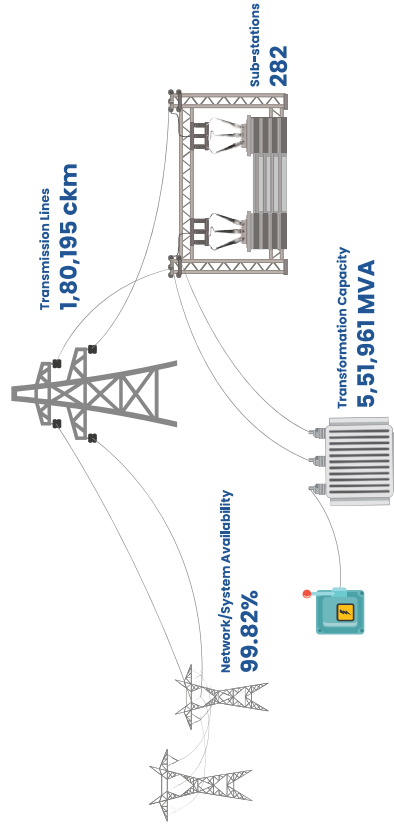


MANUFACTURED CAPITAL

Advanced Infrastructure Boosting
Grid Efficiency





Over the years, we have consistently demonstrated expertise in executing large-scale transmission projects, significantly contributing to India's power sector growth. We focus on resource efficiency, operational excellence and meeting the needs of our stakeholders. Committed to continuous improvement, we strive to advance our technological standards, ensuring our transmission infrastructure is modern, adaptable, and environmentally responsible. Our focus remains on creating lasting value for all stakeholders by prioritizing structured improvements in infrastructure development, asset management, and responsible sourcing.

FOCUS AREAS OF MANUFACTURED CAPITAL



INFRASTRUCTURE DEVELOPMENT

Success in Tariff-Based Competitive Bidding (TBCB)

POWERGRID has consistently demonstrated its prowess in Tariff-Based Competitive Bidding (TBCB) by actively participating in both Inter-state Transmission System (ISTS) and Intra-State Transmission System (ISTS) bids. Leveraging its financial strength, exceptional project execution capabilities, and cost efficiencies, POWERGRID conducts comprehensive pre-bid assessments to ensure optimized Return on Investment (RoI) and competitive tariff discovery during e-Reverse Auctions (e-RA). Despite intensifying competition, POWERGRID has maintained its leadership position in TBCB bids.

In the fiscal year 2025, POWERGRID emerged as the successful bidder for 24 ISTS projects, securing a total annual tariff of ₹10,125 crore. Notably, POWERGRID won the prestigious ₹800 KV, 6000 MW KPS2-Nagpur HVDC Project, marking the first-ever HVDC project tendered through TBCB. Among other major achievements, POWERGRID secured projects include:

- » Transmission System for Evacuation of Power from Rajasthan REZ Phase-IV (Part-4: 3.5 GW); Part A
- » Transmission System for Evacuation of Power from Rajasthan REZ Phase-IV (Part-3: 6 GW) (Bikaner Complex); Part B
- » Transmission System for Integration of Kurnool-IV REZ - Phase-I (for 4.5 GW)
- » Renewable Energy Evacuation in Khavda Area of Gujarat under Phase-IV (7 GW); Part B

POWERGRID'S PIVOTAL ROLE IN INDIA'S RENEWABLE ENERGY TRANSITION

POWERGRID is instrumental in facilitating India's ambitious renewable energy transition, directly supporting the national objective of achieving over 500 GW of non-fossil fuel capacity by 2030. The company is strategically developing essential transmission infrastructure to integrate this substantial renewable energy influx into the national grid.

KEY CONTRIBUTIONS

» **Transmission Infrastructure Development:** POWERGRID has implemented Inter State Transmission Schemes under Green Energy Corridors (GEC-I) across eight states and is implementing Green Energy Corridor Phase-II, and numerous other renewable energy transmission projects, including those for offshore wind farms in Gujarat and Tamil Nadu.

» **Grid Stability and Integration:** To manage renewable energy variability, POWERGRID has deployed advanced STATCOMs and SVCs in the 400 kV grid, with many under implementation. Further, thirteen operational Renewable Energy Management Centers (REMCs) have been established, enhancing forecasting and scheduling capabilities, with a new SIDC cum REMC under development in Ladakh.

These comprehensive efforts by POWERGRID are critical to ensuring the seamless integration and reliable operation of India's expanding renewable energy capacity.

DOMESTIC CONSULTANCY

We offer consulting services in power sector including transmission line construction, diversion, restoration, laying of OPGW, bay implementation, engineering services including tower designs & drawings, grid upgradation etc.

Some of the key initiatives during the year include:

- Executing about 76 nos. of consultancy assignments and about 116 nos. of diversion consultancy projects mainly for NHAI.
- Entered MoUs with several organisations including NTPC, EIL, ONGC and others for collaborating in the fields of green hydrogen, offshore wind, data centres, green mobility etc.



INTERNATIONAL CONSULTANCY

POWERGRID has significantly expanded its global presence through strategic consultancy, project execution, and partnerships. We are currently executing about 16 nos. of international consultancy assignments.

Some of major achievements during the year include:

- We have bagged 8 nos of new assignments and expanded our global footprint to 24 countries by taking up a power system study for a 300 MW solar plant at Oman.
- POWERGRID was project management consultant for prestigious Grid Expansion Reinforcement Project (GERP) Uganda under which Nebbi and Arua Sub-stations, 132 kV D/c Gulu-Oliwyo transmission line along with associated 132 kV bays at Gulu and Oliwyo substations were successfully commissioned.



CROSS BORDER INTERCONNECTION

POWERGRID has been significantly contributing to power exchange through cross-border interconnection links with neighbouring countries such as Nepal, Bhutan, Bangladesh, and Myanmar. During the year, at 12th India-Nepal JWG and JSC meeting it was agreed to implement 400 kV D/c (Quad) Inaruwa - New Purnea and 400 kV D/c (Quad) Dadadhar - Barailly links through formation of two JVs, one to work on Nepal portion and the other on Indian portion.



TELECOM

PowerTel demonstrated remarkable performance in FY2024-25, achieving a standalone revenue of ₹128 crore. The company maintained an impeccable 100% availability of its telecom network backbone, underscoring its commitment to reliability and operational excellence. A significant milestone was PowerTel's strategic entry into the International Long Distance (ILD) business, marking its expansion into global connectivity services. Further solidifying its reputation, PowerTel continued to be the preferred bandwidth solution provider for several marquee projects across both government and private sectors, reflecting its trusted position in India's digital infrastructure landscape.



DATA CENTERS

PowerTel made significant strides in developing its data center infrastructure during FY2024-25. A major highlight was the implementation of a state-of-the-art, 1,000-rack, 14MW Pilot Data Center at Manesar, near Gurgaon, which is Uptime Tier-III certified. This facility is poised to go commercial in the financial year 2025-26, marking a key milestone in PowerTel's digital infrastructure roadmap. The company acquired land in Chennai for the development of a Zone-2 Disaster Recovery (DR) Data Center, reinforcing its commitment to providing resilient and scalable data solutions.



LA & ROW CELL

POWERGRID established a dedicated Land Acquisition & Right of Way (LA & ROW) Cell. The primary goal of this initiative is to streamline land acquisition for new substations and resolve Right of Way (ROW) challenges for transmission lines. By proactively addressing these long-standing hurdles, POWERGRID aims to ensure the timely completion and commissioning of its projects, thereby avoiding costly penalties, especially under the Tariff-Based Competitive Bidding (TBCB) regime. This committed effort has already yielded significant results in FY 2024-25, with 100% land acquisition targets achieved for key TBCB/RTM substations in Rajasthan, Ladakh and Karnataka.

The ROW Cell, with its dedicated team of women officers focusing on ROW issues, employs a multi-pronged approach involving frequent site visits, direct engagement with landowners through counseling and mediation, and close coordination with district administrations and other stakeholders.

OUR FIRST LARGE-SCALE SOLAR PHOTOVOLTAIC (PV) PLANT

In a major step toward renewable energy generation, POWERGRID Energy Services Limited (PESL), our wholly owned subsidiary, successfully developed its first large-scale Solar Photovoltaic (PV) Plant with a capacity of 85 MW at Nagda, Madhya Pradesh. The plant commenced commercial operations on April 24, 2025, and is projected to generate approximately 184 million units (MUs) of electricity annually, contributing significantly to sustainable energy goals.



ASSET MANAGEMENT

POWERGRID is aligned with ISO 55001 standards for asset management. This underscores our commitment to excellence. By adhering to globally recognized benchmarks, the company ensures the highest standards of efficiency, reliability, and risk management across its asset base.

POWERGRID excels in asset management through its Asset Management Policy and Strategic Asset Management Plan (SAMP).

- » **Asset Management Policy:** This policy outlines core principles, objectives, and commitments for managing assets, focusing on decision-making, risk management, and continuous improvement throughout the asset lifecycle.
- » **Strategic Asset Management Plan (SAMP):** The SAMP turns strategic goals into actionable plans to optimize asset performance and value. It guides resource allocation, investment decisions, and maintenance priorities based on asset health, criticality, and lifecycle costs, ensuring effective management of POWERGRID's assets.
- » **Reliability Centered Maintenance (RCM):** POWERGRID uses RCM practices to enhance asset reliability and longevity, integrating systematic and data-driven strategies as part of the Annual Maintenance Plan for major assets.





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OPERATIONAL PHILOSOPHY

Our asset management philosophy emphasizes cost-effective practices across asset deployment, operation, maintenance, replacement, and upgrading to achieve superior performance. This approach includes comprehensive asset lifecycle management, risk mitigation, and activities that guide optimal maintenance both proactive and reactive measures. Innovations such as remote substation operations, advanced condition monitoring, aerial and app-based line patrolling, GIS-based disaster preparedness, and asset health indexing enhance system efficiency and are part of our operational philosophy.



Reliability Centered Maintenance (RCM) Framework for Transmission Assets

POWERGRID has adopted an advanced Reliability Centered Maintenance (RCM) framework to enhance the reliability of transmission assets. This framework utilizes AI/ML and predictive technologies to transform maintenance practices.

Key Features

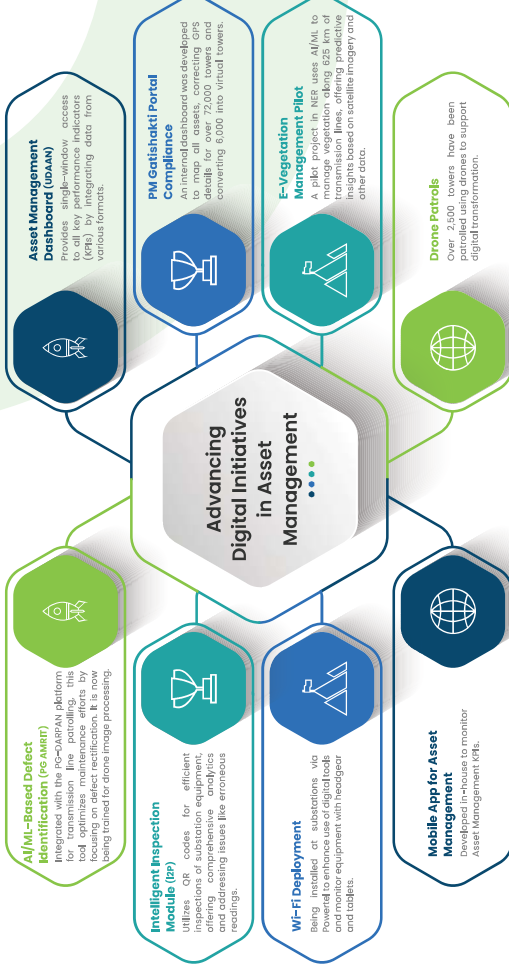
- » **Data-Driven Health Model:** Utilizes large set of data points from more than 4,000 EHV class power transformers and reactors. For transmission lines, processes multiple patrolling images to identify 47 types of defects with over 70% accuracy.
- » **Health-Impact Assessment:** Employs a dual approach:
 - » **Health Analysis:** Reviews operational parameters, design, manufacturing details, and historical interventions.
 - » **Impact Analysis:** Assesses risks related to asset outages, grid contingencies, inventory, financial, & environmental impacts.
- » **Machine Learning Algorithms:** Uses tools like Random Forest and Decision Trees to calculate Probability of Failure (PoF) and Impact of Failure (IoF) scores, forming an Asset Risk Index.
- » **Normalization and Categorization:** Equipments are categorized into five risk levels based on exponential risk models for precise maintenance actions.

CENTRALIZED ASSET MANAGEMENT

POWERGRID has established the National Transmission Asset Management Centre (NTAMC) for centralized control of its transmission system, enabling fully automated remote-controlled operations. As of March 31, 2025, all 282 substations are remotely operated via control centres. The NTAMC is located in Manesar, Haryana, with Regional Transmission Asset Management Centres (RTAMCs) situated across the country.

DIGITALIZATION IN ASSET MANAGEMENT

POWERGRID leverages digital technologies for efficient asset management. The digital transformation is achieved through the 3Ds: Digitization of Data, Digitalization of Processes, and Digital Transformation of business activities. This approach fully leverages the opportunities presented by digital technologies to optimize processes, competencies, and models.



SUSTAINABLE PRACTICES

» DIGITAL SUBSTATIONS

POWERGRID has pioneered digital substation technology in India, first implementing a Process Bus-based system at Malerkotla in December 2020, followed by the commissioning of a greenfield digital substation at Hailo Majra, Chandigarh, in January 2023. World's largest Digital Substation at Navsari sets a benchmark in digital automation. Retrofitting conventional systems with Process Bus technology at Kanpur is underway to enhance reliability and efficiency.

» USE OF NATURAL ESTER OIL

POWERGRID is committed to sustainable practices, exemplified by the world's first 420 kV, 50 MVAR natural ester fluid-filled reactor commissioned at Mathon Substation in 2021, operating for over four years. In 2023, a 132 kV, 20 MVAR bus reactor at Aizawl Substation was retro-filled with natural ester fluid, marking a first for POWERGRID in retrofitting old designs meant for mineral oil. The latest achievement is the commissioning of a 132/33 kV, 10 MVA transformer with natural ester at HVDC Pusauli Substation.

» ALTERNATIVES TO SF₆

A pilot project is underway to replace 132kV circuit breakers with environmentally friendly green gas at the Imphal Substation. POWERGRID is actively transitioning from conventional SF₆-filled equipment to sustainable gas or clean air-based switchgear and substations.

DISASTER PREPAREDNESS

During the year 2024, India's eastern and southern coastal regions experienced the impact of three cyclonic events; Remal in May, Dana in October, and Fengal in November. Owing to POWERGRID's robust disaster preparedness framework and proactive maintenance protocols, the transmission infrastructure withstood these extreme weather conditions without any tower failures or major power interruptions. POWERGRID has been conferred with "World Congress on Disaster Management - Disaster Risk Reduction (WCDDM-DRR) 2024 Award" in category "Response during disaster and emergencies"

INTERNATIONAL TRANSMISSION OPERATIONS & MAINTENANCE STUDY (ITOMS)

POWERGRID actively engages in ITOMS, an initiative led by ESOURCE (USA), to benchmark its operations and maintenance practices against leading global transmission utilities. During the 2023-24 cycle, POWERGRID was evaluated alongside 22 international utilities, with the results released in March 2025. The company achieved a first-quadrant ranking, reflecting superior performance combined with cost efficiency. POWERGRID stood out particularly in the maintenance of transformers, transmission lines, circuit breakers, and protection relays. Participation in ITOMS equips POWERGRID with valuable insights into asset availability, maintenance cost-effectiveness, and outage management, fostering ongoing improvements in operational excellence.

DYNAMIC LINE RATING PILOT PROJECT

As part of its grid modernization strategy, POWERGRID has launched a Dynamic Line Rating (DLR) pilot on the 400kV D/C Madurai-Tuticorin line. DLR adjusts transmission capacity in real-time based on environmental conditions like temperature and wind, optimizing infrastructure use during peak demand and renewable energy surges while maintaining safety and reliability. The pilot assesses DLR's feasibility and benefits for the Indian grid using advanced sensors and real-time monitoring. This initiative enhances decision-making with predictive models, offering flexible power flow management and positioning POWERGRID as a sector innovator.



RESPONSIBLE SOURCING

VENDOR SCREENING AND SELECTION

Vendor selection at POWERGRID is characterized by openness, transparency, and fairness. Suppliers are evaluated on criteria such as delivery consistency, technical skills, product quality, and competitive pricing. Environmental and social responsibility, including ethical labour practices, are also critical considerations. A structured electronic system is used for tendering and contract awards to ensure transparency.

POWERGRID conducts comprehensive screening and assessment of 100% of potential suppliers, ensuring adherence to stringent environmental and social standards, including prohibitions on child and forced labour, unsafe conditions, discrimination, and inadequate wages. Valid environmental permits are mandatory. A continuous improvement framework involves regular audits, facility inspections, supplier engagement, and transparent reporting to maintain safety regulation adherence.

VENDOR DEVELOPMENT AND ASSESSMENT

The vendor assessment process is thorough, verifying the manufacturer's capabilities in design, manufacturing, testing, and adherence to quality and safety standards. It also ensures compliance with statutory requirements like factory licenses and pollution clearances, where applicable. The process evaluates the manufacturer's compliance with social accountability norms, such as prohibiting child labour, ensuring non-discrimination, and adhering to minimum wage laws. During facility assessments, initiatives in energy conservation, women's empowerment, and worker participation are also considered. Upon approval, vendors are listed in the Compendium of Vendors (CoV) and initially receive a one-year approval, with potential extensions based on performance. POWERGRID's procurement strategy prioritizes local sourcing to enhance transmission system efficiency and reliability.

PROMOTION OF MICRO, SMALL, & MEDIUM ENTERPRISES (MSMEs)

POWERGRID is actively promoting the participation of Micro and Small Enterprises (MSEs) in its procurement processes through a comprehensive set of initiatives. This includes a purchase preference of up to 25% for MSEs in procurement, with specific sub-targets of 4% for SC/ST-owned MSEs and 3% for women-owned MSEs. For FY 2024-25, POWERGRID successfully procured ₹1,696.40 Crore (73.51%) from MSEs, exceeding the sub-targets for SC/ST and women entrepreneurs. To further encourage MSE involvement, POWERGRID offers relaxation in financial qualification criteria, including 100% relaxation for procurements under ₹5 Crore, and waiver of Tender Fees and Earnest Money Deposit (EMD). POWERGRID has introduced 'Exclusive Tenders' specifically for SC/ST and women-owned MSEs. Additionally, 28 Vendor Development Programs were organized, with 12 exclusively for SC/ST and women MSEs, to foster the growth and integration of micro and small manufacturers into POWERGRID's supply chain.

SUPPLIER CODE OF CONDUCT

POWERGRID enforces a Supplier Code of Conduct to ensure ethical behaviour across its supply chain. This code sets minimum standards for business partners, emphasizing ethics, safety, environmental stewardship, and human rights.

SENSITIZATION OF VALUE CHAIN PARTNERS ON SUSTAINABILITY

Recognizing the importance of value chain partners in achieving sustainability objectives, POWERGRID conducted workshops to engage and educate them on ESG parameters. The top 75% of value chain partners were identified and sensitized on sustainability metrics, and need to align with POWERGRID's goals.

