

GIS INSIGHTS

Building Robust Electrical Networks with GIS

India's electricity sector has achieved near-universal access, electrifying over 597,500 villages and serving more than 1.4 billion people, with installed capacity growing from 1.3 GW in 1947 to 520.51 GW (as on January, 2026). Government initiatives like Deendayal Upadhyaya Gram Jyoti Yojana (DDUGJY), SAUBHAGYA, Integrated Power Development Scheme (IPDS), and Revamped Distribution Sector Scheme (RDSS) have played a key role in expanding access and improving last-mile connectivity. However, with this growth, challenges such as high AT&C losses and aging infrastructure have also intensified, which can be resolved only with higher integration of advanced technologies in the power utility ecosystem.

Achieving More with GIS

Using technologies like Geographic Information Systems (GIS), power utilities can map and analyse the entire lifecycle of transmission and distribution assets, including substations, transformers, feeders, and transmission lines. By integrating operational data with location intelligence, electric utilities can perform network planning, asset tracking, predictive maintenance, and outage management on a unified platform. With platforms such as Esri's **ArcGIS**, utilities can build a comprehensive system of record and engagement, improving visibility, accelerating project timelines, and enabling more informed, data-driven decisions. For instance, organizations like Adani Electricity Mumbai Limited (AEML) and BSES are using GIS solutions to achieve unmatched efficiency in network planning, outage management, customer service, and more.

When integrated with smart meters, sensors, and SCADA systems, GIS allows utilities to monitor grid performance, optimize maintenance, and respond faster to disruptions. With increasing climate risks, GIS can also

help utilities assess vulnerabilities, simulate the impact of extreme events, and strengthen grid resilience.

With advanced tools such as the **Network Information Management System** and **ArcGIS Utility Network**, powered by **ArcGIS**, electric utilities can efficiently manage all the complexities of a modern network.

Going Further with AI

AI can further enhance transmission and distribution planning by evaluating multiple route options to minimize costs, land conflicts, and environmental impact. Through terrain and land-use analysis, it can identify optimal locations for transmission poles, while site suitability assessments improve safety and efficiency. AI-powered assistants and inspection tools can provide real-time insights and enable faster, data-driven decisions, including anomaly detection for proactive maintenance.

When combined with GIS, these capabilities can become even more powerful, allowing power utilities to visualize and analyze spatial data effectively. This integration enables a shift from reactive operations to predictive modelling, improving accuracy, reliability, and long-term planning in the power sector.

Along with overcoming the mentioned challenges, we also need to prepare well for the renewable energy transition. As India continues to add 15-20 GW of renewable capacity annually, with solar energy being at the forefront of this expansion, **GeoAI (GIS powered by the capabilities of AI) can aid in forecasting solar energy generation by leveraging weather forecast data**. This can lead to better power planning. Overall, GIS can empower power utilities to optimize asset management, enhance outage response, and plan infrastructure with greater precision. It is thus imperative for the stakeholders to accelerate adoption and invest in GIS-driven innovation to build smarter, more resilient, and future-ready power networks.

