INTERNATIONAL SOLAR ALLIANCE

BRPL: POWERING THE FUTURE WITH DIGITAL TWIN OF NETWORK TECHNOLOGY

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Reimagining Power Distribution for the Digital Era

BSES has long led Delhi's power transformation — from reducing losses and integrating renewables to automation and digitalization. Now, BSES Rajdhani Power Limited (BRPL) is taking the next leap through the Digital Twin of Network Project — a landmark initiative introducing India's first large-scale, real-time digital twin for power distribution.

This transformative technology will redefine how electricity is planned, operated, and experienced. In simple terms, it is "Google Maps for electricity" — a live, interactive view of the grid with AI-driven analytics, predictive insights, and "what-if" simulations that help engineers make faster and smarter decisions.

The Digital Twin of Network Project marks a shift from traditional grid monitoring to predictive, data-led management. It combines operational, asset, and consumer intelligence — allowing BRPL to plan, operate, and optimize its power distribution in real time.

Janakpuri: India's First Model Digital Division

The Digital Twin initiative is being deployed in BRPL's Janakpuri Division, which serves over 165,000 consumers in Delhi's South-West Circle. It builds on a pre-feasibility pilot under the Sagarpur 66/11 kV grid, where two 11 kV feeders covering about 5,000 consumers were digitally mapped — providing end-to-end visibility from the substation to each household.

At its core, the Digital Twin is a real-time virtual replica of the power distribution network. Using both static and live data, it integrates SCADA, GIS, SAP, iOMS, IoT sensors, FRTUs, and smart meters into one unified platform. This "living model" enables BRPL to visualize power flows, predict faults, simulate contingencies, and plan network expansion — bringing operations, planning, and service delivery together on a single intelligent system.

By November 2025, the digital twin will cover the entire Janakpuri Division, creating India's first fully digitized, live-monitored urban distribution network. The project supports Delhi's smart-city vision of safe, reliable, and aesthetic power through underground cabling and digital operations.

Strategic partners include the Global Energy Alliance for People and Planet (GEAPP), Edge Electra (digital-twin platform), and TekUncorked (IoT sensors), ensuring strong global collaboration in design and deployment.

Four-Level Digital Twin Capability Framework

- Digitization: GPS-based mapping of assets using mobile tools, capturing photos, nameplate data, and connectivity for substations, feeders, transformers, and LT circuits.
- Network Modeling: Integration of SCADA and AMR streams with load-flow analysis and loss modeling to create a validated single source of truth.
- Simulation Modeling: **"What-if"** testing and long-term simulations for renewable integration, EV charging, and demand growth — optimizing network investment.
- AI/ML Decision Support: Predictive maintenance and anomaly detection using artificial intelligence and reinforcement algorithms, plus intuitive natural-language interfaces.

This layered architecture ensures seamless interoperability with SCADA, ADMS, OMS, and billing systems, making the twin both future-ready and backward-compatible.

Transformational Benefits

For Consumers

- **Faster restoration:** Real-time fault detection and automated lineman dispatch via iOMS reduce outages from hours to minutes.
- **Smarter services:** Automated feasibility for new connections, rooftop solar, and EV chargers cuts site visits and approval time.
- **Transparency:** Digital alerts and voltage-quality monitoring enhance reliability and trust.

For BRPL

- **Operational excellence:** End-to-end grid visibility enables quicker fault localization, load optimization, and reduced losses.
- **Strategic planning:** AI insights guide targeted reinforcements and defer unnecessary investments.
- **Regulatory strength:** Unified data simplifies compliance and enhances transparency.
- **Future readiness:** Supports hosting-capacity studies for renewables, EVs, and storage systems.

Globally, utilities using digital-twin platforms report 2–4 % O&M savings, 1–2 % loss reduction, and up to 20 % faster outage restoration — outcomes BRPL's pilot is already replicating.

Transformation of Janakpuri Division

The C4E feeder pilot has already demonstrated success. About 2 km of LT overhead lines have been converted into underground cabling, feeder pillars and service infrastructure upgraded, and the Digital Twin Dashboard integrated with iOMS for live monitoring.

The results are tangible — cleaner streets, safer networks, and faster power restoration — establishing a replicable model for Delhi and India's smart-city transition. The Janakpuri and Vikaspuri model feeders represent the next generation of distribution — integrating underground networks, digital visibility, and AI-enabled reliability in one seamless system.

Powering Delhi's Digital Tomorrow

The Digital Twin of Network Project is more than a technological upgrade — it is the foundation of BRPL's digital future. Aligned with the Revamped Distribution Sector Scheme (RDSS), PM Surya Ghar Muft Bijli Yojana, and India's smart-grid vision, it will create a digital backbone for predictive maintenance, renewable integration, and consumer analytics.

By merging physical modernization with digital intelligence, BRPL is redefining power distribution — building a resilient, data-driven, and consumer-first ecosystem that embodies its enduring commitment.

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