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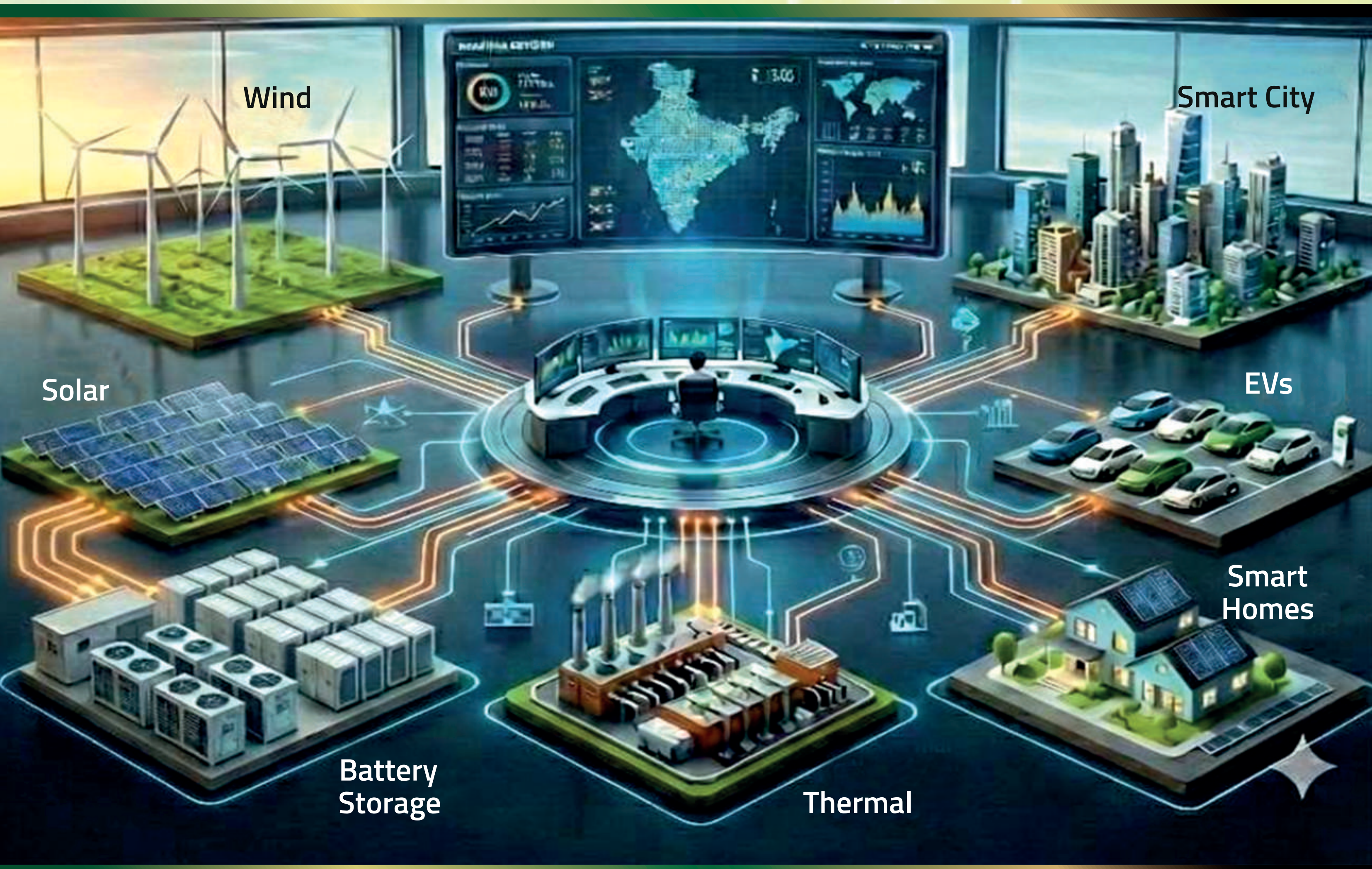
INDIA DISCOMS 2025

ANNUAL PUBLICATION OF AIDA



Distribution Sector Outlook

Experts Speak

About AIDA

AIDA Annual Awards

Research Study

AIDA Activities

Collaboration | Innovation | Excellence

ALL INDIA DISCOMS ASSOCIATION

INDEX

From the desk of Director General – AIDA

Shri Alok Kumar, Former Power Secretary (Govt. of India)

We are very happy to present the 1st annual report of AIDA, titled as India Discoms 2025, on the occasion of our annual conference - Electricity Distribution Industry Conference 2026 in January 2026 when AIDA is one year old. We salute the vision of our founding Discoms for making the idea of the voice of Discoms of India being heard a reality.

We wanted to make our annual report much more useful for the stakeholders going beyond the description of the activities of AIDA in the previous year. Pursuing this objective, we are delighted to include about a dozen articles on various aspects of the distribution segment authored by well known experts and hands-on professionals. India Discoms 2025 also includes glimpses of excellent work being done by those Discoms who have been recommended for AIDA annual awards by an independent expert jury. Our senior colleagues in the AIDA secretariat are also happy to present a sector outlook covering the present trends, challenges, and the major initiatives of the Government which are going to shape the future of Discoms in India.

Though our achievements so far may look modest, it is heartening to share that 53 distribution utilities - which include both government owned and private ones- are members of AIDA. Not only this constitutes more than seventy-five per cent of the total utilities, our membership spreads to all corners of the country, from Kashmir to Kerala and from Gujarat to Manipur. In this one year, we have effectively contributed to several policy and regulatory initiatives through policy advocacy, organised a number of international and national study tours for our member Discoms in addition to large number of webinars for sharing best practices and innovative work, have entered into close to 10 collaborative partnerships with international and national organisations, and were able to arrive at common agreed specifications of distribution transformers aimed at improved quality and better prices. With the support of the Ministry of Power and NPTI, a special customised leadership course for the middle management of Discoms has also commenced. This all has been possible due to the guidance from the AIDA Executive Council and, cooperation and trust from our member Discoms. A special appreciation to the field level experts from Discoms who have contributed to deliberations in the meetings of the seven standing AIDA committees. All the Directors and staff of AIDA secretariat have worked very hard to make all this possible.

AIDA expresses heartfelt gratitude to the Ministry of Power, CEA, CERC for all the encouragement to our initiatives. We are also grateful to REC and PFC - our lead sponsors, other sponsors and supporting organisations of our annual conference and annual publication.

मनोहर लाल
MANOHAR LAL

विद्युत मंत्री एवं
आवासन और शहरी कार्य मंत्री
भारत सरकार
Minister of Power and
Minister of Housing and Urban Affairs
Government of India

सत्यमेव जयते

Message

I am happy to know that All India DISCOMs Association (AIDA) is bringing out its first annual publication, India DISCOMs 2025 on the occasion of its first Annual Conference in January 2026. In the very first year of its existence, AIDA's effort to present a collective and well-reasoned viewpoint of India's DISCOMs is truly commendable. This report is expected to serve as an important enabler for DISCOMs to enhance their performance through peer learning, knowledge sharing, and capacity building.

Under the visionary leadership of the Hon'ble Prime Minister, the Government has undertaken several reform measures to make India a power-surplus country and to ensure that electricity reaches every household. Among these, improving the financial health of DISCOMs has been a top priority, pursued through schemes such as the Revamped Distribution Sector Scheme (RDSS) and other structural interventions in the distribution segment.

Guided by the philosophy that viable and financially strong DISCOMs are essential for attracting the necessary investments across the power supply value chain, the Government is committed to ensure the delivery of reliable and quality power supply to industries and households alike.

The Government of India is also striving to ensure that tariffs increasingly reflect the true cost of supply. In this direction, reforms have been undertaken to incentivise States to release subsidies and Government department payments in a timely manner, and to strengthen the collection systems in DISCOMs through prepaid smart meters, thereby improving transparency, efficiency, and financial discipline in the sector.

I appreciate this publication for offering valuable insights through contributions from eminent experts across diverse backgrounds, showcasing the exemplary work of award-winning DISCOMs, and presenting a forward-looking perspective on the power sector.

I extend my best wishes to AIDA in its future endeavours.

(Manohar Lal)

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पंकज अग्रवाल, भा.प्र.से.
सचिव
Pankaj Agarwal, I.A.S.
Secretary

सत्यमेव जयते

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MESSAGE

Distribution utilities form the backbone of the power sector, ensuring reliable and affordable electricity supply to consumers. It is essential that policy, regulatory and programmatic interventions are periodically reviewed from the standpoint of their impact on financial viability of DISCOMs. In this context, it is heartening that AIDA has assumed an important role in policy and regulatory advocacy, undertaken capacity building of DISCOM personnel, and facilitated dissemination of innovative practices among DISCOMs.

Ministry of Power is, currently, undertaking various measures to improve the viability of the power distribution sector. One of these measures include implementing the Revamped Distribution Sector Scheme (RDSS), a flagship programme to support DISCOMs for upgradation and modernisation of the distribution network and improving their performance. The smart metering assumes special importance in view of increasing power system complexities and large-scale integration of distributed energy resources. Timely and extensive analysis of smart meter data can significantly enhance both the cost-effectiveness and reliability of electricity supply.

The Ministry of Power looks forward to supporting AIDA in its endeavours through research studies and capacity building and conveys best wishes on the publication of its first Annual Report, "India DISCOMs 2025".

(Pankaj Agarwal)

AIDA
Collaboration | Innovation | Excellence

ALL INDIA DISCOMs ASSOCIATION

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Save Energy!
Save Nation!!

Message

Distribution companies are providing a vital service to the economy and the residents in the areas where these have respective universal service obligations. While discharging duties, Discoms interact on a day-to-day basis with a large number of stakeholders, in addition to frequent interface with the Ministry of Power, State Governments and the Regulatory Commissions. Discoms procure electricity from a large number of sources and sell the same to a very large number of consumers having very diverse social and economic status. Many of the consumers are Government Departments and local bodies which provide critical services making disconnection of supply practically impossible in case of payment default. Integration of variable distributed sources of energy with the grid poses another set of challenges.

These ground realities and the challenges faced by the Discoms need to be taken into account at the time of policy formulation and design of regulations. All India Discoms Association was set up with the objective of fulfilling this requirement by actively taking up policy and regulatory advocacy. I am glad to share that with the assistance of the AIDA secretariat and support of member Discoms, AIDA has started discharging this mandate quite effectively. It is also proactively disseminating the innovative work being done and the lessons learnt by various member Discoms and other collaborating organisations among the all member Discoms.

I am sure that the successful organisation of the 1st annual conference organised by AIDA, publication of its annual report - India Discoms 2025, and presentation of AIDA annual awards will further motivate and encourage the Discoms of India to upscale their efforts for improving their performance and reliability of supply.

I express my heartfelt gratitude to the Ministry of Power for supporting AIDA in its endeavour and also extend my best wishes to all the member Discoms on this occasion.

Lokesh Chandra (IAS)
President, AIDA

AIDA Executive Council

President and General Secretary

President – AIDA Shri Lokesh Chandra, CMD, MSEDCL	General Secretary – AIDA Dr. Ashish Kumar Goel, Chairman, UPPCL

Representatives of Western Region

Shri Kandarp Patel CEO / MD, Adani Electricity Mumbai Ltd. (AEML)	Shri Jenu Dewan MD, GUVNL

Representatives of Eastern Region

Shri Gajanan S. Kale CEO, TPNODL	Shri Mahendra Kumar MD, SBPDCL

Representatives of Northern Region

Shree Raveesh Gupta MD, PVVNL	Shri P. R. Kumar MD & CEO, NPCL

Representatives of Northern Eastern Region

Shri Rakesh Kumar MD, APDCL (Assam)	Shri Sanjay Goyal CMD, MECL (Meghalaya)

Representatives of Southern Region

Shri Prudhvi Tej Immadi CMD, APEPDCL	Shri Minhaj Alam CMD, KSEBL

AIDA General Body Members

Sr. No.	Name of Member	Address	Logo
1	Adani Electricity Mumbai	Devidas Lane, Off SVP Road,Borivali (W), Mumbai, Maharastra – 400103	adani Electricity
2	Ajmer Vidyut Vitran Nigam Limited.	Vidyut Bhawan, Makarwali Rd, B Block, Panchsheel Nagar, Ajmer, Rajasthan 305004	Ajmer Vidyut Vitran Nigam Limited
3	Andhra Pradesh Central Power Distribution Corporation Limited	Corporate Office Beside Polytechnic College ITI Road, Vijayawada, NTR District, A.P. – 520 008	సదా మీసేవలో...
4	Assam Power Distribution Company Ltd	1st Floor, Bijulee Bhawan, Paltanabazar, Guwahati, Assam -781001	APDCL
5	Bangalore Electricity Supply Co. Ltd	K.P.C.C. Building, K.R. Circle, Bangalore, karnataka – 560001	BESCOM
6	BSES Rajdhani Power Ltd	BSES Bhawan, Nehru Place, New Delhi – 110019	BSES BSES Rajdhani Power Limited
7	BSES Yamuna Power Ltd	BSES Shakti Kiran building , Karkardooma, Delhi-110032	BSES BSES Yamuna Power Limited
8	CESC Limited	CESC House, Chowringhee Square, Kolkata, West Bengal – 700001	CESC LIMITED
9	Chandigarh Power Distribution limited	4th Floor, SCO-33 To 35, Sector 34A, Chandigarh – 160 022	Chandigarh Power Distribution Limited (CPDL)
10	Chhatisgarh Power Distribution Company Ltd.	Shakti Bhawan, 3rd Floor, Near Rampur, Block No 7, Vidyut Nagar, Jabalpur-482008	CSPDCL

Sr. No.	Name of Member	Address	Logo
11	Dakshin Gujarat Vij Co Ltd – Surat	Urja Sadan, Nana Varachha Road, Kapodara, Surat, Gujarat – 395 006	
12	Dakshinanchal Vidyut Vitaran Nigam Ltd. – Agra	Urja Bhavan, Sikandra, Agra,Uttar Pradesh – 282007	
13	Damodar Valley Corporation	DVC Towers, VIP Road, Kolkata, West Bengal -700054	
14	Eastern Power Distribution Company Of Andhra Pradesh, Limited-Visakhapatnam	TPT Colony, Seethammadhara, Visakhapatnam, Andhra Pradesh-530013	
15	Gujarat Urja Vikas Nigam Limited	Sardar Patel Vidyut Bhavan, Race Course, Alkapuri, Gujarat- 390007	
16	Gulbarga Electricity Supply Company Ltd	Market Road, Gulbarga-585101	
17	India Power Corporation Limited	Block EP, Sector V, Salt Lake City, Kolkata, West Bengal- 700091	
18	Jaipur Vidyut Vitran Nigam Ltd – Jaipur	Vidyut Bhawan, Near Vidhan Sabha, Janpath Road, Jyothi Nagar, Jaipur – 302005	
19	Jammu Power Distribution Corporation Limited.	Gladni Narwal, Jammu, Jammu & Kashmir -180006.	
20	Jodhpur Vidhyut Vitran Nigam Ltd	New Power House Road, Industrial Area, Jodhpur, Rajasthan - 342003	
21	Kanpur Electricity Supply Co. Ltd	KESA House, 14/17 Civil Lines, Kanpur, Uttar Pradesh – 208001	

Sr. No.	Name of Member	Address	Logo
22	Kashmir Power Distribution Company Ltd	Opposite High Court Jehangir Chowk, Srinagar, Jammu & Kashmir-190001.	
23	Kerala State Electricity Board Limited-Thiruvananthapuram	Vydyuthi Bhavanam, Pattom Pottakuzhy Rd, opp. arya central school, Vrindavan Gardens, Pattom, Thiruvananthapuram, Kerala-695004	
24	Madhya Gujarat Vij. Co. Ltd – Vadodra	3rd Floor, Sardar Patel Vidyut Bhavan, Race Course Road, Vadodara – 390007	
25	Madhya Pradesh Madhya Kshetra Vidyut Vitaran Co. Ltd	Bijli Nagar Colony, Nishtha Parisar, Govindpura, Bhopal – 462023	
26	Madhya Pradesh Paschim Kshetra Vidyut Vitaran Company Limited	Madhya Pradesh Paschim Kshetra Vidyut Vitaran Company Limited GPH Compound, Polo Ground, Indore-452003	
27	Madhya Pradesh Poorv Kshetra Vidyut Vitaran Company Limited	Shakti Bhawan, 3rd Floor, Near Rampur, Block No 7, Vidyut Nagar, Jabalpur-482008	
28	Madhyanchal Vidyut Vitran Nigam Ltd.- Lucknow	4-A, Gokhale Marg, Lucknow, Uttar Pradesh- 226001.	
29	Maharashtra State Electricity Distribution Co. Ltd. – Mumbai	Hongkong Bank Building, M.G. Road, Fort, Mumbai , Maharastra – 400001	
30	Manipur State Power Distribution Company Limited	3rd Floor, New Directorate Building, Imphal-Dimapur Road, near 2nd MR Gate, Ragailong, Imphal, Manipur-795001	
31	Meghalaya Power Distribution Corporation Ltd	Lumjingshai Short, Round Road, Riatshamthan, Shillong, Meghalaya – 793001	
32	Noida Power Company Limited	Knowledge Park 4th, Greater Noida, Gautam Budha Nagar, Uttar Pradesh – 201310	

Sr. No.	Name of Member	Address	Logo
33	North Bihar Power Distribution Company Limited – Patna	3rd Floor, Vidyut Bhawan, Bailey Road, Patna, Bihar – 800 001	
34	Northern power Distribution Company of Telengana Limited	Vidyut Bhavan, Nakkalgutta, Hanamkonda, Warangal, Telengana – 506001	
35	Paschimanchal Vidyut Vitran Nigam Ltd.- Meerut	Urja Bhawan, Victoria Park, Meerut, Uttar Pradesh – 250001	
36	Pashchim Gujarat Vij. Co. Ltd – Rajkot	Nana Mava Main Road, Laxminagar, Rajkot, Gujarat – 360 004	
37	Purvanchal Vidyut Vitran Nigam Ltd. Varanasi	Lahartara Road Chandpur, Varanasi, Uttar Pradesh-221106	
38	Sai Computers Ltd. (Franchise in Meghalaya)	Sai Dhaam, Victoria Park Meerut, Uttar Pradesh – 250001	
39	South Bihar Power Distribution Company Limited	2nd Floor, Vidyut Bhawan, Bailey Road, Patna, Bihar – 800 001	
40	Southern Power Distribution Company of A.P. Ltd.	Srinivasapuram Tiruchanoor Road, Tirupati, Tirupati(Dist), Andhra Pradesh-517 503	
41	Tamill Nadu Power Distribution Corporation Ltd.	Npkrr Maaligai (Tneb office) 144 Anna Salai Na Chennai-600002.	
42	Tata Power Central Odisha Distribution Limited	2nd Floor, IDCO Tower, Janpath, Bhubaneswar, Odisha – 751 022	
43	Tata Power Company Ltd-Mumbai	A Block 34, Sant Tukaram Road Carnac Bundar, Mumbai, Maharastra – 400009	

Sr. No.	Name of Member	Address	Logo
44	Tata Power Delhi Distribution Limited	NDPL House, Hudson Lines Kingsway Camp, Delhi – 110 009	
45	Tata Power Northern Odisha Distribution Limited	NESCO, Januganj, Balasore, Odisha – 756019	
46	Tata Steel Utilities and Infrastructure services Limited	Sakchi Boulevard Road, Northern Town, Bistupur, Jamshedpur , Jharkhand – 83100	
47	Telengana Southern Power Distribution Co Ltd	Mint Compound, Lakdi Ka Pool, Hyderabad, Telengana – 500004	
48	Torrent Power Ltd	Raghunath Nagar, Suresh Plaza Market, Agra, Uttar Pradesh -282002	
49	Tripura State electricity Corporation	Bidyut Bhaban, Banamalipur, Agartala, Tripura-799001	
50	Uttar Gujarat Vij Co Ltd-Mehsana	Visnagar Road, Mehsana, Gujarat - 384001	
51	Uttar Pradesh Power Corporation Limited	Shakti Bhawan, Ashok Marg, Lucknow, Uttar Pradesh – 226001	
52	Uttarakhand Power Corporation Limited	Corporate Office, Victoria Cross Vijeyta Gabar Singh Urja Bhawan Kanwali Road Balliwala Chowk , Dehradun, Uttarakhand-248001	
53	West Bengal State Electricity Distribution Company Limited.	Vidyut Bhavan, Block- DJ- Kolkata, Sector-11, Bidhannagar- 700091	

REC: Accelerating Sustainable Energy Sector Growth with the Power of AI

Artificial Intelligence and Machine Learning- the imitation by computers and robots of the intelligence inherent in humans for planning, decision making, improved communication and processing large amounts of data- is significantly changing industries across the world.

Standing at the forefront of India's dynamic power sector, REC is proactively integrating these cutting-edge technologies to enhance internal operations while also leading the integration of AI/ML across India's power distribution sector.

Jitendra Srivastava
Chairman & Managing Director
REC Ltd.

Vision- Driven Investments

REC's strategic investment and growth is driven by its deep commitment to aligning its funding with the nation's broader development goals. Driven by its Maharatna status, REC is aggressively targeting a massive expansion of its total Loan Book from the current ₹5.82 lakh crore to a landmark ₹10 lakh crore by FY2030.

REC is also prioritizing Renewable Energy (RE) financing and aims to be a leader in India's energy transition, targeting a loan outstanding of ₹3 lakh crore (30% of its business) by 2030.

The pace of this comprehensive expansion is further accelerated by the deep integration of cutting-edge technology across all operations.

Data-Informed ESG Excellence

REC has cemented its commitment to sustainability by achieving the top-rank in the latest NSE ESG Ratings. This outstanding performance is a direct result of a comprehensive three-year strategy initiated with the company's first-ever ESG Policy, guided by the REC Board of Directors.

Key drivers of this success include strategic planning, benchmarking against global standards like Climate Disclosure Project (CDP), S&P CSA, and developing a clear Net-Zero Pathway.

Looking ahead, REC is further ensuring its sustained ESG leadership by leveraging data analytics and AI to drive smarter, more sustainable decision-making across operations.

Digital Transformation with RDSS

A core component of the power sector's digital transformation is the deployment of smart meters under the Revamped Distribution Sector Scheme (RDSS). REC and PFC are the nodal agencies for facilitating the implementation of the scheme. More than 40 million smart meters have been deployed across India.

A Future-Ready Energy Sector

Further advancing the application of data-driven intelligence tools within the power sector, REC, under the aegis of the Ministry of Power and in association with PFC Limited., conducted a two-day National Conference on the Use of AI/ML in the Power Distribution Sector under the Revamped Distribution Sector Scheme (RDSS) on December 6-7, 2025, at Bharat Mandapam, New Delhi.

The Conference showcased cutting-edge use cases of smart meter data analytics, integrated IT/OT systems, and Smart Home Automation Solutions that drive innovation, improve operational efficiencies, and enhance consumer satisfaction across Distribution Companies (DISCOMs) in the country.

Shri Manohar Lal, Hon'ble Union Minister of Power and Housing & Urban Affairs, graced the event and noted that the that the AI/ML based solutions, smart meter analytics, digital twins, predictive maintenance, theft detection intelligence, appliance-level consumer insights, automated outage prediction and GenAI-based decision support can transform both consumer experience and operational efficiency.

Strengthening Digital Infrastructure with India Energy Stack (IES)

Another major stride towards leveraging AI to transform the power sector has been the initiation of the India Energy Stack (IES) by the Ministry of Power. REC is the Nodal Agency for IES.

The India Energy Stack, defined as a DPI, aims to identify and connect stakeholders and assets, and facilitate open data exchange through uniform specifications and standards, thereby unlocking transparent, reliable, inclusive, efficient, and affordable energy access. The project is scheduled to be completed by July 2026.

Driving the Energy Evolution

From powering India's Green Revolution by energising agricultural pump sets to championing the rise of green technologies in the energy ecosystem, REC has remained driven by one consistent purpose- meeting the nation's needs today while preparing it for the demands of tomorrow.

As the company continues to play a pivotal role in advancing the power sector, REC is actively exploring emerging innovations in Artificial Intelligence and harness their potential to shape a smarter, more resilient and future-ready energy landscape.

DISTRIBUTION SECTOR OUTLOOK

Distribution Sector Outlook

Shri S. N. Kalita
Director (Regulator Affairs) AIDA

Shri Khajan C. Bhardwaj
Director (Technical) AIDA

India's power distribution sector sits at the core of the nation's energy value chain, delivering electricity to over 30 crores consumers. India's peak power demand was recorded 242.77 GW in June in 2025, with a total electricity consumption of approx. 1694 billion units (TWh) in FY25. The demand is projected to grow at a rate of 6 - 6.5% annually, with a projected peak demand of approx. 277 GW in FY26. This growth is driven by economic expansion, industrialization, and increased household consumption.

In India, there are more than 60 power distribution companies (DISCOMs), including both state-owned and private entities. The exact number is dynamic due to the restructuring of state electricity boards and new companies being formed. Currently the Indian electricity sector is primarily structured with state-owned utilities responsible for most distribution. There are 14 private DISCOMs in India. These private players operate alongside state-owned utilities and have a presence in key areas like Delhi, Mumbai, Odisha, Gujarat, Rajasthan, Noida (UP) & Chandigarh.

In recent years, India has made strides toward near-universal electrification and improved supply hours. However, there are still huge scope for improvements in the area of Aggregate Technical & Commercial Losses (AT&C loss) reduction & network reliability improvement etc. These challenges are intertwined with the policies related to tariffs, subsidies and inadequate investment. This article provides a comprehensive analysis of the key challenges facing India's electricity distribution sector and presents data-driven insights, best practices, actionable reforms required and major initiatives being planned by the Government of India to build a financially sustainable, technologically modern, and reliable power distribution system that can meet India's growing demand and renewable energy targets.

1.0 Current Operations and Improvement Initiatives in DISCOMs

Despite the challenges, DISCOMs across India are undertaking various operations and maintenance (O&M) initiatives and pilot programs to improve performance. Key current practices include:

1.1 Loss Reduction:

A core focus of O&M is reducing technical and commercial losses. Feeder renovation and augmentation works are ongoing – e.g. replacing old conductors with higher capacity (and lower loss) wires, installing capacitors for voltage support, and High Voltage Distribution System (HVDS) in villages (which steps up voltage to reduce line losses and theft on agricultural feeders). DISCOMs also conduct anti-theft drives, often with local police support, to remove illegal hookups and penalize power theft. Smart meter data analytics are being increasingly used to identify abnormal consumption patterns that indicate theft or meter tampering. In Uttar Pradesh and Odisha, focused programs yielded double-digit loss percentage declines by combining network upgrades with community engagement against theft. Such targeted loss-reduction initiatives are crucial to meet RDSS goals.

1.2 Infrastructure Upgrades:

Many DISCOMs have leveraged central government schemes for infrastructure strengthening. Under past programs like DDUGJY (rural electrification) and IPDS (urban upgrades), thousands of rural feeders were separated for agriculture (allowing better load management), and urban networks saw cabling and substation additions. The ongoing RDSS is funding projects for feeder bifurcation (splitting overloaded feeders), new distribution transformers, and substation augmentation to relieve bottlenecks. For example, agricultural feeder segregation has improved rural supply hours (allowing villages to get nearly 22 hours supply while irrigation pumps are given scheduled hours) . These capital works are gradually modernizing the grid, though execution varies by state.

1.3 Metering and Billing Efficiency:

Metering infrastructure is being modernized to improve billing and collection. About 250 million smart meters are to be installed to replace conventional meters across state-owned DISCOMs. Over 50 million smart meters have already been installed across India. Smart/prepaid meters help in multiple ways such as providing accurate remote readings (eliminating human errors), enable time-of-day tariffs, and can be recharged by consumers like a mobile phone which improves payment discipline. Offering digital payment options along with the smart meter installation increase the collection efficiency and consumer awareness. Alongside, DISCOMs are cleansing billing databases, doing GIS mapping of consumers to DTs and feeders, and cracking down on unmetered connections. These efforts have improved collection efficiency nationally (which was ~96.5% in 2023-24, with over 20 DISCOMs achieving >99.5% collection). Some states have even mandated prepaid meters for government offices to ensure timely payment of electricity dues. While billing efficiency is improving (private DISCOMs billing rates now 94-95%), further gains depend on 100% metering and rigorous follow-up on defaulters.

1.4 Technical Audits and Energy Accounting:

Many utilities now conduct energy audits at various levels – feeder-wise energy audits to compare input vs billed energy, transformer-level audits, etc. This pinpointing of loss locations helps direct loss reduction efforts. Regular transformer load monitoring and maintenance tests (e.g. checking pump or capacitor performance in the system) ensure equipment operates at peak efficiency. Some regulators have pushed for segregation of technical vs commercial losses in reports to better target interventions. DISCOMs like Karnataka and Maharashtra have dedicated energy audit cells that reconcile power purchased with power sold, identifying pockets of high loss for remedial action.

1.5 Preventive and Scheduled Maintenance:

Most utilities conduct regular inspections of lines, transformers, and substations. For example, crews perform routine checks of transformer oil and silica gel breathers, and schedule overhauls after a set number of service years. The emphasis is shifting from purely reactive "firefighting" to preventive maintenance to reduce unexpected failures. Some advanced techniques like thermographic scanning of connections (to detect hot spots) and condition monitoring (e.g. dissolved gas analysis in transformer oil) are being adopted in leading utilities to predict failures before they occur. However, these practices need wider adoption and disciplined execution across all states.

1.6 Breakdown Maintenance and Outage Response:

When faults do occur, DISCOMs mobilize repair crews for breakdown maintenance. Historically, outage restoration in many areas was slow due to manual fault location and limited crew availability. To improve response time, several cities have set up centralized call centers and begun using Outage Management Systems (OMS) that integrate with SCADA to pinpoint fault locations and dispatch teams efficiently. For instance, Gujarat's utilities and some private DISCOMs use automated text alerts and feeder monitoring to restore power faster. Nonetheless, many rural areas still rely on linemen patrolling the line to find a fault, underscoring the need for technology in outage management.

1.7 Safety:

There is increasing recognition of safety in operations. Many DISCOMs now mandate use of personal protective equipment (PPE) for line staff and enforce guidelines such as proper shutdown (line clear) procedures before maintenance. A few have achieved ISO 45001 certification for Occupational Health & Safety management systems. Initiatives like "Lineman Diwas" (honoring line workers) are used as platforms to promote safety awareness and training. For example, TPDDL & BSES hosts safety workshops for linemen from various utilities to share best practices. Despite these efforts, the accident rate remains high, indicating that safety protocols, while notified, need much stricter on-ground implementation and monitoring by senior management.

1.8 Technology Integration:

DISCOMs are gradually adopting modern IT-OT solutions. SCADA systems have been deployed in most major cities for real-time grid monitoring and remote control of feeders. Advanced Distribution Management Systems (ADMS) that enable automated fault isolation and network reconfiguration (self-healing grids) are being piloted. Enterprise Resource Planning (ERP) software is being used which supports functions like materials management, finance, and HR in many utilities, improving internal efficiency. Importantly, the expanding smart meter network is bringing a deluge of data – forward-looking DISCOMs are leveraging data analytics and AI. As noted, Indore's DISCOM used AI/ML to analyze consumption from 124,000 smart meters in real-time, detecting anomalies and theft proactively. Similarly, utilities in Mumbai and Tamil Nadu are using AI-driven systems at the grid edge – smart sensors on distribution lines and solar inverters – to manage power quality and detect tampering in real time. These technological interventions are still in nascent stages but demonstrate the direction for the future. Scaling up IT-OT integration, however, will require significant investments and skilled manpower training so that DISCOM staff can effectively use these tools.

In summary, Indian DISCOMs are not static; numerous initiatives are underway to tackle losses, improve maintenance, upgrade networks, and embrace technology. Government schemes like RDSS provide a supportive policy framework and funding. The challenge is ensuring consistent implementation of best practices across all states and accelerating the pace of reforms. We now turn to a strategic roadmap of solutions – drawing on both Indian successes and global lessons – to address the identified challenges and transform the distribution sector.

2.0 Key Challenges

2.1 Financial Losses and Mounting Debt

A number of State owned DISCOMs collectively face staggering financial losses and debts, threatening the viability of the entire power sector value chain. As of FY2023-24, accumulated losses of DISCOMs nationwide were reported at INR6.92 trillion, a 5% increase from the previous year. Outstanding debt has concurrently swelled to over INR7.5 trillion. These losses stem from a persistent gap between the average cost of supply (ACS) and average revenue realized (ARR), indicating that DISCOMs are selling power below cost. In 2023-24, reforms narrowed the ACS-ARR gap to INR0.39 per kWh (down from INR0.59 the year before), but an annual cash loss of INR578.5 billion still remained. Key structural factors drive this financial distress: inefficiencies in metering, billing and collection; non-cost-reflective consumer tariffs; and delays in receiving government subsidy dues. Collectively, these issues force DISCOMs to rely on short-term borrowing to stay afloat, creating a debt spiral. By comparison, well-run utilities internationally operate on cost-covering tariffs and maintain healthy balance sheets, underscoring the need for financial reform in India's distribution sector.

2.2 High Aggregate Technical & Commercial (AT&C) Losses

India's power distribution network has high AT&C losses which is the combined effect of technical losses in the network and commercial losses due to poor billing & collection efficiencies. National AT&C losses averaged 16.12% in 2023-24, up slightly from 15.36% the year prior. This is over twice the average of the developed nations where the T&D losses are around 6-8%. Such high losses translate to massive revenue leakage – for example, in just one Indian state, two regional utilities exceeded regulatory loss norms and had to procure ~8 billion extra units of power in a year to cover the shortfall, costing an estimated INR3,200 crores in additional expense. High AT&C losses in India directly erode DISCOM finances and undermine reliability, since overloaded or tampered networks suffer more frequent breakdowns. The Delhi case exemplifies what focused loss-reduction can achieve. After privatization in 2002, Delhi's private DISCOMs, TPDDL, BRPL & BYPL have invested in network upgrades and anti-theft measures, slashing AT&C losses from ~55% to below 7% (comparable to New York or London). Many Govt. DISCOMs in the states of Gujrat, Kerala, Karnataka have also slashed their AT&C losses to below 10%.

2.3 Tariff Issues and Subsidies

Electricity tariffs in many states are kept artificially low for certain consumer groups e.g. agricultural, residential users & low income consumers groups. As a result, tariffs often do not reflect the true cost of supply, leaving a revenue shortfall. State governments promise subsidies to compensate DISCOMs for charging below-cost tariffs but these payments are frequently delayed or only partially paid, causing cash flow crises for DISCOMs. Moreover, regulators have historically allowed creation of "regulatory assets" (deferred costs) instead of timely tariff hikes, pushing today's costs into the future. By 2025, these deferred costs have grown significantly high. The Supreme Court has now ordered to cap regulatory assets at 3% of ARR and clear them within 3–4 years via structured tariff adjustments. The subsidy burden is very high. In the year 2021 alone, the state governments owed around INR1.3 trillion to DISCOMs in pending subsidies and departmental dues. In many countries affordability has been addressed through direct benefit transfers or targeted subsidies outside the utility's accounts, thereby keeping the utility financially whole. In India, reforms are being mooted to implement Direct Benefit Transfer (DBT) of electricity subsidies to farmers and low-income consumers, which would allow tariffs to be set at cost-recovery levels while protecting needy consumers via direct cash support. Additionally, regular, small tariff revisions linked to fuel costs and inflation (rather than infrequent large hikes) can help align revenues with costs and depoliticize the process. Without tariff rationalization and timely subsidy payment, DISCOM finances will continue to bleed, hindering their ability to invest in improvements.

2.4 Aging and Overburdened Infrastructure

A significant portion of India's distribution infrastructure is old, under-capacity, or poorly maintained, resulting in frequent equipment failures, high losses, and safety hazards. Many distribution lines and transformers have been in service well beyond their design life. Historical underinvestment in the network – especially at the last-mile in rural and semi-urban areas – means that much of the grid operates near overload conditions. The consequences are evident in reliability metrics: customers in India experience far more and longer outages on average than those in advanced economies – one analysis found India's outage durations per customer to be roughly 15 times those in the European Union or China. A major cause is equipment failure. For instance, the distribution transformer failure rate in Indian utilities has historically been extremely high (estimated 12–17% annually), whereas in developed countries it is 1–2%. In the late 1990s, some Indian utilities saw distribution transformer failures as high as 20–25% per year, a symptom of overloading and lack of preventive maintenance. Although India has added millions of new poles, wires, and transformers in the past decade (45% of distribution infrastructure by line length is less than 10 years old, reflecting recent expansion), the legacy system still has large pockets of severe dilapidation. Aging transformers, deteriorated conductors, and outdated switchgear not only cause outages but also pose safety risks (e.g. transformer fires or line snap incidents). This aging infrastructure problem is compounded by insufficient maintenance practices – many utilities operate reactively, fixing breakdowns after they occur rather than replacing components proactively. The challenge ahead is twofold: securing large investments to refurbish and augment the network, and adopting modern asset management practices to extend equipment life and reduce failure rates.

2.5 Insufficient Investment in Modernization

Investment in grid infrastructure has not kept pace with growing demand and the transition to clean energy. Globally, annual investment in transmission and distribution grids has stagnated around $300 billion per year for over a decade. Analysts estimate this needs to double to $600–700 billion per year by 2030 to meet climate and reliability goals. India exemplifies this investment gap. While generation capacity additions (including renewables) have surged, investment in distribution often lags behind – leading to a "weak link" in the power system. The Government of India has launched the Revamped Distribution Sector Scheme (RDSS) in 2021, a INR3.03 trillion program to upgrade infrastructure, reduce losses, and modernize metering. RDSS targets cutting AT&C losses to 12-15% and eliminating the revenue gap by 2024-25. It has provision for installation of 250 million smart/ prepaid meters and hundreds of new substations and lines. However, actual progress remains slow – by mid-2025 only ~32 million smart meters were installed (far short of the 2025 target) in this schedule. State utilities often face hurdles in securing the counterpart funding or executing projects on time. Additionally, outside of central schemes, private capital in distribution infrastructure is minimal due to the sector's poor finances. By comparison, countries like China have aggressively invested in grid expansion and automation as an enabler for economic growth – China added 3.5 million km of distribution lines in the past decade, and its grid investments continue to rise. Bridging India's investment deficit will likely require innovative financing models (public-private partnerships, multilateral loans, green bonds) and policy support (e.g. outcome-linked funding like the 0.5% extra borrowing limit for states implementing power sector reforms). Without sufficient capital infusion, needed upgrades (network strengthening, reliable 24x7 supply, and integration of new technologies) will remain elusive.

2.6 Integration of Renewables and Grid Modernization

India's ambitious renewable energy push – targeting 500 GW of non-fossil capacity by 2030 – poses new challenges for distribution grids. Traditional distribution networks were designed for one-way power f low (from central plants to consumers). Now, the rapid growth of rooftop solar PV, small-scale wind, and other distributed energy resources (DERs) means DISCOMs must handle bi-directional flows and more volatile supply. For example, midday solar generation can cause back-feed into the grid in some neighborhoods, while clouds or evening hours lead to sudden demand peaks. Most existing feeders and transformers lack the automation and controls to smoothly manage these fluctuations, resulting in voltage swings and potential reliability issues. Additionally, integrating renewables requires accurate load and generation forecasting, fast-reacting controls, and sometimes local energy storage to buffer intermittency. International experience underscores the need for smart grids: many European countries and the US have deployed advanced distribution management systems (ADMS), voltage regulation equipment, and battery storage to accommodate high solar and wind penetration at the distribution level. India is also taking initial steps – pilot projects in states like Kerala and Telangana are implementing distributed energy resource management systems (DERMS) and battery storage for grid balancing. The Ministry of Power's National Smart Grid Mission and other programmes propose mandates for smarter distribution systems, including provisions for net metering and feed-in tariff mechanisms to encourage rooftop solar while maintaining grid stability. However, the majority of DISCOMs still need to modernize their SCADA (Supervisory Control and Data Acquisition) systems and upgrade legacy hardware (like adding automatic voltage regulators, smart inverters, etc.). International best practices include real-time monitoring of feeder loads, dynamic 3 voltage control, and demand response programs (e.g. incentivizing consumers to shift loads to off-peak times) – all enabled by digital technology. Embracing such measures will be crucial for India's distribution utilities to reliably integrate the planned influx of renewables while maintaining power quality.

2.7 Grid Resilience and Cybersecurity Threats

The reliability of power supply is increasingly threatened by external shocks – from extreme weather events to cyber-attacks – for which many Indian distribution networks are ill-prepared. Severe weather (cyclonic storms, floods, heatwaves) can devastate overhead distribution lines and poles, especially older networks. For instance, coastal states have seen entire feeder lines knocked out by cyclones, leaving tens of thousands without power for days. Strengthening grid resilience entails hardening infrastructure (e.g. using flood-resistant designs, cyclone-proof poles, selective underground cabling in cities, creating redundancies so alternate paths can supply power). Financially constrained DISCOMs often carry out minimal resilience upgrades, leading to protracted outages after disasters. Equally pressing is the new realm of cybersecurity. As DISCOMs deploy millions of smart meters and digitize operations, the risk of cyber intrusion rises. India has already faced warnings – notably, a 2020 cyber attack on Mumbai's load dispatch center caused a major blackout, suspected to be linked to foreign actors. In 2021, the Central Electricity Authority (CEA) issued the first Cyber Security Guidelines for the power sector, which, reinforced by the 2023 Indian Electricity Grid Code, set out requirements for cyber audits, dedicated Chief Information Security Officers (CISOs) in utilities, and a sectoral Cyber Security Coordination Forum for threat intelligence sharing. Despite these steps, many DISCOMs have legacy control systems that are vulnerable and staff not fully trained in cyber hygiene. The attack surface is growing – each IoT sensor or smart appliance at the grid edge could be a potential entry point. Internationally, utilities are adopting comprehensive cyber defenses: real-time threat detection systems, network segmentation, regular penetration testing, and strict compliance to standards like NERC-CIP or ISO 27001. Indian utilities will need to invest in similar measures and build in-house cyber expertise or collaborate with specialized agencies. Encouragingly, some Indian utilities are leveraging advanced tools – for example, AI-based systems in Indore and Mumbai to monitor meter data and detect anomalies (such as theft or hacking attempts) in real time. Nonetheless, ensuring a resilient and secure grid demands prioritizing both physical upgrades (for weather resilience) and robust cyber security frameworks, lest the progress made in electrification is undone by preventable disruptions.

2.8 Human Resource and Technology Gaps

Beyond physical infrastructure, many DISCOMs struggle with human capital and process inefficiencies that hamper operational performance. A large segment of the workforce – engineers, linemen, technicians – have not been adequately trained in modern grid practices or even in existing regulations. It is not uncommon to find field staff and junior engineers unaware of key provisions of the Electricity Act 2003, the latest Central Electricity Authority (CEA) codes, or regulatory orders that govern their day-to-day work. This knowledge gap leads to suboptimal practices – e.g. not following standard operating procedures (SOPs) for maintenance and safety, or mis-procuring equipment that doesn't meet standards. The consequences are severe: neglecting technical standards and safety protocols has contributed to frequent accidents (electrocutions, equipment explosions) and financial losses for DISCOMs due to equipment damage. Worker safety is a particular concern India unfortunately reports hundreds of lineman fatalities each year due to electrocution and falls, often because proper safety gear was not provided or procedures (like ensuring lines are de-energized) were not strictly enforced. Unions and safety auditors have highlighted that many linemen lack insulated gloves, harnesses, and other protective equipment, and supervision is lax in enforcing lock out/tag-out processes. On the technology front, IT integration in DISCOM operations remains weak. Many utilities have yet to fully exploit available software for enterprise resource planning (ERP), outage management, and data analytics. Consumer services in some areas still rely on face-to-face interactions and manual record-keeping, which can breed inefficiency. While initiatives like online bill payment, mobile apps for complaints, and GIS mapping of networks are underway in leading DISCOMs, the diffusion of these digital tools across all utilities is slow. The under utilization of central funding for IT modernization – such as under RAPDRP (Restructured Accelerated Power Development and Reforms Programme) and IPDS (Integrated Power Development Scheme). Bridging the human and tech gap will require a cultural shift toward continuous capacity building, better incentive structures, and stronger accountability for performance at all staff levels.

3.0 New Initiatives and Outlook of the Distribution Segment:

The Government has set targets to address the incumbent issues and monitor the development of the power industry. The translation of inputs (budget, projects, regulations) into outcomes (reliable, affordable, sustainable power) requires a robust output–outcome monitoring framework that links finance disbursement to measurable results. The Government aims to reduce AT&C losses and reduce the ACS-ARR gap for DISCOMS across the country in the year 2026 & in coming years. To achieve these targets, Smart meter adoption will need to be further promoted to support the reduction in losses and the projects under the Loss Reduction works will have to be completed. Projects aimed at strengthening the power transmission system in the Northeastern states are also planned. The government also aims to promote the adoption of solar panels at the local level. Large fund allocation has taken place for PM-Surya Ghar Muft Bijli Yojana (PMSGMBY). To transition from polluting to renewable sources of power generation, budget allocation and targets under the PM KUSUM schemes have been enhanced. As a large part of the renewable energy potential occurs in certain pockets of the country, MNRE is aiming to develop the transmission corridors joining the RE-rich areas to demand centers. This would be done through the development of Green Energy Corridors, which would in the evacuation of renewable energy.

3.1 The Electricity (Amendment) Bill, 2025

It has been brought forward to resolve deep-rooted inefficiencies, ease financial strain on the power sector, promote competition, and optimise network cost across India's power distribution sector. The Bill aims to transform the existing market structure by rationalising cross-subsidy, promoting cost-reflective tariffs, and enabling direct procurement of power by industrial users. The Bill empowers State Electricity Regulatory Commissions (SERCs) to determine cost-reflective wheeling charges to ensure adequate network development by all the distribution licensees in accordance with the framework established by the SERCs. These regulated charges will be uniformly applicable to all users of the distribution network, whether public or private. This mechanism ensures that utilities have sufficient financial resources for staff salaries, routine maintenance, and future network development.

Structural Reforms: The Bill facilitates regulated competition in electricity distribution, allowing multiple licensees to operate in the same area using shared and optimized infrastructure. It mandates Universal Service Obligation (USO) for all licensees, ensuring non-discriminatory access and supply to all consumers while enabling SERCs to make Distribution licensees free from USO, in consultation with State Governments, for large consumers eligible for Open Access (more than 1 MW).

Tariff and Cross-Subsidy Rationalisation: The Bill promotes cost-reflective tariffs while protecting subsidised consumers (e.g., farmers, poor households) through transparent budgeted subsidies under Section 65. It Seeks elimination of cross-subsidy for the Manufacturing Industry, Railways, and Metro railways within five years.

Infrastructure and Network Efficiency: The Bill empowers Appropriate Commissions to regulate wheeling charges and prevent duplication of distribution networks. It Introduces provisions for Energy Storage Systems (ESS) and defines their role in the electricity ecosystem.

Governance and Regulatory Strengthening: The establishes an Electricity Council for Centre-State policy coordination and consensus-building. It empowers State Electricity Regulatory Commissions (SERCs) to enforce standards, penalise non-compliance, and determine tariffs suo moto if applications are delayed.

Sustainability and Market Development: The Bill strengthens obligations for non-fossil energy procurement, with penalties for non-compliance. It promotes power market development, including new instruments and trading platforms.

Legal and Operational Clarity: The Bill provides updated definitions and references (e.g., Companies Act 2013). It Introduces detailed provisions for the Electric Line Authority, including compensation, dispute resolution, and coordination with local authorities. The power of the Electric Line Authority will be the same as the Telegraph Authority under the Indian Telegraph Act, 1885.

3.2 RCO (Renewable Consumption Obligation) compliance

Section 86(1)(e) of Electricity Act, 2003 mandates SERCs to specify a minimum share of total consumption from renewable sources of energy for their state. The Ministry of Power (MoP) has notified a revised renewable consumption obligation (RCO) framework by subsuming state-level renewable purchase obligations (RPOs) into a unified national compliance mechanism under the Energy Conservation Act, 2001. The revised framework applies to distribution licensees, open access consumers and captive users.

Ministry of Power had issued revised trajectory for Renewable Consumption obligation compliance vide notification date 20th Oct, 2023 under Energy Conservation Act, 2001, with effect from 1st April 2024. Year-wise RCO targets have also been set (e.g., from 29.91% in FY 2024-25 to 43.33% in FY 2029-30), which are split into categories like wind, hydro and distributed renewable energy (DRE) and other RE (with fungibility for wind, hydro, other RE). This notification has been revised in year 2025 for providing fungibility across renewable sources, rationalising penalties and clarifying the methodologies for computing RCO achievement.

SERCs are responsible for translating central directives into effective state-level execution to align with national clean energy goals. SERCs, or State-Designated Agencies (SDAs), monitor compliance and may initiate proceedings for imposing penalties on non-compliant entities under Section 26 of the Energy Conservation Act, 2001. They ensure that obligated entities submit annual compliance reports, certified by a BEE-empanelled accredited energy auditor, within specified deadlines. Failure to meet RCO targets or submit reports on time can attract penalties under Section 26 of the Energy Conservation Act, 2001.

DISCOMs are complying with the new Renewable Consumption Obligation (RCO) order but also facing some challenges. Following is the **RCO compliance data (in %) of few DISCOMs** for last three years.

Year	UPPCL	MSEDCL	APEPDCL	APDCL	NBPDCL	SBPDCL	NPCL	TPDDL	TPNODL	TPCD (Mumbai)
2022-23	9.37	15.80	21.52	21.04	29.51	29.88	19.79	20.93	30.42	39.71
2023-24	11.45	14.25	22.43	20.56	29.96	31.31	10.60	27.45	29.42	37.85
2024-25	13.89	16.84	25.53	22.77	19.34	18.98	21.34	29.97	28.20	38.94

Some specific challenges faced in compliances

Growth in Energy Consumption: In Maharashtra the Gross Energy Consumption (GEC) is rising annually due to industrial, commercial, and residential growth. MSEDCL aligns Renewable Energy (RE) procurement with MERC's Renewable Purchase Obligation (RPO) targets (approx. 15%–22%). Rapid escalation in RPO Targets creates significant compliance pressure on DISCOMs like MSEDCL.

3.3 Maintaining Grid Stability & Challanges

The Central Electricity Regulatory Commission (CERC) ensures grid stability primarily by specifying and enforcing the Indian Electricity Grid Code **(IEGC)** and implementing commercial mechanisms, like the Deviation Settlement Mechanism (DSM), to enforce grid discipline among all participants. This code outlines the rules, guidelines, and technical standards that all grid users (generators, transmission licensees, load despatch centers, etc.) must follow to maintain a secure, reliable, and efficient power system. The CERC directs the National, Regional, and State Load Despatch Centres (NLDC, RLDCs, SLDCs) to actively monitor and plan for grid operations. The Ministry of Power's **RA (resource adequacy) Framework** mandates a system-wide planning process to ensure adequate generating capacity is available to meet future demand and prevent shortfalls. Resource adequacy plans are expected to improve significantly with advanced model STELLAR.

India's 2024 grid stability report (CERC & Grid controller of India) highlight challenges from high renewable energy (RE) integration, leading to frequent high frequency events (above 50.05 Hz) due to oversupply from consistent solar/wind power. GRID-India noted extended periods of frequency above 50.05 Hz in August 2024, peaking at 50.377 Hz, driven by monsoon-induced lower demand and steady RE output. Consistent solar generation (around 40 GW peaks) coupled with high initial wind output (20-25 GW) created surplus power during peak solar hours, challenging grid operators. The reports cite specific metrics like the Frequency Variation Index (FVI) and standard deviation to highlight frequency fluctuations. On August 4, 2024, the FVI was 0.1378, indicating notable fluctuations, with the grid operating above the 50.05 Hz threshold for about 26.27% of the day.

Deviation Settlement Mechanism (DSM): The CERC implements the Deviation Settlement Mechanism and Related Matters Regulations (latest being 2024). These regulations impose financial charges on grid entities that deviate from their scheduled power generation or drawal in 15-minute time blocks. This penalizes non-adherence to schedules and incentivizes balancing demand and supply, which is critical for frequency control. CERC has undertaken an exercise to transition the RE generator to same penalty regime as applicable to other generators.

Managing Renewable Energy Integration: Recognizing the variability of renewable sources (solar and wind), the CERC is adapting its regulations to ensure their smooth integration. This includes gradually aligning deviation rules for renewable generators with conventional generators as forecasting technology improves, encouraging flexibility in thermal power plants and promoting energy storage systems to balance the grid with increased renewable penetration. Central Electricity Authority (CEA) has issued a new advisory guidelines mandating energy storage systems with solar power projects. The initiative, spearheaded by the Ministry of Power, aims to integrate approximately 74 GW/412 GWh of storage capacity by 2031-32 to stabilize the grid, manage solar intermittency, and support India's 500GW renewable target.

Forecasting & Scheduling technologies: As renewable energy adoption continues to rise, next-generation F&S technologies will be crucial in optimising energy efficiency. Future developments are expected to bring forecasting errors down to below 5%, making renewable sources as reliable as conventional energy. AI-based models will integrate hyper-local weather predictions with real-time energy monitoring. Self-learning algorithms will adapt to unexpected weather changes, reducing prediction errors further. Rooftop solar and community-based microgrids will require localised forecasting models to optimise power distribution. Blockchain-based energy trading platforms will enable users to sell excess renewable energy in real-time. Pilot projects in Delhi and Gujarat are already exploring peer-to-peer energy trading using blockchain, expected to scale nationwide by 2026.

3.4 Improving Grid resilience

Improving grid resilience involves a multi-faceted approach using technology, infrastructure modernization, decentralization (microgrids, DERs), advanced monitoring (AI, IoT), robust cybersecurity and operational strategies to quickly recover from disruptions like extreme weather or cyberattacks.

The **Central Electricity Authority (CEA**) is implementing a comprehensive strategy to improve India's grid resilience through a multi-pronged approach that includes integrating energy storage, modernizing infrastructure, and preparing for extreme weather events.

CEA has published a report / guidelines on Disaster Management Plans for the power sector that focuses on building resilient generation, transmission, and distribution networks, particularly in coastal and seismic-prone areas. Specific measures include the use of underground cabling, gas-insulated substations (GIS), and emergency restoration systems. The report suggests that each coastal State/ UT may mark out areas prone to cyclone within 20 to 30 km of coast line and any new construction/ reconstruction of power system in these areas will follow the design parameter as laid down in the report. Recommendations from a task force on cyclone-resilient infrastructure has also been incorporated into the planning and technical specifications for transmission projects in coastal regions.

Government of India is providing funding for building cyclone-resilient power systems through schemes like **Revamped Distribution Sector Scheme (RDSS)** to support distribution utilities improve their operational efficiency and financial viability. Under the scheme, Disaster/ Cyclone Resilient Works amounting to Rs. 3,088 Cr have been sanctioned for coastal areas in the States of Maharashtra, Gujarat, Kerala and Andhra Pradesh. Sanctioned works includes HT and LT underground cabling, Ring Main Unit (RMU), Ariel Bunched Cabling (ABC), augmentation of distribution transformers etc.

DISCOMs are reinforcing physical infrastructure like making the power lines stronger to withstand cyclonic wind by reducing the span length, using high strength poles/towers, using corrosion-resistant materials and redesigning substations (indoor type – AIS/GIS), replacing OH lines to UG lines where possible. DISCOMs in various states like Odisha, Andhra Pradesh & Gujrat are actively working on making their distribution network cyclone resilient in coastal areas by following CEA guidelines. DISCOMs are also deploying modular Emergency Restoration Systems ERS to quickly restore power lines after natural disasters, a key component of disaster response and recovery.

3.5 Strengthening Cybersecurity – CSIRT/CEA

The power sector's digital infrastructure faces threats from nation/state-sponsored adversaries with advanced capabilities. While focusing on reliable energy supply, improving India's grid cybersecurity is very critical and this requires a multi-pronged approach such as upgrading legacy systems with modern tech, integrating AI for real-time threat detection, enforcing strict regulations, building indigenous capacity, training of personnel and creating robust IT-OT security frameworks. Key actions include modernizing SCADA, setting up AI-powered Security Operation Centers (SOCs), developing local tech, and ensuring compliance with new CEA guidelines for smart grid resilience.

Central Electricity Authority (CEA) issued the Cyber Security in Power Sector Guidelines, 2021 to ensure a cyber-secure power ecosystem. These guidelines provide a comprehensive cyber assurance framework and strengthen the cybersecurity governance structure across all entities in the power sector. Further, the Draft Central Electricity Authority (Cyber Security in Power Sector) Regulations, 2025 are under finalization to establish a detailed cybersecurity framework for the power sector. Ministry of Power (MoP) established the **Computer Security Incident Response Team – Power (CSIRT-Power**) at CEA on 5th April, 2023 as an extended arm of CERT-In. CSIRT-Power supports utilities in detecting, responding to, managing cyber incidents, and in improving overall cybersecurity preparedness.

Ministry of Power has mandated that all equipment, components, and parts imported for use in power supply system and network shall be tested in the country to check for any kind of embedded malware/ trojans/ cyber threat and for adherence to Indian Standards. Further, the Standard Bidding Document (SBD) for smart metering works under RDSS has provisions in respect of Cyber Security which cover aspects like securing communication infrastructure, cloud security requirements, cyber security incident management, etc.

Cyber-security audits are conducted periodically across the power sector in accordance with the Central Electricity Authority (Cyber Security in Power Sector) Guidelines, 2021. These audits are carried out by third-party cyber-security auditors empaneled by CERT-In. In the past five years, 9 assessments of the Information Technology infrastructure (IT) and 5 assessments of the Operational Technology (OT) infrastructure have been carried out at the National Load Despatch Centre. In the past five years, no cyber-security breaches or successful cyber-attacks have been reported in the operational systems of the National Load Despatch Centre.

3.6 Growing DIGITISATION

Digitalization is transforming the Indian power distribution industry by leveraging technologies such as Smart Grids, IoT, AI, and Big Data to improve operational efficiency, reduce losses, integrate renewable energy sources and enhance customer experience. Following key Government initiatives are accelerating this transition. Government's Revamped Distribution Sector Scheme (RDSS) is providing funding for installation of Advanced Metering Infrastructure & grid automation systems. Over 250 million smart meters are to be installed to replace conventional meters across state-owned DISCOMs. Over 50 million smart meters have been installed so far.

National Smart Grid Mission (NSGM): National Smart Grid Mission was established by Govt. of India to accelerate Smart Grid deployment in India. NSGM Framework document outlines the institutional structure for the NSGM, recommends potential policies and standards for enabling Smart Grid rollout and summarizes existing business models for the launch of various schemes and programs under Smart Grids. It also details monitoring, review and verification framework for the NSGM, and its programs and pilot projects which will enable assessment of the initiatives and measures implemented.

Advanced Metering Infrastructure (AMI): Distribution utilities cannot operate efficiently without smart meters and automation. DISCOMs are installing smart meters at consumer premises, at DT meters and at feeder level. Smart meters provide continuous data which leads towards the digital transformation for DISCOMs and encourages them to undertake in accurate forecasts and minimise the reliance on expensive power purchases. DISCOMs in India also using Smart meter data in detecting electricity theft through anti-tampering features and consumption pattern analysis. This helps financially strained distribution companies (DISCOMs) reduce Aggregate Technical & Commercial (AT&C) losses.

Grid automation & Optimized Operations: Real-time monitoring and advanced distribution management systems (ADMS) help utilities balance loads, optimize power flow, and manage peak demand efficiently. Government's RDSS is providing funding to modernize the power distribution infrastructure. The integration of information and communications technology into the network allows for two-way communication and automated control. There are other applications like Faster outage management, Predictive maintenance, Demand forecasting. Digitalization is crucial for managing the intermittent nature of solar and wind power. Distribution segment is set to witness increasing predictive analytics and AI algorithms forecast renewable generation, enabling efficient grid management and the integration of energy storage systems.

India Energy Stack (IES): The India Energy Stack (IES) (India's new DPI for power sector), intends to digitise the power system and innovate across the energy value chain. The IES proposes unique and verifiable identifiers for energy assets and stakeholders. This denotes that every actor in the ecosystem, from DISCOMs and SLDCs to AMISPs and consumers, can engage in transparent and reliable transactions. The platform also supports plug-and-play capabilities to enable technology providers and developers to build region-agnostic solutions at a large scale.

The Ministry of Power has announced (in year 2025) the launch of a task force to conceive the India Energy Stack (IES). The IES has been envisioned as a Digital Public Infrastructure (DPI) to provide standardisation and interoperability across various segments of the Power Sector. The proposal is to develop a roadmap for the India Energy Stack, along with the PoC of the Utility Intelligence Platform. IES has been approved by this Ministry under the Revamped Distribution Sector Scheme (RDSS) with REC Ltd. as the Programme Nodal Agency. Implementation involves pilot projects in states like Delhi, Gujarat, UP, and AP, and aims to support renewable energy, EVs, and smart grids through unique IDs, real-time monitoring, and market platforms for energy trading and rooftop solar.

Due to growing renewable energy penetration and distributed energy resources such as rooftop solar and batteries, managing the grid is becoming complex. Taking this into account, the IES promises greater visibility, flexibility and control. It allows for smoother integration of clean energy and increased grid resilience. On the consumer side, IES plans wide-ranging digital services such as dynamic pricing, green tariffs, portability across power distribution companies and faster grievance redressal mechanisms. These features are set to give consumers more choice, transparency and control over their energy usage. It ensures real-time data interoperability, supports analytics and nurtures an open and modular approach to application development.

NPTI & NPTI Academy of Digital Readiness (NADR): NPTI is a national apex body for human resources development in the power and energy sectors, operating under the Ministry of Power. Recently launched NPTI Academy of Digital Readiness (NADR) has taken initiative to incorporate modern digital technologies like Cyber Security, AI, Data Analytics, and IoT etc. into its curriculum through various programs and faculty development initiatives. This initiative focuses on equipping the workforce with skills necessary for the modernization and digitalization of the energy grid.

NPTI has a mandate from the Central Electricity Authority (CEA) to provide training and certification on basic, intermediate, and advanced levels of **cyber security** in the power sector. Another program - **Smart Grid Technologies** covers smart grids, smart metering, microgrids, distributed generation, and their applications for smart cities.

NPTI also conducts faculty development programs and includes specializations in areas such as Artificial Intelligence (AI), Data Analytics, Data Sciences, Blockchain Technology, Internet of Things (IoT) and Renewable Energy Grid Integration.

3.7 Electricity Tariff Rebalancing:

It is about adjusting electricity prices to better reflect actual costs and demand patterns, moving from complex, subsidized structures to more cost-reflective, often time-varying (ToD) rates, to improve sector finances, encourage efficiency, and integrate renewables, balancing economic efficiency with social equity for consumers.

A key aspect of the proposed **Electricity (Amendment) Bill, 2025,** is to make it mandatory for both CERC and State Electricity Regulatory Commissions (SERCs) to determine tariffs that reflect the actual cost of supply. This aims to eliminate the financial distress of DISCOMs, which face significant losses due to a gap between the cost of supply and the tariffs charged.

The policy ensures that state governments can continue to provide targeted subsidies to specific consumer categories like farmers and low-income households, but these subsidies will be given in advance and transparently, without burdening other consumer groups or the DISCOMs themselves.

The CERC is being further empowered to introduce market-driven instruments to attract investment and encourage competition in the power sector, facilitating a faster transition to clean energy. The Commission is actively processing petitions for the "truing up" of transmission tariffs for past periods (e.g., 2019-24) and determining tariffs for the current period (2024-29) based on actual costs and performance, as seen in numerous recent orders from late 2025.

The CERC has allowed DISCOMs to seek tariff relief due to a **reduction in the GST rate** on renewable energy project inputs (from 12% to 5%). This is treated as a "change in law" event, ensuring the benefits are passed on to electricity buyers.

The **Central Electricity Regulatory Commission (CERC)** has recently notified the draft CERC (Terms and Conditions of Tariff) (Second Amendment) Regulations, 2025, which introduce a detailed framework for BESS integrated into generating stations and transmission systems. The framework allows for the recovery of costs associated with energy storage through supplementary fixed storage charges and energy charges. Gains from storage services (such as ancillary services or market sales) are to be shared equally between the generator/transmission licensee and the beneficiaries after costs are recovered. A recent trend has emerged for aligning the demand Charges in rebuild retail tariff to recover the fixed cost of the DISCOMs. Rajasthan SERC has recently increased the demand charges of urban consumer categories.

3.8 Group of Ministers (GoM) on Restoring Viability of DISCOMs

Distribution Companies in India face severe financial distress due to high technical & commercial (AT&C) losses, unsustainable debt, political interference affecting tariffs, and inefficiencies from aging infrastructure, leading to poor service and a huge gap between cost of supply (ACS) and revenue realized (ARR). As of early 2025, reflecting FY2024 data, India's state-owned DISCOMs total accumulated losses were around ₹6.92 to ₹7.08 trillion (lakh crore), an increase from the previous year, despite some reports showing slight annual loss reduction due to tariff hikes

To improve the quality, reliability, and affordability of power supply to consumers, a high-level **Group of Ministers (GoM)**, chaired by the Union Power State Minister, was constituted recently to address issues related to the viability of distribution utilities and recommend measures.

A suggestion has emerged that private companies should meet a minimum of 20% of a state's total power consumption, either through new entities or by divesting existing equity. Under the proposed options for private participation (minimum 51% or 26% stake offload), management control of the utility would be transferred to a strategic private partner. States implementing key reforms such as timely tariff revisions, transparent subsidy payments, and audited accounts would receive incentives like extra borrowing headroom and central capex support. States that prefer not to cede management control but require central capex support may be required to list their DISCOMs on a recognized stock exchange within three years and maintain a positive profit after tax (PAT) for five years. The government decision after consideration of the GoM consideration is expected to improve the viability of the DISCOMS.

3.9 Aggregation and P2P Systems

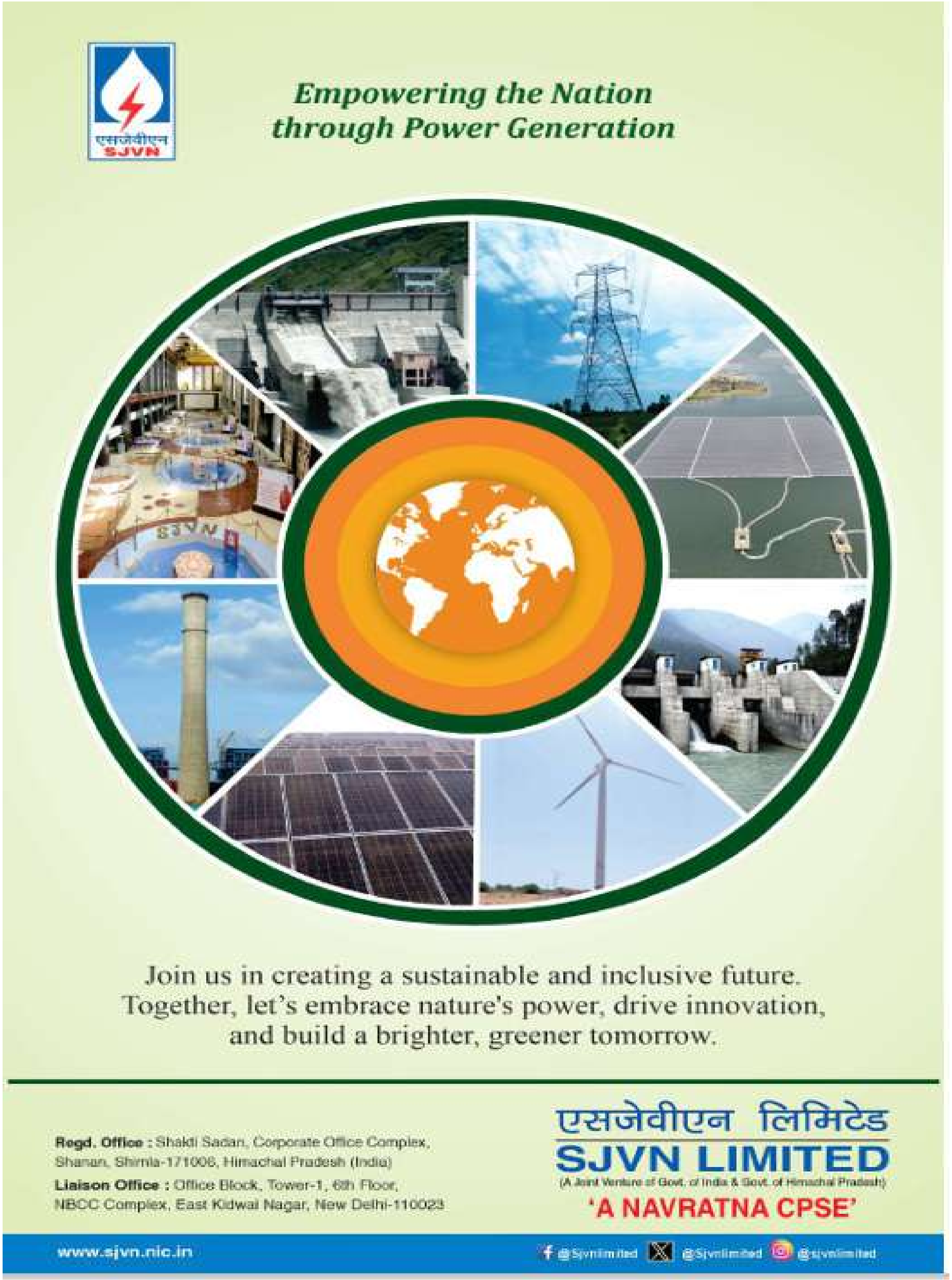
In a power distribution system, P2P (Peer-to-Peer energy trading) is a model that enables direct, decentralized electricity exchange among individuals or small entities (prosumers and consumers). **Aggregation** refers to the practice where these numerous small-scale participants or their Distributed Energy Resources (DERs) are virtually bundled together, often by an aggregator entity, to manage their collective impact on the wider electrical grid and participate more effectively in the energy market. While P2P trading facilitates localized, individual transactions, the sheer volume and intermittent nature of small-scale generation (like solar PV) can pose challenges for the stable operation of the broader distribution network.

Successful pilot projects have been conducted in Delhi (by Tata Power DDL in collaboration with Power Ledger), Uttar Pradesh and Karnataka to test the technical and commercial viability of blockchain-based P2P platforms.

State Regulatory Commissions in Uttar Pradesh, Delhi, Karnataka & Kerala have also issued regulations & P2P Energy Transaction Guidelines which provide specific rules for prosumers (consumers who also produce energy) to sell surplus solar power.

The Ministry of New and Renewable Energy (MNRE) is also supporting innovative projects, including blockchain-based P2P solar trading, through schemes like the PM-Surya Ghar: Muft Bijli Yojana. The overall direction indicates a gradual, pilot-driven approach toward a more decentralized and flexible electricity market in India. This is likely to get a boost by roll out of IES.

In nutshell, India's distribution segment is set to move faster towards viability, modernisation, more secure and data driven operations and a decentralised & market-oriented paradigm.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EXPERTS SPEAK

Vision for Making DISCOMs Future Ready

Shri Shasank Mishra

As the country transitions toward a sustainable, digital, and consumer-centric energy framework, Distribution Companies (DISCOMs) must evolve beyond their traditional role of power supply management. Making DISCOMs future-ready requires a multi-pronged approach that addresses their long-standing financial distress, operational inefficiencies, and the need to integrate modern, green technologies. This involves reimagining their operations through modernization, digital transformation, policy reform, and customer empowerment. A future-ready DISCOM must be financially sound, technologically advanced, consumer-centric, and capable of integrating high levels of renewable energy. Key elements for DISCOMs to transition to efficient, consumer-centric, and resilient institutions are:

- **Financial Sustainability:** The financial health of DISCOMs remains a critical challenge. DISCOMs need to reduce their financial losses through tariff rationalization, timely subsidy payments, and reduction of AT&C losses. Though, today AT%C loss levels have come down to around 16%, but this is still higher than the global standards of 5-6%. Ensuring cost-reflective tariffs, improving billing and collection efficiency, are critical for long-term sustainability. Regulators need to ensure an annual and timely revision of tariffs that reflect the actual cost of supply, avoiding sudden price shocks while ensuring revenue adequacy.

- **Digitalisation and Technology Adoption:** Modern and automated systems are the backbone of future-ready operations. Deployment of smart meters and Advanced Metering Infrastructure (AMI), GIS-based asset mapping, SCADA/ADMS systems, predictive maintenance, and other such IT/OT tools will enhance reliability and transparency. Strengthening cybersecurity is also essential due to increased use of digital systems.

- **Renewable Energy Integration:** With increasing renewable energy penetration, DISCOMs must adopt robust forecasting and scheduling tools, strengthen local grids, and support energy storage solutions. Enabling rooftop solar, distributed generation, and demand response programs helps balance load and improve grid flexibility.

- **Consumer-Centric Approach:** DISCOMs must focus on improved consumer services through online portals, mobile apps, transparent grievance redressal, and real-time outage information. Implementing Time-of-Day tariffs, promoting EV charging infrastructure, and supporting prosumers will further enhance customer engagement.

- **Infrastructure Upgradation:** Strengthening the distribution network through re-conductoring, upgradation of transformers and cables, and underground cabling in urban areas is necessary for reliability and resilience. Automation of outage management and fault detection systems can significantly reduce downtime.

- **Governance and Regulatory Reforms:** Reforms such as improved corporate governance will ensure better operational discipline. Capacity building of staff in digital tools, data analytics, and customer management is equally important. Long-term structural reforms like providing choice to consumers may improve competition and efficiency.

Significant steps have been taken in recent years by the Government of India and various States/ DISCOMs to modernise the power distribution sector, improve financial health of DISCOMs, and prepare the network for a future. Few of the interventions made by Government of India in this direction are as follows:

- **Financial Reforms:** Implementation various schemes like UDAY, IPDS, DDUGJY, additional borrowing etc. Revamped Distribution Sector Scheme (RDSS) has been launched to reduce AT&C losses, improve financial position of the DISCOMs, and modernise distribution infrastructure with performance-linked funding.

- **Smart Metering and Digitalisation:** Nationwide rollout of smart meters with more than 4.5 crore meters already installed in the country. Increased adoption of SCADA/ DMS/ OMS, GIS-based asset mapping and automated switching systems for reliability improvement.

- **Renewable Energy Integration:** Expansion of rooftop solar, solar parks, and PM-KUSUM scheme for solar pumps, reducing peak loads on DISCOMs.

- **Consumer-Centric Improvements:** Notification of the Electricity (Rights of Consumers) Rules, 2020, ensuring timelines for new connections, metering, and grievance redressal. Widespread deployment of mobile apps and online service systems for billing, payments, outages, and complaints. Introduction of Time-of-Day tariffs for industrial and commercial categories in several states.
- **Policy framework:** Rules for implementation of Fuel and Power Purchase Costs Adjustment (FPPCA) and cost reflective tariff so as to ensure that all prudent cost for supply of electricity are passed through. Rules and Standard Operating Procedure issued for proper subsidy accounting and their timely payment.
- **Electricity Distribution (Accounts and Additional Disclosure) Rules, 2025:** Ministry of Power promulgated the rules so as to make uniform provisions for accounting and which is sector specific. The rules will come into effect from April 1, 2026. The rules require electricity distribution utilities to enhance financial transparency by making additional disclosures alongside their financial statements.

Substantial groundwork has already been done to financially rejuvenate DISCOMs, strengthen their operations, modernise network infrastructure, and prepare them for digital and renewable-driven power systems. These efforts have laid the foundation for future-ready DISCOMs capable of delivering reliable, affordable, and sustainable electricity across India. However much still needs to be done to make DISCOMs future-ready.

About Author

Shri Shashank Misra is an IAS Officer (Madhya Pradesh: 2007) and currently posted as Joint Secretary in the Ministry of Power, Govt. of India. He has been looking after Power Distribution systems in India, coordinating with DISCOMs of various States and working towards implementation of new technologies, modernisation, digitisation etc. He is also Government Nominee Director on the Board of Power Finance Corporation Limited and REC Limited.

Reforms in the Distribution Sector- The Way Forward

Shri Ajay Shankar

The Electricity Act 2003 brought about a fundamental transformation in the electricity supply industry in the country by abolishing the State Electricity Boards.

The two key objectives of the Act enunciated in the Preamble were:

(a) "promoting competition" and
(b) "protecting interest of consumers."

The premise was that protection of consumer interest was required while competition was promoted. The Act breaks new ground. It is an Indian product designed to suit our conditions and needs. Neither the World Bank or any other external aid or consulting agency was involved in the preparation of this law.

The Act brought in competition in generation. It delicensed generation and provided for acceptance of the generation tariff emerging from a transparent bid process. Private investment in generation surged in response to the bids invited by the Discoms for power supply through long term power purchase agreements (PPAs). The law provided non discriminatory open access in transmission. India moved swiftly to create a national grid. This enabled the emergence of an all-India competitive market in generation. Competition resulted in thermal power tariffs turning out to be lower than expectations. The long term PPA with Discoms made new investment in generation practically risk free as sale of the electricity produced and its price were not subject to any market risk. This made financing easy for the successful bidders. The National Solar Mission adopted similar competitive bidding for procurement of solar power through long term PPAs. Competition for long term PPAs has given India the lowest solar power tariffs. The Discom with its long term PPAs became the pillar which gave the full benefit of competition with lower generation prices. This distinct market design has served the nation well. The maximum gains come to consumers through competition in production and India has reaped the full benefits from this competition in electricity generation.

The Act makes the Distribution Licensee, the Discom, a regulated entity under the oversight of the State Electricity Regulatory Commission (SERC) which approves the rates at which the Discom supplies electricity to its consumers. The Discom has the legal universal service obligation to supply electricity to meet the full demand of every consumer in its license area. However, consumers are free to take electricity from captive power plants and those with a load of 1 MW and more directly from generators and traders through open access. Almost all consumers get their electricity from their Discoms, and their experience and satisfaction depends entirely on their Discom.

Distribution is the foundational pillar of the electricity supply industry. Their financial losses remain high and are naturally a cause of major concern. This sector is very important politically in each state as it effects every citizen. The Electricity Act provisions reduced the role of the state government drastically to only laying down policy and giving subsidies for free supply to farmers and low-income households with the Discoms functioning commercially under the regulatory oversight of the independent SERCs who would determine tariffs. These provisions remain but in reality the political leadership of the state, the Chief Minister, exercises de facto control of the sector.

The financial losses of the Discoms are the result of tariffs not rising to reflect the cost of supply. The SERCs, though statutorily independent, have across states and over time gone by the wishes of the CM. There is considerable diversity across the country. At one extreme there are states where governance in the sector is weak and there is a huge potential for reducing the Transmission and Distribution losses. This reduction can be achieved with sustained effort and investment of political capital by the CM. Effective officers who are good leaders are always available. They need a long tenure and insulation from the prevailing political economy which is at the root of misgovernance and high losses. Privatisation and franchisee arrangements have also yielded good results. At the other end of the spectrum there are efficient well run Discoms. They are in financial difficulties as the Discoms are unable to seek the upward tariff revisions that are essential and get the approval of the SERC as the political decision is against any increase in tariffs. Most states are between these two ends of this spectrum. But a few, such as the Discoms in Gujarat, have been financially healthy since the days Modiji was the CM.

The Power Ministry has been trying for a financial turnaround through a series of conditionality-based schemes and periodic bailout packages with some progress. What would work is a firm and sustained 'hard budget' constraint with no exceptions whatsoever backed by a clear political decision by the Prime Minister. The principles are simple. No supply of electricity by CPSUs without a fully operational LC and timely payment. No provision of loans by PFC, REC and PSU Banks for buying electricity. These loans are essentially disguised working capital loans without the actual revenue stream to repay. This would compel the state governments to bring about the long overdue financial turnaround by the combination of efficiency gains and tariff increases that are needed. The states do not need soft money for achieving this. Past debt can be taken over by the state government so that the turnaround effort begins with a debt free balance sheet. This should be feasible. Only a firm decision of the CM is needed. The financial turnaround is a prerequisite for providing reliable 24x7 quality power supply. The distribution network needs increasing investment to augment distribution capacity as demand, especially peak demand will keep rising. The situation where there is power available at the macro level but there are power cuts in some areas as the distribution network does not have the carrying capacity would become increasingly unacceptable.

Further, Discoms have been conservative in entering into new PPAs as electricity demand growth has been lower than expected. But this can change suddenly and without adequate reserve capacities power cuts on a large scale could well return. The bigger emerging challenge for the Discom is to create in house capacity for projecting energy and peak demand separately on a continuing basis and making least cost reliable supply arrangements for both. The increasing share of really cheap but variable and inflexible solar and wind power requires immediate and rapid increase in storage capacity. This would be most economical if Discoms contracted for storage capacities directly over and above the RTC contracts emanating from SECI.

Taking a broader perspective improving the financial health is now relatively easier for the political leadership in the states. They have been giving free or nearly free electricity to farmers and giving the subsidy for this to the Discoms. With the PM Suryaghar Bijli Yojana and the provision of free life line electricity for the households of the weaker sections and providing the subsidy for this also from the state budget, there is no section of consumers left who cannot afford to pay the actual cost of supply. The provision in the law and in tariff policy of 'reducing cross subsidy' can now be implemented by the Discoms with the approval of the SERCs without the political leadership feeling the need to stall this. The multiplicity of tariff slabs has outlived its rationale. With rising peaks in demand and increasing share of solar power, the transition to time of day tariffs reflecting costs with smart metering would give the effective price signal for changing consumer demand patterns.

There is a 'reform' idea of introducing retail competition which keeps resurfacing from time to time. This was vigorously advocated by Enron when the Electricity Act was being formulated and was wisely rejected when the implications were fully understood. These must be understood again. The Discom has the universal service obligation of meeting the rising demand of all consumers. This cannot survive operationally once retail competition is introduced. Then inviting bids for long term PPAs for reliable supply would not be the responsibly of the Discom as there would be many suppliers as is the case in countries which have undertaken such reforms starting with the UK in the early 1990s. The fact that electricity demand has hardly grown in the UK is overlooked in the discussion. The risk of power shortages would be real. The other implication is that prices would be deregulated and become market driven. The demand for electricity is inelastic and price surges in situation of shortages is only natural. In the power exchange, government has had to impose price caps. Where there are no restrictions, prices go through the ceiling as happened with air fares to Prayagraj at the time of the Kumbh last year. UK, the pioneer of such reforms, had to deal with energy price surges recently and was politically compelled to give cash to low-income households and then impose a 'windfall profit' tax on the energy companies whose profits rose many times with the same volume of supply.

It would be prudent to not get tempted with such 'reform' ideas where the likely adverse consequences are very real and the potential benefits illusory.

The Discoms have achieved truly impressive results by taking electricity to all households. The hours of supply in remote rural villages has been steadily rising. The energy transition to renewables is proceeding rapidly. The Discoms have to increase in house capacity to successfully provide reliable 24x7 quality power supply, navigate the new challenges arising from the transition away from thermal power to renewables with sufficient storage. And most importantly, get political backing for the financial turnaround which is imperative.

About Author

Shri Ajay Shankar Currently, working as Distinguished Fellow in the Director-General's Office at The Energy and Resources Institute (TERI), continuing his engagement in policy research and advisory work on energy and sustainability. He retired as Secretary, Department of Industrial Policy and Promotion (DIPP), Government of India, and played a pivotal role in major economic reforms, including the Electricity Act, 2003, industrial policy liberalization, and national manufacturing initiatives.

Best Practices in Financial Management: The Gujarat Model

Shri Jai Prakash Shivahare

1. Introduction

Financial sustainability has long been the Achilles' heel of India's power distribution sector. Across most states, persistent losses, delayed payments, and politically driven tariff distortions have eroded both fiscal and operational strength. Gujarat, however, offers a rare and replicable success story — one where social willingness to pay, reliable power supply, and disciplined financial management have together created a virtuous cycle of growth and trust.

At the heart of this transformation lies GUVNL — the unified holding company managing Gujarat's power utilities — whose integrated model combines cost-reflective tariffs, zero tolerance for theft, prompt payment discipline, equity-led investment, and consistently high external ratings. The journey began not in boardrooms but at the grassroots, with a powerful social contract forged under the Jyotigram Yojana. Gujarat's political leadership viewed this not as a short-term electoral move but as a strategic intervention to place the state on a long-term growth trajectory.

2. The Jyotigram Revolution: Reliability and Willingness to Pay

The turning point in Gujarat's power sector came with the launch of the Jyotigram Yojana, which promised 24×7, three-phase, uninterrupted power to all — but on one clear condition: consumers had to be willing to pay for quality power.

People realized that the hidden costs of unreliable electricity — including generator expenses, equipment damage, and productivity loss — far exceeded their monthly bills. Hundreds of villages voluntarily contributed toward feeder bifurcation, a remarkable demonstration of collective willingness to pay for dependable power, before the scheme was made fully government-funded. By then, expectations had already been set on both sides: society had demonstrated its willingness to pay, and the government had shown its commitment to provide 24×7 uninterrupted power — at a time (2004—2006) when such reliability was unavailable even in the capital cities of many other states.

With strong political backing from the state government, GUVNL and its DISCOMs capitalized on this sentiment by delivering on their promise of round-the-clock, high-quality supply. Over time, the need for backup systems vanished, productivity surged, and citizens began viewing timely bill payment as a civic duty rather than a burden.

This unique social compact created a self-reinforcing loop — better service improved payment discipline; improved payments funded network reliability; and reliability deepened trust in governance. The result was a virtuous cycle of reliability, accountability, and financial sustainability — the foundational ethos of Gujarat's power success.

3. Reliability as an Economic Multiplier

Reliable electricity did more than light homes — it powered Gujarat's industrial transformation. Over the last 15 years, the industrial share of power demand in the state rose from 34 percent to 53 percent, demonstrating how dependable supply attracts investment and fuels job creation.

Industries value Gujarat's predictable, high-quality electricity ecosystem, where voltage fluctuations and outages are rare. This consistency has given the state a competitive edge in manufacturing and services, while simultaneously strengthening the financial position of its utilities.

4. Closing the ACS–ARR Gap: Cost-Reflective Tariffs and Regulatory Flexibility

Most Indian DISCOMs suffer chronic revenue shortfalls, with their Average Cost to Serve (ACS) exceeding the Average Revenue Requirement (ARR). Gujarat stands out as an exception. Through efficiency in procurement, near-100 percent collection, and rational tariff design, GUVNL has effectively bridged the ACS–ARR gap — meaning every unit sold recovers its full cost. This equilibrium eliminates the need for perpetual subsidies, strengthens balance sheets, and ensures the sector's self-reliance.

A critical ingredient in sustaining this reliability has been Gujarat's commitment to cost-reflective tariffs. The state's regulatory framework allows GUVNL to revise the Fuel and Power Purchase Price Adjustment (FPPPA) by up to ₹0.10 per unit without prior GERC approval, providing operational flexibility and enabling swift cost recovery.

This small yet vital autonomy keeps tariffs aligned with real costs and shields the utility from cash-flow disruptions. It also prevents large retrospective hikes, maintaining tariff stability and consumer confidence — a hallmark of prudent regulation. By adopting a balanced approach between affordability and financial recovery, Gujarat has ensured that its tariff structure remains sustainable, transparent, and reflective of market realities.

5. Stable Power Costs and Inflation-Adjusted Affordability

The basic tariff for electricity in Gujarat is around ₹4 per unit (varying across consumer categories between ₹3.20 and ₹5.0), and over and above this, the FPPPA is added to the billed energy charges. Despite volatile global energy markets, Gujarat has maintained remarkable price stability.

In 2019, the total energy charge (basic tariff + FPPPA) was ₹5.90 per unit (₹4.00 + ₹1.90). By 2025, it stands at ₹6.30 per unit (₹4.00 + ₹2.30) — an increase of just ₹0.40 per unit, or about 7 percent over six years. Even during the coal-price surge of 2022–23, when the FPPPA temporarily peaked at ₹3.35, the system stabilized quickly once global prices normalized.

In comparison, India's average annual inflation rate of 5.4–6.2 percent led to a cumulative rise of nearly 30 percent in general prices during the same period. Electricity prices in Gujarat rose by less than one-fourth as much, effectively outperforming inflation and keeping power affordable for both households and industries.

This inflation-beating performance has protected consumers, preserved competitiveness, and reinforced Gujarat's reputation for fiscal and operational discipline.

6. Zero Tolerance for Theft: Political Will and Enforcement

A major factor sustaining Gujarat's financial integrity is its zero-tolerance stance on electricity theft. The state established dedicated electricity police stations under GUVNL and launched targeted enforcement drives in high-loss areas.

With full political backing, this strict approach drastically curtailed theft and pilferage — issues that cripple other state utilities. Today, Gujarat boasts near-100 percent collection efficiency, demonstrating how law enforcement and governance can together sustain revenue stability and consumer trust.

7. The Single Buyer Model: Institutional Integration for Efficiency

Beyond field-level efficiency, Gujarat's success rests on institutional architecture. The Single Buyer Model, unique to the state, positions GUVNL as the central agency for power procurement, scheduling, and financial settlement across all DISCOMs.

This structure delivers multiple benefits:

- Economies of scale through centralized procurement and portfolio optimization.
- Liquidity management by pooling working capital and managing subsidies transparently.
- Uniform Bulk Supply Tariffs (BST) ensuring equity and predictability for consumers.
- Regulatory coherence through centralized handling of petitions, fuel linkages, and contracts.

The result is a financially integrated ecosystem where transparency and efficiency replace duplication and fragmentation.

8. Investment-Led Efficiency and Reliability

Infrastructure modernization lies at the heart of Gujarat's financial prudence. Over the past decade, more than ₹34,000 crore has been invested by the state government in strengthening DISCOM networks, automating systems, and upgrading substations.

9. Prompt Payment Rebate: Discipline that Pays

Financial prudence extends to payments as well. While most states delay payments to generators, GUVNL pays within seven days, availing prompt-payment rebates that have cumulatively earned it ₹5,740 crore since FY 2017–18.

This policy transforms discipline into profitability. It also strengthens GUVNL's reputation with suppliers and investors, eliminating dependence on high-cost borrowings.

10. Recognition by the Union Ministry of Power and Credit Rating Agencies

Gujarat's performance is not only internally consistent — it is externally validated. In the Union Ministry of Power's Integrated Rating and Ranking of Power Distribution Utilities, Gujarat's four state-owned DISCOMs — have consistently figured among the top utilities in the country. In recent editions of the ranking exercise, all four Gujarat DISCOMs secured A+ grades and featured in the top tier, with DGVCL repeatedly placed among the best-performing public-sector DISCOMs in India.

External credit rating agencies have reached the same conclusion. CARE Ratings has repeatedly assigned GUVNL and its subsidiaries very strong long-term ratings (AA / AA+ with Stable outlook) and A1+ for short-term facilities, citing strong Government of Gujarat ownership, robust cash collections, a predictable regulatory environment (including the FPPPA mechanism), and centralized power procurement under GUVNL. ICRA and other agencies have likewise highlighted low leverage, healthy debt-service indicators, and timely equity support from the state. These ratings show that Gujarat's model is not only financially sound but also bankable and trustworthy.

11. Commitment to Renewable Energy: Contract Sanctity Builds Trust

As one of India's renewable energy–rich states, Gujarat has leveraged its natural advantages of high solar irradiation and strong wind corridors to expand clean generation capacity at scale. Importantly, GUVNL has reduced its overall power purchase cost by steadily increasing the share of renewable energy in its procurement portfolio, diversifying supply sources while lowering dependence on expensive fossil-fuel-based generation. At the same time, this transition has made Gujarat a leading contributor to India's national commitments on climate change and decarbonization, aligning the state's growth trajectory with the country's broader energy transition goals.

While some states renegotiated tariffs when market prices fell, Gujarat honored every contract it signed — including early solar PPAs priced at ₹13–₹15 per unit — thereby upholding contractual sanctity and investor confidence. This reputation has attracted new bidders, driven competitive tariff discovery, and accelerated capacity addition. The state's approach has thus balanced affordability, sustainability, and credibility — all anchored in institutional integrity and long-term policy consistency.

12. Conclusion: The Gujarat Ethos

Gujarat's power-sector transformation is not the result of isolated reforms but of an integrated vision that connects citizen trust, financial discipline, regulatory foresight, and political will.

It began with citizens under the Jyotigram Yojana agreeing to pay for reliable supply — and evolved into a governance model where utilities earn trust through reliability, regulators ensure cost-reflective pricing, and the state upholds law and contract integrity.

By paying early, investing wisely, maintaining tariff flexibility, and operating transparently, GUVNL has created a financially sound and socially responsive power ecosystem. The Gujarat model demonstrates that good governance — rooted in trust, transparency, and discipline — is the best guarantee of financial sustainability and inclusive growth.

About Author

Sh. Jai Prakash Shivahare, IAS, is currently posted as Joint Secretary, DPIIT, Government of India. He served as MD, GUVNL from February 2022 to October 2025, where he led transformative initiatives in renewables and the broader energy transition. His work focused on how clean energy adoption, smarter procurement strategies, and technological innovation can strengthen the financial resilience and long-term sustainability of DISCOMs.

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- **Maharatna PSU; Govt of India majority shareholder.**
- **Loan Assets (Mar 31, 2025):** ₹5,43,120 crore.
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- **Net NPA:** 0.39% (FY 2024-25).
- **Credit Rating:** 'AAA' domestic.

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- **Largest renewables financier:** Supported **~60 GW** of renewable energy capacity and a renewable loan portfolio of **₹81,031 crore**.
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Strategic Management of Discoms

Shri Malay Kumar De

The power sector in India has been going through a challenging time and the distribution segment of the value chain has been dragging the whole sector down. The problems of this segment are fairly well identified and documented and the solutions to fix them are also not unknown but several attempts made in the past, both at the national and the state levels, had yielded mixed and, often, unsatisfactory results. The problems of inefficiency, non-recovery of reasonable cost, high aggregate technical and commercial losses, poor network management, poor customer service, poor financial management, poor HR practices etc are further compounded by the political economy of power sector. The unbundling of the erstwhile State Electricity Boards into different corporatised entities for Generation (Genco), Transmission (Transco) and Distribution (Discoms), setting up of independent Regulatory Commissions and other structural changes have not been able to insulate the sector from the political economy of the country.

In this context, strategic management of Discoms assumes importance. Since distribution segment is the last mile in the value chain in the electricity business, this segment has to improve it's performance in terms of cost recovery and quality of service. It may be worthwhile to look at the governance structure of the Discoms with particular reference to their internal processes, financial management practices, HR practices, customer orientation and different internal controls and align them with global best practices. If these are done with high level of sincerity then most of the problems faced by the Discoms can be addressed.

Policy makers in India had, in the past, focussed on AT & C loss reduction, improvement of reliability and quality of electricity supplied, increasing competition through open access etc but improving management of Discoms had largely escaped their attention. However, inefficient management of the Discoms (barring a few exceptions) has prevented the policy designs and different schemes launched by the Government of India to address the above-mentioned issues from delivering desired results.

In this context, the West Bengal model of power sector reform implemented during 2006-2010 with a focus on internal reform of the newly created Discom, which significantly improved the performance of the sector, can be adopted throughout the country with state specific modifications to meet the local requirements.

In West Bengal the restructuring of the West Bengal State Electricity Board into a single Discom and a Transco (the state already had a separate Genco) was done with effect from 1st April, 2007 to implement the mandate of the Electricity Act, 2001. Both the entities were given clean balance sheets with healthy debt equity ratios with the State Government absorbing more than Rs 10,000 crores of unpaid loans and interest thereon extended in the past to the erstwhile State Electricity Board. The restructured utilities were given complete freedom for taking decisions in terms of finances, personnel, recruitment, promotions, compensation structure, procurement and all other matters provided they did not come to the Government for any kind of financial support. These companies were also given very powerful Board of Directors with the Government appointing the CMD and the functional Directors as well as the nominee Directors and independent Directors of impeccable background from outside.

Prior to unbundling of the SEB, widespread and detailed consultations were made with the employees and their unions, consumer groups, chambers of commerce and other stakeholders in order to delineate the roadmap for efficiency improvement, financial profitability, improvement of customer service, extension of rural electrification (the state had a huge backlog at that time), improvement of reliability and quality of supply and improvement of working condition of the employees with better pay and promotion prospects, all at the same time, without causing tariff shock to the consumers. This also ensured complete buy in of the process of restructuring by all the stakeholders including the employees.

After unbundling, the Discom started the journey with a clear mandate and a roadmap for the future course of action. The beginning was made with a complete relook at the existing work processes and the organisational structure. The work processes were streamlined by aligning them with the global best practices and in line with the Regulations made by the West Bengal State Electricity Regulatory Commission. Each streamlined process was standardised and the specific tasks were identified and the roles identified with defined Key Performance Indicators. The existing organisational structure was found obsolete and incapable of adequately and efficiently handling the revised processes. This needed substantially changing the organisational structure and buy in by the employees. The organisation had seven decision making layers below the Board level leading to role overlap, inadequate delegation and poor accountability. The organisation was restructured with delayering by reducing the decision-making levels below the Board level to five. In order to make it acceptable to the employees, a new pay structure with a significant raise and other enhanced benefits and attractive and enhanced promotion scheme were also introduced. The Discom also introduced an all-encompassing IT system with an ERP solution integrating finance, HR, billing and commercial modules. All the other processes were computerised and integrated with the ERP solution.

At the same time, revised job charts, delegation of powers, performance management structure based on KPIs and linking the same with financial incentives and promotions of employees were also introduced. This led to significant improvement of employee productivity and financial health of the utility far outweighing the additional cost incurred for implementation of the revised pay and benefits granted to the employees. In view of the changing requirements, it was found that skill sets available within the organisation in areas like IT, regulatory affairs, corporate communications, human resources etc were not sufficient and a few senior level positions were filled up through lateral recruitment. Adequate care was taken to recruit fresh engineers, finance and HR professionals and customer care executives only through merit by competing with reputed public and private sector recruiters. This further enhanced employee productivity.

In the area of customer service and network management, extensive use of IT based applications with support from remote call centres and mobile units for fuse call management and line maintenance completely revolutionised the customer experience with prompt and satisfactory delivery of service. The customer facing offices dealing with new connections, bill payments etc were given complete face lift with all modern facilities and the newly recruited customer care executives trained to handle customer requirements. Needless to say that all those facilities like bill payment, new connections etc were also made available to the customers through web-based solutions.

At the same time the Discom was also able to significantly reduce AT&C losses, achieve financial profitability, achieve universal rural electrification, improve SAIDI & SAIFI and keep tariff within reasonable level.

The West Bengal model of reforms carried out in the Discom is noteworthy for overall success and should be studied in depth for replication in the country.

About Author

Shri Malay Kumar De is an IAS officer of 1985 batch, Retired as the Chief Secretary of West Bengal. He has served as the Chairman of WBSEB, CMD of WBSEDCL and Principal Secretary of the Power Department of West Bengal.

Reforms in Distribution (Regulatory Perspective)

Dr. Sushanta Chatterjee

Reforms in the distribution sector have been a subject of discussion and a focus area for policy intervention in India for decades. The first spate of reforms, unleashed in 1991, focused on opening the power sector to private-sector participation in generation. Initially, there was a lot of enthusiasm among investors for investing in the power sector. However, interest waned upon discovering the poor state of the distribution sector, which is a primary source of revenue for sustaining investment in upstream transmission and generation.

It is in this context that reforms in the distribution sector took centre stage in policy space. The two main focus areas were reorganizing the vertically integrated State Electricity Boards and establishing the independent Regulatory Commissions. Between 1996 and 1998, three states, viz., Odisha, Haryana, and Andhra Pradesh, enacted their own state-specific laws toward this end. Then, the Electricity Regulatory Commissions Act of 1998 was enacted, paving the way for the creation of independent regulatory commissions at the national and State levels, with the primary aim of rationalizing tariffs. There was consensus among political leaders across party lines that, for the power sector to attract investment in generation and transmission, the distribution sector needed urgent reform, and that tariff setting should be shielded from external influences. Consequently, an independent regulatory body was established with the power to determine tariffs based on sound economic and commercial principles.

Over the period, in 2003, another comprehensive legislation, viz., the Electricity Act, 2003, was enacted, which further strengthened the regulators by empowering them with responsibilities of the development of the power sector in general and the distribution sector in particular. Regarding distribution reforms, the 2003 Act envisaged distribution reforms across three broad seams: Tariff Reforms, Performance Improvement of distribution companies (Discoms), and Consumer Choice.

Talking of Tariff Reforms, the focus, ever since 1996, has been on tariff rationalization and ensuring that the tariff reflects the cost of supply of electricity. Tariffs were to be rationalized by reducing cross-subsidies among consumer categories. The Tariff Policy also stipulated that tariffs for all consumer categories should be within ±20% of the average cost of supply (ACOS). The reality check, however, reveals that while this target has been achieved in some States, it remains elusive in several States. There are States where the tariffs for industrial and commercial consumers are as high as 29%-52% of the ACOS, and those for agriculture and domestic consumers are as low as 32%-100% of the ACOS (REC, 2025, Key Regulatory Parameters of Power Utilities FY2024-25). As regards the second aspect of tariff reforms, viz., the cost-reflective tariff, the gap between the average cost of supply and the average revenue realized or tariff remains high on a pan-India basis, at around 40 paise per kWh in 2023-24 (PFC, 2025 https://www.pfcindia.co.in/ensite/DocumentRepository/ckfinder/files/GoI_Initiatives/Annual_Integrated_Ratings_of_State_DISCOMs/13th_IR_Report_Final_9_Jul_2025.pdf). This implies that the tariff or the revenue realized by the discoms is still not reflective of the cost of supply in all States. Though it would be unfair to paint all States with the same brush for performance assessment, it is definitely not a happy state at a pan-India level. It is disquieting to note that, even after almost three decades, the discourse on distribution reforms still hovers around tariff vs cost of supply.

Linked to the Tariff Reforms is the operational performance of the discoms. The Act requires the regulators to formulate performance-based regulations and set performance standards for the discoms. The tariff regulations of most States do have provisions for performance-based incentives and disincentives. Operation and Maintenance (O&M) expenses are generally allowed on a normative basis, meaning that the discom performing better can retain the savings. At the same time, if the actual O&M expenses exceed the norm, the discom has to bear the loss to this account. Similarly, there are provisions for the Aggregate Technical and Commercial (AT&C) loss reduction trajectory and for the sharing of gains. These operational performance metrics are critical and constitute a significant portion of the discom's annual revenue requirement. The O&M expenses for some States are relatively high and need rationalization. In this context, the Forum of Regulators

(FOR) has conducted a detailed study (FOR, 2025: https://forumofregulators.gov.in/Data/study/Report_Discom%20Viability(R).pdf) and recommended a trajectory for States across various categories to rationalize O&M expenses going forward. This is indeed worth noting.

The exercise of setting the AT&C loss reduction trajectory has been a bone of contention. Reportedly, the Government of India wants the regulators to align their trajectories with those outlined in the Revamped Distribution Sector Scheme (RDSS). Some regulators argue that it would be difficult for them to shift the 'goal post' every time the Government introduces a new scheme and outlines a new AT&C loss reduction trajectory. What is essential in this context is a scientific study to determine the baseline AT&C loss level before setting the trajectory. Unless the initial level of AT&C is identified realistically through a scientific study, the trajectory would appear like a mirage, and the discoms would continue to incur losses due to disallowances on power purchase costs.

The consequences of all this are reflected in the distribution sector's overall performance. The net worth of the distribution companies remains negative at about Rs. 1,73,367 crores as of 31st March, 2024. The accumulated losses of the discoms also stood at approximately 7 lakh crores as of 31st March, 2024 (PFC, 2025 ibid). This is a pan-India picture. Assessment of State-wise performance reveals that of the 73 discoms, 32 have not performed well in FY 2024 (PFC, 2025 ibid), while the remaining 41 have performed satisfactorily. There are best practices in these utilities, resulting from satisfactory performance.

In the States that have not performed well, the following trends have been identified: disallowance of power purchase costs, creation of regulatory assets, unaddressed revenue gaps, rising AT&C losses, lack of advanced technology, inadequate infrastructure investment, and so on. The FOR study on the viability of discoms analyzed the best practices of various states and utilities to recommend a way forward to improve the health of distribution utilities in underperforming states. The highlights of the good performers included greater use of advanced technology, consumer engagement, and a special drive to reduce commercial losses, advanced metering infrastructure, technical upgradation, a revenue collection drive, consumer-centric initiatives, and measures to control electricity theft. The regulators in these States have also been forthcoming in approving costs for such investments.

Another important aspect of distribution reform from a regulator's perspective is the regulation of the government-owned discoms. Government utilities have been found to lack incentives to improve performance, especially for employees responsible for such improvement. The FOR report (FOR, 2025, ibid) includes recommendations to incentivize employees (KPI-linked incentives) to boost motivation and, in turn, improve utilities' performance. These recommendations must be taken seriously.

The next critical component of Distribution Reforms is Competition and Consumer Choice. Open Access is the cornerstone of the Act. Then, there are provisions of multiple licensees in the same area of supply. The objective of Distribution Reforms can be truly realized when these provisions are implemented in the true spirit. Open Access in Distribution has not yet taken off. We also see very few examples of multiple licensees in the same supply area of supply. There are, however, some examples of franchisees under the public-private partnership (PPP) model. Under this model, asset ownership remains with the public discoms, while management is left to the private players. This has worked well in some parts of the country. Well, there have been some complaints about excess profits for franchisees, but the fact remains that performance in areas that have gone for the franchisee route has improved significantly compared to that under the pre-existing structure. Full-fledged privatization might face resistance, but franchisees could definitely be replicated, with course corrections wherever required, based on the existing experiences.

At the heart of the distribution reforms lies the consumer. Consumer interests are best served when a quality supply of electricity is ensured at an efficient price. This is possible when the supplier is efficient, and efficiency comes from competition and professional business management. Ironically, whenever we talk about competition, the discussion veers toward protecting existing discoms by ignoring consumers' right to choose their supplier. It is time we tried structural reforms by way of multiple licensees or a PPP model, at the least, especially in the States or areas where operational performance lags behind. But for this, the distribution reforms would remain on paper, and we would continue to gyrate in a vicious circle. Of course, the regulators' supportive role and professional approach are paramount in this journey of reforms, whether the discoms remain under public, private, or public-private ownership and management.

About Author

Dr. Sushanta Chatterjee, presently Chief of Regulatory Affairs at CERC, is a Fulbright Scholar and has been a research fellow at Harvard Kennedy School, USA. He specializes in power sector reforms and regulatory policies. He has authored books and papers on Policy and regulation, renewable energy and market design. Dr. Chatterjee has led several policy initiatives, including the Electricity Act of 2003, renewable energy certificate mechanism, market design, and electricity derivatives.

Experience of Distribution Franchisees in Small Geographies

Shri Sanjay Goyal

In the entire value chain of the power system in India, the Power Distribution business is undoubtedly the most important but unfortunately the weakest link. As known to all, prior to the Electricity Act and the Electricity Reform Act of respective States, the power portfolio was managed by Electricity Departments and State Electricity Boards, which in most the states were unbundled as State Owned Power Generation, Distribution and Transmission Corporations. As of now around 90% of the State have the Government owned Power Distribution Corporation which are struggling with the legacy issues such as huge outstanding, loan burdens and regulatory hurdles. As per the report published by Power Finance Corporation Limited on Performance of Power Utilities across the country, the accumulate losses of the Distribution Corporations as on 31.03.2024 has reached to the level of Rs.6,92,269 Crore. The reasons attributable to this are High AT&C losses and tariff which is not cost reflective, legacy dues etc.

It is pertinent to mention that though the power purchase cost is the most dominating contributor to the overall cost of the DISCOM, the next biggest contributor is the O&M expenses which contributes to around 12% of the total cost of the DISCOM.

The Governments over the years have been focusing on reforms to revive the Power Sector. Most of such reforms have been focused on performance linked financial assistance in the improvement areas to the Utilities and at the same time encouraging private participation in the industry. Though the private participation in the Generation Sector has increased substantially, the Distribution Sector still is primarily governed by the State-Owned corporation. The main reason for the same is the licensing requirement. Most of the Private Companies either do not qualify for obtaining the license due to adequacy requirement and, at the same time, those who are capable, are not willing to invest in loss making utilities. Though there are success stories of Delhi and Mumbai where the private participation has helped the distribution sector to a large extent but the same cannot be implemented all the states because of various constraints and factors, both social and political.

Distribution Franchisee - a window of opportunity

To overcome the above constraint, the Electricity Act 2003 introduced the concept of Distribution Franchisee wherein some portion of the area of Distribution Licensee can be given to Private Players for the discharging all the functions of the Licensee in that area without having a requirement of the License or Adequacy requirements.

The concept was based on the premise of distribution franchisee helping the Distribution Utility in managing the areas where there are high distribution and commercial losses.

There are various models of Distribution Franchisee available. These are Collection based Revenue Franchisee, wherein the responsibility of the Franchisee is limited to meter reading, bill distribution and revenue collections and in turn receives a fixed percentage of collection linked to pre-defined targets. One another model is Revenue Collection with Operation and Maintenance, under this model apart from the functions of the collection-based franchisee, the operator is also responsible for the Operation and Maintenance of the distribution infrastructure.

However, the most prevalent model in India in the Input Based Distribution Franchisee Model under which the Franchisee pays for the input energy provided by the Distribution Utility at the pre-defined metering point and all the downstream functions are performed by the Franchisee. This model was adopted by one of the most successful franchisees in India i.e., Bhiwandi in Maharashtra, handled by Torrent Power Limited. From the figures publicly available, it can be inferred that the total energy requirement is to the tune of 3500 MU which can be the total energy requirement for an entire state with small geographies like the North-Eastern States. For other Operational Franchisee like Kota in Rajasthan to total sales is in the range of 1400 MU. Thus, it can be seen that where the franchisee implementation has been successful, the consumer base is high and the quantum of sales is substantial.

Many States have attempted the Distribution Franchisee model which has been a mixed bag of success and failure. The States that took up the implementation of the Franchisee Model are Maharashtra, Uttar Pradesh, Rajasthan, Meghalaya, Tripura, Bihar, Madhya Pradesh, Jharkhand and Odisha.

As per the publicly available information the following tables present the list of operational and cancelled Franchisees in the country:

State	Number of Functional Franchisee Area
Maharashtra	3
Uttar Pradesh	1
Rajasthan	4
Meghalaya	4*
Tripura	5
Total	**17**

State	Number of cancelled Franchisee Area
Maharashtra	3
Bihar	3
Madhya Pradesh	3
Uttar Pradesh	1
Jharkhand	2
Odisha	4
Total	**16**

Three of the DF areas have recently been retendered due to sub-par performance and awarded to new D

It can be seen that the success rate of distribution franchisee is almost 50%. An analysis of the major reasons for the cancellation of the Distribution Franchisee are as below:

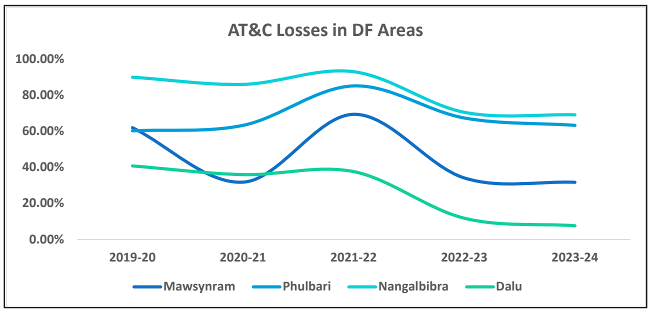
State	Number of Franchisee Area	%
Non-Payment of Input Energy	2	13%
Sub-Par Performance	3	19%
Franchisee Could Not Take Over Operation	4	25%
Other Reasons	9	56%
Total	**16**	

It can be seen that about one-third of the franchisee were cancelled because of two main reasons i.e., non-payment of input energy and sub-par performance of the franchisee operator.

The Meghalaya Experience

Meghalaya also adopted the same model while bidding out the franchisee for 4 of its sub-division in the year 2019. The franchisee was awarded to two private entities M/S Feedback Energy Distribution Company Ltd. (M/s FEDCO) and M/s Sai Computers Limited. Total of four sub-divisions were awarded under Input Based Franchisee Model for a period of 10 years. The 3 sub-divisions namely Mawsynram, Phulbari and Nangalbibra were awarded to M/s FEDCO whereas the Dalu Sub-Division was awarded to M/S Sai Computers Limited.

The mid-term experience for Meghalaya was also the mixed bag of success and failure. The performance of these two franchisee operators in terms of AT&C loss, which is the most important parameter, is depicted below:



In the initial years, though their functioning promised improvements, however, later M/s Feedback Energy Distribution Company Limited's performance deteriorated and there were several lapses which ultimately led to their cancellation. However, M/s SAI Computer Limited's performance was relatively better, and it still continues to operate.

To understand this phenomenon happening within the same DISCOM, it is important to understand and analyse some basic parameters which would give some more insights into this model of franchisee.

The table below mentions the basis Consumer Mix in both the franchisees.

Consumer Category	M/s SAI Computers Limited		M/s Feedback Energy Distribution Company Limited	
	No of Consumers	Load in Kw	No of Consumers	Load in Kw
Agricultural			1	15
Below Poverty Line (Metered)			41084	16999.92
Below Poverty Line (Un-Metered)			12294	4232.17
Bulk Supply	15	720	7	454.5

Consumer Category	M/s SAI Computers Limited		M/s Feedback Energy Distribution Company Limited	
	No of Consumers	Load in Kw	No of Consumers	Load in Kw
Commercial HT			4	693.9
Commercial LT	811	1058.61	2538	6860.044
Domestic HT	1	90	3	264.6
Domestic LT	11180	8363.21	22877	20262.04
General Purpose	110	194.07	165	1416.39
Industrial HT			4	424.692
Industrial LT	8	40	87	893.79
BPL (Kutir Jyoti)	16674	1453.03	0	0
Public Water Supply (HT)	5	106.2	2	118.8
Public Water Supply (LT)	36	96.75	16	271.95
Total	**28840**	**12121.87**	**79082**	**52907.796**
% of total Consumer Base of State	5%	0.9%	13%	3.8%

The above table depicts some interesting points to ponder:

i. M/s SAI Computer Ltd. was serving a 5% of the consumer base of the State with one sub-division whereas M/s Feedback Energy Distribution Company Ltd. was serving 13% of the total consumer base of the state in three sub-divisions.

ii. M/s SAI Computer Ltd. in their consumer mix was having a huge concentration of DLT consumers of 39% of the total consumers, while M/s Feedback Energy Distribution Company Ltd. was having the highest mix of BPL (Metered) of 52% and BPL (Unmetered) of 16%.

iii. The energy consumed by BPL Unmetered consumers cannot be monitored, it was a big disadvantage for M/s Feedback Energy Distribution Company Ltd. which probably was not factored in by the DF while bidding.

It is pertinent to note that under this model, the Franchisee has to pay for the input energy injected in their system. However, if for any reason, the energy billed to the consumers in their respective area is not proper, they will never be able to recover the amount paid for input energy. A small variation in accurate billing can hamper the cash flow putting them in double jeopardy and ultimately leading into default of payments of the input energy, which happened in the case of M/s Feedback Energy Distribution Company Ltd.

Adding to the problem of high concentration of the BPL unmetered consumers, a deeper analysis into their failure also revealed that M/s Feedback Energy Distribution Company Ltd. also failed to maintain and replace the meters which were out of order for some or the other reasons resulting in only 6% of the consumers being billed on actual meter reading which lead to reduced consumer satisfaction and their willingness to pay for the electricity ultimately leading them into a vicious circle of arrears and poor services to the consumers. On the other hand, M/s SAI Computers installed 9200 new meters (including replacement of defective meters) which helped them in correct billing and energy accounting. In addition to the above SAI computers also focused on consumer satisfaction by achieving the average supply of hours of 23 hours and reduced breakdown time by employing more manpower and extensive use of technology for monitoring and grievance redressal.

Comparison between functional Franchisee's performance with similar placed areas in DISCOM

A comparison of the performance of M/s Sai Computers Limited and the adjoining areas under Meghalaya Power Distribution Corporation Limited is tabulated below:

Parameter	M/s SAI Computers Ltd Dalu Sub-Division	Tura Division	South Garo Hills Division	East Garo Hills Division
Number of Consumers	28840	29161	17050	65773
% of Unmetered Consumers	0.00%	1.45%	6.82%	2.49%
T&D Loss	13.94%	31%	53%	46%
AT&C Loss	14.83%	30%	63%	56%

It can be inferred from the above table that Ms Sai Computers Ltd. has been able to perform better than some of the similar placed areas in MePDCL.

Additionally, one more factor which make it challenging for the Franchisees to function in these geographies is a low Consumer base and the consumer mix is mostly domestic, as compared to larger geographies. This makes the capital investment in the infrastructure for the franchisee to be unviable, especially when the contract period is limited to 10 years only. The rate of billing is as per the rates determined by the State Electricity Regulatory Commission, there is no means for the franchisee to recover their investment. This derails the purpose of the appointment of Franchisee as without network and infrastructure upgradation, the reduction of T&D losses is near to impossible.

Case for DISCOMs to take up capital investment in Franchisee Areas?

In case the DISCOMs take up the capital investment plan on their own in these areas, there are chances of under-recovery on such assets as the rate of input energy charged to the Distribution Franchisee is low as compared to the ABR decided by the Regulator. This makes the situation more complex. In the recent tenders awarded by Meghalaya, provision has been kept for Capital Investment to be made by the Meghalaya Power Distribution Corporation Limited, but that is limited to the extent for which funding support is available from Government of India. It will still take some time to review and analyse the impact of the same.

Though, the failure of M/s Feedback Energy Distribution Company Ltd. was mostly due to its own inefficiencies and several non-compliance of the agreement, it looks like that small geographies do not offer a financially attractive avenue for the Distribution Franchisee under Input Based Franchisee Model unless the Distribution Utility takes up the capital investment in those areas and at the same time the Franchisee also does initial substantial investment to plug all the revenue leakages points including the theft.

Conclusion

Based on the experience of Meghalaya in the implementation of Distribution Franchisee and the lessons learnt from the same, it can be inferred that Input Based Distribution Franchisee is a good model, subject to the condition that Distribution Franchisee maintains discipline in following areas:

a. Consumer metering and replacement of defective meters in time bound manner.
b. Focus on collection efficiency, not only pertaining to current billing but also arrears.
c. Handholding by Distribution licensee in the capital expenditure during the initial years of operations.
d. Regular inspection of the metering points of input energy.
e. Focus on consumer satisfaction by planned maintenance, improvement of reliability indices, hours of supply and reduction in the breakdown time.

Alternatively, Revenue Collection with Operation and Maintenance model might be a better model in such small geographies. This model can help the Distribution Utility make the required capital expenditure in the Distribution Franchisee area and claim it as a part of its capital expenditure plan. The Government aided schemes can also be implemented in these areas under this model without any hurdles. This will shift the focus of the Distribution Franchisee from the reduction of technical losses to revenue collection and better O&M practices, resulting in increase in billing and collection efficiency. Last but not the least the Distribution Utility can reduce the burden of O&M expenditures on their books of accounts to some extent resulting in a marginally better financial position.

About Author

Sanjay Goyal is an IAS officer of 2004 Batch currently holding the post of Commissioner & Secretary Power Department as well as CMD of Meghalaya Energy Corporation Ltd in Govt of Meghalaya. He has an experience of more than five years in power sector and was instrumental in implementation of Saubhagya Scheme in Uttar Pradesh during his deputation tenure to UP. Currently he is involved in critical reforms in power sector in Meghalaya.

Implementation of ERP in UP Discoms - Challenges faced and Improvements Achieved

Shri Pankaj Kumar

Why invest such a huge amount of money on something like ERP when our own various portals can very well take care of all the issues which one plans to solve via ERP. This is the most obvious and important question asked by most.

The biggest benefit of ERP over all other technological intervention is that ERP functions as a single source of truth. It breaks down information silos, providing a single source of truth for all departments (finance, HR, inventory, operations, etc.). So, while in earlier days each and every vertical had its own online systems which were silos which did not talk to one another. Now we have ERP where every bit of data is shared across the whole organisation, making its management much more efficient and effective. As an illustration, work of constructing an electric line will be as follows in the two systems.

- In the BAS (business as usual) scenario: The whole project along with cost estimate will be created in one portal. The procurement of material will be done in a different portal. The financial approvals and reflection in balance sheet will be done in another portal/software like tallies. All of them will be perfect in their own work however there will always be a mismatch between different data points in different portals. For eg. Data sets of Health department and Women & Child Care department never match, though the mothers and children is a static fixed number.
- In ERP the project will be created in Project module and the data points created there will automatically create the indent for procurement along with financials of the project so that reflection in the balance sheet and Fixed Asset Register happens automatically without any fresh data feeding. This enables a much better management control.

Real-time reporting on key performance indicators (KPIs) enables faster and more informed strategic decisions by management. This helps in streamlining not just one vertical but has impact across all the verticals of the organisation improving efficiency, automating routine tasks across verticals, more efficient stock / inventory management, streamlining budgeting, accounts payable / receivable and general ledger processes. One of the biggest bane of huge organisations is the human management, ERP with ability to manage each and every human resource mapping him/her to functional roles enables this with ease.

The Uttar Pradesh Power Corporation experience is outlined below:

1. Uttar Pradesh Power Corporation Limited (UPPCL) led one of Asia's largest SAP S/4HANA rollouts under the Integrated Power Development Scheme (IPDS), integrating its five DISCOMs: PuVVNL, PVVNL, DVVNL, MVVNL & KESCo on a single platform. The project faced major challenges in data digitization, process standardization, workforce training, and change management. Despite these hurdles, strong leadership and disciplined governance enabled UPPCL to complete the transformation successfully.
2. Over 11,000 end-user licenses and 34,000 payroll licenses were implemented.
3. The system integrated finance, materials, HR, and project systems into a unified framework.
4. A rollout across 180+ stores/workshops and 400+ divisions digitized physical and financial workflows state-wide.

The entire transformation program, spanning 12 months of pilot testing, 6 months of go-live, and 6 months of stabilization, was completed within a record two-year period, ie, from Feb 2019 to Feb 2021, supported by over 100 core team members

2. Scope of ERP Implementation

2.1 Finance and Accounting (FICO)

1. General Ledger, Accounts Receivable, and Accounts Payable
2. Payments and Bank Reconciliation
3. Budgeting and Costing
4. Fixed Assets Accounting
5. Taxation, Duties, and Levies
6. Management Information System (MIS) Reporting

2.2 Project Management (PS)

1. Project Planning, Scheduling, and Execution
2. Project Monitoring, Progress Tracking, and Cost Control

2.3 Materials Management, Procurement, and Contract Management (MM)

1. Sourcing and Vendor Management
2. Procurement of Goods and Services, Tendering, and Purchase Order Management
3. Contract Lifecycle Management
4. Inspection, Stores, and Warehouse Management
5. Inventory Management and Post-Procurement Activities

2.4 Human Resources Management and Payroll (HCM)

1. Employee Lifecycle (Recruitment to Separation)
2. Manpower Planning and Transfer/Postings
3. Disciplinary Action and ACR
4. Payroll Processing and Employee Self-Service (ESS) Portal

3 Implementation Methodology

The implementation followed the following processes:

3.1 Business Blueprint Phase:

This is a structured document that outlines how a company operates, detailing its core processes, organizational roles, workflows, and system requirements to achieve its strategic goals. It serves as a comprehensive framework that maps out business needs, objectives, and operational strategies.

3.2 "AS IS" Study was done.

3.3 "TO BE" Submissions were made.

It involves designing optimized workflows that eliminate inefficiencies identified during the "As-Is" study, aligning processes with organizational objectives and performance goals.

3.4 Customization in the Standard SAP ERP System

It involves modifying or extending standard SAP functionalities to meet specific organizational requirements that cannot be fully addressed through configuration alone.

3.5 Unit Testing:

Individual components, or custom developments—such as reports, enhancements, user exits, BADIs, or function modules—are validated to ensure that each performs correctly in isolation before integration with other modules.

3.6 System Integration Testing:

Integrated business processes across multiple modules—such as FICO, MM, PS, and HR—are tested end-to-end to verify that data flows correctly and all system components interact seamlessly.

3.7 User Acceptance Testing

3.8 End User Training:

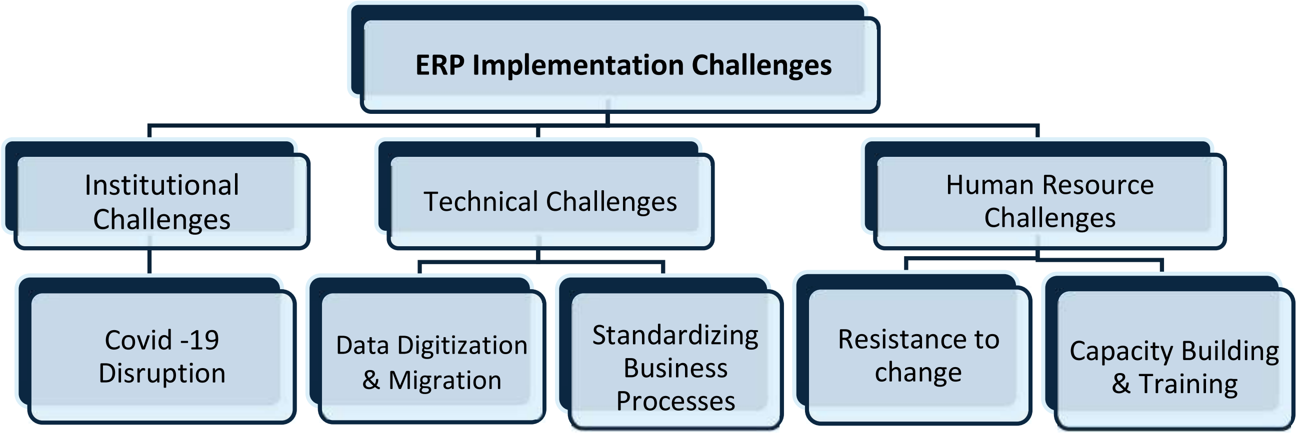
This is the process of preparing business users to effectively operate the SAP system after implementation or upgrade by providing role-based, hands-on instruction aligned with their day-to-day responsibilities. It ensures that employees understand both system navigation and underlying business processes. This is the most important step as shifting from the traditional system to ERP requires a hug unlearning and process reengineering.

3.9 Go-Live

3.10 Stabilization Phase:

This is the post-go-live period during which the new system is monitored, fine-tuned, and supported to ensure steady performance, user adaptation, and process reliability. Its primary goal is to resolve any production issues, stabilize system operations, and confirm that users can perform business transactions smoothly within the live environment.

4 Challenges in ERP Implementation



1. Materials	1. Approvals	1. Centralized Payment	1. Lack of Core Team Members ownership
2. Employee	2. Requisitions	2. MB / SES	2. Lack of Business User's involvement
3. Contracts	3. Vendor Mgt.	3. Inventory Movement	
4. Projects	4. Purchase Order	4. Accounting Principles	
5. Provident Fund	5. Invoicing		
6. Fixed Asset	6. Payroll		

Despite clear goals and strong executive support, UPPCL's implementation faced major institutional, technical, and human resource challenges.

4.1 Standardizing Diverse Business Processes

Each of UPPCL's five DISCOMs evolved independently with different workflows, approval hierarchies, and documentation formats. For example, purchase requisition, vendor management, and project monitoring procedures varied widely. Basically, all 5 Discoms were fairly independent in following their own procedures and even softwares / portals.

Aligning these disparate practices into a single standardized SAP workflow was one of the most complex challenges. It required over 50 process-mapping workshops and 120+ "As-Is" and "To-Be" documents to ensure uniformity. Reconciling the existing systems, manual ledgers, spreadsheets, and legacy databases into harmonized digital workflows demanded consensus across thousands of employees and multiple management levels.

4.2 Data Digitization, Migration, and Validation

The challenge was not just size, but data reliability. Incomplete or inconsistent entries had to be verified manually. The Master Data Management (MDM) teams were established early in the project to manage this validation effort and prevent "garbage in, garbage out" scenarios.

4.2.1 Material Master and Stock Inventory

Each DISCOM used different inventory management software for its stores, which utilized distinct material codes (over 10,000 in each DISCOM), rates, and valuation processes.

4.2.2 Employee Master

Employee data was kept in physical paper records at different levels (Division, Zonal Offices, DISCOM Headquarters, UPPCL Headquarters). At each level, multiple units held employee data relevant only to their section, such as Accounts, ACR, Disciplinary, and Personal Administration sections. After gathering all employee data, a single unique identifier, the SAP ID, was issued to all employees.

4.2.3 Running Contract/Agreement: uploaded

Before the implementation of the ERP system, all data regarding contracts and agreements was kept in physical form at the DISCOM, Circle, Zone, and UPPCL levels. Prior to the ERP system's go-live, all data concerning running contracts and agreements was collected, compiled at different levels, and uploaded to the ERP system.

4.2.4 Running Project/Estimate uploaded.

Before the ERP system implementation, all data regarding running projects was kept in physical form at the DISCOM and Circle levels. Prior to the ERP system's go-live, all data concerning running projects was collected, compiled at different levels, and uploaded to the ERP system.

4.2.5 CPF/GPF Data

Before the ERP system implementation, all employee provident fund data was kept in physical paper records at different levels (Division, Zonal Offices, DISCOM Headquarters, UPPCL Headquarters). As provident funds use different identifiers for each employee, it was a huge task to gather all CPF/GPF balances and reconcile them with the data available at the Provident Fund section at UPPCL HQ.

4.2.6 Fixed Asset Register creation and updation

4.3 Digitization Stalled by Employee Resistance / Organizational Change Management

The most intangible but persistent challenge was employee resistance. Many viewed ERP as an intrusive system that increased oversight and accountability. Shifting from manual registers to digital dashboards was seen as a loss of control.

UPPCL countered this through over fifty change-management workshops to build understanding of ERP's benefits, such as faster reimbursements, easier leave approvals, and transparency in payroll. For leadership, the system provided comprehensive management dashboards that offered a bird's-eye view of enterprise performance, enabling data-driven decision-making. Continuous communication from top management emphasized that ERP was not an audit tool but a productivity enabler.

Some major re-engineered processes where disruption or non-cooperation was faced during implementation include:

4.3.1 Centralized Payment Processing

Before the implementation of the ERP system, every unit (Division), comprising over 1,000 bank accounts, had an expense bank account from which payments were made to vendors and salaries were disbursed. In the ERP system, all division-level accounts were closed, and all payments to vendors and salaries to employees were disbursed by a central account at the DISCOM level only after the vendor payment against material or service was processed and the salary was prepared in the ERP system.

4.3.2 Measurement Book/Verification of Work only on ERP.

4.3.3 Inventory Movement completely shifted to ERP.

Before the ERP implementation, all inventory movement was done through the manual approval of the SDO and the Executive Engineer, with the possibility of backdating. After implementation, all approvals were managed on the ERP system without the possibility of backdating and with a proper approval trail.

4.4 Capacity Building and Training

The ERP rollout spanned over 5,000 operational sites, involving 11,000 transactional users & 25000 Self Service users, mostly unfamiliar with digital systems. Conducting role-based training for such a wide audience was a major challenge.

UPPCL organized over repeated training sessions (around 200), manuals, SOPs, and video tutorials, supplemented by online sessions for VCs. However, digital literacy gaps meant that field engineers, clerks, and accountants required repeated handholding. Training had to be highly localized, iterative, and tailored to user roles.

ERP success depended not only on system design but on users' ability to trust and operate the new digital workflows. Building this confidence required persistence, patience, and continuous communication from the leadership.

5 Organizational Benefits of ERP Implementation

UPPCL's ERP deployment delivered enterprise-wide improvements that strengthened the organization's governance, transparency, operational discipline, and financial control. The benefits went beyond IT modernization. ERP fundamentally transformed how UPPCL manages people, finances, materials, projects, and service delivery. It has:

a) Strengthened financial controls
b) Enhanced operational governance
c) Reduced manual dependency
d) Accelerated field responsiveness
e) Delivered visible benefits to electricity consumers

Below are the organization-focused benefits:

5.1 Reduced Invoice Cycle, Faster Contractor Payments, Better Field Responsiveness, Better Consumer Service:

With all work measurement, invoice verification, and invoice processing conducted entirely within the ERP system, UPPCL has achieved a significant reduction in both invoice verification time and vendor payment time. The data clearly shows a consistent year-on-year improvement :

Average Time in Verification of Invoice (Work Verification + Invoice Approval)

Year	2021-22	2022-23	2023-24	2024-25
Days	62	59.88	41	32.2

Average Time Taken in Payment of Invoice after Invoice Approval

Year	2021-22	2022-23	2023-24	2024-25
Days	41	32	19.2	16.3

a. The ERP system supports automated three-way matching of invoices, ensuring greater accuracy and transparency in the payment process.

b. Payments are now centrally processed through the Central Payment Cell (CPC), ensuring better fund management and smoother transactions.

5.2 Year-on-Year Improvement in Material Issue Time Through ERP Digitization

Before ERP implementation, limited visibility of stock balances and absence of Material Requirement Planning often led to delays in issuing essential materials for field work. Procurement decisions were reactive, stock levels were unclear, and manual stock valuation created discrepancies. With ERP-driven digitization, inventory management became real-time, transparent and aligned with accounting standards. This has resulted in a steady year on year reduction in material issue time as shown below

Avg. Time: Indent by JE to Material Issue

Year	2021-22	2022-23	2023-24	2024-25
Days	3.68	3.1	2.63	2.25

5.3 Scrap Sale Revenue: Transparent Processes, Higher Realization Yearly Scrap Sale

Year	2021-22	2022-23	2023-24	2024-25
in Rs Crore	138.1	216.7	165.9	342.2

5.4 Project Works faster Execution & Improved Infrastructure on the Ground

Project estimates were previously prepared manually on paper, which was time-consuming and prone to errors.

a. Tracking project progress, cost settlements, and asset capitalization was difficult due to a lack of automation.

b. All the project works are now created, executed, and completed on ERP, which resulted in the completion of long-pending project works.

c. The approval process for project-related activities is now more transparent and efficient.

d. With ERP cost consumption, settlement, and asset capitalization are managed more accurately, ensuring proper financial oversight.

e. YoY comparison of Project Creation, Closure & Completion Time is as below:

2021-22			2022-23			2023-24			2024-25		
Created	Closed (Current + Previous Year)	Average Work Completion Time in days	Created	Closed (Current + Previous Year)	Average Work Completion Time in days	Created	Closed (Current + Previous Year)	Average Work Completion Time in days	Created	Closed (Current + Previous Year)	Average Work Completion Time in days
88,428	9,751	187	1,24,174	80,574	148	1,98,784	1,62,456	102	2,06,325	2,76,764	67

5.5 Trial Balance Finalization: From 657 Days to 76 Days Avg. Days to Finalize Trial Balance

Financial Year	2021-22	2022-23	2023-24	2024-25
Days	657	416	277	76

5.6 Improved Field Response for Damaged Transformers

Now, all the damaged DTs reported for replacement and repair are treated through ERP. Here, the average turnaround time from reporting a damaged Distribution transformer to issuing a replacement transformer is reduced from around 37 hours to 17 hours. The YoY data since implementing is shown below:

Average Time to Replace a Damaged Distribution Transformer

Year	2021-22	2022-23	2023-24	2024-25
Average Time (in hrs)	37 Hrs 24 Min	26 Hrs 7 Min	20 Hrs 30 Min	17 Hrs 30 Min

5.7 Procurement Turnaround Time Improved

The problem of untracked and non-transparent supply of material from 3rd party vendors was plugged by ERP, which significantly optimized the DI -to-receipt cycle.

Avg. Time: Dispatch Instruction to Receipt of Materials

Year	2021-22	2022-23	2023-24	2024-25
Days	31	23	15	13

5.8 Higher Operational Efficiency Across All Business Functions

a. ERP removed delays caused by manual registers, physical file movement, scattered data, and non-standard procedures.

b. UPPCL witnessed:

   i. Timely monthly payroll without manual reconciliation.

   ii. Faster vendor payments lead to improved vendor confidence.

   iii. Accurate stock visibility,

   iv. optimizing procurement, and reducing turnaround time.

   v. Automated calculations and system-generated estimates save thousands of man-hours.

   vi. Quick retrieval of employee data, PF status, and service records.

c. This made the organization faster, more reliable, and more responsive.

5.9 Standardization of Processes across All DISCOMs

a. Earlier, every DISCOM followed its own method for approvals, procurement, inventory management, work verification, and finance workflows.

b. ERP brought:

   i. Uniformity of policies and procedures across 5 DISCOMs.

   ii. Standardized HR, payroll, procurement, and project workflows.

   iii. Consistent interpretation of rules and reduced ambiguity.

   iv. One harmonized system acting as the "Single Source of Truth"

c. This institutional uniformity dramatically improved organizational cohesion and administrative discipline.

5.10 Benefits in Human Resource Management

ERP has modernized the entire HR landscape of UPPCL and DISCOMs, empowering employees through seamless online self-services and strengthening organizational efficiency. Employees have hugely benefitted from the following provisions in ERP:

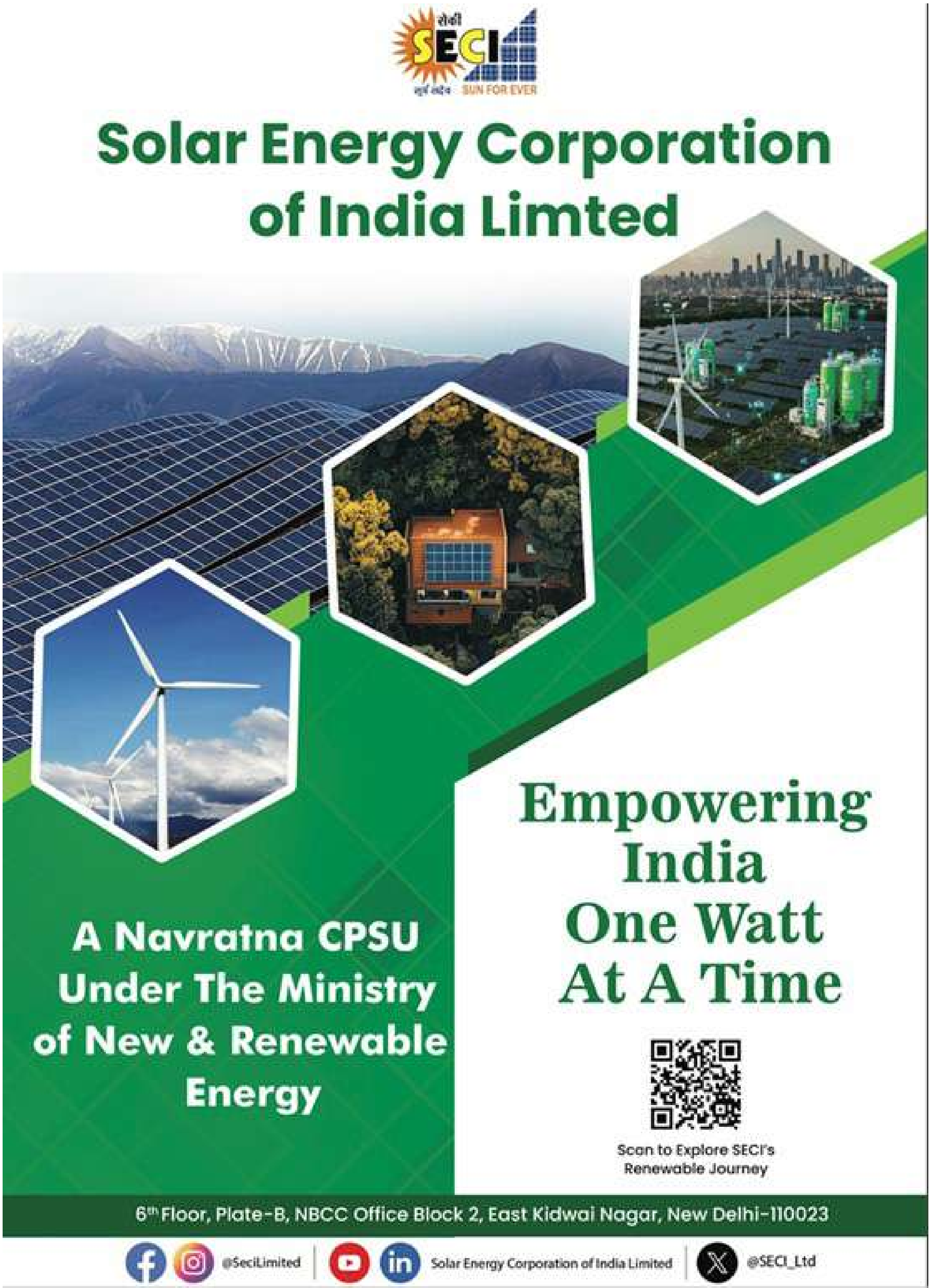
1. Centralized & Secure Employee Master Data
2. Provident Fund (PF) Slip & Balance Access
3. Online PF Advance Applications
4. Streamlined Payroll Processing
5. One-Click Service History Retrieval
6. Employee Self-Service (ESS) – Empowering the Workforce

Conclusion

Enterprise Resource Planning (ERP) is a critical strategic imperative for any large-scale operation, particularly those defined by an extensive field presence. Treating ERP as the definitive mechanism for centralizing data, enforcing standardized best practices, and achieving real-time operational transparency represents the only viable path forward to ensure both organizational scalability and sustained competitive advantage. Its deployment is the single most critical step toward integrated management and operational excellence, ensuring a decisive 'win-win' outcome across the organisation.

About author

Shri Pankaj Kumar is serving as the Managing Director of Uttar Pradesh Power Corporation Limited. He is an Indian Administrative Services (IAS) officer from the 2002 batch whose extensive expertise encompasses Public Administration, Health, Land Revenue, Urban Development, Secondary Education, Tourism, and critical Energy Department.



SUN FOR EVER
Solar Energy Corporation of India Limted
A Navratna CPSU Under The Ministry of New & Renewable Energy
Empowering India One Watt At A Time
Scan to Explore SECI's Renewable Journey
6th Floor, Plate-B, NBCC Office Block 2, East Kidwai Nagar, New Delhi-110023
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The Journey of Indian DISCOMs: From Compliance to Grid Orchestration

Shri Alok Kumar, Shri Adarsh Nagarajan and Shri Abhishek Ranjan

Over the past two decades, India's distribution sector has transformed from **static supply management to dynamic orchestration** of renewables, prosumers, and digital platforms. Consumers have become prosumers; loads once considered inflexible are capable of actively providing demand flexibility. This report presents critical milestones that a typical distribution utility must navigate on its **journey towards becoming a grid orchestrator and market enabler affordably**.

Today's DISCOMs must operate in an environment that is far more dynamic than earlier decades, with rapid shifts in technology landscape, consumption patterns, and rising consumer dependency on electricity. The growing shares of rooftop solar, electric vehicles, and behind-the-meter storage further demands that utilities think beyond traditional boundaries and prepare for a system where every node can both consume and supply electricity with very high reliability. These transitions reinforce the need for forward-looking planning and operational readiness.

Two Pillars of Electricity Grid Operations

At the heart of every modernization initiative lies a simple truth: all projects, technologies, and regulations ultimately expand either visibility or controllability of the grid. Whether it is smart metering, SCADA, GIS, BESS pilots, or digital twins, each effort is a step toward seeing the system more clearly and shaping it more precisely.

Visibility ensures that DISCOMs understand what is happening at feeders, substations, and even prosumer premises in real time.

Controllability empowers them to act on information to shift demand, dispatch DERs, stabilize voltage, or orchestrate flexibility markets.

Visibility reveals how the grid behaves moment to moment, from feeder loading to prosumer injections. Controllability lets DISCOMs act on that intelligence by adjusting demand, dispatching DERs, and maintaining voltage discipline. Together, they define a modern utility's capability to manage uncertainty, prevent instability, and run a responsive, data-driven distribution system.

As these two dimensions grow together, DISCOMs progress naturally along their five-stage journey—from foundational reliability and compliance, through efficiency and modernization, into advanced digital operations and finally leadership as grid orchestrators. In this way, the twin pillars of visibility and controllability provide the scaffolding on which the future of India's distribution utilities is being built.

Together, these pillars define how far a DISCOM has traveled on its modernization journey.

How to Use This Knowledge Article

This article is written for **DISCOM leadership, state and central policy makers, regulators, technical teams, system integrators**, and **policy research institutions** that support distribution reforms in India. This article is intended to be a map that helps you locate where a DISCOM stands today and what practical steps come next.

The five-stage journey gives a simple language for internal conversations, using which leadership teams can ask: "Are we still foundational, or already in modernization for some divisions?" Planning, IT, and operations teams can use the stage definitions and parameter table to build a self-assessment and identify gaps in visibility and controllability.

The technology landscape section can guide solution roadmaps, vendor dialogues, and RFPs. It explains how AMI, ADMS, DERMS, digital twins, and flexibility platforms support the move from set and forget to sense and act. The past versus future roles table can feed directly into job descriptions, training plans, and organization design.

How to turn 5 stage DISCOM journey into an action agenda:

- Identify your current stage for each major business area, for example metering, outages, DER integration.
- Mark which enabling policies and schemes are already in force in your state.
- Understand cost-benefits of each project identified. Ensure affordability is considered.
- List 5 to 10 gaps in visibility and controllability.
- Translate those gaps into a 1 to 3 year project sequence with clear roles for DISCOM, regulator, and central support.

DISCOM modernization journey

1. Foundational – Compliance & Reliability

DISCOMs focus on basic service delivery, regulatory compliance, loss reduction, and reliable supply through feeder metering, accounting, and early SCADA adoption.

2. Efficiency – Digitization & Cost Control

Utilities digitize core operations with GIS, SCADA, online billing, smart meter pilots, improving process efficiency, customer service, and basic demand-side management at scale.

3. Modernization – Grid Visibility & Flexibility

Smart meters, outage systems, BESS pilots, and DER integration enable real-time visibility, early demand flexibility, and improved resilience in grid operations.

4. Advanced – Digital DISCOM of the Future

DISCOMs evolve into active system operators using ADMS, DERMS, and digital twins, enabling P2P trading, SCED participation, and customer-centric energy services.

5. Leadership – Grid Orchestrator & Market Enabler

Leading DISCOMs act as market facilitators, orchestrating DERs, enabling flexibility platforms, supporting community microgrids, and shaping India's clean energy transition.

Stage	Parameters to Monitor / Control	Key Technologies & Tools
1. Foundational – Compliance & Reliability	AT&C losses, feeder-level energy accounting, power purchase cost	- Feeder metering & AMR - Basic SCADA (33kV+) - Energy accounting systems
2. Efficiency – Digitization & Cost Control	GIS-mapped asset registry, outage frequency (SAIFI/SAIDI), billing efficiency, customer service response times, DSM participation	- GIS platforms- Online billing & payment portals - SCADA expansion - Basic DSM tools (LED programs)

Stage	Parameters to Monitor / Control	Key Technologies & Tools
3. Modernization – Grid Visibility & Flexibility	Feeder/DT load profiles, AMI meter data, solar/battery integration, EV charging load, outage localization	- Smart Meters & AMI - OMS (Outage Management Systems) - BESS pilots - Rooftop solar monitoring - Early DR/DF platforms
4. Advanced – Digital DISCOM / Utility of the Future	Real-time feeder/sub-division loads, DER dispatch schedules, flexibility availability, cyber-physical security	- ADMS (Advanced DMS) - DERMS (DER management) - DRMS (Demand Response Mgmt) - Digital twins for planning & ops - Peer-to-peer trading platforms
5. Leadership – Grid Orchestrator & Market Enabler	System-wide DER coordination, prosumer participation, community microgrid flows, ancillary service delivery	- Integrated DERMS and ADMS - Flexibility markets - Blockchain/Beckn for P2P - Resilience awareness platforms - Advanced forecasting (AI/ML)

Policy and Regulatory Landscape - A Decade of Enablers for Indian DISCOMs (2015–2025)

India's policy and regulatory frameworks are shaping DISCOMs' modernization pathways. Each of these policy and regulatory milestones is more than a stand-alone reform—they act as rungs on the ladder of the DISCOM transformation journey. At the Foundational and Efficiency stages, initiatives like the Rights of Consumers Rules, National Smart Grid Mission, and RDSS gave DISCOMs the tools to digitize billing, roll out smart meters, and establish early SCADA visibility. Modernization was propelled by frameworks such as Green Open Access rules, EV charging guidelines, and Rooftop-PMSGY/PM-KUSUM, which demanded finer DER telemetry, new settlement capabilities, and feeder-level solar integration. Finally, the leap into the Advanced and Leadership stages is enabled by instruments like BESS Viability Gap Funding and CEA's cyber and safety codes, which enable dispatchable flexibility, secure digital operations, and a market-ready posture. Taken together, these measures map almost seamlessly onto the five-stage evolution pathway, showing how India's policy and regulatory arc is actively scaffolding the journey from compliance to grid orchestration.

- **2015 – National Smart Grid Mission (NSGM, MoP):** Launched to plan and monitor smart-grid policies and projects nationwide; set the institutional backbone for AMI, SCADA, and IT-OT pilots and eventual scale-up.
- **2019 – MNRE Rooftop Solar Phase-II (DISCOM Incentives):** Introduced performance-linked incentives to DISCOMs for incremental rooftop capacity—aligns utility economics with distributed solar adoption.
- **2019 – PM-KUSUM (MNRE):** Three-component national program catalyzing decentralized RE (Component-A), solar pumps (Component-B), and feeder-level solarization (Component-C); reduces rural losses/daytime demand and creates local generation anchors for DISCOMs.
- **2020–2024 – Electricity (Rights of Consumers) Rules (MoP) & Amendments:** Established consumer rights and smart-metering/ToD framework; 2023/2024 amendments operationalized ToD tariffs and simplified smart-meter rollouts—enabling demand flexibility and granular billing.
- **2021 – Revamped Distribution Sector Scheme (RDSS, MoP):** Reforms-based, results-linked scheme with major outlay; centers on prepaid smart metering and AT&C loss reduction to 12–15% and closing ACS-ARR gaps—core for DISCOM viability and data-rich operations.
- **2021 – Cyber Security in Power Sector Guidelines (CEA):** Introduced sector-wide baseline for cyber governance, CERTs, and risk management across utilities and vendors—prerequisite for safe digital operations (AMI/ADMS/DERMS).
- **2022 – Green Energy Open Access Rules (MoP):** Lowered open-access threshold from 1 MW to 100 kW, streamlined banking/charges—expanded C&I access to renewables, pushing DISCOMs to upgrade settlement, forecasting, and flexibility management.
- **2022 – Late Payment Surcharge (LPSC) Rules (MoP):** Established framework for payment discipline by restructuring outstanding dues, penalizing delays, and

incentivizing timely compliance—critical for maintaining financial health between DISCOMs and generators.

- **2023 – CEA "Measures Relating to Safety and Electric Supply" Regulations:** Updated safety and electric-supply code reflecting modern distributed networks—important for compliance, field practices, and protection in a DER-rich system.
- **2023–2025 – BESS Viability Gap Funding (MNRE/MoP):** Cabinet-approved scheme (2023) with operational guidelines (2024), later expanded in 2025; provides bankable pathway for deploying grid-scale storage for peak-shaving, ToD arbitrage, and ancillary services at the distribution level.
- **2024 – PM Surya Ghar Muft Bijli Yojana (MNRE/GoI):** Large-scale rooftop solar subsidy scheme targeting 10 million households; reduces household bills, expands prosumer participation, and relieves DISCOM subsidy burdens by shifting demand to self-generation.
- **2024 – EV Charging Infrastructure Guidelines & Standards (MoP):** Issued 17 Sept 2024, superseding prior versions; extended tariff caps to March 2026 with ToD incentives; mandated BIS standards, CEA 2023 safety; retained timelines; strengthened nodal roles (Steering Committee/ BEE); enabled DISCOM planning for load growth and public/private/captive integration
- **2024 – Fuel and Power Purchase Cost Adjustment (FPCCA, CERC/DERC/States):** Institutionalized timely cost-recovery mechanism for fuel and power purchases, reducing regulatory lag, ensuring transparency, and improving DISCOM financial sustainability.

Future Steps: Enabling DISCOMs as Leaders

The Government of India and the regulators are steadily laying the groundwork for DISCOMs to move beyond compliance into true market leadership. Recent policy directions highlight how the regulatory arc is shifting toward flexibility, digital markets, and distributed resource integration:

- **CERC's Ancillary Service Regulations** opened the door for battery energy storage systems at the DISCOM level to provide national frequency services, making storage a controllable and revenue-generating asset.
- **Distributed Renewable Energy (DRE) obligations in Renewable Purchase Obligation (RPO) guidelines** have accelerated the spread of distributed solar, creating visibility and forecasting needs that push DISCOMs toward modernization.
- The **Ministry of Power's India Energy Stack** has proposed a digital public infrastructure for peer-to-peer transactions, modeled after UPI, which would transform customer engagement and make energy markets as simple and interoperable as digital payments.
- **State Energy Regulators in Maharashtra and Delhi** have already defined frameworks for aggregators, virtual power plants, and demand flexibility, setting a template for other states to follow.
- **State-level initiatives**, such as those in **Maharashtra**, demonstrate how demand flexibility regulations can be localized and scaled, proving that DISCOMs can lead innovation at the state level.

Together, these steps show that policy developers and regulators are not just responding to today's challenges—they are actively paving the path for DISCOMs to become orchestrators of distributed resources and enablers of clean energy markets.

Global Evolving Technology Landscape from "set-and-forget" to "sense-and-act"

For a century, distribution networks were tuned infrequently—capacitor settings, voltage regulator taps, and feeder switching were adjusted seasonally and left alone. That world is gone. The rise of variable renewables, storage, EVs, and prosumers means grid conditions shift minute-to-minute; value now lies in sensing what's happening and acting quickly and safely across millions of endpoints. Around the world, six technology trajectories are setting the template that Indian DISCOMs can adapt at scale.

1) Data-rich sensing at the edge.

1) Data-Rich Sensing at the Edge

Mass AMI deployments and advanced substation or feeder sensing provide near–real-time views of load and generation, enabling time-of-day tariffs, demand flexibility, and direct consumer participation. International evidence shows that AMI is not just a visibility tool but a cost-saving enabler: U.S. and EU utilities report avoided peak power purchases and deferred network upgrades by using meter data to shape demand and target grid investments. The EU's smart-meter rollouts explicitly link data access with demand-response programs, while in the U.S., utilities like PG&E and Florida Power & Light have documented measurable reductions in capacity procurement costs. In India's dense distribution networks, combining AMI insights with feeder-level telemetry can similarly translate flexibility into avoided capex and improved power-purchase efficiency, turning visibility into actionable economic value. Beyond meters, high-speed distribution phasor sensors (μPMUs) and modern PMUs improve fault location, oscillation detection, and hosting-capacity analysis—critical for dense Indian feeders.

2) Orchestration platforms, not just SCADA

Utilities are layering ADMS (operational awareness and switching) with DERMS (device/aggregator control, constraint management) and DRMS (program management). Lessons learned from DISCOMs around the world shows DERMS architectures optimize PV, storage, and flexible demand to provide reliability, resilience, and non-wires solutions—precisely the "act" side India needs as DERs surge.

3) Market-ready distribution operations

Regulators are opening the door for aggregators and small customers to sell flexibility. In the US, FERC Order 2222 compels wholesale markets to accept aggregations of DERs with coordination protocols among ISOs, utilities, and regulators—codifying the DER-as-a-resource model. (Federal Energy Regulatory Commission) In Europe/UK, independent aggregators and DSO flexibility tenders (local, dynamic services) are maturing routes to procure demand turn-down/turn-up as an alternative to reinforcement. (EU Science Hub, Ofgem, Energy Networks Australia) These frameworks are directly portable to Indian pilots under state regulations and the emerging India Energy Stack.

4) EVs, chargers, and the standards layer

EV load will be the fastest-growing source of new demand; managed charging and (eventually) V2G can provide low-cost flexibility if chargers speak open protocols. The IEA's Global EV Outlook 2024 highlights the system value of smart charging as EV shares climb, making distribution-level coordination essential. (IEA, IEA Blob Storage) Open standards such as OCPP (charger↔backend) and ISO 15118 (vehicle↔charger) underpin interoperability and utility integration—important as Indian DISCOMs scale public and private charging. (swtchenergy.com)

5) Digital twins and secure digitalization

Utilities are building grid digital twins—live, data-fed models that forecast constraints, test switching plans, and price flexibility before dispatch—shifting from reactive fixes to predictive operations. (ScienceDirect) This rests on trusted data access and cybersecurity; global digitalization agendas emphasize consumer-controlled data sharing and robust cyber practices—principles India can embed as smart-meter and RDSS data flows expand. (Energy)

6) Resource Adequacy, Integrated Resource Planning, and Forecasting Accuracy

As global grid becomes increasingly variable, accurate forecasting and planning will define reliability and investment efficiency. The traditional separation between "planning" and "operations" is collapsing; data that was once used only for annual planning now feeds real-time decision-making.

Distribution systems must balance variable generation, flexible demand, and storage minute-by-minute, not season-by-season. Critical enabler for distribution grid operators is that Resource adequacy (RA) and Integrated Resource Planning (IRP) must move from deterministic spreadsheets to probabilistic, data-driven models.

Roles of DISCOMs: Past vs Future

<table>
<tr><th>Past Roles</th><th>Emerging & Future Roles</th></tr>
<tr><td>

Voltage & Power Factor Monitoring
Outage Response & Supply Continuity
Asset Maintenance
Billing & Revenue Collection
Load Growth Management
Straightforward Capex Calculations

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Active voltage optimization and reactive power management through distributed assets (inverters, BESS, and smart transformers).
Predictive outage management using real-time data, digital twins, and automated fault isolation; improved SAIDI/SAIFI through AI-based restoration.
Condition-based and predictive asset management leveraging IoT sensors, SCADA, and analytics to extend asset life and reduce downtime.
Dynamic pricing and digital settlements with smart meters, Time-of-Day (ToD) tariffs, and automated billing integration via UPI/DPI frameworks.
Integrated distribution resource planning (DRP) and localized flexibility procurement to manage load variability from DERs and EVs.
Leverage demand flexibility to optimize system costs through automated DR programs and prosumer engagement.

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Past Roles	Emerging & Future Roles
	• Real-time scheduling and economic dispatch (SCED) participation at the state and regional level for operational efficiency. • **Operate local energy markets** and act as neutral market facilitators for peer-to-peer (P2P) and community microgrid trading. • **Champion adoption of DER technologies** via DERMS/ADMS integration, interoperability standards, and open-access participation. • Strengthen cybersecurity, data governance, and AI-driven decision-making to support secure digital operations and regulatory compliance.

India's Tariff Innovation and Transparency

Tariff innovation is no longer a financial housekeeping task. It has become a necessary step in the journey of Indian DISCOMs as they shift from compliance to data-driven system operations. Retail tariffs, particularly for households, still reflect a period when predictability mattered more than accuracy. The grid today operates very differently.

Power procurement costs change every day and often every hour. Real-time markets, renewable fluctuations, and short-term decisions create constant movement in the wholesale layer. Yet most households, which form the largest customer group, face static monthly telescopic slabs that hide all variability. This mismatch weakens efficiency signals, limits demand flexibility, and increases financial risk for DISCOMs that cannot pass through short-term procurement changes.

Global experience is informative but not directly transferable. The U.S. and EU markets have tried time-of-use and dynamic tariffs, but household response has often been modest. Concerns around affordability, administrative complexity, and uneven uptake have slowed progress. India cannot directly use these structures because its consumer mix, loss patterns, and cross-subsidy needs are different.

Some tariff ideas look simple on paper but do not always deliver impact. Time-varying pricing or granular structures work only when customers have the tools, trust, and digital access needed to respond. India's diversity in incomes, the continued presence of agricultural supply norms, and uneven smart meter penetration mean tariff design must be carefully tuned to local realities.

The EV tariff is another example of misalignment. India adopted a single-part EV tariff to encourage early adoption. It succeeded in the early phase, but it does not support smart charging as EV numbers rise. This creates a two-speed power economy. Modern DISCOM systems expect flexible behaviour. The tariff framework still assumes customers respond only to monthly slabs.

Tariff evolution must move with the rest of the sector, as It sits at the intersection of controllability, visibility, consumer participation, and long-term financial stability. Tariffs should support a grid that runs on digital intelligence, flexible resources, and active prosumers. Reform does not mean complicated bills. It means pricing that reflects how the system actually works.

Tariff innovation is now a critical element in the path toward modern and responsive distribution utilities. It is the link that connects procurement reality, consumer behaviour, and advanced grid operations. India will need an approach built for its own conditions rather than borrowed designs to support a flexible and resilient power system.

India's Local Grid Realities: Why Global Playbooks Don't Plug-and-Play

International "sense-and-act" upgrades are useful references, but India's distribution context is denser, more diverse, and more price-sensitive than most external systems. That creates different failure modes and therefore different innovation needs. Below are the most important deltas—and what they imply for Indian DISCOM design.

1) Extreme Customer Density & Heterogeneity

What's different: Indian cities routinely place multi-MW load within a few hundred meters mixing high-rise commercial, settlements, hospitals, metro rail, and small industries on the same 11 kV and LT meshes. Rural networks, by contrast, stretch long LT spans to scattered consumers and agriculture feeders. Why global recipes break: Western ADMS/DERMS templates assume clearer separation of customer classes and longer MV feeders with lower customer-per-DT ratios. Fault localization, phase balancing, and switching logic tuned for sparse networks misbehave on dense, highly branched LT. Innovation needed:

- Subdivision-level operations with DT/feeder segment visibility (11 kV and below), not just a central control room.

- LT-aware analytics (phase identification, secondary-side topology inference, theft/tamper detection, "micro-section" loss accounting).

2) High LT Share & Mixed Asset Quality

What's different: A larger share of losses and interruptions originate on the LT side (service mains, joints, pillar boxes) and from staggered vintages of transformers and switchgear. Why global recipes break: Many international tools model MV well but treat LT as lumped impedance. That misses real fault locations, voltage sags, and neutral shift problems common on 415/230 V networks. Innovation needed:

- LT digitalization (smart distribution boxes, DT meters with per-phase telemetry, µPMUs where justified).
- Condition-based maintenance for DTs and breakers using low-cost sensors rather than purely time-based schedules.

3) Revenue Model & Policy Constraints

What's different: Cross-subsidy in tariffs, government subsidies, and unmetered/agricultural supply remain material; AT&C loss hot-spots coexist with world-class payment adoption (UPI). Why global recipes break: Pure cost-reflective pricing and fully metered baselines—assumed in many international DR/DER programs—don't always exist; business cases built on tariff spreads or capacity charges alone can be fragile. Innovation needed:

- Program design that works with cross-subsidy (e.g., feeder-level solarization, behind-the-meter storage for reliability rather than pure arbitrage).
- Prepaid smart metering + digital collections integrated with UPI and state subsidy workflows to improve cash cycles.

4) Prosumers Are Smaller and More Numerous

What's different: Rooftop PV systems are small (kW-scale) and highly fragmented; backup inverter-battery systems and diesel gensets are common; EV growth is led by 2- and 3-wheelers, not cars. Why global recipes break: Aggregation, telemetry, and interconnection processes designed for 5–500 kW assets or home batteries at scale don't map neatly onto India's mix of micro-assets and legacy backup fleets. Innovation needed:

- Aggregator models for micro-DER (apartment roofs, shops, schools) with low-touch onboarding, shared metering, and virtual DT-level pooling.
- Managed charging for 2/3-wheelers at workplaces and depots; V2G-like services from e-bus depots before mass household storage arrives.

5) Data Reality: Many Databases, Many Software

What's different: GIS, billing, outage, AMI, and asset systems exist in multiple vintages and vendors; ground truth (addresses, pole IDs) can be inconsistent; multilingual customer data is common. Why global recipes break: "Rip-and-replace to a single platform" or strict CIM-only interfaces are slow and expensive; brittle integrations stall programs. Innovation needed:

- Canonical data layer (common schemas, entity resolution, and lineage) that adapts to heterogeneity—not the other way around.
- **Incremental interoperability:** adapters for AMI/SCADA/OMS/DERMS using open APIs, plus data-quality feedback loops from field apps.

6) Operations Culture & Workforce

What's different: Sub-division engineers carry wide remits across operations, customer care, and works; contractor-led field execution is the norm; skills vary widely.

Why global recipes break: Centralized, engineer-heavy control-room models won't scale to India's volume of switching, connections, and maintenance tickets. Innovation needed:

- Role-appropriate UIs (simple, Hindi/regional language, mobile-first) and automation guards that prevent unsafe actions.
- **Assistive ops:** AI copilot-style recommendations for switching, fault isolation, and load transfers—auditable and teachable.

7) Urban Right-of-Way & Environmental Conditions

What's different: Crowded rights-of-way, frequent road works, and monsoon stress complicate undergrounding and asset access.

Why global recipes break: Assumptions about underground MV/LV and uniform asset health don't hold. Innovation needed:

- Compact retrofit sensors (clip-on current/temperature, fault passage indicators) and portable communications (NB-IoT/4G/5G, RF mesh hybrids).

- Resilience playbooks tailored to heat waves and flooding, with DT-level load shedding and black-start paths.

8) Market Integration from the Distribution Side

What's different: Real-time wholesale markets exist, but distribution-level flexibility is nascent; open access is widening (down to 100 kW), yet settlement and baseline methods are still evolving.

Why global recipes break: Imports of EU/US flexibility tenders or FERC-style constructs without DT/feeder constraints and Indian tariff realities risk low participation or grid stress.

Innovation needed:

- **Constraint-aware flexibility:** procure DR/DER at the feeder/DT locational level with clear baselines and verification that work with Indian metering.
- Stacked value designs (reliability + commercial + loss reduction) so programs survive tariff changes.

Way Forward for Indian DISCOMs

India has already laid much of the policy and technology groundwork for modern distribution utilities. The challenge now is to sequence affordable actions so that investments in data, control, and tariffs support each other rather than move in isolation. Enabling new solutions should bring more savings compared to the cost that is required for the same. The five-stage journey, and the twin pillars of visibility and controllability, provide a practical frame for this next phase.

Across all phases, the central question is: does this investment increase visibility, controllability, or both in a measurable way, and is the organization ready to use it.

Time frame	Focus for DISCOMs	Key role for regulators/ central bodies
1 - 2 yrs	Basic visibility, small control pilots, AMI use	Allow and document pilots, issue reference models and data norms
2 - 4 yrs	Institutionalize practices, use cost benefit analysis, scale DR	Require cost benefit analysis in filings, harmonize schemes and flexibility rules
4 - 6 yrs	Sense and act grid, portfolio orchestration	Finalize standards, refine market rules, focus on oversight

Short term: 1 to 2 years

The focus of the short term is to close the basic visibility gap and build simple control levers where they matter most. For many DISCOMs this means improving AMI analytics rather than just rolling out meters, linking AMI with billing and outage systems, and adding feeder or DT level sensing in high loss and high growth pockets. OMS and AMI integration can reduce outage handling time and improve trust in digital systems.

Goal: close the immediate visibility gap and create basic control handles where value is clear.

Key actions for DISCOMs:

- Use existing meter data for:
  - Feeder and DT level loss analysis
  - Load profiles by time of day and season
- Integrate OMS with AMI and SCADA in at least high priority urban divisions.
- Add simple feeder and DT sensors on high loss or high growth feeders.
- Run small, well-scoped pilots on:
  - Demand response with a few C&I customers
  - Constraint aware operation of BESS pilots
  - Managed charging at one or two EV depots
- Support roles:
  - Policy makers and think-tanks: publish simple reference architectures, data schemas, and example cost benefit analyses.
  - SERCs: permit and encourage low risk pilots with clear learning objectives and time bounds.

Medium term: 2 to 4 years

In the medium term the priority is to institutionalize practices that have proven value. Visibility should move from project mode to routine operations. This includes regular use of AMI data for loss analysis and forecasting, routine use of feeder level analytics for planning, and consistent OMS usage at all control centers and subdivisions.

Goal: turn pilots into routine practice and embed cost benefit analysis thinking.

Key actions for DISCOMs:

- Make AMI analytics, OMS and feeder level analytics part of monthly operations reviews.
- Standardize flexibility and DR program designs, including basic contract and settlement templates.
- Begin ADMS - DERMS POC coordination in selected divisions where data quality and telecom support it.
- Use cost benefit analyses that explicitly count:
- Avoided peak purchases
- Deferred capex
- Improved billing and collection performance

Support roles:

- **Central agencies and think tanks:** Provide standard cost benefit analyses toolkits, training, and casebooks.
- **SERCs:** Ask for cost benefit analysis and clear stage alignment in tariff and investment filings.

Long term: 4 to 6 years

In the long term the goal is to operate a sense and act grid at scale. Visibility should include near real time insights at feeder, DT, and critical LT segments for most urban and priority rural areas. Digital twins should support both planning and operations, including what if analysis for switching, DER integration, and resilience planning.

Goal: operate a sense and act grid at scale and align markets, tariffs, and operations.

Key actions for DISCOMs:

- Maintain near real time visibility at feeder, DT, and critical LT segments across most urban load and key rural feeders.
- Use digital twins for:
  - Planning of reinforcements and DER hosting
  - Simulation of switching and contingency actions
- Orchestrate portfolios of DERs, storage, EVs, and demand response to provide:
  - Peak shaving
  - Congestion relief
  - Local reliability support

Support roles:

- **National and state regulators:** set clear standards on data access, cyber security, and flexibility products.
- **DISCOMs:** focus on disciplined execution, operational risk management, and internal capability building.

About authors

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Roadmap for Digitalization in DISCOMs

Shri Abhishek Ranjan

India's distribution sector is going through a structural shift. Rising peak demand, rapid urbanization, weather-driven stresses, and the steady growth of rooftop solar, EVs, and storage are reshaping how utilities must plan and operate their networks. Critically, the absence of reliable, integrated data—spanning customer, meter, network, and operational systems—limited trend analysis, benchmarking, and predictive analytics, leading to inaccurate billing, silos, error-prone manual workarounds and dissatisfied customers at Discoms.

For frontline distribution companies, the question is no longer *whether* to digitize. The real question is *how* to digitize in a way that improves reliability, reduces losses, strengthens safety, and prepares the grid for the future.

At BSES Rajdhani Power Limited (BRPL), we have seen the impact of a steady, ground-up digital journey across large, diverse service areas in South and West Delhi. Much of this progress has come from field-tested solutions, patient integration work, and consistent operational discipline. Based on that experience as well as global experience, this article presents a practical roadmap for digitization that DISCOMs can use as reference.

Digitalization Timeline at BRPL (2005–2030)

BRPL's journey has progressed through clear and measurable stages. Each phase introduced technologies that strengthened operational efficiency, allowed for greater visibility, and enabled advanced forms of grid management.

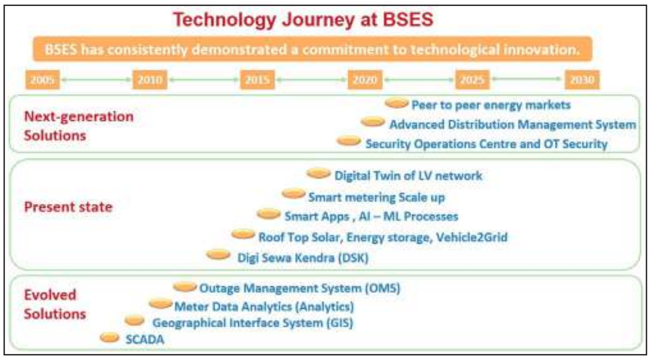

Figure 1 : Technology Journey at BSES (2005–2030)

Digitalization Milestones at BSES

- **2005–2010**: Deployment of SCADA and GIS created the foundation for system visibility.
- **2010–2015**: Meter Data Analytics and Outage Management System (OMS) introduced advanced analytical capabilities.
- **2015–2020**: Smart apps, AI-ML tools, rooftop solar onboarding, DSK rollout.
- **2020–2025**: Digital twin of LV network, smart metering scale-up, early DER integration.
- **2025–2030 (Planned)**: ADMS, peer-to-peer energy markets, SOC and OT security.

BSES's digital journey began early, at a time when most Indian DISCOMs had limited exposure to large-scale IT–OT modernization. As a result, several initiatives required multi-year effort, experimentation, and iterative improvements. This investment in first-of-its-kind projects created a strong learning base, spanning SCADA upgrades, GIS integration, MDAM, OMS, smart metering, and digital twin deployment. With these lessons now codified, BRPL's experience can help other DISCOMs compress a 15–20 year transformation into less than a decade, reducing risk, shortening implementation cycles, and enabling faster digital maturity across the ecosystem.

- Digital twin of Low voltage network piloted in Janakpuri division in West Delhi; Expansion is planned under regulatory mechanism in dense areas eying benefits on improvement in reliability and restoration time, Accurate and easy new connections, improved LT network planning and predictive maintenance, LT loss mapping and tracking, reduction in loss of billing units etc.

- Predictive maintenance (drones) deployed across multiple divisions and planned for pan BSES rollout
- BESS being deployed under regulatory approval at 33/11kv grid substations and DT substations across BSES. Public EV charging stations being deployed across BSES in collaboration with MCD.
- GIS–SCADA integration spans entire service area.

1. Start with the Fundamentals: Data, Processes, and Visibility

A strong digital program cannot begin with advanced tools. It has to start with basics that influence day-to-day work in the field.

GIS and Network Mapping

A complete and accurate GIS map is the backbone of everything else. Mapping EHV & HT feeders, transformers, LT networks, and last mile consumer connectivity improves switching decisions, reduces mismatch between physical and documented networks, and gives a single source of truth for operations and planning.

System Integration Across Functions

Digitization has little value if core systems work in silos. Integrating SCADA, GIS, SAP, MDM, CIS Demand forecasting & Power scheduling and dispatch systems and outage management gives operators the ability to see and act on the same information. In our experience, this integration improves restoration time, reduces manual interventions, optimizes power purchase cost, iproves customer experience and brings consistency to field reporting.

Smart Meters as the Data Engine

Smart meters at consumer end as well as within distribution system at DT and 11 kv feeder level, improve billing accuracy, reduce theft, and provide consumption patterns that feed forecasting and load-flow models. They create the minute-by-minute operational awareness needed for the next stage of grid modernization including Non-Wired Assets based network planning.

These foundational blocks are mandatory before moving to advanced applications.

2. Move from Observing the Grid to Understanding the Grid

Once data flows across systems, the next step is to use analytics and AI to understand asset behaviour, energy consumption patterns at appliance level of the consumer, and network stress.

AI-Driven load Forecasting

High-resolution load forecasts help avoid expensive power purchases and reduce imbalances. Working with technology partners, BRPL forecasts load at 15-minute intervals at the 11 kv feeder level by integrating load history with weather data.

Predictive Maintenance for distribution assets

Drones and AI diagnostics allow early detection of hot spots, weak joints, corrosion, equipment health issues and vegetation growth. This shifts maintenance from reactive to planned activities and lowers transformer failure rates.

Digital Compact Substations

Embedding sensors in compact substations enables remote health monitoring, early warning for overloads, and safer operations in dense urban zones.

These solutions do not require large investments. They require clarity of purpose, stable data, and consistent operational use.

3. Build Digital Twins to Improve Reliability and Reduce Outage Time

A digital twin is not a visual model. It is an operational tool that brings together SCADA, GIS, metering, asset health, and switching logic in one view.

BRPL's Janakpuri Digital Twin pilot shows how a division can benefit when operators can see faults, topology, loading, and switching options in one place.

With a digital twin, operators can:

- locate faults faster
- simulate switching options
- predict overloads or voltage issues
- use historical patterns to plan targeted maintenance
- Quick and accurate decisions on new connections requests

As the grid becomes more complex, digital twins will form the operational core of reliable distribution networks. It enables instantaneous assessment of technical feasibility for new customer connections or load enhancement requests, allowing operators to respond faster, with greater accuracy and confidence.

4. Prepare for Climate Stresses: Resilience Must Become Operational

Delhi is now facing longer heat waves, short-duration but intense rainfall, and higher storm exposure. These events stress transformers, flood substations, and disrupt access routes.

Digitization must support resilience, not just monitoring.

A resilience-aware system should be able to:

- Predict which assets are at risk during a heatwave or flood
- Send actionable instructions to field crews
- Pre-position resources before an event
- Optimize restoration once access is restored
- Quantify avoided losses for audits and compliance

This is essential for future regulatory requirements and for maintaining citizen trust during climate-driven events.

5. Unlock Flexibility and DER Integration

Going forward, DISCOMs will operate networks with higher solar rooftop penetration, EV clusters, and storage systems. Integrating these resources safely requires:

- Feeder-level hosting capacity models
- Smart charging coordination for EVs
- Operational visibility of behind-the-meter generation
- Ability to shift load or absorb surplus solar
- Open frameworks to support emerging concepts like local flexibility markets

These capabilities depend on the earlier stages: mapped networks, consolidated data, strong cybersecurity, and a reliable digital twin.

6. Cybersecurity: Protecting the Digital Utility

As digitization increases, cyber risk rises. With SCADA and grids designated as critical infrastructure, DISCOMs must invest in OT security and SOC capabilities.

A secure digital utility requires:

- Continuous monitoring
- Threat detection and investigation
- Clear escalation workflows
- Periodic testing and audits
- Alignment with national cybersecurity standards

Cyber readiness is essential to sustain trust, ensure availability, and support growing digital dependence.

7. A Practical Roadmap Forward (5-Step Approach)

Step 1 — Digitize the Network Foundation

GIS, network cleansing, basic automation, SCADA upgrades, smart meters.

Step 2 — Integrate Systems for Operational Visibility

GIS–SCADA–SAP–OMS-CIS consolidation, unified dashboards, control-room automation.

Step 3 — Deploy Analytics and AI

Load forecasting, predictive maintenance, anomaly detection, consumer analytics.

Step 4 — Scale Digital Twin Across Divisions

Full-area visualization, switching simulation, real-time reliability tools.

Step 5 — Enable Resilience and DER Preparedness

Hazard-linked asset modelling, distributed flexibility tools, EV charging coordination, cybersecurity.

Conclusion:

The Next Decade Will Define the Sector

India's DISCOMs now stand at a pivotal moment. The combination of demand growth, weather impacts, and distributed generation requires a new operating model. Digitization is no longer an IT initiative. It is a core reliability, safety, and financial-strength initiative.

The BESS, digital twin, and AI initiatives help strengthen grid flexibility, reduce peak demand pressures, and enhance renewable absorption. Predictive maintenance and compact substations help lower O&M costs, while Behavioural energy efficiency programs enable deepening of consumer participation in energy transition.

The field experience of BRPL shows that digitization is not achieved by one large project. It is the result of steady improvements, decade-long discipline, and strong alignment between field teams, engineers, planners, and leadership.

DISCOMs that invest in these capabilities will be better prepared for the future, better equipped to manage risk, and better positioned to support India's clean-energy transition.

About author

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Data Management and Data Governance in Electric Utilities: Key Practices and Emerging Trends

Shri Reji Kumar Pillai and Ms. Shashi Bala

A. INTRODUCTION

Electric utilities today are undergoing one of the biggest transformations in their history. For more than a century, power utilities were handling wires, poles, transformers, power plants, substations and control rooms. Decisions were made based on human intuition, manual records, and limited supervisory data. Today**,** data has become the backbone of every modern electricity system. Meter data from smart meters in every 15-30 minutes, grid health from SCADA/EMS/DMS/PMU systems in milliseconds from thousands of nodes; and rooftop solar panels, EV chargers, and home batteries constantly send data to utility platforms. Drones, IoT sensors, and field devices generate humungous amounts of operational data. Today, a large utility generates several terabytes of new data every day.

In this new digital era, the utilities that succeed are the ones that treat data not as a by- product—but as a strategic asset as:

- *Data replaces guesswork*
- *Algorithms augment operators*
- *Digital twins complement physical networks*
- *AI becomes the nervous system of the grid*

This Paper attempts to articulate how modern utilities are managing and governing their data, the frameworks they use, the maturity levels in data management, and the roadmap that can help electric utilities in India to evolve into data-driven digital utilities.

Why Data Matters More in Electric Utilities

A modern electric grid is like a living organism - every feeder, transformer, smart meter, EV charger, rooftop solar inverter, and control room is constantly communicating with each through data. If the data is bad or incomplete it can impact grid operations seriously.

Good Data Leads to	Poor Data Leads to
• Error free bills • Low technical and commercial losses • Better load and generation forecasting • Better renewable energy integration • Lesser outages and faster outage restoration • Better regulatory submissions • Better customer experience • Better network optimisation and efficient grid operation	• Wrong bills • Missing meter reads • High technical and commercial losses • Unreliable information to consumers and regulators • Delayed outage restoration • Unhappy customers • Poor network visibility and inefficient grid operation

This is why data governance and data management have become core functions—just like maintenance, billing, and grid operations.

B. DIGITAL JOURNEY OF INDIAN UTILITIES

Electric utilities India began their digital transformation with the R-APDRP program in 2009, which introduced:

- GIS-based network mapping
- Feeder metering
- Integrated billing systems

- Data centres and disaster recovery centres

This was revolutionary for its time, which was followed by the next wave of digitalization:

- Smart grid pilot projects
- SCADA/DMS in large cities
- Demand response (DR) pilots and outage management systems (OMS)

Today, under the Revamped Distribution Sector Scheme (RDSS), India is executing the world's largest smart metering program covering 250 million smart meters. This creates a never- before opportunity as soon, India will have the largest real-time electricity dataset on the planet. But this opportunity is also a challenge because:

- Data is fragmented
- Systems do not talk to each other
- Data quality is inconsistent
- Metadata is missing
- Policies for sharing, access, and privacy are unclear
- IT and OT systems operate in separate silos

To become a global benchmark in digital utilities, Indian DISCOMs must adopt modern data governance and data management practices.

C. DATA MANAGEMENT IN UTILITIES

Data Management comprises of following processes:

- **Data Collection:** Utilities collect digital data from sources such as:
  - o Smart meters – accurate meter reads
  - o SCADA - time-series data
  - o GIS - asset location data
  - o ERP - enterprise asset management data
  - o Human resources data
  - o Billing and payment records
  - o Rooftop solar generation data
  - o Outage and fault logs
  - o Network configuration
  - o Complaint history/Call centre logs
- **Data Cleansing:** Data cleansing is the foundation of every digital utility. In electric utilities, data flows from millions of smart meters, SCADA systems, billing platforms, GIS maps, and field devices every minute. If this data is inaccurate, duplicated, or incomplete, even the most advanced analytics or AI models will fail. Data cleansing involves identifying and correcting errors such as missing meter reads, incorrect consumer identifiers, wrong feeder mappings, duplicate asset records, and time- stamp mismatches. For example, cleansing ensures that a consumer's CA number, meter ID, transformer, and feeder are correctly linked across AMI, billing, and GIS systems. Clean data enables accurate billing, reliable loss calculations, better forecasting, faster outage restoration, and credible regulatory reporting. In simple terms, clean data allows the grid to "see clearly" instead of operating blindly.
- **Proper Organization of the Data:** Utilities generate enormous volumes of data, but its value comes only when it is organized rightly. Proper data organization means structuring data in a way that different departments—operations, billing, planning, customer service, and regulators—are all working from the same, consistent information. This includes organizing data by standard hierarchies such as substation to feeder to transformer to consumer, and aligning master data across systems like AMI, SCADA, GIS, ERP, and CRM. Organized data eliminates silos, reduces inter- department disputes, and ensures that everyone sees the same version of reality. When data is properly organized, utilities move from fragmented decision-making to coordinated action. One grid, one dataset, one truth becomes possible.
- **Data Storage:** Modern utilities no longer rely on isolated databases or legacy data warehouses. Instead, they use scalable, cloud-first data storage architectures that can handle real-time streams as well as decades of historical data. Data storage follows a layered approach—raw data is stored securely, cleaned and standardized data is organized for analysis, and business-ready data is made available for dashboards, AI models, and regulatory reports. Critical operational data is protected with strict access controls, encryption, and compliance with data privacy laws such as DPDP Act 2023. Good data storage ensures that utilities can meet regulatory retention requirements, support audits, enable advanced analytics, and scale effortlessly as smart meters, DERs, EVs, and grid sensors grow. Well-designed storage turns data from a burden into a long-term asset.
- **Proper Usage of Data**: Data delivers value only when it is used correctly, securely, and purposefully. Proper usage of data means ensuring that the right people access the right data, at the right time, for the right reason. In utilities, this includes using data for accurate billing, loss reduction, load forecasting, renewable integration, outage prediction, asset health monitoring, and personalized consumer engagements. At the same time, it requires strong governance—consumer consent management, anonymization of personal data, audit trails, and controlled sharing with third parties. Responsible data usage builds trust—with consumers, regulators, and internal teams. It also enables advanced use cases like AI-driven forecasting,

digital twins, and peer- to-peer energy trading. When used well, data becomes the nervous system of the modern digital utility.

Good data management ensures every department sees the same data – Single Source of Truth!

D. DATA GOVERNANCE

Data Governance is the set of rules, roles, responsibilities, and processes that ensure data is:

- Correct
- Secure
- Accessible to the right people
- Audited
- Traceable
- Compliant with regulations

In simple words, it is the "traffic rules" for how data flows inside the utility. While data management is the "engine", data governance is the "driver and the traffic rules".

Federated Data Governance Framework deployed in Modern Utilities

Most modern utilities use a **federated governance model**, which balances IT/OT systems with domain ownership as explained below.

i. Enterprise Data Governance Committee

Enterprise Data Governance Committee is typically led by the Chief Digital Officer (CDO) with all senior business heads as its members. This committee will have the responsibility to:

- Approve data strategy and investments
- Resolve data conflicts
- Prioritise major data initiatives
- Ensure cross-department alignment

ii. Data Owners - Domain Leaders

Business Heads who owns the data in key domains such as:

- Grid operations
- Customer service
- AMI
- Billing
- DER
- Asset management
- Regulatory reporting

iii. Data Stewards – Operational Custodians of Data

These are people who are responsible for day-today handling of data; and they ensure:

- data quality
- metadata accuracy
- daily checks
- issue resolution

iv. Data Centre of Excellence (Data CoE)

Data CoEs are usually led by the IT Departments, and it is responsible for:

- data architecture
- selection of tools
- designing pipelines
- maintaining the data lake
- building reusable analytics

E. POLICIES AND STANDARDS FOLLOWED BY UTILITIES

Modern utilities follow clear policies and rules on data management, access control, retention and archival etc which are briefed below.

a. Data Classifications

- Public, Internal, Confidential, Restricted (Restricted includes cyber-critical substation and SCADA data)
- Aggregated, Anonymised and Personal

b. Access Control

Utilities are moving from role-based access to Zero-Trust and attribute-based access (ABAC**)** with strong Master Data Management and Energy Data Management processes.

i. Master Data Management (MDM): A permanent "single source of truth" for:

- o Consumer data
- o Asset data (GIS + EAM)
- o Meter data
- o Location data

Consider MDM as a single, trusted family photo album. Everyone in the family may have copies, but the "master album" is the source of truth. For utilities, this means:

- One accurate customer database
- One accurate asset register
- One accurate location dataset

This avoids confusion, duplication, and billing discrepancies.

ii. Energy Data Management (EDM): EDM is the heartbeat of the modern smart grid. Smart meters generate usage data every 15 minutes, SCADA/EMS/DMS systems generate telemetry data every few seconds; PMUs sends data every millisecond, DER systems generate bidirectional flows. The EDM system must ensure that this massive volume of data is:

- Clean
- Timely
- Standardized
- Accessible
- Secure

c. Data Quality is monitored across the following six dimensions:

- o Accuracy
- o Completeness
- o Consistency
- o Timeliness
- o Validity
- o Uniqueness

Utilities aim for >99.95% accuracy in AMI and billing data.

d. Metadata and Lineage

Metadata is data (or details) about the data which includes the labels, descriptions, definitions and lineage. Without metadata, data scientists will find it hard to understand data. Track every step of data flow:

- o IED to Data Historian
- o Data Historian to Data lake
- o Data Lake to Analytics Tools
- o Analytics Tools to Reports

Lineage tracking tells where data came from, how it changed, who changed it; and where it is used. This is critical for audits, regulatory compliance, and trust.

e. Retention and Archiving: Data is stored in low-cost systems (***S3 Glacier, ADLS Cool Blob***) for regulatory compliance.

f. Data Security and Privacy

With cyberattacks increasing, utilities must adopt:

- Zero-trust models
- Strong encryption
- Continuous monitoring
- Role-based access
- Regular security assessments

Because grid cybersecurity = national security.

F. MODERN DATA ARCHITECTURE

Most utilities have shifted from old data warehouses to modern **cloud-first** architectures based on the ***"medallion" pattern*** which is described below.

a. Bronze Layer – Raw Data

- Stores raw, unprocessed data
- Technologies: Azure Data Lake, AWS S3, Snowflake Staging
- Sources: SCADA historians, AMI HES, DMS, OMS, DERMS, IoT devices

b. Silver Layer – Clean and Standardised Data

- Cleaned, validated and harmonized data streams
- Matched with master data
- Feeder/DT hierarchy corrected

c. Gold Layer – Business Ready Data

- Semantic models
- KPI calculations
- Regulatory reporting
- Finance and planning dashboards

d. Consumption Layer

- Dashboards (Power BI/Tableau)
- AI/ML models (for theft detection, outage prediction, load forecasting)
- APIs for mobile apps

This architecture allows utilities to:

- Build **digital twins** of their grids
- Run predictive maintenance
- Identify **non-technical losses**
- Provide personalized consumer engagement
- Improve **demand forecasting**
- Enable **DER orchestration**
- Drive **automation** in field operations

The shift to cloud-first models also reduces costs, accelerates innovation, and enhances cybersecurity.

G. KEY FOCUS AREAS FOR UTILITIES

a. DER and Grid Flexibility Data

Rooftop solar, battery storage, EV chargers—everything needs real-time monitoring and governance.

b. Grid Edge Data Sovereignty

Critical OT data cannot leave substation/utility premises without strict controls (NERC-CIP compliance).

c. AI Governance

AI models must be tracked like assets:

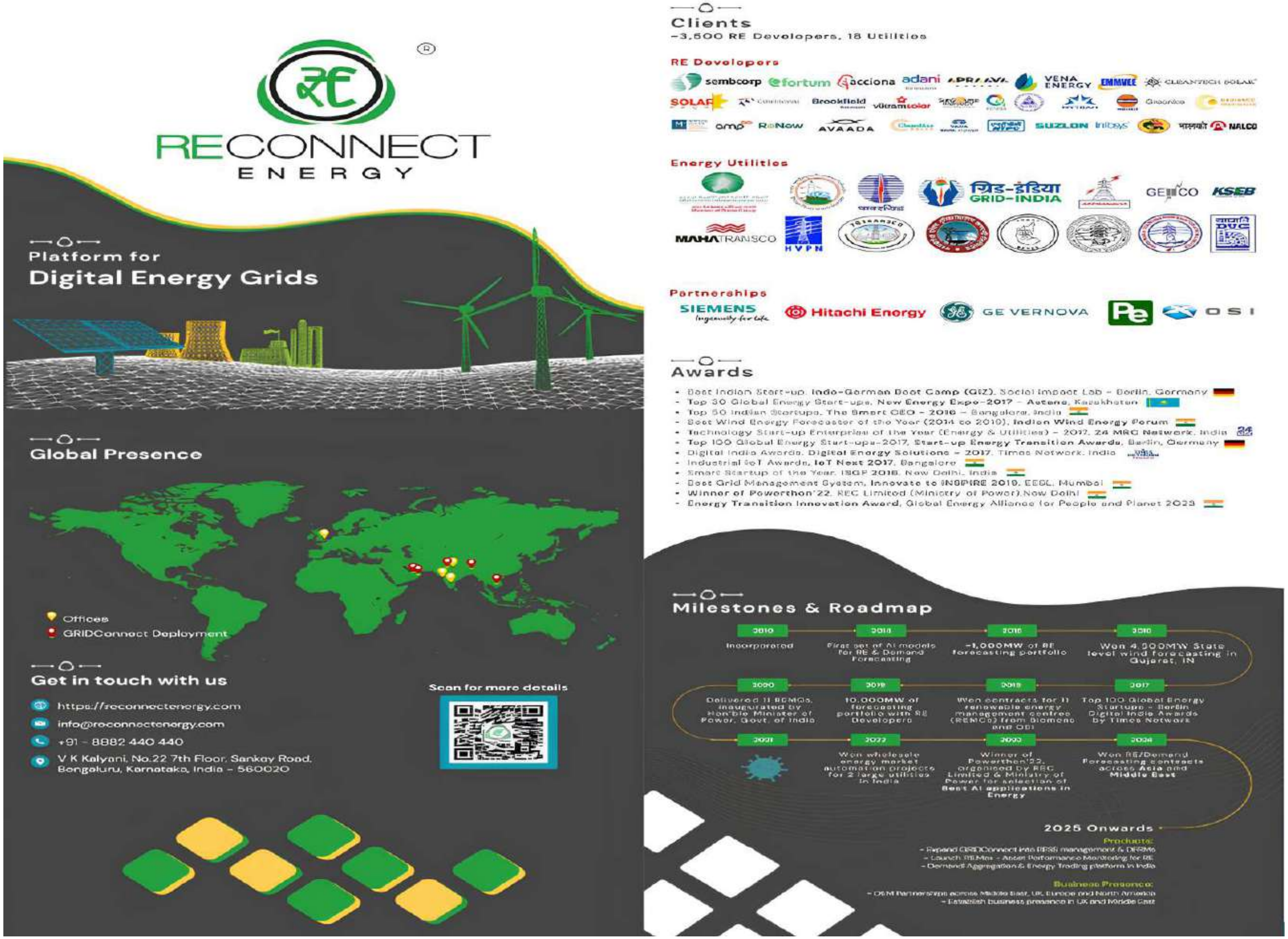
- training data
- accuracy
- bias testing
- version control

d. Secure Third-Party Data Sharing

Using frameworks like data trusts or encrypted exchange platforms.

e. Zero-Trust Architecture

Continuous verification for every data access request.



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- Top 30 Global Energy Start-ups, New Energy Expo-2017 - Astana, Kazakhstan
- Top 50 Indian Startups, The Smart CEO - 2016 - Bangalore, India
- Best Wind Energy Forecaster of the Year (2014 to 2016), Indian Wind Energy Forum
- Technology Start-up Enterprise of the Year (Energy & Utilities) - 2017, 24 MRC Network, India
- Top 100 Global Energy Start-ups-2017, Start-up Energy Transition Awards, Berlin, Germany
- Digital India Awards, Digital Energy Solutions - 2017, Times Network, India
- Industrial IoT Awards, IoT Next 2017, Bangalore
- Smart Startup of the Year, ISGF 2018, New Delhi, India
- Best Grid Management System, Innovate to INSPIRE 2019, EESL, Mumbai
- Winner of Powerthon'22, REC Limited (Ministry of Power),New Delhi
- Energy Transition Innovation Award, Global Energy Alliance for People and Planet 2023
Milestones & Roadmap
2010
Incorporated
First set of AI models for RE & Demand Forecasting
~1,000MW of RE forecasting portfolio
Won 4,500MW State level wind forecasting in Gujarat, IN
Delivered 11 REMCs, inaugurated by Hon'ble Minister of Power, Govt. of India
2019
10,000MW of forecasting portfolio with 82 Developers
Won contracts for 11 renewable energy management centres (REMCs) from Siemens and OSI
2017
Top 100 Global Energy Startups - Berlin
Digital India Awards by Times Network
2021
2022
Won wholesale energy market automation projects for 2 large utilities in India
Winner of Powerthon'22, organised by REC Limited & Ministry of Power for selection of Best AI applications in Energy
Won RE/Demand Forecasting contracts across Asia and Middle East
2025 Onwards
Products:
- Expand GRIDConnect into BESS management & DERMS
- Launch REMax - Asset Performance Monitoring for RE
- Demand Aggregation & Energy Trading platform in India
Business Presence:
- O&M Partnerships across Middle East, UK, Europe and North America
- Establish business presence in UK and Middle East

H. DATA GOVERNANCE MATURITY MODELS

The maturity levels of data governance models are depicted in the table below.

Maturity Level	Data Governance Status	Data & Technology Capability	Grid / System Integration
Level 1 – Ad Hoc	Data scattered, no policies or ownership	Manual data checks, legacy systems, minimal security	AMI, SCADA, Billing operate in silos
Level 2 – Basic	Systems exist but major data quality issues	Basic integrations, role- based access	Partial integration across systems
Level 3 – Defined	Data rules defined, owners and stewards identified	Automated data quality, standardised integrations	Full integration via MDM and data lake
Level 4 – Managed	Continuous monitoring, governed data sharing	Unified data platforms, enterprise analytics	Near real-time grid visibility
Level 5 – Optimised	AI-driven,enterprise- wide governance	Unified data lake + AI, zero-trust security	Real-time digital grid with AI analytics

I. GOVERNING LAWS IN DIFFERENT COUNTRIES ON DATA PRIVACY

1. India

a. DPDP Act 2023

The Digital Personal Data Protection Act, 2023 (DPDP Act 2023) was passed by Parliament of India in August 2023; but it is yet to be notified by Government of India. This is considered to be a very good legislation for personal data protection which imposes heavy fines to the tune of Rs 200-250 crores for violations in each incident. This is expected to bring about major changes in the IT and data management policies of ecommerce and related services companies.

b. RDSS in India

The Standard bidding document of RDSS prescribes following key considerations with respect to data management for Advanced Metering Infrastructure Service Providers (AMISPs). All DISCOMs, AMISPs and their ecosystem parters are mandated to follow these provisions which are in accordance with the IT Act 2011 as described below.

Data Privacy

AMISP should ensure that the AMI system is compliant with the applicable provisions of the *"Reasonable security practices and procedures and sensitive personal data or information Rules, 2011 (IT Act)"* as well as shall be committed to work with Utility for compliance to Personal Data Protection requirements. In this regard, the general elements of the data privacy framework may include:

a) The Utility shall be the sole custodian of the smart meter data. The AMISP and its contracted vendors will have limited need basis access to the data. In case of pre-mature termination or at the end of contract, the AMISP and the contracted vendors should relinquish all access to the data and transfer the same to the Utility.

b) AMISP is required to prepare and submit a "Privacy by Design" document to the Utility which details out all the policies, practices, processes and technologies employed to manage and process the smart meter data in a secure manner. This should also include the details on methods of anonymization applied to the personal smart meter data based on data types defined below:

   i. **Aggregated Data**: No identification individually and at neighbourhood level unless explicitly required to report

   ii. **Anonymized Data**: A data set which has individual smart meter data but without any personally identifiable information like consumer name, account number, address etc.

   iii. **Personal Data**: A data set with smart meter data tagged with personally identifiable information.

c) AMI system should enable the Utility to get the consumer consent on sharing and processing of smart meter data based on following criteria

i. Consumer consent not required

1) If any type of Smart Meter data is processed by the Utility or a third party on behalf of Utility for the purpose of generating bills, identifying theft, network planning, load forecasting or any related activities that can enable the Utility to fulfil its duty as a licensee.

2) If any type of Smart Meter data is requested by the law enforcement agencies.

3) If aggregated or anonymized data is shared with not-for-profit academics, policy research, civil society entities for research that can benefit the sector in general.

ii. Opt-out consumer consent

1) If any type of smart meter data is shared with or processed by any third-party commercial entity to provide services other than as enabled by regulation. In this case, the AMI system should enable the Utility to conduct the following consumer consent process

- Consumer should be notified and given a time to opt-out
- Consumer should have the right to change his/her option through the app/web account/direct communication to Utility.

d) AMI system should enable following Data sharing protocol

i. Data should be shared by providing finite and secure access to the system. The access can be modified or terminated as need be.

ii. Sharing of part/full database shall be subject to review and consent of Utility.

e) All data sharing shall be recorded and periodically submitted to utility for review / regulatory requirement

f) AMISP should have a data breach response plan and should communicate to the utility and consumers in case of any data breach from AMI system

g) AMISP is responsible to conduct 3rd party data privacy audit at least once every year based on evaluation criteria pre-identified by the Utility in consultation with data experts. The audit report should be made available to Utility. AMISP to take necessary actions on audit observations in consultation with the utility.

Today, each AMISP stores meter data in its own format, which creates problems. This was clearly seen when a single common user app had to be developed for all DISCOMs in Uttar Pradesh, where multiple AMISPs were involved. Because the data formats were different, it became difficult and inefficient to build and run one common app

2. California Consumer Privacy Act 2018

California Consumer Privacy Act (CCPA) is considered the gold standard in consumer privacy protection which was enacted in June 2018 and is effective from January 2020. The CCPA describes in detail the following issues:

a. General duties of businesses that collect personal information. Per this Act, personal information (PI) covers name, address, email, phone number, IP address, location data, biometric data and browsing and purchase history

b. Consumers right to delete PI

c. Consumers right to correct inaccurate PI

d. Consumers right to know what PI is being collected; and the right to access the PI

e. Consumers right to know what PI is sold or shared and to whom

f. Consumers right to opt out of sale or sharing of PI

g. Consumers right to limit use and disclosure of sensitive PI

h. Consumers right to "No Retaliation" following opt out or exercise of other rights

i. Methods of limiting sale, sharing and use of PI and use of sensitive PI

Per CCPA, all California residents (individuals, households or devices) and for-profit-business are covered. For profit entities that collect PI and meet any of the following conditions come under CCPA:

- o Annual gross revenue over US$ 25 million
- o Buy/sell/share PI of 50,000+ consumers/households/devices
- o Derive 50% or more annual revenue from selling PI

The penalties start from US$ 2500 per violation and US$ 7500 per intentional violations. Consumers can sue in case of certain data breaches.

CCPA has created a California Privacy Protection Agency which is funded from the Consumer Privacy Fund setup under CCPA within the General Fund of the State Treasury.

3. General Data Protection Regulation (GDPR) 2016

European Union (EU) Parliament passed the GDPR in 2016 and is effective from May 2018 which covers all EU residents. This is a very comprehensive data protection regulation that is much stricter compared to CCPA.

The penalties under GDPR can be up to €20 million or 4% of global annual turnover; and it applies regardless of company size if EU data is processed. Under GDPR individuals are treated as data subjects who have stronger rights where as CCPA treats individuals as consumers.

Other policies and standards related to data protection are:

- EU AI Act on risk-based governance of autonomous AI systems
- OECD AI Principles
- ISO/IEC 2001 and 42001

4. Data Protection and Governance in the Era of Generative AI and Agentic AI

Generative AL models and Agentic AI systems collect large amounts of personal data (PI) and process them for the purposes they are deployed. PI is also used for training AI models. Here data protection rules becomes very difficult to apply. Dynamic learning models make it difficult to track and honour user consent at times. Agentic AI systems continuously collect large volumes of sensitive PI and based on which autonomous decisions are made without human oversight.

AI Agents could repurpose data beyond the original intent which violates core principles of data protection regulations. AI Agents interacting with external systems increases the risk data leakage, prompt injections and unauthorized access. This also brings in the accountability issue – who is liable? developer, deployer or AI system owner? Agentic AI uses complex models that are difficult to interpret and conflicts with provisions of GDPR. AI Agents also process data across national boundaries or legal jurisdictions that further complicates the data localization and transfer laws.

Cyber security and anti-hacking measures are equally critical in the era of Generative and Agentic AI

AI systems and agents are increasingly exposed to cyber threats such as hacking, data poisoning, prompt injection attacks, model manipulation, and unauthorized system access. Since Agentic AI can take autonomous actions and interact with multiple external systems, any security breach can lead to large-scale data leaks, incorrect decisions, grid or service disruption, and financial or reputational damage. Therefore, strong cyber security controls such as encryption, secure authentication, role-based access control, continuous monitoring, vulnerability assessments, and incident response mechanisms must be built into AI systems from the design stage itself.

ISGF White Paper "Smart Metering Program in India – A Critical Assessment" published in October 2023 has described the essential Cyber Security measures in a utility embarking on digitalization including smart metering (Link: 1748423369UoTzV5NWCriaerfRnZUWgrXqfc3dsa890wslQdaZ.pdf). This white paper also captures the key provisions mandated in the Standard Bidding Document (SBD) of RDSS for 250 million smart meter rollout. Owing to space limitations in this article, we are not elaborating on the cyber security topic.

Another key issue is regarding storage of data, retention and deletion. How long the data to be stored in short-term memory? What data to be transferred to long term memory and how long it should be retained there? When and how to delete data from long term memory.

Some of the governance principles for Agentic AI systems are:

- o Privacy be design and default – embed data protection into AI architecture and limit autonomy where PI is involved
- o Human in the Loop (HITL) - mandate human review for high-risk decisions and create kill-switch mechanisms for autonomous agents
- o Mandate clear policies on data ownership, classification and retention; and regular reviews
- o Implement risk management procedures such as pre-deployment assessments, and continuous testing for bias, security and compliance
- o Maintain decision logs for traceability and enable post-incident forensic analysis
- o Establish AI Governance Board and appoint Data Protection Officers and AI Ethics Leaders in organizations

In the era of Agentic Ai, traditional data protection models are insufficient. Effective governance requires adaptive legal compliance, technical safeguards and ethical oversights.

J. ROADMAP FOR INDIAN DISCOMS TO BE DATA-DRIVEN DIGITAL UTILITIES

A. Short-Term (1- 2 Years) – *Build the Foundation*

- Define Policies and Roles
- Constitute a Data Governance Committee
- Appoint Data Owners and Stewards
- Basic data quality cleanup (CA numbers, feeder mapping etc)
- Create inventory of all data sources
- Build a data catalogue and glossary
- Build initial dashboards (reads, losses, outages)

B. Mid-Term (2-3 Years) – *Strengthen the Core*

- Adopt cloud-first medallion architectures
- Build a central data lake (AMI–SCADA–Billing–GIS)
- Deploy data quality tools – some of the popular tools are:
  - o *Informatica Data Quality: enterprise-grade profiling and cleansing*
  - o *SAP Information Steward / Data Services: strong for*

SAP billing and ERP

- o *Oracle Enterprise Data Quality: customer and asset data validation*
- o *Azure Purview + Data Factory: cloud-native quality and lineage*
- o *AWS Deequ: rule-based checks for data lakes*
- o *Great Expectations: lightweight, open-source data quality rules*

- Standardise metadata
- Strengthen cybersecurity and access controls
- Integrate OT and IT systems
- Launch analytics and AI pilots

C. Long-Term (3-5 Years) – *Become a Digital Utility*

- Deploy AI/ML for forecasting, theft detection, asset failure
- Integrate DER, EVs, solar, battery, P2P data
- Enable consumer-centric digital services
- Automate regulatory reporting
- Mature governance audits every quarter
- Monetize data responsibly
- Participate in national open energy data ecosystems
- Build an AI-driven, resilient grid

K. CONCLUSION

Forward looking utilities like Exelon, National Grid, Enel, Iberdrola, Southern Company, and EDF are years ahead because they:

- Treat data as a business asset, not an IT function
- Have strong federated governance
- Use end-to-end lineage tools (Purview, Collibra, Alation)
- Maintain strict cyber compliance (NERC-CIP, GDPR)
- Invest heavily in DERMS, AMI, OMS, and data lakes
- Encourage cross-team collaboration

The gap between "average" and "leading" utilities has widened. The winners share 5 common traits:

1. *Business-led governance, not IT-led*
2. *Data treated as an asset, not a by-product*
3. *Strong integration of OT + IT data*
4. *Cloud-scale platforms with clear lineage*
5. *AI and analytics deployed responsibly*

Utilities that embrace these principles are better equipped to handle rooftop solar growth, EV adoption, P2P energy trading, digital substations, demand response, battery storage, and the rapidly emerging "energy internet". Those who delay will struggle with losses, outages, data silos, regulatory pressure, and customer dissatisfaction. The future electric utility is not just a network operator—it is a data-powered intelligent energy enterprise.

Data governance and data management are no longer optional technical functions—they are strategic imperatives that define consumer trust, grid reliability, decarbonization success, and financial sustainability.

Indian utilities, with their massive smart metering rollout, have a unique opportunity to leapfrog the world and build **future-ready, data-driven digital grids**.

By embracing global best practices and tailoring them to local realities, DISCOMs can evolve into agile, intelligent, consumer-centric energy providers of tomorrow.

About Author

Shri Reji Kumar Pillai is the President of India Smart Grid Forum (ISGF) and Chairman of the Global Smart Energy Federation (GSEF). With over four decades of experience across the global power sector, he has led groundbreaking initiatives in renewable energy, smart grids, digital utilities, electric mobility, and energy storage, championing reliable, affordable and clean energy access for all.

About Co-Author

Ms. Shashi Bala is an Electronics and Communication Engineer specializing in Artificial Intelligence and Blockchain applications in the energy sector. She is Deputy General Manager at PowerXchange, leading digital energy, P2P trading, BESS and smart grid initiatives, with prior experience at India Smart Grid Forum (ISGF) working on national innovation programs and regulatory reforms.

Safe Power Delivery to Rural Telangana

Shri K. Varun Reddy

The northern districts of Telangana are characterized by agricultural fields, low-density rural habitations, and pockets of dense forest cover, which is the distribution service area of the Northern Power Distribution Company of Telangana Limited (TGNPDCL). Covering 55% of state's geographical area with 18 districts under its jurisdiction, TGNPDCL caters to more than 69 Lakh consumers and nearly half of the TGNPDCL's entire demand is Agricultural.

This landscape is not merely vast but also challenging. A significant portion of the territory is under forest cover, with feeders running through deep wooded belts and hilly terrain. 354 out of TGNPDCL's 457 sections are rural. The entire distribution network length of TGNPDCL is more than 3 lakh CKM and with portions of it passing through forest areas, open fields and farms, which are prone to damage due to natural calamities such as strong gale & winds, storms, cyclones and flashfloods. With a large network, such as that of TGNPDCL, comes the risk of being prone to accidents. Year-wise Accidents Details are provided below:

Table 1: Year-wise Accidents Details of TGNPDCL

Year	Human			Animal	Total
	Fatal	Non-fatal	Total		
FY-21-22	469	70	539	1116	1655
FY-22-23	429	94	523	860	1382
FY-23-24	383	91	474	802	1273
FY-24-25	289	99	388	680	1068

Accidents are a result of both network related issues and consumer centric issues. Seasonal monsoonal conditions further elevate risks by causing insulation failures, conductor snapping, and loosening of poles in black soil conditions. It has been observed that because of factors enlisted below, the accidents are more prone to occur in Rural DISCOMs compared to more urbanized DISCOMs

Network related accidents

- Distribution systems (HV lines, DTRs, LV lines) lack proper ground, horizontal, and vertical clearances,
- Poor or defective earthing.
- Lack of knowledge on locations where there are double feeding points, lines crossing over causing induction or electrical shock
- Line clears being taken over phone resulting in wrong line clear i.e., LC requested for one feeder but wrongly given on another feeder by substation operator
- Safety precautions not followed while working on lines like local earthing not provided, non-wearing of helmets, DTR AB switch blades not opened completely etc., resulting in accidents

Consumer related accidents

- Buildings and structures are constructed too close to existing electrical networks without maintaining safe clearances.
- Contact with LT live conductors.
- Accidental contact due to inadequate clearances, energised poles, guy wires, and guard wires
- Illegal energisation of fences in agricultural fields and faulty consumer installations contribute to accidents
- Insulation failure to I/C service wire or domestic services/ faulty house wiring/Appliances

- Agricultural starter repairs performed without trained professionals

Zero Accident Mission

At the core of TGNPDCL's safety transformation is the Zero-Accident Mission, an organization-wide effort that embeds safety into every field activity with the objective to bring down accidents to zero by addressing the above-mentioned causal factors.

Safety as a Daily Operating Discipline

To institutionalize safety oversight, TGNPDCL formed a dedicated Safety Wing, redesignating circle-level DEs/Technical Staff as Safety Officers. Section Officers conduct daily "pep talks" to build safety awareness before field tasks begin, while Circle Safety Officers ensure strict adherence to these briefings. Further, their responsibilities include investigating accidents and enforcing corrective or disciplinary actions, reviewing safety practices regularly, ensuring availability and functionality of safety equipment, and conducting ongoing safety training and awareness programmes. Senior officials from corporate office also conduct regular surprise inspections to reinforce compliance and eliminate unsafe shortcuts.

Building a Skilled Workforce: Training 5,580 Employees for Safety

To strengthen the Zero-Accident Mission, TGNPDCL launched one of its largest safety training initiatives using a Master Trainer model. A total of 5,580 field staff, including linemen, sub-engineers, assistant engineers, and MRT teams, were trained by certified NPTI experts. These trainers conducted circle-level and section-level sessions to standardize safety behavior across the DISCOM. The programme focused on safety practices during line and pole climbing, identifying hazardous installations, correct isolation earthing, proper handling of protective equipment, DTR and substation safety, and effective response to emergency faults and accidents.

This continuous skill reinforcement created a workforce that was not just trained, but alert, confident, and capable of preventing accidents before they occurred. The DISCOM also invested in Rs. 6.73 crore worth of safety tools, ensuring availability of insulated gloves, voltage testers, hot sticks, helmets, earth rods, and fall protection gear in all sections.

Digital Safety Enforcement: The Line Clearance Application

Field safety depends on one non-negotiable rule: no maintenance work should begin until the line is confirmed de-energized. To enforce this universally, TGNPDCL introduced a digital Line Clearance (LC) Application, replacing manual mobile phone or paper-based permits with a real-time, automated process. Through the LC App, every maintenance job requires:

- A digital request from field staff
- Verification and approval by supervisors
- Feeder shutdown confirmation from control rooms
- Locked-out status monitoring to prevent accidental energization
- Photo of same is taken and uploaded in APP for confirmation.

This system ensures complete traceability and eliminates ambiguity during field work. The integration of the LC App with the Real-Time Feeder Monitoring System (RTFMS) adds an additional layer of safety: even if a line is mistakenly energized, RTFMS alerts operators instantly, enabling correction before any harm occurs.

Real-Time Network Intelligence: RTFMS and Fault Passage Indicators

Physical rectification alone could not solve delayed hazard detection, so TGNPDCL deployed the Real-Time Feeder Monitoring System (RTFMS) to continuously track feeder performance, load changes, and outages. This gave operators instant visibility into abnormal conditions, enabling early intervention and reducing undetected live faults, critical on long, sparsely populated feeders. To complement RTFMS, 1,400 Fault Passage Indicators (FPIs) were installed at strategic points to detect fault currents, signal locations, and alert control rooms. In remote agricultural and forest belts, FPIs cut fault-locating time and reduced public exposure to snapped or energized conductors. Together, RTFMS and FPIs shifted operations from reactive to intelligence-driven, improving response time and safety.

Building on this foundation, TGNPDCL is further implementing agentic AI-driven predictive analytics to monitor feeder health in real time. These AI solutions enable predictive maintenance, helping prevent outages caused by equipment wear or natural calamities, thereby ensuring a more resilient, sustainable power supply and reduction of incidents like conductor snapping etc. which lead to accidents.

Polam Bata: Taking Safety Directly to the Fields

Recognizing that rural accident prevention requires grassroots engagement, TGNPDCL expanded Polam Bata, its flagship field-outreach initiative. Unlike conventional complaint- based operations, Polam Bata is being taken up for resolving agriculture consumer's grievances, creating safety awareness and on spot rectification of defects like loose lines, leaned poles, damaged poles, DTR structure rectification etc., in agriculture network. In

FY25 alone, more than 5,000 Polam Bata camps were held across all sections.

As part of Polam Bata, TGNPDCL undertook one of the largest infrastructure safety rectification drives in the region's history, investing ₹65.20 crore in FY25 toward safety infrastructure and reducing structural hazards. This effort resulted in the erection of 18,554 intermediate poles, the rectification of 14,671 bent or leaned poles, replacement of 14,250 damaged poles, and removal of 5,365 rusted poles. Additionally, 5,640 damaged stay wire or stud poles were replaced, and 18,750 loose spans were tightened to eliminate conductor sag. Recognizing the risks posed by transformer grounding failures and flooding, 12,337 defective DTR earthing's were renovated, 4,967 DTR plinths were raised in low-lying areas, and 5,526 low-level road crossings were rectified.

1912 Customer Care Centre

Consumer-side responsiveness was also strengthened. The Customer Care Centre (CCC), established in 2012, evolved into a 24×7 operation with expanded staffing—growing from two operators per shift to eight. This enhancement reduced call drops from 23.40% to 2.21% and enabled faster reporting of hazardous conditions. A dedicated Chasing Cell, led by a Divisional Engineer and supported by ADE and AE, ensured 99.74% complaint resolution within stipulated timelines, while handling an average of 1,300 calls per day. The introduction of a WhatsApp chatbot added a faster reporting channel for electrical hazards such as snapped lines, exposed conductors, and unsafe installations, reducing the window between risk identification and action.

Outcome: A Significant Year-on-Year Drop in Accidents

TGNPDCL achieved a 16% reduction in electrical accidents in FY 2024-25, equivalent to 205 fewer incidents compared to the previous year Fy 2023-24, marking one of its most significant improvements in recent times. The combined effect of rural engagement, technology adoption, digital enforcement, structured training, and behavioral reinforcement was visible in outcomes. Altogether, the initiatives have not only resulted in saved lives but also created value to TGNPDCL in monetary terms. In FY25, TGNPDCL has seen savings of more than Rs. 10 Crores, by avoiding revenue loss due to compensation.

Conclusion

TGNPDCL's success proves that accident reduction is not a matter of luck — it is the result of deliberate, disciplined, and multi-layered interventions. The utility's approach stands out because it tackles safety at every level: from field awareness to real-time monitoring, from procedural enforcement to technological modernization, and from community engagement to workforce training.

In regions where geography works against safety, forests, scattered settlements, monsoon- driven terrain, TGNPDCL has shown that accidents can be significantly reduced with the right strategy. Its model now offers a compelling blueprint for DISCOMs across India operating in similarly challenging environments, one that puts lives first while powering the region's growth.

About Author:

Shri. K. Varun Reddy is an IAS officer of 2019 batch, Telangana Cadre. He has been working as Chairman & Managing Director, TGNPDCL for the past 2 years. Initiated many reforms in the DISCOM to automate all substations, improve reliability parameters, increase revenue, adoption of AI & digitization of functioning, consumer outreach & interaction and bring safety into work culture

Potential Role of Women Self-Help Group in Improving Billing and Collection in Rural Area

Shri Joydip Roy

"Empowering Women, Powering Communities"

1. BACKGROUND

Electricity is a key enabler of rural development, yet efficient service delivery in remote, hilly, and tribal regions remains a persistent challenge. Limited road connectivity, scattered households, language barriers, and lack of consumer awareness have traditionally hindered effective meter reading, billing, and collection operations.

TP Northern Odisha Distribution Limited (TPNODL), a joint venture between Tata Power and the Government of Odisha, recognized these challenges as both Commercial bottlenecks and social opportunities. In line with its CSR vision of creating shared value, TPNODL designed an innovative model that not only improves billing efficiency but also empowers rural women to become change agents in their communities.

Thus emerged the Urja Sakhi Intervention Model — an initiative that integrates women's empowerment, digital inclusion, and utility efficiency into one cohesive framework.

2. CONCEPT

The Urja Sakhi Model is a unique, community-led mechanism that mobilizes Women Self- Help Groups (WSHGs) to undertake electricity meter reading, billing, and collection activities within their own villages.

By transforming rural women into Urja Sakhis (meaning "Friends of Energy"), TPNODL turned local community members into partners in ensuring timely, transparent, and trustworthy billing operations.

These women, being from the same villages, are well-acquainted with the geography, local dialects, and community practices. Their involvement has built bridges of trust between the electricity distribution company and rural consumers—enhancing service access, accountability, and customer satisfaction.

3. OBJECTIVES OF THE MODEL

A. Operational Objectives

- Ensure 100% billing coverage and reduce provisional billing.
- Improve collection efficiency through regular consumer engagement.
- Promote accuracy, transparency, and timeliness in billing processes.
- Build consumer trust and accountability in service delivery.

B. Social Objectives

- Create sustainable livelihood opportunities for rural women.
- Promote digital and financial literacy among women in underdeveloped areas.
- Strengthen women's participation in local governance and decision- making.
- Foster behavioral change among consumers toward energy conservation and timely bill payments.

4. IMPLEMENTATION FRAMEWORK

The Urja Sakhi Model follows a structured, scalable, and sustainable five-phase implementation framework designed for long-term operational integration and community ownership.

The model was implemented over a progressive timeline, enabling measurable improvement within

6-9 months and stabilizing within 12 months of deployment.

Phase 1: Mobilization & Selection

- Identification of active and responsible Women Self-Help Groups (WSHGs) in rural and semi- urban areas.
- Orientation sessions conducted to communicate the project's objectives, benefits, and responsibilities.
- Selection of literate, motivated women members willing to take on operational responsibilities in their communities.
- Formal linkage of the selected SHGs with TPNODL under a structured engagement process.

Output: Formation of the pilot team and readiness for onboarding.

Completion Timeline

Mobilization & Selection of WSHGs: One month (1st Apr'22 – 30th Apr'22)				
Activities	**Week 1**	**Week 2**	**Week 3**	**Week 4**
Identification of WSHGs from rural and semi-urban areas	■			
Orientation sessions for SHG members to communicate project's objectives, benefits, and responsibilities		■	■	
Selection of Urja Sakhis willing to take on operational responsibilities and linking them with TPNODL				■

Phase 2: Training & Capacity Building (1st May – 31st May 2022)

- Intensive training provided on meter reading, billing procedures, and consumer engagement.
- Technical sessions on the use of mobile billing applications and digital payment tools.
- Awareness sessions on financial management, customer interaction, grievance handling, and safety practices.
- Focus on enhancing digital literacy, communication skills, and data accuracy to ensure reliable billing performance.
- Periodic refresher courses and field demonstrations organized to maintain quality and motivation.

Output: Competent and digitally skilled Urja Sakhis ready for field operations.

Completion Timeline

Training & Capacity Building of Urja Sakhis: One month (1st May'22 – 31st May'22)				
Activities	**Week 1**	**Week 2**	**Week 3**	**Week 4**
Intensive training to Urja Sakhis on meter reading, billing procedures, and consumer engagement, digital payment tools, financial management, customer interaction, grievance handling, and safety practices	■	■	■	■
Periodic refresher courses and field demonstrations organized to maintain quality and motivation	Ongoing since then. Refresher training organized every 6 months			

Phase 3: Operational Integration

- Urja Sakhis are assigned defined consumer clusters for billing and collection.
- Equipped with handheld billing devices and digital applications for real-time data entry.
- Implementation of door-to-door billing and timely bill delivery to all consumers.
- Continuous handholding support from TPNODL's CSR & commercial teams.
- Awareness drives conducted by Urja Sakhis to sensitize consumers on payment timelines, safety, and responsible energy use.

Output: Real-time issue identification and operational stabilization.

Completion Timeline

Operational Integration: One month (1st Jun'22 – 30th Jun'22)				
Activities	**Week 1**	**Week 2**	**Week 3**	**Week 4**
Assigning Urja Sakhis defined consumer clusters for billing and collection	■			
Start of door-to-door billing and timely bill delivery to all consumers with support from TPNODL's CSR & commercial teams		■	■	■
Awareness drives for sensitizing consumers on payment timelines, safety, and responsible energy use	Ongoing since than			



Phase 4: Monitoring & Review (1st July – 31st July 2022 onward)

- A robust monitoring system established through monthly review meetings with Urja Sakhis and TPNODL field Staffs.
- Performance evaluated on parameters such as billing percentage, collection efficiency, consumer satisfaction, and service coverage.
- Regular feedback mechanisms implemented to address field-level challenges promptly.
- Digital dashboards and progress trackers used to ensure transparency and accountability.
- Recognition and incentive system introduced for high-performing Urja Sakhis to maintain enthusiasm and commitment.

Output: Measurable improvement began; operational gaps reduced significantly.

Completion Timeline

Monitoring & Review: One month (1st Jun'22 – 30th Jun'22)				
Activities	Week 1	Week 2	Week 3	Week 4
Developing a robust monitoring mechanism through monthly review meetings along with digital dashboards and progress trackers to ensure transparency and accountability				
Regular feedback mechanisms implemented to address field-level challenges promptly				
Project Monitoring and feedback mechanism	Ongoing and continuing till date			

Phase 5: Sustainability & Scale-Up

- Financial sustainability ensured through an incentive-based payment model linked to performance outcomes.
- Capacity building continued through periodic workshops and peer learning sessions.
- Community ownership promoted by involving local leaders and governance bodies.
- Documentation of learnings and best practices for replication across other divisions and districts.
- 5% of Urja Sakhis' earnings deposited into WSHG accounts to promote savings and local entrepreneurship.

Output: Model stabilized and became commercially and socially sustainable; ready for scale-up.

Completion Timeline

Project Sustainability & Scale-Up: Eight months (1st Aug'22 – 31st Mar'23- Ongoing)								
Activities	**Aug'22**	**Sep'22**	**Oct'22**	**Nov'22**	**Dec'22**	**Jan'23**	**Feb'23**	**Mar'23**
Continuation of Capacity building of Urja Sakhis through periodic workshops and peer learning sessions								
Involving local leaders and governance bodies to ensure community ownership and project governance								
Introduction of best practices to ensure model effectiveness	Ongoing and continuing till date							

Timeframe of Improvement

Significant improvements in billing, collections, and operational efficiency were observed within 6–9 months (June 2022 – March 2023) from project rollout. The model reached stable and consistent performance within one year of implementation.

Parameter	Before	After	Improvement Period
Billing Efficiency	65%	97%	Within 8 months
Collection Efficiency	40%	65%	Within 9 months
Women Income Growth	Nil	10K–16K/month	6 Months onward

5. CHALLENGES FACED

Category	Challenges	How It Was Solved
Digital Learning	Many women were not comfortable using mobile apps and billing devices	Extra practice sessions, hands-on demos, and support from trained peers
Field Accessibility	Some areas were difficult to cover regularly due to distance and poor connectivity	Local women's knowledge of village locations and travel routes ensured smooth coverage and timely visits
Social Restrictions	Some families and communities were unsure about women working outside	Awareness meetings and support from SHGs and village leaders helped gain acceptance
Consumer Mindset	Some consumers hesitated to pay bills on time or did not trust the system	Local women doing billing-built trust and encouraged timely payments
Technical Issues	Problems in syncing data and printing bills in the beginning	Technical support teams helped with real- time troubleshooting and corrections

6. DURABILITY & FUTURE SUSTAINABILITY

- Strong Community Trust: Since Urja Sakhis are from the same villages, consumers cooperate better, ensuring long-term acceptance of the model.
- Performance-linked Earnings: Income based on billing and collection performance keeps women motivated and financially sustained.
- Digital Integration: Use of mobile billing apps and OCR tools ensures accuracy, transparency, and reduces manual dependency.
- Continuous Skill Development: Regular training and refresher workshops help Urja Sakhis remain competent and adaptable.
- Support from WSHG Ecosystem: Integration with SHG savings and group structure enables financial stability and entrepreneurship growth.
- Operational Scalability: The model is replicable across multiple divisions and can be adopted by other DISCOMs across India.
- Long-term Sustainability: With periodic technology upgrades and review, the model can sustain effectively for 5–10 years.

7. CONCLUSION

In conclusion, the following impact was observed:

I. Business impact:

- Improved Billing percentage from 65% to 97% by utilizing OCR method in rural areas with involvement of WSHGs.
- Increased Collection efficiency in rural areas from 40% to 65% by engaging SHG women who are familiar with the local community and trusted by consumers.

II. Social impact:

- The SHG members are now earning Rs. 10,000 to Rs. 16,000 each month, and its qualitative and quantitative impact has been inspiring.
- Qualitatively, one of the noticeable changes was that the Urja Sakhis experienced social and economic upward mobility. Many women recounted the change in the way their family and community saw them after they started working. Increased visibility in the village meant greater respect within the family and the community.
- Since the Urja Sakhis were closely connected with an electricity distribution company, the villagers looked to them for any queries or issues regarding electricity. These women were also trained to take customers complaints and relay it to the Section manager.
- The Urja Sakhis, with the confidence boost they received, have also gone on to stand for panchayat and block level elections, and now make tough decisions on sending their girl children for higher education. With better decision making capacity and greater respect within the family, they are able to spend their income on health, nutrition and tuition for their children.
- Quantitatively, more than 2500 women were trained in being financial and digitally resilient and aware. They are now able to make and receive digital payments, and also well-versed with the bank and electricity department.
- Besides this, more than 300 women are able to earn an average of Rs. 10000 - 16,000 per month. 5% of this income is deposited in the WSHG corpus account, which allows rest of the group members to also start other businesses.

III. Impact on consumers:

- Transparency and Trust: The involvement of SHG women enhanced transparency in the billing process. Timely meter readings and direct interactions between SHG women and consumers-built trust and credibility, resulting in more timely payments.
- The Urja Sakhi Intervention Model has redefined how last-mile service delivery can be achieved through community participation and gender empowerment.
- By blending technology, training, and trust, the model demonstrates how corporate responsibility can evolve from charity to capability-building. Each Urja Sakhi is not just a service provider but a symbol of empowerment, accountability, and hope — illuminating both homes and lives.

"Urja Sakhi – Empowering Women, Powering Communities."

About author

Shri Joydip Roy is the Chief of Commercial & Business Excellence and currently working with TPNODL. He has 28 years of experience in power distribution working with utilities like CESC, AES, PwC, Tata Power Mumbai, and TPDDL.

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Behavioral Demand Response: A Successful Experiment at Tata Power- DDL for Bringing Grid Resilience through Customer Engagement

Shri Dwijadas Basak

Global electricity demand has been increasing rapidly and is projected to rise at a rate of 3.4 % annually from 2024 to 2026. In the same lines, India being one of the fastest-growing economies in the world, is looking forward to a highly energy-intensive future with a forecast of peak demand of 458 GW by 2032. There are plans to add an interstate transmission system network with a capacity of 335 GW to evacuate 280 GW of variable renewable energy (VRE) by 2030 *(Ministry of Power, 2024)*. However, in addition to the afore mentioned supply-side interventions, India's progress towards Net Zero Emission target can be further strengthened by reducing demand through consumer-side demand response and flexibility. Smart grid technologies including smart meters, battery storage, vehicle-to-grid charging and energy efficiency management will play a key role in harnessing the flexibility potential among consumers.

Demand-side management is an effective strategy for actively managing the electrical grid and integrating renewable energy sources. By adopting this approach, infrastructure investments are optimized, energy efficiency is improved and sustainable practices are promoted. From a consumer perspective, demand-side management refers to the ability of customers to adjust their consumption and generation patterns in response to external signals. These methods have received attention from policymakers and utilities as a source of meeting ever-increasing demand.

Demand Response:

Demand response (DR) mechanism can be either through direct (behavioral) or through automated methods. In the direct method, customers are notified by the Distribution Company (DISCOM) about the DR via email, SMS, apps, calls or other social media platforms, and they have the option to turn off their devices in response to these signals. India's annual energy-saving potential through behavioral demand responses is estimated to be between 3.4–10.2 TWh, with potential reductions of 1.8–5.3 million tons of CO_2 and 17 to 51 billion Rupees in annual savings by 2030 *(Sasidharan et al., 2022)*. On the other hand, automation involves consumers using smart appliances connected to the grid through smart meters, where demand response occurs automatically according to predefined programmes, without the need for intervention from either the utility or consumers. In both forms, customers are either penalized through Critical Peak Pricing (CPP) or incentivized through Critical Peak Rebate (CPR).

From Tata Power-DDL's experience in 2014-15 where 162 customers were involved and cumulative saving of 0.063 MUs was obtained through 17 events, it has been seen that consumers resent automated demand response, as they perceive they are losing control over their consumption.

Policy Shifts Promoting Demand Response:

In 2022, the Central Electricity Regulatory Commission (Ancillary Services) Regulations (CERC, 2022) included the entities capable of providing demand response as qualified to provide Secondary Reserve Ancillary Services and Tertiary Reserve Ancillary Services (SRAS and TRAS). This expands the range of potential providers of ancillary services beyond generating stations and energy storage resources to other entities, including end consumers. Thus, DR is increasingly being recognized as a more viable solution to optimize power procurement costs and improve capacity utilization of electricity generation, transmission, and distribution in India.

The 2023 MoP report of the group on the development of the electricity market in India also recognize DR as an enabler for reducing reserve requirements and lowering the cost of electricity through tariff-based incentives or direct load control by utilities (MOP, 2023).

Pilot Study at Tata Power-DDL:

In order to meet the rising demand in Delhi, Tata Power-DDL decided to adopt Behavioural Demand Response in 2021-22. This was facilitated by stabilization of smart metering technology, CEA's guidelines on Resource Adequacy along with rising air conditioning load and the rising desire among customers to contribute towards sustainability. The model designed with customer engagement has been unique in many respects, including the methodology adopted to calculate participation. Data from smart meters was processed and baseline was determined for participating customers prior to initiation of the program.

Key Highlights of the pilot:

- Offered customers incentives on reduction in consumption from normal levels during critical events as called by utility (CPR)
- Only for Residential customers (First in India) using smart meters
- Availability Period : 15th Jul to 30th Sep 21 (16 Events)
- Response Timing : Day Peaks (2 pm to 4 pm)
- Technology used : Smart meters, Big data platform, Measurement C Verification through DERMS platform of AutoGrid (Presently acquired by Schneider)
- Implemented with intimation to DERC
- Notification to customers : 24 hrs in advance thru sms, email C calls
- Measurement : Drop in consumption compared to last 10 days during same slot
- Calculation : Porting of customer profile data, last 10 day's 30-minute interval data C consumption data of day of event
- Customer Compensation Structure : Cash rewards based on participation/ event C Lucky Draw Schemes

Impact:

A saving of 7 MW was achieved with 2000 participating customers.

The results of the 2021 program were intended to advance policy discussions about augmenting DR programs and recommend enhancing the predictability of specific operational components of demand response like consumer category and consumer behaviour.

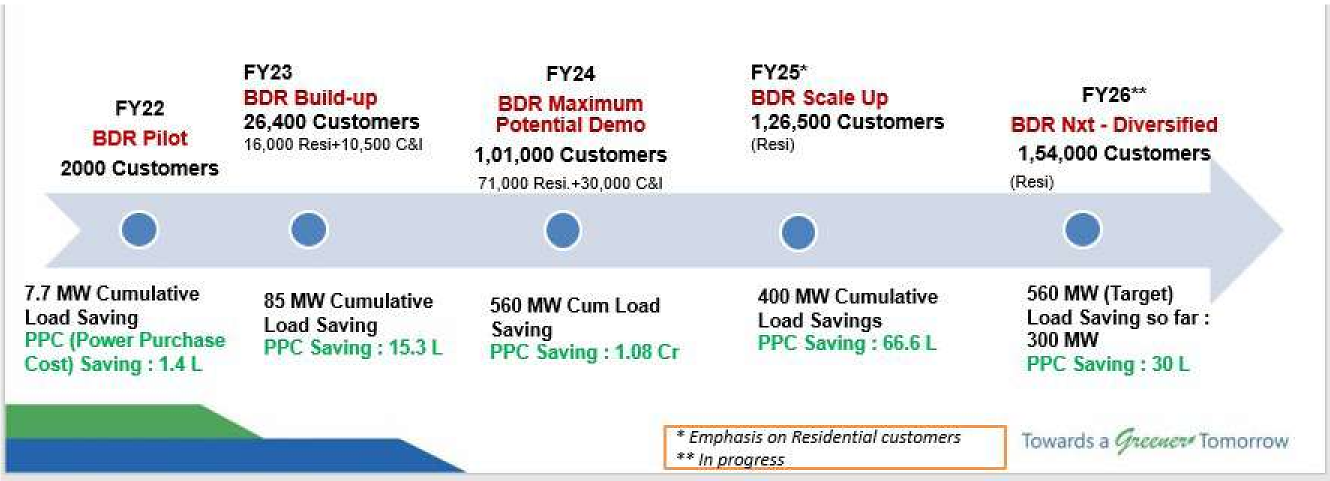
Learnings s Improvements in Scale up programs:

- While success was achieved in saving, the incentive amount was large and needed optimization to scale up.
- Measurement & Verification logics needed refinement along with platform.
- 50% customers responded on premise of grid stabilization contribution but a more compelling reason was required.

Scale Up Programs:

With this in mind, Behavioral Demand Response (BDR) in 2022-23 was launched under the banner of "Urja Arpan". The essence of the 'Urja Arpan' program was to save 'Mother Earth' by urging the customers to lead a sustainable and responsible lifestyle by optimizing energy consumption. It called for sacrificing energy consumption by participating in demand flexibility program when DR events are triggered. This improved participation and peak load curtailment envisaged during different DR events through systematic engagement of Residential consumers and could be scaled up to Commercial & Institutional customers. The program was designed and was validated through Indian Statistical Institute and Centre For Energy, Environment C People (CEEP).

Based on the design the BDR program was scaled up every year and today a cumulative saving of over 1100 MW have been achieved. To make the program more sustainable, an in-house platform has been created. Key statistics of the year-wise programs is given below.



- Among 100,000 residential consumers with smart meters installed in their houses, 70.7 % were enrolled in the behavioural response programme over three years. Most importantly, in later years, enrollment occurred without any incentives and was achieved solely by engaging customers and securing their trust. Hence, this project has set a unique example for utilities worldwide.
- The participation of enrolled residential consumers in the demand response events over three years was 52 %. The total contribution from residential consumers towards flexible demand was 116.9 MW through 16 DR events. This load flexibility helped the utility manage its evening peak load, which is typically dominated by residential loads. This result proves the importance of residential consumers in DR.
- CCI consumer enrollment stood at 30,000, thus demonstrating their intent to contribute to energy savings and reduced emissions.
- The study also demonstrates that continuous consumer engagement leads to an increase in consumer interest in offering flexibility, as evidenced by the rise in MW potential from 7.69 MW in 2022 to 560 MW in 2024. Hence, when all smart meter consumers participate, the cumulative demand flexibility potential will increase considerably. This potential highlights the need to expedite the implementation of smart meters in India.
- The program found increased interest in energy savings and efficiency measures among residential consumers. This view is inferred from the fact that the use of energy-efficient air conditioners almost doubled from 2023 to 2024.
- This program adopted the widely used 'shed' DR program, managed by the consumers with the help of smart meters. The consumers themselves decide to join a DR without any peer pressure. Systematic consumer engagement and regular communications with consumers are key elements in the success of such a DR response method. With the implementation of smart grid technologies and smart appliances, other demand flexibility techniques such as 'shape,' 'shift,' and 'shimmy' can be utilised to smoothen supply curves more efficiently.

Key success factors of the Program:

- **Smart Meter Technology:** The entire program hinges on half-yearly data obtained from smart meters.
- **Communication channels:** Extensive usage of calls, a dedicated webpage, and mobile applications.
- **Community based participation:** Engagement with Resident Welfare Associations (RWAs) C Industrial Welfare Associations (IWAs) to drive larger participation.

The program has also been replicated successfully in Mumbai.

Policy Advocacy for mainstreaming Demand Response:

Petition filed in DERC in May 25 for incentivizing customers C Discom for generating savings from BDR ; Matter admitted C appreciated C hearing is under progress due to persistent efforts (rejected earlier by Regulator in 2021)

Global Recognition- International Smart Grid Action Network (ISGAN) Award in 2024

Conclusion:

The program has introduced a unique demand flexibility model driven by social causes rather than financial incentives and leveraged the potential of trusted peer groups, such as residents' and industry welfare associations. The program's easily scalable model can be followed elsewhere by any utilities for DSM by integrating programs that motivate consumers to switch to energy-efficient and smart appliances. This approach will be foundational for an automated response program in future.

About author

Shri Dwijadas Basak is the Chief Executive Officer (CEO) of Tata Power Delhi Distribution Limited, a Joint Venture between Tata Power and the Government of National Capital Territory of Delhi, supplying electricity to a population of around 9 million in North & North-West Delhi.

AIDA ANNUAL AWARDS

AIDA Awards

AIDA Awards 2025

All India Discoms Association (AIDA), on completion of its first year of inspiring existence , has decided to organise a two day conference on 21st and 22nd January, 2026. With the objective of recognizing and motivating exemplary work and innovative initiatives undertaken by member Discoms, it was further decided to institute the 'AIDA Annual Awards 2025' to be presented during the Conference. It is envisaged that recognition of such initiatives will not only encourage utilities to sustain and scale best practices but also enhance positive public perception of Discoms.

The AIDA Secretariat decided to confer awards on six different categories, each category is to have two awards - Gold Award and Silver Award. The six categories are:

1. Highest improvement in recovery of revenue in FY 2025 in a rural circle or equivalent area and the innovative methods deployed for the same
2. Best use of smart meter data by DISCOMs for purposes other than billing
3. Highest improvement in FY 2025 in consumer satisfaction in terms of digital payment in a DISCOM
4. Innovation in Energy Transition and Renewable Energy integration
5. Agricultural feeder solarization
6. Effective change management for improvement in consumer services

The AIDA Secretariat received 78 nominations from 29 Discoms across the six award categories. AIDA constituted a Jury comprising eminent experts to assess the nominations received. The jury comprises of Shri Rakesh Nath, former member of Appelate Tribunal on Electricity and forme Chairperson of Central Electricity Authority, Shri Sutirtha Bhattacharya, former Chairperson of West Bengal State Electricity Regulatory Commission and former Chairman cum Managing Director of Coal India LImited, Shri Sudeep Jain, Member Secretary, National Commission for Women and former Additional Secretary, MNRE and Shri T.S.C. Bosh, Director (Projects), REC Limited. The Jury brought together deep and diverse expertise from across the power and energy sector.

Category-I: Highest improvement in recovery of revenue in FY 25 in a rural circle of equivalent area and the innovative methods deployed for the same.

The objective of this award was to identify innovations deployed in rural areas for improving collection efficiency. The assessment of the entries was carried out based on the innovativeness of the interventions and the improvement achieved over the previous year. While the innovation may have been initiated two to three years earlier, it was required to be sustainable and replicable. The entry also explained the costs involved in deploying the innovative method(s) and the benefits obtained in terms of additional revenue collected.

Gold Award: Tata Power Central Odisha Distribution Limited (TPCODL)

TPCODL serves 33 lakh consumers across 30,000 sq. km in Central Odisha, with nearly 80% of its consumer base belonging to rural, agriculture-dependent communities. The utility operates through five Circles BBSR-1, BBSR-2, Cuttack, Dhenkanal and Paradeep. Paradeep Circle, comprising 5.79 lakh rural consumers across Kendrapara, Marsaghai, Paradeep and Jagatsinghpur Divisions,

TPCODL's Paradeep Circle, serving predominantly rural and cyclone-prone areas of Central Odisha, significantly strengthened revenue recovery in FY 2024–25 through community-driven and technology-enabled interventions. Key measures included deployment of Women Self-Help Groups for meter reading and collections, expanded CSC payment points, "Gaon Chalo" outreach camps, GIS-based route optimisation, digital payment promotion, MPOS-enabled collection apps, and integration with government payment platforms. These initiatives improved accessibility, transparency and consumer trust, resulting in a 31.79% improvement in collection realisation over FY 2022–23, higher paid-consumer coverage, reduced arrears, improved collection efficiency, and sharply better meter reading performance establishing Paradeep Circle as a benchmark for rural utility operations.

Silver Award: Gujarat Urja Vikas Nigam Limited (GUVNL)

Gujarat Urja Vikas Nigam Limited (GUVNL), as the Holding Company of MGVCL and other State Distribution Utilities, plays a pivotal role in providing strategic direction, policy guidance, and performance oversight to ensure sustained commercial and operational excellence across DISCOMs. MGVCL serves 36.72 lakh consumers across 23,854 sq. km in Central region of the state. The utility operates through five Circles Baroda City, Baroda O&M (Rural), Anand, Nadiad and Godhra. Baroda Rural Circle, comprising 7.25 lakh rural consumers across Baroda Rural, Jambuva, Bodeli, and Dabhoi Divisions.

Under the strategic guidance of GUVNL as the holding company, MGVCL's Baroda Rural Circle serving a large, remote and predominantly rural consumer base implemented data-driven, accountable and field-focused revenue recovery measures in FY 2024–25. Through strengthened analytics, uniform commercial oversight, intensive monitoring, and innovative recovery interventions, the Circle achieved the highest improvement across MGVCL, reducing arrears by 44.43% (₹1207.42 lakh to ₹670.91 lakh) and improving collection efficiency to 102.20%. These results demonstrate the effectiveness of GUVNL-led strategic direction and establish Baroda Rural Circle as a strong model for rural revenue recovery.

Category-II: Best use of smart meter data by Discom for purposes other than billing

The entries in this category were assessed on the basis of the actual utilization of smart metering data (beyond billing) for purposes such as asset management, theft detection, load research, etc., and the quantifiable benefits derived by the Discom. The use of smart metering data from Distribution Transformers for predictive maintenance, network loss reduction, etc., was also included. Internal capabilities developed and the steps taken for institutionalizing these practices at various levels were also considered during the assessment.

Gold Award: Assam Power Distribution Company Limited (APDCL)

APDCL has leveraged large-scale smart meter deployment under RDSS to build a strong data-analytics framework aimed at reducing AT&C losses and improving system efficiency. With 100% feeder and DT metering and 68% consumer smart meter coverage, granular, near real-time data is being used to analyse consumption behaviour, recharge patterns and communication status to detect probable theft, bypasses and habitual defaulting. Between April and October 2025 alone, analytics flagged over 53,000 suspected cases for field verification, directly supporting revenue protection and loss reduction.

In parallel, smart meter data is being applied for asset health monitoring using AI-driven analytics. Electrical parameters from DT meters are analysed to identify phase imbalance, overloading and frequent outages. A pilot using generative AI (DiscomGPT) detected critical issues in multiple transformers, enabling corrective action that reduces technical losses, improves reliability and lowers O&M costs. As a result of smart-meter-enabled analytics and operational actions, APDCL has achieved AT&C losses of 15.45% (FY 2024–25) while maintaining high supply reliability (over 23 hours in both urban and rural areas). These use cases demonstrate how smart meter data has moved beyond billing to become a core tool for operational excellence and financial sustainability.

Silver Award: Tata Power Western Odisha Distribution Limited (TPWODL)

TP Western Odisha Distribution Limited (TPWODL) has transformed its operations by leveraging smart meter data as a strategic asset to overcome historically high losses and limited field visibility. At takeover, AT&C losses stood at 28.56% (FY 2019–20). With 100% smart meter coverage in LTCT and WC categories and increasing penetration among other consumers, TPWODL uses granular 15-minute, daily and event-level data through a dedicated Meter Data Analysis Group (MDAG) to monitor consumption behaviour, meter health and network conditions—well beyond the purpose of billing.

Smart meter analytics enable precise detection of theft, tampering, abnormal load patterns and meter anomalies, providing high-probability leads for targeted enforcement. Since June 2024, this data-driven approach has resulted in significant additional billing, improved billing efficiency and stronger deterrence against malpractices. Supported by smart meter–led operational controls, TPWODL reduced AT&C losses to nearly 17% by FY 2024–25 and improved collection efficiency to 99%, demonstrating the critical role of smart meter data in sustainable loss reduction and utility modernization.

Category-III: Highest improvement in FY 25 in consumer satisfaction in terms of digital payment in a Discom.

The entries in this category were assessed on the basis of the percentage increase in the number of consumers using digital payment modes for payment of their monthly electricity bills and the incentives and awareness measures taken by the Discom for the same. The increase in consumers adopting the prepaid payment mode was also included in this percentage. Special consideration was given to improvements achieved in smaller towns and rural areas, excluding municipal corporation towns. Accordingly, the figures of improvement were provided with an appropriate breakup.

Gold Award: North Bihar Power Distribution Company Limited (NBPDCL)

NBPDCL serves over 13.4 million consumers in Bihar, with nearly 85% belonging to rural areas, where traditional payment methods once dominated. To improve convenience and satisfaction, the utility built an inclusive, multi-channel digital payment ecosystem integrating BBPS banks, CSCs, mobile devices, multiple payment gateways, and an innovative e-wallet enabled doorstep payment system, ensuring digital access even for consumers with low digital literacy.

This transformation was further accelerated by the deployment of over 52 lakh smart prepaid meters, leading to more than 95% of prepaid charges being paid digitally, supported by consumer incentives, awareness campaigns, and automated reconciliation systems. As a result, digital transactions rose sharply, with digital payment share increasing from about 45% to nearly 80% over two years, significantly enhancing transparency, reducing queues, and improving rural consumer satisfaction.

Silver Award: Dakshin Gujarat Vij Company Limited (DGVCL)

DGVCL serves a large and diverse consumer base across urban and rural areas of South Gujarat, with a significant share of consumers located in villages where access and digital familiarity were earlier limited. To improve consumer convenience and satisfaction, DGVCL systematically shifted its payment ecosystem towards digital modes, mandating online payments for high-value consumers, promoting QR-code–based billing, and reducing physical footfalls at subdivision offices through awareness and doorstep education campaigns.

Special emphasis was placed on rural consumers by expanding Common Service Centre (CSC) and Village Level Entrepreneur (VLE) networks, removing collection charges, and actively guiding consumers toward online payment options. These sustained efforts resulted in a sharp rise in digital adoption, with online payments by consumer count increasing from about 28% in FY 2020–21 to nearly 70% in FY 2024–25, and digital payment share by value reaching over 95%, significantly enhancing transparency, ease of payment, and overall consumer satisfaction.

Category IV: Innovation in Energy Transition and RE Integration

The entries described the roadmap drawn and the steps taken to implement the roadmap for increasing the share of non-fossil-based electricity input at the periphery of the distribution network of the Discom. These were assessed on the basis of the increase achieved in this percentage over the last three years and the share assessed to be made available by the end of FY 27 from the PPAs already contracted.

Gold Award: Paschim Gujarat Vij Company Limited (PGVCL)

PGVCL has recorded a substantial increase in renewable energy (RE) integration through large-scale adoption of distributed and consumer-centric RE schemes. The total RE input capacity integrated by PGVCL has reached 3393 MW up to FY 2024–25 and is projected to grow significantly to 6453 MW by FY 2026–27. This growth is driven by multiple initiatives including PM-KUSUM (663 MW PPA signed with 346 MW commissioned), Surya Shakti Kisan Yojana scheme (62 MW), Rooftop Solar (1728.3 MW as of Oct 2025), Small Scale Distributed Solar Project (145 MW), and Distributed Renewable Energy Bilateral Purchase (17.5 MW commissioned with a strong pipeline of 632.5 MW), demonstrating a clear upward trend in RE capacity addition and grid-level integration.

Alongside capacity growth, PGVCL has actively strengthened RE tie-ups through structured Power Purchase Agreements (PPAs), bilateral purchase mechanisms, and captive/third-party arrangements, enabling diversified participation from farmers, small developers, industries, and MSMEs. Under captive and third-party projects alone, RE capacity has increased to 1734 MW by Oct 2025, with an additional 508 MW expected by March 2027

Silver Award: Noida Power Company Limited (NPCL)

NPCL has demonstrated a clear and data-backed acceleration in renewable energy (RE) adoption despite rapid demand growth. Starting from a modest RE capacity base of 61 MW (50 MW solar and 10 MW wind) as of March 2024, the company has consistently exceeded its Renewable Purchase Obligation (RPO) targets over the last three years, achieving a cumulative surplus of 266 MUs by FY 2024–25, including a 154% year-on-year growth in RPO fulfilment in FY25. Looking ahead, NPCL has laid out a structured 10-year roadmap aligned with CEA's Resource Adequacy framework, targeting a shift from 86% thermal dependency to an RE share of 59% by FY34, supported by firm renewable capacity and large-scale storage. Contracted RE capacity is planned to scale sharply, with a 7.5-times increase from 61 MW to 461 MW between FY26 and FY28, marking a decisive transition toward a green and reliable energy mix.

In parallel, NPCL has significantly strengthened its RE tie-ups through diversified long-term contracting and innovative procurement models. The company has already contracted 100 MW of Firm and Dispatchable Renewable Energy (FDRE) to address intermittency, complemented by a 300 MW Hybrid Solar-Wind PPA, with additional RE tenders in preparation to meet the FY30 target of sourcing 50% energy from renewables. These tie-ups are reinforced by enabling mechanisms such as short-term RE procurement, RECs, Green Open Access for 27 consumers, and distributed RE initiatives, including 50 MW of rooftop solar integration. Together, these structured RE tie-ups ensure assured capacity addition, sustained RPO compliance, reduced APPC by ₹0.3–0.4, and long-term decarbonization benefits, positioning NPCL as a frontrunner in innovative RE integration.

Category V: Agricultural feeder solarization

The entries in this category provided details of supply feeders having agricultural load (contracted demand) of more than 30 percent of the total load on the feeder. A feeder was considered solarized if the installed capacity of solar generation exceeded fifty percent of the contracted load. The installed capacity included both the actual installed capacity and the capacity for which PPAs had been signed (with SCOD within the next 18 months), as well as solar installation projects sanctioned for individual farmers on the feeder, along with the list of beneficiaries issued for subsidy entitlement. The entries were assessed based on the combined achievement in terms of the percentage of total agricultural feeders covered as per the above criteria and the percentage of solarized capacity with respect to the total contracted load on all agricultural feeders of the Discom.

Gold Award: Jaipur Vidyut Vitran Nigam Limited (JVVNL)

JVVNL has delivered a large-scale, data-driven transformation through feeder-level solarization (FLS) under Component-C of the PM-KUSUM scheme. In a State served by three distribution companies, JVVNL has emerged as a front-runner in agricultural feeder solarization, demonstrating remarkable performance in both scale and execution. With an agricultural connected load of about 6,138 MW, JVVNL has already commissioned around 2,200 MW of solar PV capacity under PM-KUSUM Components A and C, with 1700 MW (669 projects) specifically commissioned under Component-C (FLS). These projects have enabled the solarization of agricultural feeders serving 1.02 lakh beneficiaries within just 1.5 years, against a long-term target of 3.98 lakh agricultural pumps/consumers, reflecting rapid on-ground execution and scale.

JVVNL has also secured strong project tie-ups and forward capacity creation to sustain and expand feeder solarization. Under PM-KUSUM, 5400 MW of decentralized solar PV projects have already been awarded. These tie-ups involve farmers, landowners, and private developers through lease-based and decentralized development models, strengthening stakeholder participation. The structured contracting and award of large capacities not only ensure reliable daytime power for agriculture but also help DISCOMs reduce power purchase costs, transmission investments, and AT&C losses, while improving RPO compliance and financial sustainability.

Silver Award: Maharashtra State Electricity Distribution Company Limited (MSEDCL)

MSEDCL, through the Mukhyamantri Saur Krushi Vahini Yojana (MSKVY), has achieved large-scale and measurable progress in commissioning decentralized solar capacity for agriculture feeder solarization. Under MSKVY 1.0, the state successfully commissioned 620 MW, and this momentum has accelerated sharply under MSKVY 2.0, with 2,289 MW already commissioned, taking the total commissioned capacity to 2,909 MW. This commissioning has enabled the solarization of 1,985 agricultural feeders across 537 substations, benefiting nearly 7.75 lakh agricultural consumers by shifting a significant portion of subsidized night-time agricultural load to reliable daytime solar supply. The scale and speed of commissioning position MSKVY as one of the largest distributed solar programs for agriculture globally.

Equally significant are the robust project tie-ups and contracting mechanisms established under MSKVY 2.0. A total of 15,404 MW of solar capacity has been awarded across 2,659 substations, involving 231 developers, with 100% of awarded projects having commenced work. These long-term tie-ups are secured through transparent, competitive e-bidding on the e-Bharat Portal, with discovered tariffs in the range of ₹2.69–₹3.10/kWh, ensuring cost-effective power procurement for MSEDCL.

Category VI: Effective Change Management for Improvement in Consumer Services

Discoms had made changes from time to time to their internal structures and processes to deliver better services to consumers and to achieve cost efficiency. The entries in this category provided details of the changes made, the time taken from planning to full implementation, and the extent of improvement in consumer services. The entries were assessed on the basis of the recency of the initiatives, the speed and scale of the changes implemented, and the measured improvement in services to consumers in terms of service quality and the level of consumer satisfaction in interactions with Discom interfaces.

Gold Award: CESC Limited

CESC Limited has implemented a structured, multi-year digital transformation that has fundamentally redesigned consumer interactions across its service territory of around 3.7 million consumers in Kolkata and Howrah. Anchored in a clear 5-Pillar Customer Experience (CX) strategy, the initiative focused on speed, transparency, simplicity, and reliability while ensuring scalability and resilience. Key consumer-facing journeys including complaint management, payments, service requests, and self-service were re-engineered through AI-led voice bots, cloud-based IVR, GenAI chatbots, unified digital platforms, and end-to-end automation. As a result, 75% of complaints are now resolved autonomously, digital adoption has reached 85%, WhatsApp engagement has doubled to 11 lakh users, and customer feedback systems have shifted from reactive to predictive, with NPS improving from –5 to +14.

These service improvements are strongly reinforced by exceptional network reliability and supply performance, underscoring the effectiveness of CESC's change management.

The utility delivers 24×7 power availability, supported by industry-leading reliability indices—SAIDI of just 0.25 hours per year and SAIFI of 0.41 interruptions per year, among the best in the country. The integration of real-time outage mapping, predictive insights from the Digital Voice of Customer (E-VOC) platform, and seamless digital service journeys has reduced consumer effort, improved resolution times, and enhanced trust in digital channels.

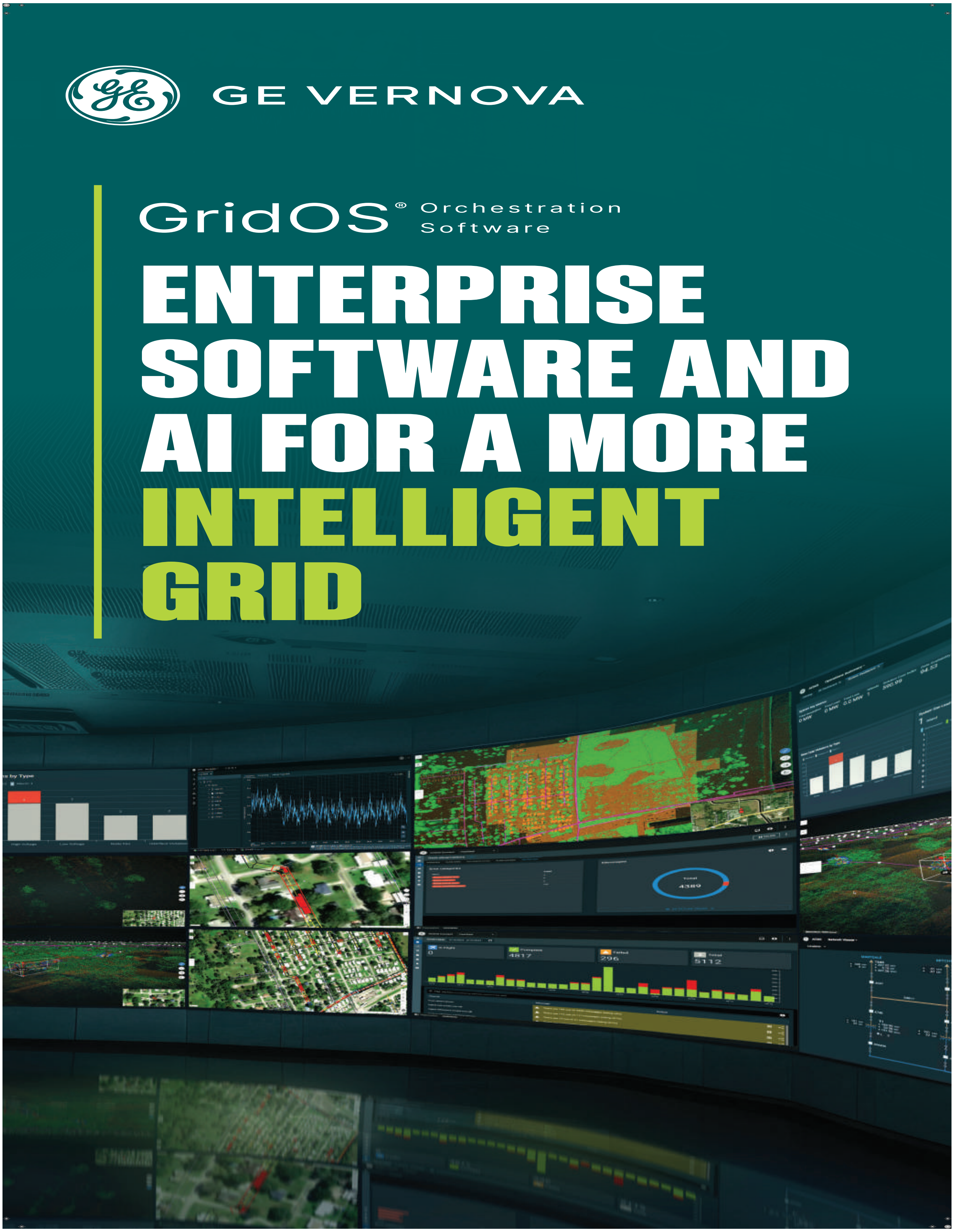
Silver Award: Tamil Nadu Power Distribution Corporation Limited (TNPDCL)

TNPDCL has implemented focused, technology-driven reforms to modernize billing and ensure accuracy at scale. The shift from legacy handheld devices to an Android-based Mobile App for Automatic Meter Reading has significantly reduced manual errors, eliminated desk-based entries, and enabled instant bill generation and upload. Adoption levels are high, with 75% of LTCT readings and 76% of Non-CT readings now captured automatically, benefiting a vast consumer base of 3.4 crore LT consumers. Further, the statewide rollout of the Reading Quality Check (RQC) system using machine-learning models has arrested abnormal billing cases by detecting anomalies in consumption patterns and blocking bill generation until field verification, directly improving consumer confidence and satisfaction.

Complementing these consumer-facing improvements, TNPDCL has strengthened backend efficiency through SAP-ERP–based vendor and payment process reforms, including a unified Vendor Portal, TN-TReDS integration for MSMEs, and centralized payments via Bank APIs, ensuring transparency, faster settlements, and reduced grievances. These change initiatives support service delivery across a large and complex network with power availability of 23.56 hours/day, SAIDI of 116.45 hours/year, and SAIFI of 28.87 interruptions/year, demonstrating TNPDCL's structured approach to improving consumer services through effective change management.

GOLD AWARD WINNER

SILVER AWARD WINNER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RESEARCH STUDY

Dynamics of Tariff and True-up Mechanisms : Insights from Tariff order and Regulations

(A Report prepared by REC in collaboration with AIDA)

Executive Summary

Introduction

The electricity distribution sector in India is fundamental to delivering reliable and affordable power to consumers while safeguarding the financial viability of Distribution Companies (DISCOMs). Central to this ecosystem are the State Electricity Regulatory Commissions (SERCs), which play a crucial role in tariff regulation and determination. Established under the Electricity Act, 2003, SERCs are independent bodies tasked with approving tariffs that reflect prudent costs, promoting efficiency, and balancing stakeholder interests. They determine the Annual Revenue Requirement (ARR), issue Multi-Year Tariff (MYT) orders, conduct true-up exercises to reconcile actuals with projections, and enforce compliance with national policies.

This regulatory oversight ensures that tariffs are cost-reflective, non-discriminatory, and aligned with operational realities, while incorporating considerations for DISCOM financial sustainability—such as allowing recovery of legitimate expenses, managing Regulatory Assets (RA) to prevent liquidity crises, incentivizing loss reduction, and facilitating timely cost pass-throughs to avert debt spirals.

However, challenges like regulatory disallowances, RA accumulation, inefficiencies in collection and billing, and inconsistencies in policy implementation continue to strain the sector. This report, Dynamics of Tariff and True up Mechanisms: Insights from Tariff Order and Regulations, offers a detailed analysis of tariff orders and true-up orders issued by SERCs, emphasizing how these mechanisms impact DISCOM sustainability.

Stemming from a collaborative meeting between the All India Discoms Association (AIDA) and the REC Ltd on June 10, 2025, this study assesses the alignment of SERC decisions with policies and rules framed by the Ministry of Power (MoP), Government of India (GoI). By scrutinizing parameters such as power purchase cost disallowances, RA management, and cross-subsidy levels, the report identifies compliance gaps, trends, and observations. As an annual initiative, with the first edition of the report, it establishes a framework for ongoing monitoring and advocacy to bolster DISCOM financial health under ongoing schemes like the Revamped Distribution Sector Scheme (RDSS).

Background and Context

India's power sector reforms, initiated with the Electricity Act, 2003, have empowered SERCs to regulate tariffs in a transparent and accountable manner. SERCs determine tariffs through a rigorous process involving public consultations, scrutiny of DISCOM petitions, and alignment with national guidelines. Their role extends to approving power purchase agreements, setting performance standards, and conducting periodic reviews to ensure tariffs promote competition, protect consumers, and support sector growth. A key focus in tariff regulations is DISCOM financial sustainability: SERCs should consider factors like prudent cost recovery, RA creation only as a last resort (with liquidation plans), efficiency incentives for reducing AT&C losses, and mechanisms like Fuel and Power Purchase Price Adjustment (FPPPA) for volatile costs. These considerations aim to prevent financial distress by enabling DISCOMs to maintain liquidity, invest in infrastructure, and meet service obligations.

The National policies, including the Tariff Policy 2016 (as amended), Electricity (Rights of Consumers) Rules 2020, and MYT Regulations, guide SERCs to prioritize cost-reflective tariffs, timely pass-throughs, and cross-subsidy reduction. Under RDSS, MoP emphasizes performance-linked funding for loss reduction and digitization, underscoring the need for sustainable tariff frameworks. Yet, variations in SERC approaches—such as differing interpretations of short-term purchase limits or O&M norms—have led to inconsistencies, amplifying challenges like delayed generator payments and subsidy dependencies. Amid evolving sector dynamics, including post-global energy crisis fuel hikes and renewable integration mandates, the analysis explores how tariff mechanisms influence DISCOM resilience and consumer affordability.

Scope of the Study

This study intends to study and analyze the tariff orders and true-up orders issued by State Electricity Regulatory Commissions (SERCs) for Distribution Companies (DISCOMs) across selected Indian states, with a primary emphasis on FY 2025-26. The core focus is on evaluating compliance with key provisions outlined in policies and rules framed by the Ministry of Power

(MoP), Government of India (GoI), such as the Tariff Policy 2016, Electricity (Amendment) Rules 2022 and Multi-Year Tariff (MYT) Regulations. This includes assessing adherence to norms on:

- Power purchase cost disallowances
- Regulatory Assets (RA) management,
- Fuel and Power Purchase Price Adjustment (FPPPA) mechanisms
- Tariff Subsidy
- Operation & Maintenance (O&M) benchmarks from the Central Electricity Authority (CEA)
- Cross-subsidy limits (±20% band), and
- Efficiency trajectories for Aggregate Technical & Commercial (AT&C) losses, Collection Efficiency (CE), and Billing Efficiency (BE).

The scope is delimited to orders issued up to June 30, 2025, ensuring the analysis captures the most recent regulatory decisions.

Criteria for Selection of SERCs

The selection criteria of SERCs are based on the following parameters:

I. SERCs should have issued Tariff Order for FY-26 and True-up Order for FY-24 up to 30th June 2025.

II. SERCs of each of the Five (5) regions (namely North, East, West, South and North-East) must be selected, with at least one Union Territory (UT)

III. SERCs have been selected in such a way that it covers both (i.e., State-owned as well as Private-owned DISCOMs)

IV. Any other exception is considered for selection of SERCs to the extent that it adds significant value to the overall outcome of this study and addresses the critical aspects of the Power Sector in the country.

   a. Addresses the key issues (such as Contribution to the overall Regulatory Assets being created)

   b. Covers a significant population from the regional context

The ERCs and DISCOMs covered for this study as per the following:

- The report covers valuable insights and relevant aspects of the True-up orders issued by 7 SERCs for 7 DISCOMs for this year.
- The seven Discoms covered are: APDCL (Assam), BRPL (Delhi), JBVNL (Jharkhand), MESCOM (Karnataka), MPMaKVVCL (Madhya Pradesh), TNPDCL (Tamil Nadu), and PuVVNL (Uttar Pradesh).
- The seven SERCs covered are: AERC, DERC, JSERC, KERC, MPERC, TNERC and UPERC.

Key Observations:

- **Power Purchase Cost:** The Electricity Rules require SERCs to adopt AT&C loss trajectories aligned with the RDSS, yet most commissions continue to use distribution loss targets instead, often set below RDSS benchmarks. When actual losses exceed these approved targets, most commissions disallow excess power purchase costs, though the basis for calculating disallowance varies by state—some use the Average Power Purchase Cost, while others apply alternative methodologies. Resource Adequacy regulations have been notified in most states, typically capping short-term contracts at 10–15% for meeting resource adequacy, with allowances for exigency purchases subject to post-facto submissions within 15–45 days. However, low caps and prior-approval requirements can impede the quick decision-making needed for short-term procurement. Overall, while SERCs follow their own regulations, most do not share losses with consumers—contrary to the Electricity Rules, which envisage a 2/3:1/3 split between licensees and consumers. These practices, combined with large disallowances, materially impact ARR and weaken DISCOM financial health.
- **Regulatory Assets:** Almost all states have RA regulations, and most allow carrying costs. However, across states, approved carrying cost rates are below the base LPS rate, creating a financial shortfall for DISCOMs and liquidation timelines are often undefined, risking protracted recovery periods. Most commissions are not creating new gaps, aligning with Electricity Amendment Rules 2023. RAs are generally constant or declining.
- **FPPAS Mechanisms:** Five of the seven jurisdictions allow automatic FPPAS adjustments, with monthly or quarterly frequencies. Most states enable timely FPPAS recovery, but design and rigor vary.
- **Tariff Subsidy:** All reviewed states notify full-cost, subsidy-independent tariffs, as required, enabling governments to provide targeted support separately and improving transparency and cost reflectivity. Some states have specified category wise subsidies within tariff orders to reduce disputes, others may also follow it.
- **O&M Norms:** The importance of robust O&M benchmarks, including CEA guidelines, is underscored. The report evaluates O&M expenses relative to ARR, highlighting the need to balance adequate spending with efficiency improvements. It is observed that there is a substaial gap in the O&M expenses allowed by the regulators with respect to the actuals and CEA norms. There is a regional disparities

in adoption of the CEA guidelines leading to a vicious cycle in maintaining asset health and thus in providing a reliable and quality service.

- **Prior-Period Adjustments:** Prior-period gains have not been explicitly adjusted in the approved ARR of the current year in any of the reviewed states. Although ARR shows no prior-period surplus adjustments, state commissions are still addressing prior-period items via true-ups, surplus pass-throughs, or pending regulatory decisions; disclosure is not always explicit in ARR approval.
- **Cross-Subsidy:** Cross-subsidy levels vary significantly across consumer categories. The analysis points to the need for progressive reduction of cross-subsidies and better targeting of subsidies. As a matter of policy, cross-subsidisation should be reduced to a minimum. In spite of repeated focus on reducing cross-subsidisation, this continues to significantly distort the tariff structure. Industrial tariff being 28-35 % higher than the cost of supply acts as a serious impediment to industrial growth. Same is the case with commercial tariff being as high as 51% above the cost of supply. These are bound to jeopardize economic growth and employment creation.

There are observable compliance gaps and inconsistent practices in tariff mechanisms, which influence DISCOM financial health. Strengthening cost-reflective tariffs, ensuring timely cost pass-throughs, and systematically reducing cross-subsidies are critical for sustainability. Closer alignment of regulations and tariff determination by SERCs/JERCs with national policies and rules is essential to support financially resilient and operationally efficient DISCOMs.

Major areas requiring interventions

The analysis of tariff and true-up orders issued by State Electricity Regulatory Commissions (SERCs) for Distribution Companies (DISCOMs) in India have brought out the need of initiating interventions in certain areas, as below:

- Re-fixing of AT&C loss trajectory after considering ground realities
- Strict implementation of FPPPA mechanism on monthly basis
- Re-fixation of O&M benchmark norms in line with CEA guidelines
- Adherence to the cross-subsidisation limit of ±20%
- Initiating measures to liquidate exixting RAs, allowing appropriate carrying cost on RAs till liquidation and to ensure that new RAs are not created
- Issue of proper guidelines for treatment of prior-period adjustment


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AIDA ACTIVITIES

AIDA Annual Activities, 2025

About AIDA

All India DISCOMs Association (AIDA) is a non-profit charitable society with the key objectives of bringing together all the electricity distribution utilities of India, including private sector ones and government departments, for policy and regulatory advocacy, experience sharing, capacity building, taking up research-driven initiatives and studies, and finding collaborative solutions to sectoral challenges. Its key objectives also include standardisation of equipment specifications and collaboration for cost effective procurement systems for better quality and competitive prices. Further, it is sharing best practices, organising national and international study tours, and tying up with institute of excellence like IITs, IIMs and NPTI for imparting training with the aim of capacity building of its members.

AIDA was launched on 14 November 2024 by the Hon'ble Union Minister of Power, Shri Manohar Lal on the occasion of Distribution Utility Meet, 2024 in Lucknow, and was registered as a society in December 2024. Within this short span of one year, it has emerged as a unique national platform representing the reasoned and collective viewpoint of distribution utilities in India. Presently it has 53 electricity distribution utilities as its members. The Association is committed to enabling world-class distribution performance for the larger welfare of common electricity consumers.

General Body

The General Body (GB) is AIDA's highest authority and meets at least annually to approve work plans, budgets, and other policy matters related to society's functioning. It comprises representative of the Ministry of Power, Govt of India, Government Discoms and their holding companies, Private Discoms, Distribution Licensees and Franchisees, and Municipal bodies or government departments engaged in electricity distribution, with CMDs/MDs/CEOs representing members on a one-member-one-vote basis. Special invitees such as PFC, REC, CEA, MNRE, ISGF, IEEMA and eminent persons from reputed institutions, as decided by the GB, participate without voting rights.

The first GB Meeting was held during ISUW 2025, chaired by Shri Lokesh Chandra, CMD, MSEDCL and President of AIDA, and co-chaired by Dr. Ashish Goel, MD, UPPCL and General Secretary of AIDA, with Shri Alok Kumar, Former Secretary (Power) and first Director General of AIDA, sharing his vision for AIDA's role in India's energy transition.

Executive Council

The Executive Council (EC) members are appointed by the General Body (GB). The Executive Council of AIDA, formed first by seven founding members and now comprises the President, General Secretary ; and two representatives from each of the five regions of the country, namely north, east, west, south and north-east. DG AIDA is permanent invitee to EC. The EC is responsible for overall governance and strategic direction of the society. It plays a vital role in facilitating coordination on key operational, commercial, and regulatory matters. The EC, as of now, includes Shri Lokesh Chandra, CMD, MSEDCL as President; Dr. Ashish Kumar Goel, Chairman, UPPCL as General Secretary and Shri Alok Kumar as Director General of AIDA); the other members are Shri Kandarp Patel, MD, Adani Electricity Mumbai Ltd. (AEML), and Shri Jenu Devan, MD, GUVNL from the Western Region; Shri Gajanan S. Kale, CEO, TPNODL, and Shri Mahendra Kumar, MD, SBPDCL from Eastern Region; Shri P.R. Kumar, MD & CEO, NPCL, and Shri Raveesh Gupta, MD, PVVNL from northern region; Shri Rakesh Kumar, MD, APDCL (Assam), and Shri Sanjay Goyal, CMD, MECL (Meghalaya) from North Eastern Region; Shri Prudhvi Tej Immadi, CMD, APEPDCL, and Shri Minhaj Alam, CMD, KSEBL from southern region.

The EC meets quarterly to review AIDA's activities, policies, and finances, providing strategic direction and governance while overseeing the Secretariat led by the Director General.

AIDA Committees

As per the Bye-laws of All India Discoms Association (AIDA), policy advocacy, collaboration for experience sharing in various areas, capacity building, and standardization of specifications of various commonly used equipment's are the main objectives. AIDA Secretariat has the mandate to take action to achieve these objectives. Suggestions and input from the member discoms are important input for AIDA Secretariat in order to prepare recommendations, responses and action plans in respective areas. Seven AIDA Committees has been set up to operationalize this process.

The main task of the committees is to identify relevant issues for further deliberations, suggest best practices in the concerned area for experience sharing with other member discoms, formulate recommendations, and suggest responses on various proposals received from sources like Ministry of Power, CERC, etc. Each committee is expected to meet at least once in 2 months. More number of meetings are convened as per the requirements.

AIDA has constituted the following committees with nominated members from the member discoms and from other expert bodies:

1. Policy Related Matters
2. Regulatory Matters
3. Planning and Procurement of Bulk Power/ Capacity
4. Commercial Aspects of Discom Functioning
5. Capacity Building
6. Specifications and Procurement Practices
7. Smart Grid Technologies

The AIDA secretariat has held twenty four number of committee meetings in the year 2025, as below:

Committee	Number of Meetings
Policy Related Matters	Four
Regulatory Matters	Eight
Planning and Procurement of Bulk Power/ Capacity	Three
Commercial Aspects of Discom Functioning	Two
Capacity Building	Two
Specifications and Procurement Practices	Three
Smart Grid Technologies	Two

The committees had threadbare discussions on many important issues relevant to DISCOMs and helped AIDA in finalising its input submitted to the appropriate authorities. Some of the major areas are:

- Trajectory of Renewable Consumption Obligations
- Impact of GST reduction on solar and wind power generating equipment by Government of India on tariffs
- Report being prepared by Central Electricity Authority (CEA) on reduction of cost of electricity
- Guidelines on DTR specifications prepared by CEA
- Rate contracts of various electrical items being prepared by AIDA
- Inputs related to various Rule and Regulations of MoP, CERC and CEA.

The AIDA Secretariat, after detailed deliberations in its Specifications and Procurement Practices Committee, has finalized standard specifications for commonly used distribution transformers in DISCOMs. The process involved consultations with DISCOMs and technical experts, collaboration with the Central Electricity Authority, and preparation of a draft based on inputs from various discoms. The finalized specifications were shared with CEA on 7th November 2025 to promote uniformity and efficiency in transformer procurement.

Further, in the 5th and 7th meeting with Executive Council, the EC directed the Secretariat to prepare an All-India Directory of suppliers for fast-moving Discom inventories through national-level rate contracts. To implement this, a Standing Committee (Contracts) was constituted on 4th December 2025, comprising 15 members representing Discoms from across the country, tasked with preparing procurement policies, vendor development, and managing tenders.

AIDA's Strategic MoU Partnerships – 2025

The All India Discoms Association (AIDA) has strengthened India's power distribution sector through strategic collaborations with national and international organizations in 2025. These partnerships focus on policy research, capacity building, technology adoption, knowledge sharing, and regulatory support, enabling DISCOMs to modernize operations, enhance sustainability, and ensure reliable and affordable electricity.

Key MoUs signed:

1. **Power Foundation of India** (**PFI**) (July 2025)**:** This strategic partnership sets the stage for both organizations to jointly identify key challenges and priorities within the power distribution sector. The collaboration will focus on evidence- based studies and stakeholder consultations to identify priorities and support reforms. By combining AIDA's sector-wide experience with PFI's policy research expertise, the partnership aims to support the development of a robust, resilient, and future-ready power distribution network across the country.

2. **Alliance for an Energy Efficient Economy** (**AEEE)** (Aug 2025)**:** The objectives of this ground-breaking partnership include: advancing utility modernisation through the design and implementation of demand-flexibility programmes in states, and identifying business models for sustained action; conducting pilot demonstrations, regulatory sandboxing initiatives, and providing strategic support to strengthen engagement with Discoms and Electricity Regulatory Commissions; offering technical inputs, expert reviews, and access to technology-related information, along with policy support and capacity-building opportunities; co-organising events and workshops to facilitate cross-flow of knowledge on mutually relevant topics. building collaborative networks, and fostering public–private partnerships to develop innovative concepts and project proposals; co-authoring articles, policy briefs, and issue briefs for targeted or wider circulation.

3. **National Association of State Energy Officials** (**NASEO), USA** (Aug 2025)**:** This partnership marks a significant step towards fostering international collaboration in the electricity distribution sector, paving the way for enhanced knowledge sharing and mutual growth. The areas of collaboration include: exchange of information, organization of seminars and meetings on topics of mutual interest, sharing of administrative experiences, and other cooperative activities benefiting both organizations.

4. **National Power Training Institute** (**NPTI)** (Aug 2025)**:** The objective of this partnership is to strengthen capacity building and support the transformation of India's power distribution sector. It aims to equip Discoms for a sustainable and tech- driven future. NPTI and AIDA will jointly work on training, research, and technology adoption. The key areas of collaboration include: Training Need Assessment (TNA) and customized capacity-building programs; focus on increasing women's participation in the sector; workshops, seminars, and joint studies; handholding support to Discoms on advanced technologies such as smart metering, SCADA, data analytics, cybersecurity, AI/ML, blockchain, IT/OT, network planning, and energy accounting.

5. **Rocky Mountain Institute** (**RMI), USA** (Oct 2025)**:** The partnership aims to collaborate on research, knowledge sharing, and undertake joint initiatives in the areas of Grid Flexibility, Battery Energy Storage Systems (BESS), and Distributed Renewable Energy (DRE). It will support Discoms in improving reliability, affordability, and sustainability of electricity supply. The areas of Collaboration include: Exchange of Information; conduct of joint research projects; organization of workshops, seminars, and other meetings on agreed topics. Under the MoU, both organizations will jointly explore opportunities, conduct analysis, and advance the discourse on power sector decarbonization in India by leveraging RMI's technical expertise and AIDA's network of member Discoms.

6. **Regulatory Assistance Project** (**RAP), USA** (Nov 2025): The objective of this partnership is to foster knowledge sharing, capacity building, and collaborative research in mutually identified areas. It aims to promote knowledge exchange in the electricity sector particularly in modernizing distribution sector, support interdisciplinary research for sustainable development, advance efforts toward resource adequacy and energy security in the context of energy transition, and jointly undertake technical studies related to energy systems, electricity distribution, and markets. Specific areas of cooperation covered under this MoU includes: knowledge generation, exchange, and transfer of knowledge as knowledge partners, through AIDA Committees; discussion of policies and regulations to support scale-up and acceleration of renewable energy in accord with Government of India targets; discussion of policies and regulations to support wholesale electricity market reforms, enable discoms' participation in the wholesale market, and strengthening market performance; discussion of other innovations in power sector policies, strategies, and plans at the central and state level. The partners will jointly take initiatives for capacity building of discoms, regulatory, and other electricity sector officials, carry out technical studies related to energy and electricity systems, distribution, and markets.

Partnerships/ Memberships

AIDA is strengthening global collaboration and innovation in the power sector through strategic memberships with organisations of international repute.

1. **Utilities for Net Zero Alliance (UNEZA):** AIDA has joined UNEZA as a member. Through this association, AIDA looks forward to collaborating with global utilities and stakeholders to support the achievement of net-zero ambitions, including the goals of tripling renewable energy capacity and doubling energy efficiency by 2030, while contributing to knowledge sharing and collective action in the power and utilities sector.

2. **Electric Power Research Institute (EPRI):** AIDA has become a member of **Open Power AI**, hosted by the EPRI. AIDA looks forward to contributing insights from Indian DISCOMs and collaborating with EPRI and global partners to advance research, innovation, and the responsible application of AI in the power and utilities sector.

Legal Briefs

AIDA prepared regular legal briefs to apprise DISCOMs of important judicial pronouncements and regulatory developments in the power sector. These briefs help DISCOMs understand emerging legal trends, manage contractual and regulatory risks, and take informed strategic decisions.

1. **Doctrine of frustration and Force Majeure in electricity contracts, with key implications for Discoms:** Recent rulings have clarified the scope of Force Majeure and frustration in power sector contracts, stressing the importance of timely notices, proper documentation, and clear objections by Discoms. In Morjar Windfarm vs SECI, CERC held that Discoms cannot raise time extension

issues in Change-in-Law petitions but may challenge such extensions separately. ACME Heergarh vs MERC affirmed that even delayed Force Majeure notices can be accepted if the event is genuine and known to the DISCOM. BALCO vs TANGEDCO highlighted that procedural lapses like failure to serve notice can defeat valid Force Majeure claims. GUVNL vs Taxus case clarified that internal developer decisions don't qualify as Force Majeure and that undertakings given to avoid penalties can be binding. Finally, Brahmani Thermal vs GRIDCO introduced permanent Force Majeure as valid grounds for PPA termination, stressing the need for Discoms to verify whether such claims are genuine or commercially motivated. Overall, these rulings underscore the need for Discoms to maintain vigilance, assert rights promptly, and document all contractual deviations to safeguard their commercial and regulatory interests.

2. **Change in Law under the Electricity Act 2003 - An Ever-Evolving Jurisprudence:** The evolving interpretation of the 'Change in Law' (CIL) clause under Sections 79 and 86 of the Electricity Act, 2003, has led generators to increasingly seek compensation, including interest, for regulatory changes impacting project costs. While CIL is a key risk mitigation tool in power contracts, its expanding scope raises concerns for distribution companies . To manage exposure, Discoms should prioritize timely objections, proof of actual loss, and strategic legal responses. Our brief examines recent CIL trends, assesses regulatory and judicial positions, and outlines strategic considerations for Discoms facing such demands.

3. **Policy Direction issued to SERCs by the government under section 107 and 108 of the Electricity Act, 2003** empower the Central and State Governments to issue policy directions to Electricity Regulatory Commissions in matters of public interest, with courts affirming that such directions are binding and that the Government alone determines what qualifies as public interest. However, judicial interpretation has drawn a clear boundary: while Commissions must be guided by these directions on policy issues—such as subsidies or tariff design—they retain exclusive jurisdiction over core regulatory functions like tariff determination, licensing, and dispute resolution. Cases like Adarsh Textiles and Rockhopper reinforced the binding nature of policy directives, whereas cases like Jhabua Power and PGCIL emphasized that regulatory independence cannot be compromised, ensuring that while executive policy can guide, it cannot control regulatory adjudication or override statutory responsibilities.

4. **Section 11 in the Electricity Act - What It Means for Discoms:** Section 11 of the Electricity Act lets the government direct power generation in emergencies, but can raise costs for Discoms. In Coastal Energen, CERC ruled that final cost compensation—especially for imported coal—must be verified and reasonable, beyond temporary Ministry-set rates. In TANGEDCO vs. TNERC, Discoms should issue clear, unconditional non-requisition notices during Section 11 to avoid paying fixed charges; conditional refusals may still incur costs. Outside Section 11, Discoms are not liable if generators refuse supply at contract rates. Rising coal prices are not force majeure, so Discoms can enforce contracts and limit unjustified claims.

5. **Are Discoms liable to pay for power injected in the absence of a valid contractual agreement:** The general principle in power procurement is that Discoms are not liable to pay for electricity injected without a valid contract or scheduling consent, as reinforced by several APTEL rulings (e.g., Indo Rama, OPG Power, Kamachi Sponge). However, exceptions have been recognized in cases involving renewable or "Must Run" power plants, where Discoms did not object to injections or continued scheduling after PPA expiry, as seen in TGV SRAAC, Greenko Maha Wind, and UP Ceramics. APTEL's recent judgment in PCKL v. Athani Sugars clarified that such exceptions are narrowly confined to specific facts like "Must Run" status or ongoing meter readings, and generally, no payment is due for power injected without a contract. Discoms are advised to promptly object to unauthorized injections, ensure clear terms in supplementary PPAs, and rely on PCKL case to resist claims in non-renewable or non-consensual cases.

6. **Interest on Outstanding Late Payment Surcharge - Regulatory Trend and Legal Validity.** Regulators like CERC and APTEL allow interest on unpaid Late Payment Surcharges (LPS) by Discoms to ensure timely payments, but this conflicts with court rulings that generally forbid interest on interest without clear legal or contractual basis. The 2022 LPS Rules don't explicitly support interest on unpaid LPS, creating legal uncertainty and financial strain for Discoms. Discoms should clarify LPS capitalization and push for regulatory decisions aligned with court principles to avoid unfair burdens.

7. **Collection of Parallel Operation Charges (POC) by Discoms from Captive Generating Plants:** Captive Generating Plants (CGPs) benefit from operating in parallel with DISCOM grids, gaining reliability and backup support. To cover grid maintenance costs, Discoms charge

Parallel Operation Charges (POC), but regulations differ by state. Most require CGPs to formally opt for parallel operation to be liable for POC, not just connectivity. Due to unclear rules, Discoms face legal challenges and should push for clearer regulations and proper procedures before imposing POC.

8. **Additional Tariff for projects approved under section 63.** Section 62 of the Electricity Act, 2003 allows Commissions to set regulated, cost-plus tariffs using fixed normative parameters, while Section 63 mandates adoption of tariffs through competitive bidding without applying those norms. However, in cases of change-in-law (CIL) events affecting Section 63 projects, Commissions like KERC and APTEL applied Section 62 parameters (like 70:30 debt-equity and 14% RoE) for computing tariff adjustments, arguing the absence of a prescribed mechanism in bidding documents. In contrast, CERC has rejected this, stating that Section 62 norms cannot be retroactively imposed on competitively bid projects and instead favors a uniform annuity method. Discoms are advised to resist generator claims based on cost-plus assumptions and rely on CERC's more legally sound approach.

9. **Cost Reflective Tariff and Liquidation of Regulatory assets in terms of the Supreme Court judgment in BSES VS.UOI:** In the BSES vs. Union of India judgment, the Supreme Court has mandated that electricity tariffs must be cost-reflective, meaning there should be no gap between the approved Annual Revenue Requirement (ARR) and the revenue from tariffs. The creation of Regulatory Assets (RAs) — which defer revenue recovery — is to be allowed only in exceptional cases, with a cap of 3% of ARR and a recovery period not exceeding 3 years, as per Rule 23. Existing RA's must be fully liquidated by 31st March 2028, with carrying costs provided to Discoms. Regulatory Commissions are directed to provide a clear roadmap for RA recovery, audit the reasons for their accumulation, and follow previous APTEL judgments. APTEL will also monitor implementation through a Suo moto case. For Discoms, this marks a shift from delayed recovery practices to strict financial discipline, improved liquidity, and proactive regulatory engagement.

10. **Regulatory Oversight in respect of Distribution Franchisees - Directly or Indirectly through the Discoms:** The brief reviews key rulings by the Supreme Court (UP case) and APTEL (Maharashtra case) on the regulation of distribution franchisees under the Electricity Act, 2003, clarifying that while Discoms appoint franchisees to improve efficiency and reduce losses, regulatory oversight is exercised indirectly through Discoms and not directly over franchisees. These judgments reaffirm the autonomy of Discoms in appointing and managing franchisees, shield franchisees from direct regulatory and public interest scrutiny, and limit the role of State Electricity Regulatory Commissions (SERCs) to supervisory oversight—ensuring that license obligations, tariff-setting, and consumer interests are not undermined. However, the rulings also place full responsibility on Discoms to ensure franchisee compliance with license conditions, requiring strict internal controls, effective consumer grievance redressal mechanisms, and careful structuring of franchisee agreements to prevent adverse financial or regulatory impacts.

11. **Section 63 PPAs to be strictly construed- APTEL; ERCs cannot be permitted to override parties' bargain:** The Supreme Court in Chamundeshwari Electricity Supply Co. Ltd. vs. Saisudhir Energy (2025) reinforced that PPAs under Section 63 must be strictly construed, and neither APTEL nor ERCs can override the contractual terms or rewrite risk allocations. The Court held that developers must invoke the correct PPA clauses, issue Force Majeure (FM) notices on time, and seek formal extensions where needed—failure to do so is fatal to their claims. Discoms retain the right to encash Performance Guarantees and deny relief if developers bypass contractual procedures. Regulatory bodies must adjudicate strictly within contractual limits, not on grounds of equity or fairness. For Discoms, this ruling strengthens their position in enforcing PPA timelines, rejecting vague FM claims, and safeguarding commercial terms.

12. **Press Release and Tentative Policy Proposals issued by the Government do not constitute Change in Law unless promulgated or notified in accordance with law:** The Supreme Court in Nabha Power Ltd. v. Punjab State Power Corporation Ltd. clarified that only formally notified legislative changes constitute 'Change in Law' under PPAs; press releases or draft policies do not. It ruled that power plants are not "goods" eligible for deemed export benefits unless strict conditions are met. Developers cannot rely on tentative policies for CIL claims, and Discoms may deny unsubstantiated claims while requiring proof of fiscal benefits. The judgment emphasizes strict interpretation of PPAs under Section 63 of the Electricity Act, 2003, ensuring legal certainty and protecting Discoms from unfounded Change in Law claims.

13. **GST Cut on Renewable Energy & Coal:** Change in Law Claims by Discoms. From September 22, 2025, GST on renewable energy drops to 5%, and coal taxes decrease overall despite a GST hike to 18%. This lowers Discoms' costs, allowing them to invoke Change in Law clauses in Power Purchase Agreements to claim benefits. Discoms should review contracts, issue timely notices, and seek regulatory guidance to ensure tax savings are passed on effectively.

14. **Tariff cannot be fixed by mutual agreement of the parties but subject to approval of the Commission – Supreme Court Judgment in KKK Hydropower Vs. HPSEB:** The Supreme Court in KKK Hydropower vs. HPSEB held that tariff cannot be fixed by mutual agreement between a generator and a DISCOM and must be approved by the Appropriate Commission under Sections 61, 62, 79, and 86 of the Electricity Act, 2003. In this case, a supplementary PPA fixing a revised tariff of Rs.2.95/kWh executed without the Commission's approval, and was held unenforceable. The Court clarified that tariff fixation is not a matter of private negotiation and any modification or enhancement must be approved by the Commission. It also noted that Generic Tariff Orders cannot override specific approvals. DISCOMs should therefore ensure that all PPAs and tariff changes receive prior approval from Commission and be proactive in challenging orders that contradict the Act.

15. **Supreme Court's Limited Jurisdiction in Electricity Matters:** How DISCOMs should Strategize the Feasibility of Filing appeals before the Supreme Court: Section 125 of the Electricity Act, 2003 permits appeal to the Supreme Court only on substantial questions of law, limiting its role to correcting serious legal or jurisdictional errors, not re-evaluating facts decided by expert bodies. While the Court has cautioned DISCOMs against routine appeals, as seen in MSEDCL v. Adani Power and HPPC v. GMR Kamalanga, it has intervened in cases like Torrent Power v. UPERC and Chamundeshwari ESCOM v. Saisudhir Energy where substantial legal issues arose. As clarified in BSES Rajdhani v. DERC, appeals must be carefully framed to meet the test of substantial questions of law. Though the Supreme Court is slow to disturb concurrent findings, DISCOMs may still approach it when such legal questions exist or when there are divergent views between the Commission and APTEL, or the Commission's decision is clearly erroneous or contrary to the Act. Hence, DISCOMs should file appeals selectively, based on clear legal grounds, to avoid unnecessary litigation and financial burden.

16. **Adoption of Tariff under Section 63 not mechanical:** It must be reasonable, fair and consistent with consumer interest - APTEL Judgment in APPEAL NO. 26 oF 2025 - JSW Vs. CERC: APTEL, in JSW vs. CERC (Appeal No. 26 of 2025), held that tariff adoption under Section 63 of the Electricity Act, 2003 is not a mechanical exercise. While the Commission must adopt tariffs discovered through a transparent competitive bidding process, it is also obligated to ensure that the tariff is reasonable, fair, market-aligned, and consistent with consumer interest. In this case, CERC refused to adopt the tariff for a BESS project due to significant delays in issuing the Letter of Award, signing agreements, and filing the adoption petition, finding that the tariff was no longer aligned with prevailing market prices. APTEL upheld this decision, clarifying that CERC is not a mere "post office" under Section 63 and can invoke its general regulatory powers under Section 79(1) to protect public and consumer interest, even in the absence of explicit provisions in the guidelines. The Tribunal reiterated that consumer interest is paramount and rejected the developer's claim of legitimate expectation. The appeal against this decision is pending before the Supreme Court. For DISCOMs, the judgment underscores the need to expedite post-bid contracting, issue LOAs and execute PPAs within prescribed timelines, approach the Commission promptly for tariff adoption, maintain transparency in case of delays, monitor market trends to ensure competitiveness, and recognize that tariff adoption under Section 63 entails regulatory scrutiny to safeguard consumer interest.

17. **Payment of interest/late payment surcharge on liquidated damages or penalty levied by discoms on generators:** Liquidated Damages (LD) clauses supported by Section 74 of the Contract Act, 1872—allow DISCOMs to recover pre-determined compensation for delays such as failure to meet Conditions Precedent, delay in commissioning, or non-compliance with PPA obligations. Sample PPAs from Karnataka, Tamil Nadu, Maharashtra, Telangana, and Meghalaya show that DISCOMs can encash Performance Security and that interest or LPS on delayed LD may be provided either within general payment provisions or supplementary bill clauses, even if not stated in the LD clause itself. In existing PPAs, DISCOMs are entitled to levy interest/LPS where specified, and due dates for LD payment may be expressly mentioned or inferred from general payment terms; where absent, DISCOMs may set a reasonable due date or invoke the Interest Act, 1978 as

a last resort. For future PPAs, it is advisable for DISCOMs to clearly specify the due date for LD payment and include explicit interest/LPS provisions—ideally aligned with rates applicable to delayed DISCOM payments—to avoid ambiguity and strengthen enforceability.

Studies

AIDA is conducting various studies in collaboration with other expert bodies to support Discoms efficiency, financial sustainability, and policy compliance, covering tariffs, renewable obligations, project implementation, and consumer billing patterns.

1. **Dynamics of Tariff and True-up mechanism: Insights from SERC FY 2025-26:** AIDA and REC have jointly carried out a study and analysis of the tariff orders issued by the State Electricity Regulatory Commissions (SERCs) for Discoms for the FY 2024-25, including the trued-up and tariff orders for the previous FY 2023-24. The objective of this study is to assess the extent of compliance with the various provisions of the policies and rules framed by the Ministry of Power (MoP), Government of India, particularly those related to tariff determination. The report, to be published annually, covers key regulatory aspects such as disallowances in power purchase cost, treatment of regulatory assets, collection and billing efficiencies, fuel cost pass-through mechanisms, treatment of fixed costs, subsidy-related compliance, O&M cost norms, prior-period adjustments, and the status of cross-subsidy levels. The findings are intended to promote transparency, regulatory consistency, and financial discipline across the distribution sector.

2. I**mpact of Renewable Consumption Obligations (RCOs) on Discoms:** AIDA has undertaken a detailed in-house study on the challenges faced by Distribution Utilities in meeting Renewable Consumption Obligations (RCOs). The study was based on inputs collected from 11 distribution companies across various regions of the country and further deliberated within the Executive Council of AIDA. The findings highlighted that while Discoms are fully committed to supporting India's long-term renewable energy goals, there are several practical issues that need to be addressed for smooth implementation. Key aspects emerging from the study include: alignment of RCO & SERC Regulations to avoid overlaps and regulatory uncertainty; trajectory mismatch to ensure targets are realistic and aligned with ground realities; rationalisation of penalties to make compliance supportive rather than punitive; alignment of timelines for synchronising obligations with operational and planning cycles; extension of aggregated RCO Compliance to allow flexibility through aggregation across years and utilities. Through this exercise, AIDA has reinforced the importance of a calibrated approach to RCO compliance, which can both safeguard the financial health of Discoms and contribute to the country's clean energy transition.

3. I**mpact of non-completion of RE Projects delays on Discoms:** In collaboration with PFI, AIDA is conducting a study to analyse the challenges faced by Discoms in meeting Renewable Consumption Obligations (RCOs) notified by the Ministry of Power under the Energy Conservation Act, 2023. The study focuses on delays in commissioning of renewable energy projects contracted through Renewable Energy Implementing Agencies (REIAs), such as SECI, due to reasons including transmission connectivity issues, material unavailability, court orders, and administrative decisions. The study will assess the justification for delays and their impact on Discoms ability to meet energy needs, fulfil RCOs, and manage increased costs including expenditure on RECs and tariff impacts from Change in Law provisions.

4. **Average Billing Rate (ABR):** AIDA is conducting an in-depth in-house study on Average Billing Rate (ABR) to assess the effective tariff paid by consumers across various categories, beyond the slab-wise rates outlined in tariff schedules. The objective of this study is to identify patterns and inefficiencies in billing and revenue realization, enabling data-driven recommendations for improving Discoms performance, enhancing tariff rationalization, and ensuring long-term financial sustainability.

Projects

AIDA is implementing focused projects in collaboration with other expert institutions to strengthen demand-side management and grid efficiency in the power distribution sector. These initiatives aim to improve DISCOM planning capabilities and unlock demand flexibility across consumer segments.

1. **Strengthening Load research and Demand forecasting capabilities of Discoms:** AIDA Secretariat, in collaboration with Prayas (Energy Group), is doing a project to strengthen load research and demand forecasting capabilities of selected electricity distribution companies. The project is being implemented in three phases across 4–5 Discoms. Phase I involves developing draft guidelines for load research and forecasting; Phase II

focuses on finalizing these guidelines through stakeholder consultations; and Phase III involves implementing them in the participating Discoms. Prayas will provide technical assistance for Phases I and II across all Discoms and lead Phase III in two of them, while AIDA will support Phase III in the remaining Discoms. The Discoms taking part in this project are NBPDCL, BRPL, APEDCL, TSECL, TPC-Mumbai, APDCL, NPCL, and UPPPCL.

2. **Design and Implemention of the Aggregator Lead Demand Flexibility Program:** AIDA in collaboration with AEEE has undertaken a project on Demand Response. AEEE is providing the technical assistance for design and launch of aggregate led demand flexibility programme. The programme is implemented to achieve the objectives like: create a market for demand responses aggregates across residential, commercial, and industrial segments; design effective incentive structure; deploy modern, real-time monitoring and automated demand response technologies. The Discoms taking part in this project are NBPDCL,SBPDCL, APDCL, MSEDCL, BESCOM, KESCO, and TPCODL.

Best Practices Sharing Webinars

AIDA regularly hosts national webinars to facilitate knowledge sharing, peer learning, and capacity building among DISCOMs. These sessions bring together sector leaders and practitioners to discuss policy reforms, technology adoption, and operational best practices in power distribution.

1. **Webinar on MSKVY 2.0** (25th June 2025)**:** The AIDA Secretariat organised its 1st National Webinar on 25th June, 2025 on 'Mukhya Mantri Saur Krushi Vahini Yojana 2.0 (MSKVY 2.0)', under 'PM KUSUM Yojana' - a flagship solar initiative by the Government of Maharashtra. Shri Lokesh Chandra, CMD, MSEDCL, delivered a focused presentation on the scheme's key features and its wide-ranging impact. Recognized as the world's largest decentralized solar distribution scheme, MSKVY 2.0 is a game- changer for India's clean energy and agricultural power ecosystem. It ensures financial relief to Discoms while empowering the rural economy through sustainable and reliable energy access.

2. **ACEF 2025 Learnings** (20th June 2025)**:** AIDA hosted a webinar to share insights from the Asia Clean Energy Forum in Manila. Senior DISCOM delegates highlighted clean energy transitions, smart distribution, and global best practices, including a visit to MERALCO, Philippines' largest distribution utility.

3. **Assam's Smart Metering** (22nd July 2025)**:** AIDA hosted a where Shri Rakesh Kumar, MD, APDCL delivered an insightful session on Assam's Smart Metering journey highlighting AT&C loss reduction, advanced data analytics for load forecasting, targeted theft and bypass detection, a mobile app for real-time reporting with photographic evidence, and a centralized dashboard for monitoring non-communicating meters and prompt corrective actions.

4. **Behavioural Demand Response** (21 Aug 2025):AIDA hosted a national webinar where Shri Dwijadas Basak, CEO, TPDDL shared insights on demand response concepts, peak pricing, India's first mass-scale BDR program with smart meters, implementation strategies, pilot learnings, and policy support.

5. **Human Resource Management in Discoms,** (23 Sep 2025):AIDA Secretariat organised a national where Mr. Abhishek Ranjan, CEO, BSES Rajdhani Power Ltd., shared the importance of a continuous learning culture, HR Business Partners, enhanced employee experience, and digital HR transformation. He also showcased initiatives like Project Setu and Urja Yodha, aimed at skill development, safety, and leadership training.

6. **Learnings from ENLIT ASIA,** (23 Oct 2025):AIDA Secretariat hosted a webinar to share key learnings from the ENLIT ASIA 2025 study tour in Bangkok. Senior DISCOM officials highlighted global best practices in renewable integration, smart grids, AI, and emerging grid technologies, reinforcing AIDA's focus on capacity building and modernization of the distribution sector.

7. **Challenges Faced by DISCOMs in Field-Level Management** (28 Oct 2025): AIDA organized a national webinar with a presentation by Dr. Shiva Shankara N., MD, BESCOM. The session highlighted BESCOM's best practices in loss reduction, automation, smart metering, and operational efficiency, offering practical insights for building resilient and consumer-centric distribution systems. BESCOM's experience showcased how innovation, automation, and financial discipline can strengthen Discoms operations, paving the way for a smarter, more resilient, and consumer- centric power distribution network across India.

8. **Best Practices in Design of Solar and BESS Tenders** (20 Nov 2025): AIDA hosted a knowledge-sharing webinar featuring a presentation by Shri Manu Srivastava, IAS, Additional Chief Secretary, MPUVNL. The session shared practical insights on cost-effective tender structuring,


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storage integration, flexible tariff provisions, and lessons from the Rewa solar-BESS project. He also examined centralized versus decentralized storage approaches.

Capacity Building Initiatives by AIDA

AIDA is strengthening capacity building in the power distribution sector through targeted training and academic collaborations aimed at enhancing leadership, technical expertise, managerial and strategic decision-making among Discom's professionals. A few of the initiatives take up AIDA are:

1. **NPTI, Faridabad**: As part of its capacity-building efforts under Revamped Distribution Sector Scheme (RDSS), facilitated a three-day residential training program at NPTI Faridabad on "Leadership and Strategic Management" from 22-24th December, 2025. Organised by NPTI at AIDA's initiative, the program focuses on emerging issues in electricity industry, challenges in RE integration, leadership development, and smart grid technologies including smart meter data analytics. Fully sponsored by PFC/MoP, the training offers DISCOMs an opportunity to strengthen the capabilities of their middle- management officers and enhance preparedness for upcoming sectoral reforms. This programme will cover 300 officers in ten batches.

2. **IIM, Lucknow**: In collaboration with IIM, Lucknow AIDA developed a national- level General Management Programme for senior officials of the distribution sector. The proposed course aims to enhance managerial, strategic, and leadership capabilities, equipping Discom executives to navigate emerging sectoral challenges and drive organisational transformation. The programme will serve as a high- quality capacity-building platform for the power distribution fraternity.

3. **IIT, Delhi**: AIDA is currently in discussions with IIT, Delhi to design a national-level training programme for DISCOM officers focused on data analytics using AI/ML. The proposed programme, targeted at senior officials, aims to strengthen analytical capabilities for improved operational decision-making. Once finalised, the collaboration will support Discoms in leveraging advanced technologies for sectoral reforms and data- driven governance.

4. **IGNOU**: AIDA is in active discussions with IGNOU to upgrade and redesign the ACPDM programme to meet the emerging needs of the power distribution sector. The collaboration focuses on updating modules on smart metering, digital platforms, renewable integration, data analytics, safety, and operational efficiency, while also exploring the upgradation of the programme to a PG Certificate with pathways to a PG Diploma/MBA. The initiative aims to create a more industry-relevant, holistic techno- commercial-regulatory curriculum that enhances the capabilities of Discom professionals nationwide.

Policy Advocacy and Regulatory Engagements

AIDA actively engages in policy advocacy and regulatory consultations to address critical challenges faced by DISCOMs and to support sustainable reforms in the power distribution sector. Through structured representations and participation in regulatory processes, the association works closely with central institutions to promote regulatory alignment, cost efficiency, and financial viability while advancing India's clean energy transition.

1. **RCO Challenges**: AIDA submitted its detailed representation to the Ministry of Power on 24th July, 2025 highlighting the genuine challenges being faced by distribution companies (Discoms) regarding the proposed penalties under the Energy Conservation Act (ECA) for shortfall in Renewable Consumption Obligations (RCOs), as notified on 20th October 2023 and further amended through the draft notification of March 2025.

2. **Presentation at MNRE**: AIDA made a comprehensive presentation to the Ministry of New & Renewable Energy (MNRE) on 12th August 2025 on Key Issues and Challenges of Discoms in Renewable Energy. The discussion covered critical topics including Renewable Consumption Obligation (RCO), procurement challenges under REIAs, evacuation constraints, strategies for controlling the cost of RE integration, and implementation challenges in flagship schemes such as KUSUM 2.0 and PM Surya Ghar: Muft Bijli Yojana.

3. **Engagement with CERC & FOR**: AIDA held an extensive and interactive meeting with the Central Electricity Regulatory Commission (CERC) on 27th August 2025, attended by the Chairman, Secretary of the Forum of Regulators (FOR), and other senior officials. The discussions were highly constructive and paved the way for stronger collaboration between AIDA, CERC, and FOR.

4. **Reduction of GST**: AIDA conveyed its appreciation and recommended to CERC and the Ministry of Power the expeditious steps to pass on the benefits of reduction of GST on equipment used for solar and wind power projects from 12% to 5%.

5. **Trajectory for X-factor in CERC DSM Regulation**: AIDA participated at the CERC public hearing on the draft proposal for determination of the value of 'X' under the DSM Regulations 2024 for Wind and Solar Sellers, held on 3rd December 2025, and submitted its recommendation for a three year trajectory and further tightening of the frequency band to enhance grid security. AIDA also highlighted the mismatch between stringent forecasting expectations for DISCOMs and minimal accountability for WS sellers. With rising RE penetration, AIDA stressed the need for stronger forecasting discipline to ensure a secure and cost-effective grid.

6. **Recommendation to FOR**: AIDA requested the Forum of Regulators (FoR) to frame Model Regulations allowing the funding cost of Delayed Payment Surcharge (DPS) to be included in the Discoms ARR, in line with the APTEL Judgment dated 12.07.2011 (BSES vs. DERC), that appropriately recognizes legitimate financing costs due to delayed consumer payments while preserving incentives for timely collections.

7. **Reduction of Cost of Power**: AIDA conducted a study on cost reduction opportunities across the power sector and submitted key recommendations to the CEA on the identified subjects along with detailed analysis.

Impact of AIDA's Policy and Regulatory Advocacy

Reduction of GST rates on solar and wind power equipment: *AIDA welcomed the Finance Ministry's cut of GST from 12% to 5% on solar and wind equipment from 22 Sept 2025, expected to lower renewable tariffs by 9–10 paise/unit for solar and 13–14 paise/unit for wind*, benefiting DISCOMs and consumers. CERC has issued a Suo motu order in this regard directing the generators to furnish audited details to offtaker discoms.

AIDA Consultative advocacy outcome on the 'difficulties being faced by Discoms in complying the Renewable Consumption Obligations': *AIDA's internal study from 11 Discoms and representation to the Ministry of Power has led to several constructive changes in RCO Notification, including flexible RE source use, rationalized urban DRE obligations, enhanced RTS generation multiplier from 3.5 to 4.0 kWh/kW/day, exclusion of OA/captive consumption, and removal of restrictive hydro cut-off dates.*

Resource and Knowledge Centre (RKC)

AIDA has initiated the process of establishing a Resource and Knowledge Centre (RKC) as a Centre of Excellence to support Discoms through knowledge sharing, capacity building, and regulatory guidance. The RKC is intended to support DISCOMs in addressing financial, technical, and operational challenges, including the development of appropriate business and operational models, provision of regulatory guidance, creation of an updated e-resource portal, and institutional strengthening, with the objective of improving operational efficiency and service delivery.

Pursuant to the approval of the Executive Council, the AIDA Secretariat has initiated a project titled "Preparation of an Implementation Roadmap for a Resource and Knowledge Centre for the Distribution Sector under AIDA." The Energy and Resources Institute (TERI) has been engaged to prepare a detailed implementation roadmap for establishing the RKC. As part of this assignment, the TERI team has undertaken consultations with selected DISCOMs to understand key operational issues, financial planning requirements, and implementation challenges going forward.

National Workshops

AIDA actively participates in national workshops and knowledge-sharing programs to promote innovative solutions in renewable energy and agricultural solarisation. These engagements focus on practical approaches, including solar-plus-storage integration and DISCOM-led feeder-level solarisation models, to enhance reliable power supply and support clean energy adoption.

- **Solar Plus Storage Auction Workshop, Bhopal** (25 Sept 2025)**:**

  AIDA participated in the workshop on solar plus storage auction design, focusing on integrating storage with solar to ensure firm, reliable, and dispatchable power. Discussions covered bid structures, storage sizing, performance requirements, contracting frameworks, and risk allocation, with recommendations for state and central agencies.

- **National Knowledge Sharing on Agricultural Solarisation, Ahmedabad** (29–30 Oct 2025)**:** AIDA, along with eight delegates, took part in the PM-KUSUM knowledge-sharing and study tour. The program included field visits, interactive sessions, and discussions on innovative feeder-level solarisation models, farmer-focused strategies, and DISCOM-led solutions, promoting practical approaches to scale agricultural solar adoption.

- **Distribution Utility Meet (DUM 2025), Mumbai** (4–5 Nov 2025)**:** AIDA supported the 9th DUM organized by ISGF, MSEDCL, and Tata Power, engaging DISCOMs and experts on energy transition and grid modernization. AIDA was session partner for Innovative Policies for DISCOM Sustainability (with PFI) and Smart Meters for Digitalization. Other sessions covered AI/ML, EV infrastructure, and renewable integration.

International Study Tour

AIDA organizes international study tours to expose DISCOM leaders to global best practices, emerging technologies, and innovative solutions in the power sector. These tours, including ACEF 2025 in Manila and ENLIT ASIA 2025 in Bangkok, enhance capacity building through learning, networking, and first-hand exposure to clean energy and grid modernization initiatives.

1st International Study Tour – ACEF 2025, Manila (2–6 June 2025):

AIDA facilitated participation of 10 senior DISCOM representatives at the Asia Clean Energy Forum, including a utility field visit. The tour focused on clean energy innovations, regional cooperation, and financing solutions to enhance capacity building through international exposure.

2nd International Study Tour – ENLIT ASIA 2025, Bangkok (9–12 Sept 2025):

A 12-member delegation attended ENLIT ASIA 2025 to gain insights on global energy trends, including grid resilience, renewables, energy storage, digital transformation, and industrial decarbonisation, alongside awards, networking, and technology exhibitions.

AIDA's Engagement in Policy & Initiatives Update

AIDA's engagement in key regulatory committees and working groups is driving tangible impact in the power sector, strengthening regulatory governance, enhancing consumer protection, improving service quality, and promoting standardized smart metering practices across DISCOMs.

- **Taskforce on developing Roadmap for the India Energy Stack and a Proof of Concept for the Utility Intelligence Platform by MoP:** The Ministry of Power constituted a Task Force on 27 June 2025 for developing the Roadmap for the India Energy Stack and a Proof of Concept (PoC) for the Utility Intelligence Platform. As part of the power sector's digitalisation agenda, the India Energy Stack has been envisaged as a Digital Public Infrastructure (DPI) to enable standardisation and interoperability across various segments of the sector. The proposal has been approved under the Revamped Distribution Sector Scheme (RDSS), with REC Ltd. as the Programme Nodal Agency and FSR Global as the Knowledge Partner. Sri Alok Kumar, Director General, AIDA is a member of this prestigious Task Force, represented by the Director General, AIDA, and is supported by expert sub-working groups for consultations and deliberations; the Task Force may also co-opt additional members as required.
- **Central Advisory Committee (CAC) Constituted by CERC to Guide Regulatory Policy:** CERC Constituted CAC on 15th Sept 2025 under Section 80 of the Electricity Act, the CAC advises CERC on regulatory policy, consumer protection, service quality, and performance standards. Shri Alok Kumar, DG, AIDA, is nominated as a member of this committee. The Committee will advise the Commission on major policy questions, consumer interest protection, service quality, and overall performance standards to strengthen regulatory governance in the electricity sector.
- **Constitution of Committee to develop training modules and capacity building programs on Smart Meter Data Analytics for Discoms**: Ministry of Power (MoP) constituted a committee on 16th September, 2025, to develop the the standard training modules, create SOPs/guidelines for utilisation of data, adoption of standard-based regime, cyber security practices, etc. Shri Alok Kumar, DG, AIDA, is nominated as a member of the steering committee, and Shri Satyendra Nath Kalita, Director (Regulatory Affairs), AIDA is a member of the sub-working group.
- **Standing Committee for effective implementation of Rules and Regulations related to Electricity Distributions by MoP**: The Ministry of Power constituted a Standing Committee on 9 October 2025 for the effective implementation and periodic review of rules and regulations governing electricity distribution. The Committee has been established as a structured mechanism to channel practical insights from distribution utilities into the Ministry's regulatory review process, with the objective of ensuring a financially viable, efficient, and consumer-centric distribution sector. The broad roles and responsibilities of the Committee include identifying rules and regulations impacting the viability of the distribution sector; recommending amendments or modifications for simplification and harmonisation of the regulatory framework; proposing actionable reforms to enhance operational efficiency, service delivery, and regulatory compliance while promoting competition and safeguarding consumer interests; and advising on other matters relevant to the electricity distribution sector. Director General, AIDA is a member of this committee.

- **Taskforce for the implementation of Peer-to-Peer (P2P) Energy Transactions by MoP:** The Ministry of Power constituted a Task Force on 15 October 2025 for the implementation of Peer-to-Peer (P2P) Energy Transactions in India, in response to the rapidly evolving energy landscape driven by decentralised generation, digital trading platforms, and consumer-centric reforms. The mandate of the Task Force includes identifying technical, regulatory, economic, and social challenges in P2P energy trading; examining global and domestic best practices; evaluating enabling digital infrastructure such as blockchain, distributed ledger systems, and smart contracts; and recommending comprehensive policy, regulatory, and operational frameworks. It is also tasked with defining the roles of DISCOMs, prosumers, aggregators, and platform providers; developing accounting, settlement, reporting, data privacy, interoperability, and cybersecurity frameworks; suggesting regulatory amendments, pilot projects, and regulatory sandboxes; ensuring alignment with national priorities including the India Energy Stack, energy transition, consumer empowerment, and grid resilience; formulating a uniform SOP for all distribution utilities; recommending training and capacity-building measures; and submitting periodic updates along with a final report outlining a phased implementation roadmap and monitoring mechanism.Shri Alok Kumar, DG, AIDA is a member of this Task Force.

- **Working Group Constituted on Smart Metering Works (Ministry of Power):** Ministry of Power (MoP) Constituted Working Group on 1st Dec 2025 to standardize smart meter rollout and operations. Shri Alok Kumar, DG, AIDA, is chair of this working group, and Shri Satyendra Nath Kalita, Director (Regulatory Affairs), AIDA, is Member-Convenor.

Miscellaneous: AIDA website

The All India Discoms Association (AIDA) website is now fully functional, offering comprehensive information about the Association, its ongoing activities, and its organizational structure. It also enables member DISCOMs and committee members to access presentations, reports, and minutes of committee meetings.

RATINGS OF DISCOMS BY REC & PFC

Consumer Service Rating of DISCOMs (CSRD) Report

CSRD Report is a flagship, consumer-focused initiative by the Government of India to evaluate and rate the service delivery of electricity distribution companies (DISCOMs). This report is prepared by REC Limited under the guidance of the Ministry of Power.

CSRD Report covers 66 willing DISCOMs (10 private, 56 state-owned) across India, including Special Category States which are collectively serving approximately 33.4 crore consumers. DISCOMs are rated from A+ to D based on performance across various sub-parameters. Ratings are given based on Operational Reliability, Connections & Services, Metering, Billing & Collection, Fault Rectification & Grievance Redressal etc.

The table below shows the grades obtained by DISCOMs and Power Departments for FY2023-24.

S. No.	States / UT	DISCOM	Operational Reliability (45 Marks)	Connection and Other Services (10 Marks)	Metering, Billing and Collection (35 Marks)	Fault Rectification and Grievance Redressal (10 Marks)	Final Grade (100 Marks)	Change in Grade from FY23
1	Delhi	BRPL	A+	A+	A	A+	A+	↔
2	Delhi	BYPL	A+	A+	A+	A+	A+	↔
3	Delhi	TPDDL	A+	A	A	A+	A+	↔
4	Maharashtra	AEML	A+	A+	B+	A+	A+	↑
5	Maharashtra	TPCL	A+	A+	A+	A+	A+	↑
6	Uttar Pradesh	NPCL	A+	B+	A+	A+	A+	↔
7	Andhra Pradesh	APCPDCL	A+	B	B+	A+	A	↔
8	Andhra Pradesh	APEPDCL	A+	B+	B+	A	A	↔
9	Andhra Pradesh	APSPDCL	A+	B+	B+	A	A	↔
10	Assam	APDCL	A+	C+	B+	B	A	↑
11	Bihar	NBPDCL	A+	B	B+	A	A	↑
12	Gujarat	DGVCL	A+	A	C+	A+	A	↑
13	Madhya Pradesh	MPPaKVVCL	A+	A	B	A+	A	↑
14	Manipur	MSPDCL (SCS)	A+	B+	A	B+	A	↔
15	Odisha	TPCODL	A+	B	B	A+	A	↑
16	Odisha	TPNODL	A+	B+	B+	A	A	↑
17	Tamil Nadu	TNPDCL	A+	A	B+	A+	A	↔
18	Telangana	TGNPDCL	A+	B+	B+	A+	A	↔
19	Telangana	TGSPDCL	A+	B+	B+	A+	A	↔
20	Uttar Pradesh	KESCO	A	B+	B+	A+	A	↑
21	Uttarakhand	UPCL (SCS)	A	B+	B	A+	A	↑
22	Bihar	SBPDCL	A	C+	B+	A+	B+	↔
23	Goa	Goa PD	A+	B+	C	A	B+	↔
24	Gujarat	MGVCL	A+	A	C	B+	B+	↔
25	Gujarat	PGVCL	A+	B	C	A+	B+	↑
26	Gujarat	UGVCL	A+	B+	C	A+	B+	↔
27	Haryana	DHBVNL	B+	B+	B+	A+	B+	↔
28	Haryana	UHBVNL	B+	B+	B+	A+	B+	↔
29	Karnataka	BESCOM	A+	A+	C+	A	B+	↔
30	Karnataka	CESCOM	A	B+	C+	A+	B+	↔
31	Karnataka	GESCOM	A+	A+	D	A+	B+	↑

S. No.	States / UT	DISCOM	Operational Reliability (45 Marks)	Connection and Other Services (10 Marks)	Metering, Billing and Collection (35 Marks)	Fault Rectification and Grievance Redressal (10 Marks)	Final Grade (100 Marks)	Change in Grade from FY23
32	Kerala	KSEBL	A+	B+	C	A	B+	↔
33	Madhya Pradesh	MPMaKVVCL	A	A	B	B	B+	↔
34	Madhya Pradesh	MPPoKVVCL	A	A	C+	A+	B+	↔
35	Maharashtra	BEST	A+	A	C	D	B+	↑
36	Maharashtra	MSEDCL	A+	A	C	A	B+	↑
37	Meghalaya	MePDCL (SCS)	A	B+	B	B+	B+	*
38	Odisha	TPSODL	A+	B+	C+	C	B+	↑
39	Odisha	TPWODL	A+	A	C+	A+	B+	↔
40	Punjab	PSPCL	A+	C+	B	B+	B+	↔
41	Tripura	TSECL (SCS)	A+	B	C+	B+	B+	↑
42	Uttar Pradesh	DVVNL	B	A	B	A+	B+	↑
43	West Bengal	WBSEDCL	A+	A	C+	A	B+	↔
44	Chandigarh	CED	A	B+	C	D	B	↔
45	Chhattisgarh	CSPDCL	A+	B+	D	A	B	↔
46	Karnataka	HESCOM	A	D	C+	B+	B	↔
47	Karnataka	MESCOM	B+	A+	C	A	B	↔
48	Kerala	TCED	A+	C+	C	C+	B	*
49	Ladakh	Ladakh PDD (SCS)	A+	B	D	C+	B	↔
50	Lakshadweep	Lakshadweep ED (SCS)	A	C+	C	D	B	*
51	Puducherry	PED	A+	B+	D	D	B	↔
52	Rajasthan	AVVNL	B+	B	C	A+	B	↓
53	Rajasthan	JdVVNL	A+	D	C	A+	B	↔
54	Rajasthan	JVVNL	B	C+	C+	B	B	↔
55	Uttar Pradesh	MVVNL	C+	B+	C+	A+	B	↔
56	Uttar Pradesh	PuVVNL	B	B+	C	C+	B	↔
57	Uttar Pradesh	PVVNL	C+	B+	B	A+	B	↑
58	Andaman & Nicobar Islands	A&N PD (SCS)	B	B	D	B	C+	↓
59	Arunachal Pradesh	Arunachal PD (SCS)	B	B+	D	C+	C+	↑
60	Himachal Pradesh	HPSEBL	C+	B+	C	B+	C+	↔
61	Jammu & Kashmir	KPDCL (SCS)	B	B	C	B+	C+	↑
62	Jharkhand	JBVNL	B+	D	D	C	C+	↑
63	Mizoram	Mizoram PD (SCS)	A	B	C	D	C+	↔
64	Sikkim	Sikkim PD (SCS)	B	C+	C+	D	C+	↔
65	Jammu & Kashmir	JPDCL (SCS)	C	C+	D	B+	C	↑
66	Nagaland	Nagaland PD (SCS)	B	C	D	D	C	*

Integrated Rating & Ranking of Power Distribution Utilities

This section presents the outcomes of the Thirteenth Integrated Rating Exercise (13th IR) of Power Distribution Utilities by Ministry of Power & Power Finance Corporation, conducted under the framework approved by the Ministry of Power, with Power Finance Corporation Limited (PFC) as the nodal agency.

The 13th Integrated Rating Exercise methodology comprises 15 base rating metrics and 9 disincentives, culminating in a comprehensive score out of 100 to evaluate each utility's performance holistically. Subsequently, utilities are assigned grades (A+, A, B, B-, C, C- and D) based on these scores and specific overriding conditions. Out of the 72 Utilities, 63 have been rated in the 13th Integrated Rating, with exception of JPDCL, KPDCL, Lakshadweep PD, and Chandigarh PD, as their audited accounts were not available and Torrent Power Surat, Torrent Power Ahmedabad, DNHDDPDCL, Tata Power Mumbai and CESC, as they did not participate in the exercise.

The table below provides rating and scores for year 2024, published on 20-Feb-2025 for reference purposes.

Rank	Utility	State	Score	Grade
1	AEML	Maharashtra	99.8	A+
2	DGVCL	Gujarat	97.5	A+
3	NPCL	Uttar Pradesh	97.2	A+
4	MGVCL	Gujarat	95.6	A+
5	UGVCL	Gujarat	93.0	A+
6	UHBVNL	Haryana	92.8	A+
7	TPCODL	Odisha	91.8	A+
8	TPWODL	Odisha	91.5	A+
9	TPNODL	Odisha	90.9	A+
10	PGVCL	Gujarat	89.9	A+
11	TPDDL	Delhi	89.8	B-
12	DHBVNL	Haryana	87.6	A+
13	BRPL	Delhi	79.0	B-
14	BYPL	Delhi	78.7	B-
15	PSPCL	Punjab	77.0	A
16	IPCL	West Bengal	76.9	A
17	APDCL	Assam	76.5	A
18	MPPKVVCL	Madhya Prad.	73.7	A
19	CHESCOM	Karnataka	73.1	A
20	UPCL	Uttarakhand	67.5	B
21	APEPDCL	Andhra Prad.	64.9	B
22	KSEBL	Kerala	64.3	B

Rank	Utility	State	Score	Grade
33	HPSEBL	Himachal Prad	42.9	B-
34	BESCOM	Karnataka	40.4	B-
35	SBPDCL	Bihar	38.5	B-
36	MPMKVVCL	Madhya Prad.	37.9	B-
37	KESCO	Uttar Pradesh	35.6	B-
38	MPPoKVVCL	Madhya Prad.	32.3	C
39	MESCOM	Karnataka	32.2	C
40	APCPDCL	Andhra Prad.	31.5	C
41	TSECL	Tripura	23.6	C
42	MePDCL	Meghalaya	20.5	C
43	APSPDCL	Andhra Prad.	19.5	C
44	PuVVNL	Uttar Pradesh	18.8	C-
45	HESCOM	Karnataka	18.7	C
46	TGNPDCL	Telangana	16.7	C-
47	MVVNL	Uttar Pradesh	14.4	C-
48	TNPDCL	Tamil Nadu	11.9	C-
49	TGSPDCL	Telangana	11.4	C-
50	DVVNL	Uttar Pradesh	11.2	C-
51	JBVNL	Jharkhand	5.6	C-
52	MSEDCL	Maharashtra	1.5	C-
Power Department				
1	TCED	Kerala	82.4	A

23	AVVNL	Rajasthan	61.4	B-
24	PVVNL	Uttar Pradesh	57.5	B
25	GESCOM	Karnataka	57.3	B
26	WBSEDCL	West Bengal	55.3	B
27	CSPDCL	Chhattisgarh	55.2	B
28	NBPDCL	Bihar	52.9	B
29	TPSODL	Odisha	51.4	B-
30	JVVNL	Rajasthan	51.3	B-
31	MSPDCL	Manipur	47.5	B-
32	JDVVNL	Rajasthan	43.1	B-

2	NDMC	Delhi	82.0	A
3	Arunachal PD	Arunachal Pradesh	72.3	A
4	Sikkim PD	Sikkim	72.3	A
5	Goa PD	Goa	68.2	A
6	Puducherry PD	Puducherry	67.1	A
7	Nagaland PD	Nagaland	64.2	B
8	BEST	Maharashtra	57.9	B
9	Ladakh PD	Ladakh	24.7	C
10	Andaman & Nicobar PD	Andaman & Nicobar	24.4	C
11	Mizoram PD	Mizoram	17.4	C

Distribution Utilities Ranking (DUR) Report

Ministry of Power has released the 1st edition of the Distribution Utilities Ranking (DUR) Report for FY 2023-24, prepared by REC Limited. The DUR report stands as the single point of reference for benchmarking the overall performance of Distribution Utilities.

This report, building on existing rankings and ratings reports such as Consumer Service Rating of Discoms (CSRD), Key Regulatory Parameters of Discoms and Annual Integrated Rating (IR), provides a holistic evaluation of discoms.

A total of 66 Utilities have participated in the DUR Report FY 23-24, with 41 Distribution Utilities, 15 Special Category State Utilities and 10 Urban Utilities.

The table below shows the combined Score and Ranking for distribution utilities in DUR FY 2023-24.

State/UT	DISCOM/PD	IR Report (35%)	CSRD Report (35%)	RPO achievement (5%)	Communicable system metering (5%)	Demand side response (5%)	Resource adequacy (15%)	Combined Score	Category wise Rank	Overall Rank
Distribution Utilities * | 41 Nos.										
Haryana	UHBVNL	92.8	78.2	100.0	50.0	65.0	67.7	**80.8**	**1**	**6**
Haryana	DHBVNL	87.6	77.9	100.0	50.0	80.0	63.3	**78.9**	**2**	**7**
Odisha	TPWODL	91.5	79.3	37.5	75.0	70.2	40.0	**74.9**	**3**	**10**
Odisha	TPNODL	90.9	85.0	37.5	50.0	44.8	40.0	**74.2**	**4**	**11**
Kerala	KSEBL	64.3	76.6	37.5	100.0	90.0	87.7	**73.8**	**5**	**12**
Odisha	TPCODL	91.8	83.2	37.5	25.0	67.0	40.0	**73.7**	**6**	**13**
Punjab	PSPCL	77.0	79.3	50.0	0.0	83.3	79.3	**73.3**	**7**	**14**
Bihar	NBPDCL	52.9	81.8	75.0	75.0	85.7	90.0	**72.4**	**8**	**15**
Andhra Pradesh	APEPDCL	64.9	86.9	25.0	50.0	22.2	95.5	**72.3**	**9**	**16**
Goa	Goa PD	68.2	74.8	50.0	75.0	50.0	87.9	**72.0**	**10**	**17**
Gujarat	DGVCL	97.5	80.6	0.0	50.0	60.0	0.0	**67.8**	**11**	**18**
Gujarat	UGVCL	93.0	78.2	25.0	50.0	59.3	0.0	**66.6**	**12**	**19**

State/UT	DISCOM/PD	IR Report (35%)	CSRD Report (35%)	RPO achieve-ment (5%)	Communi-cable system metering (5%)	Demand side response (5%)	Resource adequacy (15%)	Combi-ned Score	Category wise Rank	Overall Rank
Gujarat	MGVCL	95.6	72.7	25.0	75.0	53.8	0.0	**66.6**	**13**	**20**
Madhya Pradesh	MPPaKVVCL	73.7	81.0	12.5	25.0	87.9	40.0	**66.4**	**14**	**21**
Karnataka	GESCOM	57.3	73.2	50.0	50.0	31.3	78.5	**64.0**	**15**	**24**
Bihar	SBPDCL	38.5	78.3	87.5	25.0	74.6	90.0	**63.7**	**16**	**25**
Chhattisgarh	CSPDCL	55.2	68.3	50.0	50.0	50.6	85.4	**63.6**	**17**	**26**
Gujarat	PGVCL	89.9	72.1	0.0	50.0	60.0	0.0	**62.2**	**18**	**27**
Rajasthan	JVVNL	51.3	63.0	75.0	75.0	60.8	77.2	**62.1**	**19**	**28**
Puducherry	PED	67.1	66.6	37.5	75.0	40.0	50.3	**62.0**	**20**	**31**
Rajasthan	AVVNL	61.4	64.2	25.0	25.0	71.7	77.2	**61.6**	**21**	**32**
Uttar Pradesh	PVVNL	57.5	62.7	0.0	50.0	24.4	94.6	**60.0**	**22**	**34**
Karnataka	BESCOM	40.4	78.4	25.0	50.0	6.4	90.0	**59.2**	**23**	**35**
Andhra Pradesh	APSPDCL	19.5	85.3	25.0	50.0	61.1	95.6	**57.8**	**24**	**36**
Odisha	TPSODL	51.4	74.5	37.5	25.0	80.8	40.0	**57.2**	**25**	**37**
Andhra Pradesh	APCPDCL	31.5	86.4	25.0	50.0	0.0	76.3	**56.5**	**26**	**38**
Rajasthan	JdVVNL	43.1	65.5	25.0	25.0	53.0	77.2	**54.7**	**27**	**39**
Telangana	TGSPDCL	11.4	86.5	0.0	50.0	81.5	87.5	**54.0**	**28**	**40**
Telangana	TGNPDCL	16.7	85.9	0.0	25.0	67.5	87.5	**53.7**	**29**	**42**
Madhya Pradesh	MPMKVVCL	37.9	75.6	12.5	50.0	75.4	40.0	**52.6**	**30**	**44**
Karnataka	CESCOM	73.1	73.1	25.0	0.0	2.7	0.0	**52.5**	**31**	**45**
West Bengal	WBSEDCL	55.3	76.7	50.0	0.0	70.5	0.0	**52.2**	**32**	**46**
Tamil Nadu	TNPDCL	11.9	88.7	50.0	0.0	65.4	73.8	**52.0**	**33**	**47**
Madhya Pradesh	MPPoKVVCL	32.3	76.1	12.5	0.0	75.2	40.0	**48.3**	**34**	**49**
Karnataka	MESCOM	32.2	67.7	100.0	0.0	21.0	40.0	**47.0**	**35**	**51**
Uttar Pradesh	DVVNL	11.2	72.5	0.0	50.0	20.0	94.6	**47.0**	**36**	**52**
Uttar Pradesh	PuVVNL	18.8	60.2	0.0	50.0	30.1	94.6	**45.8**	**37**	**54**
Karnataka	HESCOM	18.7	64.0	50.0	0.0	2.3	90.0	**45.1**	**38**	**55**
Uttar Pradesh	MVVNL	14.4	60.8	0.0	25.0	54.5	94.6	**44.5**	**39**	**56**
Maharashtra	MSEDCL	1.5	76.8	25.0	25.0	48.0	74.6	**43.5**	**40**	**60**
Jharkhand	JBVNL	5.6	52.0	50.0	0.0	40.0	50.1	**32.2**	**41**	**63**
Special Category State Utilities | 15 Nos.										
Uttarakhand	UPCL	67.5	81.1	87.5	50.0	65.0	100.0	**77.1**	**1**	**8**
Assam	APDCL	76.5	81.1	62.5	50.0	48.5	91.8	**77.0**	**2**	**9**
Arunachal Pradesh	Arunachal PD	72.3	57.3	75.0	0.0	40.0	90.0	**64.6**	**3**	**23**
Sikkim	Sikkim PD	72.3	55.6	75.0	0.0	0.0	90.7	**62.1**	**4**	**29**
Himachal Pradesh	HPSEBL	42.9	53.2	75.0	0.0	58.6	90.0	**53.8**	**5**	**41**

State/UT	DISCOM/PD	IR Report (35%)	CSRD Report (35%)	RPO achieve-ment (5%)	Communi-cable system metering (5%)	Demand side response (5%)	Resource adequacy (15%)	Combi-ned Score	Category wise Rank	Overall Rank
Meghalaya	MePDCL	20.5	78.6	25.0	0.0	35.0	100.0	**52.7**	**6**	**43**
Manipur	MSPDCL	47.5	88.9	0.0	0.0	0.0	0.0	**47.7**	**7**	**50**
Mizoram	Mizoram PD	17.4	57.9	62.5	0.0	0.0	99.2	**44.4**	**8**	**57**
Tripura	TSECL	23.6	76.1	0.0	0.0	38.2	50.0	**44.3**	**9**	**58**
Ladakh	Ladakh PDD	24.7	69.3	0.0	25.0	80.0	40.0	**44.2**	**10**	**59**
Nagaland	Nagaland PD	64.2	45.8	62.5	0.0	0.0	0.0	**41.6**	**11**	**61**
A&NI	A&N PD	24.4	53.5	0.0	0.0	0.0	40.0	**33.3**	**12**	**62**
Jammu & Kashmir	KPDCL	-	58.5	50.0	50.0	4.6	40.0	**31.7**	**13**	**64**
Jammu & Kashmir	JPDCL	-	42.0	50.0	25.0	18.0	40.0	**25.3**	**14**	**65**
Lakshadweep	LED	-	61.5	0.0	0.0	0.0	0.0	**21.5**	**15**	**66**
Urban Utilities | 10 Nos.										
Maharashtra	AEML	99.8	90.0	100.0	100.0	65.7	91.7	**93.5**	**1**	**1**
Delhi	TPDDL	89.8	93.6	87.5	75.0	78.6	100.0	**91.2**	**2**	**2**
Uttar Pradesh	NPCL	97.2	93.6	50.0	75.0	31.8	82.4	**87.0**	**3**	**3**
Delhi	BYPL	78.7	94.5	75.0	50.0	36.0	100.0	**83.7**	**4**	**4**
Delhi	BRPL	79.0	93.9	75.0	50.0	36.0	100.0	**83.6**	**5**	**5**
Maharashtra	BEST	57.9	71.3	0.0	75.0	65.7	90.0	**65.7**	**6**	**22**
Uttar Pradesh	KESCO	35.6	83.9	0.0	50.0	69.3	94.6	**62.0**	**7**	**30**
Kerala	TCED	82.4	68.1	0.0	100.0	67.6	0.0	**61.1**	**8**	**33**
Maharashtra	TPCL	-	95.8	50.0	100.0	68.9	40.0	**50.5**	**9**	**48**
West Bengal	IPCL	76.9	-	50.0	0.0	68.6	90.0	**46.3**	**10**	**53**

AIDA SECRETARIAT

DG AIDA

EA to DG

Director (Regulatory Affairs)

Director (Admin & Finance)

Director (Technical)

Research Officer 1

Research Officer 2

Office Manager

एनएचपीसी का हरित ऊर्जा नेतृत्व

180 मेगावाट से 8582 मेगावाट तक की यात्रा

अनेक चुनौतियों का सामना करते हुए 31 नवीकरणीय ऊर्जा पावर स्टेशनों के माध्यम से उल्लेखनीय प्रगति।

सुदृढ़ वित्तीय प्रदर्शन

अपनी स्थापना के बाद से निरंतर सुदृढ़ परिणाम प्रदर्शित कर रही है।

14 सक्रिय परियोजनाएं

संधारणीय भविष्य के लिए, लगभग 10,000 मेगावाट क्षमता का निर्माण कर रही है।

एनर्जी ट्रांजिशन को बढ़ावा देना

वर्ष 2032 तक 23,000 मेगावाट और वर्ष 2047 तक 50,000 मेगावाट नवीकरणीय ऊर्जा का लक्ष्य।

भारत की दो सबसे बड़ी जलविद्युत परियोजनाओं का निर्माण

सुबनसिरी लोअर परियोजना: 2,000 मेगावाट अरुणाचल प्रदेश और असम में।
दिबांग बहुउद्देशीय परियोजना: 2,880 मेगावाट अरुणाचल प्रदेश में।

नवरत्न का दर्जा

कार्यनीतिक महत्व को मान्यता देते हुए 30 अगस्त, 2024 को प्रदान किया गया।

भविष्य के लिए विजन

एनएचपीसी संधारणीय ऊर्जा और वर्ष 2047 तक विकसित भारत के विजन के प्रति समर्पित है।

आइए,
हम सब मिलकर हरित ऊर्जा में नेतृत्व की विरासत का उत्सव मनाएं!

एन एच पी सी लिमिटेड
(भारत सरकार का एक नवरत्न उद्यम)

हमसे जुड़ें :

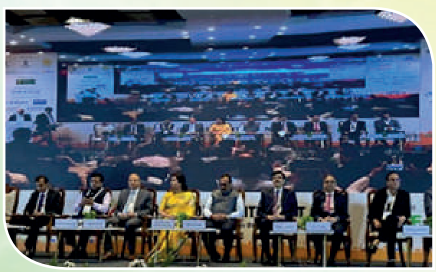
AIDA is a registered society that represents electricity distribution utilities across India, including those owned by state governments, private companies, and the electricity departments of union territories.

The key focus areas of AIDA include:

- Policy Advocacy on matters related to the electricity distribution sector.
- Collaboration for sharing best practices among member utilities.
- Capacity Building through training, workshops, and knowledge exchange.
- Development of standard specifications and pooled procurement to ensure cost-efficiency and quality.
- Sharing of resources during emergencies to strengthen collective response.



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