



Bangalore Electricity Supply Company Limited

(wholly owned Government of Karnataka undertaking)

Operational Guidelines for implementation of KERC Order on Evacuation / Utilization of Solar Energy Generation at LT/HT Voltage and connect to their LT/HT system dated 02.03.2023.

Ref: KERC order No: KERC/S/2851 dated 02.03.2023

Preamble:

In respect of installation of Solar Rooftop Plant in a premises with HT connection, where SRTPV plants are installed on multiple buildings, a single solar generation meter is to be fixed combining solar rooftop plants on all the buildings as per the prevailing norms of BESCOM.

In view of this, some HT Consumers have placed proposal before KERC for approval Evacuation / Utilization of Solar Energy Generation at LT/HT Voltage and connect to their LT/HT system as the present method would result increased cost and increased technical loss.

In this regard, the KERC has issued orders on 02.03.2023 for Evacuation / Utilization of Solar Energy Generation at LT/HT Voltage and connect to their LT/HT system.

The Hon'ble KERC has issued following guidelines through the said order;

- I. Metering application: The metering system shall consist of meters, modems and Head End System (HES)/data aggregator platform for:
 - a) Obtaining data from the solar energy generation, a separate unidirectional meter to be provided duly tested, to each solar unit installed in each of the building duly conforming to the applicable CEA Metering Regulations. A Bi-directional Meter shall also be installed on the HT side of the Consumer's Transformer to measure import and export energy.
 - b) The meters should be Device Language Message Specification (DLMS) compliant and the interface available must be RS485 serial or Transmission Control Protocol/Internet Protocol (TCP/IP). Meter data must be sent securely and must allow access to any Head End System (HES)/ data aggregator platform and should be compatible to DLMS Protocol.
 - c) Modems must be able to securely transmit/ communicate the data on channel and on any cellular carrier. Also Modems should have provision for adding secure proxy.

- d) The Head End System (HES) primarily shall have a data acquisition layer and data transformation layer that has to be hosted on a cloud and acts as a data aggregator platform. It must be cloud independent and accept any meter data from the Distribution Licensee.
- e) For metering applications, the HES must be able to read data on DLMS protocol, without any transformation or conversion. The HES or aggregator platforms shall be scalable to collect a large number of solar generation data and Net meter's data from solar roof top.
- II. Telemetry application: The HES shall collect meter data from roof top solar plant on DLMS and transfer it to Distribution Licensee Billing system or generation portal in the data format as prescribed by the Distribution Licensee
- III. Control Application: HES must be capable of implementing the control as defined by the Distribution Licensee over an accepted International/National protocol along with integration with inverter management system of the solar project, if required.

Hence, following operational guidelines are issued;

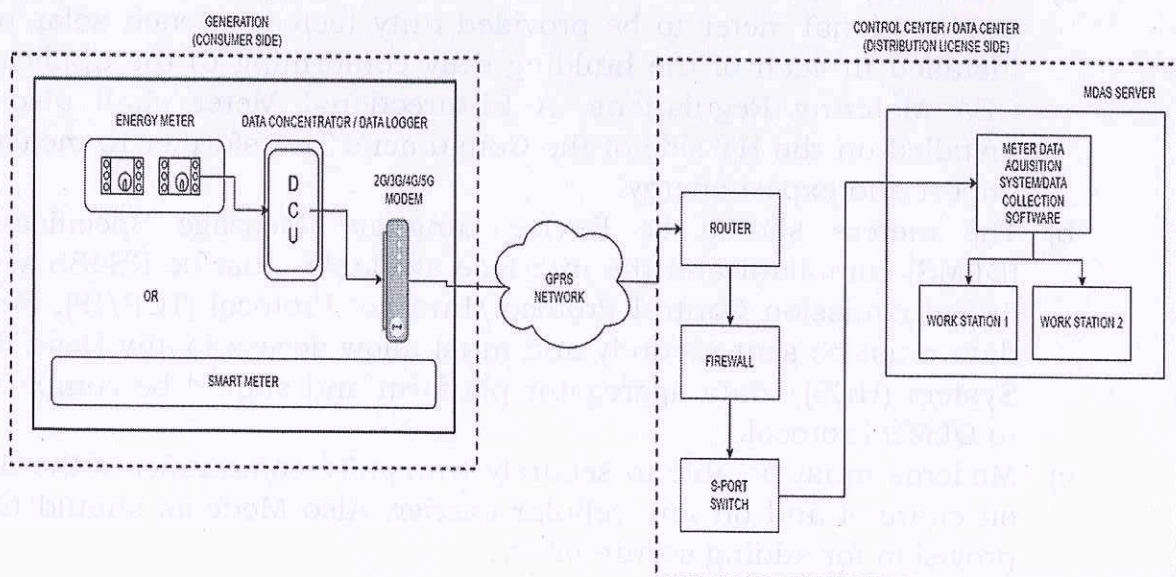
No: BESCOM/DSM/GM/DGM/AGM-5/2023-24/1109

dated: 28.07.23

for adoption of KERC Order on Evacuation / Utilization of Solar Energy Generation at LT/HT Voltage and connect to their LT/HT system for HT Consumers under the Net-metering arrangement.

Schematic Diagram:

BESCOM adopts the architecture of the metering and communication arrangement provided by KERC, which is as shown below.



Metering:

Meters shall be procured by Consumer and the metering arrangement shall be as per KERC guidelines and the meters shall comply with the specifications of BESCOM.

The specifications of meter published in BESCOM website under Solar Rooftop Guidelines menu in the home page of BESCOM website <https://bescom.karnataka.gov.in/>.

Modems:

The modems shall be procured by Consumers and shall comply with the specifications of BESCOM and data transmission from modem shall be as per the guidelines of KERC.

The specifications of modems published in BESCOM website under Solar Rooftop Guidelines menu in the home page of BESCOM website <https://bescom.karnataka.gov.in/>.

Telemetry application:

The collection and transfer of data from Head End System shall be as per the guidelines of KERC and the Consumer shall ensure an arrangement with Head End System provider for data transfer and collection and confirmation of the same shall be provided to BESCOM.

The Consumers can contact BESCOM helpline at 080-22340816 or email id : bescomsolarhelpdesk@gmail.com

Control Application:

The Consumer shall co-ordinate with Head End System provider and the concerned sub division/MT Division/GM(ICT &MIS) section of Corporate Office, BESCOM for integration and summated and individual billing data of all the proposed solar generation meters shall be provided.

Solar Generation Meter:

Parameters to be captured: billing ckwh (Cumulative kWh), billing MD KVA (Maximum Demand in KVA)

The data transfer from Head End system and integration with Billing system of BESCOM shall be ensured in accordance with KERC order under reference.

The request from Consumers for adoption of the said order shall be processed by sub division offices in co-ordination with GM(DSM) section of BESCOM Corporate Office.

The cloud service provider /modem vendor selected by Consumer should successfully integrate their Head End System with BESCOM Billing system.


**General Manager(Ele)
DSM Section,
Corporate Office, BESCOM**

MANDATORY TECHNICAL SPECIFICATION OF GPRS, 3G and 4G BASED MODEMS

1.0 TECHNICAL SPECIFICATION OF MODEM:

Note: The modem should comply for all the specification of SRS of RAPDRP, KARNATAKA.

2.1 The offered MODEM shall be an intelligent device connected to an Electronic Energy Meter by means of optical port, RS-232/RS-485 port, installed at various locations (Boundary meters/HT installations/DTC/Feeder) to collect the following data as per configured frequency/On demand.

2.0 Complete Meter data stored in the meter. (hourly/ daily/ weekly/ monthly)

- 2.1 Instantaneous parameters, at the time of reading.
- 2.2 Billing data, present and last 6/12 months' histories as per the meter make.
- 2.3 Load survey, 45 days/complete no. of days stored in the meter.
- 2.4 Tamper data, Settings/Configuration data

4.0 Instantaneous parameters. (Every 15/60 minutes/daily)

Key Features:

- 4.1 Compatible with various standard DLMS compliant Meters & some legacy version meters which are compatible to modems (compatible).
- 4.2 Shall have meter detect and meter data read feature which enables communication with all popular Indian energy meters including DLMS/non DLMS meters using built-in meter specific protocol stack.
- 4.3 Shall have auto restart feature with built-in watchdog timers and intelligence.
- 4.4 Shall have on-line tamper detection feature through which MODEM will continuously pole the meter for any new tamper and will send the event to the server and also to a set of pre-shock test
- 4.5 programmed mobile numbers as an SMS alert.
- 4.6 Shall have program over the air (POTA) feature which will reduce the manual field visits and also save project time. The modem firmware shall be reprogrammed from the server remotely.
- 4.7 Remote start/stop and restart feature.
- 4.8 Auto recover feature in case of modem / network hanging.
- 4.9 Comprehensive self-diagnosis feature which will create log file with all at a periodicity and link check for communication.
- 4.10 On demand SMS request through SMS for Instantaneous Parameters.
- 4.11 Real time outages, alarms as alerts to server and to configured mobile numbers Automatic 4G/GPRS connection (no AT commands required) and watchdog for reliable Communication.

- 4.12 Modem should be auto configurable by itself to the different make of DLMS meters if meters are changed i.e. plug & play.
- 4.13 Inbuilt 3 Phase Power supply as well as operational on single phase.
- 4.14 Automatic pushing of meter data at configured regular intervals.
- 4.15 Online monitoring of vital Instantaneous parameters like voltages, currents energies, powers, power factors.
- 4.16 IP (internet protocol) based Communication, enabling simultaneous data access from thousands of Modems.
- 4.17 Shall use meter supported baud rate to read meter data and shall use maximum network supported baud rates to push the data to server.
- 4.18 Shall have a configuration over the air feature through which all the MODEM operational settings will be configured.
- 4.19 Shall have a configurable scheduled meter read and data transmit feature to enable grouping of the meters so that the loading on the server is equally distributed from all the field installed modems.
- 4.20 Shall have selective on-demand meter read feature through which server can send an on demand request to modem to read the selective parameters from the meter (for HT/ABT feature meters).
- 4.21 Shall have a configurable scheduled meter read and data transmit feature to enable grouping of the meters so that the loading on the server is equally distributed from all the field installed modems.
- 4.22 Shall have selective on-demand meter read feature through which server can send an on demand request to modem to read the selective parameters from the meter.
- 4.23 Modem should support for time synchronization on line from HES.
- 4.24 Modems should be configurable for both dynamic TLLI and static TLLI.

5.0 Power Supply Section: -

5.1 Input specifications: -

The offered modems should be capable of operating on three phase supply drawn from the meter input itself. Auxiliary power supply will not be acceptable.

- 5.2 The MODEM shall have three phase AC input supply and should be capable of proper functioning within the power supply range of 90V AC P-P to 470V AC P-P, 50 Hz so that same MODEM shall be used for HT, boundary and LT Tri vector meters.

- 5.3 However, the MODEM should also be capable of operating on single phase 230V, 50 Hz power supply. The MODEM shall be suitably protected against the surges which are normally happens on the distribution network.
- 5.4 The offered Modem should be supplied with power cable, antenna with co-axial cable of suitable length, RS 232/RS485 connecting cable.
- 5.5 The offered Modem should be capable to transfer the entire data of HT and LT Tri-vector Meter in less than 10 Minutes after connection is made assuming there is no line disturbance. Mounting adopter etc. and should be complete in all respects.
- 5.6 Average Power consumption of the MODEM shall not be more than 3.5 VA under idle and during data transfer.
- 5.7 The modem shall safely withstand the usual fluctuations arising during transient and persistent faults in the network without any damage to or mal-operation of the modems.
- 5.8 Withstand capacity against surges should be according to Indian conditions i.e. 6 kV.
- 5.9 The SPDs used in the modem should be of suitable current rating and SPDs should pass TWO recognized UL1449 tests.
- 5.10 Surge protection comprises SPDs which is a combination of varistors and Gas Discharge (GD) tubes provided across phase to phase, phase to neutral and neutral to earth, such that the device (modem) is protected against over voltages and it is optional.
- 5.11 Input terminals: The power supply input shall be a suitable Four core integrated cable coming out from AMR box and should be ended with proper lugs.
- 5.12 The MODEM shall have capability to work under continuous power on condition.
- 6.0 **GPRS/4G Section: -**
- 6.1 The 4G/GPRS module shall comply with the following:
- 6.1.2 The module shall operate in dual Band GSM 900/1800MHz and frequencies given by Govt. of India to service provider in Karnataka for 3G and 4G
- 6.1.3 The module shall be compliant with ETSI GSM Phase 2+ Standard, 3G and 4G.
- 6.1.4 Class 4 (2W) @ 900 MHz
- 6.1.5 Class 1 (1W) @ 1800 MHz
- 6.2 The module shall support Point-to-Point transmission and Cell Broadcast features.
- 6.3 Serial binary and suitable data format for data transfer.
- 6.4 Short messaging service (SMS) features.
- Text and PDU
 - Point to point (MT/MO)
 - Cell broadcast.
- 6.5 MODEM should support both data and SMS transmission.

7.0 SIM Card Section: -

- 7.1 For placing the SIM Card, a SIM Card Holder shall be provided on the motherboard and shall be accessible only by opening/sliding the cover, MODEM shall not be opened for replacing the SIM card with sealing provision.
- 7.2 The SIM Card supported shall be of 1.8V/3V Interface.
- 7.3 Interlocking facility shall be provided under the device cover.
- 7.4 SIM card slot/cover shall be sealed to avoid access to unauthorized person. The offered MODEM shall comply for ESD as per IEC61000-4-2.
- 7.5 SIM card holder should support all possible sizes of 2G, 2.5G, 3G and 4G.

8.0 Communication Interface & Capabilities: -

- 8.1 A RS 232/RS 485 Serial Link supporting up to 115,200 bauds with an auto-bauding option shall be provided. However, the data transfer rate for remote meter reading shall depend on meter compatibility.
- 8.2 The RS 232 /RS 485 output shall be provided on a 9-pin female/RJ11 connector which can be connected to electronic energy meter's optical / serial communication port through suitable communication cable.
- 8.3 The MODEM shall be suitably pre-configured for meter reading & transferring the data to the Data Centre.
- 8.4 MODEM should be dual band MODEM capable of operating at 900 and 1800 MHz GSM transmission.
- 8.5 MODEM should support both Data and SMS transmission. It should have 4G and GPRS features.
- 8.6 For 3G and 4G Modems, it should be able to connect to frequencies available in Karnataka.

9.0 Applicable Standards:

- 9.1 The modem shall conform in all respects to the relevant International Standard Specifications with latest amendments there to unless otherwise specifically mentioned in this specification.
- 9.2 The modem shall conform to following standards
- EN60068-2-6 : Vibration 10-500 Hz Sine Vibration 2g
 - EN60068-2-30 : +40°C and 95% Relative Humidity
 - EN60068-2-1 : Cold (-10°C)
 - EN60068-2-2 : Dry Heat 60°C
 - EN60068-2-14 : Change in Temperature (-10°C to +60°C)
 - IEC 68-2-27 : 2 shocks in both directions of three mutual perpendicular axes/400 ms duration 40g
- 9.3 The modem conforming to other internationally accepted standards, which ensure equal or higher quality than the standards mentioned above would also, is acceptable. In case of any

difference between provisions of these standards and provisions of this specification, the stringent provisions shall prevail.

10.0 Service conditions:

10.1 The modem to be supplied against this specification shall be required to operate satisfactorily and continuously (24 x 7) under the following tropical conditions.

- Maximum Ambient Air Temperature : 60° Centigrade
- Minimum Ambient Air Temperature : 0° Centigrade
- Average Daily Ambient Air Temperature : 45° Centigrade
- Maximum relative humidity : 10-95
- Max. Altitude above mean sea level (m) : 4 Meters
- Average Annual Rainfall (mm) : 1450 mm

10.2 The overall climatic condition is moderately hot, tropical, dusty and humid, conducive to rust and fungus growth.

11.0 RF section: -

A SMA interface shall be provided on the MODEM to which either a fixed or a wired (with magnetic base) Dual Band built-in Antenna of minimum -6dbi gain can be connected. Provision shall also be made to connect 10/14dbi high gain external yagi antenna to improve poor signal strength.

12.0 Memory:

12.1 The modem shall have sufficient memory to store resident software and data. The memory shall be scalable/ upgradable.

12.2 The modem shall have non-volatile memory, so that the registered parameters will not be affected by loss of power.

12.3 The non-volatile memory should have a minimum retention time of 10 years.

12.4 Inbuilt 4MB non-volatile Data memory (Expandable to 8MB). Data memory for storing billing data, tamper information, voltages, currents, PF's etc. Inbuilt non-volatile memory for storing unit identification, loading circle, meter number and configuration data.

13.0 Memory Resident Software

13.1 The modem resident software should be reconfigurable in order to select any one or group of parameters for load survey. The bidder shall provide details of load survey duration with combination of parameters.

13.2 The modem shall be able to store following information as a part of configuration setting.

- ❖ No. of meters connected to the modem in case of feeder meters
- ❖ Meter Serial number(s)

13.3 The above can be reconfigured from the base Computer Software.

14.0. Network Identification Section: -

For determining the health of the device an LED shall be provided on the MODEM which will depict the current functioning status (power up/ registered in network/transmitting data).

15.0 Data Features for GSM/GPRS module, similarly for 3G and 4G Modems:

Internet Services: TCP, UDP, HTTP, FTP

GPRS Data transmission features: -

- GPRS Class B Multi slot class 12 or class B Multi slot class 10
- Packet channel support: PBCCH
- Coding Schemes: CS1 to CS4 compliant with SMG32 (Release 97)
- Coding Schemes:

16.0 EMI/EMC Specifications: -

16.1 The MODEM shall meet the following EMI/EMC specifications:

- Electrostatic Discharge IEC61000-4-2 (8 KV)
- Fast Transient Burst IEC61000-4-4
- Surges Immunity IEC61000-4-5
- Conducted Emission as per IEC 61000-3-2 and CISPR22 (class B)
- Radiated Emissions as per CISPR 22
- Radiate Immunity as per IEC 61000-4-3

17.0 Mechanical Specifications: -

17.1 The Mechanical Specifications of the MODEM shall be as follows:

17.1.1 MODEM shall be compact, rugged and reliable in design, as this device will be placed in a compact meter boxes. The bidder shall furnish detailed dimensional drawings of the modem and its mounting arrangement along with the offer.

17.2 Mounting Arrangement: Easy mounting arrangement with a hook Provision on the MODEM supported with the screw fixing arrangement. So that it will be comfortably fixed inside the meter Box.

17.3 The MODEM shall comply with IP55 rating.

17.4 Sealing Arrangement: The Top and Base Cover shall have a suitable sealing arrangement so that the MODEM cannot be tampered.

17.5 The MODEM shall be a compact model housed in a polycarbonate/ engineering plastic enclosure.

17.6 All parts, which are subject to corrosion under normal working conditions, shall be protected effectively. Any protective coating shall not be liable to damage by ordinary handling or damage due to exposure to air, under normal working conditions.

- 17.7 The modem shall be designed and constructed in such a way as to avoid introducing any danger in use and under normal conditions so as to ensure specially personnel safety against electric shock.

18.0 Environmental specifications: -

The MODEM shall meet the following environmental specifications:

- Temperature: -10 degrees to +60 degree.
- Operating Temperature: -10 degrees to +60 degree Celsius.
- Humidity: up to 95% RH (non – condensing).

19.0 Functional specifications: -

19.1 The MODEM should be an intelligent device and capable of providing the following functionalities on 4G and GPRS network:

19.1.1 The MODEM should be capable for long duration data transfer to central station as per configuration via suitable 4G and GPRS MODEM software.

19.1.2 When the MODEM is busy in collecting the data from the meter and the request comes to get the data, then priority shall be given to request from central station software.

20.0 Power Outage Notification: In the event of an outage, the MODEM should be able to send the outage alert to Data centre, there after SMS to predefined number to notify the outage event with date and time of occurrence/restoration.

20.1 The MODEM should be capable of operating with SIMs of local 4G and GPRS Service provider in the area. SIMs shall transmit the data **in 2G, 3G and 4G network.**

20.2 MODEM should be capable for continuous working for 24 hours every day under field conditions, even when enclosed in Metering Cubicles at Consumer sites.

20.3 Software shall have facility for Auto-Scheduler to enable automatic/Unattended data collection during night hours.

21.0 Data transfer in push Mode:

21.1 By default, MODEM should be configured for push mode of data transfer i.e., MODEM shall automatically establish a session with Static IP of MDA Server at DC at specified time (once in an hour/day/week/month) for the purpose of meter reading through 4G. This configuration of the MODEM shall be configurable remotely.

21.2 If MODEM could not establish connection to the Server placed at Data centre at specified time through 4G then it shall retry the same by 3G and 2G as configured through auto connection (fall back mechanism).

22.0 Data transfer in pull Mode:

22.1 In case the data is required on demand from the Data centre end (Server end), then connection shall be established from head end (**Meter data Acquisition system**) to the Modem.

- 4M(DSM)
- 22.2 User shall have option to get the meter data available in the memory of intelligent AMR, invoke the Modem to read & upload the meter data.
 - 22.3 Provision to generate reports of successful automatic meter reading (AMR) Calls and unsuccessful AMR calls separately shall be provided.
 - 22.4 Provision for flexible scheduling of meter reading by AMR software automatically on a pre-defined hourly, daily, weekly or monthly basis.
 - 22.5 Provision shall be made to read the groups of energy meters in one go from the AMR software and the searchable by Meter number, or as a separate group.
 - 23.0 Conditions:**
 - 23.1 The Specifications mentioned above are only indicative and should comply all SRS requirements.
 - 23.2 The modem should withstand all the surges which do happen normally in the network.
 - 23.3 The vendor should retrieve the data from the modem and push the same to MDA server as required by BESCOM.
 - 23.4 The vendor is sole responsible in case modems get burnt and shall replace the same at his cost in the guarantee period of **FIVE years** from the date of commissioning the modems after successful data collection.
 - 23.5 Shall maintain adequate man power to maintain all the modems in healthy condition throughout the contract period
 - 23.6 The bidder shall enter in to an agreement with service provider for flow of smooth data from the modem to High End Server (HES) throughout the contract period.
 - 23.7 Vendor should be responsible for security, privacy of data in all forms (i.e. in modem, MDAS, Communication State and any other place device/vendor is involved with data)