

## 1.2 SALIENT FEATURES OF SEMs

### Special Energy Meters

The meters are of 0.2S accuracy class and are specially designed for Frequency Linked Tariff Metering scheme for Inter Utility Exchanges at Grid level.

### Salient features :

- Static type – Totally Electronic
- Compliant with IEC 687 / IEC-62053-22:2003 standard
- Better accuracy (0.2S class)
- Composite meter capable of measuring Active and Reactive Energy in all 4 quadrants
- 3 phase-4 wire measurement
- Direct measurement as per CT/PT secondary quantities
- Filters harmonics and measure energy at fundamental frequencies.
- Operates on self power from connected PT supply (110V Ph to Ph/ 63.51 V Ph-N)
- Different Current ratings suiting to CT secondary [ex. 1 Amp (A-type meter) or 5 Amp (B type Meter)]
- VA burden not more than 10 on any of the phases
- Works on Real Time Clock (RTC) hence data is time stamped.
- Time adjustment facility ( in steps of 1 min in a week )
- No calibration required due to absence of moving parts.
- Calibration possible only at Manufacturers' works
- High security of data storage

### Criteria for location of SEMs

Main Meters: Those SEMs primarily used for Energy Accounting / Billing

Check Meters: Those SEMs connected to the same CT/PT as the Main meter. They are used for Energy Accounting / Billing in case of Discrepancy in reading of Main Meter.

Standby Meters: These SEMs are used for Energy Accounting in case of Discrepancy in reading of Main meter as well as Check Meter. These are connected to other set of CT/PTs as that of the Main Meter.

Sl. No.	Description	Main Meters	Check Meters	Standby Meters
1.	Injection of NTPC Generating Stations	Outgoing Feeders	Outgoing Feeders	GTs and TTs
2.	Injection of Other Generating Stations	GTs and SUTs	GTs and SUTs	Outgoing Feeders
3	Drawl by a Beneficiary at CTU Substations	HV side of ICTs	None	LV and Tertiary side of ICT (if tapped)
4	Drawl by a Beneficiary on a State owned inter-State line	Respective end.	None	Other end
5.	400 kV CTU Lines	None	None	One end of the Line

The above details are only indicative and may vary depending on the prevalent scheme and availability of CTs/PTs at a particular station. However, the Regulations published on 17<sup>th</sup> March 2006 by CEA for regulating the Installation and Operation of Meters specify the location of meters (item 7) as follows:

Quote:

“The location of interface meters, consumer meters and energy accounting and audit meters shall be as per the Table given below:

Provided that the generating companies or licensees may install meters at additional locations in their systems depending upon the requirement.

**TABLE**

Sl. No	Stages	Main Meter	Check Meter	Standby Meter
A.	<b>Generating Station</b>	On all outgoing feeders	On all outgoing feeders	(i) High Voltage (HV) side of Generator Transformers (ii) High Voltage (HV) side of all Station Auxiliary Transformers
Explanation: The location of main, check and standby meters installed at the existing generating stations shall not be changed unless permitted by the Authority/				

B.	<b>Transmission and Distribution System</b>	At one end of the line between the substations of the same licensee, and both ends of the line between substations of two different licensees. Meters at both ends shall be considered as main meters for respective licensees.		There shall be no separate standby meter. Meter installed at other end of the line in case of two different licensees shall work as standby meter.
C.	<b>Inter-Connecting Transformer (ICT)</b>	High Voltage (HV) side of ICT		Low Voltage (LV) side of ICT
D.	Consumer directly connected to the Inter-State Transmission System or Intra-State Transmission System who have to be covered under ABT and have been permitted open access by the Appropriate Commission or Any other system not covered above.	As decided by the Appropriate Commission.		

Unquote

**Sign convention of Active and Reactive energy recorded**

(i) For SEMs on all locations except GTs at Generating station.

When energy (active/reactive) flows **out of the bus** to which the SEM is connected, the energy is recorded with a '+' sign and vice versa.

(ii) For SEMs on GTs at Generating Stations

When energy (active/reactive) flows **into the bus** to which the SEM is connected, the energy is recorded with a '+' sign and vice versa.

Accordingly the values in the cumulative registers for active energy and reactive energy keep incrementing when the net energy for a particular time period recorded is '+ve' and decrementing when it is '-ve'. For example if the initial value of these registers is 00000.0 (say) and the net energy in a block is 25.0 (say), the cumulative value of the register increments to 00025.0. Once the value reaches 99999.9, the same will get reset to 00000.0

### **Details of Data recorded :**

- No multiplication Factor is incorporated in the Meter. Hence data in Secondary side (Wh) is recorded.
- Meter can be interchanged from one location to another irrespective of their CT/PT ratios
- To get data on Primary side in MWh, the secondary side data in Wh is to be multiplied by the connected CT/PT ratio.
- Stores the following data for previous 9 days and the current day period (in case of SMLOLD meters) and previous 10 days and current day period (in case of SMLNEW and L&T meters).

### **Data recorded in every Block :**

- Net Active Energy in 15 min. Time blocks (Wh)
- Average frequency in 15 min. Time block

(records frequency in the band of  $49\text{Hz} < f < 51.00\text{Hz}$  in steps of  $0.02\text{Hz}$  in a coded form as integer from 00 to 99)

$$FC = (f-49)*50$$

where FC means Frequency Code

f means Frequency

- Voltage failure flag. ( a \* mark is recorded if Avg. Voltage in the three phases falls below 70%)
- Time Correction flag ( 'aa' if time is advanced and 'rr' if time is retarded).

### **Data recorded once in a day at 00:00 hrs :**

- (1) Sl. No. Of meter
- (2) Cumulative active energy register – C
- (3) High voltage reactive energy register – H
- (4) Low voltage reactive energy register – L
- (5) Date

### **Details of Data appearing on the LED display on the front of the SEM**

On pressing a push button the following are seen in a cyclic manner:

- (i) LED check
- (ii) Meter Serial no.
- (iii) Date
- (iv) Time
- (v) Active Energy in previous 15 min. Block (Wh)
- (vi) Average Frequency in previous 15 min. Block (Hz.)
- (vii) Cumulative active energy register – C (Wh)
- (viii) High Voltage Reactive Energy Register – H (Varh)
- (ix) Low voltage Reactive Energy Register – L (Varh)
- (x) Instantaneous average voltage of the 3 ph. – U (%)
- (xi) Instantaneous reactive power – r (Var)