USAID
FROM THE AMERICAN PEOPLE

विद्युत क्षेत्रीय कौशल परिषद
Power Sector Skill Council

Training of Trainers (TOT) and Training of Assessors (TOA) on Smart Energy Meter Technician Job Role

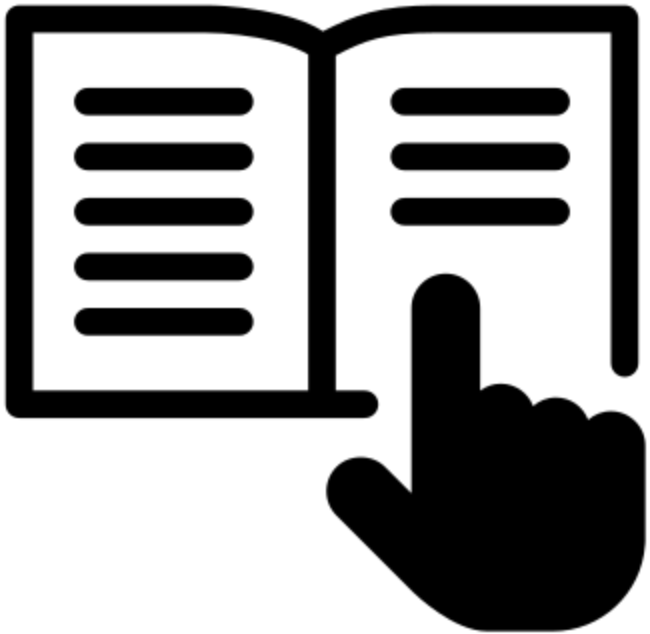
South Asia Regional Energy Partnership (SAREP)

12th January 2023

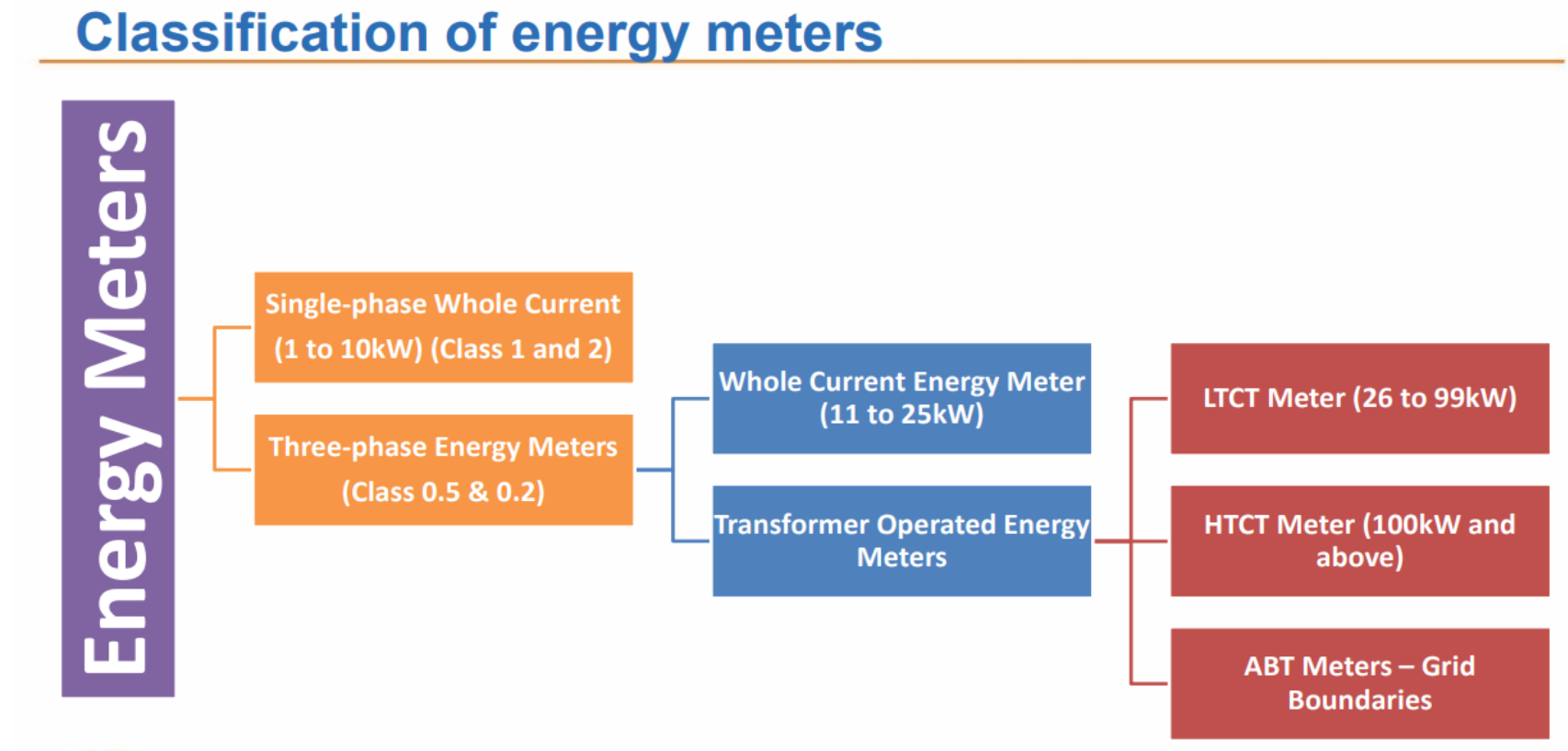
Agenda

Session	Topics Covered
Session I	• Introduction to smart grid and smart meter • Types of meters and its components • Basic of communication technologies and networking for smart meter • Consumer engagement
Break	
Session II	• Key meter specifications • Smart meter functional requirements • Quality check parameters- specifications and testing requirements • Power consumption check parameters- display parameters • General safety and care of smart energy meters
Break	
Session III	• Site selection for consumer meter installation • Identification of different ports used in the installation of smart meters • Pre-installation activities workflow • Installation activities workflow • Post-installation activities workflow
Break	
Session IV	• Compliance with standards and regulations • Power Consumption check, tampering and removing • Operation and maintenance of smart meters

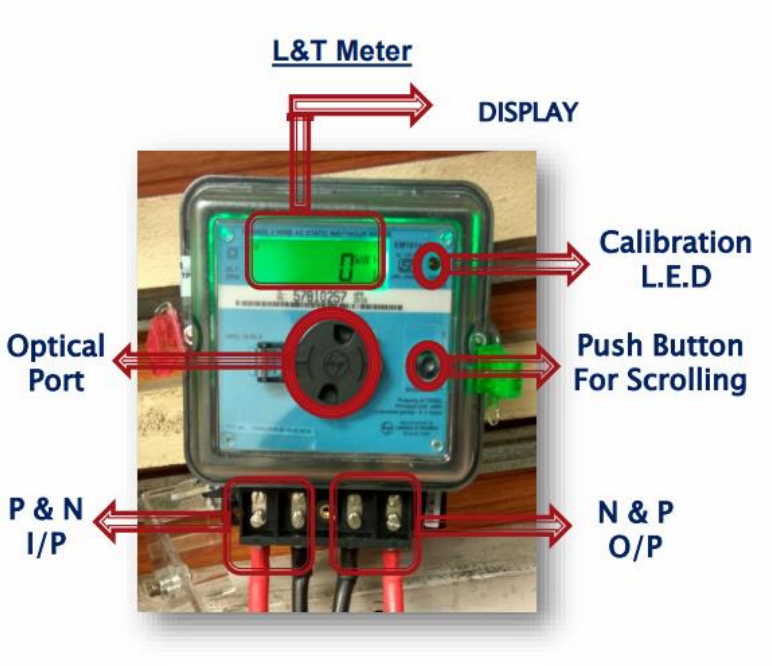
SESSION 1



Types of Meters: Single Phase Meter, Three Phase Meter, CT Meter and HT Meters.



Single phase meter



Landis + Gyr Meter

Genus Meter

Secure Meter

Three phase meter

Whole Current Meter

3-Ph,4 wire
3X230V
(20-100A)

LTCT Meter

3-Ph,4 wire
3X230V
(100/5A)
(200/5A)
(400/5A

HTCT Meter

3-Ph,4 wire
11 kV/110 V, -/5A

What does a static meter lack ?

Data Logging

- Billing, Load Survey, Daily Survey
- Tamper Logging

Demand Calculation

TOU wise logging

Communication

- Local
- Remote communication (through modem)

Transactions

LCD Display

Reading Accuracy (Manual errors)

Slow Billing Cycle (Manual activity)

Two-way communication

Outage Control – Remote connect/ dis-connect

Real-time tamper detection

Reprogrammability – ToD, display parameters, data profiles etc.

Billing Mode Change – Postpaid/ Pre-paid

Energy Calculation Mode Change – Import/ Import-Export (Net)

Introduction to smart meter

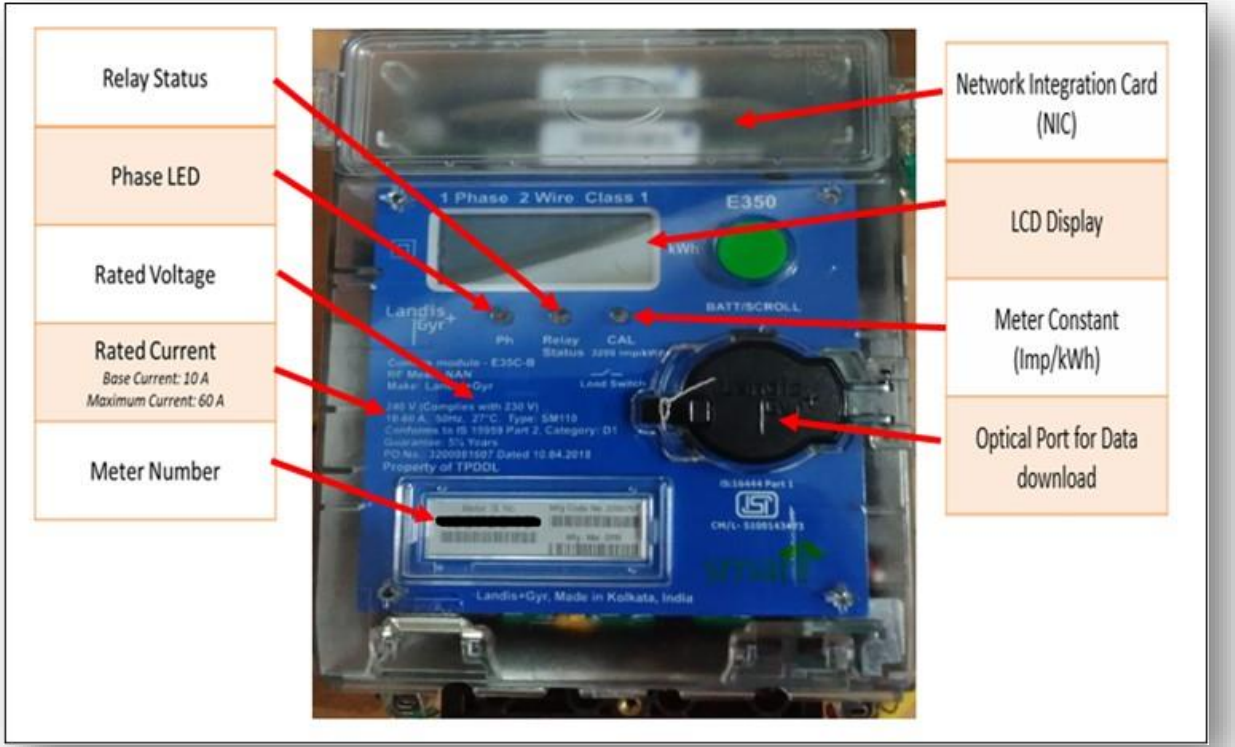
- Smart meter is an electronic device that records information such as consumption of electric energy, voltage levels, current, and power factor
- Smart meters communicate information to stakeholders for better consumption behavior, system monitoring & consumer billing
- Smart meters enables near real time energy recording and ***two-way communications*** between central system & meters.
- Smart Meters communicate via wireless, or via fixed wired connections such as power line carrier (PLC)

SMART METER

Source: L&T

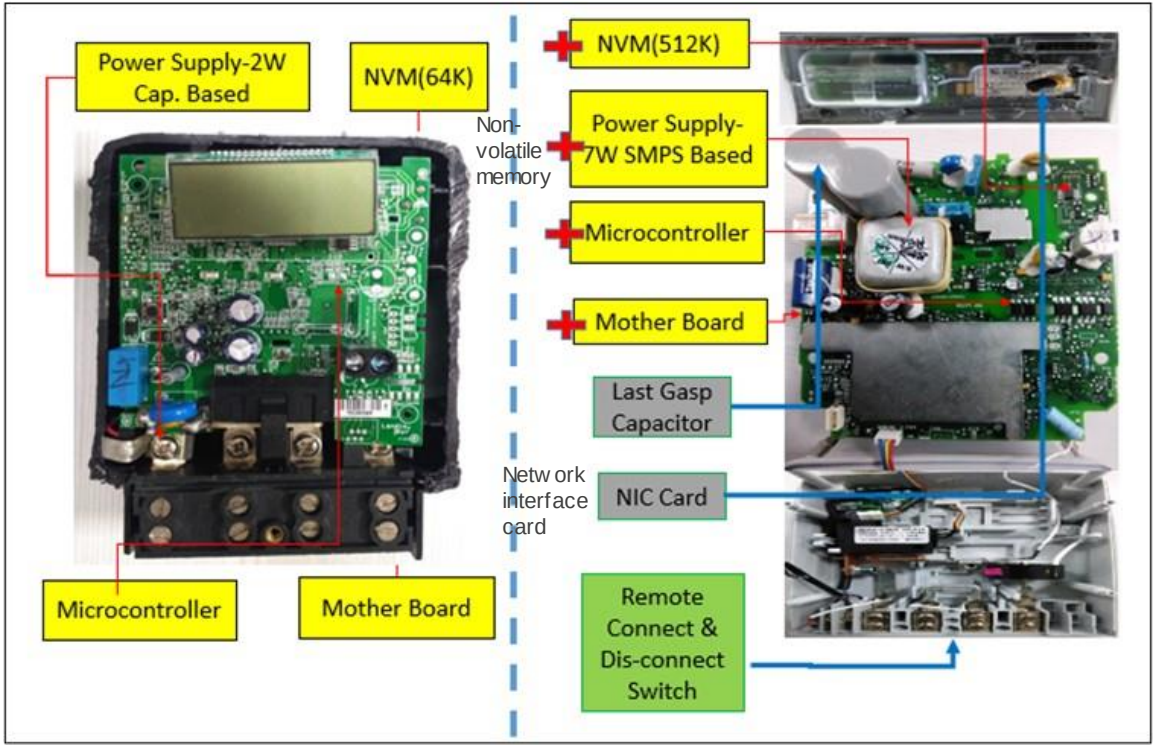
- **Objective of smart meter installation:**
  - Ensuring systematic energy management with the active participation of consumer by coordinating with the utility companies.
  - Enhancing the stability and reliability of power systems using AMI technologies.
  - Better outage management, remote monitoring and control of power losses and accurate billing

Name plate (smart meter)



Source: Tata Power- DDL

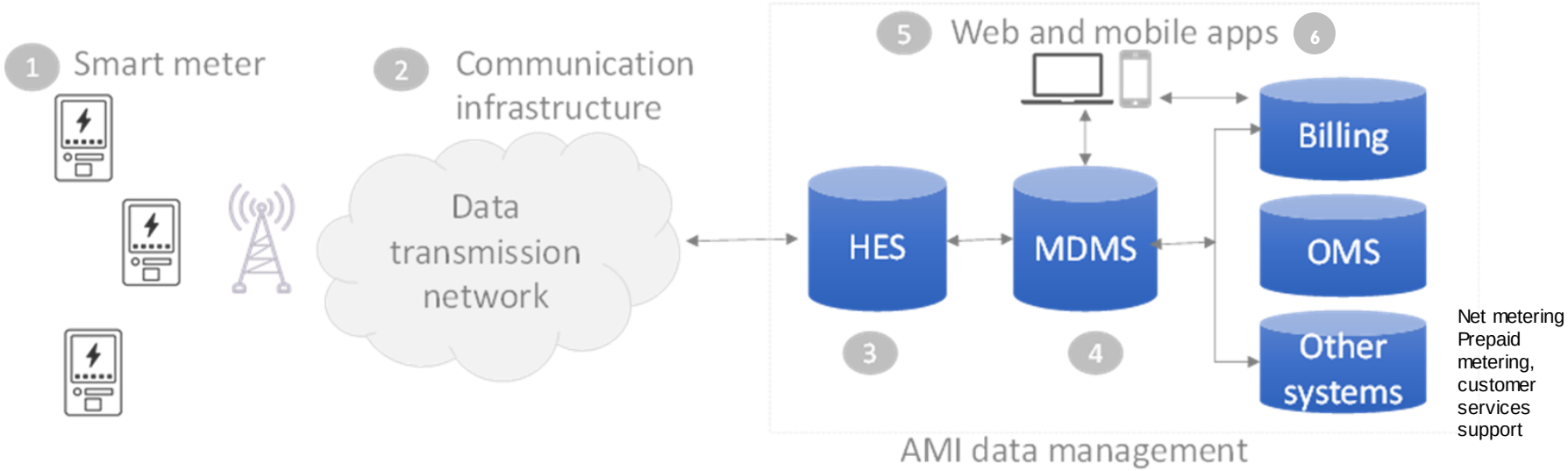
Block diagram (smart meter)



Source: Tata Power- DDL

Smart meter infrastructure components

1. Smart meters
2. Communication infrastructure
3. Head End System (HES)
4. Meter Data Management System (MDMS)
5. Web application with updated on-line data of consumers etc.
6. Mobile App



Smart meter infrastructure components

- **Smart Meters:** Single Phase & Three Phase whole current smart meters to be installed – Compliant with standards notified by CEA or other relevant authority.

- **Communication Infrastructure**: The communication network provides reliable medium for two-way communication between various nodes (smart meter) & HES.

- **Head End Systems (HES):** Helps in acquiring meter data automatically avoiding any human intervention and monitor parameters acquired from meters.

- **Meter Data Management System (MDMS):** Single storehouse of meter-related data (billing, settlement, demand forecasting, and so on) that can gather data from multiple head-end systems and make this available to multiple applications like billing, consumer Information system, customer care, reporting, network planning & analysis, load analysis/forecasting, outage management etc.

- **Web application:** It makes the data collected in the MDM system available to whoever needs it – the customer, the utility, etc. Provides the consumer near real time online views of both usage and cost and helping consumers to understand electricity usage and cost information, alerts and notifications and energy savings tips with different levels of detail.

- **Mobile app:** Enables the consumer to log in through android / iOS / Window based mobile app to see information related to his energy consumption, etc. and also provides a platform for implementation of peak load management functionality by providing existing tariff & incentives rates, participation options etc. to the consumers.

Advantages of smart meters to consumers

- Need for estimated bills, which are a major source of complaints from consumers, is eliminated.
- More accurate and timelier billing by the utilities.
- Information availability empower consumer to become energy savvy and make smarter decisions about their energy usage.
- Greater control over electricity use coupled with time-based rates which enable savings for the consumers.
- Provides real time alerts to consumers in case of violation of threshold values for factors like Power Factor and contract demand and, Load and also provides information about the Time of Use (TOU) blocks.
- Increases privacy as the periodic electricity usage information can be relayed automatically to the utility for billing purposes without requirement of on-site visits by a utility personnel.
- Enables consumer to switch between conventional to RE / battery based on the prevailing tariff.
- Measure electricity generated from domestic microgeneration, enabling the consumers who consume power from the utility as well as generate power for sell to the utility – Financial benefit

Advantages of smart meters to the utilities

- Meter reading cost reduces significantly
- Timely billing will improve the revenue management of utilities
- Cost to service customers will reduce with increased customer self-service.
- Enable system faults to be notified and located more quickly following power cuts and interruptions resulting in faster resolution of faults
- Better understanding of the power grid needs which will facilitate in optimizing infrastructure investments & energy procurement costs
- Better load management during peak load times & more efficient use of grid resources
- Improve the ability to deploy advance tariff regime & other demand side management initiatives
- Aid in energy accounting for better calculation of distribution losses
- Revenue Protection (Tamper) monitoring.

Prepaid meters

- **How prepaid meters are different from other meters**
  - Prepaid meters communicate directly with the utility and communicate the consumption details and hence it eliminates the requirement of manual meter readings.
  - Prepaid Meters helps the consumer by avoiding unexpected bills & consumers have better control over their energy usage and their budgets allocated for it.
  - Tariff rate and slab updating from IT back end system.
  - Manpower saving in coupon insertion.

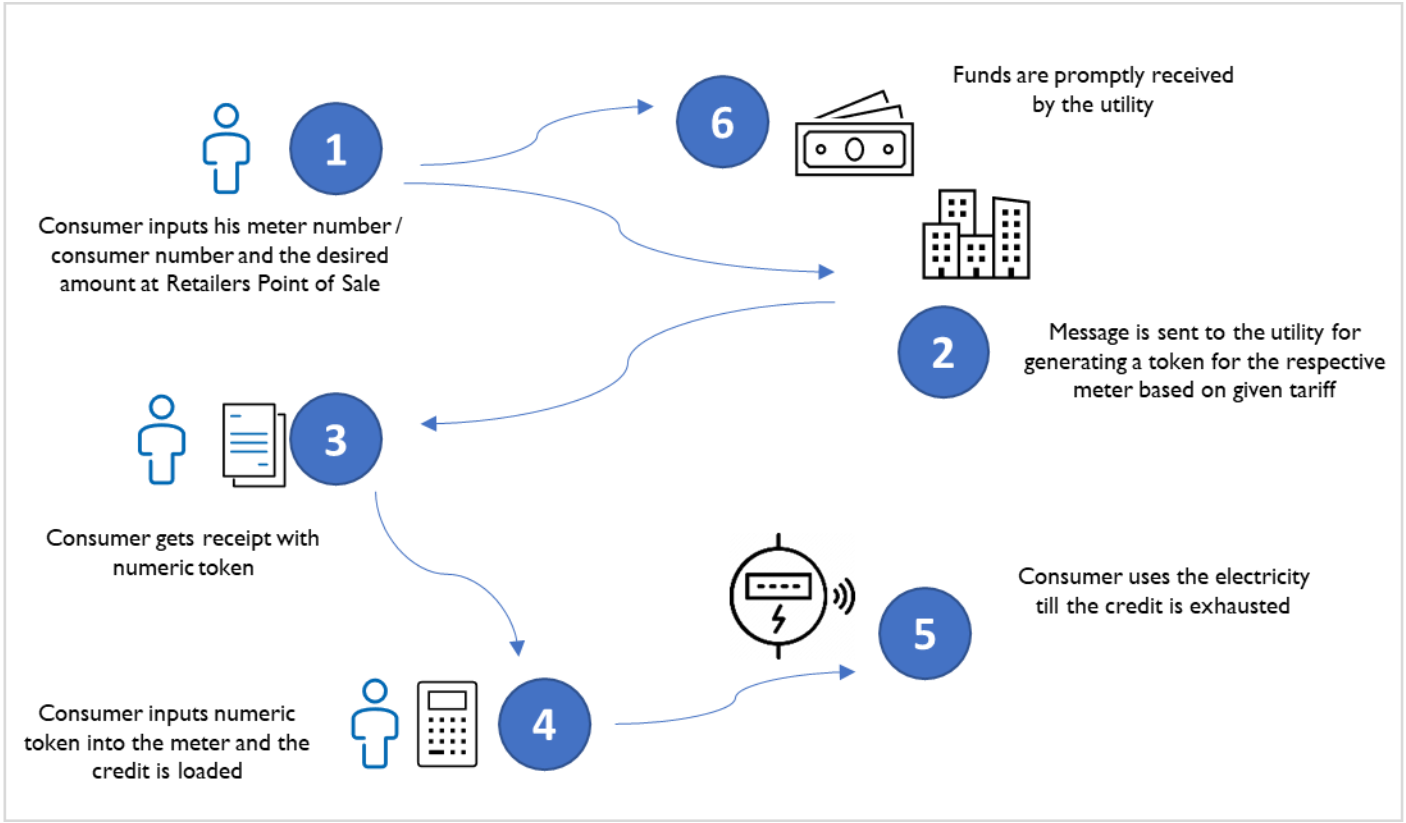
- **How do prepaid meters work?**
  - They work on electricity tokens or vouchers that are purchased by the consumer from a vending outlet which are loaded onto smart meters
  - The loading of electricity token is done by using the voucher pin using the meters pad
  - Voucher is valid till the credited kWh is exhausted or topped up. Once the credit is used up the supply is stopped
  - There are also online mobile recharge options available

Benefits of prepaid meters

- **Benefits to End Customer**
  - Flexibility to preplan the budget required for paying utility bills.
  - Consumers do not have to pay any fixed charges irrespective of the consumption in case of prepaid metering options. Ideal for consumers who use the electricity intermittently.
  - No additional charges are imposed on the customer upon reconnect.
  - Customers do not need to pay security deposit to avail the services.
  - Improved customer service with the control left to the customer.
  - Ease of recharge through various options identified by the utilities – ***similar to mobile recharge.***

- **Benefits to Utility**
  - No issues related to payment defaults by consumers
  - Reduced paperwork as the consumers are not required to be billed manually. Also leads to reduction in cost of meter reading
  - Encourages consumer for better management of energy consumption.
  - Upfront collection helps in reducing working capital requirements
  - Enhancement in call center efficiency on account of reduced customer complaints.

Illustrative process for recharging of prepaid meters



Key milestones – GOI initiatives

2013

- Smart meter standards published by BIS

2016

- National Tariff Policy 2016 mandated installation of smart meters where average monthly consumption is greater than 200 units by Dec 2019
- Functional Requirements of Advanced Metering Infrastructure (AMI) in India published by the Central Electricity Authority

2018

- Guidelines for communication system of Smart Meters PLC, RF, Cellular Network (3G/4G) issued by CEA

2020

- Technical Specifications of Single Phase and Three Phase Whole Current Smart Meters issued by CEA
- Amendments to smart meter standards released by BIS
- Govt. of India launched the Smart Meter National Program (SMNP) which aims to replace 25 crore conventional meters with smart meters

2021

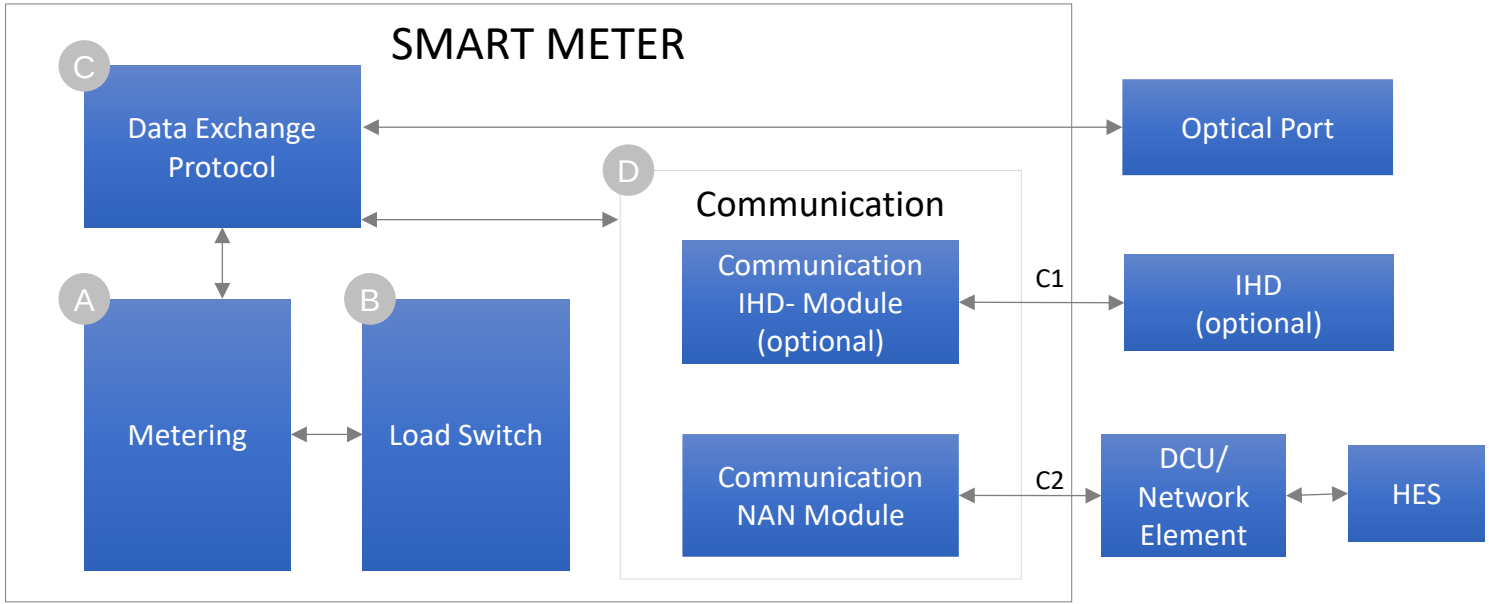
- Launch of RDSS schemes by Govt. of India which support smart metering related initiatives.
- Notification issued by Ministry of Power notifying the timelines for the replacement of existing meters with smart meters with prepayment feature

Smart meter architecture

- Smart meter comprises of 4 functional zones:
  - Metering
  - Load Switch
  - Metering Protocol
  - Communication modules
- Smart meters have a wide usage and desired features that enables it to meet the objective of the overall system and Site conditions

- Smart Meter has two variants
  - Variant 1 that uses Neighbourhood Area Network (NAN) module for communication
  - Variant 2 that uses Wide Area Network (WAN) module for communication

Smart Meter - Variant I



A: Metrology; B: Load switch for control; C: Data exchange and metering protocol *Source: BIS 16 444*

LEGEND

A – Metrology

B – Load switch for control

C – Metering protocol

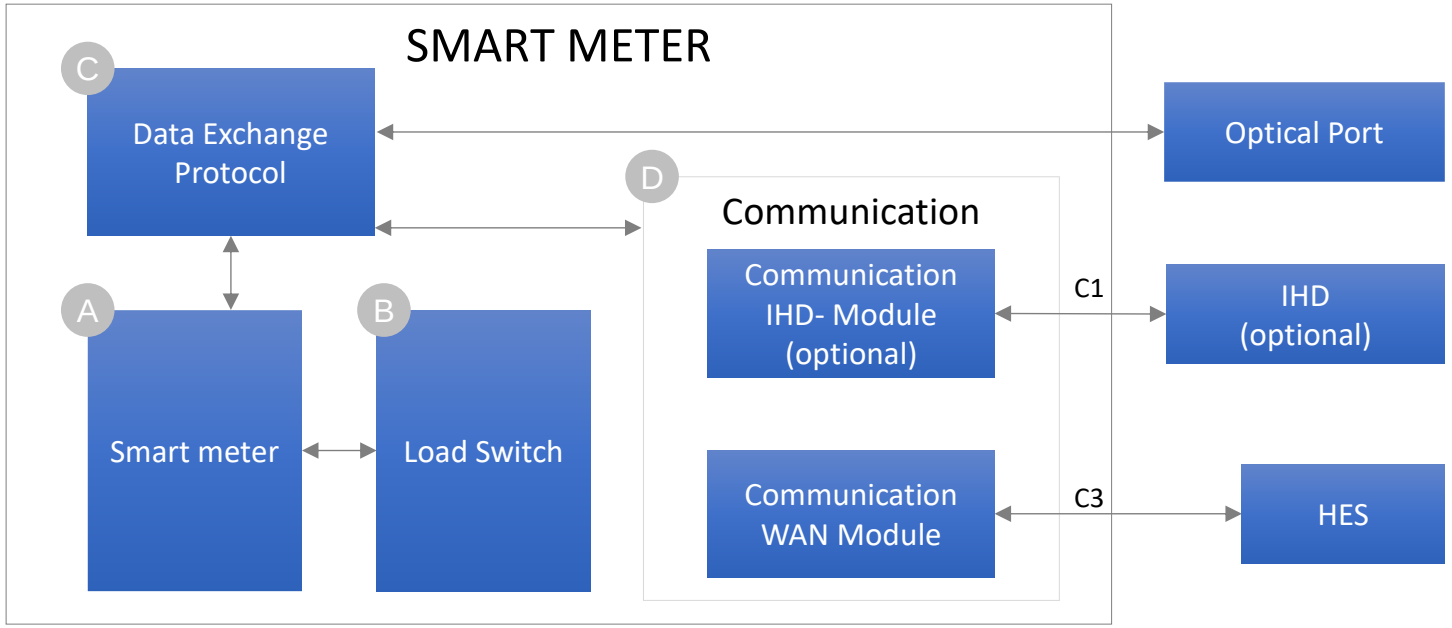
D – Communication

Optical port — As per IS 15959 (Part 2)

C1 – IHD Connectivity SM ↔ IHD (optional)

C2 – NAN Connectivity SM ↔ DCU

Smart Meter - Variant 2



A: Metrology; B: Load switch for control; C: Data exchange and metering protocol *Source: BIS 16 444*

LEGEND

A – Metrology

B – Load switch for control

C – Metering protocol

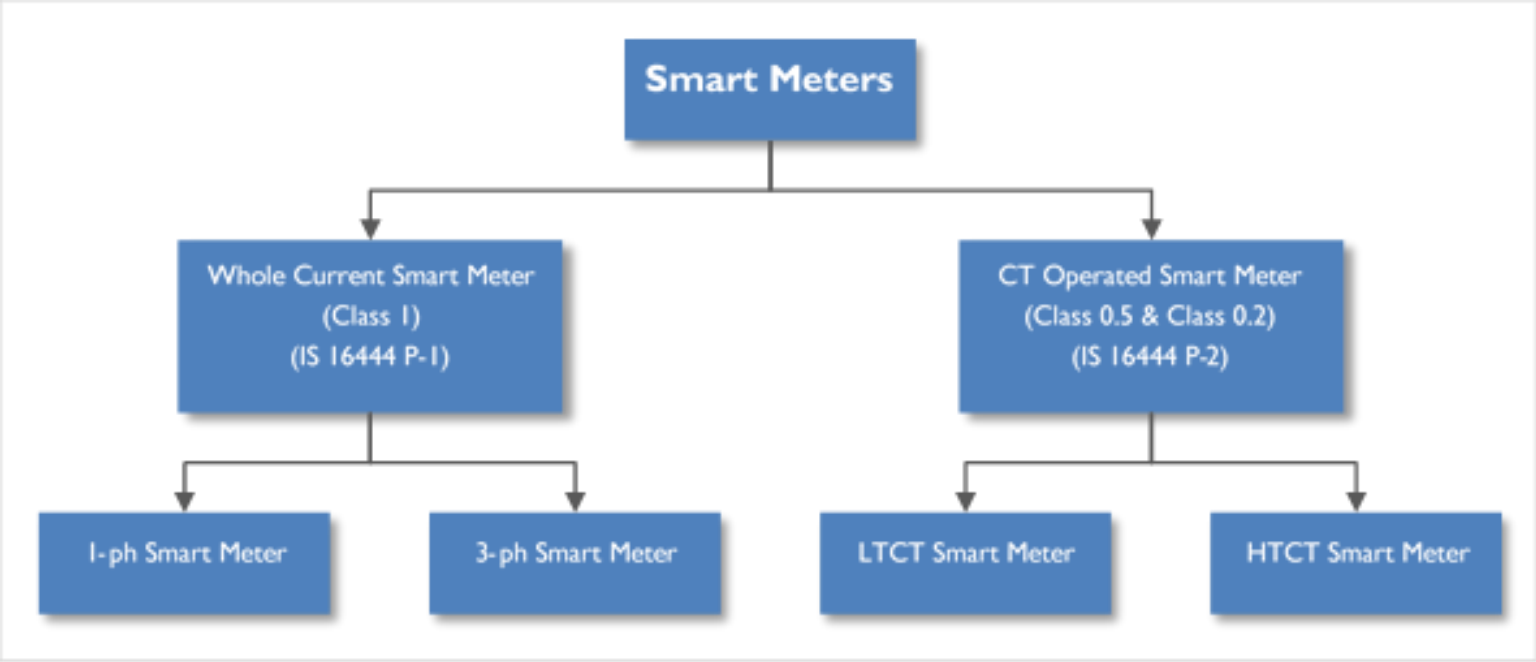
D – Communication

Optical port — As per IS 15959 (Part 2)

C1 – IHD Connectivity SM ↔ IHD (optional)

C2 – WAN Connectivity SM ↔ HES

Type of smart meters

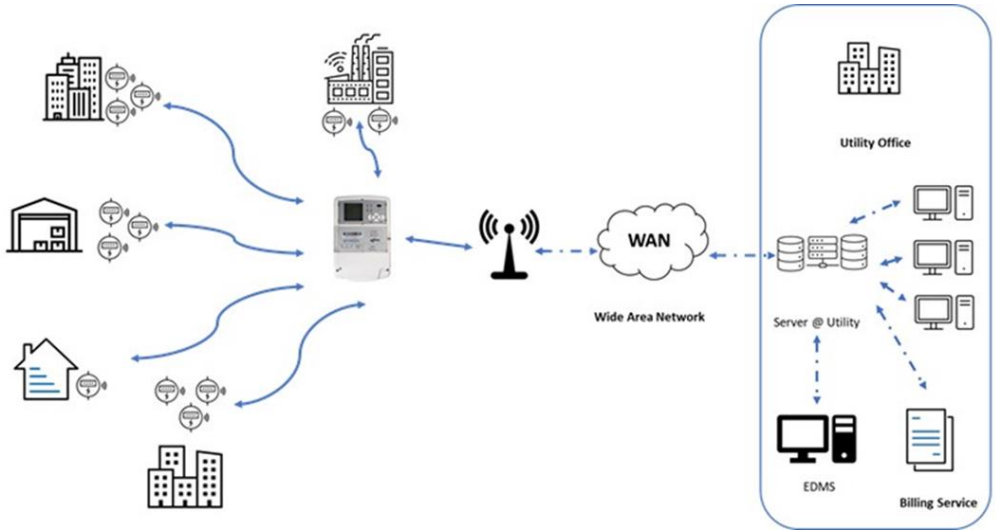


Basics of communication technologies

1. General Packet Radio Service (GPRS)
2. RF Mesh Communication
3. NB-IOT Technology
4. Powe Line Communication (PLC)
5. Zigbee

General Packet Radio Service (GPRS)

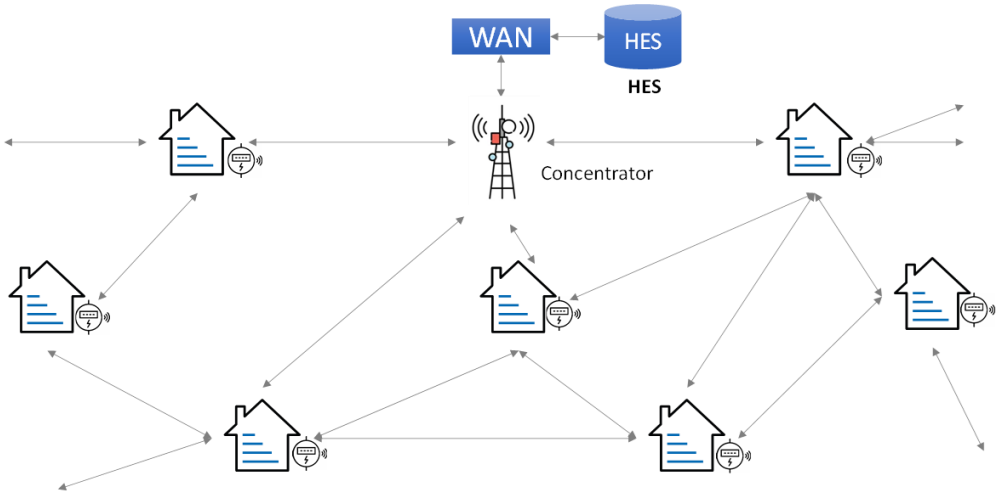
- GPRS uses packets of data rather than circuit data which is much more efficient use of the available capacity
- As a wireless network it has a great reach to small towns and villages
- Many countries have used 3G technology to implement Smart metering successfully
- It is the most suitable technology to use on account of its widespread existing network
- There may be data delay/loss in remote area/villages where network strength is poor



- there are advancements from 3G to 4G and from 4G to 5 G etc.
  - This impacts the maintenance of communication modems and chips
  - Lead to increase in rental charges which may increase the overall operational budget of utilities

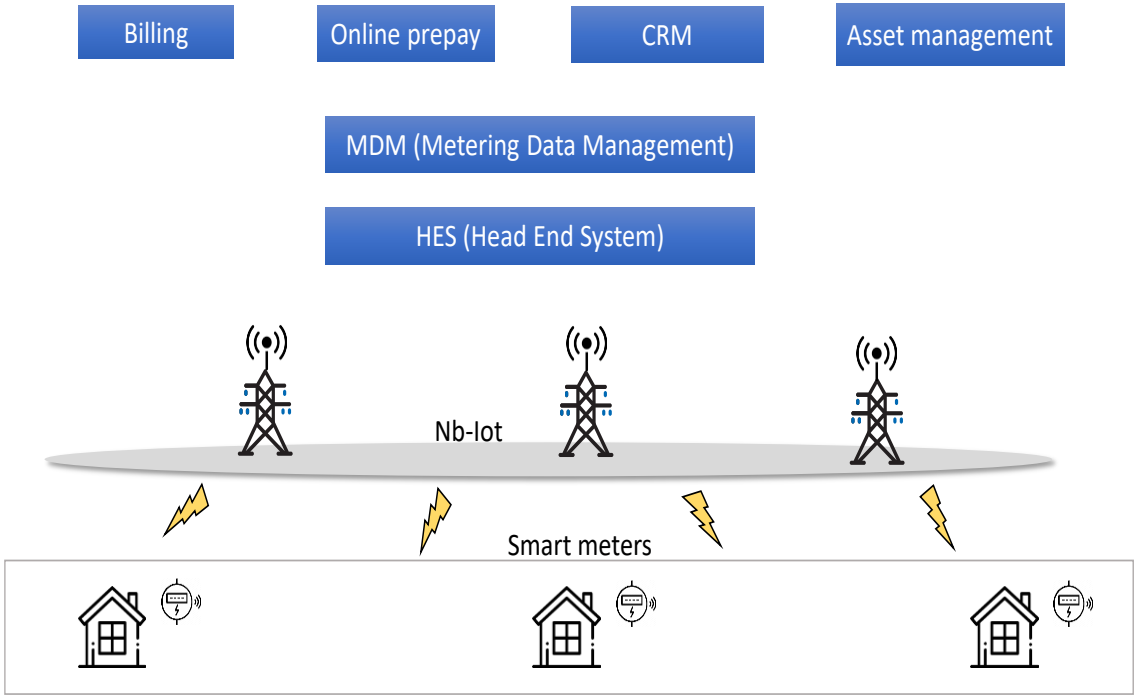
RF mesh communications

- Radio frequency (RF) is the communication technology whose frequencies lies in the range extending from around 20 kHz to 300 GHz; typically, these are used in radio communications.
- In India, following are the free band as notified by department of the telecommunication.
  - Frequency Band: 865-867 MHz
  - Use: Low power RFID equipment
  - Equipment Power: Maximum transmitter output power of 1 Watt (4 Watts Effective Radiated Power) Carrier Bandwidth: 200 KHz.



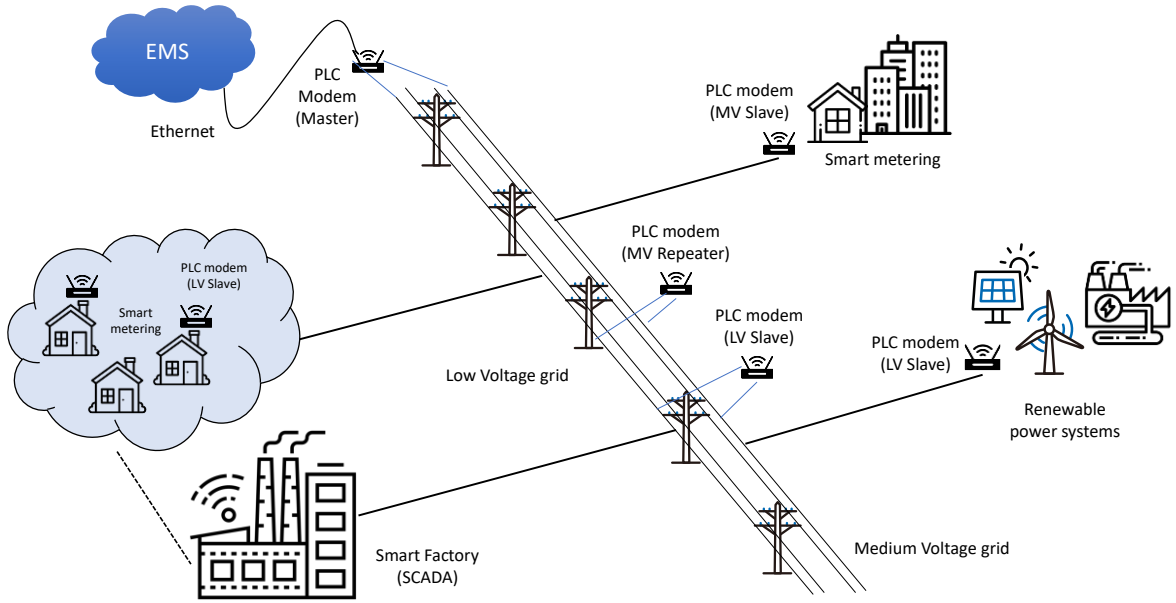
NB-IOT technology

- Narrowband (NB) – Internet of Things (IoT) is a new technology that is both 4G and 5G compatible offering a dedicated channel for the smart metering and avoiding any reduction in performance from interference or obstruction due to congestion on the public network.



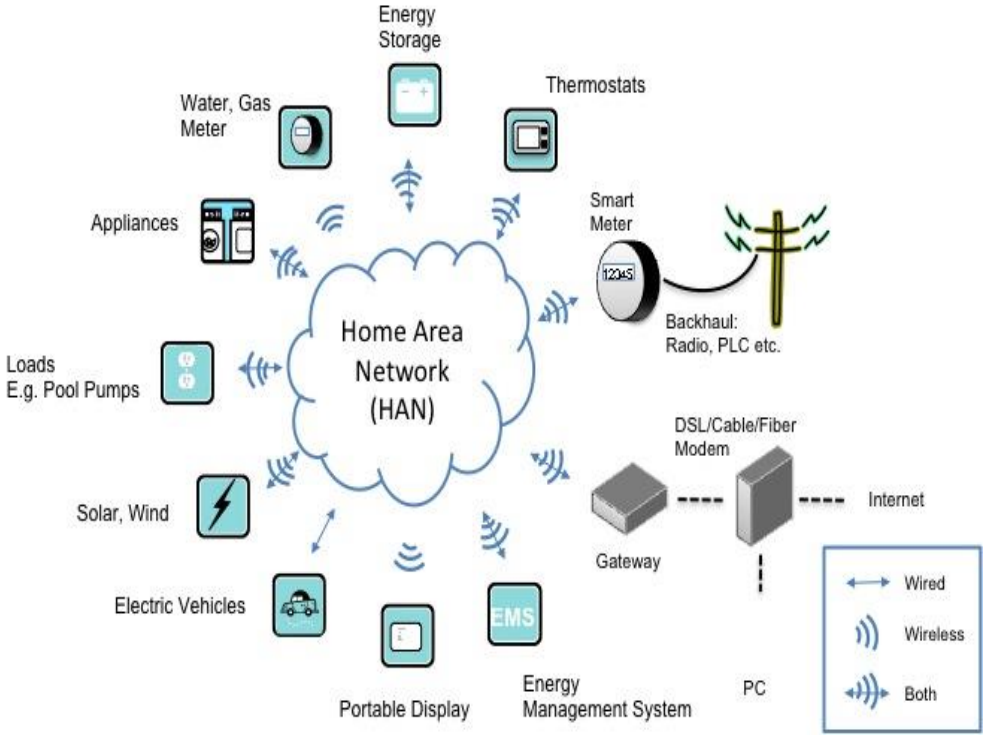
Power line communications

- Power-line communication (PLC) is a communication technology that carries data across the same power line that's used to deliver electricity.
- The major advantage of PLC is that it's effectively free
- Some limitations of the technology are:
  - Slower data transfer
  - Interruption on operation of switches, disconnections in Electrical system
  - Distortion of signals during passing through power transformers, inductors etc.



Zigbee

- Zigbee is a low-power wireless mesh network standard targeted at battery-powered devices in wireless control and monitoring applications.
- Generally used for two-way communication between sensors and control system.
- Its network is easily scalable
- Some limitations of the technology are:
  - Slower data transfer
  - Works in short range – 10 to 100 meters.



Know your stakeholders

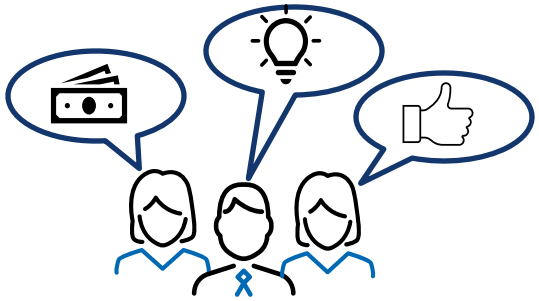
- It is crucial for utilities to map out their stakeholders for a successful communication strategy for smart meters. Some key Stakeholders include:
  - Consumer
  - Media
  - Smart meter Vendors
  - Utility Personnel
  - Meter Installers
  - Local Bodies
- Knowing the audience category helps streamline engagement activities as it helps
  - formulate the most relevant message that can be relayed
  - through the most suitable medium for the target group.
- Since Installer/technician will be the utility consumer's first point of contact. Therefore, the utilities should understand their technicians' skill sets. These would include:
  - If the meter installer understands the technology him/herself
  - Can the person demonstrate smart-meter use lucidly
  - Awareness of public etiquettes
  - Does she/he know the language that consumer is most comfortable with
- Background information on stakeholders forms a solid foundation for planning the most suitable and effective consumer engagement activities.

Importance of consumer engagement

- The success of smart meter implementation process rests upon consumer engagement and willingness.

- Technology will give more control to the consumer to monitor consumption and billing
  - Imperative for utilities to encourage consumer participation by engaging with them more.

- Instances of resistance to smart meters have been recorded even in some developed countries due to consumer ignorance
  - Clear messaging, which is easy to understand, is a prerequisite for customer engagement and the smooth rollout of smart meters

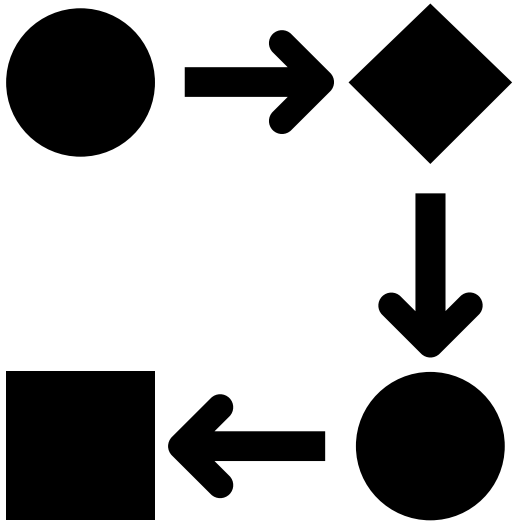


Consumer engagement strategies

Meter Installation

- Call the customer in advance and fix a convenient time to visit
- Explain the benefits of smart meter and raise awareness levels
- Assure the user that there are no hidden costs
- Reach on time, promptly display identity card and introduce yourself
- Carry an information brochure to share with the consumer
- Be polite and patient, as the consumer may have many doubts
- Demonstrate the use of the smart meter to the customer and guide them in taking the first reading
- Educate the customer about cyber security best practices
- Rectify faults on site and make the user aware of it
- Clean up and sanitize area of work
- Intimate customers attention to customer care numbers on the brochure and encourage them to download the utility's mobile app
- Fix another time for a visit and resume power supply through old meter, in case work cannot be finished due to some reason/faults

SESSION II
Meter Installation and Commissioning- Part I



Key specifications of 1-ph whole current meters

Description	Requirement
Type of Meter	AC whole current, single phase, 2 wires Smart Energy Meter with bidirectional communication facility & remote connect / disconnect switch
Rated Current	For Single Phase, Ib (Imax) A= 5(30)A or 10(60)A Withstands 120% Imax
Starting Current	0.2% Ib Connection through current transformer
Reference Voltage	240 V
Frequency	50 +/- 5%
Load contactor	Latching relay (optional)
Display	LCD
LED Indicator	Needed (ex. line, tamper, export, kWh etc.)
Communication port/method	GSM/Wi-Fi or PSTN, GSM, or GPRS, Radio, Zigbee,
Communication protocol	DLMS, COSEM

Key specifications of 3-ph whole current meters

Description	Requirement
Type of Meter	AC whole current 3 phase 4 wires Smart Energy Meter with bidirectional communication facility suitable for Advanced Metering Infrastructure (AMI) with connect/disconnect switch.
Rated Current	For Three Phase, Ib (Imax) A= 50(60)A Withstands 120% Imax
Starting Current	0.2% Ib Connection through current transformer.
Reference Voltage	240 V between line and neutral
Frequency	50 +/- 5%
Load contactor	Latching relay (optional)
Display	LCD
LED Indicator	Needed (ex. line, tamper, export, kWh etc.)
Communication port/method	GSM/Wi-Fi or PSTN, GSM, or GPRS, Radio, Zigbee,
Communication protocol	DLMS, COSEM

Data display facility – (i) auto scroll

Single Phase	Three Phase
• Display Check • Date and Time • Last Recharge Amount • Last Recharge Time • Current Balance Amount • Current Balance Time • Cumulative Active Energy kWh with legend. • Current calendar month MD in kW with legend. • Instantaneous voltage • Instantaneous Phase current • Instantaneous Load kW • Instantaneous average Power Factor	• Display Check • Date and Time • Cumulative Active Energy kWh with legend. • Cumulative Active Energy kVAh with legend. • Current month MD in kW with legend. • Current month average Power Factor • Instantaneous voltage VRN • Instantaneous voltage VYN • Instantaneous voltage VBN • Instantaneous current IR • Instantaneous current IY • Instantaneous current IB • Instantaneous current IN • Instantaneous Load kW and kVA • Instantaneous average Power Factor

- These parameters should be displayed on the LCD/LED continuously for a period of 10 seconds on Auto scroll.

Data display facility – (ii) scroll with push button

Single Phase	Three Phase
• Internal diagnostics (display check) • Meter Serial No. • Last month cumulative kWh with legends • Last month MD in kW with legends • Current month Average Power Factor • Last month Average Power Factor	• Internal diagnostics (display check) • Meter Serial No • Cumulative Energy in kVArh Lag/ Lead with legend • Cumulative Active Energy kWh ToD wise with legends. • Cumulative Active Energy kVAh ToD wise with legends. • Current month MD in kVAh with legends • Last month cumulative kWh with legends • Last month cumulative kVAh with legends • Last month MD in kW with legends • Last month Average Power Factor

- All Parameters mentioned under Auto-Scroll mode should be displayed
- the meter should display High resolution energy values with resolution of 3 digits before decimal and 2 digits after decimal in push button mode
- The meter's display should return to default display mode if push button is not operated for more than 10 seconds
- Meter display should not go in to sleep mode during Power-On condition

Display parameter of smart meters

Display Seq.	Display Parameter	HPL Smart Meter	Schneider Smart Meter
1	LCD Check		
2	Meter Sr. No.		
3	TAMPER*/OK		
4	Date		
5	Time		
6	Cumulative kWh		
7	Cumulative kVAh		
8	TOD Cumulative kWh T1		
9	TOD Cumulative kWh T2		
10	TOD Cumulative kWh T3		
11	TOD Cumulative kVAh T1		
12	TOD Cumulative kVAh T2		
13	TOD Cumulative kVAh T3		
14	Current Month MD kW		
15	Current Month MD kVA		
16	Last Month (history1) kWh		

Display parameter of smart meters

Display Seq.	Display Parameter	HPL Smart Meter	Schneider Smart Meter
17	Last Month (history1) kVAh		
18	Last Month (history1) TOD Cumulative kWh T1		
19	Last Month (history1) TOD Cumulative kWh T2		
20	Last Month (history1) TOD Cumulative kWh T3		
21	Last Month (history1) TOD Cumulative kVAh T1		
22	Last Month (history1) TOD Cumulative kVAh T2		
23	Last Month (history1) TOD Cumulative kVAh T3		
24	Last Month (history1) MD kW		
25	Last Month (history1) MD kVA		
26	Phase Current		
27	Neutral Current		
28	Instantaneous Voltage		
29	Instantaneous Phase Load		
30	Instantaneous Neutral Load		
31	Status of Load Switch (connect or disconnect)		
32	Communication Status of Meter	**Not Available**	

Smart meter functional requirement

- **Disconnection Mechanism**
  - Over current (minimum 105% of Imax in any phase for predefined persistence time)
  - Load control limit (programmable and set by utility)
  - Pre-programmed event conditions (factory set)
  - Disconnect signal from utility control center
  - In case of pre-paid facility under defined/ agreed conditions.

- **Reconnection Mechanism (Local reconnection due to disconnection under over current and load control limit)**
  - The switch re-connection shall be decided by meter locally.
    - Meter will try to re-connect the load up to predefined time, with predefined interval (time and interval is programmable by utility). If the consumption is within limits meter shall remain in normal connect mode.
  - If the consumption is still more than the programmed limits, it will lock out and wait for 30 min (lock out period).
    - After this period the meter shall reconnect the load and if the consumption is still above the limit, the procedure as defined above in previous point shall be repeated with status update to HES.
  - In all conditions other than 'Over current and load control limit' reconnection will be done from HES.
    - In case of failure of communication with HES, reconnection shall be possible through optical port locally with specified secu rity.

Smart meter functional requirement

- Status of Load Switch
  - Indication of status of load switch (that is connected/ disconnected) is available on display as well as at HES.
  - All connections and disconnections are logged as events.
- Last Gasp
  - It is a notification sent from smart meter suggesting that it is not receiving electricity from mains.
- First Breath
  - It is a notification sent from smart meter that it now receiving electricity from the mains.

Quality check parameters for consumer energy meters

- Meter Body
- Terminal Cover
- Terminals, Terminal Block
- Sealing Of Smart Meter
- Immunity to external factors
- Standard functional requirement

Meter body

- Meter Body shall be made of unbreakable, high grade, fire retardant reinforced insulating material with an opaque body having minimum thickness of 2mm with an transparent cover.
- Meter Cover & base shall be provided with continuous and seamless ultrasonic welding / Chemical bonding such that meter base and cover can be opened only after breaking the seals.
- Unidirectional screws to be used on meter covers, however, it is highly preferred that the meter top cover & base shall be of single mold.

Meter Cover Box

Source: https://www.hplindia.com/

Terminal cover

- Terminal cover shall be of short type and shall be transparent
- Appropriate space shall be available for incoming /outgoing cables without damaging/stressing terminal cover (terminal cover design shall be as per the Purchaser approval).
- After sealing the cover, terminals shall not be accessible without breaking the seals.

Terminal Cover

Source: https://www.lntebg.in/

Terminals, terminal block

- Terminals may be grouped in terminal block having adequate insulating properties and mechanical strength.
- The material of which the terminal block is made shall be capable of withstanding temperature of 135 °C and pressure of 1.8 M Pa (ISO 75).
- The terminal block shall be opaque.
- The terminal block, the terminal cover and the meter case shall ensure reasonable safety against the spread of fire.
- Terminal block shall be such that the risk of corrosion resulting from contact with any other metal part is minimized.
- The terminals and connections shall be suitable to carry up to 120 % of Imax continuously (Imax 60 A).
- Terminals shall be preferably of MS cage clamp type (IS: 15707) or of flat end screw with at least 9 mm diameter of screw for better contact area.
- Internal diameter of the terminal holes shall be minimum 9.5 mm; minimum clearance between adjacent terminals shall be 10 mm. Depth of the terminal holes shall be of 25 mm.

Sealing of smart meter

- Reliable sealing arrangement shall be provided to make the smart meter Tamper evident and to avoid tampering by unauthorized persons.
- One no. Polycarbonate seal shall be provided by the Utility and one no polycarbonate seal shall be provided by the manufacturer. All the seals shall be fixed on meter body by the manufacturer at his works before dispatch.
- One sealing provision shall be provided at meter terminal cover, such that terminal shall not be accessible without breaking the seals.
- All the seals shall be provided on front side only and Rear side sealing arrangement shall not be accepted. Only patented seals shall be used as per Central Electricity Authority (CEA) Metering Regulations, 2006.

Source: https://www.business-standard.com/

Immunity to external factors

- The meter shall be immune to external influences like magnetic induction, vibration,
- electrostatic discharge, switching transients, surge voltages, oblique suspension and harmonics;
- and necessary tests shall be carried out in accordance with relevant standard.

Source: https://www.business-standard.com/

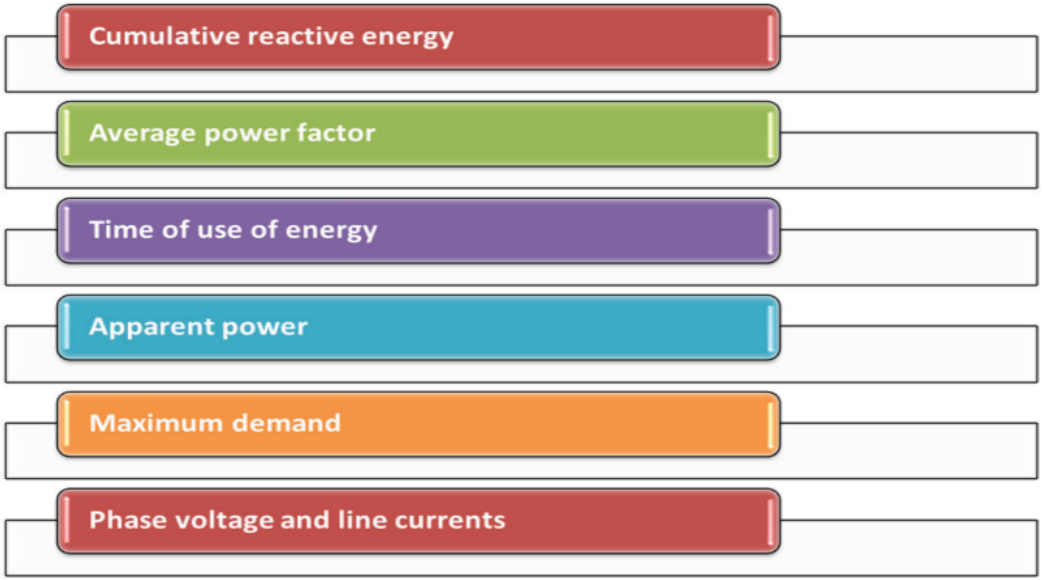
Standard functional requirements

1) Measuring Parameters

a) The consumer meter shall be suitable for measurement of cumulative active energy utilized by the consumer.

b) The consumer meter may have the facilities to measure, record and display one or more of the following parameters depending upon the tariff requirement for various categories of consumers.

All parameters excluding instantaneous electrical parameters shall also be stored in memory.



Standard functional requirements

2) Anti-tampering Features

a) The meter shall not get damaged or rendered non-functional even if any phase and neutral are interchanged.

b) The meter shall register energy even when the return path of the load current is not terminated back at the meter, and in such a case the circuit shall be completed through the earth. In case of metallic bodies, the earth terminal shall be brought out and provided on the outside of the case.

c) The meter shall work correctly irrespective of the phase sequence of supply (only for poly phase).

d) In case of 3 phase, 3 wire meter even if reference Y phase is removed, the meter shall continue to work. In the case of 3 phase, 4 wire system, the meter shall keep working even in the presence of any two wires, i.e., even in the absence of neutral and any one phase or any two phases.

e) In case of whole current meters and LV CT operated meter, the meter shall be capable of recording energy correctly even if input and output terminals are interchanged.

f) The registration must occur whether input phase or neutral wires are connected properly, or they are interchanged at the input terminals.

g) Additional anti-tampering features including logging of tampers such as current circuit reversal, current circuit short or open and presence of abnormal magnetic field may be provided as per the regulations of concerned state.

Testing and Validation Process of Smart Meter

Test of Insulation properties	Test of Accuracy Requirement	Test of Electrical Requirement
i) Impulse voltage test ii) AC High voltage test iii) Insulation resistance test	i) Test on limits of error ii) Interpretation of test results iii) Test of meter constant iv) Test of starting condition v) Test of no-load condition vi) Test of ambient temperature influence vii) Test of repeatability of error viii) Test of influence quantities	i) Test of power consumption test ii) Test of influence of supply voltage iii) Test of influence of short time over currents iv) Test of influence of self-heating v) Test of influence of heating vi) Test of influence of immunity to earth fault

Testing and Validation Process of Smart Meter

Test for Electromagnetic Compatibility	Test for Climatic Influences	Test for Mechanical Requirements
i) Radio interference measurement ii) Fast transient burst test iii) Test of immunity to electrostatic discharges iv) Test of immunity to electromagnetic HF field	i) Dry heat test, ii) Cold test and iii) Damp heat cyclic test	i) Vibration test, ii) Shock test. iii) Spring hammer test, iv) Protection against penetration of dust and water and v) Test of resistance to heat and fire

Testing and Validation Process of Smart Meter

Smart meters are subjected to various tests at all stages of implementation. These include development test, acceptance test, routine test, metrology tests, load switch capability test, data exchange protocol and smart meter communicability test (which is optional).
These tests certifies that the meter complies with the product design.

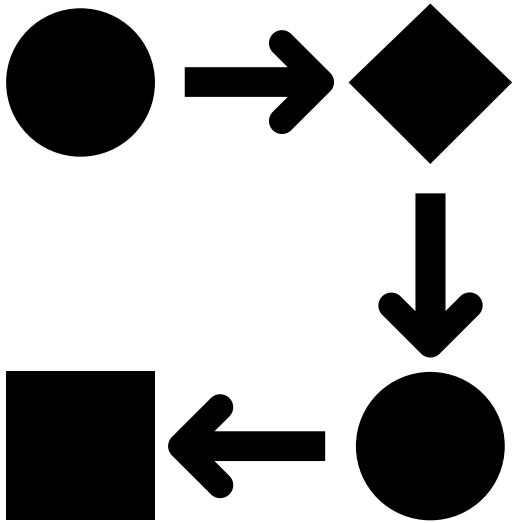
The development test or metrology include type tests for parameters such as construction requirements, clearance and creepage distances, display of values, output device and marking.

Type tests are a series of tests undertaken on meters of the same type and having identical characteristics. They are selected by manufacturers to ensure consistency in standard requirements to ensure that the product conforms to meter standards. Type tests cover verification of requirements such as insulation properties, accuracy requirements, electrical requirements, electromagnetic compatibility, climatic influences and mechanical requirements.

Acceptance tests are carried out on samples taken from a lot for the purpose of acceptance of the lot.
Routine tests are carried out on every meter to ensure that they conform to the requirements and standards.

Accuracy requirement tests can be carried out through tests on limits of error caused due to variation in current, test of meter constant expressing the relation between the energy registered by the meter and the corresponding pulse count of the test output, test of starting condition, test of no-load condition, test of ambient temperature influence, etc.

SESSION III
Meter Installation and Commissioning- Part 2

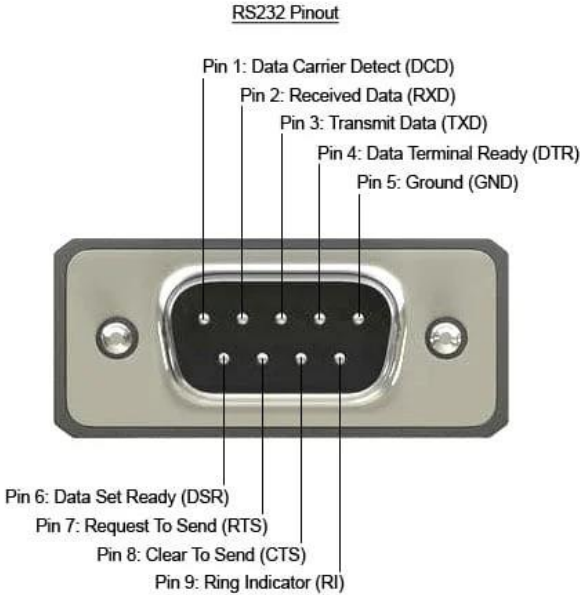


Selecting suitable site for installing an energy meter

- Visually traceable and joint-free incoming cable
- Clearly visible seals for easy inspection
- Mounting of meter and CTs inside a box wherever applicable
- Ensuring proper height and location for easy readability
- Plug possibility of bypassing the meter.
- Metering installation shall be protected from excessive dust and moisture, exposure to direct sunlight, rain and water seepage.
- A minimum clearance of 50 mm shall be maintained around the meter itself for be er inspection. This includes the space between two meters, between meter and meter box and between two-meter boxes
- For outdoor installations, the meters shall be protected by appropriate enclosure of level of protection IP 55 and ensuring compliance with above conditions

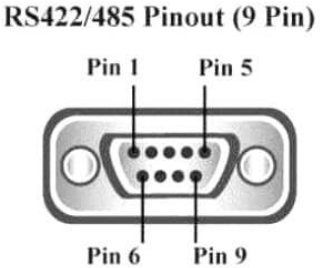
Potential sites

Identification of different ports used in the installation of smart meters such as RS-232, RS-485 etc.



RS422/485

Pin 1	TXD-
Pin 2	TXD+
Pin 3	RTS-
Pin 4	RTS+
Pin 5	GND
Pin 6	RXD-
Pin 7	RXD+
Pin 8	CTS
Pin 9	CTS+

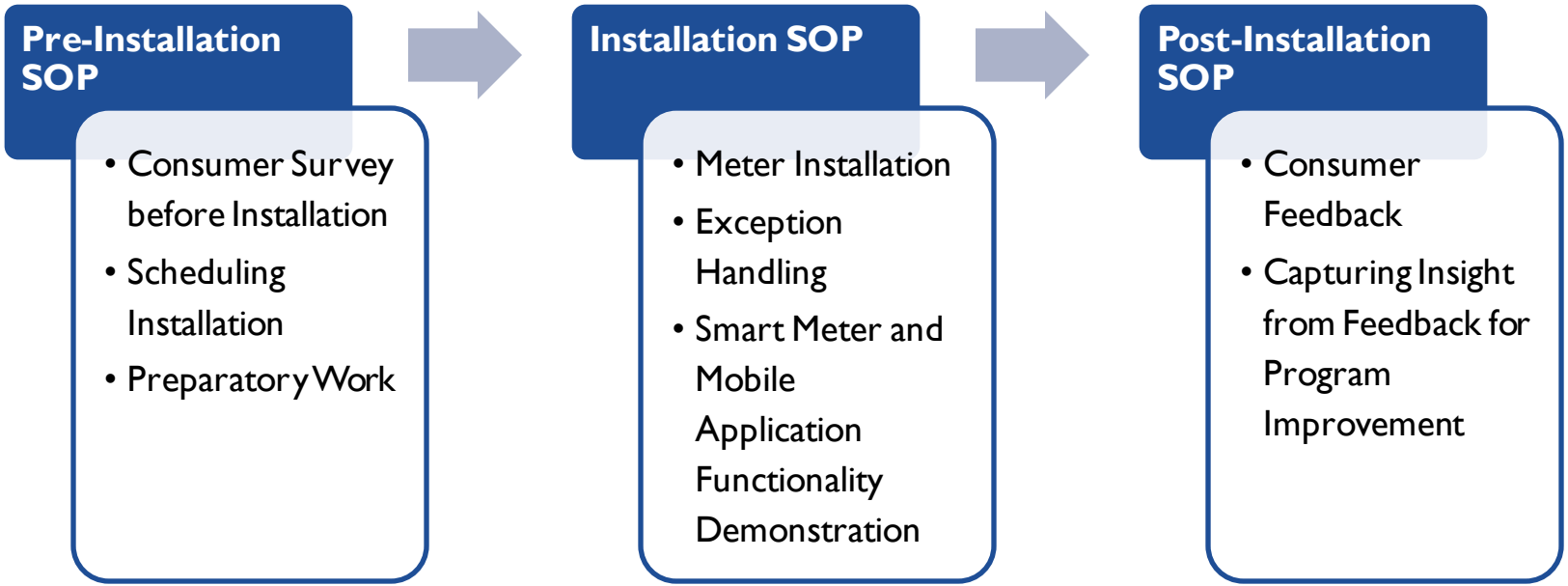


RS-232 and RS-485 are standards for serial interfaces that each specify the transmission media and a defined set of logic levels, data rates and timings. These are some of the oldest serial interfaces around, yet they are still very widely used in control and measurement equipment, mainly due to their simplicity and low cost.

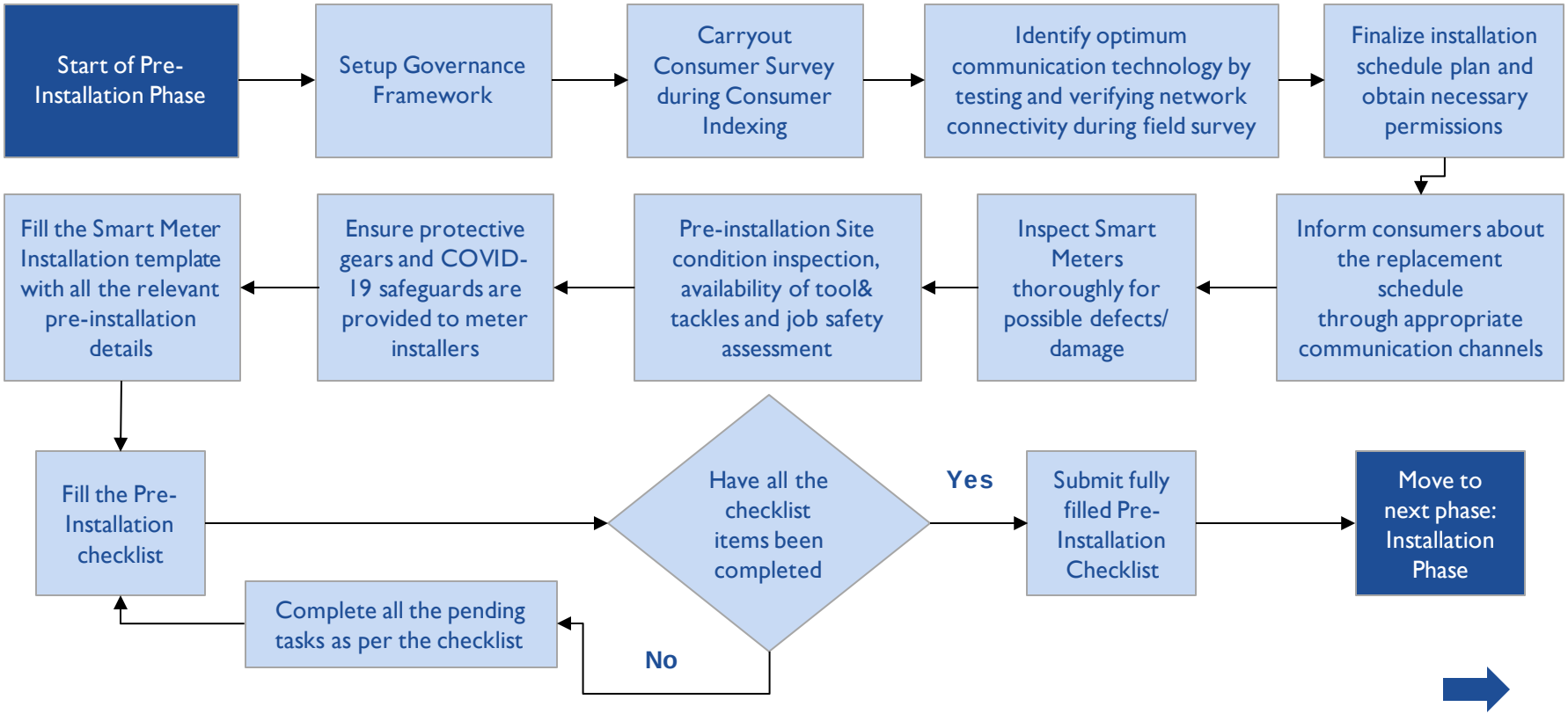
Where RS-232 specifies single-ended connections referenced to ground, RS-485 specifies differential signaling on two lines, called A and B. Up to 32 devices can be connected via the same RS-485 bus, though only one device can "talk" at any given time (half-duplex).

SOP for installation of smart meters

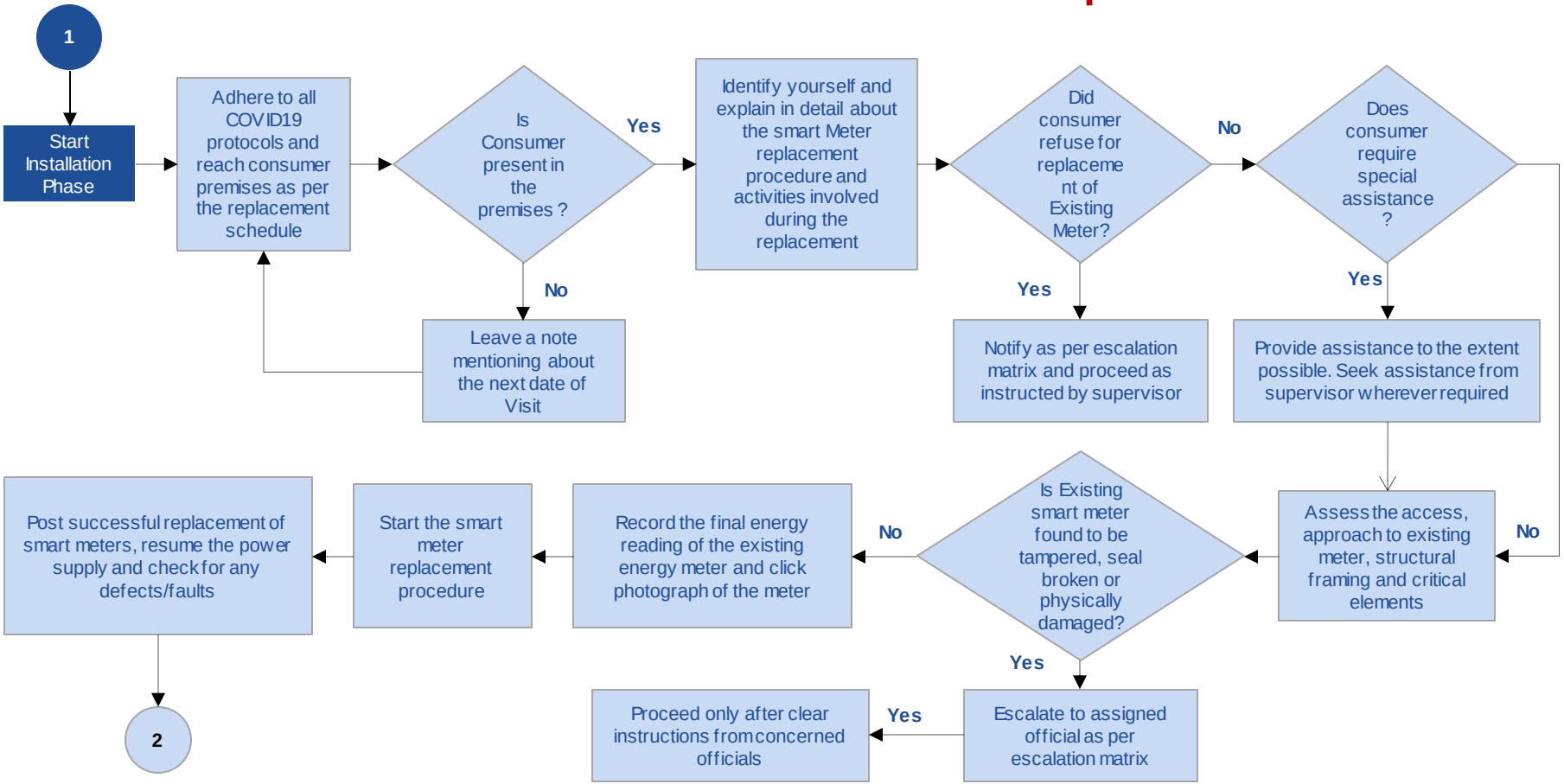
- The Standard Operating Procedure (SOP) provides a structured approach to help utilities engage effectively with their consumers during different stages of smart meter deployment.
- The SOPs cover the pre-installation activities, installation activities and post-installation activities that should be performed.



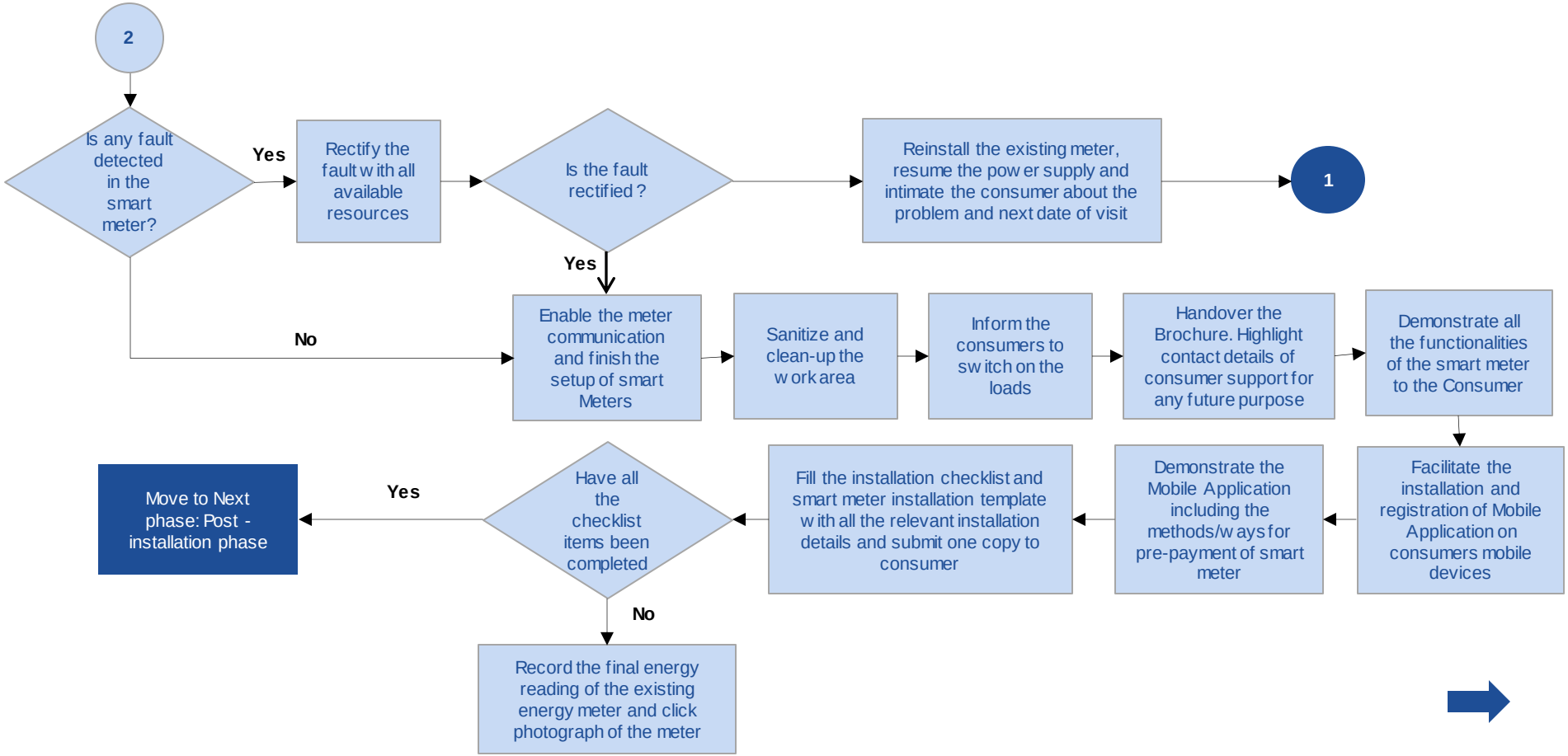
Workflow of activities in pre-installation phase



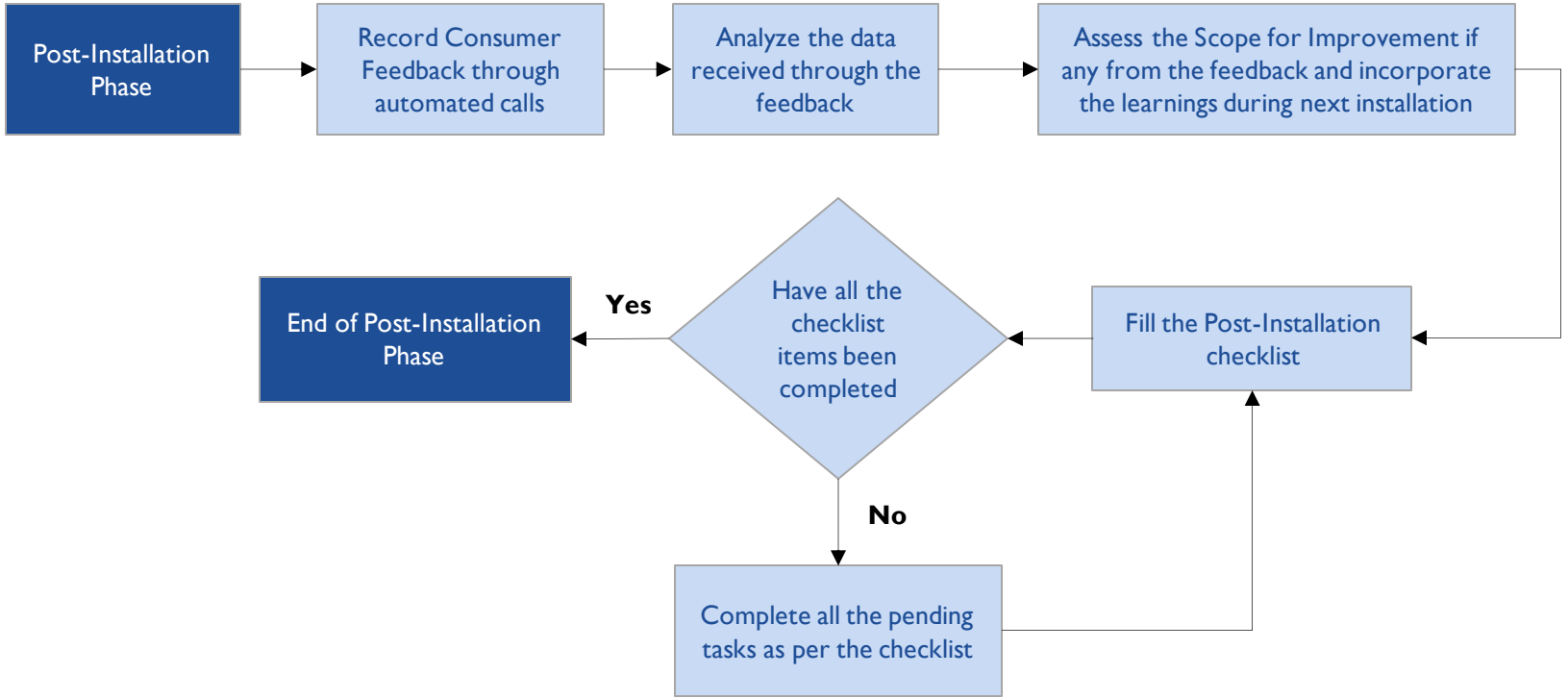
Workflow of activities in installation phase



Workflow of activities in installation phase



Workflow of activities in post-installation phase



Illustrative Job Safety Analysis (JSA)

Following points are typically covered in the Job Safety Analysis Checklist:

- Details about the smart meter installation team
  - Identification ID no.
  - Request / Notification no.
  - Band/ Eligibility
- Checking site conditions and necessary equipment
- Identification of Dangers
  - While standing on the ground
  - Related to network after climbing the pole (before starting the work)
- After completion of work
  - Checking if the work has been done properly.

- Detailed illustrative format from the JSA checklist have been provided in subsequent slides.

Sample meter installation template

- Following details are typically captured in the Smart Meter Installation Template:
  - Consumer Details
  - Area information
  - GIS information
  - Network information
  - Existing meter information
  - New Smart meter details
  - Consumer demonstration details
  - Mobile application demonstration details
  - Any additional remarks
  - Utility representative information

- Detailed illustrative format from the JSA checklist have been provided in subsequent slides.

Sample pre-installation checklist (1/2)

S. No.	Description	Response
1	Service Request Number	_____
2	Has the consumer been surveyed during consumer indexing and consumer survey?	Yes / No
3	Has the Site supervisor checked the site condition before starting of work?	Yes / No
4	Have the required approvals / permissions been taken?	Yes / No
5	Has the installation schedule and contact details of the meter installers been communicated to the consumer?	Yes / No
6	If answer to Q2 is yes, then what was the communication channel (s)? (Tick all that applies, Tick Not Applicable if no schedule has been shared)	Not Applicable / SMS / E Mail / IVR Call / Door-to Door communication
7	Has the consumer been notified that no fee is applicable for the meter replacement?	Yes / No

Sample pre-installation checklist (2/2)

S. No.	Description	Response
8	Is smart meter Installation template prepared and relevant information pre-filled as mentioned in the template?	Yes / No
9	Have all items like enclosure, meter, meter seals, accessories etc. been made available with the Installation team?	Yes / No / Partially Available
10	Has the smart meter been inspected for possible damages?	Yes / No
11	Have the meter installers been handed proper safety equipment including requirements under COVID-19 protocol?	Yes / No
12	Has liaison officer been identified for handling escalations, exceptions and challenges	Yes / No
13	In case of Installation of cellular communication based smart meters, have SIM cards been activated?	Yes / No
14	Service Personnel Name	_____
15	Employee ID/Contractor ID	_____

Sample installation checklist (1/2)

S. No.	Description	Response
1	Service Request Number	_____
2	Were all the COVID-19 protocols followed?	Yes / No
3	Was arrival at the consumer's presence timely?	Yes / No
4	Was installation carried out in presence of the consumer?	Yes / No
5	Was Consumer explained about the detailed procedure for smart meter replacement and informed about the interruption of power during the replacement?	Yes / No
6	Did the customer refuse for a replacement of existing meter?	Yes / No
6a	If the answer to Q-6 was yes, was the issue escalated to the supervisor?	Yes / No
7	Did the consumer require any special assistance (due to old age/ medical condition/ disability etc.)?	Yes / No
7a	If the answer to Q-7 was yes, was the necessary assistance provided?	Yes / No / NA (no special assistance needed)
8	Was the existing meter damaged/ tampered?	Yes / No
8a	If the answer to Q-8 was yes, was the issue escalated to the assignment official?	Yes / No

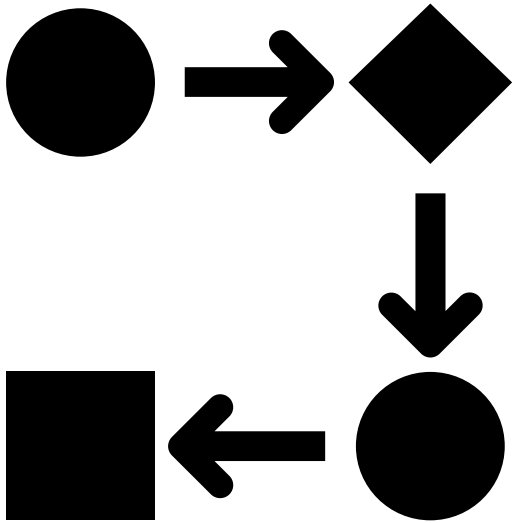
Sample installation checklist (2/2)

S. No.	Description	Response
9	Was installation completed before sunset?	Yes / No
10	Was the meter tested to be functional and communication successful?	Yes / No
10a	If the answer to Q-10 was no, was the existing meter reinstalled and was the consumer given the next date of visit?	Yes / No
11	Has the power supply been resumed?	Yes / No
12	Has the meter been sealed?	Yes / No
13	Has the brochure been shared with the consumer and all aspects explained (including the process of prepaid recharge)?	Yes / No
14	Has the mobile application been downloaded by the user?	Yes / No
15	Was the prepayment method explained?	Yes / No
16	Has the smart meter installation template been filled and a copy shared with consumer?	Yes / No
17	Has the area been sanitized and cleaned prior to leaving the premise?	Yes / No
18	Has the cyber security Do's and Don'ts explained to the consumer	Yes/ No
19	Service Personnel Name	_____
20	Employee ID/ Contractor ID	_____

Sample post installation checklist

S. No.	Description	Response
1	Service Request Number	_____
2	Has the consumer been contacted through automated calls for the feedback?	Yes / No
3	Were the data privacy and cyber security protocols followed?	Yes / No
4	Has the result of the consumer feedback been analysed?	Yes / No
5	Has the insights from the consumer survey been shared with relevant teams to support program improvement	Yes / No
6	Assessment Personnel Name	_____
7	Employee ID/ Contractor ID	_____

SESSION IV
Meter Installation and Commissioning- Part 3



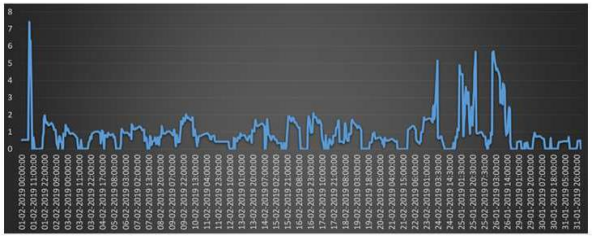
Compliance with Energy Meter Standards-APEX Regulators

Regulators: Bureau of Indian Standards (BIS), British Standards (BS), International Electro-technical Commission (IEC) Standards, etc.

(a)	IS 13779 (1999) (Amended)	A.C. Static Watt hour meter class 1.0 and 2.0
(b)	IS 9000	Basic environmental testing procedure for electrical and electronic items.
(c)	IS 12346 (1999)	Specification for testing equipment for A.C. electrical energy meter.
(d)	IS 11000 (1984)	Fire hazard testing
(e)	IEC 62052-11 (2003)	Electricity requirements (AC) general requirements tests and test conditions for A.C. Static Watt hour meter for active energy class 1.0 and 2.0.
(f)	IEC 62053-21 (2003)	A.C. Static Watt hour meter for active energy class 1.0 and 2.0
(g)	IEC 62053-22 (2003)	A.C. Static Watt hour meter for active energy class 0.2 and 0.5
(h)	IS 15707 (2006)	Testing evaluation installation and maintenance of AC electricity meters - code of practice.
(i)	IEC 60068	Environmental testing.
(j)	CBIP – TR No.88	Specification for A.C. Static electrical energy meters (latest (technical report) (88 amendment).
(k)	CEA Regulation (2006)	Installation and operation of meters (Dated: 17/03/2006).

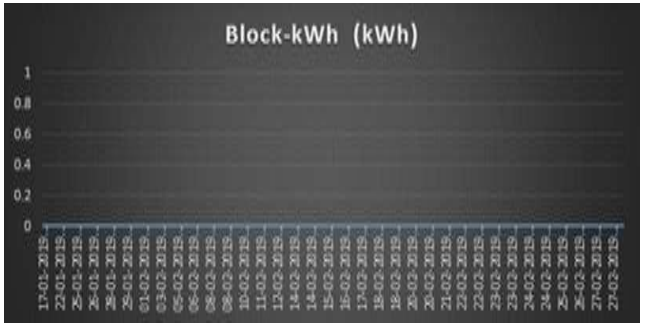
Power consumption check tampering, breaking or removing

- **Case 1: Abnormal Hike in CP**

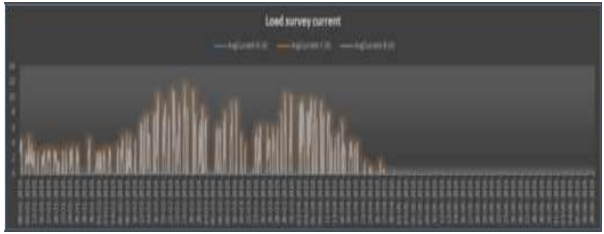


- *Low consumption observed before meter reading schedule*
- *Then, sudden increase in consumption near to the reading dates.*
-
- *After site verification, direct theft is found. Theft of electricity found at site by illegal tapping from Utility L.V mains from pole*

- **Case 2 : Zero/Low consumption**



- **Case 3 : Non-communication after Abnormal data**



- ✓ *Abnormal frequency tamper in meter data*
- ✓ *Meter has stopped communicating after abnormal frequency tamper event.*
- ✓ *Load survey current has also dropped to zero in line with abnormal frequency tamper event.*

- **Case 4: Cover Open with High Neutral Current**

- ✓ *Smart meter was installed on 28.11.2018.*
- ✓ *After smart meter installation Cover open event dated 23 & 24 Jan 2019 logged in meter tamper data.*
- ✓ *Meter power failure start event dated 23 Jan 2019 which is prior to cover open event.*

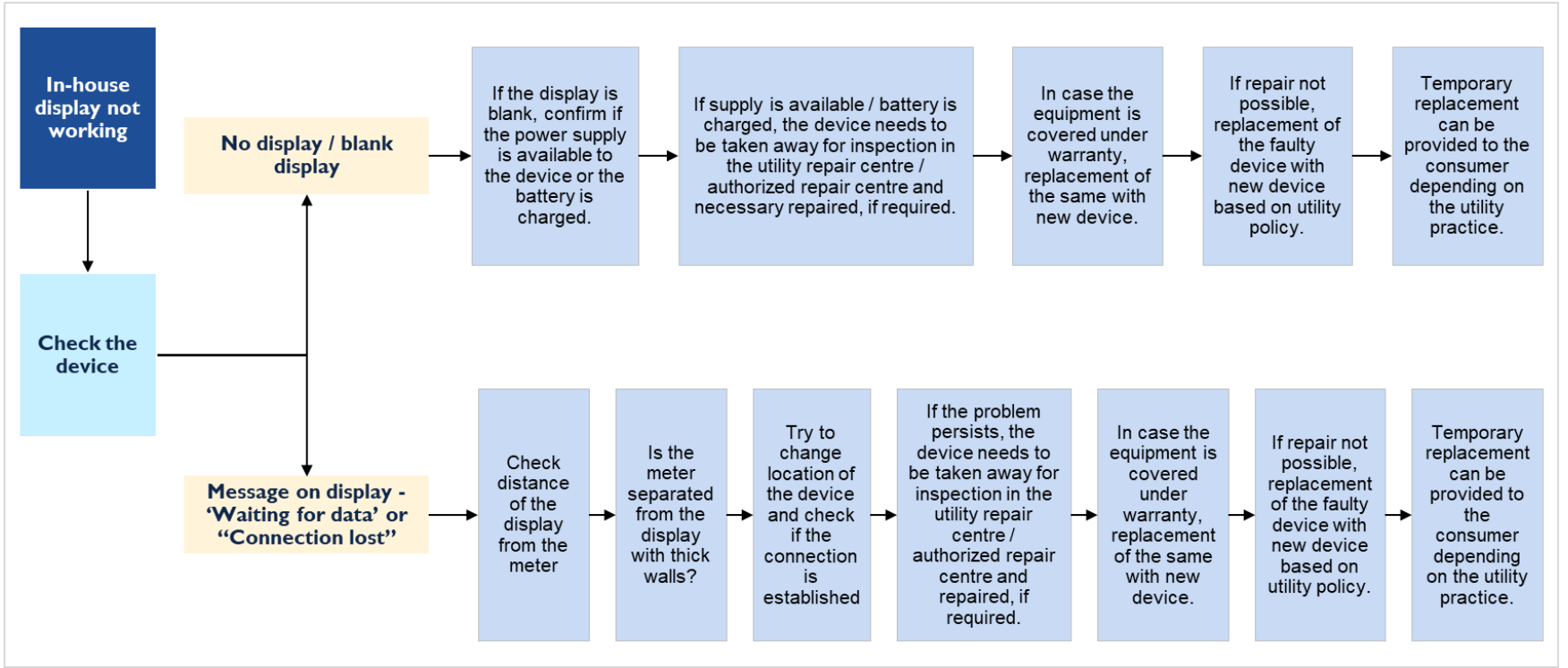
Reading reverse in meter display, sent to LAB for further checking.

- **Case 5: Reading Reversal**

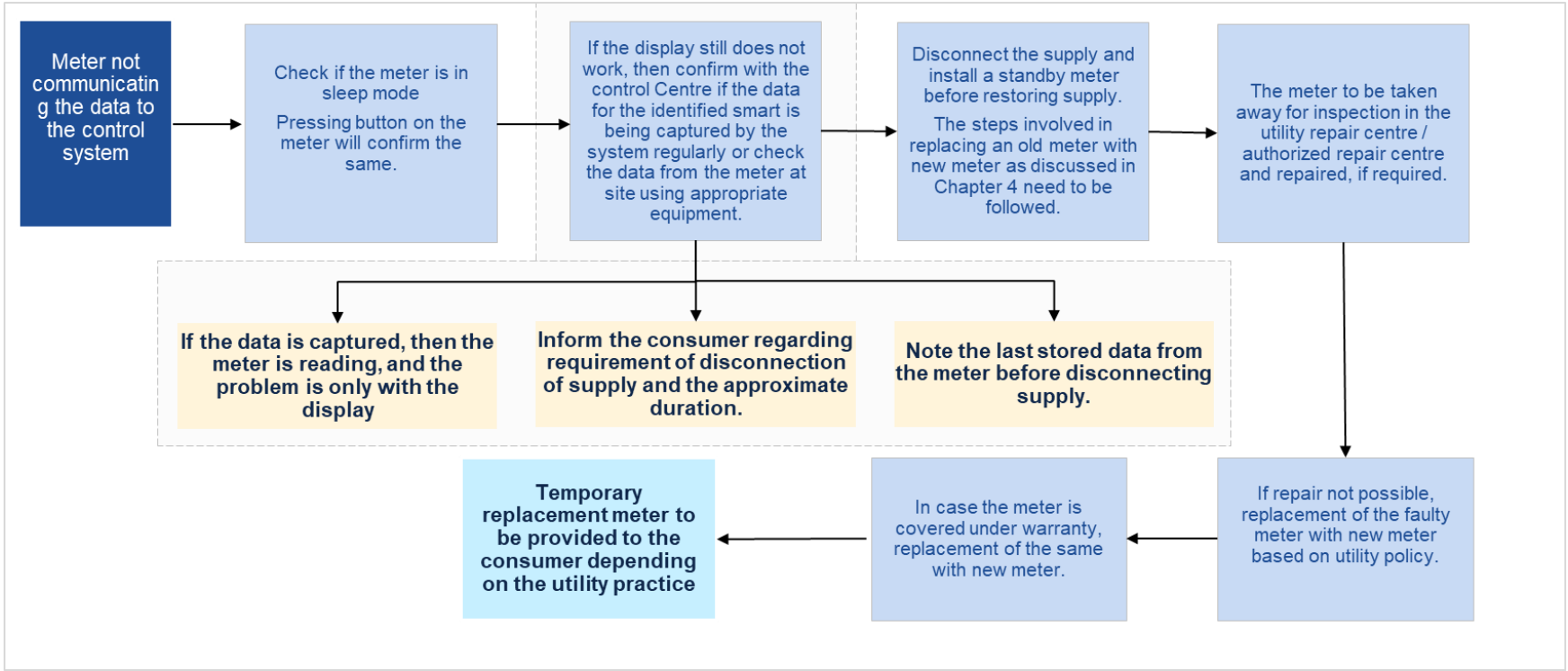
Operation & Maintenance

- Post installation the meter does not require any regular maintenance unless:
  - There are complaints from the consumers, or
  - Utility observes some discrepancies in the recording of meter reading or
  - Utility observes irregularities in the consumption pattern which may be on account of the meter or some other issues.
- Some of the issues faced in the smart meters include but not limited to:
  - In-house Display is not working
  - The meter display not working
  - Incorrect meter recording or meter not functioning
  - Meter not communicating the data back to the control system

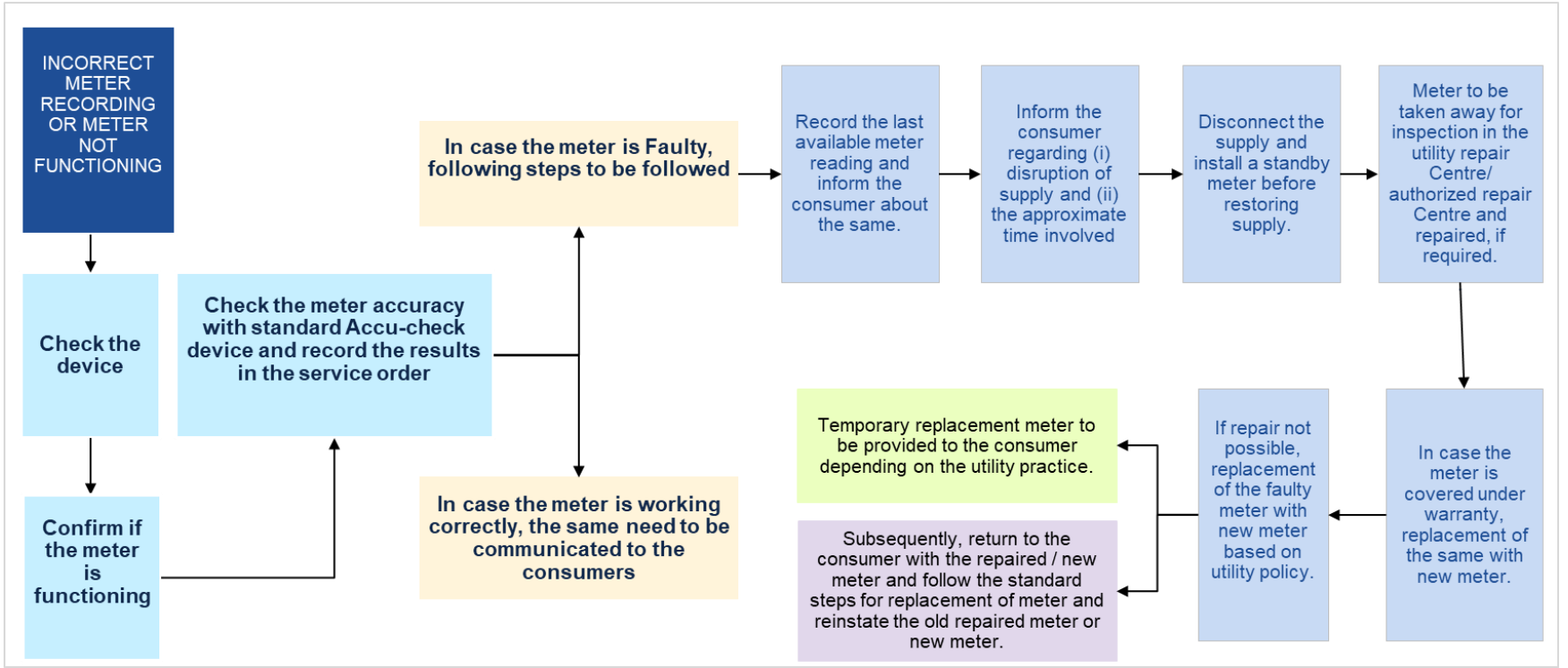
Steps to be followed: in-house display not working



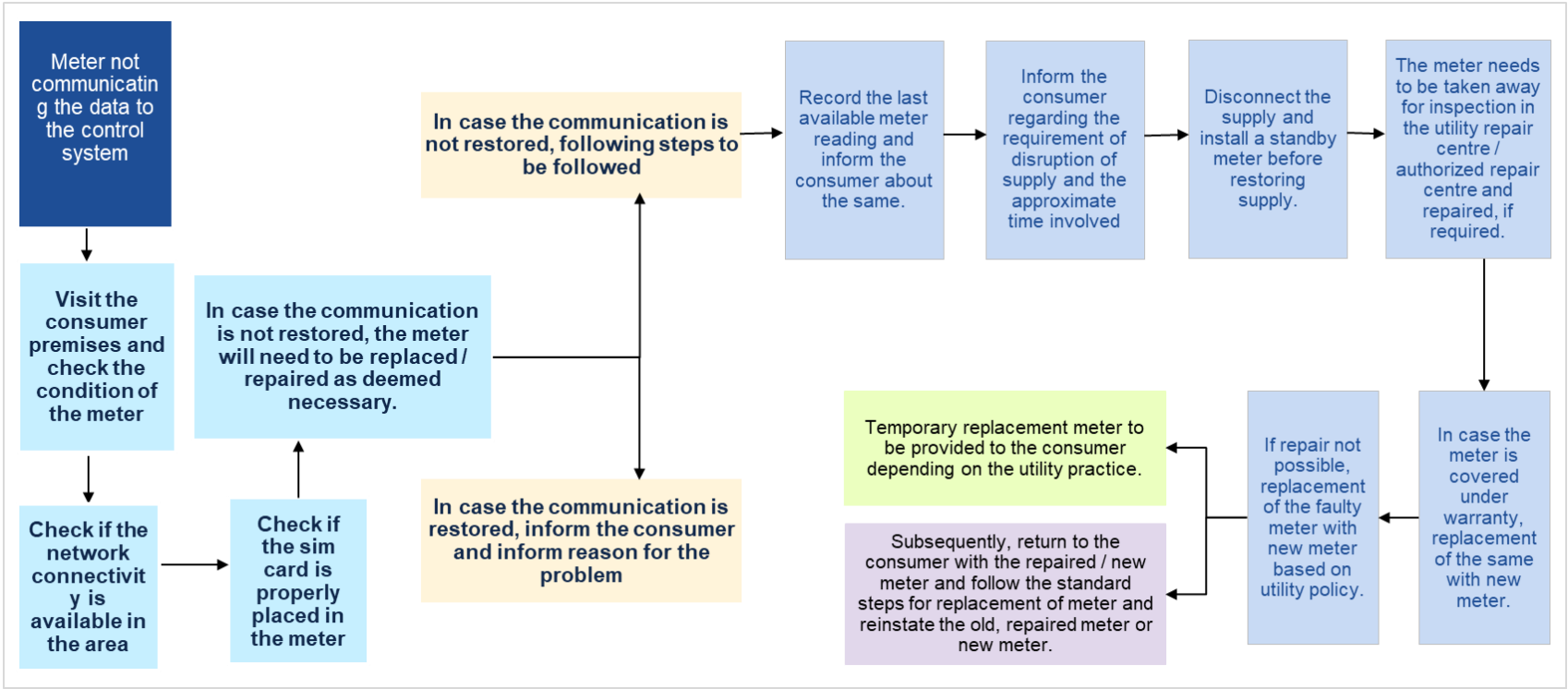
Meter display not working



Incorrect meter recording or meter not functioning



Meter not communicating the data back to the control system



Pre-installation preparatory work – meter, installation and location related (1/3)

- **Pre-installation site safety inspection & General Safety Requirements**
  - Inspect the site condition to ensure compliance with the safety requirements
  - Ensure availability of all the necessary tools and equipment.
  - Check current leakage at site consumer and pole end.
  - Check for proper space and light availability at site for working.
  - Verify smart meter location with respect to the gas / water pipeline near the smart meter location.
  - Check the 7 unsafe conditions of pole/ unsafe condition at bus bar / service pillar/D.T.
  - Verify the requirement of shutdown, if any.
  - Barricading space and ladder placing space as required
  - Check the unsafe condition as per JSA check list (provided at **Annexure I - Illustrative Job Safety Analysis (JSA)**)

Pre-installation preparatory work – meter, installation and location related (2/3)

Unsafe Conditions at Pole	Unsafe Condition at Consumer End
○ Pole is having 30 or more no. of service cables. ○ Presence of open joints and jumbling up of cables within 1.5 meter radius of cables. ○ Presence of physical damage on the pole (cracks, loose installation, bent pole etc.) ○ Pole is having two or more no. of different feeders i.e. composite networks. ○ Pole is having bilateral network with LT & HT network on the same pole. ○ Pole is having 4 or more than 4 nos. of distribution boxes. ○ Actions to be taken: • Work must be done in presence of Site Engineer. • Check site condition and ask for shut down, if required. • Strict use of PPE must be ensured. • On damaged or cracked pole "no work shall proceed". Site supervisor/engineer zone must be informed for necessary action.	○ Presence of water logging / wet floor near the smart meter site. ○ Presence of gas / water pipeline near the smart meter location. ○ Smart meter box is damaged / hanging / tilted on the wall. ○ Proper continuity of earth is not found at site (where sanction load is 10 kW & above)

Pre-installation preparatory work – meter, installation and location related (3/3)

- **General Safety Requirements**
  - All the works shall be carried out in compliance to the organizational safety requirement as well as Occupational Health & Safety Standards (OHSAS: 18001).
  - Any activity must be stopped if the safety of general public and the workers cannot be ensured
  - The safety practices at site must include:
    - Use of PPE like safety helmet with visor, safety shoes, hand gloves, full body harness with double rope latching arrangement including thigh protection etc.
    - Working at site under the influence of alcohol is strictly prohibited.
    - Smoking & chewing tobacco products strictly prohibited.
    - Bamboo scaffolding not allowed at work sites.
    - Smart meter installation safety manual must be followed.
    - First Aid Box should be available and basic safety training should be done for the installers.

Smart meter installation- general guidelines (1/3)

- Smart meter shall be installed at locations near by the entrance or outer wall, which is easily accessible for installations, testing, commissioning, reading, recording and maintenance.
- Protect the Smart meter from excessive dust & moisture, exposure to direct sunlight, rain, water seepage and vermin.
- The site temperature should be within the limits of O°C to +50°C. It should not be in proximity of machineries, heating devices, equipment generating high vibration, magnetic fields and areas prone to fire & toxic hazards.
- Smart meter should not be located at an elevated area or a depressed area that does not have access by means of a stairway of normal rise.
- The height of smart meter display shall be between 750 mm to 1800 mm.
  - In case the smart meter is provided with a secondary display unit, this requirement applies to the secondary display unit as well.
- Maintain a minimum clearance of 50 mm around the smart meter itself for better inspection.
  - Space between two-meter boxes should be minimum 300 mm
- All the installation work should take place under the supervision of power distribution utility Engineer / Supervisor.
- There should not be any seepage / water leakage on the wall surface or accumulation of water near smart meter installation area.

Smart meter installation- general guidelines (2/3)

- Use MCB/MCCB/ELCB having ISI / BIS Mark & of proper size / rating.
  - For single phase connections two pole MCB / ELCB is to be used.
  - For three phase connections 3 Phase 4 Pole ELCB /MCCB is to be used.
- At the time of smart meter installation, ensure that ELCB (if load is equal or more than 2 KW) is installed.
- Ensure that the smart meter should be located before main switch.
- Ensure proper earthing connection by working power distribution utility and should be extended upto smart meter box.
- In case of three phase connection consumer's earthing should be connected with meter box earthing.
- Ensure that the meter box has clear and legible earth symbol at each earthing connection point. (CEA (Measures relating to Safety and Electricity Supply) Regulations, 2010 as amended from time to time- clause no. 15)
- To avoid tampering and misuse by consumer in case of indoor installations at consumer premises, the following points should be taken care of:
  - Service line should be visually traceable & joint free
  - Seals should be clearly visible and accessible for easy inspection.
- The earthing connection shall not be used as return conductor and shall not carry neutral current
- The smart meter must always be installed with the smart meter box.

Smart meter installation- general guidelines (1/3)

- The smart meter box must be properly fixed to the wall using metallic fasteners.
- Service cable / wires should enter in smart meter box through the gland.
- The earthing / armour wires of the service cable should be properly dressed and connected to earthing of box using jubilee clamp/tightening clamp.
- The aluminium lugs / thimbles must be properly crimped using appropriate size of crimping tool.
- While tightening the screws, upper screw in each terminal must be tightened first and lower screw subsequently tightened.
- While installing smart meters at premises below HT / EHV lines, technical feasibility clearance must be sought from the concern zone in advance.

- In case of HT connections, the earthing of the smart metering cubicle and smart meter box installation should be ensured.
  - Earth test results of earthing pits are to be recorded in protocol sheet. (CEA (Measures relating to Safety and Electricity Supply) Regulations, 2010 as amended from time to time - clause 16)
- During installation and post installation, it is to be ensured that all cables and wires are insulated and adequately protected under ordinary conditions against electrical, mechanical, chemical or other injury to the insulation. (
  - CEA (Measures relating to Safety and Electricity Supply) Regulations, 2010 as amended from time to time - clause 13)

THANK YOU

USAID
FROM THE AMERICAN PEOPLE

Supporting Slides

Activities In Pre-installation Phase

Consumer Surveys

- Consumer survey should be planned to get insights on consumer behaviour with regards to awareness of technology and concerns about smart meters.
- The key activities to be performed during consumer survey phase are:
  - Verify network connectivity and optimum communication technology
  - Consumer survey should be shot, multi-lingual & enabling rapid data collection of information covering various areas of consumer awareness regarding smart meters:
    - Smart prepaid metering technology
    - Preferred mode of payment
    - Prepaid metering features & benefits
    - Concerns on various aspects of smart prepaid meter (e.g., concerns on overbilling, health and safety, prepaid recharges etc.)
  - Address Concerns / Issuing clarification against the concerns raised by the consumers during the survey through various communication channels
  - This activity is to be primarily undertaken by the Utility with necessary support from the meter installer in one-to-one interaction with the consumer, as deemed necessary

Pre- Installation Preparatory Work – Consumer Related

- **Finalise Installation Schedule:**
  - Daily schedule of replacement of smart meters with location identified;
  - Buffer dates in case of non-accessibility of consumer premises and failure to replace the smart meters due to valid reasons.

- **Intimation to Consumers about the schedule for meter replacement and the procedure that shall be followed:**
  - Notify consumer through SMS / Interactive Voice Response(IVR) calls / emails / door to door for consumer with limited access to online communication.
  - Provide multiple time slot options/choices to ensure maximum consumer convenience and provide option for rescheduling the installation as per their convenience if consumer is unavailable
  - Clearly explain the details of installation visit - what the installation visit will entail, presence of consumer at the premises,
  - Notify the contact details of authorized meter installer and date of replacement to the consumer through appropriate communication channels such as SMS/ IVRS/ email/etc.
  - Generate report on consumers who have been reached out to for pre-installation Intimation.

Pre-Installation Preparatory work – Meter, Installation and location Related

- **Areas of training for the meter installation technicians:**
  - Fixing of smart meters, electrical cables
  - Working procedures and standards of electrical systems.
  - Resolving consumer queries related to billing, recharge, mobile application, cyber security, data privacy etc.

- **Preparatory Work to be completed prior to start of installation**
  - Secure requisite approvals / permissions, wherever necessary, prior to meter installation.
  - Ensure & prepare all required format for data recording.
  - Record the types, model, and capacity of new smart meter to be installed at consumer end. Also record the meter number, seal number, box number and other details prior to visit.
  - Ensure that the communication technology to be used is activated and ready for data communication.

Pre-Installation Preparatory work – Meter, Installation and location Related

- **Inspection of Meter**
  - Thoroughly inspect the new smart meter unit for any possible damages that may have occurred during shipping.
  - Verify that the manufacturer's seal is intact.
  - Smart meters with broken / damaged seals should be returned to the manufacturer or sent to their authorized repair agency with defect report and suitably packed to avoid damage in transit.
  - After repairing and resealing, these smart meters can be installed.

- **Tools & tackles for the meter installation team**
  - Appropriate tools and tackles should be available with the working team while executing any work at site.

Pre-Installation Preparatory work – Meter, Installation and location Related

- **Pre-installation site safety inspection & General Safety Requirements**
  - Inspect the site condition to ensure compliance with the safety requirements
  - Ensure availability of all the necessary tools and equipment.
  - Check current leakage at site consumer and pole end.
  - Check for proper space and light availability at site for working.
  - Verify smart meter location with respect to the gas / water pipeline near the smart meter location.
  - Check the 7 unsafe conditions of pole/ unsafe condition at bus bar / service pillar/D.T.
  - Verify the requirement of shutdown, if any.
  - Barricading space and ladder placing space as required
  - Check the unsafe condition as per JSA check list (provided at **Annexure I - Illustrative Job Safety Analysis (JSA)**)

Pre-Installation Preparatory work – Meter, Installation and location Related

Unsafe Conditions at Pole	Unsafe Condition at Consumer End
○ Pole is having 30 or more no. of service cables. ○ Presence of open joints and jumbling up of cables within 1.5 meter radius of cables. ○ Presence of physical damage on the pole (cracks, loose installation, bent pole etc.) ○ Pole is having two or more no. of different feeders i.e. composite networks. ○ Pole is having bilateral network with LT & HT network on the same pole. ○ Pole is having 4 or more than 4 nos. of distribution boxes. ○ Actions to be taken: • Work must be done in presence of Site Engineer. • Check site condition and ask for shut down, if required. • Strict use of PPE must be ensured. • On damaged or cracked pole "no work shall proceed". Site supervisor/engineer zone must be informed for necessary action.	○ Presence of water logging / wet floor near the smart meter site. ○ Presence of gas / water pipeline near the smart meter location. ○ Smart meter box is damaged / hanging / tilted on the wall. ○ Proper continuity of earth is not found at site (where sanction load is 10 kW & above)

Pre-Installation Preparatory work – Meter, Installation and location Related

- **General Safety Requirements**
  - All the works shall be carried out in compliance to the organizational safety requirement as well as Occupational Health & Safety Standards (OHSAS: 18001).
  - Any activity must be stopped if the safety of general public and the workers cannot be ensured
  - The safety practices at site must include:
    - Use of PPE like safety helmet with visor, safety shoes, hand gloves, full body harness with double rope latching arrangement including thigh protection etc.
    - Working at site under the influence of alcohol is strictly prohibited.
    - Smoking & chewing tobacco products strictly prohibited.
    - Bamboo scaffolding not allowed at work sites.
    - Smart meter installation safety manual must be followed.
    - First Aid Box should be available and basic safety training should be done for the installers.

Smart Metering Installation Template and Pre-Installation Checklist

- **Development of Smart Metering Installation Template**
  - Standard Meter Installation Template should be prepared, and the relevant pre-installation data should be filled in prior to installation.
  - The installation template should be available in 2 copies (either physical or digital format) out of which one copy should be shared with the consumer and one copy should be retained by the meter installer.
  - The sample meter installation template is provided at **Annexure II - Sample meter installation template**.

- **Pre-Installation Checklist**
  - The fully filled up pre-installation checklist should be submitted prior to the start of installation phase.
  - The checklist will keep record of all activities performed during pre-installation phase and ensure adherence to pre-installation SOPs.
  - A sample pre-installation checklist is provided at **Annexure III - Sample pre-installation checklist**.

Smart Metering Installation Template and Pre-Installation Checklist

- **General Guidelines for smart meter installation**

○ Smart meter shall be installed at locations near by the entrance or outer wall, which is easily accessible for installations, testing, commissioning, reading, recording and maintenance. ○ Protect the Smart meter from excessive dust & moisture, exposure to direct sunlight, rain, water seepage and vermin. ○ The site temperature should be within the limits of O°C to +50°C. It should not be in proximity of machineries, heating devices, equipment generating high vibration, magnetic fields and areas prone to fire & toxic hazards. ○ Smart meter should not be located at an elevated area or a depressed area that does not have access by means of a stairway of normal rise.	○ The height of smart meter display shall be between 750 mm to 1800 mm. • In case the smart meter is provided with a secondary display unit, this requirement applies to the secondary display unit as well. ○ Maintain a minimum clearance of 50 mm around the smart meter itself for better inspection. • Space between two-meter boxes should be minimum 300 mm ○ All the installation work should take place under the supervision of power distribution utility Engineer / Supervisor. ○ There should not be any seepage / water leakage on the wall surface or accumulation of water near smart meter installation area.

Smart Metering Installation Template and Pre-Installation Checklist

- **General Guidelines for smart meter installation**

- Use MCB/MCCB/ELCB having ISI / BIS Mark & of proper size / rating.
  - For single phase connections two pole MCB / ELCB is to be used.
  - For three phase connections 3 Phase 4 Pole ELCB /MCCB is to be used.
- At the time of smart meter installation, ensure that ELCB (if load is equal or more than 2 KW) is installed.
- Ensure that the smart meter should be located before main switch.
- Ensure proper earthing connection by working power distribution utility and should be extended upto smart meter box.
- In case of three phase connection consumer's earthing should be connected with meter box earthing.
- Ensure that the meter box has clear and legible earth symbol at each earthing connection point. (CEA (Measures relating to Safety and Electricity Supply) Regulations, 2010 as amended from time to time- clause no. 15)
- To avoid tampering and misuse by consumer in case of indoor installations at consumer premises, the following points should be taken care of:
  - Service line should be visually traceable & joint free
  - Seals should be clearly visible and accessible for easy inspection.
- The earthing connection shall not be used as return conductor and shall not carry neutral current
- The smart meter must always be installed with the smart meter box.

Smart Metering Installation Template and Pre-Installation Checklist

- **General Guidelines for smart meter installation**

○ The smart meter box must be properly fixed to the wall using metallic fasteners. ○ Service cable / wires should enter in smart meter box through the gland. ○ The earthing / armour wires of the service cable should be properly dressed and connected to earthing of box using jubilee clamp/tightening clamp. ○ The aluminium lugs / thimbles must be properly crimped using appropriate size of crimping tool. ○ While tightening the screws, upper screw in each terminal must be tightened first and lower screw subsequently tightened. ○ While installing smart meters at premises below HT / EHV lines, technical feasibility clearance must be sought from the concern zone in advance.	○ In case of HT connections, the earthing of the smart metering cubicle and smart meter box installation should be ensured. • Earth test results of earthing pits are to be recorded in protocol sheet. (CEA (Measures relating to Safety and Electricity Supply) Regulations, 2010 as amended from time to time - clause 16) ○ During installation and post installation, it is to be ensured that all cables and wires are insulated and adequately protected under ordinary conditions against electrical, mechanical, chemical or other injury to the insulation. (• CEA (Measures relating to Safety and Electricity Supply) Regulations, 2010 as amended from time to time - clause 13)

Activities In Installation Phase

Activities in Smart Meter Installation Phase

Activities to be performed during the installation of Smart Meter:

- Adherence to Covid Protocol and other guidelines
- Identification
- Consumer Refusal
- Special Assistance
- Damaged Meters
- Meter Reading
- Meter Replacement

Activities to be performed Post Installation Of Smart Meter:

- Handling of faults
- Failing to finish setup
- Brochure and query resolution
- Explanation of Prepayment method
- Installation of mobile application
- Meter Installation template
- Installation Checklist

Adherence To Covid Protocol And Other Guidelines

- Adhere to all current Covid-19 protocols by the meter installer. Some aspects to be ensured includes:
  - Workforce to wear mask at all times.
  - Body temperature should be checked prior to field deployment
  - Workforce to thoroughly disinfect the tools and equipment after reaching the consumer premises
  - Workforce to sanitize all the surfaces that have been in contact during installation
- Carry out the replacement work only when consumer is present in the premises.
- Complete the replacement work before sunset.

Meter replacement procedure

- **Distribution / Bus-Bar Box installations**
  - Distribution box/Bus bar Box is installed according to the availability of space and no. of connections. The distribution box is available in following sizes:
  - Single Phase Two Wire, 4 Ways (1I/C + 3O/G)–Approx. size. 350 mm x 270 mm x 160 mm
  - 3 Ph. 7 ways (1 I/C + 6 O/G) – Approx. size 400 mm x 300 mm x 200 mm
  - 3 Ph. 10 ways (1 I/C +9 O/G) – Approx. size 500 mm x 400 mm x 200 mm

- **Elements to be considered during meter replacement process:**
  - **Mounting of the distribution box** - The said box must be mounted in straight position using metallic fasteners.
  - **Mounting height** - When the boxes are installed on consumer building premises. The boxes shall be mounted at accessible position at least 300 mm above ground and upto the human height.
  - **Use of lugs (thimbles)** - All Lugs of appropriate size as per the wire to be connected in case of strip type bus bar box. In case of Allen key base bus bar there is no use of lugs & thimbles.

Meter replacement procedure

- **Elements to be considered during meter replacement process:**

  - **Dressing of Incoming (I/C) & Outgoing (O/G) cables** - All I/C & O/G wires to be properly placed inside the box to avoid jumbling.
  - **Glands of I/C & O/G** - The appropriate size gland must be used for all I/C & O/G wires.
  - **Vermin proofing** - All the holes must be filled with M-SEAL/sealant to protect the entry of vermin.
  - **Sealing the box** - While installing new smart meters, distribution box is to be properly sealed.
  - **Load balancing (in case of Poly phase phase)** - While installing a new smart meter it is to be ensured that load is balanced for all three phases.
  - Nut & bolt in strip type bus bar box and screws in Allen key type bus bar box shall be properly tight to avoid any loose connections.
  - Ensure that the earthing marking is present on all distribution boxes and bus-bar boxes earth terminals.
  - Each box to be provided with earthing from main incoming cables and all out going cables earthing should be connected on earthing terminals provided.

Meter replacement procedure

- **Steps For Meter Box Installation**
  - Make a marking for smart Meter box with leveling frame on wall (height within 3 to 6 foot).
  - Use Drill machine for drilling hole in wall.
  - Position the smart Meter box accurately.
  - Fix the smart Meter Box & tighten the Screws.

- **Steps For Meter Fixing In Meter Box**
  - Mount the Meter in center of smart meter box. (Smart Meter mounting screw).
  - Fix the smart Meter with the screws near the smart meter
  - Unscrew all the smart meter terminals.
  - Insert the service line in smart meter terminal in sequence.

Meter replacement procedure

- **Steps Of New Connection For Single Phase Smart Energy Meter (Sequence for cable connection)**
  - Insert phase of Output and screw it properly.
  - Insert neutral of output and screw it properly.
  - Insert neutral of input and screw it properly.
  - Insert phase of input and screw it properly.

- **Steps Of New Connection For Three Phase Smart Energy Meter (Sequence for cable connection)**
  - Insert neutral of output and screw it properly.
  - Insert B phase of Output and screw it properly.
  - Insert Y phase of Output and screw it properly.
  - Insert R phase of Output and screw it properly.
  - Insert neutral of Input and screw it properly.
  - Insert B phase of Input and screw it properly.
  - Insert Y phase of Input and screw it properly.
  - Insert R phase of Input and screw it properly.

Meter replacement procedure

- **Work Instructions For Single Phase Meter & Poly Phase Meter Replacement With Smart Single-phase Meter & Smart Poly Phase Meter**
  - Only competent / authorized lineman is permitted to work on live network, hence, all activities related to meter replacement should be executed by Lineman.
  - All live line activity should be done under the supervision of engineer in charge only.
  - Lineman should wear PPE's (Palm size gloves, Safety shoes, helmet with visor, cotton gloves) & lay insulated rubber mat on ground where he stands and execute the work.
  - If available, note the last reading of meter on service order.
    - In case of 3 phase meter note the TOD reading also.
  - Disconnect the load by Switching off (MCB / ELCB / RCCB / MCCB at consumer end).
  - Confirm any inverter / generator or any other source of supply to avoid chances of reverse / back current.
    - If available, disconnect the identified source from the main line or disconnect the Neutral physically till meter replacement work is completed.
  - Remove the seal of meter box & meter by using seal cutter.
  - Capture existing seal nos. of meter box on service order.
  - Open terminal cover with appropriate size screwdriver.

Meter replacement procedure

- **Steps To Be Followed For Replacement Of Old Single-phase Meter & Old Poly Phase Meter:**

1) **Single phase meter replacement steps:**
   - Unscrew & remove the terminals of phase of Input and insert Insulated Cap on bare part.
   - Unscrew & remove the terminals of Neutral input and insert Insulated Cap on bare part.
   - Unscrew & remove the terminals of neutral output and insert Insulated Cap on bare part.
   - Unscrew & remove the terminals of phase output and insert Insulated Cap on bare part.

- Remove the meter and replace the meter with checking its physical condition with sequentially removing of insulating Cap:
   - Remove taping, insert wire in terminal of phase output & screw the terminal properly.
   - Remove taping, insert wire in terminal of Neutral output & screw the terminal.
   - Remove taping, insert wire in terminal of phase Input & screw the terminal properly.
   - Remove taping, insert wire in terminal of phase Input & screw the terminal properly.

Meter replacement procedure

- **Steps To Be Followed For Replacement Of Old Single-phase Meter & Old Poly Phase Meter:**

2) **Poly phase meter replacement steps**

- Unscrew & remove the incoming phase and neutral wire in sequence R – phase, Y-phase, B-phase and neutral wire, Tape all the removed cables un-insulated part (tip) properly to avoid shorting. Marking should be done with colour tape red, yellow, blue and black accordingly.
- Unscrew & remove the output phase and neutral wire in sequence R – phase, Y-phase, B-phase and neutral wire, Tape all the removed cables un-insulated part (tip) properly to avoid shorting. Marking should be done with colour tape red, yellow, blue and black accordingly in output wires.
- Marking should be done properly to identify the phases & neutral during removal of wire as per above said. Tape all the removed cables un-insulated part (tip) properly to avoid shorting.
- Replace the old meter with new one. Place new meter on box mounting screw & Tight both lower screw meter along with meter box mount.

Meter replacement procedure

- **Steps To Be Followed For Replacement Of Old Single-phase Meter & Old Poly Phase Meter:**

2) **Poly phase meter replacement steps (Continued)**

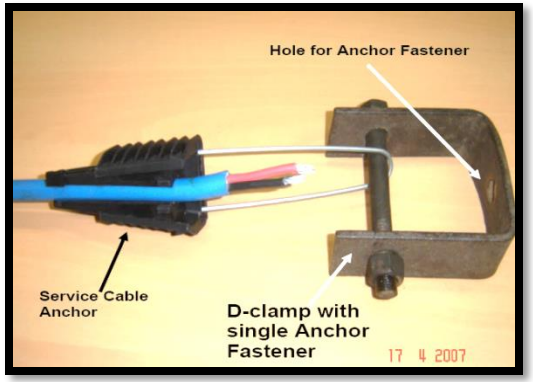
- Remove tape, insert the output cable first in terminals & screw them in sequence - Neutral- B phase-Y phase-R phase wire (in poly phase meter) respectively.
- Remove tape, insert the wire & screw the input cable in Neutral- B, phase-Y, phase-R, phase wire (in poly phase meter) respectively.
- Connect the Earthing with earth point at meter box through Jubilee clip (cable size 2×10 sq. mm, 2×16 sq. mm, 2×25 sq. mm) in single phase & through armoured for the cable size (4×25 sq. mm, 4×50 sq. mm) in polyphase meter.
- Check the continuity of Earthing at metering end with the help of double test lamp after energization of meter.

Meter replacement procedure

- **Installation Of Service Cable**
  - The laying of service cables from nearest LT pole / LT Service pillar / DT (HVDS) is done either overhead (O/H) or underground (U/G) depending on the site conditions.

1. **Connection on Pole and consumer wall:**
   - Service cable shall be tightly placed and clamped at the pole end using slotted angles / D clamp etc. for holding during laying of service lines.
   - Service cable shall be supported using service cable anchor to angle bracket / D-Clamp/ wall corner clamp.
   - Three phase cables shall be supported through G.I. connector of appropriate size (35×6 for 4C×25 /4C×50 sq.mm cable and 50×6 for 4C×95 / 4C×150 / 4C×300 sq.mm cable) or pin insulator.
   - Service cable at consumer wall shall be supported by using wall corner clamp or Angle bracket and service main suspension clamp or Anchor clamp as per site condition.

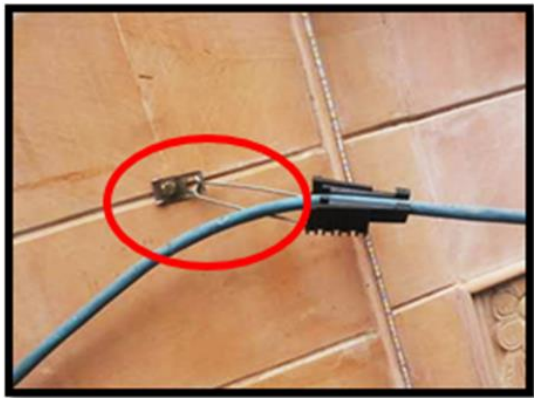
D-Clamp &
service cable anchor GI Connector



Meter replacement procedure

- **Installation Of Service Cable**

1. **Connection on Pole and consumer wall (continued):**
   - The height of service cable while crossing the road must be 5.8 meters above ground level.
   - The height of service cable along the road shall be 5.5 meters, elsewhere it must be 4.6 meters if bare conductor and for insulated conductor / service cable it shall be 4.0 meters.
   - Binding wire (dog / rabbit conductor) to be used to tie up three phases and neutral on D-hook for LT O/H line instead of using service cable phases directly (do not use armoured wire of cable).
   - For existing LT ABC line, the service line connections must be done with proper size I.P. connectors.
   - The service cable armouring shall be connected to earth conductor of O/H LT line and LT-ABC. In case of LT ABC (old type having 5 wires), armour of service cable is to be connected to the messenger wire through distribution box.



D-Wall corner clamp and Service main suspension/Anchor clamp

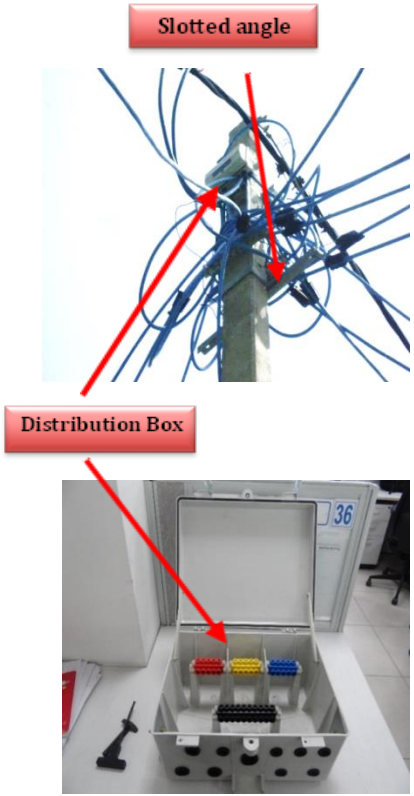
Meter Replacement Procedure

- **Installation Of Service Cable**

2. Connections From Service Pillar:

While installing / connecting the service cable in the service pillar:

- Digging for cable laying is to be done by agency to whom the responsibility has been allotted.
- The cable shall be laid underground and it shall enter into the pillar box from the bottom portion.
- Sharp bending of service cable while entering the service pillar must be avoided.
- In any case service cable shall not be laid from front / back side of feeder/ service pillar so that, the front / back door must be closed and locked properly.
- The service cable must be laid through using the entry hole provided beneath the service pillar.
- Aluminium lug/ thimble of appropriate size shall be used for service cable termination at the outgoing of cut-out in service pillar.
- The service cable shall be properly earthed at the feeder / service pillar to the earthing bus-bar using Jubilee clamp / earth gland and proper size of thimble.



Meter Replacement Procedure

- **Safety & Quality Aspects To Be Considered During Meter Installation**
  - While executing the smart energy meter service connections, tighten the lower terminal screw first after inserting the service cable in the meter terminal. The upper terminal screw should be tightened after the lower terminal screw.
  - The service cable conductor should not touch Gland.
  - Avoid sharp bends while laying the service line. (Bend should be more than 12 Deg.)
  - Fill the remaining air gap of the gland with M- seal compound.
  - Connect the meter output wire compulsorily with consumer provided ELCB / MCB/ MCCB, near the meter box. (MCB – upto 2 kW & ELCB More than 2 kW).
  - For laying and energization of service line with meter work, instructions are to be followed for service line laying process while working on different types of networks.
  - After energization of smart Meter, Engineer in Charge / Supervisor should check the display & other parameters (as mentioned in Table 6 and Table 7).
  - Engineer in Charge should check the meter accuracy with standard Accu-check device and record the results in the service order.
  - Take the consumer or representative feedback.

Meter Replacement Procedure

- **Safety & Quality Aspects To Be Considered During Meter Installation (Continued)**
  - Arrange to seal the smart meter with polycarbonate seals and cut the extra wire of seal with cutter.
  - Check the earthing with double test lamp by connecting one wire with Earth point (Nut) & 2nd wire connected with the phase of ELCB / MCCB / MCB. (Ensure that ELCB / MCCB / MCB should be off during testing.
  - Sealing arrangement for single phase smart meter- 1 No. seal at smart meter terminal, & 4 Nos. seals at smart Meter box.
  - Sealing arrangement for poly phase smart meter- 2 No. seals at smart meter terminal, & 4 Nos. seals at Meter box.
  - Fill the details in the service order after completion of all the technical work-related formalities.
  - Describe all the display parameter of new meter installed & tariff details to the consumer.
  - Site engineer & supervisor to check the meter & NIC communication signal.
  - Take signatures of the consumer on the meter installation service order copy after completion of all activity. Site in charge should handover the consumer service order copy with meter test notice, safety pamphlet etc.
  - Before leaving the site, team should collect and remove the entire cable / PVC scrap from the site and dispose it at a proper location.

Activities post installation of smart meters

- Resume the power supply after completion of installation.
- Test the meter for any operational defects.
- After successful communication and functional testing, the terminal cover of meter/ meter box should be sealed, and the seal number should be recorded in the smart meter installation template.
- Clean-up and sanitize the area of work (remove any wires and consumable from the area).

- **Handling Of Faults**
  - Following activities to be performed in case faults observed after resuming the power supply:
    - If a fault is identified with the smart metering system after replacement, try to rectify the faults on site.
    - Make the consumer aware of the problem, what the resolution is likely to be, and the approximate timeline for resolution.
    - In case of non-resolution of faults, reinstall the old meter and inform the consumer about next date of visit for replacement.
    - Share the contact details with the consumer for accessing any further information.

Activities post installation of smart meters

- **Failing To Finish Setup**
  - Inform the consumer about the reasons and provided the timelines for next visit.
  - Install back the old meter and resume the power supply to consumer.

- **Brochure And Query Resolution**
  - Carry the Consumer Welcome Brochure (if made available by the utility) during the visit.
  - Handover the brochure to the consumer, explain key content of the brochure and provide contact details for any support, query resolution and feedback post smart meter installation.
  - Best effort should be made to provide resolution to all queries of the consumer.
  - All unanswered queries related to functionality of smart meters, cyber security and data privacy issues of smart meters should be escalated as per the defined escalation matrices.

Activities post installation of smart meters

- **Explanation Of Prepayment Method**
  - Inform the consumer about the prepayment mechanism with information of the various modes of recharge (online and offline modes).
  - Inform the consumer about the process of checking prepaid balance and accessing low balance notifications.
  - Inform the consumers about the disconnection protocols.

- **Installation Of Mobile Application**
  - The meter installers should facilitate the installation of mobile application on consumer's smart phone and demonstrate all relevant functionalities

Activities post installation of smart meters

- **Meter Installation Template**
  - Post demonstration, relevant information should be filled in the meter installation template.
  - One copy of the fully filled meter installation template should be handed over to the consumer (physical or digital form).

- **Installation Checklist**

- The installation checklist should be filled up once all installation activities are complete.
- The meter installer should complete any incomplete task as highlighted in the checklist. Sample meter Installation checklist is provided at **Annexure IV - Sample Installation Checklist**.

Activities In Post-Installation Phase

Post Installation Phase

- **SEEKING CONSUMER FEEDBACK**

Capture of consumer feedback helps assessing the consumer satisfaction levels and areas of improvement regarding the smart metering program. The survey can cover the below mentioned areas:

- Effectiveness of the consumer engagement activities of the Utility
  - e.g., Feedback on whether consumers received brochures, whether information was clear, was information available through different media, etc.
- Assessment of the overall consumer experience throughout the smart meter installation process
- Assess if meter installers demonstrated the smart metering technology (including prepaid recharge process and use of mobile application) and resolved consumer concerns/ queries in a courteous manner
- Assess if the relevant consumer information captured in the Meter Installation Template were verified and validated by the consumer
- Capture consumer concerns/comments on procedure of replacement, usage of smart meters, mobile application, billing, recharge etc.
- Different mediums can be considered for consumer survey (e.g., personal interaction with consumers through the meter installers, automated feedback calls, emails, SMS, consumer portal of the utility, etc.)

Post Installation Phase

- **SEEKING CONSUMER FEEDBACK**
  - Key aspects need to be considered while preparing the consumer survey strategy.
    - **Recording of consumer feedback:** Automated calls to be made to the consumers for filling of the questionnaire and the feedback received should be collated and used for process improvement.
    - **Number of questions:** Utilities should limit data collection to the extent which is consistent with data transaction or the consumer's relationship with the business, or as required or specifically authorized by law.
    - **Language of questionnaire:** Choice of language (incl. local vernacular languages) should be provided to consumers for responding to the questionnaire.
    - **Continuous Analysis of Consumer Feedback:** Consumer feedback received should be analysed, to continuously enhance the smart meter deployment program. These insights can be utilized to improve the smart metering program and increase consumer participation in other areas of utility operation.

- The post-installation checklist should be filled up and submitted once all post-installation activities are complete. Any pending task identified in the checklist should be completed. The sample post installation checklist is attached at **Annexure V – Sample Post Installation Checklist**.

Annexure I - Illustrative Job Safety Analysis (JSA)

(Name of the Distribution Utility) – (Job safety analysis) (JSA) (format)		
Meter Management Group (MMG) Job Safety Analysis Check List for Single/Poly Phase		
_____ zone /BU Number:	Date:	Notification/ Request Number_____; CA Number_____
Engineer: Band/ Eligibility:	Identification ID Number	1) Zonal TO, Breakdown ZSO & ZM's Contact information:
BA Agency Name: Team Leader: _____	BA Vehicle Registration: _____	2) Safety Control Office Contact Number: _____, +91 - _____
Supervisor Band/Eligibility:	Identification ID Number_____	3) In the Zone where the work is in progress, write the contact number and name of another MMG Team engineer starting from the nearest:
Lineman Band/Eligibility:	Identification ID Number _____	4) Telephone number of the nearest ESI Hospital _____
Helper Band/Eligibility:	Identification ID Number_____	5) List of other hospitals is present in the Van, and I have seen it.
Meter Installer Band/Eligibility:	Identification ID Number_____	
Time when work has started:	Time when work has ended:	

Annexure I - Illustrative Job Safety Analysis (JSA)

(Name of the Distribution Utility) – (Job safety analysis) (JSA) (format)		
Meter Management Group (MMG) Job Safety Analysis Check List for Single/Poly Phase		
Work is being done under the supervision of a permanent engineer. Live line work, is done under his supervision of operation engineer (whose *ID card no. is of 70 ----Series*).		
Important Check before starting work:		
After reaching the work site kindly ensure:	**Yes**	**No**
Are the hand gloves, face shield/visor, double line yard full body harness available for the linemen?		
Before starting the work, was it made sure that the linemen do not have any accessories like chain, bracelet etc. worn by him and the team mobile handsets are given to the MMG driver or have been placed in a locked box in the van?		
Is the lighting sufficient on site to work safely?		
Does the consumer wall have any other utility service (water pipe, electricity wires or gas pipeline) present in the wall?		
Does the site have earthing?		
Is the wall capable of sustaining the weight of the Meter, Meter box and the weight of the cables?		
While installing New meter/ Meter box/ bus box sufficient height, 3-6 feet can be maintained?		
Is an ISI marked MCB/ELCB/RCCB/RCD installed by the consumer for cutting the load on site?		

Annexure I - Illustrative Job Safety Analysis (JSA)

Part-I Identification of Dangers while standing on the Ground				
Choose the method of connection (1) Pole (1. a) Bare / (1.b) LTABC (2) Feeder pillar/Service pillar (3) Ground Bus-bar				
	Kindly write the details such as Pole number, feeder pillar/service pillar number			
I	Have the following situations been checked before starting the work on the pole.	Yes	No	If yes, then write the steps that were taken after suggestions from Hand engineer or team leader to make the workplace safer–
	1) Is there leakage Current on the pole?			
	2) Does the pole have 2 or more LT feeders available, coming from different transformers? If yes, then please specify the count.			
	3) Does the pole have more than 4 LT ABC feeders or 2 ABC and 1 or more than one bare network connections present?			
	4) Is there a network of 30 or more service wires present on the pole?			
	5) Is there any cable within 5 feet radius of the pole with damaged insulation or the LTABC network or rising cable has damaged insulation? If yes, please tell the count.			
	6) Does the pole have more than 2 network (HT / LT) - composite network? If yes, so please specify the count.			
	7) Does the pole have any external cable or wire (Cable T.V., internet)?			
	8) Is there pole encroachment due to unauthorized construction?			

Annexure I - Illustrative Job Safety Analysis (JSA)

Part-I Identification of Dangers while standing on the Ground				
	9) Is the pole broken/ tilted or cracked?			
	10) Are there more than 4 distribution boxes present on a single pole?			
	11) Does the last pole, T-off pole or the pole at the turn not have stay wire or Stud pole available?			If yes, then before starting the work give the pole enough support (using at least 2 bamboo ladders) or make sure to use the tower wagon before continuing the work
	12) Is the physical condition of the ladder suitable for work and does it have any crack, stiffness or twisting?			If yes, please don't use that ladder
	13) Before starting the work was it ensured that the height of the ladder is sufficient, and the ladder can be properly placed at ¼ distance from the pole?			If no, please ask the ladder of appropriate height from the back office/ zone and place the ladder correctly and then only start the work
	14) Has the ladder in use has been properly checked and does it have the serial number, given by the BA?			If no, please refrain from using that ladder
	15) Before placing the ladder, was the work site checked for possible situations such like uneven surface or, oily, slippery or loose surface etc. and has it been found safe for work.			If no, please inform your engineer/ back office. If required, get extra manpower/ helper to give support to the ladder to make the work site safe and then only start the work

Annexure I - Illustrative Job Safety Analysis (JSA)

Part-I Identification of Dangers while standing on the Ground				
	16) Before starting the work, has it been ensured that there is sufficient barricading around the work site?			*If no, then remove any obstruction in the way of barricading and only after putting appropriate barricading, start the work*
	17) In case of a Shutdown: has the switch for streetlights been switched off by the zone during work hours?			*If no, then start your work only after the switch for the streetlight has been turned off*
	After evaluation of the situation, it has been determined that the work can be done without a shut down			If no, then proceed with the work only after shutdown. And in serial number 7 describe LT PTW & LOTO. Even in the case of a shutdown, please ensure that you are using all required PPEs like hand gloves, face shield visor etc.

Annexure I - Illustrative Job Safety Analysis (JSA)

Part-2 Identification of Dangers related to network after climbing the pole (before starting the work) (After climbing the pole, the line man should assess the dangers present there for at least 2 to 3 minutes)				
2	Danger identified by the lineman. Description is as follows	Yes	No	If the answer to question 1-6 is 'Yes", then write down the steps that were taken after suggestions from engineer/team leader to make the work site safe
	1) Is there any wire or LTABC network with damaged insulation inside the work site of the lineman, if yes, so write the count			
	2) Is the current leakage in any part of the pole?			
	3) Is there a crack in the upper part of the pole?			
	4) Does the distribution box (both outgoing and incoming) or the single-phase DT have wires with damaged insulation or cut thimbles?			
	5) Is there current present in the non-insulated wire?			
	6) Does the pole have a street light switch, connected wires or damaged insulation?			
	7) After climbing the pole and evaluating the situation, has it been determined that the work can be done without a shut down			If no, then only proceed with the work after shutdown. And describe LT PTW & LOTO in serial number 7. Even in case of a shutdown, ensure the use of all required PPEs like hand gloves, face shield visor etc.

Annexure I - Illustrative Job Safety Analysis (JSA)

Part-2 Identification of Dangers related to network after climbing the pole (before starting the work) (After climbing the pole, the line man should assess the dangers present there for at least 2 to 3 minutes)				
3	If you are in the primary tagging list then before taking shutdown through GO operated switch, kindly take the below written precautions			
	1) Before operating the GO switch has it been ensured that the load on LT switch has been switched off creating a no-load condition?			
	2) Does the GO handle or the three phase's blades have any kind of damage or any other operating problem?			
	3) After operating the GO handle has it been ensured that there is proper separation between the blades of the three phases?			
	4) Is an electrical safety zone created after taking all the 6 steps of a safety zone?			

Annexure I - Illustrative Job Safety Analysis (JSA)

Part-2 Identification of Dangers related to network after climbing the pole (before starting the work) (After climbing the pole, the line man should assess the dangers present there for at least 2 to 3 minutes)				
4	To work on old / present bus box / distribution box / service pillar/ feeder pillar, cable removal, temporary meter:	While opening the cover of the meter box, make sure to be on the side and also use the necessary PPEs like gloves, helmet with visor and insulating rubber mat while opening it.		
	1) Does the bus box / distribution box / service pillar/ feeder pillar have any leakage current?			Write down the steps that were taken after suggestions from engineer/team leader to make the work site safe
	2) Are there damaged/ burnt part/ cut off thimbles, loose nut bolts present. If yes, please specify the count			
	3) Are there any naked wires/ lose joints in the bus box / distribution box / service pillar/ feeder pillar?			
	4) Is the situation of vermin proofing of the gland bad?			
	5) Does the bus box / distribution box / service pillar/ feeder pillar have doors hanging from broken hinges or the box doesn't have a cover?			
	6) Have all the surrounding unsafe situations been analysed and is the work site safe to work?			If no, then only proceed with the work after shutdown. And describe LT PTW & LOTO in serial number 7. Even in case of a shutdown, ensure the use of all required PPEs like hand gloves, face shield visor etc.

Annexure I - Illustrative Job Safety Analysis (JSA)

Part-2 Identification of Dangers related to network after climbing the pole (before starting the work) (After climbing the pole, the line man should assess the dangers present there for at least 2 to 3 minutes)				
5	**If the meter has to be replaced**			
	1) Did a visual inspection happen and was the condition of service cable & meter terminal checked?			
	2) Is there any leakage current present in the meter body/ nearby circuit?			
	3) Is the review for all types of naked wire/ loose joints done and is there a need to insulate them? If yes, then please specify count			
	4) Are there any other points to be inspected such as burnt meter terminal, swinging meter, meter in a burnt state, or broken seal on the meter and is there a requirement of fixing them on site?			
	5) Is there an ISI marked MCB /MCCB /ELCB /RCD present to cut the meter's load?			
6	Mention any other dangers found other than the above-mentioned points and also write the adopted methods to deal with them			

Annexure I - Illustrative Job Safety Analysis (JSA)

Part-2 Identification of Dangers related to network after climbing the pole (before starting the work) (After climbing the pole, the line man should assess the dangers present there for at least 2 to 3 minutes)				
7	If after analysing questions 1-6 you find out that the work cannot be done without shutdown then after switching off LT instrument, following the LT PTW procedure make sure to use LT LOTO LT PTW No— LOTO NO ---			If no, then do not start work without making an appropriate safety zone.
Part-3 After completion of work				
8	After completion of work did the lineman rectify the unsafe situations like damaged insulation or service cables joined without insulation which are situated on pole/ bus-bar box/ distribution box/ service box/ feeder pillar. If yes, please specify the count			If no, then please inform the TO and make sure to do an entry on the safety portal Safety ID number: _____
	Is the wiring and phase sequence correctly colour coded? (If this is not found on site, then please do the correct colour coding)			
Signature Engineer: BA Supervisor BA Lineman				BA Helper BA Meter Installer

Annexure II - Sample Meter Installation Template

<DISCOM NAME & ADDRESS> SMART METER REPLACEMENT PROGRAM (Following details to be captured during Installation of Smart Meter)				
SN	**Parameter**	**Observation**	**Remarks**	**Data Capturing Method**
1	**Consumer Details**			
1.1	Service Request Number	X1234567	Service Request Number generated for replacement of Smart Meter	Prefilled
1.2	Customer ID Number	12345678910111120	Consumer connection details to be captured and verified with details provided by DISCOM	To be filled prior to installation
1.3	Customer Service Number	N1234567		
1.4	Consumer Name	Mr. XYZ		
1.5	Consumer Address	Flat-XYZ, Sector ABCD,		
1.6	Address Pin code	New Delhi-1100xx		
1.7	Consumer Contact Details	9988xxxxxx		

Annexure II - Sample Meter Installation Template

SN	Parameter	Observation	Remarks	Data Capturing Method
1.8	Consumer Category	LT I – Domestic	Details of Consumer Category as per the Tariff Order for the state	To be filled prior to installation
1.9	Phase	3 Phase/1 Phase	Consumer connection details to be captured and verified with details provided by DISCOM	
1.10	Sanctioned Load	2 KW		
1.11	Connection Status	Active/ Disconnected/ Temporary Connection etc.		
1.12	Purpose of Meter Replacement	Smart Meter Installation	Reason for meter replacement	Prefilled
1.13	Date of Smart Prepaid Meter Installation	x/xx/xxx	Date of Installation of Smart Meter	To be filled at Consumer Premise
1.14	Any Other Details		Any other details observed during Installation visit	

Annexure II - Sample Meter Installation Template

SN	Parameter	Observation	Remarks	Data Capturing Method
2	**Area Information**			
2.1	Section Code/ Zone Code	456	Details of the location to be captured by area code	To be filled prior to installation
3	**GIS Information**			
3.1	Latitude Meter	xxxxx° N	Details of Latitude & Long to be captured for Geo Tagging of Smart Meter	To be filled at Consumer Premise
3.2	Longitude Meter	xxxxx° E		
4	Network Information			
4.1	HT Line Code (Feeder)	Z1678	Details of the connection	To be filled prior to installation
4.2	DTR Code(s)	Z2678	In case of Ring System, all DTRs connected to consumers to be recorded. To be verified with details provided by DISCOM	
4.3	LT Line Code (Pole)	X1678	Details of the connection	

Annexure II - Sample Meter Installation Template

SN	Parameter	Observation	Remarks	Data Capturing Method
2	**Area Information**			
2.1	Section Code/ Zone Code	456	Details of the location to be captured by area code	To be filled prior to installation
3	**GIS Information**			
3.1	Latitude Meter	xxxxx° N	Details of Latitude & Long to be captured for Geo Tagging of Smart Meter	To be filled at Consumer Premise
3.2	Longitude Meter	xxxxx° E		
4	Network Information			
4.1	HT Line Code (Feeder)	Z1678	Details of the connection	To be filled prior to installation
4.2	DTR Code(s)	Z2678	In case of Ring System, all DTRs connected to consumers to be recorded. To be verified with details provided by DISCOM	
4.3	LT Line Code (Pole)	X1678	Details of the connection	

Annexure II - Sample Meter Installation Template

SN	Parameter	Observation	Remarks	Data Capturing Method
5	Existing meter			
5.1	Meter Serial Number	12345678	Unique serial ID of the existing meter	To be filled at Consumer Premise
5.2	Meter Seal Number	ABCD123	Unique Meter seal number of the existing meter	
5.3	Meter Box Number	XYZ123	Unique Meter Box number of the existing meter	
5.4	Reading (as on date of installation)	25876 units	Important Billing information. Should be supported by Meter's data download/ picture of meter reading at the time of replacement	
5.5	Maximum Demand Reading	1.8 kW	Reading present in existing meter	
5.6	Existing Meter Type	Single/ Three Phase Digital/ Electro mechanical	Details of the existing meter type	
5.7	Meter Make	XYZ	Details of the existing meter make	

Annexure II - Sample Meter Installation Template

SN	Parameter	Observation	Remarks	Data Capturing Method
5.8	Meter Category	Whole Current/CT Operated	Details of the existing meter category	To be filled at Consumer Premise
5.9	Energy recording type	Unidirectional/ Bidirectional	Details of the recording type of existing meter	
5.10	Meter Condition	Working/Tampered/ Burnt	Condition of existing meter. Should be supported by picture of meter, taken at the time of installation	
5.11	Meter Seal Condition	Intact/ Tampered/ Damaged	Condition of the existing Meter Seal. Should be supported by picture of the seal, taken at the time of installation	
5.12	Meter Box Condition	Intact/ Tampered/ Damaged	Condition of the existing Meter Box. Should be supported by picture of the box, taken at the time of installation	
5.13	Old Meter Removal Status (Removed/ Retained)	Removed	To be filled after installation of new meter	
5.14	Other Remarks		Any other remarks observed during Installation Visit	

Annexure II - Sample Meter Installation Template

SN	Parameter	Observation	Remarks	Data Capturing Method
6	**New Smart Meter Details**			
6.1	Smart Meter Serial Number	87654321	Unique ID of new meter	To be filled at Consumer Premise
6.2	Seal Number	DFGH123	Unique ID of Seal Number	
6.3	Box Number	A987	Unique ID of Box Number	
6.4	Meter Make and model number	ABCD- Model Number 3287	Meter Information viz. Model & Make	
6.5	Meter Communication (GPRS/ PLC/ RF etc.)	GPRS	Mode of communication of the new meter	To be filled at Consumer Premise
6.6	Meter Category	Whole Current/CT Operated	Details of the new meter	
6.7	Energy recording type	Unidirectional/ Bidirectional		
6.8	New Meter Type	Single/ Three Phase	Details of the new meter type	
6.9	SIM card provider	XYZ	Details of Network Service provider. Applicable only in case of cellular communication	

Annexure II - Sample Meter Installation Template

SN	Parameter	Observation	Remarks	Data Capturing Method
6.10	Meter Capacity	5-30A, 2 Wire, 240V, 50Hz, 3200imp/kWh	Meter Information	To be filled at Consumer Premise
6.11	Signal Strength for Meter communication	Good	To be checked post Installation of Smart Meter	
6.12	New Meter Functioning	All functionalities tested okay	Specific observations should be highlighted here	
6.13	Other Remarks		Any other remarks observed post Smart Meter Installation	
7	**Consumer Demonstration**			
7.1	Meter functioning demonstrated to consumer (Y/N)?	Yes	Newly installed Smart Meter to be demonstrated in details to consumers	To be filled at Consumer Premise
7.2	Awareness Material shared with customer	Yes	Share the Brochure and Information booklet with the Consumers	

Annexure II - Sample Meter Installation Template

SN	Parameter	Observation	Remarks	Data Capturing Method
8	Mobile Application Demonstration			
8.1	Application Downloaded	Yes	Facilitate the Installation of Mobile Application on Consumer Smartphone	To be filled at Consumer Premise
8.2	Application Registration	Complete	Facilitate the Registration of downloaded Mobile Application on Consumer Smartphone	
8.3	Application feature demonstration (Y/ N/ NA)	Yes	Demonstration of mobile application demonstration. To be mentioned as NA if no mobile application is available for demonstration	
9	Additional Remarks			
9.1	Additional Remarks	Additional remarks from the Installation Personnel	Any specific point to be noted about the installation/ about the consumer/ about the location/ about the old meter / about the new smart prepaid meter etc.	To be filled at Consumer Premise
10	Utility Representative Information			
10.1	Service Personnel Name	Mr. ABCD	Name of the Installation Personnel to be recorded	
10.2	Employee ID/ Contractor ID	123456	Unique ID of the installation personnel- to be assigned by the DISCOM	To be filled at Consumer Premise