KV WALVE	168.1	-0.49
55	T S WIND (AUNDH)	132 KV AUNDH	29.7	-0.16
56	T S WIND (ALEPHATA)	220 KV ALEPHATA	29.7	-0.10
57	T S WIND (MEDHA)	220 KV SATARA MIDC	7.2	0.00
58	T S WIND (SHIRALA)	132 KV SHIRALA	81.6	0.30
59	T S WIND (WAI)	132 KV WAI	20.1	-0.05
60	VALSANG (SANGLI)	132 KV VALSANG	139.5	-0.20
61	VESTAS (KARVE)	220 KV VITA-KARVE	53.4	-0.80
62	VESTAS (SAKRI)	132 KV SAKRI	86.55	0.00
63	VESTAS (SHIRALA)	132 KV SHIRALA	37.95	0.44
64	VICTORY WINDFARM (JAMKHED)	132 KV ASHTI	8.4	-0.06
65	VISH WIND (KHANDKE)	220 KV JEUR-KHANDKE	49.6	0.00
66	WINDWORLD (ANDHALAKE)	110 KV ANDRALAKE	106.4	-0.36
67	WINDWORLD (BHAMBARWADI)	132 KV BHAMBARWADI	50.4	0.22
68	WINDWORLD (CHAVANESHWAR)	132 KV CHAVANESHWAR	61.6	1.00
69	WINDWORLD (KARVEKURD)	110 KV KALE	6.4	0.00
70	WINDWORLD (KHANAPUR)	132 KV KALEDHONE	36.8	5.95
71	WINDWORLD (PANCHPATTA)	132 KV PANCHPATTA	62.4	0.32
72	WINDWORLD (VAREKARWADI)	110 KV KALE	13	0.00
73	VICTORY WINDFARM (POKHARI)	132 KV ASHTI	9	0.00
74	ZYPHERSUN (PATODA)	220 KV PATODA	10	0.00
75	SUYOG URJA (KORAL)		26	0.00
76	SUZLON (ATIT)	110 KV ATIT	7.5	-0.03
77	GLOBAL METAL		10	0.35
78	GAMESA OSMANABAD		76	-0.48
79	GAMESA LOHARA		100	-0.82
80	SHRIRAM EPC PATODA		8	0.00
81	PERTINENT INFRA		15	-0.00
		SP7 TOTAL	4881.025	33.57

30.47

SP4 TOTAL 33.58

50.04 Hz 23.11.21 17:21:13

Maharashtra State Electricity Transmission Co. Ltd.

State Load Despatch Center Airoli

REVISION : BLOCK :

RENEWABLE ENERGY GENERATION OVERVIEW

NASHIK

Dist.	PSS Name	IC	Solar	Wind
A'nagar	Kharda 132kV	10	-0	—
	Karjat 132kV	5	1	—
	Kedgaon 132kV	22	—	0
	Khandke 132kV	108	—	0
	Kombhalne 132kV	32+47.6	2	0
	Supa 132kV	35	—	0
	Jeur-Khandke 220kV	49.6	—	0
	Bhoyre Pathar 33kV	7.5	—	-0
Dhule	Sakri 132kV	86.55	—	0
	Jamde 220kV	70+328	2	-0
	Shivajinagar 220kV	230	5	—
	Walve 220kV	168.1	—	-0
	Ranala 33kV	11.25	—	0
	Jaitane Rural 33kV	6.25	—	NI
J'gaon	Fermi Solar 132kV	80	3	—
	JBM Solar 12kV	100	4	—
	Muktainagar 132kV	50	1	—
	New J'gaon MIDC 132kV	8.5	0	—
N'bar	Nandurbar 132kV	50	—	0
	Gangapur 220kV	236.25	—	0
Nashik	Khaprale 132kV	87.9	—	0
	Ozar 132kV	15	0	—
	Pachpatta 132kV	62.4	—	0
	Pandurli 33kV	9	—	-0

AMRAVATI

Dist.	PSS Name	IC	Solar	Wind
Akola	Murtizapur 132kV	13.4	0	—
A'vati	Mulawa 33kV	9	—	0
	Sawargaon 33kV	10.5	—	2
	Shembalpimpri 33kV	10.5	—	1
B'dhna	Balapur 220kV	100	2	—

KARAD

Dist.	PSS Name	IC	Solar	Wind
Satara	Atit 110kV	25.15	—	-0
	Mayni 110kV	99	—	1
	Palaswadi 110kV	55	1	—
	Satara Road 110kV	28	—	0
	Ambheri 132kV	48	—	0
	Aundh 132kV	10+99	0	0
	Chavneshwar 132kV	61.6	—	1
	Kaledhone 132kV	36.8	—	6
	Mograle 132kV	54	3	—
	Wai 132kV	25	—	-0
	Bhambarwadi 132kV	50.4	—	0
	Dahiwadi 132kV	22.1	—	0
	Bothe 220kV	199.7	—	0
	Dasgaon 220kV	97.6	—	-0
	Ghatnandre 220kV	226.15	—	-0
	Hiwarwadi 220kV	187.5	—	4
	Malharpeth 220kV	99.85	—	17
	Nerle 220kV	72	—	0
	Nigade 220kV	96.8	—	0
	Sadawaghapur 220kV	117.9	—	0
	Satara MIDC 220kV	62.08	—	0
	Vankuswade 220kV	203.24	—	0
	Varkute-Malwadi 220kV	100	1	—
	Wayphale 220kV	30	—	1
	Kadegaon 220kV	14.8	—	0
	Dafalapur 33kV	10	—	0
	Dhebewadi 33kV	5.76	—	NI
	Medha 33kV	7.2	—	0
	Shirshi 33kV	8.4	—	0
	Undale 33kV	6	—	-0
	Kokrale 33kV	18.38	—	0
K'pur	Kale 110kV	13	—	0
	Bambavde 132kV	24.65	—	0
	Five Star MIDC 220kV	5.5	2	—
Sangli	Jath 110kV	71.35	—	-0
	Kavthemahankal 110kV	8.4	—	NI
	Savlaj 110kV	8.75	—	0
	Shirala 132kV	81.6	—	1
	Vaspeth 132kV	198.7	—	-1
	Walsang 132-110kV	141.5	—	-0
	Jath 220kV	19.55	—	0
	Khanapur 220kV	96	—	-0
	Mendhegiri 220kV	132.3	—	-0
	Shedyal 220kV	217.17	—	0
	Vita 220kV	60.9	—	1
	Lengare 33kV	7.5	—	-0
	Darikonur 33kV	10	—	NI
	Jamsande 33kV	10	—	NI
	Koregaon 33kV	14.4	—	0
	Kundlpur 33kV	8.7	—	0
	Panumbre 33kV	12.26	—	NI
	Sanmadi 33kV	10	—	0
	Savlaj 33kV	15	—	0

NAGPUR

Dist.	PSS Name	IC	Solar	Wind
C'pur	Warora 220kV	5	NI	—
	Chandrapur 33kV	5	0	—
N'pur	Katol 132kV	56.4	20	—
	Mansar 132kV	5	-0	—

PUNE

Dist.	PSS Name	IC	Solar	Wind
Pune	Andhralake 100kV	106.4	—	-0
	Alephata 220kV	29.7	—	-0
S'pur	Karajgi 132kV	47.23	1	—
	Mandrup 132kV	47.75	1	—
	Mohol 132kV	10	0	—
	Sangola 132kV	10	0	—
	Wagdari 132kV	149	9	—
	Walwhan 132kV	20	1	—
	Shirsuphal 220kV	50.33	2	—

AURANGABAD

Dist.	PSS Name	IC	Solar	Wind
Abad	Pishor 132kV	21	—	3
Beed	Aranvihira 132kV	73.5	—	-0
	Raimoha 132kV	20	0	—
	Mahtargaon 132kV	80	0	—
	Naldurg 132kV	58.25	6	—
	Rajpimpri 132kV	10+80	0	-0
	Telgaon 132kV	50	2	—
	Rohatwadi 33kV	10	0	—
	Dhanora 33kV	5	NI	—
	Jamkhed 33kV	10.2	—	-0
	Kuslamb 33kV	10.2	—	0
	Patoda 33kV	7.75	—	0
Latur	Jalkot 220kV	12.8	-10	—
	Panchincholi 33kV	10	6	—
obad	Koral 132kV	26	—	0
	Lohara 132kV	100	—	-1
	Osmanabad 220kV	76	—	-0
	Tuljapur 220kV	35	14	—
	Pokhari 33kV	9	—	0
	Wadala 33kV	15	0	—
	Savargaon 33kV	10	1	—
Pbhni	Gangakhed 132kV	60	1	—
	Pathri 132kV	20	0	—

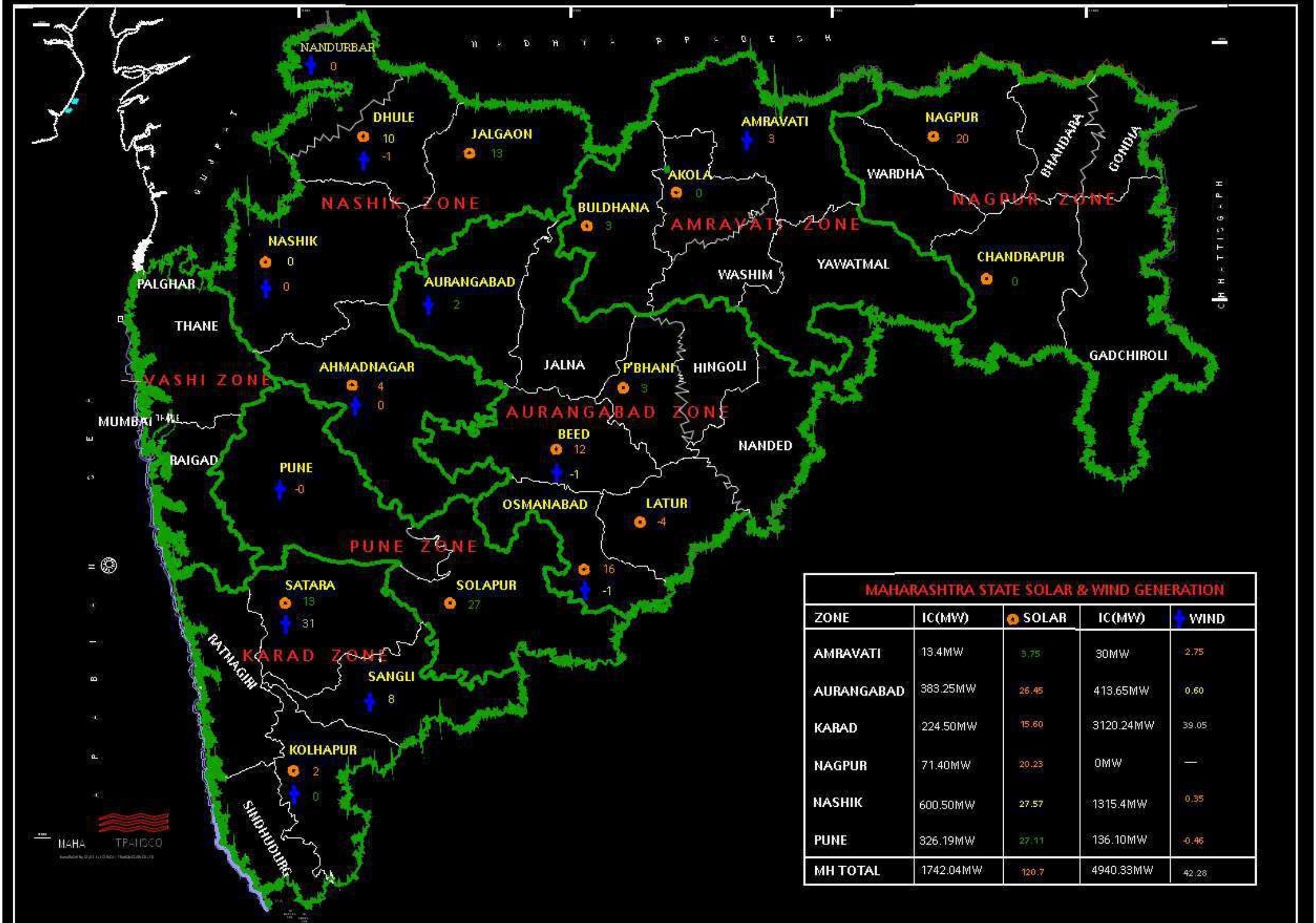
MAHARASHTRA STATE

Zone / District (IC)	SOLAR		WIND	
	IC(MW)	Actual	IC(MW)	Actual
AMRAVATI (143.4)	113.4	2	30	3
Akola (13.4)	13.4	0	—	—
Amravati (30)	—	—	30	3
Buldhana (100)	100	2	—	—
AURANGABAD (796.9)	383.25	21	413.65	1
Aurangabad (21)	—	—	21	3
Beed (414.9)	233.25	9	181.65	-1
Latur (10)	10	-4	—	—
Osmanabad (271)	60	15	211	-1
Parbhani (80)	80	2	—	—
KARAD (3344.74)	224.50	7	3120.24	37.85
Sangli (1124.08)	—	—	1124.08	7
Satara (2177.51)	219	5	1958.51	31
Kolhapur (43.15)	5.5	2	37.65	0
NAGPUR (71.40)	71.40	20	—	—
Chandrapur (10)	10	0	—	—
Nagpur (61.4)	61.4	20	—	—
NASHIK (1915.9)	600.50	18	1315.40	-1
Ahmednagar (316.7)	47	3	269.7	0
Dhule (900.15)	300	6	600.15	-1
Jalgaon (238.5)	238.5	8	—	—
Nandurbar (286.25)	—	—	286.25	0
Nashik (174.3)	15	0	159.3	1
PUNE (462.29)	326.19	15	136.10	-0
Pune (136.10)	—	—	136.10	-0
Solapur (326.19)	326.19	15	—	—

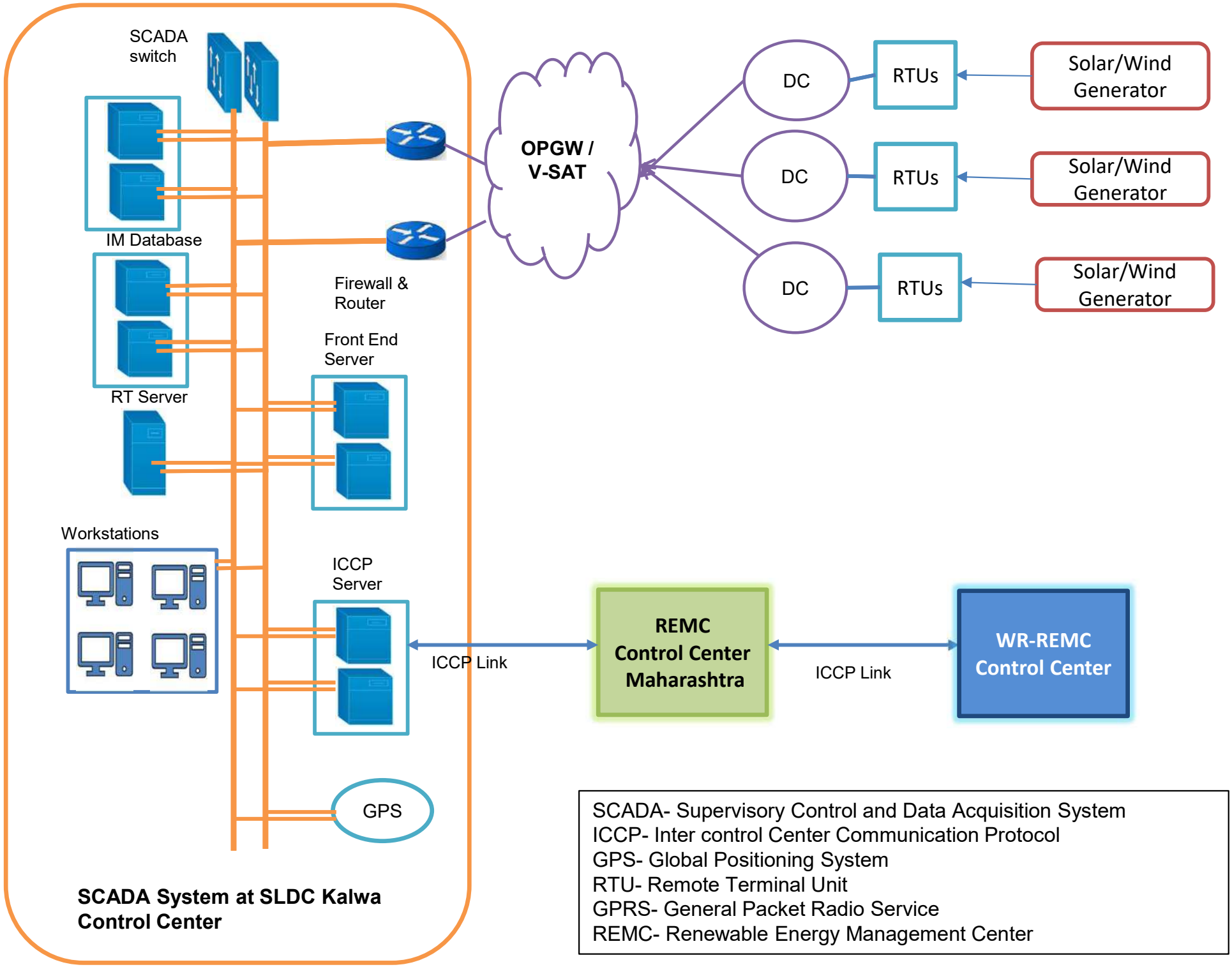
MAHARASHTRA REMC

RE Source	IC (MW)	SCHEDULE	ACTUAL
SOLAR	1760 MW	96.25	82.58
WIND	4993 MW	664.4	41.35
TOTAL	6745 MW	760.6	123.9

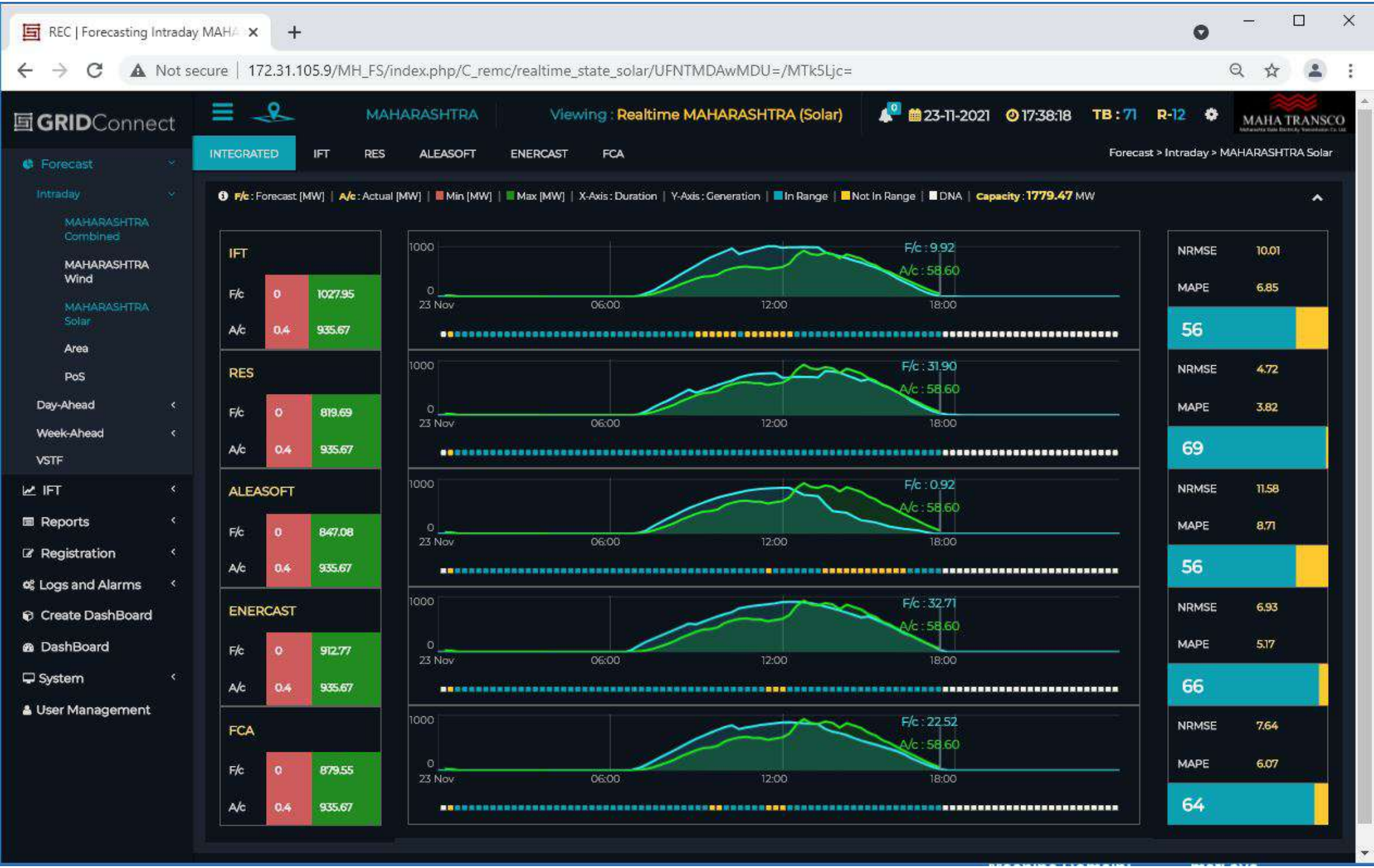
* NI: NOT INTEGRATED *ALL VALUES ARE IN MW *In case of Hybrid PSS IC is mentioned as Solar+Wind



MAHARASHTRA STATE SOLAR & WIND GENERATION				
ZONE	IC(MW)	SOLAR	IC(MW)	WIND
AMRAVATI	13.4MW	3.75	30MW	2.75
AURANGABAD	383.25MW	26.45	413.65MW	0.60
KARAD	224.50MW	15.60	3120.24MW	39.05
NAGPUR	71.40MW	20.23	0MW	—
NASHIK	600.50MW	27.57	1315.4MW	0.35
PUNE	326.19MW	27.11	136.10MW	-0.46
MH TOTAL	1742.04MW	120.7	4940.33MW	42.28



SCADA- Supervisory Control and Data Acquisition System
ICCP- Inter control Center Communication Protocol
GPS- Global Positioning System
RTU- Remote Terminal Unit
GPRS- General Packet Radio Service
REMC- Renewable Energy Management Center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Not secure | 172.31.105.9/MH_FS/index.php/C_remc/realtime_state_solar/UFNTMDAwMDU=/MTk5Ljc=
GRIDConnect
MAHARASHTRA
Viewing : Realtime MAHARASHTRA (Solar)
23-11-2021
17:38:18
TB : 71
R-12
MAHA TRANSCO
INTEGRATED
IFT
RES
ALEASOFT
ENERCAST
FCA
Forecast > Intraday > MAHARASHTRA Solar
Forecast
Intraday
MAHARASHTRA Combined
MAHARASHTRA Wind
MAHARASHTRA Solar
Area
PoS
Day-Ahead
Week-Ahead
VSTF
IFT
Reports
Registration
Logs and Alarms
Create DashBoard
DashBoard
System
User Management
F/c : Forecast [MW] | A/c : Actual [MW] | Min [MW] | Max [MW] | X-Axis : Duration | Y-Axis : Generation | In Range | Not In Range | DNA | Capacity : 1779.47 MW
IFT
F/c 0 1027.95
A/c 0.4 935.67
RES
F/c 0 819.69
A/c 0.4 935.67
ALEASOFT
F/c 0 847.08
A/c 0.4 935.67
ENERCAST
F/c 0 912.77
A/c 0.4 935.67
FCA
F/c 0 879.55
A/c 0.4 935.67
1000
0
23 Nov
06:00
12:00
18:00
F/c : 9.92
A/c : 58.60
F/c : 31.90
A/c : 58.60
F/c : 0.92
A/c : 58.60
F/c : 32.71
A/c : 58.60
F/c : 22.52
A/c : 58.60
NRMSE 10.01
MAPE 6.85
56
NRMSE 4.72
MAPE 3.82
69
NRMSE 11.58
MAPE 8.71
56
NRMSE 6.93
MAPE 5.17
66
NRMSE 7.64
MAPE 6.07
64


REC | Forecasting Intraday MAHA
Not secure | 172.31.105.9/MH_FS/index.php/C_remc/realtime_state_wind/UFNTMDAwMDU=/MTk5Ljc=#
GRIDConnect
MAHARASHTRA
Viewing : Realtime MAHARASHTRA (Wind)
23-11-2021
17:37:35
TB : 71
R-12
MAHA TRANSCO
INTEGRATED
IFT
RES
ALEASOFT
ENERCAST
FCA
Forecast > Intraday > MAHARASHTRA Wind
Forecast
Intraday
MAHARASHTRA Combined
MAHARASHTRA Wind
MAHARASHTRA Solar
Area
PoS
Day-Ahead
Week-Ahead
VSTF
IFT
Reports
Registration
Logs and Alarms
Create DashBoard
DashBoard
System
User Management
F/c : Forecast [MW] | A/c : Actual [MW] | Min [MW] | Max [MW] | X-Axis : Duration | Y-Axis : Generation | In Range | Not In Range | DNA | Capacity : 5024.66 MW
IFT
F/c 157.58 630.32
A/c 44.6 295.07
RES
F/c 110.07 438.92
A/c 44.6 295.07
ALEASOFT
F/c 8.21 168.91
A/c 44.6 295.07
ENERCAST
F/c 5.89 73.38
A/c 44.6 295.07
FCA
F/c 71.36 376.75
A/c 44.6 295.07
F/c : 166.46
A/c : 47.60
F/c : 146.84
A/c : 47.60
F/c : 58.98
A/c : 47.60
F/c : 32.39
A/c : 47.60
F/c : 83.46
A/c : 47.60
500
200
0
23 Nov
06:00
12:00
18:00
NRMSE 4.91
MAPE 4.76
70
NRMSE 1.63
MAPE 1.34
70
NRMSE 3.6
MAPE 3.34
70
NRMSE 3.23
MAPE 3.06
70
NRMSE 1.94
MAPE 1.84
70

Sr. No.	Upstream Unit Display Name	Downstream Unit Name	Voltage Level [kV]	Installed Capacity [MW]	Generation Type
1	Alephata 220kV	Alephata 220kV	220	29.7	WIND
2	Ambheri 132kV	Ambheri 132kV	132	48	WIND
3	Ambheri 132kV	Kokarale 33kV	132	18.38	WIND
4	Andhralake 100kV	Andhralake 100kV	100	106.4	WIND
5	Aranvihira 132kV	Aranvihira 132kV	132	73.5	WIND
6	Aranvihira Solar 132kV	Aranvihira Solar 132kV	132	20	SOLAR
7	Atit 110kV	Atit 110kV	110	25.15	WIND
8	Aundh Solar 132kV	Aundh Solar 132kV	132	10	SOLAR
9	Aundh Wind 132kV	Aundh Wind 132kV	132	99	WIND
10	Balapur 220kV	Balapur 220kV	220	100	SOLAR
11	Bambavde 132kV	Bambavde 132kV	132	24.65	WIND
12	Bhambarwadi 132kV	Bhambarwadi 132kV	132	50.4	WIND
13	Bhambarwadi 132kV	Undale 33kV	132	6	WIND
14	Bothe 220kV	Bothe 220kV	220	199.7	WIND
15	Chandrapur 33kV	Chandrapur 33kV	33	5	SOLAR
16	Chavneshwar 132kV	Chavneshwar 132kV	132	61.6	WIND
17	Dafalapur 33kV	Dafalapur 33kV	33	10	WIND
18	Dahiwadi 132KV	Dahiwadi 132KV	132	22.1	WIND
19	Dasgaon 220kV	Dasgaon 220kV	220	97.6	WIND
20	Dhanora 33kV	Dhanora 33kV	33	5	SOLAR
21	Dhebewadi 33kV	Dhebewadi 33kV	33	5.75	WIND
22	Dhorala 33kV	Dhorala 33kV	33	9	SOLAR
23	Fermi Solar 132kV	Fermi Solar 132kV	132	80	SOLAR
24	Five Star MIDC 220kV	Five Star MIDC 220kV	220	5.5	SOLAR
25	Gangakhed 132kV	Gangakhed 132kV	132	60	SOLAR
26	Gangapur 220kV	Gangapur 220kV	220	236.25	WIND
27	Gangapur 220kV	Ranala 33kV	220	11.25	WIND
28	Ghatnandre 220kV	Ghatnandre 220kV	220	226.15	WIND
29	Hiwarwadi 220kV	Hiwarwadi 220kV	220	187.5	WIND
30	Jaitane 33kV	Jaitane 33kV	33	6.25	WIND
31	Jalkot 220kV	Jalkot 220kV	220	12.8	SOLAR
32	Jamde Solar 220kV	Jamde Solar 220kV	220	70	SOLAR
33	Jamde Wind 220kV	Jamde Wind 220kV	220	328.35	WIND
34	Jamkhed 33kV	Jamkhed W33kV	33	10.2	WIND
35	Jamsande 33kV	Jamsande 33kV	33	10	WIND
36	Jath 110kV	Jath 110kV	110	71.35	WIND
37	Jath 220kV	Jath 220kV	220	19.55	WIND
38	JBM Solar 132kV	JBM Solar 132kV	132	100	SOLAR
39	Jeur-Khandke 220kV	Jeur-Khandke 220kV	220	49.6	WIND
40	Kadegaon 220kV	Kadegaon 220kV	220	14.8	WIND
41	Kale 110kV	Kale 110kV	110	13	WIND
42	Kaledhone 132kV	Kaledhone 132kV	132	36.8	WIND
43	Kaledhone 132kV	Lengere 33kV	132	7.5	WIND
44	Karajgi 132kV	Karajgi 132kV	132	47.235	SOLAR
45	Karjat 132kV	Karjat 132kV	132	5	SOLAR
46	Katol 132kV	Katol 132kV	132	56.4	SOLAR
47	Kavthemahankal 132 kV	Kavthemahankal 132 kV	132	8.4	WIND
48	Kedgaon 132kV	Kedgaon 132kV	132	22	WIND
49	Khanapur 220kV	Khanapur 220kV	220	96	WIND

Sr. No.	Upstream Unit Display Name	Downstream Unit Name	Voltage Level [kV]	Installed Capacity [MW]	Generation Type
50	Khandke 132kV	Khandke 132kV	132	108	WIND
51	Khaprale 132kV	Khaprale 132kV	132	87.9	WIND
52	Khaprale 132kV	Pandurli 33kV	132	9	WIND
53	Kharda 132kV	Kharda 132kV	132	10	SOLAR
54	Kombhalne Solar 132kV	Kombhalne Solar 132kV	132	35	SOLAR
55	Kombhalne Wind 132kV	Kombhalne Wind 132kV	132	47.6	WIND
56	Koral 132kV	Koral 132kV	132	26	WIND
57	Koregaon 33kV	Koregaon 33kV	33	14.4	WIND
58	Kuslamb 33kV	Kuslamb 33kV	33	10.2	WIND
59	Lohara 132kV	Lohara 132kV	132	100	WIND
60	Mahtargaon 132kV	Mahtargaon 132kV	132	80	SOLAR
61	Malharpeth 220kV	Malharpeth 220kV	220	100.55	WIND
62	Mandrup 132kV	Mandrup 132kV	132	47.75	SOLAR
63	Mansar 132kV	Mansar 132kV	132	5	SOLAR
64	Mayni 110kV	Mayni 110kV	110	99	WIND
65	Mayni 110kV	Vikhale 33kV	110	7.8	WIND
66	Medha 33kV	Medha 33kV	33	7.2	WIND
67	Mendhegiri 220kV	Mendhegiri 220kV	220	132.3	WIND
68	Mograle 132kV	Mograle 132kV	132	54	SOLAR
69	Mohol 132kV	Mohol 132kV	132	10	SOLAR
70	Muktainagar 132kV	Muktainagar 132kV	132	50	SOLAR
71	Mulawa 33kV	Mulawa 33kV	33	9	WIND
72	Murtizapur 132kV	Murtizapur 132kV	132	15.4	SOLAR
73	Naldurg 132kV	Naldurg Inter 132kV	132	20	SOLAR
74	Naldurg 132kV	Naldurg Intra 132kV	132	38.25	SOLAR
75	Nandurbar 132kV	Nandurbar 132kV	132	50	WIND
76	Nerle 220kV	Nerle 220kV	220	72	WIND
77	New MIDC Jalgaon 132kV	New MIDC Jalgaon 132kV	132	8.5	SOLAR
78	Nigade 220kV	Nigade 220kV	220	96.8	WIND
79	Osmanabad 220kV	Osmanabad 220kV	220	76	WIND
80	Ozar 132kV	Ozar 132kV	132	15	SOLAR
81	Pachpatta 100kV	Pachpatta 100kV	100	62.4	WIND
82	Palaswadi 110kV	Palaswadi 110kV	110	55	SOLAR
83	Panchincholi 33kV	Panchincholi 33kV	33	10	SOLAR
84	Panumbre 33kV	Panumbre 33kV	33	12.26	WIND
85	Pathri 132kV	Pathri 132kV	132	20	SOLAR
86	Patoda 33kV	Patoda 33kV	33	7.75	WIND
87	Pishor 132kV	Pishor 132kV	132	21	WIND
88	Pokhari 33kV	Pokhari 33kV	33	9	WIND
89	Raimoha 132kV	Raimoha 132kV	132	20	SOLAR
90	Rajpimpri Solar 132kV	Rajpimpri Solar 132kV	132	10	SOLAR
91	Rajpimpri Wind 132kV	Rajpimpri Wind 132kV	132	80	WIND
92	Rohatwadi 33kV	Rohatwadi 33kV	33	10	SOLAR
93	Sadawaghapur 220kV	Sadawaghapur 220kV	220	117.9	WIND
94	Sakri 132kV	Sakri 132kV	132	86.55	WIND
95	Sangola 132kV	Sangola 132kV	132	10	SOLAR
96	Sanmadi 33kV	Sanmadi 33kV	33	10	WIND
97	Satara MIDC 220kV	Satara MIDC 220kV	220	62.08	WIND
98	Satara Road 132kV	Satara Road 132kV	132	28	WIND

Sr. No.	Upstream Unit Display Name	Downstream Unit Name	Voltage Level [kV]	Installed Capacity [MW]	Generation Type
99	Savargaon 33kV	Savargaon 33kV	33	10	SOLAR
100	Savlaj 110kV	Kundlapur 33kV	110	8.7	WIND
101	Savlaj 110kV	Savlaj 110kV	110	8.75	WIND
102	Savlaj 110kV	Savlaj 33kV	110	15	WIND
103	Sawargaon Gorhe 33kV	Sawargaon Gorhe 33kV	33	10.5	WIND
104	Shedyal 220kV	Shedyal 220kV	220	217.7	WIND
105	Shedyal 220kV	Darikonur 33kV	220	10	WIND
106	Shembal Pimpri 33kV	Shembal Pimpri 33kV	33	10.5	WIND
107	Shirala 132kV	Shirala 132kV	132	81.6	WIND
108	Shirala 132kV	Shirshi 33 kV	132	8.4	WIND
109	Shirsuphal 220kV	Shirsuphal 220kV	220	50.33	SOLAR
110	Shivajinagar 220kV	Shivajinagar 220kV	220	230	SOLAR
111	Supa 132kV	Supa 132kV	132	35	WIND
112	Supa 132kV	Bhoyare Pathar 33kV	132	7.5	WIND
113	Telgaon 132kV	Telgaon 132kV	132	50	SOLAR
114	Tuljapur 220kV	Tuljapur 220kV	220	40.3	SOLAR
115	Vankusvade 220kV	Vankusvade 220kV	220	203.24	WIND
116	Varkute-Malwadi 220kV	Varkute-Malwadi 220kV	220	100	SOLAR
117	Vaspeth 132kV	Vaspeth 132kV	132	198.7	WIND
118	Vita 220kV	Vita 220kV	220	60.9	WIND
119	Wadala 33kV	Wadala 33kV	33	15	SOLAR
120	Wagdari 132kV	Wagdari 132kV	132	149	SOLAR
121	Wai 132kV	Wai 132kV	132	25	WIND
122	Walsang 132kV	Walsang 132kV	132	141.5	WIND
123	Walve 220kV	Walve 220kV	220	168.1	WIND
124	Walwhan 132kV	Walwhan 132kV	132	20	SOLAR
125	Warora 220kV	Warora 220kV	220	5	SOLAR
126	Wayphale 220kV	Wayphale 220kV	220	30	WIND

Hybrid PSS	4	
Merged PSS	10	
Total	14	(A)

RE-DSM	REMC scheduling	(A)
112	126	14

महाराष्ट्र विद्युत नियामक आयोग
Maharashtra Electricity Regulatory Commission

MERC/Open Access/ MSLDC/1300/2018 Date: 7th December, 2018

To,
Chief Engineer,
Maharashtra State Load Dispatch Centre (MSLDC)
Thane-Belapur Road,
P.O. Airoli, Navi Mumbai-400708

Subject: Procedure as per MERC (Forecasting, Scheduling and Deviation Settlement for solar and wind generation) Regulations, 2018

Reference No.: CE/MSLDC/TECH/SO/02472 Dated 15 November, 2018

Sir,

This has reference to the procedure for implementation of Forecasting, Scheduling and Deviation Settlement for solar and wind generation, submitted by MSLDC vide letter dated 15 November, 2018.

I am directed to inform you that the Commission has approved the said procedure and the same is enclosed herewith. Further, it is also informed that the procedure needs to be uploaded on your website at the earliest.

(Prafulla Varhade)
Director (EE), MERC

Enclosed: Approved procedure for implementation of Forecasting, Scheduling and Deviation Settlement for solar and wind generation

MAHATRANSCO
Maharashtra State Electricity Transmission Co. Ltd.

Procedure for Forecasting, Scheduling and Deviation Settlement of Solar and Wind Generation

In accordance with
The Maharashtra Electricity Regulatory Commission
(Forecasting, Scheduling and Deviation Settlement of Solar and Wind Generation) Regulations, 2018

Prepared by

Maharashtra State Load Despatch Centre

&

Approved by Maharashtra Electricity Regulatory Commission

7th December, 2018

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PROCEDURE FOR FORECASTING, SCHEDULING AND DEVIATION SETTLEMENT OF SOLAR AND WIND GENERATION

1. OUTLINE:

1.1. This Procedure is in accordance with the various provisions of MERC (Forecasting, Scheduling and Deviation Settlement of Solar and Wind Generation) Regulations, 2018, hereinafter referred as "the Regulations". All applicants shall abide by the provisions of the Regulations.

1.2. APPLICABILITY OF THE PROCEDURE:

All Wind and Solar Energy Generators in Maharashtra connected to the Intra-State Transmission System, on or after the date notified by the Commission of coming into force of the Regulations, including those connected through Pooling Sub-Stations, and using the power generated for self-consumption or sale within or outside the State.

Provided that the combined installed capacity of the Solar or Wind Generators connected to a particular Pooling Sub-Station, or that of an individual Generator connected to some other Sub-Station, shall not be less than 5 MW.

Provided further that till further direction in this matter this Procedure shall not be applicable for Solar power generation projects developed under 'Mukhyamantri Sour Krishivahini Yojana' as these projects are load serving embedded generation connected to distribution network of distribution licensee.

2. QUALIFIYING CRITERIA FOR THE QCA:

2.1. As per Regulation 6.1 of MERC F&S Regulations, 2018, Generators at Pooling Substation shall appoint one amongst themselves or any other entity as QCA. The QCA shall be a company incorporated in India under the Companies Act 1956/2013.

2.2. In case of appointment of entity other than Generator(s) at Pooling Substation, the Generators shall consider following guiding principles for appointment of QCA. Adherence to these guiding principles for appointment of QCA would be in the interest of Generators and would facilitate smooth implementation of F&S framework in the state.

2.2.1. The QCA shall have the capabilities of Modeling wind energy generation potential on seasonal time scales with impact surfaces, a tool to visualize the wind energy generation potential in "Climate Space".

2.2.2. The QCA shall have the experience in the field of Wind/Solar Power forecasting and scheduling in different terrain and regions for minimum period of one (1) year including pilot project work with appropriate accuracy levels in forecasting.

2.2.3. The financial strength of the QCA must be such that it should be in a position to handle the risk of penalties due to deviation charges applicable to generator. Considering this, the Average Net Worth of the QCA for forecasting & scheduling services shall be in positive amounting to at least Rs.1.50 Crores (Net worth = Share Capital + Reserve – Revaluation Reserve – Intangible Asset – Misc. Expenditure to the extent not written off – Carried Forward Losses – Liabilities) in the current financial year which should reflect from its audited balance sheet or CA's certificate.

2.2.4. QCA should have established team of:

a. Renewable resource analyst,
b. Modeling statisticians,
c. Energy model,
d. Software developers
e. 24 x 7 operation and monitoring team,

The corresponding supporting certificates/documents justifying qualification should be submitted along with the application for registration.

2.3. It is envisaged that Generators acting as QCA themselves, shall also strive to build requisite skillsets, capacity and technical competence adhering to qualification requirements over the period of two years.

2.4. The QCA shall possess/provide authorization as per **Annexure - I** from at least 51 % of the Generators connected in the Pooling Sub-Station in terms of their combined installed capacity for appointment as QCA. (Not applicable if Generator is connected through dedicated inter-connection facility with the Grid) at the time of Registration.

3. ROLES AND RESPONSIBILITIES OF THE QCA:

3.1. In accordance with these Procedures and Regulations, the QCA shall be the State Entity.

3.2. The QCA shall be the single point of contact between the MSLDC and the Generators to whom it is representing in the Pooling Sub-Station.

3.3. The QCA shall establish a Control Center round the clock and shall have complete control over Wind/Solar injection feeders connected to Pooling Sub-Stations. The Control Centre shall have facilities of voice communication with MSLDC and Wind/Solar Generators with voice recording facilities, Fax machine and internet connection available for all the 24 hours. The QCA shall comply the instructions of the System Operator in normal condition as well as during emergencies, appropriate decisions taken by the System Operators in view of Grid security and safety.

3.4. The QCA shall have established alternate voice and data communication with MSLDC.

3.5. The QCA shall establish protocol for communication with individual generators to implement the instructions of System Operators and MSLDC.

3.6. Declaration of Available Capacity of the Generating Station to MSLDC to which it is representing.

3.7. Provide aggregated Day ahead & Week ahead forecast (based on their own forecast or on the forecast done by MSLDC) and Schedule as per **Annexure - II** through a web-based application maintained by MSLDC.

Provided that if the QCA is representing on behalf of the multiple Pooling Sub-Stations, the Scheduling, Energy accounting and Deviation monitoring for each Pooling Sub-Station of wind and/or solar power generation shall be undertaken separately.

Provided further that, Generators/QCA and Buyers shall maintain Buyer-wise schedule information and protocol for sharing the same.

3.8. OCA in coordination with Generator shall provide real time data for power generation parameters (at Pooling Sub-Station level) and real time generation data (turbine and inverter level) and weather data wherever available as per **Annexure – III**.

3.9. In case of non-availability of Real Time Data (at Turbine Level /inverter Level), QCA in coordination with Generator shall maintain

and provide time block wise generation data at (turbine and inverter level) and weather data on Weekly basis:

- For wind plants, at the turbine level:
  Average wind speed, Average power generation at 15-min time block level
- For solar plants, for all inverters* >= 1 MW:
  Average Solar Irradiation, Average power generation at 15-min time block level.

* *if a solar plant uses only smaller string inverters, then data may be provided at the plant level.*

3.10. Bc Responsible for metering and data collection, transmission and co-ordination with RLDC, MSLDC, STU, CTU, MSEDCL and other agencies as per IEGC and CERC/MERC Regulations.

3.11. Undertake commercial scttlement of all deviation-settlement charges as per applicable MERC and CERC DSM Regulations.

3.12. Maintain records and accounts of the time block-wise Schedules, the actual generation injected and the deviations, for the Pooling Sub-Station and the individual Generators separatcly.

3.13. Prepare deviation accounts on weekly basis as per regulation 15 of the Forecasting, Scheduling and Deviation Settlement of Solar and Wind Generation Regulations, 2018.

3.14. QCA shall execute an agreement with MSLDC wherein it is mentioned that QCA shall undertake all operational and commercial responsibilities on behalf of the Constituents as per the prevalent MERC Regulations.

3.15. Use Automatic meter reading (AMR) technologies for transfer, analysis and processing of interface meter data to MSLDC in line with Metering /AMR protocol and Metering/AMR standards to be finalised by STU in accordance with provisions of Metering Code and CEA Metering Regulations, as amended from time to time. STU/MSLDC/Transmission Licensee/Distribution Licensee, as the case may be, shall co-ordinate, facilitate and provide necessary support to Generators/QCA for installation of Meters and AMR facilities as per the Orders/directions of the Commission from time to time.

3.16. Perform commercial settlement beyond the connection point (De-pooling arrangement among each generator in the Pooling Sub-

Station) and technical coordination amongst the generators within the Pooling Sub-Station and up to the connection point as the case may be.

3.17. Shall furnish the PPA rates on notarized affidavit as per **Format – 2**, for the purpose of Deviation charge account preparation to MSLDC supported by copy of the PPA.

3.18. The QCA, within seven (07) days, shall inform the details to MSLDC in case there is any change in:

- The Generating Station (in case of individually connected generator),
- Pooling Sub-Station
- Individual generators in the Pooling Sub-Station
- Reduction in authorization from generators in a Pooling Sub-Station below 51 % of the total installed Capacity of the Pooling Sub-Station.

3.19. Keep MSLDC indemnified at all times and shall undertake to indemnify, defend and save the MSLDC harmless from any and all damages, losses including commercial losses due to forecasting error, claims and actions including those relating to injury to or death of any person or damage to property, demands, suits, recoveries, costs and expenses, court costs, attorney fees, and all other obligations by or to third parties, arising out of or resulting from the transactions undertaken by the Generators. The QCA shall submit the indemnity bond (**Format – 3**) on Non-Judicial Stamp Paper of value notified from time to time by the State Government at the time of registration.

4. ROLES AND RESPONSIBILITIES OF GENERATORS:

4.1. The Generators in the Pooling Sub-Station shall appoint QCA and give authorization for a period of at least 2 years as per **Annexure – I**, for registration of QCA at MSLDC.

4.2. The Generator shall not appoint and authorize multiple QCAs for a particular Pooling Sub-Station. In such case, the authorization provided by the Generator shall be treated as invalid & MSLDC shall process the application of the QCA as per the provisions of this procedure and the decision of MSLDC on registration of QCA shall be binding on such generator.

4.3. In case of non-consensus among the generators connected through a common feeder for appointment of QCA, then such generators shall take separate connectivity from STU/DISCOM and furnish the schedules by appointing separate QCA in accordance with these regulations and procedure.

4.4. Once the QCA is registered, the generator/s shall not re-appoint another QCA, at least within two (2) years from the date of successful registration of the QCA at MSLDC.

Provided that in case of defaults by the QCA, the generator/s can re-appoint another QCA by giving prior notice of three (3) month to MSLDC and the process of registration of new QCA shall be carried in accordance with these regulations and procedures.

4.5. All the generators shall save and store the block-wise generator injection data or any other data desired by MSLDC and make available the same to their respective QCA so that it could be sent to MSLDC within (7) days from the date of demand from MSLDC.

5. ROLES AND RESPONSIBILITIES OF MSLDC:

5.1. MSLDC shall develop a web-based Software for use by QCA with login and password facility for:

- Online registration/de-registration of QCA
- Uploading of Day ahead and Week ahead Generation Forecasts
- Uploading of the revisions in Schedules in accordance with these Procedures and Regulations.
- Communication of Grid Constraints and curtailments if any.
- Mechanism for monitoring deviations in Scheduled & Actual generation along with commercial impact for MSLDC and QCAs' along with acquisition of Meter Reading of all the Nodes in the State for calculation of Deviations and Charges thereof.

5.2. The MSLDC shall be responsible for scheduling, communication, coordination with QCAs'. Forecasting of the renewable energy generation shall be done by the MSLDC and the forecast will be available on the website. The generation forecast shall be done on the basis of the weather data provided by IMD or on the basis of other methods used by the Forecasting Agency whose service may be availed. However, the forecast by the MSLDC shall be with the objective of ensuring secure grid operation.

5.3. The MSLDC shall maintain records and accounts of the time block-wise Schedules, the actual generation injected and the deviations, for the Pooling Sub-Station and the individual Generators separately.

5.4. Maintain State Deviation Settlement Account for Wind and Solar Generations.

6. REGISTRATION AND DE-REGISTRATION PROCEDURE:

A. Registration as a Qualified Co-ordinating Agency (QCA):

6.1. The application for Registration as a Qualified Co-ordinating Agency (QCA) should be submitted online through MSLDC's web-based Software.

6.2. The QCA shall submit separate application for each Pooling Sub-Station. For each Pooling Sub-Station only one application shall be accepted from the QCA.

6.3. The application for Registration shall be made as per the application format for registration (**Annexure - IV**) and shall contain details such as,

- Location of the generation (Village, Taluka, District)
- Total Capacity of the Generation and inter-connection arrangement with InSTS.
- Authorization from at least 51 % of the Generators connected in the Pooling Sub-Station in terms of their combined installed capacity for appointment as QCA. (Not applicable if Generator is connected through dedicated inter-connection facility with the Grid)
- Names along with individual installed capacity of generation of the constituents to whom QCA is representing
- Metering arrangements
- Communication arrangements with MSLDC for Real time Generation, Meter reading for accounting etc.

6.4. The Application for Registration shall be accompanied by a non-refundable processing fee of Rs. 20,000/- (Twenty Thousand Rupees Only) payable through NEFT.

6.5. The scanned copies of the required documents shall be uploaded while submitting application.

6.6. Once the application is submitted, the print of online application with sign and seal along with required documents in original, shall be submitted to MSLDC. Without receipt of the hard copy for verification purpose, MSLDC shall not process the online application for registration.

6.7. The details of Nodal Officers from MSLDC for processing applications for Registration and day to day activities towards forecasting, Scheduling and Revisions thereof shall be displayed on MSLDC's website for smooth implementation of these procedures.

6.8. An incomplete Application, and/or an Application not found to be in conformity with these Procedures and Regulations, shall be rejected.

6.9. The time period for registration of QCA shall be (15) working days from the date of receipt of all the documents & information in complete to MSLDC.

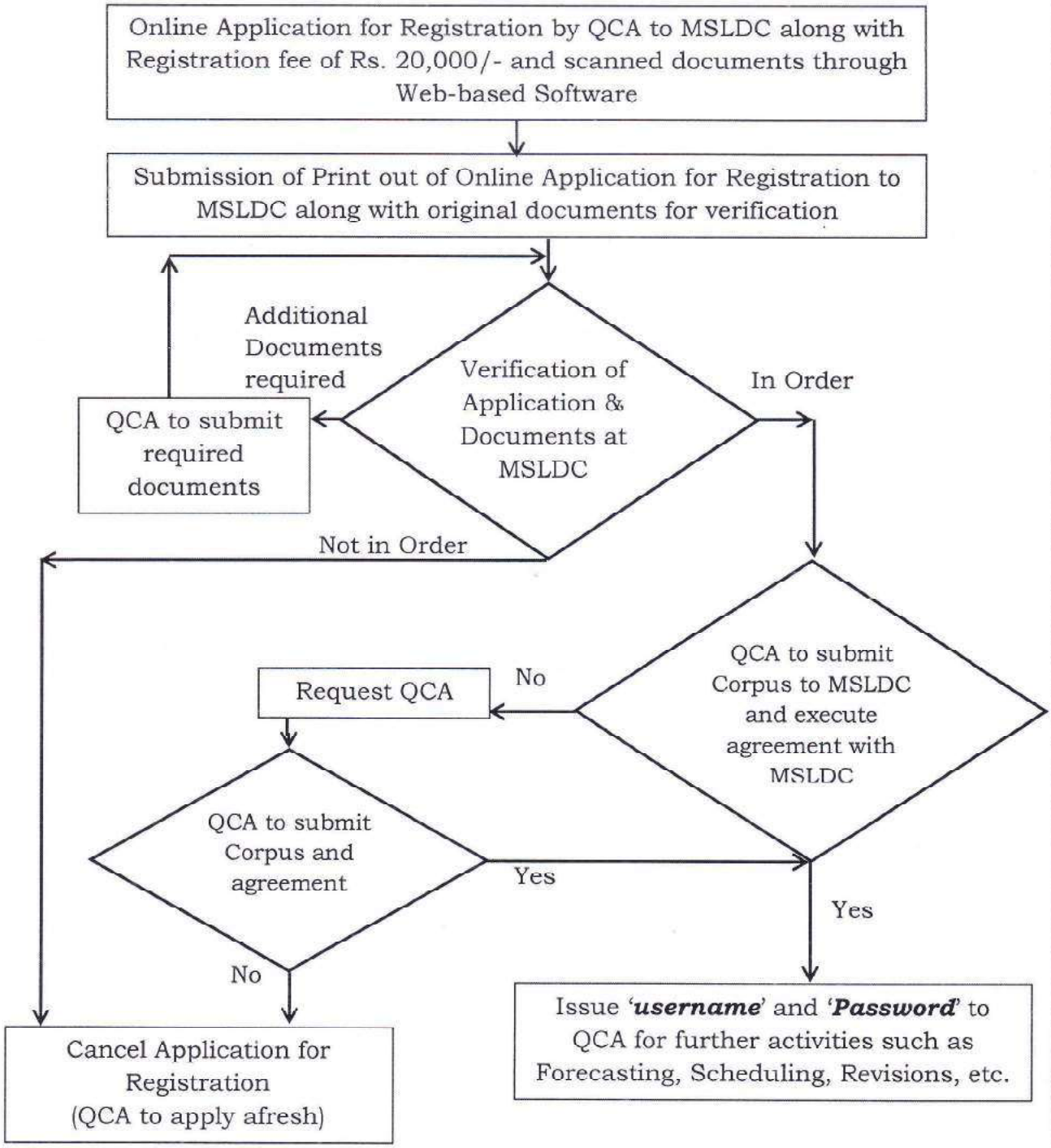
6.10. After verification of all the documents, the QCA shall execute an agreement with MSLDC wherein it is mentioned that QCA shall undertake all operational and commercial responsibilities on behalf of the Constituents as per the prevalent MERC Regulations.

6.11. Within two (2) weeks from the date of Registration , the QCA shall deposit a corpus, to MSLDC towards payment security. The details of the same shall be in accordance with the Clause No. 13.7, of the said procedure.

6.12. Once the QCA executes agreement with MSLDC and deposits Corpus, MSLDC shall register the QCA and issue a '***username***' and '***password***' for accessing the website for further activities such as uploading of day ahead / week ahead forecasts, revisions to existing schedules etc.

6.13. The above procedure is depicted below in the form of Flow chart for easy understanding.

Flow Chart for Registration of QCA



B. De-Registration as a Qualified Co-ordinating Agency (QCA):

Case - 1: Own De-registration:

6.14. The QCA may request MSLDC for de-registration as QCA, however, in such case, it shall be the responsibility of the QCA to settle all the commercial obligations of both MSLDC and Generators to whom it is representing.

6.15. Three (3) months prior notice to be served to all the generators to whom it is representing for de-registration with copy to MSLDC.

6.16. The generator/s shall be responsible for appointing new QCA and ensure registration of new QCA at MSLDC within this notice period, post which generation shall not be scheduled.

Case – 2: De-registration due to non-authorization of Generator:

6.17. Three (3) months prior notice to be served by the generator to the QCA for non-authorization with copy to MSLDC, subject to Clause No. 4.4.

6.18. The generator/s shall be responsible for appointing new QCA and ensure registration of new QCA at MSLDC within this notice period, post which generation shall not be scheduled.

6.19. Before de-registration, the generator shall ensure that all the commercial settlements pertaining to it has been completed by the QCA with MSLDC.

Case – 3: De-registration under default condition:

6.20. The MSLDC shall initiate the process of de-registration, if the condition as per Clause No. 3.18 is violated by the QCA.

6.21. The MSLDC shall initiate the process of de-registration, in case of default conditions mentioned at Clause No. 14.1.

6.22. In such case, the process of de-registration shall be initiated as per Clause No. 14.2.

6.23. The generator/s shall be responsible for appointing new QCA and ensure registration of new QCA at MSLDC within this notice period, post which generation shall not be scheduled.

7. MSLDC FEES & CHARGES AND OTHER CHARGES:

7.1. MSLDC fee and charges including scheduling fee and re-scheduling fee shall be payable by QCA as specified in the MSLDC ARR approved by the Commission time to time. Scheduling and re-scheduling charges shall be applicable per Pooling Sub-Station. The

other charges shall be levied as per the applicable MERC Regulations/Orders.

8. COMMUNICATION MODE AND PROTOCOL:

8.1. SCADA from the turbine level to Pooling Sub-Station in real time shall be provided up to the Pooling Sub-Station by QCA/Generators. The data from the Pooling Sub-Station to MSLDC shall be transmitted with IEC: 104 protocol along with communication without any interruption by QCA.

The requirements for data visibility and interfacing requirements at MSLDC Kalwa/ ALDC Ambazari are as detailed below.

- The Remote Terminal Unit under the proposed scheme shall be capable of communication with LD Centres in IEC-104 Protocol.
- Communication media such as BSNL/MTNL leased circuit, MPLS, TATA Communication, Reliancc Communication, VSAT etc. with latency less than 800ms may be used for data transmission. The typical bandwidth requirement for real-time Point to point data inter-connection bandwidth of 64 kbps communication between Pooling Sub-Station/ Generator (in case of individual generator) and MSLDC and depends upon data volume.
- Wind/Solar Generators shall submit request letter along with Single Line Diagram of their plant area to MSLDC for data points. MSLDC will issue list of data points to be transmitted from Wind/Solar Generators station in real time mode.
- Wind/Solar Generators shall submit complete proposal along with schematic diagram for RTU installation and data communication with LD Centres with the above confirmations/clarifications for approval by this office.
- Integration of Wind/Solar Generators station data into the SCADA systems at MSLDC Kalwa & ALDC Ambazari on IEC 104 protocol.
- Completion of all above is under the scope and responsibility of Wind/Solar Generators Station.
- SCADA system provided at nearest substation of MSETCL is only for the purpose of monitoring/control of Wind/Solar Generators data/ operations at local level and do not cover the scope of visibility of real-time data at MSLDC Kalwa/ ALDC Ambazari.

- Integration of Real time data from RTU of any make in IEC-104 Protocol is to be done in MSLDC SCADA system. The work of integration will be carried out by M/s Siemens. In order to carry out integration work, MSLDC has approved the rates of integration to be paid by third party vendor to M/s Siemens. The rate for integration of one RTU in MSLDC-SCADA system is Rs. 3.00 Lakhs/per RTU (Rs. Three Lakhs Only) plus GST at the rate 18 percent.

8.2. QCA shall be responsible for providing A redundant and reliable communication link between Pooling Sub-Station and MSLDC shall be made and maintained by the QCA.

9. FORECASTING AND SCHEDULING:

9.1. Forecasting of Wind/Solar injection on Pooling Sub-Station basis shall be done by the MSLDC for overall planning of resource requirements on day ahead basis in view of secure grid operation. The MSLDC may engage a forecasting agency to undertake forecasting for Wind & Solar Generators / Solar Parks / Wind Parks connected to InSTS.

9.2. The QCA shall provide Pooling Sub-Station wise forecasting for the Wind/Solar generators connected to Pooling Sub-Station to MSLDC based on their own forecast or may adopt forecast carried out by MSLDC.

9.3. In the event of QCA adopting forecast provided by MSLDC, charges amounting to Rs. 3,000/- per Pooling Sub-Station per day, shall be paid by the QCA to MSLDC. The consequences of any error in such forecast provided by MSLDC which results in a deviation from scheduling shall be borne by the concerned Generators through their QCA and QCA shall indemnify MSLDC on account of the commercial impact.

9.4. The MSLDC shall consolidate and forecast, based on various parameters and weather data obtained from IMD or from any other forecast service provider (which could be different from that provided by QCA)

9.5. The submission of Pooling Sub-Station wise day ahead forecast shall be in accordance with the time lines specified in Scheduling & Despatch Code.

9.6. The Pooling Sub-Station wise day ahead forecast submitted by QCA shall be on 15 min time block basis in MW up three Decimal places.

The forth Decimal place shall be rounded off to 3rd Decimal place as per standard practice. Deviation Volume and Value shall be calculated accordingly.

9.7. The QCA may revise Pooling Sub-Station schedule for the InSTS (excluding collective and inter-state bi-lateral transactions) by giving advance notice to the MSLDC;

Provided that, such revisions shall be effective from the forth (4th) time block following the time block in which notice was given.

Provided further that, there may be one (01) revision for each time slot of one and half hours starting from 00.00 hours of a particular day, subject to a maximum of sixteen (16) revisions during the day.

9.8. Process for submission of a day ahead Forecast for Intra-State Transactions is as follows:

QCA to upload separate Pooling Sub-Station wise and 15 min time block wise day ahead Forecast & Available Capacity (AvC)	By 10:00 Hrs.
↓	
MSLDC to prepare and upload separate Pooling Sub-Station wise and 15 min time block wise day ahead Schedule	By 12:30 Hrs.
↓	
QCA to upload revised Forecast & Available Capacity (AvC)	By 14:00 Hrs.
↓	
MSLDC to prepare and publish separate Pooling Sub-Station wise Target Schedule	By 19:00 Hrs.
↓	
QCA to upload revised Schedules & Available Capacity (AvC), if any	By 21:30 Hrs.
↓	
MSLDC to prepare and publish separate Pooling Sub-Station wise Final Schedule	By 23:00 Hrs.

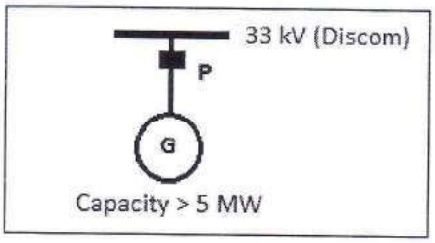
Note: No revision in Forecast shall be accepted after 21:30 Hrs.

9.9. The various cases indicating point of Forecast and Scheduling are as follows:

Inter-connection at Distribution Level:

Case – 1:

Single Generator or group of generators having capacity above 5 MW connected at 33 kV level of Discom's Pooling Sub-Station, selling power within the State:



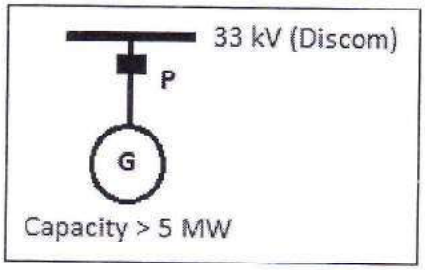
In this case, the Forecasting shall be provided by the QCA at Point 'P'. Scheduling and Accounting shall be done by MSLDC at Point 'P'.

The Distribution losses as approved by Hon'ble MERC shall be applicable.

The QCA shall de-pool the deviation charges among respective generators separately based on the mechanism developed within themselves.

Case – 2:

Single Generator or group of generators having capacity above 5 MW connected at 33 kV level of Discom Pooling Sub-Station, selling power outside the State:



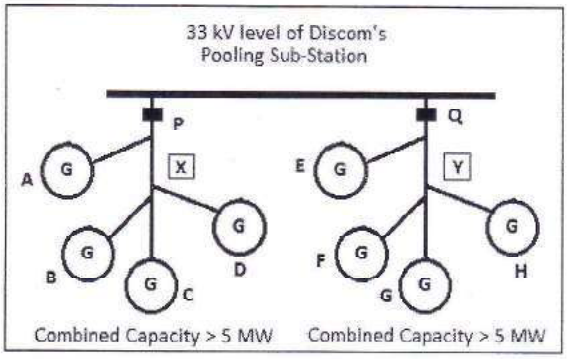
In this case, the Forecasting shall be provided by the QCA at Point 'P'. Scheduling and Accounting shall be done by MSLDC at Point 'P'.

The Distribution losses and Transmission losses up to State Periphery as approved by Hon'ble MERC shall be applicable.

The QCA shall de-pool the deviation charges among respective generators separately based on the mechanism developed within themselves.

Case – 3:

Multiple Generators connected at 33 kV level of Discom's 33 kV Pooling Sub-Station through dedicated feeder and selling power within and Outside the State:



In such case, generators 'A' to 'D' are connected through a common & dedicated feeder 'X' having inter-connection point at 'P', selling power within the State.

Generators 'E' to 'H' are connected through a common & dedicated feeder 'Y' having inter-connection point at 'Q', selling power outside the State.

In such case, the QCA shall submit separate feeder-wise forecast at Point 'P' and 'Q' i.e. for Intra-State and Inter-State. MSLDC shall Schedule at Point 'P' being Intra-State and at State Periphery for Point 'Q' by applying Transmission losses as approved by Hon'ble MERC.

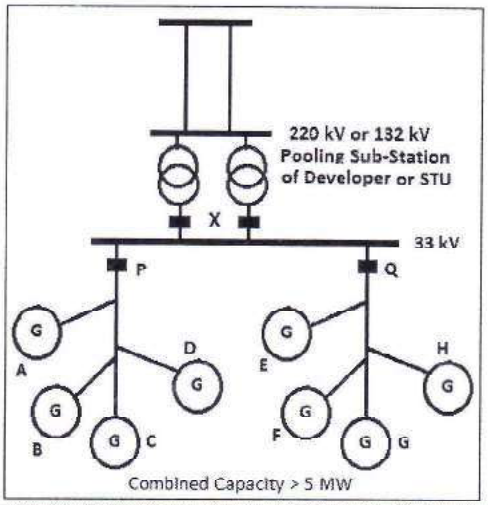
Further, in both the cases, Distribution losses as approved by Hon'ble MERC shall be applicable.

The QCA shall de-pool the deviation charges among respective generators separately based on the mechanism developed within themselves.

Inter-connection at Transmission Level:

Case – 4:

Single Generator or group of generators having capacity above 5 MW connected at 33 kV level of EHV Pooling Sub-Station, selling power within the State:



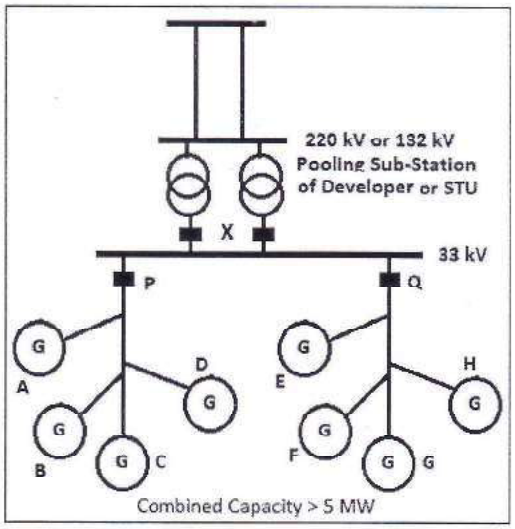
In this case, a group of generators ('A' to 'H') are connected at 33 kV level of the EHV Pooling Sub-Station through common 33 kV feeders.

In such case, the Forecast shall be done by the QCA at Point 'X'. Scheduling and Accounting shall bc done by MSLDC at Point 'X'.

The QCA shall de-pool the deviation charges among respective generators separately based on the mechanism developed within themselves.

Case – 5:

Single Generator or group of generators having capacity above 5 MW connected at 33 kV level of EHV Pooling Sub-Station, selling power Outside the State:



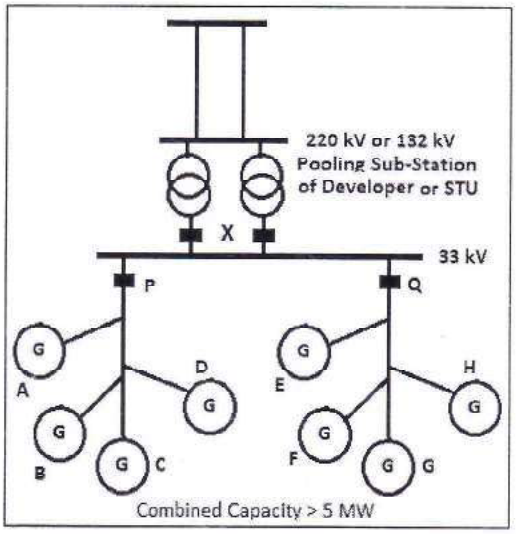
In this case, a group of generators ('A' to 'H') are connected at 33 kV level of the EHV Pooling Sub-Station through common 33 kV feeders.

In such case, the Forecast shall be done by the QCA at Point 'X'. Scheduling and Accounting shall be done by MSLDC at State Periphery by applying Transmission Losses as approved by Hon'ble Commission as per Point 'X'.

The QCA shall de-pool the deviation charges among respective generators separately based on the mechanism developed within themselves.

Case – 6:

Multiple Generators connected at 33 kV level of EHV Pooling Sub-Station through dedicated feeder and selling power within and Outside the State:



In this case, multiple generators ('A' to 'D') are connected at 33 kV level of the EHV Pooling Sub-Station through common 33 kV feeders selling power within the State.

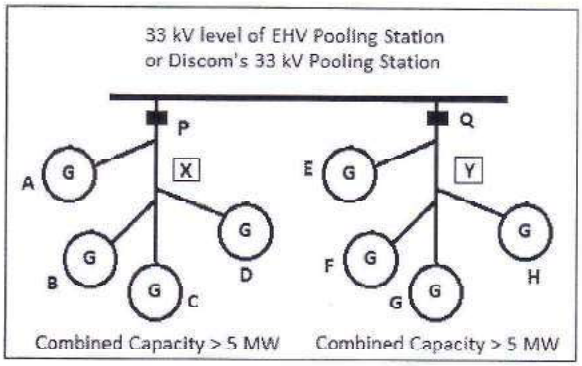
The Generators 'E' to 'H' are connected at 33 kV level of the EHV Pooling Sub-Station through common 33 kV feeders selling power outside the State.

In such case, the QCA shall submit separate feeder-wise forecast at Point 'P' and 'Q' i.e. for Intra-State and Inter-State respectively. MSLDC shall Schedule at Point 'P' being Intra-State and at State Periphery for Point 'Q' by applying Transmission losses as approved by Hon'ble MERC.

The QCA shall de-pool the deviation charges among respective generators separately based on the mechanism developed within themselves.

Case – 7:

Multiple Generators connected at 33 kV level of EHV Pooling Sub-Station or 33 kV Pooling Sub-Station of Discom, through dedicated feeder:



In this case, Generators 'A' to 'D' and 'E' to 'H' are connected to a Pooling Sub-Station of STU or Discom through separate & dedicated feeders having separate inter-connection points at 'P' and 'Q' respectively.

In such case, there shall be only one QCA. The QCA shall submit consolidated Forecast for all the Generators for a Pooling Sub-Station and maintain separate forecast at Point 'P' & 'Q'.

MSLDC shall carry out scheduling and accounting for Pooling Sub-Station as a whole and the QCA shall de-pool the deviation charges among respective generators separately based on the mechanism developed within themselves.

However, in case of Intra and Inter-State transactions, separate feeder-wise forecast (for Intra & Inter-State) shall be submitted by the QCA. In such case, MSLDC shall separately schedule the power accordingly. For Inter-State schedules, Transmission Charges, as approved by Hon'ble MERC shall be applicable.

If the Pooling Sub-Station is of Discom, then Distribution losses as approved by Hon'ble MERC shall be applicable.

10. ENERGY ACCOUNTING:

10.1. The energy accounting shall be undertaken on the basis of the data recorded by the Special Energy Meters (SEM) provided at HV feeders at STU Pooling Sub-Stations capable of recording the energy in 15-minute time blocks. The SEM shall be under the control of STU for EHV Pooling Sub-Stations.

10.2. **By 00.00 hours on every Tuesday,** the QCA shall furnish weekly meter readings of Wind/Solar generators connected to Pooling Sub-Station of the previous week starting from Monday 00:00 hrs to Sunday 24:00 Hrs, to the MSLDC, in addition to the data provided to the Supervisory Data and Control Acquisition (SCADA) Centre, through the software developed for communication & data exchange with QCAs' for the purpose of energy accounting under these Regulations.

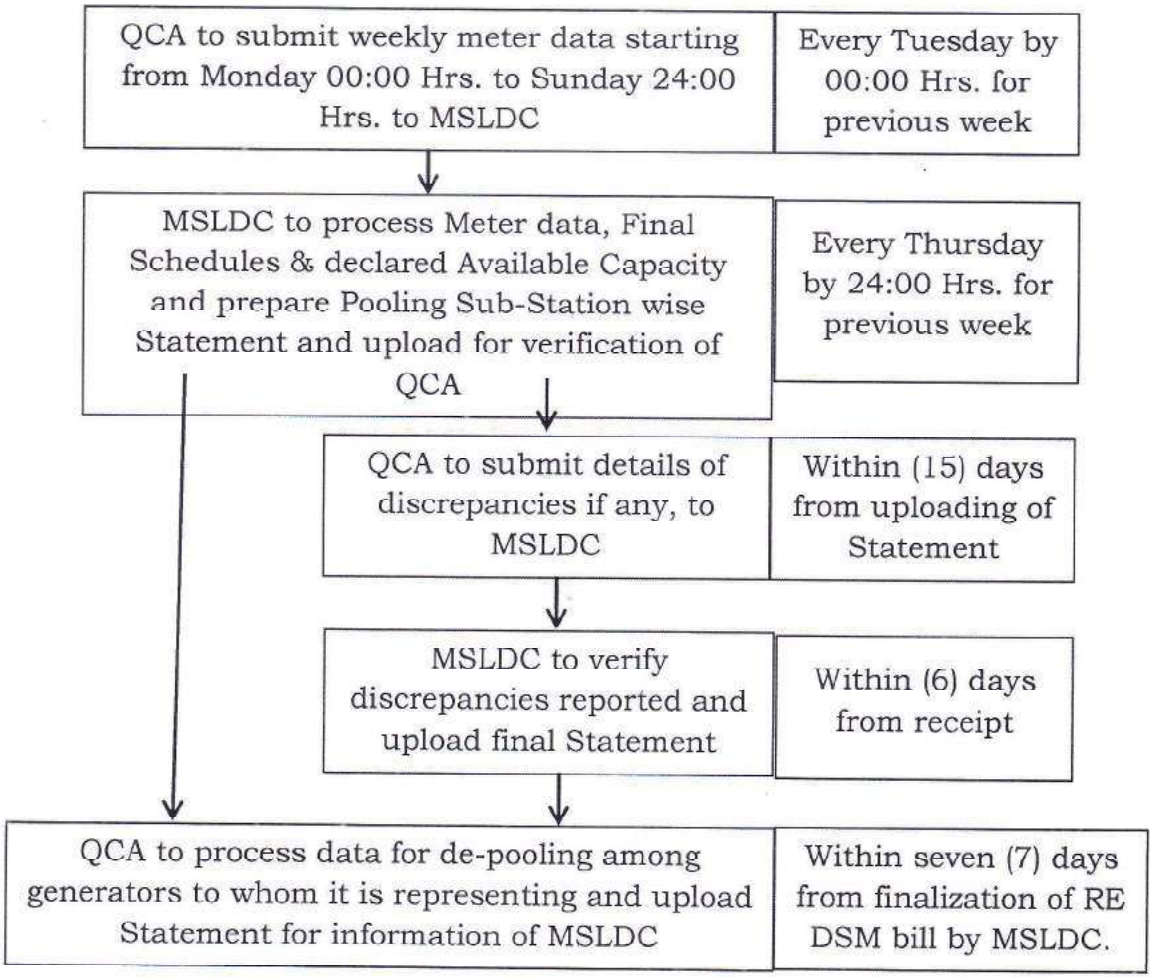
10.3. MSLDC shall process the data provided by all the QCAs' and furnish processed data to respective QCA on **every Thursday mid-night** (24:00 Hrs) for the previous week starting from Monday 00:00 hrs to Sunday 24:00 Hrs. for the preparation of weekly Energy Accounts by the QCA, for the Pooling Sub-Station or the stand-alone Generator, as the case may be.

10.4. All accounts relating to de-pooling of deviations charges shall be prepared by the QCA on a weekly basis, based on Pooling Sub-Station level inputs from the MSLDC, and shall be accessible to the MSLDC through an IT-enabled system and software.

10.5. The QCA shall communicate any discrepancies to MSLDC within (15) days which shall be corrected forthwith by MSLDC after due verification.

Any of the discrepancies reported after (15) days shall not be considered by MSLDC and in such case, the Statement prepared by MSLDC shall be final.

10.6. The process chart for Accounting is as below:



11. DEVIATION ACCOUNTING:

11.1. MSLDC shall consider the deviation charges for the State as a whole at the periphery of the State as issucd by WRPC weekly DSM bills.

11.2. MSLDC shall determine the impact of deviation of Wind & Solar injection at Pooling Sub-Station from schedule and its contribution on the total deviation charges at the State periphery as per WRPC weekly DSM bills.

11.3. MSLDC shall compute the absolute error for each Pooling Sub-Station and for Generators injecting Power individually, and shall calculate the deviation charges in accordance with the regulations.

11.4. Any shortfall in the aggregate amount of Deviation Charge payable by Solar and Wind Energy Generators at the State periphery and the amount receivable from them by the Pool Account shall be paid by the respective QCAs in proportion to their deviation reflected at the State periphery.

11.5. MSLDC shall compute the deviation charges and issue bills to the QCAs'.

12. DEVIATION CHARGES METHODOLOGY:

12.1. All EHV Pooling Sub-Stations shall be classified in three categories i.e.

a. **Intra-State Pooling Sub-Station**: where all wind & solar generators connecting through HV feeders are having delivery point within the State.

b. **Inter-State Pooling Sub-Station**: where all the wind & Solar generators connecting through HV feeders are having delivery point out-side the State.

c. **Mixed Pooling Sub-Station**: where some of the feeders are having delivery point outside the State and balance within the State.

12.2. **Methodology for Intra-State Transactions:**

12.2.1. Charges towards sale of Energy shall be settled by the Procurer on the basis of their actual generation, whereas the charges towards deviation of Energy from its given schedule shall be settled by the Generator.

12.2.2. The charges towards deviation in case of actual generation are lower/more than scheduled generation (Under-Injection/Over-Injection) shall be in accordance with the **Table - 1**.

Table – 1

Sr. No.	Absolute Error in %age terms in 15-minute time block	Deviation Charge payable to Pool Account for Wind/Solar Generation
1	< = 15%	None #
2	>15% but <=25%	At Rs. 0.50 per unit for the shortfall or excess beyond 15% and up to 25%
3	>25% but <=35%	At Rs. 0.50 per unit for the shortfall or excess beyond 15% and Up to 25% + Rs. 1.00 per unit for the balance energy beyond 25% and Up to 35%
4	>35%	At Rs. 0.50 per unit for the shortfall or excess beyond 15% and Up to 25% + Rs. 1.00 per unit for the shortfall or excess beyond 25% and Up to 35% + Rs. 1.50 per unit for the balance energy beyond 35%

[# : subject to the conditions specified in Regulation 12 of MERC F&S Regulations, 2018]

12.2.3. Even though there are no deviation charges for the deviation within +/- 15 %, the charges on account of impact on State periphery due to deviation shall be applicable.

12.2.4. The % error shall be calculated on the basis of available capacity and deviation as actual – schedule and % error shall be calculated by rounding up to second decimal place.

12.2.5. Illustrative example for calculation of deviation and its apportionment of deviation charges for five Pooling Sub-Stations is as under in **Table - 2** & **Table - 3**.

Table - 2

Pooling Sub-Station wise deviation charge calculation (for One Time block)						
Wind Pooling Sub-Station No	**Available Capacity (kWh)**	**Schedule (MWh) (kWh)**	**Actual Injection (kWh)**	**Deviation (KWh)**	**% Deviation**	**Dev. Charges payable by Individual Pooling Sub-Stations (F)**
	(A)	**(B)**	**(C)**	**(D)**	**(E)**	
W.P.S.	**Av.C**	**Sch.**	**Act. Inj.**	**Dev.**	**Dev.**	**Deviation Charges (Rs.)**
P.S. - 1	35000	25000	32500	7500	21.43%	1,125
P.S. - 2	80000	50000	52500	2500	3.13%	-
P.S. - 3	120000	75000	90000	15000	12.50%	-
P.S. - 4	90000	50000	47500	-2500	-2.78%	-
P.S. - 5	55000	37500	20000	-17500	-31.82%	6,500
Grand Total	380000	237500	242500	ABS 45000	11.84%	7,625
Net Exch. With Grid	**380000**	**237500**	**242500**	**5000**		

Table – 3

Apportionment of deviation charges						
Deviation Charge (Rs/kWh) as per the MERC F&S Regulations						
	0	**0.5**	**1**	**1.5**		**Deviation charges (Rs.)**
Deviation (%)	**15%**	**25%**	**35%**	**35%**		
21.43%	5250	2250	0	0	1125	1125
3.13%	2500	0	0	0	0	0
12.50%	15000	0	0	0	0	0
-2.78%	2500	0	0	0	0	0
-31.82%	8250	5500	3750	0	6500	6500
11.84%						

12.2.6. In order to calculate impact of RE deviation at State Periphery, a virtual pool of all Intra-State Pooling Sub-Stations and Intra-State part of mixed Pooling Sub-Stations shall be formed.

12.2.7. To determine the impact of RE deviation at State periphery, the part of DSM weekly bill issued by the WRPC shall be apportioned to the net deviation of Intra-State RE on the basis of applicable composite per unit rate (inclusive of additional DSM or capping DSM charge) for particular time block.

12.2.8. The apportionment of deviations of RE Pooling Sub-Stations shall be carried out for absolute deviation. Deviation percentage of each Pooling Sub-Station shall be carried out in percentage basis with respect to total absolute deviation of virtual pool.

12.2.9. Absolute deviation applicable for calculating impact of RE at State level shall be carried out by way of considering deviations of all the Pooling Sub-Stations together.

12.2.10. The illustrative example of impact of RE deviation at State periphery is as per **Table - 4**.

12.2.11. The RE Pooling Sub-Stations having deviations within +/- 15 % may not contribute to Pooling Sub-Station level deviation pool, however, this Pooling Sub-Station shall contribute to impact of RE deviation at State Periphery.

Table - 4

- Net Deviation at State Periphery : 5000 kWh
- Deviation charges at State periphery (UI charges) : Rs.3.0/-
- Total Deviation Charges on account of RE deviation at State periphery (D) : Rs. 15,000/-
- Total Deviation Charges collected from RE generators as per F&S Regulations (R) : Rs. 7,625/-
- Shortfall of deviation charges on account of RE generators (D-R) : Rs. 7,375/-

Apportion the shortfall to all P.S in proportion to their deviation									
Wind Pooling Station No	Available Capacity (kWh)	Schedule (MWh) (kWh)	Actual Injection (kWh)	Deviation (KWh)	% deviation	Dev. Charges payable by Individual Pooling Stations (F)	Apportionment of Net Deviation Charges amongst different Pooling Stations on the basis of different options (Rs.)		Total Dev. Charges in Rs. payable by Individual Pooling Stations
	(A)	(B)	(C)	(D)	(E)				
W.P.S.	Av.C	Sch.	Act. Inj.	Dev.	Dev.	Dev. Charges (Rs.) (R)	% contribution in RE Deviation	(Dev. Charges) (D-R)	Total in Rs. D-R +R
P.S. - 1	35000	27500	32500	5000	14.29%	-	16.39%	7,131	7,131
P.S. - 2	80000	50000	52500	2500	3.13%	-	8.20%	3,566	3,566
P.S. - 3	120000	75000	90000	15000	12.50%	-	49.18%	21,393	21,393
P.S. - 4	90000	50000	47500	-2500	-2.78%	-	8.20%	3,566	3,566
P.S. - 5	55000	37500	32000	-5500	-10.00%	-	18.03%	7,844	7,844
Grand Total	380000	240000	254500	ABS 30500	8.03%	-	100%	43,500	43,500
Net Exch. With Grid	380000	240000	254500	14500					

12.3. Calculation of impact of Wind/Solar generators at State Periphery shall be subject to revision in case the WRPC post facto revise DSM bill for concern week at any time.

12.4. In case of calculation of impact of Wind/Solar generators at State periphery, an amount payable to Wind/Solar generators shall be paid if sufficient balance amount is available in RE DSM pool account. However, in case sufficient balance amount is not available, payment to Wind/Solar generators on account of impact at State periphery shall be paid when sufficient balance is made up in RE DSM pool account.

12.5. **Methodology for Inter-State Transactions:**

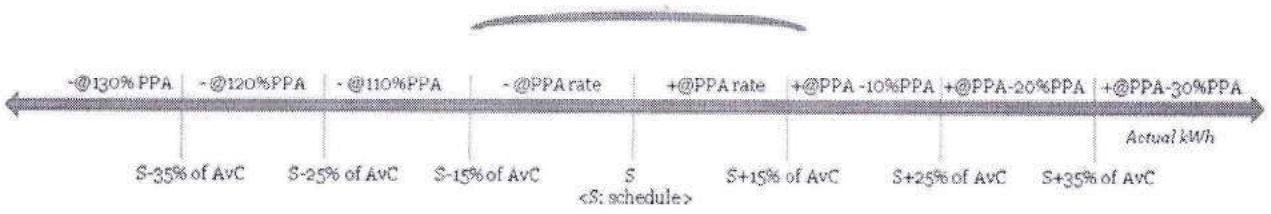
12.5.1. Inter-State transactions at a Pooling Sub-Station shall be permitted only if the concerned Generator or group of generators is connected through a separate feeder.

12.5.2. The Generator/s, through the QCA, shall submit a separate Schedule for its energy injection at Pooling Sub-Station, in accordance with these Regulations, to the MSLDC.

12.5.3. The Inter-State Schedule submitted by the QCA shall be grossed-up to State Periphery by applicable transmission losses at par with conventional scheduling & settlement mechanism and further shall be forwarded to Regional Load Despatch Centre (RLDC) to in-corporate in the State drawl schedule.

12.5.4. The MSLDC shall prepare the deviation settlement account for such Generator on the basis of measurement of the deviation in the energy injected as per CERC's F&S Regulation.

12.5.5. The rate for deviation settlement shall be based on PPA rates or in case of multiple PPAs, it will be based on Weighted Average PPA Rate.



12.5.6. The Generator shall pay the Deviation Charges applicable within Maharashtra in case of deviations in the State DSM Pool Account, the consequences of such deviation at the Inter-State level being governed by the CERC Regulations governing the Deviation Settlement Mechanism and related matters.

12.5.7. The Deviation Charges for actual injection is lower/higher than the scheduled generation (Under-Injection/Over-Injection) by Generators connected to the InSTS and selling or consuming power **outside Maharashtra** shall be in accordance with **Table - 5** & **Table - 6**.

Table - 5

Sr. No.	Absolute Error in %age terms in 15-minute time block	Deviation Charges payable to State DSM Pool Account
1	< = 15%	At the fixed rate for the shortfall in energy for Absolute Error up to 15%
2	>15% but <=25%	At the fixed rate for the shortfall in energy for Absolute Error up to 15% (+) 110% of the fixed rate for the balance energy beyond 15% and up to 25%
3	>25% but <=35%	At the fixed rate for the shortfall in energy for Absolute Error up to 15% (+) 110% of the fixed rate for the balance energy beyond 15%, and up to 25% (+) 120% of the fixed rate for the balance energy beyond 25% and up to 35%
4	>35%	At the fixed rate for the shortfall in energy for Absolute Error up to 15% (+) 110% of the fixed rate for the balance energy beyond 15% and up to 25% (+) 120% of the fixed rate for balance energy beyond 25% and up to 35% (+) 130% of the fixed rate for the balance energy beyond 35%

Table – 6

Sr. No.	Absolute Error in %age terms in 15-minute time block	Deviation Charges payable from State DSM Pool Account
1	< = 15%	At the fixed rate for the excess energy up to 15%
2	>15% but <=25%	At the fixed rate for the excess energy up to 15% (+) 90% of the fixed rate for excess energy beyond 15% and up to 25%
3	>25% but <=35%	At the fixed rate for the excess energy up to 15% (+) 90% of the fixed rate for excess energy beyond 15% and up to 25% (+) 80% of the fixed rate for excess energy beyond 25% and up to 35%
4	>35%	At the fixed rate for the excess energy up to 15% (+) 90% of the fixed rate for excess energy beyond 15% and up to 25% (+) 80% of the fixed rate for excess energy beyond 25% and up to 35% (+) 70% of the fixed rate for excess energy beyond 35%

12.5.8. Deviations in respect of Inter-State and Intra-State transactions shall be accounted separately at each Pooling Sub-Station.

12.5.9. The MSLDC shall provide separate DSM accounts for Inter-State and Intra-State transactions to the QCA, who shall settle the Deviation Charges with the concerned Generators.

12.5.10. The generator or group of generators selling power outside the State shall not be the part of apportionment of impact at State Periphery and shall not form part of virtual pool in order to avoid double settlement.

12.6. **Deviation Accounting and settlement in ABT Regime at State Level (in FBSM):**

12.6.1. As per Intra-State ABT mechanism operating in the State known as Final Balancing and Settlement Mechanism (FBSM), any entity selling power outside the State or having Inter-State transaction shall be State Pool participant in FBSM.

12.6.2. In accordance with above provision, generators selling power out-side the State shall become State Pool Participants.

12.6.3. As an interim arrangement, till new deviation settlement mechanism in place of FBSM comes in force, Inter-State Wind/Solar generators shall be FBSM Pool members and bill will be calculated as per approved procedure for FBSM.

12.6.4. However, any amount payable/receivable by Inter-State Wind/Solar generators in FBSM pool shall be compensated from RE DSM Pool so as to balance Energy Pool and Zero-Sum Pool in FBSM.

12.6.5. The revisions in schedule received by MSLDC for Inter-State RE transactions under LTOA/MTOA shall be forwarded by MSLDC to WRLDC for incorporation in the State schedule and shall be governed by CERC F&S Regulation.

12.6.6. In case of revisions in schedule of Inter-State RE transactions under STOA, it shall be governed by the provisions of CERC's Open Access Regulations.

12.6.7. In case of Collective transactions, no revisions are allowed.

13. DEVIATION CHARGES PAYMENT MECHANISM:

13.1. All the commercial transactions shall be through Electronic Clearance System (ECS) only.

13.2. The QCA shall open Bank Account in any Nationalized Bank and intimate the details of the same to MSLDC.

13.3. The Deviation Charges shall be paid by the QCA within ten (10) days from the issue of the accounts and billing by the MSLDC.

13.4. If the QCA fails to pay charges within time frame, a late payment surcharge amounting to 1.25% per month shall be levied for the period of delay.

13.5. The responsibility of ensuring the payment of the Deviation Charges to the MSLDC by the QCA shall remain to that of the concerned Generators.

13.6. After successful registration of the QCA, it shall be the responsibility of the QCA to deposit corpus to ensure payment security mechanism which shall needs to be maintained as per Clause no. 13.7.

13.7. The amount of the corpus shall be the interest free amount equivalent to Rs. 25,000/- (Twenty Five Thousand Rupees only) per MW for Solar Generation and Rs. 50,000/- (Fifty Thousand Rupees only) per MW for Wind Generation.

13.8. In case of insufficient/exhausted corpus, QCA shall make up corpus amount within seven (7) days from receipt of such information from MSLDC. Failure to make up corpus amount within prescribed time limit, the Wind/Solar generation which QCA is representing shall not be scheduled.

13.9. If the QCA fails to pay deviation charges within Ninety (90) days from the issue of the accounts and billing, MSLDC shall utilize the corpus deposited by the QCA during registration process for payment of deviation charges.

14. MECHANISM FOR MONITORING COMPLIANCE:

14.1. **The event of breach or default of the procedure shall be as follows:**

14.1.1. Non-payment or delay in payment of Deviation Charges.

14.1.2. Non-compliance of any of the terms/conditions/rules outlines under this procedure.

14.1.3. Non-compliance of any of the directives as per the provisions of this regulation issued by MSLDC.

14.1.4. Obtaining registration on the basis of false information or by suppressing material information.

14.1.5. QCA fails to provide schedules continuously for 10 days.

14.1.6. Non-availability of real time data continuously for three (3) days without justified reason.

14.1.7. In case the Available Capacity (AvC) is intentionally and repeatedly mis-declared by the QCA.

14.1.8. Non-submission of accounts to MSLDC relating to de-pooling of deviations charges prepared by the QCA.

14.1.9. Non-payment of RE DSM charges to RE DSM Pool by QCA for consecutive three (3) weeks.

14.1.10. In case the QCA has become insolvent

14.1.11. In case of continued default for statutory compliance leading to declaration of wilful defaulter by Competent Authority.

14.2. **Consequences for event of default:**

14.2.1. If schedule is not provided by the QCA (default as per 14.1.5) then the previous day's schedule (d-1) for those non-submission days shall be considered and DSM charges shall be computed accordingly. The non-submission of schedule shall attract scheduling charges as per the provisions of the MSLDC's ARR approved by Hon'ble MERC as amended from time to time.

14.2.2. In case of default for acts covered under as per 14.1.1 to 14.1.11 without prejudice to other actions as may be taken by MSLDC, the MSLDC shall issue a notice of period not less than 15 days for revocation of registration of QCA and non-scheduling of Pooling Sub-Station to which said QCA represents and adequate opportunity shall be given to QCA to present its case before MSLDC.

14.2.3. In case QCA fails to address/rectify the breach expressed by MSLDC in the Notice within stipulated time, the MSLDC shall proceed with revocation of registration of QCA and disconnection from grid.

15. GRIEVANCE REDRESSAL:

15.1. MSLDC shall refer the Complaints regarding unfair practices, delays, discrimination, lack of information, supply of wrong information or any other matters to the Commission for redressal.

15.2. Any disputes between QCA and concern generators shall be governed as per the dispute resolution mechanism under their Agreement, failing which it shall be subject to jurisdiction of the MERC. Pending the decision of the State Commission, the directions of the MSLDC shall be complied by the QCA and concerned generator(s).

16. REMOVAL OF DIFFICULTIES:

16.1. In case of any difficulty in implementation of this procedure, MSLDC may approach the Commission for review or revision of the procedure with requisite details.

17. GENERAL:

17.1. All costs/expenses/charges associated with the application, including bank charges, Affidavits etc. shall be borne by the applicant.

17.2. The Generators and QCA shall abide by the provisions of the Elcctricity Act, 2003, the MERC Regulations and Indian Electricity Grid Code and MERC (State Grid Code) Regulation - 2006, and applicable CERC and MERC regulations as amended from time to time.

17.3. This procedure aims at easy and pragmatic Forecasting, Accounting and Settlement of Deviations for Wind and Solar Generations. However, some teething problems may still be experienced. The various implications would be known only after practical experience is gained by way of implementing thcsc procedures. In order to resolve the same, this procedurc shall be reviewed or revised by the MSLDC with prior approval of Commission.

17.4. After approval of procedure by Hon'ble MERC, MSLDC shall undertake development of software for RE DSM and after go-live of RE DSM software there shall be trial run period of (8) weeks for ensuring implementation of RE DSM as envisaged in the regulation. Actual commercial settlement shall commence from start of week immediately after end of trial run period or from such othcr date to be notified separately.

18. ANNEXURES & FORMATS:

18.1. List of Annexures and Formats are listed below:

Sr. No.	Particulars	Annexure / Format No.
1	Consent/Authorization Letter from Generator for appointment of QCA	ANNEXURE - I
2	Format for submission of Forecast & Revision	ANNEXURE - II
a	For Forecast and Schedule Data to be submitted by QCA	FORMAT – A
b	For Revision of Availability & Revision	FORMAT – B
3	Real-time Data Telemetry requirement	ANNEXURE - III
4	Application for Registration of QCA	ANNEXURE - IV
5	Technical Data of individual Generators	FORMAT – 1
6	PPA details of individual Generators in the Pooling Sub-Station	FORMAT – 2
7	Format for Indemnity Bond to be submitted by QCA	FORMAT – 3

ANNEXURES AND FORMATS

Annexure – I

Consent/Authorization Letter from Generator for appointment of QCA

Proforma Consent Letter

Date:

To,
The Chief Engineer,
Maharashtra State Load Dispatch Centre,
Thane-Belapur Road, P.O. Airoli,
Navi Mumbai - 400 708.

Sub : Appointment of QCA as per MERC (Forecasting, Scheduling and Deviation Settlement for Solar and Wind Generation) Regulations, 2018.

Dear Sir/Madam,

We would like to inform you that we, as the Wind/Solar power generator at _____ Pooling Sub-Station have decided to exclusively appoint only as the Qualified Coordinating Agency (QCA) for Forecasting, Scheduling and Commercial Settlement, as per the MERC (Forecasting, Scheduling and Deviation Settlement for Solar and Wind Generation) Regulations, 2018.
Kindly find below the details of our capacity at_____ Pooling Sub-Station having ____ MW.

S. No	Customer Name	No of WTGs/Panels	Contact Person	E-mail ID & Contact No.	Capacity in MW

We would like to state that henceforth the role of QCA at _____Pooling Sub-Station will be taken care by _____

Contact Details:

- **Contact Person-1:**
  Name & Designation:
  Address:
  Phone No. (O): Mobile No.:
  E-mail:
- **Contact Person-2:**
  Name & Designation:
  Address:
  Phone No. (O): Mobile No.:
  E-mail:

- **Contact Person-3:**
  Name & Designation:
  Address:
  Phone No. (O): Mobile No.:
  E-mail:

Details of Forecasting Operations Desk:

Address:
Phone No. (O): Mobile No.:
E-mail:

This is for your kind information and records.

Regards,

Date: _____ Sign: _____

Place: _____ Authorized Signatory

Name: _____

Designation: _____

Name of Generator: _____

Seal:

Annexure – II

FORMAT – A: For Forecast and Schedule Data to be submitted by QCA for date: dd/mm/yyyy

(to be submitted a day in advance)

Pooling Sub-Station Name: _____ Pooling Sub-Station No.: _____

Name of QCA: _____

15 Min time block (96 Block in a day)	Time	Available Capacity (MW) - Day Ahead	Day Ahead Forecast (MW)
1	00:00 – 00:15		
2	00:15 – 00:30		
3	00:30 – 00:45		
4	00:45 – 01:00		
95			
96			

FORMAT – B: for Revision of Availability & Revision for date: dd/mm/yyyy

(to be submitted on the day of actual generation by QCA)

Pooling Sub-Station Name: _____ Pooling Sub-Station No.: _____

Name of QCA: _____

Revision No.: _____

15 Min time block (96 Block in a day)	Time	Day Ahead Schedule (MW)	Current Available Capacity (MW)	Revised Schedule (MW)
1	00:00 – 00:15			
2	00:15 – 00:30			
3	00:30 – 00:45			
4	00:45 – 01:00			
95				

96				

Real-time Data Telemetry requirement (Suggested List)

Wind turbine generating plants:

- Turbine Generation (MW/MVAR)
- Wind Speed (meter/second)
- Generator Status (on/off-line)- this is required for calculation of availability of the WTG
- Wind Direction (degrees from true north)
- Voltage (Volt)
- Ambient air temperature (°C)
- Barometric pressure (Pascal)
- Relative humidity (in percent)
- Air Density (kg/m^3)

For Solar generating Plants:

- Solar Generation unit/ Inverter-wise (MW and MVAR)
- Voltage at interconnection point (Volt)
- Generator/Inverter Status (on/off-line)
- Global horizontal irradiance (GHI) (Watt/m^2)
- Ambient temperature (°C)
- Diffuse Irradiance (Watt/m^2)
- Direct Irradiance (Watt/m^2)
- Sun-rise and sunset timings
- Cloud cover (Okta)
- Rainfall (mm)
- Relative humidity (%)
- Performance Ratio

Annexure - IV

Application to be submitted for Registration as a Qualified Co-ordinating Agency (QCA) under the MERC (Forecasting, Accounting and Deviation Charge Settlement of Solar & Wind Generation) Regulations, 2018

Sr. No.	Name of the QCA	
1	Type of Generator	Wind / Solar
2	Location of Generator (Village, Tal, District)	
3	Total Installed Capacity of Generating Station	
	Total Number of Units with details	
4	Individual or on Behalf of Group of generators	
	If on behalf of Group of generators connected to a Common Pooling Sub-Station	(Please attach consent from at least 51 % of Generators in the Pooling Sub-Station) (Please attach copy of agreement executed with Generators)
	Details of the individual Generators in the Pooling Sub-Station	(Please attach names with installed capacity of each & individual Generator in the Pooling Sub-Station)
5	Name & Voltage level of the Pooling Sub-Station to which Generation is connected	
	Latitude & Longitude of Pooling Sub-Station	
	Schematic diagram of Connectivity with the Grid & Metering Arrangement	(Please attach)
6	Whether any PPA has been signed: (Y/N)	If yes, then attach Notarized Affidavit indicating details as per Format-2
7	Metering Details	Meter No. 1. Main 2. Check
8	Contact Details of the Nodal Person	Name: Designation: Landline Number: Mobile Number: Fax Number: E - Mail Address:
	Contact Details of the Alternate Nodal Person	Name: Designation: Landline Number:

		Mobile Number: Fax Number: E - Mail Address:
	Contact Details of Control Room for Communication on Forecasting, Scheduling, Revisions, event of Curtailments etc.	Landline Number: Mobile Number: Fax Number: E - Mail Address:
9	Details of Payment towards Registration as QCA	
10	Technical Data of Generators	(Please attach detailed information as per Format: 1)
11	Statement of PPA of individual Generators in Pooling Sub Station	(Please attach detailed information as per Format: 2)
12	Indemnity Bond	(Please attach as per Format: 3)

Date: _____

Place: _____

Sign: _____

Authorized Signatory

Name: _____

Designation: _____

Name of QCA: _____

Seal:

Format – 1

Technical Details to be submitted by the QCA

Pooling Sub-Station Name: _____ Pooling Sub-Station No.: ____

Name of QCA: _____

For Wind turbine generating plants:

Sr. No.	Particulars
1	Type:
a	Manufacturer
b	Make
c	Model
d	Capacity
e	Unique WTG ID
f	Customer Name
g	Commissioning Date
h	Hub Height
i	Total Height
j	RPM Range
k	Rated Wind Speed
2	Details of PPA (Name of Procurer, Effective Date, Validity Date, per Unit Rate, Escalation in per unit energy rate per year (if any)
3	Performance Parameters:
a	Rated Electrical Power at Rated Wind Speed
b	Cut-In Speed
c	Cut-Out Speed
d	Survival Speed (Max. Wind Speed)
e	Ambient Temperature for Out of operation
f	Ambient Temperature for In Operation
g	Survival Temperature
h	Low Voltage Ride Through (LVRT) setting
i	High Voltage Ride Through (HVRT) setting
j	Lightening Strength (kA & in Coulombs)
k	Noise Power Level (db)
4	Rotor Parameters:
a	Hub Type
b	Rotor Diameter
c	Number of blades
d	Area Swept by blades
e	Rated Rotational Speed
f	Rotational Direction

g	Coning Angle
h	Tilting Angle
i	Design Tip speed ratio
5	Blade Details:
a	Length
b	Diameter
c	Material
d	Twist Angle
6	Generator Details:
a	Generator Type
b	Generator Speed
c	Winding Type
d	Rated Generation Voltage
e	Rated Generation Frequency
f	Generator Current
g	Rated Temperature of Generator
h	Generator Cooling
i	Generator Power Factor
j	kW/MW @ Rated Wind Speed
k	kW/MW @ Peak Continuous
l	Frequency Convertor
m	Filter - Generator side
n	Filter - Grid side
o	Turbine Power Curve
7	Transformer Details:
a	Transformer Capacity
b	Transformer Cooling type
c	Voltage
d	Winding Configuration
8	Weight Details:
a	Rotor
b	Nacelle
c	Tower
9	Over Speed Protection
10	Design life
11	Design Standard
12	Latitude
13	Longitude
14	COD Details
15	Past Generation History from the COD to the date on which DAS facility provided to MSLDC

16	Elevation above Mean Sea level (MSL)

For Solar generating plants:

Sr. No.	Particulars
1	Latitude
2	Longitude
3	Elevation and Orientation angles of arrays or concentrators
4	The generation capacity of the Generating Facility
5	Elevation above Mean Sea level (MSL)
6	COD Details
7	Rated Voltage
8	Details of Type of Mounting: (Tracking Technology if used, single axis or dual axis, auto or manual)
9	Manufacturer and Model (of Important Components, Such as Turbine, Concentrators, Inverter, Cable, PV Module, Transformer, Cables)
10	DC installed Capacity
11	Module Cell Technology
12	I-V Characteristic of the Module
13	Inverter Rating at different temperature
14	Inverter Efficiency Curve
15	Transformer Capacity & Rating, evacuation voltage, distance form injection point

Format – 2

(To be submitted on Notarized Affidavit)

Pooling Sub-Station Name: _____ Pooling Sub-Station No.: _____

Name of QCA: _____

Sr. No.	Name of Generator	Installed Capacity (MW)	PPA with	Effective Date	PPA Validity Date	Rate per Unit (Rs.)

Date: _____

Place: _____

Sign: _____

Authorized Signatory

Name: _____

Designation: _____

Name of QCA: _____

Seal:

Format – 3

(On the Non-Judiciary Stamp Paper)

INDEMNIFICATION

The Renewable Energy generator and QCA shall keep MSLDC indemnified at all time and shall undertake to indemnify, defend and save the MSLDC harmless from any and all damages, losses, claims and actions, including those relating to injury to or death of any person or damage to property, demands, suits, recoveries, costs and expenses, court costs, attorney fees and all other obligations by or to third parties, arising out of or resulting from the Registration of QCA under DSM Mechanism.

The Renewable Energy generator and QCA shall keep MSLDC indemnified at all time and shall undertake to indemnify, defend and save the MSLDC harmless from any and all damages, losses, claims and actions, arising out of disputes with MSLDC, as well as with generators and QCA inclusive of confidentiality issues.

Date: _____

Place: _____

Sign: _____

Authorized Signatory

Name: _____

Designation: _____

Name of QCA: _____

Seal:

Abstract of Payments to be made to MSLDC by the QCA

Sr. No.	Reason for Payment	Amount (Rs.)	Time of Payment
1	Registration Charges	20,000/-	For each Pooling Sub-Station during Application for Registration
2	Scheduling Charges	2,250/-	For every day
3	Revision in Schedules	2,250/-	For every revision
4	Forecasting services	3,000/-	Per day, if availed
5	Corpus	25,000/- per MW for Solar 50,000/- per MW for Wind	During Registration
6	Top-up of Corpus	As required	In the event of reduction in Corpus as per Sr. No. 5
7	Any other charges	As required	As required

Flow Chart for Procedure for Grant of Grid Connectivity to Wind/Solar Projects as per Methodology of GoM : Proposed

Application along with processing fee to MEDA

Preliminary Scrutiny (MEDA)

Letter from MEDA to MSETCL for Feasibility

Application to Chief Engineer (STU) with Processing Fee (Rs.1.0 Lac per project)

Preliminary Scrutiny (STU)

Letter to Field Office and Applicant for Joint Survey & Technical Feasibility Report

Co-ordination of Applicant for site visit

- E-Mail to Superintending Engineer (EHV Construction) Circle of MSETCL with intimation to Applicant for joint survey.
- Joint survey with Applicant and MSETCL's Construction Division and Sub-division Officers.
- Preparation of technical feasibility report by E.E. (Construction) & submission to S.E. Construction
- Scrutiny of feasibility report by S.E. Construction in consultation with S.E. O&M and submission to C.E. Zone, MSETCL.
- Scrutiny & submission of feasibility report by C.E. Zone to STU

Joint Survey & Feasibility Report

Committee: Member from STU, MEDA and MSEDCL

Scrutiny of the Project in the Committee for Grid Connectivity

Feasible

Grid Connectivity Recommendation

Intimation towards feasibility & submission of refundable Security Deposit (S.D.) of Rs.1.0 Lac per MW to MSETCL is issued to the Applicant.

YES

Applicant ready for any alternative?

Not Feasible

Applicant is intimated the reason for non-

NO

Payment of Security Deposit within 30 Days?

YES

Application is Cancelled with reasons for

Grid Connectivity is

Application, documents & processing fee by developer

NO

Execution of Scope of Works by the Developer

Time Frames:
Upto 50 MW at 33 kV level: 15 Months
Upto 100 MW at 132 kV level: 24 Months
Upto 150 MW at 132 kV level: 30 Months
Upto 100 MW at 220 kV level: 34 Months
Above 100 MW at 220 kV level: 36 Months

Scrutiny by the Committee for Grid Connectivity & forfait of S.D.

No Progress

Committee: Member from STU, MEDA and MSEDCL

Substantial progress

Time extension is issued

Completed

Documents submitted by the developer:
1) Connection Agreement,
2) Site Responsibility Schedule,
3) Work Completion Report with Visibility to SLDC

Security deposit is refunded if completed in time.

Final Grid Connectivity is issued by STU & Security Deposit Refunded to

Permission for Synchronization issued by SLDC