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POWERING DELHI
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BSES Yamuna Power Ltd

A successful Public- Private-Partnership in Electricity Distribution

BSES: 23 years of serving the National Capital

हर दिन रोशन, हर पल रोशन... बीएसईएस से दिल्ली रोशन!

Discom Profile

BSES Yamuna Power Ltd

51 : 49 Joint Venture
of R-Infra & GoNCTD formed on 1st July 2002

- ✓ *Successfully serving the **National Capital for over two decades…***
- ✓ BYPL supplying power to **historic, theft prone and most challenging high density** old city areas of Delhi with consumer density of ~12,700/sq km and low HT to LT Network ratio of 0.56
- ✓ *Caters **22% of National Capital's demand**, spread across EAST & parts of CENTRAL Delhi*
- ✓ One of the most Successful Public Private Partnership. *An **ISO 9001:2015, ISO 14001:2015 & BS OHSAS 45001:2018 Certified** Organization*

Key Parameters	FY25
Distribution Area	160 sq KM
Consumers	**2.04 million**
Peak Load	**1,882 MW** (on 19th Jun-24)
Customer Density	**~12,700 /Sq.Km**
T&D Loss	**6.57%**
Reliability Index	**99.9%**
EHV Capacity	4,046 MVA
Distribution Capacity	3,801 MVA
HT Cable Length	3,467 ckt km
LT Cable Length	6,171 ckt km

Towards progressive and sustainable journey for improving customer services & deployment of cutting edge technologies

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Emerging Challenges for DISCOMs

GW-scale AI Data Centers, MW-scale EV Charging Stations, and Grid-level Power Quality Challenges

GW-scale AI Data Centers

AI data centers — especially those supporting large models (like GPT or cloud computing infrastructure) — require **hundreds of megawatts** and operate **24×7 with high reliability**.

Challenges:

- **Massive, concentrated loads:** Unlike traditional distributed consumption, data centers create *point loads* of 100 MW–1 GW in single locations, stressing local transformers and feeders.
- **Reliability & redundancy:** These customers demand **very high reliability** often exceeding grid supply reliability standards.
- **Grid expansion & congestion:** Sudden addition of such large loads can **outpace substation and transmission capacity**, requiring accelerated infrastructure upgrades.
- **Reactive power and harmonics:** High-frequency switching in UPS systems and power electronics create **harmonic distortions**, affecting power quality for other consumers.
- **Load forecasting uncertainty:** Unpredictable commissioning timelines make **demand forecasting** and **capacity planning** difficult.

Contd

What DISCOMs Need to Do:

- **Infrastructure Readiness:**
  - Develop **dedicated high-capacity substations** and **redundant feeders** near data center zones.
  - Plan **spatial load forecasting** in coordination with state industrial and IT departments.
- **Work towards Policy & Tariff Reforms:**
  - Offer **green energy tariffs**, **time-of-day (ToD)** rates, and **reliability-linked premium tariffs**.
  - Enable **direct RE procurement** and **energy storage integration** under open access.
- **Digital Coordination:**
  - Use **AI-driven load forecasting** tools and **GIS-based network planning** to anticipate large-load connections.
- **Resilience Planning:**
  - Partner with data center operators to create **microgrid and islanding capabilities** for continuity during grid faults.

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MW-scale EV Charging Stations

The rapid adoption of electric mobility — especially **fleet and highway fast charging** — creates **MW-scale load centers** that operate intermittently and can spike demand.

Challenges:

- **Peak demand & load management:** Fast chargers (350 kW–1 MW per station) can create sharp **demand peaks**, stressing transformers and feeders.
- **Load diversity loss:** Unlike traditional loads, EV charging is often **simultaneous (e.g., evening hours)**, reducing the natural load diversity DISCOMs rely on.
- **Voltage and frequency fluctuations:** Rapid ramp-up/ramp-down of charging leads to **voltage dips** and **harmonic distortions** in the distribution network.
- **Infrastructure planning:** Need for **dedicated feeders, upgraded transformers, and smart metering**.
- **Tariff design:** Existing tariff structures are unsuitable — DISCOMs must introduce **time-of-day (ToD)** and **demand-based** pricing to flatten peaks.
- **Integration with distributed generation:** Opportunity and challenge to integrate **rooftop solar + storage** for charging hubs.

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What DISCOMs Need to Do

- **Smart Infrastructure Development:**
  - Identify **EV charging corridors** and develop **dedicated EV sub-networks** with sufficient transformer sizing.
  - Deploy **smart meters, load control systems, and AMI** to monitor charging loads in real-time.
- **Tariff Innovation:**
  - Implement **Time-of-Day pricing**, **demand charges**, and **special EV tariffs** encouraging off-peak charging (through suitable regulatory intervention).
  - Introduce **dynamic pricing pilots** for fleet and highway chargers.
- **Integration with Renewable Energy and Storage:**
  - Promote **co-located solar + battery storage** at charging hubs to mitigate grid impact.
  - Enable **Vehicle-to-Grid (V2G)** participation when technically and regulatory feasible.
- **Forecasting & Planning:**
  - Develop **EV load forecasting models** using vehicle registration and mobility data.

Grid-level Power Quality Challenges

As both **loads** (EVs, data centers) and **generation** (renewables, rooftop solar) become **inverter-based**, maintaining grid stability and quality becomes difficult.

Challenges:

- **Harmonics & waveform distortion:** From non-linear power electronics (VFDs, chargers, UPS).
- **Voltage flicker & imbalance:** Caused by fluctuating or unbalanced loads.
- **Frequency stability:** Especially with high rooftop solar penetration reducing inertia.
- **Power factor deterioration:** Due to inductive and capacitive components of converters and chargers.
- **Monitoring limitations:** Traditional SCADA and metering are insufficient — need **real-time PQ monitoring and advanced analytics**.
- **Cyber-physical vulnerabilities:** Increased digitalization introduces **cybersecurity risks** in grid operations.

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What DISCOMs Need to Do

- **Comprehensive Power Quality Monitoring:**
  - Install **PQ meters** at key nodes, feeders, and industrial connections.
  - Implement **real-time PQ analytics dashboards**.
- **Harmonic and Reactive Power Regulations:**
  - Enforce compliance to **IEEE and applicable Power Quality Standards**.
  - Impose penalties/incentives for PQ performance(through suitable regulatory intervention).
- **Grid Modernization:**
  - Deploy **smart transformers** and **Dynamic Voltage Restorers (DVRs)**.
  - Introduce **distribution-level energy storage** for smoothing voltage/frequency fluctuations.
- **Cybersecurity & Digital Infrastructure:**
  - **Secure communication protocols**.

Strategic Roadmap for DISCOMs

To manage these emerging challenges, DISCOMs must transition from **passive distributors** to **active system operators**:

Focus Area	Actionable Strategies
Infrastructure Modernization	Upgrade substations and feeders, introduce automation, and deploy digital substations with advanced sensors.
Data-driven Operations	Use AI/ML for demand forecasting, asset health prediction, and anomaly detection.
Distributed Energy Integration	Facilitate rooftop solar, battery storage, and peer-to-peer energy trading.
Regulatory & Tariff Reforms	Introduce dynamic tariffs, reliability-linked pricing, and incentives for flexibility.
Customer Engagement	Collaborate with large consumers (AI data centers, EV operators) for demand response and co-investment in grid upgrades.
Resilience & Flexibility	Promote microgrids, local energy markets, and hybrid systems for reliability.
Capacity Building	Train DISCOM personnel in advanced metering and technologies, digital systems, and cybersecurity.

Conclusion

DISCOMs are entering a new era where:

- **AI Data Centers** create *continuous, high-reliability* gigawatt loads.
- **EV Charging Infrastructure** introduces *intermittent, peaky* megawatt loads.
- **Power Electronics and Renewables** challenge traditional *power quality and stability*.

To stay resilient and relevant, DISCOMs must **evolve from passive electricity distributors to active energy system operators — digitally enabled, data-driven, and future-ready.**

The future-ready DISCOM will:

- **Embrace digitalization** (AI, IoT, analytics).
- **Invest in flexibility and resilience** (storage, demand response, microgrids).
- **Collaborate with new ecosystem players** (data centers, EV fleet operators, renewable developers).
- **Redefine tariffs and regulations** for a sustainable, intelligent, and reliable grid.

AI based Projects in BYPL

- **AI based Demand Forecasting**
- **AI ML based Solar Aggregation (Being Initiated)**
- **Commercial Feasibility with AI/ML**
- **Voice Bot For registering No Current complaint**
- **AI based substation health monitoring for Predictive maintenance (under implementation)**
- **AL / ML based meter data anomaly detection (pilot)**

Thank You

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