

SMART METER

INDUSTRY RESEARCH REPORT

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FOREWARD

It is with great pleasure that we present Smart Meter Outlook Report. Smart Meter is one of the most important devices used in the Smart Grid (SG). The smart meter is an advanced energy meter that obtains information from the end users' load devices and measures the energy consumption of the consumers and then provides added information to the utility company and/or system operator. Several sensors and control devices, supported by dedicated communication infrastructure, are utilized in a Smart Meter. In this report, we touch base critical facets that define the present state of the Smart Meters, examining the macroeconomic factors influencing its growth, technological advancements driving innovation, and the regulatory landscape shaping its future.

Our research is grounded in a meticulous analysis of data, market dynamics, and expert insights, with the objective of offering valuable perspectives to decision-makers and investors. The report is structured to facilitate a nuanced understanding of the Smart Meters, providing a holistic view of the challenges and opportunities that lie ahead with CAGR and market analysis to give specific insight on the sector.

Various insights, inputs, data, Industry experts' perspective, news, articles have been navigated & explored from various data points available on public domain to give in-depth and comprehensive outlook yet presented in a concise manner on the smart meter in this report.

We extend our gratitude to the experts, industry leaders, stakeholders who generously contributed their knowledge and perspectives on the public domain which formed the input to this report. Their insights have been invaluable in enriching the depth and credibility of this report. We also thank our team members Mr.Rachit Gupta who contributed extensively in the preparation of the report and Mr.Dishant Prajapati for presenting the content effectively.

As we embark on this exploration of the smart meters, we remain committed to delivering a report that not only reflects the current state of affairs but also serves as a roadmap for informed decision-making. We hope that this document sparks meaningful discussions and contributes to the collective effort of fostering sustainable growth within the sector.

Thank you for entrusting us with your time and consideration.



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Consultants Private Limited

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DISCLAIMER

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Sector Overview

Smart Meters are a new generation digital meters that allow consumers to learn about their respective electricity consumption pattern and help DISCOMs conduct system monitoring and raise customer billing without manual intervention. Smart Meters are expected to prevent **electricity theft, reduce AT&C losses to DISCOMs and promote responsible power consumption among consumers.** Smart Meters can be in 2 (Two) forms, i.e.-

- (i) Prepaid where the consumers would be required to recharge prior to consuming the electricity or
- (ii) Post-paid, where the consumers would be required to pay subsequent to the consumption of electricity.

Key differences between smart meters and traditional meters

Feature	Smart meters	Traditional meters
Data Collection	Automatic, real-time data transmission	Manual readings required
Billing Accuracy	More accurate due to real-time data	Prone to errors due to manual input
Communication	Two-way communication with utilities	One-way communication only
User Access	Users can view consumption data online	Limited access; usually requires a bill
Energy Management	Enables demand response programs	No capability for real-time management
Installation Cost	Generally higher initial cost	Lower initial cost
Maintenance	Requires software updates	Mechanical maintenance needed



Acronyms:

DISCOMs: Distribution Companies;
RDSS: Revamped Distribution Sector Scheme of Govt. of India;
AT&C: Aggregate Technical and Commercial losses

Source: - https://www.nishithdesai.com/fileadmin/user_upload/pdfs/Research_Papers/Smart_Meters.pdf
<https://recindia.nic.in/uploads/files/FAQs-Smart-Meter-Booklet-with-revised-text-on-27-10-2021.pdf>

BACKGROUND

Smart Meters scheme is launched by Govt. of India through **Smart Meter National Programme (SMNP)** under which it aims to replace 25 crores conventional meters with smart meters in India.

The concept of Smart Meters has taken shape with the emergence of **India Smart Grid Task Force (ISGTF)** and **India Smart Grid Forum (ISGF)** in 2010. Further Smart Grid Pilot Projects were launched in 2012. Along with this Smart Grid Knowledge Center was also launched with implementing agency being PowerGrid.

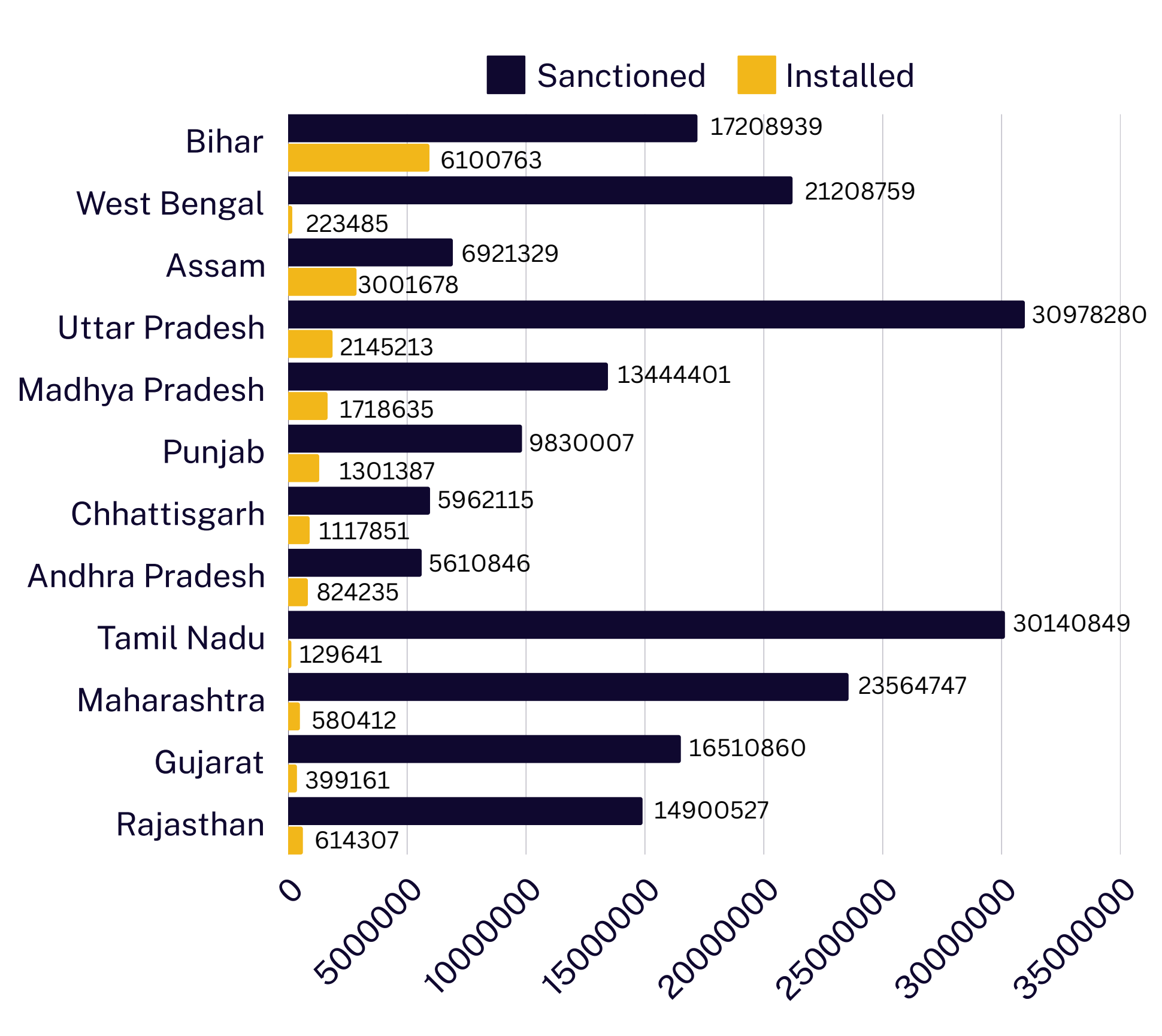
A Smart Grid Vision and Roadmap for India was approved by the Ministry of Power in August 2013 which also envisaged the launch of a **National Smart Grid Mission (NSGM)** with total budgetary support of Rs.380 crores.

Further to it till date smart meters are implemented under different schemes and projects .

- **IPDS (Integrated Power Development Scheme)** launched in December, 2014 for strengthening distribution and transmission power network of the country through various measures to help in reducing AT&C losses under which installation of prepaid/ smart meters in Govt. establishments and AMI and smart meters in towns where SCADA being established under R-ARDRP. Govt. of India has allocated Rs.830 crores for smart metering under this scheme.
- **National Tariff Policy, 2016** – Mandated installation of smart meters for Consumers with monthly consumption of 500 units and more at the earliest but not later than 31.12.2017 and for Consumers with monthly consumption above 200 units by 31.12.2019. Further, two way smart meters shall be provided to all prosumers, who also sell back electricity to the grid as and when they require.
- Further Ministry of Power, Govt. of India has asked to all the states vide Office Order dated: 16th August, 2018 to give roadmap for implementation of smart meters in next 3 years say by March, 2021.
- **Revamped Distribution Sector Scheme (RDSS)** – Govt. of India has given major boost for the implementation of Smart Meters with the launch of Revamped Distribution Sector Scheme (RDSS) vide OM dtd. 20.07.2021 with an outlay of Rs. 3,03,758 crores with an estimated Gross Budgetary Support of Rs. 97,631 crores for the duration of 5 years i.e. from (FY 2021-22 to FY 2025-26). The Scheme aims to reduce the Aggregate Technical & Commercial (AT&C) losses to pan-India levels of 12-15% and Average Cost of Supply (ACS)-Average Revenue Realised (ARR) gap to zero by 2024-25.
- Schemes of IPDS, DDUGJY along with PMDP2015 for the erstwhile State of Jammu & Kashmir are being subsumed in this scheme to be implemented as per their extant guidelines and under their existing terms & conditions.

Market Analysis

As of June 2024, 222.3 million meters have been sanctioned by the Gol out of which ~199.6 million are implemented under 10 different schemes by the Gol itself and remaining 22.6 million by State Utilities. Out of this over 117 million consumer smart meters have been awarded, which is 53 per cent of the total sanctioned meters, and 19.2 million consumer smart meters have been installed till date as per the **National Smart Grid Mission (NSGM) Dashboard**. Notably, during 2023-24, 4.84 million smart consumer meters have been installed, nearly double the installations from the previous year. With the government mandating the transition to a complete smart metering system, replacing all the existing 250 million meters by 2027, the pace of smart meter awards and installations is expected to accelerate in the coming months.



Note:
Gol: Government of India

Source: NSGM Website

Scheme Wise

Scheme	Sanctioned	Installed	Remaining Balance
DDUGJY	38,400	38,400	-
IPDS	6,90,616	6,90,616	-
IPDS (SG Pilots)	32,642	32,642	-
IPDS ST&D	1,19,641	1,19,641	-
Non-RDSS to RDSS	29,70,100	24,18,223	5,51,877
NSGM	1,78,522	1,69,557	8,965
PMDP-Phase-I	1,27,050	1,25,095	1,955
PMDP-Phase-II	6,00,000	5,15,454	84,546
RDSS	19,48,60,030	71,18,506	18,77,41,524
SDP	58,930	55,580	3,350
Utility Owned	2,26,78,559	86,15,871	1,40,62,688
Grand Total	22,23,54,490	1,98,99,585	20,24,54,905

Status of Smart Consumer Metering (January 2025)

Agency Wise

Agency	Sanctioned	Installed	Remaining Balance
EESL	65,000	65,000	-
NSGM	2,11,164	2,02,199	8,965
PFC	8,95,10,895	59,20,496	8,39,20,668
REC	13,22,97,331	1,34,41,790	11,92,40,293
Utility	2,70,100	2,70,100	-
Grand Total	22,23,54,490	1,98,99,585	

Acronyms:

DDUGJY: Deen Dayal Upadhyaya Gram Jyoti Yojana; IPDS: Integrated Power Development Scheme; RDSS: Revamped Distribution Sector Scheme; PMDP: Prime Minister's Development Package; SDP: Special Development Package; ST&D: Sub Transmission & Distribution; EESL: Energy Efficiency Services Limited; NSGM: National Smart Grid Mission; PFC: Power Finance Corporation; REC: Rural Electrification Corporation Limited

DT Metering

Agency	Sanctioned	Installed	Remaining Balance
Non-RDSS to RDSS	52,000	20,190	31,810
PMDP	20,794	11,369	9,425
RDSS	52,00,692	3,06,576	48,94,116
SDP	1,931	1,804	127
Utility Owned	23,680	16,396	7,284
Grand Total	52,99,097	3,56,335	49,42,762

Agency	Sanctioned	Installed	Remaining Balance
PFC	18,22,654	1,61,347	16,61,307
REC	34,76,443	1,94,988	32,81,455
Grand Total	52,99,097	3,56,335	49,42,762

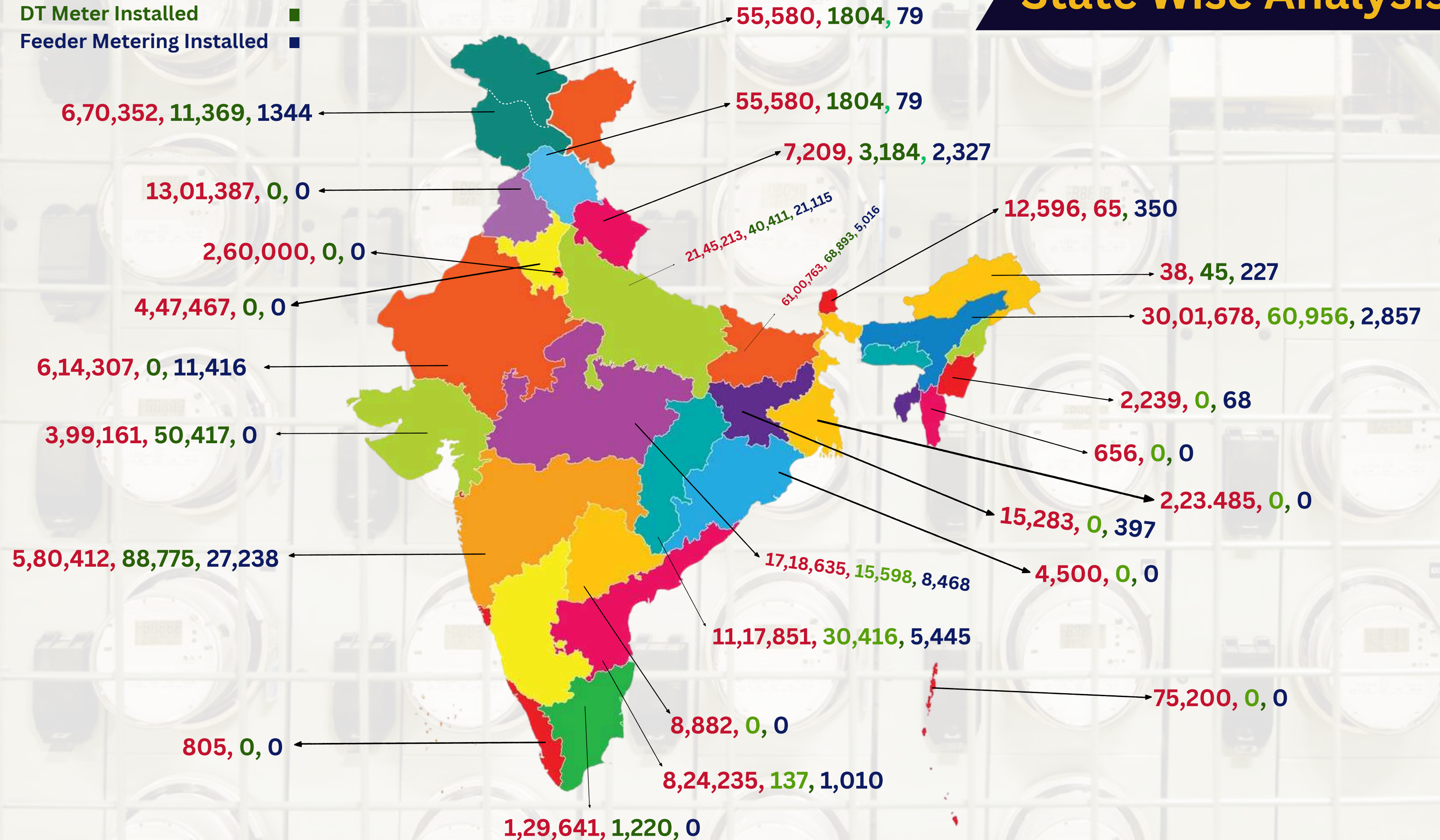
Feeder Metering

Agency	Sanctioned	Installed
Non-RDSS to RDSS	455	637
RDSS	2,05,020	87,255
SDP	54	79
Grand Total	2,05,529	87,971

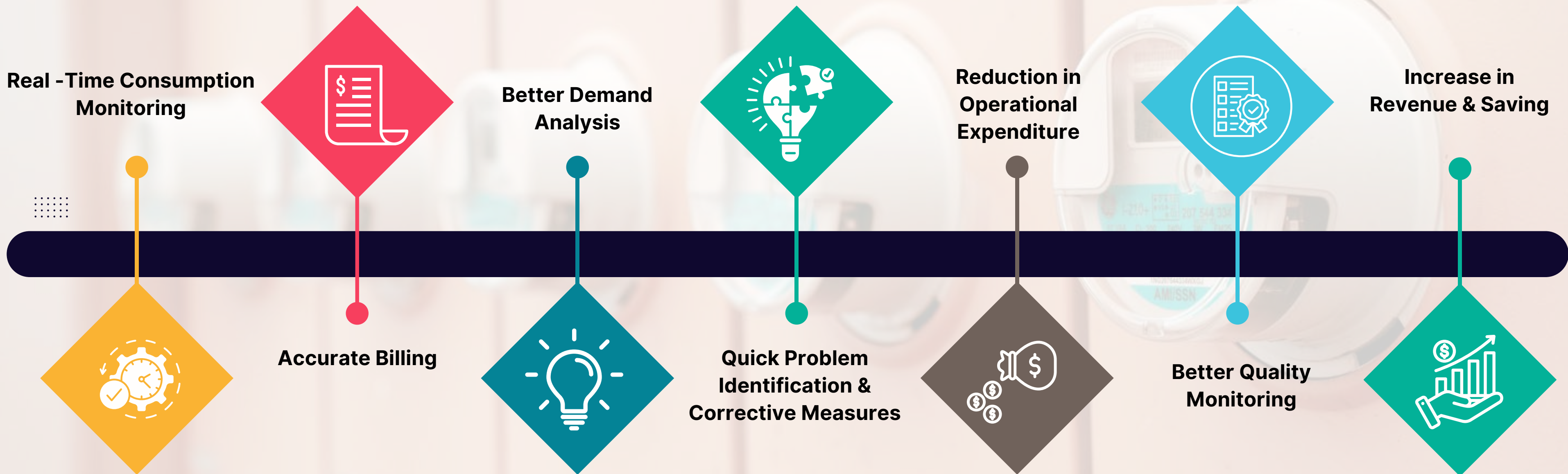
Agency	Sanctioned	Installed	Remaining Balance
PFC	1,03,582	39,786	63,796
REC	1,01,947	48,185	53,762
Grand Total	2,05,529	87,971	1,17,558

State Wise Analysis

Smart meter Installed ■
 DT Meter Installed ■
 Feeder Metering Installed ■



Smart Meter Benefits



Building Blocks of AMI

AMI comprised of various hardware and software components, all of which play a role in measuring energy consumption and transmitting information about energy, water and gas usage to utility companies and customers. The overarching technological components of AMI include:

Smart Meter Infrastructure

Advanced Metering Infrastructure (AMI) facilitates monitoring and measurement of consumer information through Smart Meters installed at customer premises. The information is transferred to utility control center through communication mode such as GPRS / PLC / RF. Smart meters can also perform advance functions such as Time of Day (TOD) and Critical Peak pricing (CPP)/Real Time Pricing (RTP) rate metering and monitoring based on energy consumption.

Smart Meters

Advanced meter devices have the capacity to collect information about energy, water, and gas usage at various intervals and transmits the data through fixed communication networks to utility, as well as receiving information like pricing signals from utility and conveying it to consumer.

Communication Network

Advanced communication networks which supports two-way communication enables information from smart meters to utility companies and vice-versa. Networks such as Broadband over PowerLine (BPL), Power Line Communications, Fiber Optic Communication, Fixed Radio Frequency or public networks (e.g., landline, cellular, paging) are used for such purposes.

Meter Data Acquisition System

Software applications on the Control Centre hardware and the DCUs (Data Concentrator Units) used to acquire data from meters via communication network and send it to the MDMS.

Meter Data Management System (MDMS)

Host system which receives, stores and analyzes the metering information.

Notes:

GPRS: General Packet Radio Service; PLC: Power Line Communication;
RF: Radio Frequency

Source: <https://energy.vikaspedia.in/viewcontent/energy/policy-support/energy-efficiency/smart-meter-national-programme?lgn=en>

Communication Technologies for AMI

The following table depicts some of the available choices for communication technologies for AMI deployment.

Technology/ Protocol	Last Mile/NAN/FAN	Home Area Network (HAN)	Backhaul/WAN and Backbone
Wireless	6LoWPAN-based RF mesh, ZigBee, Wi-Fi, Millimeter Wave Technology	6LoWPAN-based RF mesh, ZigBee, Wi-Fi, Bluetooth, Z-Wave, NFC	Cellular, Satellite, LPWA, Long Wave Radio, TVWS, Private Microwave Radio links (P2P and P2MP)
Wired	PLC, Ethernet, Serial interfaces (RS-232, RS-422, RS-485), DSL	PLC, Ethernet, Serial interfaces (RS-232, RS-422, RS-485)	Optical Fiber, Ethernet, PLC, DSL

*This list is indicative only.

Note:

NAN: Neighborhood Area Network; FAN: Field Area Network; WAN: Wide Area Network; DSL: Digital Subscriber Line; LoWPAN: Low-power Wireless Personal Area Network; ZigBee: Zonal Intercommunication Global-standard; NFC: Near-field Communication; LPWA: Low Power Wide Area; TVWS: TV white spaces; Wi-Fi: Wireless Fidelity; P2P: Peer-to-Peer; P2MP: Point-to-multipoint communication;

01 Automatic Meter Reading (AMR)

AMR technology is used to collect meter readings remotely, reducing the need for manual meter reading and improves data accuracy.

02 Advanced Metering Infrastructure (AMI)

AMI systems enable two-way communication between meters and utilities, helping utilities to manage grid operations and perform remote monitoring.

03 Communication Networks

Various communication technologies (RF, PLC, Cellular, Wi-Fi/Bluetooth, LPWAN) are employed in smart meters to transmit data over long distances or through existing infrastructure.

04 Real-Time Data Monitoring

Smart meters allow utilities and consumers to monitor energy usage in real-time, which enables better demand-side management.

05 Time-of-Use (ToU) Pricing

Time-of-use pricing benefits both consumers and utilities by encouraging energy use during off-peak hours and managing demand.

Remote Control and Disconnect/Connect Features 06

This feature allows utilities to remotely manage customer connections, improving operational efficiency and reducing the need for field visits.

Data Analytics and Machine Learning 07

Data analytics and machine learning enable utilities to predict energy demand, detect irregularities, and optimize grid performance.

Energy Management Systems (EMS) 08

Energy management systems integrated with smart meters help consumers and utilities reduce energy consumption and improve overall grid management.

Security Features 09

Cybersecurity measures such as encryption protocols ensure the secure transmission of data from smart meters to utilities.



Sources:

Smart Energy International, European Commission (EC); National Institute of Standards and Technology (NIST); IEEE Spectrum; US Deptt. of Energy (DOE); International Energy Agency (IEA); : U.S. Energy Information Administration (EIA); McKinsey & Company. "The Future of Utilities: Smart Metering and Data Analytics

Govt. Initiatives

Government initiatives such as **Restructured Accelerated Power Development and Reform Program (R-APDRP)** and **Central Electricity Authority (CEA) guidelines** have facilitated the adoption of intelligent smart metering in India.

The Ministry of Power launched the **Revamped Distribution Sector Scheme (RDSS)** in 2022 to improve the operational efficiency and financial sustainability of distribution companies (DISCOMS).

Part A

Provides financial support for prepaid smart metering, system metering, and distribution upgrades.

Part B

Focuses on training, capacity building, and support activities.



In the union budget 2025-26, the import duty on smart electricity meters has been lowered from 25 percent to 20 percent, further supporting the expansion of efficient power management systems.



Investments/Developments in the industry



EESL has installed over 3.575 million smart meters across Uttar Pradesh, Delhi, Haryana, Bihar, Rajasthan, and Andaman. Additionally, its JV, M/s Intellismart, has installed 303,000 smart meters in Assam.

1



Shete Advance Technologies, a startup incubated by Marathwada Mitra Mandal's FMCIII, has secured a USD 2.5 million investment from Filtrum LLP, Pune.

2



Iskrameco to invest INR 1000 Cr. for to establish an integrated hardware and software facility for smart metering solution in New Town

3



Energy Solutions

Adani Energy Solutions has secured smart meter projects worth Rs. 27,000 crores in Maharashtra, Bihar, and Andhra Pradesh. Deployment will begin within 12-18 months, with support from Esyasoft, Airtel, and others. A capex of Rs. 1,000-2,000 crore is planned for FY2025 to support installations.

4



Kaynes acquires smart meter company Iskrameco India for \$430 million

5

Major Companies



EVENT CHRONICLES



CHALLENGES

The widespread deployment of smart meters is facing several challenges as highlighted.



IT system integration and interoperability, as different hardware and software components from various vendors don't always work seamlessly together.



The lack of standardized protocols creates compatibility problems leading to delays and increased costs.



The risk of technology becoming outdated over time can raise maintenance costs and limit functionality.



Network reliability is another hurdle, with unreliable networks causing latency and congestion, increasing costs and dependence on telecom operators.



Managing and disposing of old meters is also inefficient due to the absence of clear procedures.



Limited adoption of smart meters by utility officials, along with insufficient training, prevents utilities from fully utilizing data insights for better decision-making.



The lack of clear processes for integrating data insights into strategic planning and policy formulation means the full potential of smart metering technology is not being realized.

WHAT TO EXPECT IN THE FUTURE (WAY FORWARD)

Under the RDSS, implementation of prepaid smart metering is currently being prioritised for:

- 500 (Five Hundred) cities under the Atal Mission for Rejuvenation and Urban Transformation with AT&C losses of more than 15%;
- All union territories of India (Andaman & Nicobar Islands, Dadar & Nagar Haveli and Daman & Diu, Jammu & Kashmir, Lakshadweep, Chandigarh, Government of NCT of Delhi, Ladakh and Puducherry)
- Micro Small and Medium Enterprises, industrial and commercial consumers.
- All government offices at the block level and above.
- Other areas with high losses.

THE IMPLEMENTATION WILL OCCUR IN TWO PHASES

Phase I (by 2026)

Focus on metering, AMI, consumer indexing, SCADA, and outage management at critical points, aiming for 50% coverage. Initial improvements will include underground lines, smart streetlighting, and pilot projects for smart energy storage and data analytics.

Phase II (by 2030)

Full implementation with 100% coverage of smart metering, expanded infrastructure, and pilot projects for DER management, peer-to-peer energy trading, and flexibility services.

This smart grid transition will be crucial for handling rising energy demand, improving efficiency, and enhancing consumer satisfaction.

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