TransTech India 2024

A Successful Start

Power Line's inaugural event sets the pace for the transmission sector

Power Line held its first trade show, TransTech India 2024, on October 7-9, 2024 at the India International Convention Centre (Yashobhoomi) in New Delhi.

The mission of TransTech India was to provide a platform for industry leaders and innovators to exchange insights, showcase technology advances and forge collaborations that will shape the future of power transmission.

The three-day exhibition and conference was India's biggest event this year focused solely on the transmission sector. It was supported by the Ministry of Power and the country's top four transmission developers – Power Grid Corporation of India Limited, Adani Energy Solutions Limited, IndiGrid and Sterlite Power.

The event was also supported by Global Transmission Report, which is the leading provider of information and analysis on the global electricity transmission industry.

The event had a very good response from the industry. Over the course of the three days, it attracted almost 1,500 participants from over 300 organisations, representing developers, government agencies, state transcos, system operators, regulators, technology providers, EPC contractors, financiers/investors, consultants, etc. It had representation from almost every state and every segment of the industry.

The event was kicked off by an address by Ravindra Kumar Tyagi, Chairman and Managing Director, Power Grid Corporation of India Limited. The high-level conference had a stellar cast of speakers with CEOs and CXOs from leading sector players and key stakeholders.

The discussions at the conference focused on key trends, developments, challenges and opportunities in the Indian transmission sector. The sessions were very informative and insightful, covering topics such as: Industry Perspective; Transition to Clean Energy; State Utility Perspectives and Plans; EPC Perspective; O&M Best Practices and Asset Management; Transmission System Planning; GRID-India Initiatives; Renewable Energy Evacuation; Offshore Wind Transmission; and Skill Development for Transmission.

The exhibition attracted leading technology players and equipment manufacturers, who showcased cutting-edge solutions, innovative projects and noteworthy initiatives.

The feedback from the participants was very positive. They all praised the event for its high quality. In particular, they appreciated the B2B feel, the clean and uncluttered layout, the availability of lots of meeting areas and the excellent hospitality.

But they were most impressed with the fact that every visitor was qualified, relevant and involved with the transmission sector. They were able to meet their key clients, prospects, partners and vendors. It was an excellent opportunity for networking, and learning about new products and technologies.

Encouraged by the success of this event, *Power Line* has decided to hold TransTech India every year. The next edition (TransTech India 2025) will be held on December 10-12, 2025, at the same venue. ■

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"A monumental task"

Remarks by R.K. Tyagi

R.K. Tyagi, Chairman and Managing Director, Power Grid Corporation of India Limited, delivered the inaugural address at the Power Line TransTech India 2024 Conference and Exhibition. He highlighted the need for expanding and strengthening the transmission network, the key issues and challenges facing the sector, and the way forward. Edited excerpts from his address…

The global shift towards cleaner energy is being driven by the urgent need to combat climate change. There is a growing focus on reducing carbon emissions and transitioning towards more sustainable and environment-friendly energy sources. India, being rich in renewable energy resources, especially solar and wind, has the potential to achieve energy security through renewable energy development.

The country is already making significant progress in this direction with renewable energy capacity surpassing 200 GW, and is on track to reach 500 GW by 2070. However, to manage the variability of renewable energy, it is essential to integrate diverse renewable energy sources across regions.

Network growth projections

With the increasing integration of renewable energy into the grid, the need for robust transmission infrastructure that is capable of handling the intermittent and variable nature of these energy sources has become paramount.

Under the new National Electricity Plan, the transmission network is projected to grow from 485,000 ckt km in 2024 to 650,000 ckt km by 2032. Transformation capacity is also expected to increase from 1.25 million MVA to 2.34 million MVA. Nine new high voltage direct current (HVDC) lines with a combined capacity of 33.25 GW are expected to be added to the existing 33.5 GW HVDC network. The interregional transfer capacity will increase from 119 GW to 168 GW, with the expansion costing approximately over $100 billion. This plan is essential for meeting the growing electricity demand and facilitating the integration of renewable energy and green hydrogen into the grid.

Key challenges in expanding transmission infrastructure

Laying transmission lines through difficult terrain such as deserts, forests and mountains while balancing environmental protection and local community concerns are major hurdles. The process of securing right of way often encounters public resistance, and clearances such as environmental and forest approvals take significant time, delaying projects and leading to cost overruns. Additionally, global supply chain disruptions due to the pandemic, geopolitical tensions and logistical bottlenecks have exposed vulnerabilities, particularly in sourcing high-tech components such as transformers, HVDC parts and semiconductor chips.

In view of the manpower-intensive nature of transmission projects, along with the growing number of projects in the pipeline, the need for engineering, procurement and construction contractors and skilled labour for tasks such as tower erection and stringing is growing rapidly. In order to keep pace with the rising power demand, the ageing transmission infrastructure needs upgrading. Further, condition-based monitoring and predictive maintenance are needed to enhance grid reliability. Drones are revolutionising transmission line inspections, while artificial intelligence and machine learning are enabling predictive maintenance and real-time grid optimisation. Digital twins, real-time simulations and automated decision-making will further enhance grid reliability.

The way forward

The establishment of skill development centres by POWERGRID in West Bengal and Bihar has been a significant step towards addressing the shortage of technicians and fitters for transmission line construction. To further mitigate this challenge, it is essential for utilities to invest in training and capacity building throughout the value chain.

Supply chain strategies must be re-evaluated to secure materials and components for modern transmission systems, focusing on diversifying our sources and fostering regional partnerships to enhance resilience.

The energy transition is a monumental task, and the power transmission sector plays a pivotal role in this process. By embracing innovation and adapting to new technologies while building human capital and robust supply chains, and implementing effective regulatory frameworks, we can ensure sustainable progress. The journey ahead may be challenging, but the potential for a cleaner, more sustainable energy future makes it worthwhile. ■

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"Integrated planning is key"

Views of S.K. Soonee

At the "Future Forward for Transmission" session of TransTech 2024, S.K. Soonee, Former and Founding Chief Executive Officer of Power System Operation Corporation Limited (now Grid Controller of India Limited), underscored the importance of integrated transmission planning and the benefits of robust transmission in ensuring resource adequacy, and shared a vision for the future of transmission systems. Edited excerpts below…

Transmission planning

The future of power transmission must address the trilemma of affordability, decarbonisation and reliability. These factors are deeply interconnected. While keeping costs low is critical, the transition to renewable energy sources also requires high reliability. As consumers increasingly prioritise dependable energy, the need for resilient transmission systems grows, making it essential to balance these three priorities effectively. Sustainable, integrated planning is vital for power transmission. This approach must incorporate a long-term perspective that considers future interactions between new and existing infrastructure.

The role of market signals in transmission planning is crucial as effective transmission pricing fosters competition among energy generators, helping lower costs for consumers. A well-structured electricity market promotes efficiency and innovation, making market dynamics an essential consideration in transmission design. Furthermore, innovative urgency indicators for transmission could guide stakeholders in prioritising critical projects, ensuring timely upgrades and system resilience.

Transparency and stakeholder engagement are also essential in the planning process. Consensus among stakeholders — government agencies, private companies and the public — is crucial for advancing infrastructure projects.

Transmission-related benefits

India needs a robust transmission network to harness its vast and diverse power resources effectively. The country's power system spans a subcontinent-sized area with numerous intra-state systems. Efforts are ongoing to strengthen inter-state and cross-border interconnections, enhancing the overall grid.

A strong transmission system ensures resource adequacy and electricity security nationwide, helping lower decarbonisation costs. Well-connected markets are vital for mitigating price shocks and maintaining a stable supply. Comprehensive assessments of resource adequacy are necessary, alongside strengthened governance and institutional frameworks to ensure capacity availability.

Moreover, a resilient transmission system can better withstand climate-induced extreme weather and meet rising electricity demand. Developing a resilience performance scoring matrix can support power system resilience and minimise potential damage.

The way forward for transmission planning

There is an urgent need for a transformative mindset in energy transmission, especially as renewable energy integration increases. Recognising that energy flows can be bidirectional is essential. As countries advance in decarbonisation, the potential for cross-border energy interconnections will grow, facilitating energy import/export.

A key component of effective energy grid management and planning is the institutional development of state transmission utilities. These entities should operate independently, with clearly defined roles and responsibilities to enable collaboration with the Central Transmission Utility and improve operational efficiency.

Modern planning tools are essential, supported by adequate data for informed decision-making. A renewed focus on grid resilience is necessary to ensure reliability amid disruptions. Monitoring regulatory compliance is critical, ensuring adherence to standards across entities. Harmonising regulations between the central and state governments will also help create a cohesive framework for the energy sector.

Meanwhile, the data centre market is expanding rapidly, driven by regulatory initiatives emphasising data localisation, privacy and security. Data centre capacity is projected to grow at over 50per cent CAGR, leading to substantial increases in power demand, which in turn necessitate increased investments in generation, transmission, and distribution. Given that power constitutes about 30 per cent of total capital expenditure, meeting the energy needs of this sector through effective transmission planning is crucial for sustainable growth. ■

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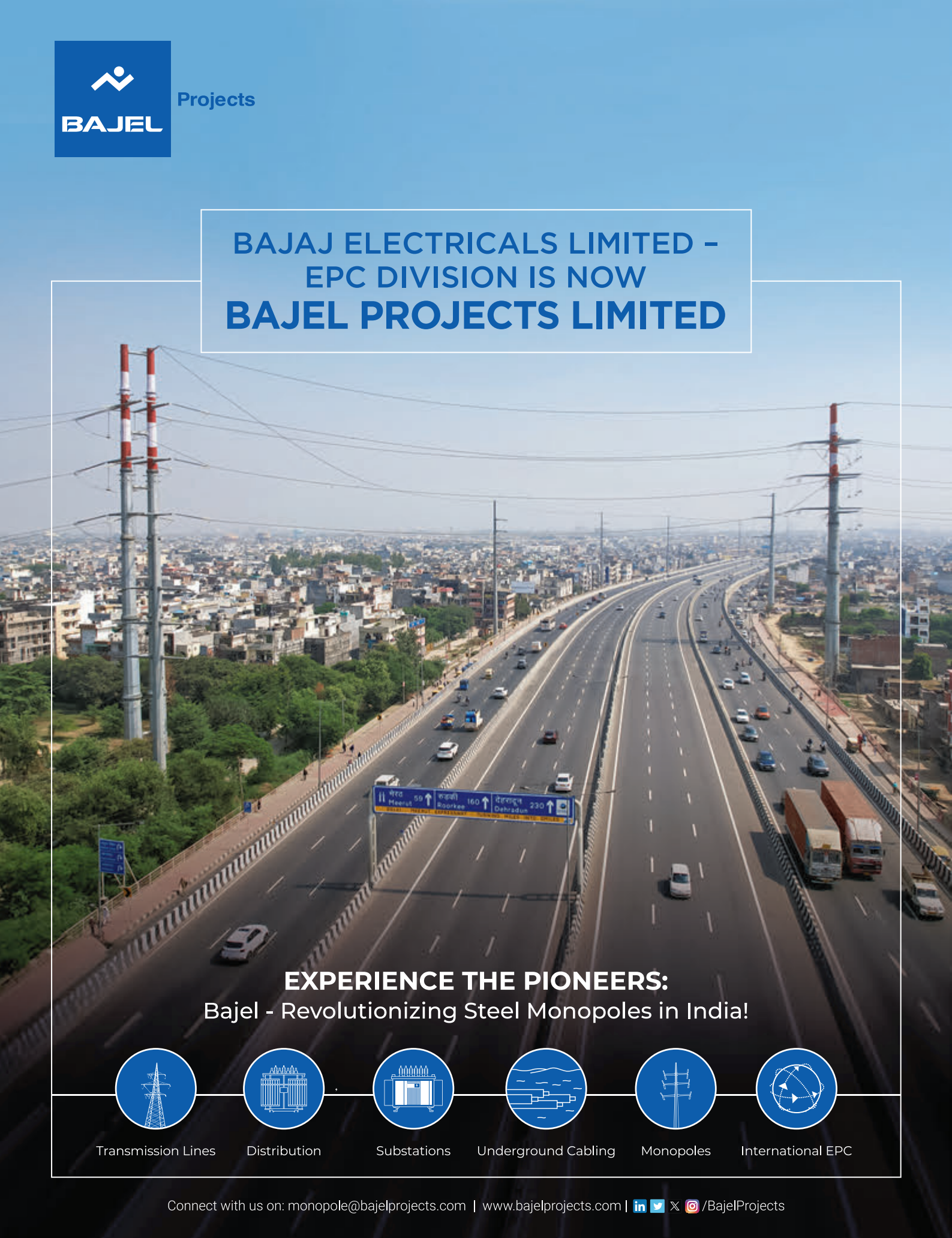

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"Sustainability and resilience are required"

Interaction with Naveen Srivastava

At TransTech India 2024, Naveen Srivastava, Director (Operations), Power Grid Corporation of India Limited (POWERGRID), spoke about the current state of the power transmission system, technological advancements in the segment and the future outlook. Edited excerpts…

Generation capacity, particularly from renewable sources, can be developed rapidly, while establishing transmission infrastructure usually takes 24 to 36 months. To ensure smooth integration, it is essential to align the planning of transmission projects with generation timelines.

India currently has a generation capacity of approximately 446 GW, with 206 GW coming from renewable energy sources. The country's transmission infrastructure is also expanding rapidly. The transmission line length, which currently stands at 418,000 ckt km, is projected to grow by an additional 200,000 ckt km. The national transformation capacity is at 1,225,000 MVA, with POWERGRID contributing nearly 50 per cent of this at 530,000 MVA.

POWERGRID currently operates 280 substations. By 2030, many more will be added to support the growing energy demand. In the near future, POWERGRID plans to extend its transmission line network by approximately 50,000 ckt km, ensuring that the transmission system can handle the increasing generation capacity and maintain grid stability.

Technological advancements

Drones are increasingly being utilised for patrolling transmission towers. Artificial intelligence and machine learning technologies are playing a pivotal role in enhancing maintenance and operational efficiency of transmission infrastructure. Smart transmission lines, based on dynamic line rating systems and equipped with sensors for improved forecasting, are being developed.

In parallel, older substations are being modernised into process control substations, employing artificial intelligence-driven technologies and remote control systems for better management. Further, all of the 280 substations are being operated remotely from the National Transmission Management Centre. Any kind of upgradation and monitoring can be done from the centralised system.

Advanced tools and methods are being deployed for Vegetation Management and early-stage fault detection. The use of sensors for real-time monitoring and predictive maintenance is central to preventing faults and improving grid reliability. Additionally, gas-insulated substations have been implemented to further support these initiatives. In line with the government's goal of achieving net zero carbon emissions by 2047, there is a shift towards environment-friendly SF6-free switchgear.

There is ongoing exploration of new technologies such as induction voltage for electricity generation, with pilot projects investigating how line induction can produce power. This innovation has the potential to benefit sectors such as telecommunications. However, there is a pressing need for advancements in ultra-high voltage direct current technology, as existing solutions such as voltage source converters and line commutated converters are approaching their voltage capacity limits. Further, as offshore wind energy continues to grow, the importance of offshore substations and transmission lines is increasing, necessitating new infrastructure to support this expansion. Critical concerns include addressing issues such as transients and harmonics, which can adversely affect system performance.

Future outlook

Going forward, sustainability and resilience are required in the power sector, which can be only achieved with innovation. The focus is on integrating advanced technologies such as artificial intelligence, digital transformation and condition monitoring systems to enhance grid efficiency and reliability. Additionally, green technologies are being prioritised to ensure that transmission infrastructure aligns with India's long term sustainability goals, including the government's commitment to net zero carbon emissions by 2047. The vision for India's power transmission sector revolves around not only modernising the grid through smart technologies, but also ensuring its robustness and environmental sustainability. The future of the sector looks promising, with efforts directed towards creating future-proof infrastructure capable of supporting the country's ambitious energy transition and growth objectives. ■

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@RA = Reverse Auction; NVVN = NTPC Vidyut Vyapar Nigam

Clean Energy Transition

Strengthening the transmission system for renewables integration

The panel discussion on "Transition to Clean Energy" brought together key sector leaders to discuss the critical role of a robust power transmission system in India's renewable energy future. The panellists included Alok Kumar, Former Secretary, Ministry of Power; I.S. Jha, former Chief Managing Director (CMD), Powergrid, and Former Member, Central Electricity Regulatory Commission; S.K. Soonee, Former and Founder Chief Executive Officer (CEO), POSOCO (now Grid-India); and S.R. Narasimhan, Chairman and Managing Director, Grid Controller of India (Grid-India). The panellists emphasised the crucial role of a robust power transmission system in overcoming challenges in integrating renewables and supporting the country's clean energy future.

State of the energy sector

India is steadily progressing towards its ambitious goal of becoming a net zero emitter by 2070. As part of this journey, the country has set a target of achieving 500 GW of non-fossil energy capacity by 2030. Grid-India has been instrumental in connecting regional grids, making regional transmission capability a critical element in supporting renewable energy growth. Considering India's vast geographical area, it is crucial for transmission planning to grow significantly to cater to future needs. Currently, the country operates with nine planning scenarios, covering three seasons and three times of day, illustrating the complexity of India's renewable energy integration. To meet its clean energy targets by 2030, the country needs to continue increasing its installed renewable energy capacity. The major renewable energy potential zones in India are located in states such as Rajasthan, Gujarat, Karnataka, Andhra Pradesh, Maharashtra, Tamil Nadu, Uttar Pradesh, Madhya Pradesh and the Leh region. A consensus that emerged during the discussion was that the transmission system will be the backbone of the clean energy transition.

Challenges

While the transition to clean energy is gaining momentum, several challenges remain. The cost of high voltage direct current (HVDC) lines has risen nearly fourfold, raising questions about the financial feasibility of expanding transmission capacity and making affordability a significant concern. This requires finding cost-effective ways to augment capacity, such as optimally pricing transmission services, to ensure the success of the energy transition.

(From left) Alok Kumar, Former Power Secretary; S.K Soonee, Founder CEO, POSOCO; I.S. Jha, Former CMD, Powergrid; S.R. Narasimhan, Grid Controller of India

Although interstate infrastructure has developed well, intra-state systems still lag. To achieve the renewable energy capacity projections laid out by the Central Electricity Authority, more states must participate in tariff-based competitive bidding. Additionally, as transmission technology evolves, there is a need for greater flexibility, resilience and cost optimisation. This necessitates policy certainty and long-term planning to preserve the interests of investors and strengthen local manufacturing ecosystems.

Solutions and the path forward

A key focus is on building resilience to withstand extreme weather events, especially in coastal areas prone to cyclones. Strengthening concession agreements with clear responsibilities and enhancing cybersecurity measures are also crucial steps to secure the power sector. Advanced technologies, such as higher voltage levels and HVDC systems, will play a pivotal role in this transformation.

A key solution highlighted was optimising the existing transmission network through studies on locational marginal pricing, loss factors and congestion pricing. Improved infrastructure use will enhance efficiency and prepare the system for future growth.

The One Sun, One World, One Grid initiative aims to connect regional power grids globally, enabling the transfer of renewable energy such as solar and wind across borders. By enabling the sharing of surplus energy between regions, this initiative enhances renewable energy's share in power supply and ensures smooth cross-border energy transfers.

Conclusion

The transition to clean energy requires a significant expansion and strengthening of India's power transmission network. As the country moves towards its clean energy future, the power transmission system will serve as the backbone of this transition, ensuring sustained growth. By optimising the existing network and adopting coordinated planning, India is well positioned to achieve its ambitious clean energy targets. ■

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Industry perspective

The Industry Perspective session featured a panel discussion among Manish Agarwal, Chief Executive Officer (CEO) (Conductors and Telecom) and Managing Director (T&D), APAR; Guilherme Mendonca, Head, Energy, Siemens; Arun Sharma, Chief Executive Officer, Sterlite Power; and Satish Talmale, Chief Operating Officer, IndiGrid, on a wide range of topics, including the state of the sector, industry priorities, the new technologies being adopted, the key challenges and outlook...

Electricity demand is rising rapidly in India and is expected to increase substantially over the next few years, led by the growth in high energy demand sectors such as electric vehicles, which are yet to achieve full market penetration. Decarbonisation will become critical, as India is expected to enforce carbon credit trading targets by 2026, necessitating industries to transition towards decarbonised operations. Moreover, economic growth in India's large middle class will lead to a significant increase in electricity consumption.

The two key considerations for meeting India's renewable energy targets are developing a robust transmission network and addressing right-of-way (RoW) and land-related issues. Approximately $5 billion-$6 billion worth of annual investments will be needed for infrastructure development. In the transmission space, while tariff-based competitive bidding (TBCB) has improved efficiency, the challenge for developers now lies in integrating the best technologies into the systems. This is crucial for ensuring the long-term sustainability of projects. While technologies are available, developers need to determine whether there is a willingness to incorporate them into the e-reverse auction framework.

Technology adoption

A major focus will be on high voltage direct current (HVDC) systems, for which long-term planning will be crucial. While point-to-point HVDC project implementation has been carried out, DC-level switching will soon be undertaken to connect large generation areas to consumption centres.

(From left) Manish Agarwal, APAR; Guilherme Mendonca, Siemens; Satish Talmale, IndiGrid; and Arun Sharma, Sterlite Power

RoW issues have been the primary cause of delays for both greenfield and brownfield projects. The use of monopoles and lattice towers can significantly help address space challenges. It is also crucial to focus on reconductoring and augmenting existing transmission lines at the planning stage itself, as this is less expensive than setting up new lines.

Further, transmission operators are implementing digital asset management strategies and using asset health indexing to monitor the condition of individual equipment such as transformers, circuit breakers and other critical components in the transmission line. They are also using weather forecasting platforms to tackle challenges such as high wind speeds and lightning that could impact transmission lines.

Challenges and outlook

A key challenge is ROW. Cross-country transmission line projects have benefitted from strong state support. Therefore, stakeholder management is crucial in tackling the RoW issue. Another challenge is the shortage of skilled labour, particularly in areas such as cybersecurity and digitalisation, which are becoming critical as we move towards smarter grid management.

The industry must focus on indigenisation and the reduction of reliance on imports. This will facilitate the development of India as a hub for exports to global markets such as Europe and South America, enabling it to compete on a global scale alongside Chinese players. There is also a need for India to promote free trade agreements at the policy level to augment the country's export competitiveness.

Another critical aspect is supply chain management. The volume of work being awarded is substantial; therefore, the pace of project execution should be improved through mechanisation. Currently, completing around 1 km of transmission lines takes 1,400-1,500 days in India, compared to less than 1,000 days in Brazil and only 350-400 days in the US and Canada. The bidding documents should be structured in a way that provides developers with opportunities to deploy time- and cost-saving technologies.

The industry outlook for the next 10-20 years is positive. However, challenges like high attrition rates and a lack of skilled manpower remain. Improving product safety and quality is essential. The central government's support in land acquisition, Right of Way, and state coordination has been commendable. ■

Transmission Support

Focus on renewable energy evacuation

At TransTech India 2024, the panel discussion titled "Focus on Renewable Energy Evacuation" explored key areas related to renewable energy evacuation, including the needs of developers, progress in improving grid connectivity, current issues and possible solutions. The panellists were Purnendu Chaubey, Senior Vice President, ReNew; Varchasvi Gagal, Chief Executive Officer (CEO), Datta Power Infra; Sarit Maheshwari, CEO, NTPC REL; and Mahesh Vipradas, Vice President, Sembcorp India. Edited excerpts…

Current scenario

India has achieved 200 GW of renewable energy capacity, with an additional 300 GW targeted by 2030. Of the transmission capacity, 270 GW has already been planned, with several projects under way. This would require approximately 50,000 ckt km of transmission lines and 400,000 MVA of transformation capacity by 2030. There is a significant difference in the commissioning timelines of renewable energy generation plants and the required transmission systems. While transmission systems typically have a gestation timeline of 36-48 months, renewable energy plants can be set up within 15-18 months. This has been partly addressed through proactive planning. Over the past couple of years, the planning and connectivity processes have been streamlined to a large extent, giving renewable energy projects easier access to the market. Improvements in the planning of the interstate transmission system (ISTS) have facilitated the growth of renewables and encouraged investments.

Developers frequently enquire about grid connectivity schedules, seeking specific commissioning dates for renewable energy parks. This requires a thorough analysis of radiation levels and wind resource assessments. While renewable energy zones are being established in certain states, there is a significant gap in the connectivity schedule, extending until 2030. There is also a significant gap between the energy generation output of renewable energy-rich states such as Rajasthan and Gujarat, and that of other states. Moreover, the development costs incurred are higher in non-renewable energy-rich states. Further, there are concerns about the tariff structures in these states.

(From left) Sarit Maheshwari, NTPC REL; Purnendu Kumar Chaubey, ReNew; Mahesh Vipradas, Sembcorp; and Varchasvi Gagal, Datta Power Infra

The transition to the general network access phase has been a positive for the sector as it offers more flexibility in siting renewable energy projects. However, it is crucial to set up such projects across the country to reduce grid management challenges in states that have significant renewable energy projects coming up. Energy storage solutions are expected to help address this congestion further. To this end, recent tender mechanisms are shifting from vanilla solar and wind projects to round-the-clock, and firm and despatchable renewable energy, allowing for more efficient use of transmission assets. The green energy corridors have been successful in evacuating significant power capacities from renewable energy-rich states. Additionally, there is a major focus on the creation of renewable energy zones and the development of solar parks, including massive ones at Bhadla, Khavda and Leh. Further, key public sector companies such as Oil and Natural Gas Corporation Limited, Indian Oil Limited, SJVN Limited, NTPC Limited and NHPC Limited are targeting 2-6 GW of renewable energy capacity annually.

Notably, the ISTS waiver is set to end in June 2025, which will significantly change the power evacuation landscape for renewable energy. Consequently, more projects are expected to come up on intra-state networks, as developers may want to avoid transmission charges. Intra-state transmission network growth is now expected to accelerate. Developers will need to weigh the advantages of planning projects in renewable energy-rich states against the increased transmission costs.

Outlook

Various new models are expected to emerge to address connectivity challenges, including the use of grid connectivity post-solar power hours. The planned renewable energy bidding trajectory provides ample opportunities for project development. However, a dynamic planning strategy is needed for renewable energy developers. Factors such as market strategy, power pricing and other variables necessitate continual adaptation. To address connectivity issues, more streamlined planning of substations with greater developer involvement is required. The current "follow-up" model is not sustainable as developers rush to secure connectivity wherever it is available, driving up land prices in those areas due to the scarcity of grid connectivity. The future of the energy industry lies in continuous, reliable power supply and flexible renewable energy sources, particularly as storage technologies become more affordable. These advancements will lead to more efficient use of the transmission network. ■

Tackling Challenges

EPC perspective on the state of the sector

The session on "Engineering, Procurement and Construction (EPC) Perspective" featured a panel discussion among Ankit Bhardwaj, EVP and BD, Global Product and Services, Sterlite Power; Rajeev Dalela, President, Kalpataru Projects International; Venkat Muvvala, CEO Infra and EPC Business, Jakson Group; Jijo Sebastian, VP and head, T&D, Larsen & Toubro; Abhishek Sil, VP, Sales and Tendering, KEC International; and Manish Srivastava, Business Head, Transmission and Distribution, APAR. Edited excerpts...

The session underscored the fact that the power transmission sector is at the cusp of transformation, with significant investments expected in the coming decade. There is significant potential for EPC in the coming years, with transmission lines expected to grow by nearly 30 per cent, adding over 20,000 ckt km annually. Over the past five years, the pace of construction has been around 18,000 ckt km per year. There have been major advancements in the use of drones for surveys, which have significantly reduced the time needed for certain tasks, particularly in challenging areas such as railway crossings.

However, the sector continues to face several challenges that hamper the expeditious development of transmission infrastructure, such as right-of-way (RoW) constraints, high employee attrition and skill gaps.

Key challenges

One of the biggest challenges facing the sector is the RoW issue. Timely RoW acquisition is critical to maintaining project timelines. Awarding projects through reverse auctions also presents a key challenge for the sector as it impacts the entire value chain. While reverse auction has led to significant tariff reductions, it has affected project quality and has put strain on the value chain. There are issues within the sector's dispute resolution mechanisms, including identifying the primary causes of disputes as contract execution issues, delays in client obligations and postponed compensation.

(From left) Jijo Sebastian, L&T; Alok Brara, Power Line (moderator); Ankit Bhardwaj, Sterlite; Rajeev Dalela, Kalpataru; Venkat Muvvala, Jakson; Abhishek Sil, KEC International; and Manish Srivastava, APAR

In addition, the industry is struggling with the conventional mode of operations and maintenance. There is an increasing demand for upskilling the workforce as well as addressing the manpower shortage in the sector. Another challenge is contractual disputes, which lead to delays in project execution and commissioning.

Possible solutions

In order to tackle issues in the sector, developers and operators are strengthening their capabilities by hiring and training staff, and leveraging advanced project management tools and analytics. Techniques such as drone surveys and digital assessments are being employed to enable faster decision-making and improve project delivery. There is a demand for on-the-job training to upskill workers.

While managing shutdowns is a key challenge, conducting timely surveys and identifying potential issues during pre-bid meetings helps minimise this problem. Apart from this, innovative technologies, including carbon composite cores for transmission lines, could reduce power losses by 30 per cent and double power transfer capacity at lower temperatures. Furthermore, technological advancements, such as the use of laser surveys, has reduced the time required to survey a 100 km line from 25-30 days to just five-six days.

Private companies such as L&T are playing their own part in addressing challenges. This involves mechanisation and the deployment of drone-based services. Initiatives such as improving worker safety will help lower the attrition rate and enhance productivity. To further address the skills issue and close the skill gap, companies can provide in-house classes and courses, and establish skill development centres.

Future outlook

The National Electricity Plan for transmission formulated by the Central Electricity Authority has set ambitious targets for the future. The objective of the plan is to increase the transmission capacity by 30 per cent over the next eight years. To achieve these goals, it is imperative to re-evaluate of the selection criteria for EPC players and contractors so as to attract top talent in the sector.

Despite all the challenges present in the sector, these are exciting times for EPC players, with ample opportunities for all players as the market expands. The increasing volume of projects will provide growth opportunities in the EPC sector over the next four to five years. ■

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Promoting Sustainable Practices

O&M and transmission asset management

The "Operations and Maintenance (O&M) and Asset Management" session at the Power Line TransTech India 2024 Conference and Exhibition featured presentations and remarks by Nihar Raj, Head of O&M, Adani Energy Solutions Limited; and Amitanshu Shrivastava, Head of Transmission, IndiGrid. Both sector experts shared their views on the key challenges in the O&M of transmission assets, as well as the best practices and key initiatives in this space...

Emerging O&M practices

Transmission companies are increasingly focusing on sustainable O&M, particularly with the construction and operation of high voltage networks. Significant strides have been made in operating high voltage direct current links, with several ongoing expansion projects. However, the introduction of new technologies, combined with the need to phase out obsolete systems, presents challenges to the seamless operation of these networks. To address the issues and enhance decision-making, risk predictability and asset longevity, transmission companies are leveraging data analytics and advanced technologies.

One of the key initiatives involves the incorporation of weather analytics into maintenance protocols to mitigate weather-related risks. By linking preventive maintenance activities with weather data, companies can better plan their workforce and adjust operations if conditions are unfavourable. Real-time weather monitoring solutions support effective risk management, while drone-based inspections enhance safety and predictive maintenance efforts. Moreover, the Asset Health Index Platform offers health assessments at portfolio, substation and equipment levels, allowing for more informed decision-making regarding asset management.

Reliability, robust risk mitigation plans and the adoption of digital technologies are essential for ensuring optimal asset performance. The shift toward predictive maintenance is a top-driven strategy supported by upper management in many transmission companies. This approach

Amitanshu Shrivastava, Indigrid (left); and Nihar Raj, Adani Energy Solutions

focuses on utilising pattern-based analysis, leveraging artificial intelligence (AI) tools and conducting studies to anticipate maintenance needs and potential failures. Moreover, the innovative "zoning" concept divides transmission lines into segments representing 10 per cent of the line's length, allowing for performance monitoring within each zone. Issues can be identified through data visualisation tools, enabling targeted interventions based on specific problem areas. Digitalisation is being embraced for every installation, utilising supervisory control and data acquisition systems to mine data for challenges that might otherwise go unnoticed. Furthermore, centralised data on critical applications allows for early detection of anomalies in equipment, such as circuit breakers, enabling rapid corrective action.

Drones are being implemented for inspections, moving towards unsupervised learning, where drones equipped with edge devices can autonomously report detected anomalies. A novel safety feature has also been introduced – if a worker falls from a transmission tower and remains inactive for over a minute, an automatic alert is triggered to initiate help.

The O&M of transmission assets faces several challenges, including changing climate patterns, unauthorised construction beneath transmission lines, the lack of coordination in infrastructure development and frequent regulatory changes. To mitigate these challenges, transmission companies are adopting cutting-edge technologies such as AI, machine learning and satellite-based vegetation management. These tools help manage risks associated with lightning strikes and thunderstorms that can affect insulators and end equipment. Additionally, protective structures have been installed to safeguard critical transmission lines from landslides and snow avalanches.

Overall, transmission companies are actively leveraging data analytics, digital tools and predictive maintenance strategies to overcome the evolving challenges in the O&M of transmission assets. By adopting innovative technologies such as AI, drones, and internet of things-based sensors, these companies are enhancing asset reliability, improving safety and ensuring the long-term sustainability of their operations. Proper O&M practices are crucial for enhancing the overall reliability and safety of the transmission sector, ultimately contributing to a more resilient and efficient energy infrastructure. As these companies continue to refine their O&M practices, they underscore the critical role of advanced analytics and technology in promoting operational excellence and safeguarding the integrity of the transmission network. ■

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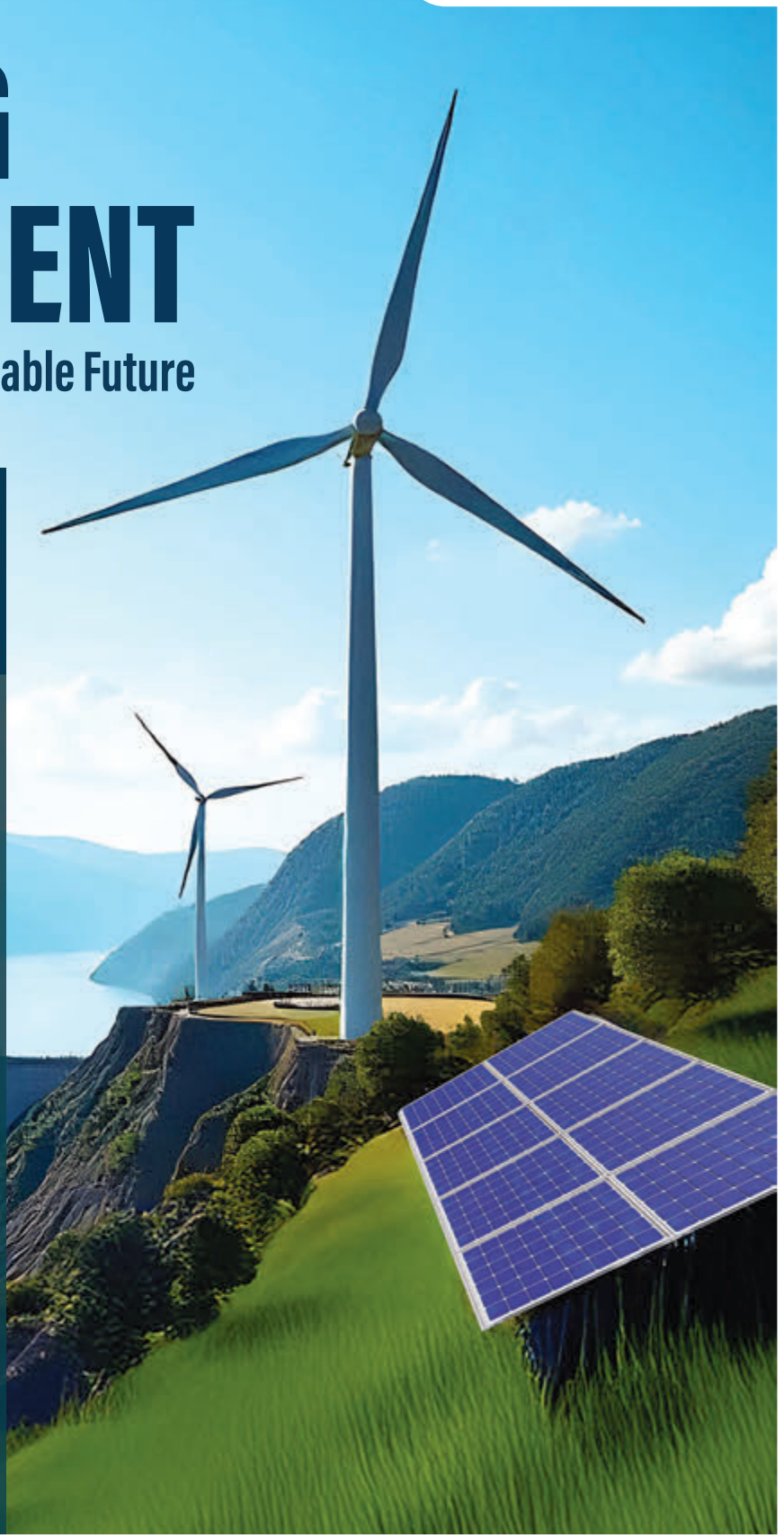

Our H1FY25 Result Reflect Continuous Growth and Steady Progress

H1FY25 vs H1FY24

Total income
₹ 26,633 CRORE
18%

Disbursements
₹ 90,955 CRORE
20%

Disbursements in Renewable
₹ 11,297 CRORE
93% YoY

Expanding Networks

Insights from leading transmission companies

TransTech 2024 featured insightful remarks from various industry leaders representing state and regional transmission companies in the country, namely, Gujarat Electricity Transmission Company Limited (GETCO); Andhra Pradesh Transmission Company Limited (APTRANSCO); Odisha Power Transmission Company Limited (OPTCL); Maharashtra State Transmission Company Limited (MSETCL); Damodar Valley Corporation (DVC); Transmission Corporation of Telangana Limited (TGTRANSCO); and North East Transmission Company Limited (NETC). The State Utility session highlighted the strategies being implemented to overcome challenges in transmission network expansion, the growing adoption of digitalisation, and future expansion plans and focus areas…

A.V.K. Bhaskar, Director of Grid, APTRANSCO

Andhra Pradesh has achieved energy surplus and its per capita consumption has increased from 1,480 kWh in 2019 to 1,797 kWh in 2024. APTRANSCO has maintained one of the lowest transmission losses in the country at 99.82 per cent in 2023-24. The utility's current network comprises 371 extra high tension substations with a total capacity of 66,638 MVA, and over 32,569 ckt km of transmission lines. Andhra Pradesh's grid handled around 81,000 MUs in 2023-24, with a peak demand of 13,712 MW this summer.

Further, to address the intermittency of wind and solar generation, APTRANSCO is planning pumped storage projects and battery storage systems, which will support future grid expansion. Smart grid technologies and green energy corridors for renewable energy evacuation are being prioritised, along with data analytics for predictive maintenance. Further, digital skill development programmes for employees are another focus area.

Over the next five years, 71 new substations are planned, along with 4,696.32 ckt km of transmission lines and 16,506.5 MVA of transformation capacity augmentation. Gas-insulated substations (GISs) are being installed at critical locations, including a 400 kV GIS at Thallayapalem, 400 kV and 220 kV GISs at Atchutapuram, and a 132 kV GIS at Kapuluppada (a 132 kV GIS at Moghalrajpuram is operational). However, the utility faces several key challenges, such as rising wind speeds and natural disasters. Highlighting APTRANSCO's swift response, Bhaskar shared that power was restored within 48 hours after cyclones Hudhud and Titli. Meanwhile, land acquisition and right-of-way (RoW) issues in forest areas have emerged as hurdles, leading to increased costs and project delays.

B.B. Mehta, Director of SLDC, OPTCL

Odisha's power sector faces unique challenges due to its geographical location and environmental conditions. Being a cyclone-prone state, special designs for towers and transmission networks are crucial. To this end, the state is transitioning to high temperature low sag (HTLS) conductors. Another significant challenge relates to the state's extensive forest cover, which complicates the process of obtaining state- and national-level clearances for power projects. In addition, the state faces the unique challenge of rerouting transmission lines to protect elephants from electrocution.

Odisha is focusing on technological advancements. A pilot project for drone-based surveys is currently under way, with plans to scale up and include hilly, forest-heavy and inaccessible areas. Other technologies being deployed in the state include remote accessibility systems, mobile-based tower monitoring systems and SAP-based linear asset management systems. OPTCL has several tenders in the pipeline. It plans to invest over Rs 20 billion in 2024-25, with this amount expected to double in 2025-26. Further, asset monetisation is being considered for the future.

Sanil C. Namboodiripad, MD, NETC

NETC owns and operates the Palatana-Bongaigaon transmission line, spanning 1,327 ckt km at the 400 kV level. The line helps in evacuating power from ONGC Tripura Power Company Limited's gas-based power project. The project has been instrumental in improving power supply in the North-eastern region, helping it transition from a power-deficit to a power-surplus region. The line not only meets one-third of the region's power needs but also facilitates power exports to Bangladesh.

One of the key issues for the region is RoW. These challenges are compounded by the region's difficult terrain, with rivers frequently changing course, heavy rainfall, poor soil quality, high seismic activity and frequent lightning, leading to higher construction costs. Some of the strategies adopted by the company include the use of special earthing methods and transmission line surge resistors to prevent lightning strikes from reaching substations. NETC also employs drone patrolling. Further, it is leveraging artificial intelli-

gence and machine learning to detect faults in transmission lines. This initiative, in collaboration with the Power Grid Corporation of India, involves app-based patrolling to capture and document any damages. In Meghalaya, where lightning strikes are frequent, NETC has installed lightning protection system units.

Avinash Nimbalkar, Director of Projects, MSETCL

MSETCL currently operates 745 substations, 52,000 ckt km of transmission lines and a transformation capacity of 142,000 MVA. The plan for the next 10 years includes the development of 138 new substations, 12,000 ckt km of new transmission lines and 27,000 MVA of transformation capacity. The company also aims to replace approximately 3,700 ckt km of its conductors with high performance conductors.

One of the key challenges in the expansion of transmission line capacity is RoW constraints. The Maharashtra government has introduced a new compensation policy, offering significantly higher compensation for tower foundations and erections, as well as transmission line corridors. This is expected to ease RoW concerns, especially in the Mumbai, Pune and western Maharashtra regions.

Going forward, MSETCL will focus on technological advancements such as deploying undersea transmission cables, converting single-circuit towers to multi circuit towers and using monopole towers and insulated platforms to maximise the efficiency of existing RoW. With these initiatives and the increase in tariff-based competitive bidding to encourage competition, the state's transmission network will be successfully expanded over the next five years.

Upendra Pande, Managing Director, GETCO

Gujarat plays a key role in renewable energy integration in India, accounting for 22.4 GW or 12 per cent of the country's total renewable capacity. The state's overall installed capacity stands at 45,500 MW, with about 50 per cent coming from renewable energy. By 2030, the state aims to contribute 100 GW towards India's target of 500 GW. From 2,300 substations as of 2023-24, the state plans to increase this number to over 3,300 by 2029-30. It also plans to add 55,000 ckt km of transmission lines and expand its transmission capacity to 250,000 MVA by 2030. Gujarat is committed to harnessing its immense solar (235 GW) and wind (142 GW) potential through a combination of solar and wind energy projects. This will necessitate the development of 14 GW of additional transmission infrastructure.

A key initiative in Gujarat is the provision of daytime power for agriculture, which would require special infrastructure to deliver solar power during peak solar hours. The state has also launched the Akshay Urja Setu portal, which simplifies the process for renewable energy developers. In addition, the state is investing in advanced transmission infrastructure, including high capacity HTLS conductors, to reduce its land footprint. The introduction of 765 kV systems will facilitate bulk power transmission, particularly to remote regions or urban areas with growing energy demands. The state is also focusing on improving power quality through static synchronous compensators for stable power supply. Further, Gujarat is prioritising sustainability in its transmission network, with the addition of green substations that use environment-friendly materials such as ester oil-filled transformers and SF6-free circuit breakers. Gujarat is also prioritising cybersecurity in its transmission infrastructure.

Swapnendu Kumar Panda, Member – Technical, DVC

DVC has a transmission line capacity of 9,300 km, operates 60 substations and supplies power at the 11-400 kV levels. In the future, DVC aims for a comprehensive transformation and upgradation of its transmission system, with a proposed investment of Rs 280 billion. The utility is focusing on increasing its transmission infrastructure capacity by upgrading existing transmission lines, transformers and substations. Significant investments are planned for upgrading transmission lines with HTLS conductors, as well as for the digitalisation and renovation of substations. Regarding digitalisation, DVC is automating its substations, with nearly 10 substations automated in 2023-24.

T. Jagath Reddy, Director, TGTRANSCO

TGTRANSCO is actively working on enhancing transmission capacity through various measures, with a primary focus on constructing new transmission lines and increasing the transmission capacity of existing ones. One of the key challenges in this expansion is RoW issues. However, the Indian government has recently developed guidelines for compensation rates, and a proposal has been submitted to the state government for its implementation. Once approved, this is expected to significantly ease RoW concerns for building transmission lines and substations. Innovative solutions are being employed to address congestion at existing substations, particularly for supplying power to data centres and large consumers.

Further, approximately 10-12 substations are now being operated remotely with minimal on-site staff. The company is well equipped to handle increasing power demands, including those from data centres, without affecting consumers. The deployment of multiple operations and maintenance teams for regular line inspections has resulted in minimal power interruptions across the network. ■

Note: TransTech India 2024 also featured technical presentations by Dr Rajesh Arora, Senior Manager Technical, Delhi Transmission Limited; Amar Kirti Saksena, CE Procurement, Madhya Pradesh Power Transmission Company Limited; Dr Prashant Saxena, Engineer, Rajasthan Rajya Vidyut Prasaran Nigam Limited; B.B. Ahir, DE Testing, Gujarat Energy Transmission Corporation Limited; and Keshnath Chauhan, ADE, Technical, Transmission Corporation of Telangana Limited.

Planning and Integration

Creating robust transmission infrastructure to support the transition to renewables

At TransTech 2024, Ashok Pal, Deputy COO, CTUIL, made a presentation on transmission system planning, highlighting the need for robust transmission infrastructure to support the anticipated capacity addition of 500 GW by 2030. Meanwhile, in another session, Samir Saxena, Director, Market Operations, GRID-India, made a presentation on the company's initiatives aimed at seamlessly integrating renewable energy, with a focus on real-time operational efficiency and effective resource management.

CTUIL's transmission system plans

Transmission system planning has been carried out for 335 GW of inter-state transmission system networks, primarily to support renewable energy transmission. Of this, 42 GW is already completed, 85 GW is under construction, 65 GW is under bidding and 143 GW is awaiting approval. The development of these networks will require a total capital investment of Rs 5,000 billion. The northern region leads with a total capacity of 123 GW, with Rajasthan accounting for the highest share at 110 GW, followed by the southern region at 117 GW (including 65 GW from Andhra Pradesh). The western region is expected to reach 94 GW, while the north-eastern region has a relatively smaller target of 1 GW.

A key challenge is that much of this transmission capacity is concentrated in just two states - Rajasthan and Gujarat. Distributed renewable energy projects across India could help address this by optimising transmission system efficiency and alleviating pressure on the grid. Leveraging the transmission system during non-solar hours with additional renewable energy, storage, and green hydrogen or green ammonia at the source can help manage transmission-related issues.

With the growing integration of variable renewable energy sources, resource adequacy is necessary to manage the fluctuation in generation and address any contingencies that may arise. Resource adequacy must be ensured across all time horizons. It is crucial to undertake reserve estimation, planning and procurement on a day-ahead, week-ahead, month-ahead and year-ahead basis to ensure grid reliability and stability.

Ashok Pal, CTUIL

Samir Saxena, GRID-India

GRID-India's initiatives

GRID-India is actively working on initiatives to facilitate a seamless transition to a renewable energy landscape. India has made impressive strides in renewable energy, with the combined capacity of wind and solar now exceeding 132 GW. This growth has led to unprecedented levels of renewable energy penetration nationwide, with states such as Karnataka achieving remarkable rates. The geographical concentration of renewable energy sources, primarily in western and southern India, has altered power transmission patterns. Seasonal electricity flows are now dynamic, requiring a renewed focus on resource adequacy, influenced by new regulations from the Central Electricity Authority (CEA). To support reliable renewable energy integration, GRID-India has established renewable energy management centres at both state and national levels, focusing on forecasting, scheduling and real-time monitoring.

On July 6, 2024, India recorded its highest level of renewable energy penetration at 33 per cent, as wind and solar capacities peaked. Further, the transmission landscape has also changed, with renewable energy projects coming online faster than traditional transmission infrastructure can be built. There needs to be a faster rate of construction of extra-high voltage and ultra-high voltage transmission lines to meet the challenges of resource adequacy and forecasting.

Looking ahead, advanced planning for transmission infrastructure is critical, as the timelines for these projects often exceed those for renewable energy installations. As India advances in its renewable energy journey, collaboration among system operators, regulators, and energy producers will be essential. ■

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Growing Interest

Offshore wind transmission

Offshore wind is gaining traction in India as part of a broader push toward sustainable energy solutions. Significant strides have been made to build capacity, including the establishment of a comprehensive policy framework. However, there are still many challenges, including issues related to financing, infrastructure development and environmental concerns. The session on "Offshore Wind Transmission" featured a panel comprising Dr Subir Sen, ED, Power Grid Corporation of India; Prabir Kumar Dash, Director, Scientist E, Ministry of New and Renewable Energy (MNRE); and Dr Arul Shanmugasundaram, ED (Operations), Ayana Power. This article summarises the key discussion points from the session...

Development and policy evolution

The offshore wind energy journey in India began in earnest around 2012, with the establishment of a formal policy framework in 2015. In 2023, the MNRE reviewed its strategy, and announced a strategic paper laying out a clear roadmap and three primary business models, catering to diverse investor needs. The goal is ambitious: 37 GW of offshore wind projects by 2030, with the first phase aiming for 500 MW each in Gujarat and Tamil Nadu.

As India builds out its offshore wind capacity, it is observing the experiences of established markets such as Europe and emerging players such as the US. India can glean valuable insights from these markets, especially regarding grid integration and the development of stable, high-capacity infrastructure.

Infrastructure and transmission challenges

Offshore wind power projects require sophisticated transmission infrastructure due to their offshore location. Transmission involves several critical components, including array cables connecting individual turbines, offshore substations, export power cables and onshore substations. For the upcoming 500 MW project off Gujarat's coast, a 66 kV array cable will connect turbines to a 220 kV offshore substation. This infrastructure is necessary to stabilise transmission from offshore turbines to onshore stations. Such complexity not only raises costs, but also adds a layer of logistical and environmental challenges, as cable routes must account for shipping lanes, fishery activities and environmental impact.

(From left) Dr. Subir Sen, Powergrid; Prabir Kumar Dash, MNRE; and Dr Arul Shanmugasundaram, Ayana Power

Environmental and logistical concerns are particularly pronounced in offshore wind projects. Cable installation, for example, must navigate sea-floor mapping, cable burial and environmental impact on marine ecosystems. Moreover, offshore wind projects being set up in India require specialised technology to withstand the country's relatively low wind speeds. While Tamil Nadu benefits from a more favourable wind profile, Gujarat's offshore sites may struggle with lower wind availability, necessitating further adaptations in turbine design. It is important to develop a robust local supply chain to minimise dependence on imported components. An indigenous supply chain would potentially reduce project costs and increase the sector's resilience against global price fluctuations.

Financing and investment appetite

The discussion around the financial viability of offshore wind projects in India is pivotal. There are substantial concerns over high tariffs, even with the viability gap funding (VGF) scheme. For example, while Tamil Nadu and Gujarat are the initial target states, projected tariffs remain at Rs 5.5-Rs 6 per kWh, which could deter investors unless competitive offtake agreements are secured. Although government-backed power purchase agreements could help offset developer risk, the high tariff rates continue to challenge the sector's bankability. MNRE has opted for VGF to address the cost gap and ensure tariff stabilisation. The issue of financing is further compounded by global supply chain disruptions and increased interest rates in recent years, leading to heightened costs for wind turbine manufacturers and developers. Companies have faced substantial financial setbacks due to volatile conditions. From an Indian perspective, both infrastructure readiness - such as port availability and transmission capabilities - and environmental clearances must be addressed to attract substantial investments from domestic and international players.

Future prospects and strategic direction

India's offshore wind sector holds considerable promise, with the government committed to providing risk-mitigation frameworks that encourage private investment. Initiatives such as the VGF scheme and commitments to cover a substantial portion of upfront risk underscore this obligation. The government intends to support grid connectivity till offshore substations, a significant cost-saving measure that could cover nearly 25 per cent of the capex. Sustained government support and investment could eventually drive down costs in the offshore wind sector. ■

Building Capability

Skill development for transmission

The session on "Skill Development for Transmission" featured a panel discussion between Dr Yatindra Dwivedi, Director (Personnel), Power Grid Corporation of India (Powergrid); and Dr V.K. Singh, Chief Executive Officer, Power Sector Skill Council. The discussion focused on the skill requirement in the power transmission sector, Powergrid's initiatives for skill enhancement and the future outlook…

India stands at a unique juncture, where it has the potential to become a global hub for skilled manpower, especially in the power sector. The demographic dividend – a young, growing population – offers an opportunity to build a skilled workforce. While technology has streamlined many operations, new skills are constantly needed to replace obsolete ones. In fact, what information technology replaced in 20 years, artificial intelligence (AI) and machine learning (ML) are set to replace in just two. Notably, the transmission sector, a critical component of the power ecosystem, is undergoing rapid transformation, driven by unprecedented growth in electricity demand, the integration of renewable energy and technological advancements. To meet the challenges of this rapidly evolving landscape, skill development of the workforce in transmission has become more crucial than ever.

Skill requirements

The transmission sector's rapidly changing landscape requires a workforce that is adaptable and technically proficient. The timeline for completing power projects has shortened considerably – from four to five years for thermal projects and six to ten years for hydro projects, to just one to two years for renewable energy projects. Consequently, transmission evacuation systems must also evolve swiftly. This demand for agility has reshaped skill requirements across the sector. There is a need to build a workforce that can adapt to these fast-paced changes. Traditionally, transmission companies would build this over a period of three to four years. However, the timeline has now been narrowed to one and a half to two years. As a result, the future skill set needs of the sector are changing significantly. Moreover, the workforce needs to be trained in emerging technologies such as AI, ML, data analytics and internet of things.

Dr Yatindra Dwivedi, Powergrid (left); and Dr V.K. Singh, Power Sector Skill Council

The integration of renewable energy into the grid brings its own set of challenges, such as variability and intermittency. The workforce now needs to be trained in managing these fluctuations, as well as in handling new technologies such as energy storage systems and high voltage direct current systems. Offshore wind energy, which requires unique expertise in sea cable laying, platform setting and interconnection, represents another frontier where specialised skills are essential.

One of the challenges in skilling the workforce is retention. Given that transmission projects are often located in remote areas, retaining workers there can be difficult, leading to high attrition. However, with the implementation of suitable policies to support the workforce, the attrition rate can be significantly reduced.

Powergrid's initiatives

Recognising the importance of skilling, Powergrid has taken various steps to address skill gaps. Through initiatives such as the Pradhan Mantri Kaushal Vikas Yojana and state-level skill development schemes, Powergrid is providing adequate training to the workforce. Notably, Powergrid's skilling initiatives extend beyond their own workforce. It has established skill development centres in regions such as Malda in West Bengal and Bihar to train unemployed youth in transmission line erection and other technical skills. These initiatives not only provide job opportunities for young people, but also ensure that Powergrid's subcontractors have access to a skilled labour pool. Powergrid is also working closely with leading educational institutions such as the IITs, ITIs and other technical schools to further expand its skilling initiatives. The PowerGrid Academy of Leadership in Manesar is a state-of-the-art training facility for Powergrid's employees as well as a training hub for workers from state utilities and foreign countries.

The way forward

As India's transmission sector experiences unprecedented growth, the demand for a skilled and agile workforce is increasing rapidly. With the growing automation, AI and renewable energy integration, the skills required to manage these new technologies will be in high demand. ■

Words of Appreciation

Comments and commendations from the industry

"The event brought together the best minds in the power transmission sector – utilities, policymakers, developers and technology providers – and offered a unique platform for exchanging ideas, exploring the latest innovations, and addressing the key challenges facing the sector. From engaging discussions to insightful masterclasses and CEO roundtables, the event was a true highlight of the power industry calendar. We are excited to have been a part of the conversation shaping the future of power transmission."

"It was a pleasure indeed participating in TransTech, a well arranged and superbly organised seminar and exhibition."

"Congratulations on the success of *Power Line*'s inaugural TransTech event. Conversations on industry-specific topics will help shape the future of our sector and foster collaboration among industry stakeholders. Many thanks for providing us the opportunity to forge meaningful connections. Looking forward to more such collaborations and engagements."

"I would like to thank the India Infrastructure team for providing an excellent platform like TransTech to network with CXOs and showcase our capabilities. It was indeed a rare exhibition and conference where the visitors were the decision-makers and were genuinely interested in exploring digital technologies. The speakers at the conference, the delegates at the workshop and the decision-makers at our booth made the event a success!"

"What an incredible three days, filled with innovation, insights and networking! We showcased cutting-edge solutions, connected with industry experts, and explored the trends shaping the transformation of technology. A big thank you to everyone who visited our stall, engaged in insightful discussions and shared their thoughts with us. We are excited about the journey ahead and the new opportunities that this event has opened up for us."

"Our team had a fantastic experience in engaging with key industry leaders and showcasing our expertise in power transmission and engineering solutions. We were honoured to host visits from Shri R.K. Tyagi, CMD, and Shri V.R. Mohan Burra, OSD (Projects), Power Grid Corporation of India Limited (Powergrid), and Shri A.K. Rajput, Member (Power Systems), Central Electricity Authority, among many other distinguished guests."

"I would like to thank *Power Line* for its immense contribution and energy in holding this successful conference and exhibition, involving all power technocrats on such a massive scale."

"Conducting these 21 sessions is no small job; it's a super hero effort. Punctuality being maintained is something that I love about *Power Line*; no nonsense, get down to the work. Very precise, very professional. This is not only about a conference and exhibition; you are contributing to nation building. And in 2025, I am sure you will do even better. Not just the whole country, the world is watching."

"We had the privilege of meeting esteemed delegates from various organisations including the Federal Ministry of Power Nigeria; Tanzania Electric Company; Shri R.K. Tyagi; Smt. Manju Gupta, ED, Powergrid; Shri Nihar Raj, Senior VP, Adani; the Torrent Power team; and the GTTPL, AEGCL, GETCO, KPTCL, MSETCL, TGTRANSCO, DTL and DVC delegates."

"It was a great show and a grand success. Very well organised!"

"I would like to compliment and congratulate you for creating this platform wherein the industry and policymakers could collaborate and exchange ideas towards powering India's transition through transmission."

"Congratulations on organising an excellent programme. It was indeed a great pleasure to participate in such a wonderful conference and visit the excellent exhibition. Thank you very much for giving me the opportunity to be here."

"Thanks for delivering a great event. We had a good response at the booth. Please extend my congratulations to the TransTech team. It is a huge achievement."

"TransTech India was truly remarkable in bringing together key stakeholders from utilities, transcos, policymakers, regulators, EPC contractors, developers, technology providers, equipment manufacturers and service providers under one roof.

Many thanks for sharing the presentations and links to the videos of the sessions. They will be a great resource for us. Thank you for the opportunity to participate in the panel discussions. The platform provided us a high-level opportunity to engage in meaningful discussions on trends, developments, challenges, and opportunities in the transmission sector.

I would like to compliment the entire team for their excellent coordination throughout the event. From the quality of the food to the accommodation of requests at short notice, seamless registration and overall courtesy – everything was executed flawlessly. We are already looking forward to the TransTech India event next year and hope to continue being a part of this remarkable forum."

"TransTech 2024 has been a tremendous event for us. With great footfall and insightful interactions, we are all set for what will be another entry to the new dynamics in the power industry."

"The event, which was graced by many top dignitaries from the power transmission and distribution sector, showcased the latest innovations and advancements driving the future of T&D. Our team had the privilege of engaging with industry leaders, exchanging ideas and exploring new opportunities."

"TransTech India 2024 provided interesting insights into the evolving power transmission sector, highlighting both exciting growth opportunities and pressing challenges such as right of way, emissions and talent acquisition."

"It was an amazing experience. The Yashobhoomi complex is on par with international standards. The conference had a good quality keynote address, as well as panel discussions, technical presentations and masterclasses. The masterclass on the PLS family of software products was most interesting. Many companies had put up stalls to showcase their products. Apart from everything else, it was an interesting opportunity to meet people and network."

"The event brought together a diverse exhibitor profile, including transmission utilities, technology providers, EPC contractors, equipment manufacturers and service providers. I also had the pleasure of connecting with experts, discussing the future of power systems, and exploring how we can contribute to this ever-evolving industry."

"TransTech India has provided an excellent platform for exchanging ideas and insights among policymakers and leaders from national transmission entities such as Powergrid, CTUIL and CERC, as well as various state transmission utilities and representatives from the private corporate sector."

"Honoured to have been a part of the main panel at TransTech India 2024, where we delved into the critical topic of renewable energy evacuation and its environmental impact. There were exciting discussions on the future of sustainable energy and the steps that can be taken to ensure a greener tomorrow."

"Excited to have been a part of TransTech India 2024, where we showcased our product, Optical Ground Wire for the Transmission and Distribution industry. A very big thank you to Mr R.K. Tyagi for showing special interest in our products for the Make in India initiative. And a special thanks to Mr Upendra Pande, MD, GETCO, for the encouragement."

"It was a full house at our Workshop on Powerline Systems! The participants gained insights into the new features in PLS-CADD, Tower and PLS-POLE during the TransTech India 2024 event."

"A huge thank you to everyone who visited our booth. We had a fantastic time showcasing our power and energy transmission solutions and connecting with industry leaders. We are excited to continue empowering industries for a brighter future."

"We shared our solutions for power transmission design and analysis of projects and showcased how digital twins will be an enabler for accelerated project delivery."

"A heartfelt thanks to all the visitors who stopped by our stall! We are excited to have been a part of this wonderful event. Your interest and engagement made it truly memorable. Looking forward to future collaborations."

"It was a pleasure to share my thoughts at TransTech 2024. In this era of renewable energy where power plants are commissioned within a few months, implementing transmission projects in alignment with these projects is a huge challenge."

"We had the pleasure of connecting with industry leaders and showcasing our cutting-edge innovations. A big thank you to everyone who stopped by our booth – your interest and engagement made it a great day. Excited for what's to come!"

"Overall, TransTech India 2024 was an invaluable learning experience. It provided a comprehensive overview of the Indian power transmission sector and its future direction. I am grateful for the opportunity to attend and network with industry peers."

Snapshots from the Event


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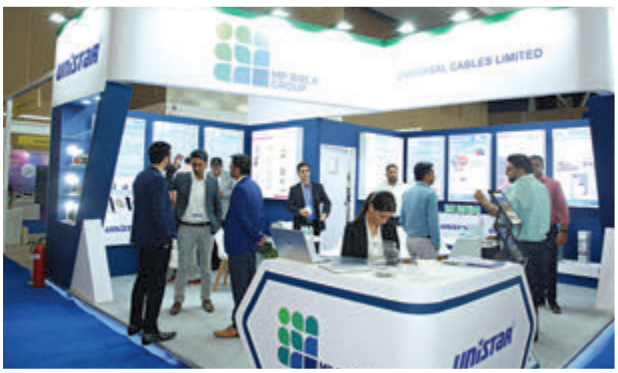
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