Towards a Connected Ecosystem

Equipment manufacturers' views

The power sector is entering a new phase, driven by rising electricity demand, rapid renewable capacity addition, and the need for greater grid flexibility and reliability. This is creating significant opportunities across transmission expansion, reconductoring, energy storage, grid modernisation and digitalisation. However, equipment manufacturers continue to face challenges related to execution delays, skilled manpower, supply chains, cost competitiveness and evolving technology. Leading equipment manufacturers share their views on the sector's performance and highlight opportunities…

What is your perspective on the current state of the power sector? How has the sector evolved over the years?

Manish Agrawal

The sector is witnessing a fundamental shift from building generation capacity to integrating, transmitting and balancing it. Over the past decade, India has expanded its power generation capacity, strengthened grid reliability and accelerated the transition towards cleaner energy. Installed generation capacity has reached 552 GW, with non-fossil sources accounting for 53 per cent, achieving the 2030 commitment over five years ahead of schedule. Electricity access and consumption have also increased, with 28.6 million households electrified and per-capita electricity consumption reaching 52.6 per cent.

A major milestone was the creation of the One Nation–One Grid–One Frequency system in 2013. This unified regional grids, enabling greater flexibility in moving power across regions and better utilisation of generation resources. Today, this is supported by a transmission network spanning 510,814 ckt km, with a transformation capacity of approximately 1,492,896 MVA.

With the power system expanding and evolving, electricity demand is becoming increasingly dynamic, driven by manufacturing, urbanisation, electric vehicles, data centres and digital infrastructure. The next phase is the green and digital transformation of the grid. Rapid renewable deployment, energy storage, smart metering and round-the-clock renewable solutions are reshaping power system planning and operations. The scale of this transition is evident: between H1 2024 and H1 2026, electricity demand increased 7 per cent, or around 63 TWh, with the entire increase met by clean energy. During the same period, India added 77 GW of solar capacity, accounting for around 60 per cent of the increase in electricity demand.

The focus is shifting beyond adding megawatts to building a grid that integrates diverse energy sources, manages variability, and reliably delivers power where and when required. Land and right-of-way (RoW) constraints also make maximising existing infrastructure increasingly important, driving demand for technologies such as reconductoring and advanced conductors to unlock greater power transfer capacity. Hence, transmission is a critical enabler of India's energy transition, requiring not only expansion but greater efficiency, resilience and flexibility. Seamlessly moving power from renewable-rich regions to demand centres



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will be central to India's next phase of economic and energy growth.

Vimal Kejriwal

The Indian power sector has undergone a fundamental transformation. We have moved from an era where the primary objective was to generate more power and extend electrification to an era where we are building a high-capacity, reliable, flexible and increasingly intelligent power system.

One of the clearest signs of this evolution is the transmission network. We have progressively moved towards higher voltage systems, with 400 kV and 765 kV transmission becoming critical for moving large volumes of power over longer distances. As renewable generation grows, it is increasingly being developed in resource-rich regions that are often far from consumption centres. This is making the grid more complex, with transmission infrastructure spanning diverse terrain and carrying larger volumes of power over longer distances. The focus, therefore, is not only on power evacuation, but also on ensuring grid stability, reliability and resilience.

This is driving the adoption of technologies such as HVDC, STATCOMs, FACTS, digital substations and advanced grid-management systems. In urban and densely populated areas, where RoW is constrained, underground EHV cabling and GIS solutions will become increasingly important.

At the same time, the nature of electricity demand itself is changing. India's economic growth, industrialisation and urbanisation are creating new demand centres, including data centres, which require large amounts of reliable and high-quality power. This is adding another dimension to the country's power infrastructure requirements.

India is now moving towards more than 900 GW of non-fossil capacity by 2035, with the approval of Rs 1.86 trillion Green Energy Corridor to evacuate 135 GW of renewable power in India. Therefore, the power sector is no longer simply about generating and transmitting more electricity. It is about creating an energy ecosystem that can generate, evacuate, store, balance and deliver large volumes of clean power reliably.

At KEC, we see this transformation across the value chain. The grid of the future will be higher voltage, more connected, more digital, more flexible and significantly more complex. That is the transformation we are preparing for.

B.C. Rajesh

India's power sector today is exceptionally vibrant, with growth unfolding across multiple dimensions. What makes this phase particularly significant is that energy security and energy transition are no longer competing priorities; they are being pursued together to support India's long-term economic ambitions. The sector is responding simultaneously to structural growth in electricity demand, rapid renewable capacity addition and the need for dependable and increasingly flexible, dispatchable generation. India has already achieved a major milestone, with non-fossil sources accounting for over 50 per cent of installed capacity. The focus is now shifting to scaling this further, with the government targeting 500 GW of non-fossil installed capacity by 2030.

At the same time, the system is strengthening conventional generation capacity, with nearly 47 GW of thermal capacity under construction. This will be important in meeting demand arising from sustained GDP growth, industrialisation, electrification and new demand sources such as data centres, electric mobility and other emerging loads, while also addressing challenges around transmission constraints, grid flexibility and energy storage. These are critical to unlocking the full value of the substantial renewable energy capacity being created. An important point is that the transition in installed capacity is moving faster than the transition in generation.

Overall, the Indian power sector is entering a period of unprecedented scale, where adding capacity, strengthening reliability and accelerating the transition towards cleaner generation will all have to happen together.

Udai Singh

India's power sector is at an important inflection point. The conversation is no longer only about adding generation capacity. It is increasingly about how we build a power system that is flexible, resilient and intelligent enough to support the next phase of India's growth. Electricity demand is rising rapidly, driven by industrialisation, urbanisation, data centres, cooling and wider electrification. At the same time, the growing share of renewables is changing how power is generated and consumed. This makes flexibility, storage, grid modernisation and demand-side management increasingly important.

In my view, the next challenge is not simply generating more electricity. It is moving, managing and optimising electricity efficiently. That means stronger transmission and distribution infrastructure, smarter grids, battery energy storage systems (BESS), advanced automation and digital technologies. This is where the sector has evolved significantly. We are moving from a largely one-way system of generation, transmission and consumption towards a more connected ecosystem where generation, storage, grids and consumers interact dynamically.

The opportunity ahead is therefore not just to build more power infrastructure, but to make the entire system smarter, more efficient and more resilient.

What are the biggest opportunities in the segment?

Manish Agrawal

The transmission segment is entering a strong multi-year growth phase, driven by grid expansion and infrastructure modernisation. Globally, the transmission line market is expected to grow at around 5.2 per cent compound annual growth rate (CAGR) through 2034. In India, transmission line additions are

expected to increase 1.3x by 2032, while transformation capacity is expected to nearly double. A Rs 9.15 trillion transmission investment pipeline provides strong visibility for sustained demand.

We see a particularly significant opportunity in reconductoring and grid modernisation. The global transmission line reconductoring market is expected to grow at an approximately 8.5 per cent CAGR between 2025 and 2030, with India expected to grow at around 15-17 per cent. As existing transmission corridors become increasingly constrained, utilities are looking for ways to increase power transfer capacity without acquiring additional RoW. Reconductoring can help narrow the requirement for new transmission corridors and maximise the utilisation of existing RoW, reducing land-related challenges and enabling faster capacity augmentation. This creates two distinct opportunities: uprating and upgrading existing transmission lines.

Another emerging opportunity is insulated cross-arm monopoles. In cities and densely populated areas, these compact structures can help utilities optimise constrained corridors while meeting Central Electricity Authority (CEA)-mandated safety clearances. Combined with HTLS conductors, they enable greater power transfer without requiring additional RoW, creating a significant opportunity for HTLS conductor manufacturers. On the transformer side, the increasing focus on higher efficiency and reliability is creating opportunities for advanced conductor technologies.

The evolution towards ultra-high voltage direct current, ultra-high voltage alternating current, extra high voltage, and smart-grid infrastructure is another important growth driver, as utilities focus on improving grid efficiency, reducing transmission losses and accelerating renewable energy integration.

At APAR, we have been preparing for this opportunity through sustained investments across our manufacturing, supply chain and technology capabilities. Our focus has been to build the capacity, resilience and technology portfolio required to support the next phase of transmission growth. Importantly, our product development roadmap is closely aligned with the evolving needs of the power sector. We continue to introduce advanced conductor technologies, including high efficiency conductors, HTLS, coated conductors and other high-performance solutions, enabling higher ampacity, lower transmission losses and greater grid efficiency, while supporting faster project execution.

Sustainability is becoming an increasingly important dimension of the transmission opportunity. We are developing lower-carbon solutions using green aluminium and recycled-content ultra green aluminium, while strengthening carbon accounting and renewable energy use across operations. APAR's ESG-driven portfolio, including CTC, PICC and ACCC-ULS conductors, further supports grid efficiency, lower losses and longer asset life.

Overall, we see significant opportunity across new transmission capacity, reconductoring, grid modernisation, advanced conductor technologies and lower-carbon transmission solutions.

Vimal Kejriwal

India's energy transition is creating growth opportunities at multiple points across the energy value chain.

On the generation side, renewable energy will continue to scale rapidly across solar, wind and hybrid projects. But as the share of variable renewable energy increases, the next set of requirements will be around energy storage, grid balancing and flexibility, creating significant opportunities in battery energy storage systems (BESS), pumped storage and other balancing solutions.

There is also a significant opportunity in transmission and grid modernisation. Renewable resources are often located far from consumption centres, requiring high-capacity transmission corridors, pooling substations, HVDC systems and advanced technologies such as STATCOMs to maintain grid stability.

At the same time, new and growing demand centres such as data centres, manufacturing facilities, electrical vehicles, metro systems and other large infrastructure projects will require reliable, high-quality and increasingly cleaner power.

For companies like KEC, this creates opportunities not only to build individual assets, but to participate across multiple stages of the energy transition. The real opportunity is to build the infrastructure that connects clean energy generation with the new centres of energy consumption and enables the entire system to work reliably.

B.C. Rajesh

India's energy sector is at an inflection point. With electricity demand expected to grow at an average 6.4 per cent annually through 2030, and peak demand having already reached 270 GW, the scale of opportunity is expanding across the entire energy ecosystem. We are simultaneously pursuing two strategic priorities – strengthening energy security and accelerating the transition towards cleaner generation. The numbers themselves tell the story: over 47 GW of thermal capacity is currently under construction, while India has already crossed 300 GW of non-fossil capacity. Alongside this, there is an opportunity to develop nearly 400 GWh of energy storage, comprising BESS and pumped storage, by FY 2032, and a growing role for nuclear to meet 100 GW by 2047.

But the opportunity is not only about adding capacity. It is equally about delivering higher efficiency, greater reliability, lower emissions and better asset performance through advanced technologies and digital solutions such as Edge Live™ deployed at scale.

The challenge before us, therefore, is not a shortage of opportunity. It is our collective ability to execute with speed, scale and certainty. In my view, the real question for all of us as stakeholders in the sector is:

Can we collectively rise to the challenge and respond to the scale and speed of demand that India is creating? And equally important, how do we come together, synergise our capabilities, bridge execution gaps and convert this unprecedented opportunity into sustainable outcomes for the sector and the country?

Udai Singh

The biggest opportunity is to build a smarter, more flexible grid that can support India's rapid electrification and renewable energy growth. As electricity demand rises and renewable generation expands, the power system will need to become more responsive and better integrated. This creates opportunities across grid modernisation, energy storage, digitalisation and automation.

Transmission and distribution infrastructure will require real-time monitoring to manage changing demand patterns and integrate distributed energy resources. BESS and pumped hydro will become increasingly important in providing flexibility and reliability. Digital technologies can further strengthen the system through smart grids, digital substations, advanced energy management and predictive asset management.

At the same time, new loads such as data centres, electric vehicles and industrial electrification are creating fresh opportunities to rethink how electricity is supplied and consumed. So, the opportunity is not simply to build more infrastructure. It is to make the infrastructure we have, and the infrastructure we add, smarter, more flexible and more efficient.

What are the key challenges facing equipment providers and manufacturers?

Manish Agrawal

- **Metal price uncertainty:** Volatility in aluminium, copper and steel prices can impact margins due to their significant share in manufacturing costs. However, our strong sourcing capabilities, long-standing supplier relationships, disciplined inventory management and efficient procurement help mitigate these risks. Appropriate commercial mechanisms further provide flexibility to manage price fluctuations.
- **Export competitiveness:** Chinese manufacturers have significant scale and cost advantages, creating pressure in price-sensitive international markets. Indian manufacturers can strengthen competitiveness through cost efficiency, product quality, technology, execution and customer relationships. We see opportunities through greater scale, supply chain localisation, product innovation and deeper presence in markets where reliability and quality matter.
- **RoW challenges:** A key challenge is the availability of RoW for new transmission corridors. Land acquisition, environmental clearances and coordination with multiple stakeholders can extend project timelines, affecting transmission execution and the timing of equipment demand.
- **Shortfalls in T&D expansion:** Despite strong planned investments, transmission and distribution (T&D) capacity additions have consistently lagged targets, with transmission line additions achieving only 58 per cent of the FY 2025 target and 78 per cent of the FY 2026 target. Key constraints include land acquisition, RoW challenges, material supply issues and execution bottlenecks. These delays can create a mismatch between generation and transmission capacity, particularly affecting the evacuation of renewable power.
- **Manpower constraints:** As the power sector becomes more technology-intensive, demand is rising for skilled talent across engineering, manufacturing, project execution and digital grid technologies. The key challenge is ensuring that the workforce has the technical and project-management skills needed for increasingly complex transmission and grid-modernisation projects.

Vimal Kejriwal

The challenge today is that demand is strong, but the complexity of that demand is also increasing.

Equipment manufacturers are operating with high capacity utilisation and, in several areas, longer lead times for critical equipment. Expanding manufacturing capacity requires significant investment, but these decisions need long-term visibility because investments in facilities, technology, supply chains and skilled manpower are substantial.

At the same time, the technology landscape is evolving rapidly. The grid is moving towards HVDC, STATCOMs, FACTS, digital substations, automation and advanced power electronics, while the energy transition is creating new requirements in areas such as BESS and hybrid energy systems. Manufacturers therefore need to invest not only in capacity, but also in engineering, R&D, technology, digital capabilities and skills.

Another important challenge is RoW. Large transmission projects often cross multiple states and diverse terrain, and delays in securing RoW can have a direct impact on project schedules. Even when equipment is manufactured and ready for dispatch, the inability to make the site available on time can affect the entire execution cycle. Better coordination between the centre, state governments and various local agencies can significantly improve the pace of approvals and RoW clearances and help projects move closer to their planned timelines. There are also challenges around commodity price volatility, supply chain resilience, project execution and the long project cycles typical of the power sector.

The key is therefore to build capacity at the right pace while maintaining financial discipline, strengthening supply chains and continuously investing in technology and capabilities. India is entering a multi-decade energy transition. Our manufacturing and execution ecosystem has to evolve at the same pace, with greater capacity, stronger technology capabilities, faster project clearances, resilient supply chains and a workforce equipped

for the technologies of the future.

B.C. Rajesh

The key challenge comes from the surge in demand, both in India and in overseas markets, while customers continue to expect competitiveness on price, delivery and performance. This is further amplified by the fact that capacity creation across talent, capex, supply chains and infrastructure has been far more incremental than the growth in demand.

Over several decades, high-quality talent has migrated from core engineering disciplines such as civil, mechanical, electrical and instrumentation to sectors such as information technology (IT). Rebuilding this depth of capability will take time. At the same time, the workforce is increasingly shifting away from farming, manufacturing and construction towards gig-economy opportunities around urban centres. Together, these trends are putting pressure on the availability of skilled manpower in manufacturing, fabrication and construction, all of which are critical to delivering end-to-end infrastructure solutions.

These structural challenges are compounded by import dependency, foreign-exchange volatility and uncertainty in freight and logistics arising from geopolitical disruptions. For equipment providers and manufacturers, the task is to balance rising demand and growth aspirations with a continued focus on operational excellence, talent development, and the adoption of emerging technologies to improve productivity and achieve right-first-time execution.

Going forward, capacity planning, measured bets, stronger planning and risk-mitigation disciplines, and a significant improvement in our say/do ratio will become critical determinants of success.

Udai Singh

The biggest challenge is balancing cost competitiveness with rapid technology evolution, while moving from an equipment-led business to an integrated solutions and lifecycle model. The market is becoming more competitive, with increasing pressure on pricing, while customers are simultaneously looking for greater value, reliability and shorter deployment timelines. Technology is also evolving quickly. Manufacturers need to keep pace with renewables, BESS, digitalisation and new-generation electrical technologies, while continuing to support the large installed base of conventional equipment.

Supply chains present another challenge. Localisation is becoming increasingly important, but it needs to be balanced with quality, capacity, cost competitiveness and resilience. At the same time, customer expectations are changing. The requirement is increasingly for integrated solutions that bring together equipment, software, automation and lifecycle services rather than standalone products.

Finally, the industry needs the right skills to execute this transition, particularly across digital technologies, grid modernisation and advanced power systems. The companies that can combine strong manufacturing capabilities with technology, execution and lifecycle expertise will be better placed to support this transition.

What is your policy wishlist?

Manish Agrawal

Our policy wish is to address a pressing challenge facing India's power ecosystem: How can every kilometre of the transmission and distribution network deliver greater capacity, reliability, digital capability and value, with minimal additional RoW and maximum domestic value addition?

India's overhead conductor industry is emerging as a globally competitive sector with world-class manufacturing and growing technological depth. Overhead conductors should therefore be viewed not simply as commoditised line hardware, but as the most critical enablers of the future grid.

- **Enhancing export competitiveness through RoDTEP:** The current remission of duties and taxes on exported products (RoDTEP) rates do not fully offset the embedded taxes and costs across the manufacturing value chain, affecting the export competitiveness of Indian cable and conductor manufacturers, particularly against Chinese suppliers. Strengthening RoDTEP support would help Indian manufacturers retain existing markets and expand their global footprint. Some proposed policy interventions include reviewing and upwardly revising RoDTEP rates for conductor tariff lines to better reflect the embedded taxes and costs in the manufacturing and logistics value chain. In addition, as an interim measure, additional export incentives of 3–4 per cent can be considered for a limited period of 1–2 years, to help Indian manufacturers compete effectively in price-sensitive international markets.
- **Strengthening Make in India through higher minimum local content:** HTLS conductor manufacturing is a specialised, technology-intensive process involving advanced materials and precision engineering. A focused, time-bound increase in minimum local content (MLC) would encourage domestic capabilities, indigenous research and development, and skilled employment while maintaining globally competitive quality. At present, the MLC requirement for both conventional and HTLS conductors is 60 per cent. Given the demonstrated capabilities of the domestic industry, it is proposed to increase MLC to 100 per cent for conventional and steel-core HTLS conductors, and to 80 per cent initially for carbon-composite-core HTLS conductors, with a defined roadmap for further enhancement as domestic capabilities develop.
- **Encouraging loss capitalisation:** Regulatory frameworks and tendering practices should give greater weight to transmission efficiency and lifecycle losses, rather than predominantly upfront conductor costs. This would encourage lower resistance, low-loss technologies, even with a modest initial premium, supporting more effi-

cient transmission infrastructure.

- **Fast-tracking free trade agreements:** While the India-UK Comprehensive Economic and Trade Agreement was signed in 2025, building on this momentum, similar agreements with the EU and South America could further expand market access and strengthen Indian conductor manufacturers' competitiveness.
- **Capitalising on existing transmission corridors through reconductoring:** India can unlock additional transmission capacity by reconductoring existing corridors with high-ampacity, low-loss conductors, reducing new RoW requirements, project timelines and infrastructure needs while accelerating renewable-energy integration. A National Reconductoring Framework could identify suitable corridors and establish technical, economic and planning criteria, with preference for maximising existing corridors before creating new RoW wherever technically feasible.
- **Enhancing the PSDF's role in reconductoring and T&D projects:** The Power System Development Fund (PSDF) should be regularly replenished and progressively expanded to support priority projects. A stronger fund could accelerate reconductoring and broader T&D projects, improving grid reliability and facilitating the integration of rising renewable capacity.

Vimal Kejriwal

My policy wishlist is fundamentally about creating long-term certainty and a stronger ecosystem for investment, innovation and execution.

The power sector requires significant investments in manufacturing capacity, advanced technologies and skilled manpower. For these investments to happen at scale, the industry needs policy stability and visibility of demand over the long term, rather than visibility limited to the next bidding cycle.

We also need a balanced contractual framework, where risks relating to RoW, statutory approvals, supply chain disruptions, force majeure and scope changes are allocated fairly across the ecosystem. At the same time, stronger coordination between the centre, states and multiple agencies can help improve approvals, RoW and project execution timelines.

For critical power infrastructure, I believe procurement also needs to look beyond the lowest initial cost. Quality, reliability, safety, technology, lifecycle performance and total cost of ownership are equally important when we are building infrastructure that will serve the country for decades.

Finally, India has a significant opportunity to emerge as a global manufacturing and export hub for power and energy infrastructure. We should continue building indigenous capabilities in areas such as HVDC, STATCOMs, energy storage and other advanced grid and clean-energy technologies, while creating an ecosystem that enables Indian companies to compete globally.

If we can create long-term visibility, enable fair risk-sharing, improve execution, focus on lifecycle value and continue investing in technology, India can build not only the energy infrastructure required for its own growth, but also a globally competitive power and energy equipment ecosystem.

B.C. Rajesh

On the policy and regulatory front, India has been agile and responsive to the evolving needs of the power sector. This is visible in measures such as enabling thermal assets to move from traditional baseload operation towards greater flexibility and cyclic operation, and providing policy support to BESS and storage, including customs-duty measures and storage obligations. The CEA's framework already requires coal-based thermal units to progressively operate at lower technical loads to support greater renewable integration.

The Shanti Act, 2025 is another important step, creating an enabling framework for nuclear energy to play a larger role in meeting India's growing electricity requirement while supporting its clean energy ambitions. The government has also set a target of reaching 100 GW of nuclear capacity by 2047, including wider participation from the private sector under the new framework.

Going forward, stronger policy and governance support could further accelerate the execution of transmission projects, strengthen the grid and reduce renewable curtailment. There is also an opportunity to deepen policy support for domestic manufacturing, encouraging capacity creation across critical equipment and supply chains, reducing import dependence and strengthening India's position as an export hub.

Udai Singh

India has made significant progress in building the policy architecture for the next phase of power sector growth. The Draft National Electricity Policy 2026, the Electricity Amendment Rules 2026, and policy support for battery storage are important steps in that direction. The Electricity Amendment Rules bring greater clarity to the group captive renewable model, while battery storage is increasingly being recognised as an integral part of the power system. The Rs 5,400 crore VGF scheme for BESS is another important step towards building storage at scale. The progress is also visible on the ground. Nearly 6 crore smart meters have been installed, signalling a significant push towards modernising distribution infrastructure and improving network efficiency.

So, my policy wishlist is actually quite simple. We need to convert policy intent into execution at pace. The technology is available, the policy direction is becoming clearer and the infrastructure is being built. The next priority should be faster implementation, stronger coordination across the ecosystem and, importantly, consistent enforcement. The next phase of India's power sector transformation will be defined not only by the quality of policy, but by the speed and discipline of execution. ■