BHARAT ELECTRICITY SUMMIT 2026
POWERING A CLEAN FUTURE

UNDER THE PATRONAGE OF
GOVERNMENT OF INDIA
MINISTRY OF POWER
सत्यमेव जयते

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Building an Energy Secure Future

Inaugural session

Bharat Electricity Summit 2026 opened at Yashobhoomi, New Delhi, on March 19, 2026. The high-profile event was inaugurated by Union Minister of Power Manohar Lal; Union Minister of New and Renewable Energy Pralhad Joshi; Minister of State for Power and New and Renewable Energy Shripad Naik; Pankaj Agarwal, Secretary, Ministry of Power; Dr R.K. Tyagi, Chairman and Managing Director, POWERGRID; and Ghanshyam Prasad, Chairperson, Central Electricity Authority.

Setting the tone for the event, **Power Minister Manohar Lal** highlighted the central role of energy in India's economic development trajectory, positioning electricity as a foundational enabler rather than a standalone sector. He underlined that the evolution of energy from traditional sources such as fire and coal to hydro, nuclear and renewables reflects both technological progress and the growing need for sustainable and scalable solutions.

India's ambition to become a developed economy hinges on the strength and reliability of its power sector. With the country already among the top global economies and aiming to move higher, adequate, affordable and accessible electricity will be critical to supporting industrial growth, exports and overall economic expansion.

The minister highlighted the rapid expansion of transmission infrastructure, with significant growth in network capacity over the past decade, improving grid stability and connectivity across regions. He also emphasised India's growing role in cross-border electricity trade with neighbouring countries such as Bhutan and Nepal, positioning it as a regional energy hub.

On the energy mix, he spoke about India's the dual approach of scaling up non-fossil fuel capacity while continuing to rely on conventional sources to meet rising demand. Renewable energy, particularly solar, will play a key role in the future energy landscape, supported by initiatives to enhance grid integration and transmission capabilities, including the development of advanced and potentially undersea transmission networks.

Looking ahead, he identified emerging demand drivers such as electric vehicles, data centres and artificial intelligence, which are expected to significantly increase electricity consumption. To address this, the government is planning significant capacity additions over the next decade, alongside continued investments in transmission infrastructure.

> "The energy transition must be pursued through coordinated planning, technological advancement and global cooperation, with the ultimate objective of ensuring reliable, affordable and sustainable power for all." – **Manohar Lal, Union Minister of Power**

He also underscored the importance of innovation and research, encouraging startups and young entrepreneurs to explore new frontiers in energy technologies, including unconventional concepts such as alternative energy conversion and wireless power transmission.

At a broader level, the minister highlighted India's objective to strengthen global collaboration in the energy sector. The energy transition must be pursued through coordinated planning, technological advancement and global cooperation, with the ultimate objective of ensuring reliable, affordable and sustainable power for all.

In his address, **Pralhad Joshi, Union Minister of New and Renewable Energy**, spoke about the evolving dynamics of India's energy transition and emphasised the importance of balancing renewable energy expansion with energy security and affordability. India has made significant progress in expanding its renewable energy capacity and he credited this progress to strong coordination across different segments of the power sector, including generation, transmission and policy support.

Joshi stressed that while renewable energy is the future, India's transition must remain pragmatic and balanced. Fossil fuel-based generation, particularly coal, cannot be phased out overnight, given the country's growing energy demand and the need for reliable baseload power. At the same time, the long-term direction of the sector is clearly towards renewable energy, which is the only sustainable pathway for meeting future energy needs.

Global geopolitical tensions and disruptions in fuel markets have reinforced the importance of building a self-reliant and diversified energy system. Conflicts and instability in various parts of the world often impact the availability and pricing of fossil fuels, making it essential for countries to accelerate the deployment of domestic renewable energy resources.

The minister drew attention to the decline in renewable energy costs over the past decade making renewable energy increasingly competitive with conventional sources. According to him, these cost reductions are strengthening the case for large-scale renewable deployment in India.

The government's efforts to ensure that clean energy growth is supported by domestic manufacturing and technological advancement. Going forward, the focus should be on scaling up manufacturing capabilities, strengthening supply chains and developing skilled human resources to support the expanding renewable energy ecosystem.

He also highlighted initiatives aimed at increasing citizen participation in the energy transition. Rooftop solar programmes and agricultural solarisation schemes are enabling households and farmers to generate their own electricity and contribute to the country's clean energy goals. He concluded by stressing that affordable electricity will remain central to India's development strategy, as it will support manufacturing competitiveness and drive long-term economic growth.

Shripad Yesso Naik, Minister of State for Power and New & Renewable Energy, discussed the rapid transformation of India's power sector and the country's growing leadership in the global energy transition. He observed that the summit's theme reflected India's broader journey of aligning economic growth with sustainability, while bringing together policy, technology, finance and innovation to accelerate the clean energy transition.

India's power sector has undergone a major transformation over the past decade. The country's installed power capacity has more than doubled since 2014, with more than 51 per cent now coming from non-fossil fuel sources. This progress enabled India to achieve one of its Nationally Determined Contribution targets ahead of schedule, demonstrating the country's commitment to climate action while sustaining economic growth.

The next phase of the transition will focus not only on adding capacity but also on strengthening the power system to support higher renewable penetration. The government is expanding transmission networks at an unprecedented pace while also scaling battery energy storage and pumped storage solutions. In addition, new market mechanisms such as virtual power purchase agreements are being introduced to unlock investments and stimulate demand for renewable energy.

Naik also drew attention to India's growing domestic manufacturing

ecosystem for clean energy technologies. The country has established 172 GW of solar module manufacturing capacity and 27 GW of solar cell capacity, strengthening India's role in the global renewable energy value chain.

He underscored the importance of citizen participation in the energy transition, noting that programmes such as the PM Surya Ghar Muft Bijli Yojana and PM KUSUM are enabling households and farmers to become energy producers, thereby making the transition more inclusive and participatory. He concluded that energy efficiency remains a central pillar of India's strategy, with every unit of energy saved effectively contributing to the country's sustainable growth pathway.

Pankaj Agarwal, Secretary, Ministry of Power, underscored the transformation of the electricity sector into a critical driver of economic growth, digitalisation and social development, noting that power is no longer a basic utility but a foundational enabler of competitiveness and inclusivity.

He noted that India is navigating a complex energy transition, balancing the traditional trilemma of energy security, affordability and sustainability, while also addressing the imperative of universal access. Delivering reliable and clean electricity at scale, remains a defining challenge, particularly given the country's rapid economic growth and rising demand.

Agarwal highlighted significant progress over the past decade, including the near elimination of peak power deficits, substantial capacity additions and accelerated growth in renewable energy. Solar power has played a pivotal role, supported by enabling policy frameworks, standardisation and cost competitiveness. India is increasingly emerging as both a major clean energy market and a manufacturing hub.

He also outlined the evolution of the grid into one of the largest synchronised systems globally, supported by advanced balancing mechanisms. On the distribution side, the deployment of smart technologies is enabling a more responsive and data-driven ecosystem. The next phase of sectoral growth will be driven not only by physical infrastructure but also by market and institutional reforms. Instruments such as time-of-day tariffs, demand response and energy storage will be critical to enhancing grid flexibility.

He further highlighted emerging demand drivers, including electric mobility, data centres and digital technologies, and the need to align consumption patterns with renewable generation to improve system efficiency. At the same time, he cautioned that the transition would require significant investments, estimated at about $2.2 trillion over the next two decades, alongside improvements in the financial health of the power sector value chain.

At a broader level, Agarwal emphasised the importance of global collaboration, positioning India as both a learner and a provider of scalable solutions. He called for actionable outcomes from the summit, including progress on distribution reforms, financial sustainability and infrastructure development, as well as long-term partnerships. He reiterated the government's commitment to building a resilient, sustainable and inclusive electricity system, while encouraging stakeholders to actively participate in this transformation.

Dr R.K Tyagi, Chairman and Managing Director, POWERGRID, emphasised the critical role of leadership in driving the growth of India's power sector and the integration of renewable energy into the grid. India's energy transition must remain both ambitious and balanced, ensuring sustainability while meeting rising demand.

The collaboration of policymakers, regulators, industry leaders, investors and global partners is essential for shaping the sector's future. The Bharat Electricity Summit 2026 serves as an important platform that brings these stakeholders together for a shared dialogue. He noted that such collaboration is critical to addressing the evolving needs of the power sector.

The electricity sector is expected to deliver scale, reliability and sustainability. Dr Tyagi highlighted that the key national reports on resource adequacy, transmission planning for large-scale non-fossil integration and the broader energy scenario demonstrate how India is planning and investing ahead to meet future requirements.

STRATEGIC CONFERENCE

Meeting the Electricity Needs of the Global South: Key catalysts for cross-border collaboration, investment and innovation

The session on "Meeting the Electricity Needs of the Global South: Key catalysts for cross-border collaboration, investment and innovation" featured remarks by H.E. Juma Daler Shafoqir, Minister of Energy and Water Resources, Tajikistan; H.E. Lyonpo Gem Tshering, Minister of Energy and Natural Resources, Bhutan; Shri Pralhad Venkatesh Joshi, Minister of Consumer Affairs, Food and Public Distribution and New and Renewable Energy, Government of India; Shri Manohar Lal, Minister of Power and Housing and Urban Affairs, Government of India; H.E. Hussain Ageel Naseer, Deputy Minister of Tourism and Environment, Maldives; and H.E. Pavel Sorokin, First Deputy Minister of Energy, Russian Federation. The session focused on global energy cooperation, renewable energy development and regional integration to sustainably meet growing electricity demand.

H.E. Juma Daler Shafoqir highlighted Tajikistan's large hydropower potential and its focus on regional energy integration, while emphasising the need for global cooperation, cross-border electricity trade and the gradual diversification of its energy mix into solar and wind.

He highlighted that Tajikistan currently ranks among the top six countries globally in the hydropower sector, with total hydropower potential estimated at around 120 GW, including pumped storage capacity. Building on this strength, he outlined that Tajikistan is continuing to prioritise hydropower development as a central pillar of its energy strategy.

Further, he stressed that the country is currently developing one of the largest hydropower projects in Central Asia, which is expected to play a key role in regional energy supply. According to him, this project will enable Tajikistan to export electricity not only within Central Asia but also to South Asia, thereby strengthening cross-border energy trade and cooperation.

He outlined that green electricity generated in Central Asia is expected to be exported to South Asia through upcoming interconnection projects. In this context, he stressed the importance of developing a regional electricity market, noting that all Central Asian countries are already connected through a common grid.

Going forward, he added that regional integration will be critical in unlocking the full potential of energy resources and ensuring optimal utilisation across countries. He also stated that Tajikistan is strengthening its engagement with South Asia, including India, and is working towards expanding physical and commercial energy linkages with the region. In addition to hydropower, he outlined that Tajikistan is increasingly focusing on diversifying its energy mix. Non-hydropower capacity, particularly solar and wind energy, will see significant development by 2040.

H.E. Lyonpo Gem Tshering highlight Bhutan's growing energy ambitions, centred on hydropower development and supported by strong bilateral cooperation with India, while outlining future capacity targets and increasing private sector participation.

He began his remarks by highlighting the close and mutually beneficial energy partnership between Bhutan and India, noting that the benefits of Bhutan's power generation are shared between the two countries in a cooperative framework. He outlined that Bhutan, despite being a small and landlocked country, possesses significant hydropower potential.

He emphasised that, with continued support from India, Bhutan has established an ambitious and structured energy roadmap for the coming decades. The country is targeting power generation of about 25,000 MW by 2040, of which approximately 20,000 MW is expected to come from hydropower and around 500 MW from solar energy. He further outlined interim milestones, including the addition of about 5,000 MW by 2029, followed by a scale-up to 10,000 MW, before reaching the 2040 generation target.

Notably, he stated that multiple power projects are currently under development and that Bhutan is in-

creasingly attracting foreign direct investment in both hydropower and solar energy. He noted the growing participation of major Indian companies such as the Tata Group, Adani Group, and also, recently, JSW Group, which are contributing to capacity expansion, technology deployment and infrastructure development in the country. He further stressed that Bhutan is witnessing a steady rise in domestic electricity demand, driven by the growth of new industries and economic activities. Despite this increasing demand, he underscored the strength and reliability of Bhutan's bilateral energy ties with India. The two countries maintain a complementary energy exchange system, wherein Bhutan exports surplus hydropower to India, while importing solar power from India during periods of excess generation.

Shri Pralhad Joshi highlighted India's renewable energy progress, particularly in solar power, as a scalable model for other countries. He underscored initiatives such as decentralised energy access, the expansion of domestic manufacturing and India's role in supporting the Global South through knowledge-sharing efforts.

He began his remarks by highlighting that India's renewable energy journey, particularly in the solar sector, represents a strong success story that could serve as a model for other countries, with necessary adaptations to suit local conditions. While acknowledging that each country faces its own challenges, he stressed that the overall concept and framework implemented in India have proven to be highly effective.

Further, he stressed that India is emerging as a key voice for the Global South. Through the International Solar Alliance (ISA), he outlined that India is actively sharing its technological expertise and experience with other countries. These initiatives include solarisation programmes and skill development efforts, tailored to the specific needs of each country. Moreover, he noted that the ISA has made significant progress in replicating India's solar success in other regions while adapting solutions to local requirements.

On the manufacturing front, Joshi outlined that India has made substantial progress in reducing dependence on imports. He noted that, about a decade ago, most solar modules were imported, whereas India has now developed significant domestic manufacturing capacity. Considerable progress has been made in the production of both modules and solar cells, with further expansion expected. This reflects India's move towards self-sufficiency across the solar supply chain, including modules, cells and upstream components such as wafers and polysilicon, with clear targets set for the coming years. He added that 50-60 per cent of wind energy equipment is already manufactured domestically. This growing self-reliance will not only meet India's own energy needs but also enable it to support other countries, particularly in the Global South.

Shri Manohar Lal highlighted that electricity, in particular, is the single most versatile instrument through which a nation transforms itself. It is not merely a commodity; it is a foundation of dignity, development and diplomacy. He pointed out that India's universal electrification is only a starting point and that, over the years, the nation has moved from basic electricity access to electricity adequacy and is now pursuing electricity abundance. The countries of the Global South, taken together, represent the single largest untapped energy market, the largest pool of renewable resources, and the fastest-growing electricity demand in the world.

He stressed that strong coordination, investments, technology sharing and resilient systems can rewrite the energy future. In order to achieve energy for everyone, there is a strong need for re-energising, revitalising and rethinking our approaches, which accordingly requires redesigning and redeveloping energy systems.

Lal underscored that India is developing long-term, non-transactional partnerships with neighbours like Bhutan, Nepal and Bangladesh through cross-border trade, transmission links, regulatory capacity building and joint grid planning. Further, he added that India is committed to being a global partner – not as a donor, but as an exporter and a fellow traveller that has faced the same roads, encountered similar difficulties, and found workable solutions. He expressed his confidence that the immensely rich discourse that India had today on the development of its energy infrastructure will surely be vital in the days to come as we forge new partnerships, scale new heights, traverse uncharted paths, and ensure the prosperity of the Global South.

H.E. Hussain Ageel Naseer spoke about the Maldives' phased journey toward 33 per cent renewable electricity, highlighting concrete achievements and a robust pipeline. He highlighted the strategic intent of the Maldives to reap mutual benefits from collaboration with India and intends to seek India's "highly relevant" experience to bridge gaps in their realistic, step-by-step approach. He emphasised India's critical role in offering expertise, technical know-how and proven success in solar-plus-storage through policies and private sector collaboration, which the Maldives sees as essential for accelerating research and scaling.

H.E. Pavel Sorokin discussed how geopolitical tensions have exposed the risks of energy supply dependence and acknowledged the need for diversifying markets and technologies amid global volatility. He noted that Russia has faced extreme volatility in recent years, which has hindered development while revealing a critical lesson: overreliance on a single energy source or technology is unwise in the long term. He emphasised that for Russia and its energy sector, the key takeaway is the value of trustworthy partners.

He pointed out that global investments in power generation and grids total about $1.5 trillion annually, with nearly half directed toward renewables – a sector growing naturally and sustainably, as it should. The focus, he said, should remain on real prices and consumer needs rather than

Industry Speak

What excites you the most about the power sector today?

What excites me the most is India's energy transition – a major, long-lasting electrification cycle driven by rising renewables, expanding transmission infrastructure and growing digitalisation. The need for reliable, affordable and sustainable energy solutions has never been greater. As a pure-play energy technology company with a pan-India presence, we are uniquely positioned to deliver solutions that advance energy security, self-reliance and the vision of Viksit Bharat 2047.

Guilherme Mendonca, CEO and MD, Siemens Energy India

What excites me the most about the power sector today is that we are in the middle of a structural, once-in-a-generation transformation. The rapid electrification of economies, the scale-up of renewable energy and the explosive growth of data infrastructure are fundamentally reshaping how grids are built and operated. This is not incremental change; it is a complete redefinition of demand.

At the centre of this shift is the need to expand and strengthen transmission and distribution networks, where transformers play a critical role. What makes this moment compelling is not just the scale of opportunity, but the purpose behind it. The infrastructure being built today will directly support cleaner energy, more resilient grids, and reliable power for communities and industries worldwide.

Satyen Mamtora, Managing Director, Transformers & Rectifiers

The global power sector is currently buzzing with transformation right now, especially regarding surging demand and innovative energy solutions. The most exciting part of this is India's power sector, which offers over ₹50 lakh crore in investment opportunities by 2032 across generation, storage, and transmission ans distribution, combined with massive investments in clean tech infrastructure.

Shivam Talwar, Managing Director, Danish Power

on artificially isolating segments. The same applies to coal, which remains the backbone of energy systems. Although its share has declined, total coal-based generation has increased over the past 20 years – a reasonable outcome for a cheap and reliable source needed by both developing and developed nations. He noted that modern coal plants have emission levels comparable to gas-based facilities, and when evaluated on a full life-cycle basis, all sources can be made environmentally competitive. The overarching goal, he concluded, is to achieve cleaner, more accessible and more affordable energy.

With respect to future opportunities, Sorokin underscored the need for joint research and development initiatives between India and Russia that extend beyond commodity trade, emphasising pragmatic and mutually beneficial collaboration to develop new equipment and technologies.

A Resilient Global Energy Mix: Strengthening reliability, affordability and clean growth

The session on "Resilient Global Energy Mix: Strengthening reliability, affordability and clean growth", featured a panel discussion among Gurdeep Singh, Chairman and Managing Director (MD), NTPC Limited; Burra Vamsi Rama Mohan, Director – Projects, Power Grid Corporation of India Limited (POWERGRID); Guilherme Mendonca, Chief Executive Officer and MD, Siemens Energy India Limited; Damitha Kumarasinghe, Director General (DG), Public Utilities Commission of Sri Lanka; and Gauri Singh, Deputy DG, International Renewable Energy Agency. The session explored the challenges and opportunities associated with integrating large-scale renewable energy while maintaining grid reliability and affordability.

Gurdeep Singh noted that the rapid growth of solar energy in India is creating new operational challenges for the power system, particularly in terms of grid flexibility and balancing. Coal-based power plants, which have traditionally been the backbone of the country's electricity supply, were not originally designed to operate with the level of flexibility required to support large-scale variable renewable energy. Increasingly, these plants are being required to ramp up and down frequently to accommodate fluctuations in solar generation, placing operational stress on existing infrastructure.

Thermal power plants are already making efforts to adapt to this new operating environment by reducing their technical minimum operating levels and improving flexibility. However, excessive back-down requirements and deep cycling can affect plant reliability, availability and long-term operational stability. If only a limited number of plants are required to provide flexibility while others continue operating normally, it may lead to disproportionate stress on certain generating units and could ultimately affect overall system reliability.

To manage high levels of solar penetration more effectively, flexibility must become a shared responsibility across the entire power system rather than relying solely on coal-based generation. A diversified set of solutions will be necessary. Energy storage technologies are expected to play an increasingly important role in this context, including battery energy storage systems (BESS), pumped storage projects and emerging storage technologies that can absorb surplus renewable energy and release it when required.

Another potential approach involves developing new generation assets that are specifically designed for flexible operations. Instead of forcing existing baseload plants to operate in ways for which they were not originally designed, smaller and more flexible thermal units could be developed to handle daily cycling and rapid ramping requirements.

Looking ahead, nuclear power is being considered as a potential contributor to India's long-term energy mix. Expanding nuclear capacity will require stronger public awareness, streamlined regulatory processes, improved financing mechanisms and the development of a robust domestic supply chain and skilled workforce.

Burra Vamsi Rama Mohan highlighted the evolving challenges and opportunities in the development of transmission infrastructure alongside the rapid expansion of power generation capacity, particularly renewable energy. A key issue is the mismatch between the pace of generation capacity additions and the availability of adequate transmission infrastructure. While there are instances where generation capacity remains stranded due to transmission constraints, there are also cases where transmission systems have already been developed and are waiting for generation to come online. This reflects the complex planning and coordination required between generation and transmission development.

Another important challenge relates to the structural nature of transmission infrastructure. Transmission systems typically require large, consolidated investments and are developed as high-capacity networks that cover long distances. In contrast, new generation capacity, especially from renewable sources, is increasingly being added in smaller, distributed units. This shift creates planning complexities because transmission systems must be designed to accommodate large capacities even when generation additions are more fragmented.

Supply chain constraints have also emerged as a key issue. Equipment shortages have affected the timely implementation of transmission projects. To address this, a shift towards bulk procurement strategies is being adopted. This approach is intended to provide better demand visibility to manufacturers, encourage the expansion of domestic manufacturing capacity, and support the development of a stronger ecosystem for power sector equipment in the country.

Human resource availability is another area of concern. The sector faces a shortage of skilled manpower required for the construction and commissioning of transmission lines and substations. Efforts are being made to establish training and skill development centres to build a broader pool of trained personnel capable of supporting infrastructure expansion across the power sector.

At the same time, emerging technologies such as BESS are being viewed as a complementary opportunity. Storage systems are increasingly being considered not only as standalone assets but also as solutions that can support grid operations and enhance the efficiency of transmission networks. The development of supportive regulatory frameworks is expected to play an important role in enabling investment in such technologies and strengthening the overall reliability and flexibility of the power system.

Guilherme Mendonca stated that achieving a large-scale energy transition requires substantial investment not only in generation capacity but also across the entire value chain, including manufacturing, equipment supply and supporting infrastructure. As electricity demand continues to grow rapidly, particularly in emerging economies such as India, the scale of investment required for clean energy deployment will be significant. This creates a need for strong policy frameworks that can attract both domestic and international capital while ensuring long-term confidence among investors.

According to Mendonca, policy stability is one of the most critical factors influencing investment decisions in the energy sector. Infrastructure investments in areas such as transformers, switchgear and other grid equipment involve high capital costs and long payback periods. Manufacturers and investors, therefore, require clear and consistent policies that provide long-term visibility and reduce regulatory uncertainty. Stable policy environments help companies justify allocating capital to large manufacturing facilities and long-term industrial projects.

Market visibility is another key driver of investment. Clear national targets for renewable energy deployment and energy transition pathways provide confidence to manufacturers and supply chain participants. When companies have a clear understanding of the scale and timeline of market demand, they are more willing to invest in expanding production capacity and developing local manufacturing capabilities. The development of a strong domestic supply chain is also essential for accelerating clean energy deployment. Large-scale manufacturing investments need to be supported by a network of component suppliers and small and medium enterprises.

In addition, the planning and development of transmission infrastructure must evolve to keep pace with the rapid expansion of renewable energy. Renewable projects can often be built within short timeframes, while transmission infrastructure typically requires significantly longer development periods. As a result, transmission planning must be undertaken well in advance so that grid infrastructure is available when new renewable capacity comes online.

Damitha Kumarasinghe highlighted that Sri Lanka's energy mix has evolved significantly over the past few decades. Around three decades ago, renewable energy accounted for nearly 100 per cent of the country's electricity generation. Over time, this share declined to about 40 per cent, largely due to increasing reliance on thermal power. In the past decade, however, the share of renewable energy has recovered to around 60 per cent. Despite this progress, the remaining 40 per cent of thermal generation continues to create vulnerabilities in the country's energy security, particularly in the context of ongoing geopolitical disruptions that affect global fuel supply chains and prices.

Ensuring energy security through national-level measures alone is becoming increasingly challenging. Regional cooperation and power system interconnections are emerging as important solutions to strengthen reliability and resilience. In the South Asian context, Sri Lanka remains the only country that is not connected to the regional electricity grid. India, in contrast, already has operational cross-border electricity connections with Nepal and Bangladesh, enabling power trade and grid support. The proposed Sri Lanka-India power interconnection has been under discussion for more than two decades. Advancing this project could enhance Sri Lanka's energy security while also creating opportunities for regional electricity trade.

According to **Gauri Singh**, the renewable energy transition has reached a stage where traditional approaches to evaluating costs are no longer sufficient. In the earlier phase of renewable energy deployment, the primary objective was to reduce the cost of generation, particularly for technologies such as solar power. Significant progress has been made in this area, with renewable energy costs declining substantially over the past decade. However, as renewable energy now accounts for a major share of new electricity capacity additions, a broader and more systematic framework is required to assess costs.

A system-level approach to evaluating renewable energy integration is becoming increasingly important. Instead of focusing only on the cost of individual renewable energy projects, attention must also be given to the broader power system. This includes the costs associated with grid infrastructure, electricity markets and system operations. These elements play a crucial role in determining the overall efficiency and affordability of electricity supply in a system with high renewable penetration.

In many countries, the development of grid infrastructure, market

mechanisms and operational practices has not kept pace with the rapid expansion of renewable capacity. Regulatory frameworks often lag behind technological and market developments, limiting the ability of power systems to respond effectively to the growing need for flexibility. As renewable energy increases, there is a greater need for mechanisms that support flexible generation and demand-side management.

A diversified portfolio of flexibility solutions will be essential for maintaining grid stability. This could include smaller flexible power plants, BESS, pumped storage hydropower and demand-side reforms. Regulatory frameworks must also consider the cost of capital across the entire electricity value chain, including generation, transmission and system participation, rather than focusing solely on developers.

India's Power Sector Roadmap to 2047: Translating national vision into a resilient, integrated and future-ready electricity system

The panel "India's Power Sector Roadmap to 2047: Translating national vision into a resilient, integrated and future-ready electricity system" highlighted the scale of transformation required across India's electricity value chain as the country moves towards a cleaner and more diversified energy mix. Discussions focused on the need to strengthen generation, transmission, distribution, supply chains and grid management to support large-scale renewable integration while ensuring reliability and long-term system resilience. The panellists

included Dr Praveer Sinha, Chief Executive Officer (CEO) and Managing Director (MD), Tata Power Company Limited; Sumant Sinha, Founder, Chairman and CEO, ReNew; Guire Servan, CEO, EDF Power Solutions India; and Dr R.K. Tyagi, Chairman and MD, Power Grid Corporation of India Limited. Edited excerpts…

Dr Praveer Sinha began his address by stating that India's power sector has witnessed significant progress over the past 25 years, with substantial improvements across generation, transmission and overall electricity infrastructure. The growth has not been limited to a single segment but has taken place across the entire value chain, reflecting coordinated development in generation capacity, transmission networks and system planning. This expansion has played an important role in strengthening the country's electricity supply and supporting rising demand.

Dr Sinha highlighted that the sector is expected to experience a phase of major transformation rather than continuing along a traditional growth path. He noted that the future energy system is likely to be shaped by increasing penetration of renewable energy and new technologies, which could significantly alter the current structure of the power mix. Coal-based generation, which currently accounts for a large share of electricity supply, is expected to gradually decline in relative terms as cleaner sources of energy expand.

Energy system modelling indicates that the share of coal in the energy mix could reduce substantially over the coming decades. This transition will lead to greater reliance on renewable energy sources, which in turn will require the development of a variety of energy storage solutions to maintain grid stability and reliability.

He stressed that the transmission sector will need to evolve to support the changing energy landscape. The planning and development approaches that have guided transmission expansion over the past two decades may require adaptation to accommodate large-scale renewable integration and new patterns of electricity generation. He highlighted that the distribution segment remains an area where further improvements are necessary. Strengthening distribution utilities and enhancing operational efficiency will be essential to ensure that the benefits of generation and transmission growth are effectively delivered to consumers.

Sumant Sinha stated that India's long-term energy transition pathway points to an unprecedented scale of renewable energy expansion over the coming decades. According to recent national energy outlook assessments, he noted that the country may require a massive increase in solar capacity as it moves towards its net-zero target by 2070. Achieving this transition will require a several-fold increase in solar deployment over the next two decades, indicating the magnitude of structural changes required across the power sector.

Such rapid expansion will necessitate coordinated development across multiple segments of the electricity value chain. While generation capacity addition has demonstrated strong momentum in recent years, other areas such as distribution, transmission and supply chains will play a decisive role in determining whether the energy transition can

proceed smoothly. He stated that the distribution segment remains particularly critical, as it represents the interface with consumers and the primary source of revenue within the electricity system. Addressing structural challenges in this segment will be essential for sustaining long-term sector growth.

Grid infrastructure and grid management are expected to become increasingly important as renewable penetration rises. The rapid addition of solar capacity is already creating operational challenges for grid operators, particularly in managing peak demand and balancing generation from multiple sources. As solar generation increasingly meets daytime peak demand, system operators will need to ensure that other generation sources remain viable while maintaining overall grid stability.

On the generation side, Sinha noted that the industry has demonstrated its ability to add renewable capacity at scale, supported by growing demand from commercial and industrial consumers, data centres and expanding electricity consumption across the economy. As a result, generation capacity addition itself may not become the primary constraint in the future. Instead, bottlenecks are more likely to emerge in areas such as grid infrastructure, supply chains and supporting equipment.

The development of a strong domestic manufacturing ecosystem is therefore becoming a major priority. India is increasingly transitioning from an import-dependent model towards domestic production of renewable energy equipment.

Guire Servan highlighted that India's evolving power sector presents significant opportunities for developing a balanced and resilient energy mix. As the country accelerates its energy transition, the focus is gradually shifting from viewing renewable energy as the sole solution to recognising the importance of a diversified energy portfolio. He stressed that a well-balanced mix of technologies will be essential to support economic growth while ensuring reliability, affordability and sustainability in the electricity system.

He added that the concept of an optimal energy mix is becoming increasingly important as countries attempt to balance different sources of power generation. Rather than relying exclusively on one technology, a combination of renewable energy, nuclear power, hydropower and storage solutions can help create a more stable and flexible power system. Hydropower and pumped storage are expected to play an important role in supporting the growth of renewable energy. Pumped storage projects, in particular, can provide critical balancing capacity by storing excess electricity generated during periods of high renewable output and supplying power during periods of peak demand.

In addition to generation technologies, Servan highlighted that the broader energy transition also involves advances in digital and grid-related solutions. The deployment of smart metering systems and modern grid management technologies is becoming increasingly important for improving efficiency, enhancing system monitoring and enabling better integration of variable renewable energy sources.

Overall, he notes that the transition towards a cleaner power system will require a combination of multiple technologies and infrastructure solutions. By adopting a diversified approach that includes renewables, hydropower, nuclear energy and advanced grid technologies, India can strengthen the resilience of its electricity system while advancing its long-term clean energy and sustainability goals.

Dr R.K. Tyagi emphasised that the power grid will play a central role in enabling India's energy transition and supporting the rapid expansion of renewable energy capacity. Over the past two decades, the country's transmission system has evolved significantly, emerging as one of the most extensive and integrated grids in the world. Earlier, regional grids operated separately, but today, India has a fully synchronised national grid that allows electricity generated in one region to be transmitted seamlessly to another. This high level of interconnection has strengthened system reliability and improved the flexibility of power flows across the country.

He remarked that the next phase of energy transition will require a major expansion of transmission infrastructure to accommodate large volumes of renewable energy. As renewable generation grows across different regions, the grid will need to transport electricity over longer distances and manage more variable power flows. This will require stronger transmission corridors and more advanced grid technologies capable of handling large-scale renewable integration.

India has also made substantial progress in developing domestic manufacturing capabilities for high-voltage transmission equipment. In earlier decades, many technologies relied heavily on imported components. Over time, however, he noted that a robust domestic ecosystem has been established, enabling the local manufacturing of several critical transmission technologies.

Going forward, the expansion of the grid will require the deployment of next-generation transmission technologies, including advanced high-voltage alternating current systems and high-voltage direct current corridors. These technologies will be essential for transporting large volumes of renewable power efficiently across long distances and ensuring grid stability as the share of variable generation increases.

Despite the progress made, Dr Tyagi highlighted that several challenges remain. Issues related to right of way for transmission lines, land acquisition and the availability of critical equipment such as transformers can slow project development. Addressing these constraints through supportive policies, improved compensation mechanisms and expanded manufacturing capacity will be essential to ensure that transmission infrastructure keeps pace with the country's rapidly growing electricity demand and renewable energy ambitions.

Digital Energy Stack: Building a secure and interoperable backbone for the modern grid

The session on "Digital Energy Stack: Building a secure and interoperable backbone for the modern grid" featured Dr Ram Sewak Sharma, Chairperson, India Energy Stack, Ministry of Power; Ashish Kumar Goel, Chairman, Uttar Pradesh Power Corporation Limited; Prince Dhawan, IAS, ED, REC Limited; N. Venu, MD and CEO, India and South Asia, Hitachi Energy and MD, Hitachi India; and Indu Shekar Jha, Patron, CIGRE India and Former Member, CERC.

The discussion focused on building a secure and interoperable digital backbone for the power sector, with emphasis on data integration, grid modernisation, cybersecurity and enabling seamless coordination across utilities and stakeholders.

Dr Ram Sewak Sharma traced the evolution of digital infrastructure in India, beginning with the creation of a foundational digital identity system in 2009. This system, he highlighted, was designed to be scalable, interoperable, frugal and based on open APIs, enabling multiple applications such as eKYC, DigiLocker and eSign to be built on top of it. He further pointed to the development of the unified payment interface as a key milestone, separating payments from traditional banking systems through a protocol-based approach. This eliminated the need for one-to-one integration among institutions and enabled seamless transactions across platforms. The result was a highly scalable and interoperable system, handling billions of transactions monthly.

Building on this approach, Dr Sharma explained that digital public infrastructure operates through standardised protocols, allowing disparate systems to connect without altering their internal operations. Applying this principle to the energy sector, the India Energy Stack (IES) aims to create a digital data exchange layer over existing, non-uniform systems.

He emphasised that the initiative is not a centralised database or application, but a data fabric enabling secure data exchange and transactions. This would facilitate the integration of distributed energy resources, including small-scale solar systems, and support optimisation, fair pricing and the participation of producers, consumers and prosumers within a unified digital ecosystem.

N. Venu highlighted India's rapid progress in building a large and innovation-driven electricity ecosystem, noting that the scale of deployment and "Made in India" technologies are enabling cost reductions and global competitiveness. He pointed out that the sharp decline in solar tariffs over the past decade reflects both scale and sustained technological advancement.

With India moving towards over 500 GW of installed capacity and a rising share of renewables, Venu emphasised the growing need for a strong digital layer to manage intermittency and ensure real-time visibility of grid operations. He noted that grid operators must increasingly rely on digital tools to track and manage power flows dynamically, particularly as solar and wind generation expand.

Drawing on industry experience, he underlined the importance of integrating energy trading platforms with grid operations. While peer-to-peer and decentralised transactions are expected to grow, these must remain aligned with grid discipline, including frequency and voltage stability. He likened the evolving framework to digital payment systems, where transactions are seamless but continue to operate within established banking and regulatory structures.

Venu also stressed the need for future-ready infrastructure, calling for all new equipment to be interoperable, scalable and aligned with emerging digital architectures. He highlighted the importance of avoiding siloed development across utilities and regions, advocating a unified and standardised ecosystem to support the IES. He added that advancements in storage, green hydrogen and digital technologies will further strengthen the sector, but scaling up deployment in a coordinated manner will be critical to realising their full potential.

Ashish Kumar Goel underscored the transformative potential of the IES, noting that it could significantly democratise energy markets by enabling peer-to-peer (P2P) transactions among consumers. He highlighted that Uttar Pradesh had already piloted such transactions in the solar segment, and posited IES as a natural progression that would empower individual producers and consumers to actively participate in electricity markets, moving beyond the traditional dominance of discoms and bulk players.

At the same time, he emphasised that distribution utilities remain central to this evolving ecosystem, as they provide the underlying network infrastructure. In this context, he pointed to the absence of a clear data-sharing framework, stressing the need to define data ownership, privacy and confidentiality norms to avoid future

legal and operational challenges. He also welcomed the modular and interoperable design of IES, noting that it accommodates varying levels of digital maturity across utilities, but called for a common digitalisation template with defined milestones to accelerate sector-wide adoption.

Goel further highlighted the importance of ensuring that future procurement of hardware and software by utilities is aligned with IES requirements, avoiding stranded investments and vendor lock-in. He advocated open standards to promote competition and called for the development of indigenous software solutions across grid operations, citing national security considerations.

While supporting P2P market development, he cautioned that the full cost structure of power supply, including network and fixed costs, must be recognised. Ignoring these could weaken discom finances and increase subsidy burdens. He also flagged unresolved issues such as accountability for losses and theft in a multi-licensee or distribution system operator framework, stressing the need for careful design to ensure both innovation and utility viability.

Prince Dhawan noted that standardisation is critical to ensuring seamless integration of multiple stakeholders, technologies and services, thereby unlocking system-wide efficiencies. He highlighted that IES is already enabling practical use cases, including peer-to-peer energy exchange across select discoms and consumer-centric applications built on access to granular meter data. He emphasised that empowering consumers with ownership and access to their energy data, in line with data protection principles, can drive innovation through third-party applications offering insights on consumption behaviour and optimisation.

Dhawan stressed that the stack is designed to support multiple use cases simultaneously, rather than a single application, with its value emerging through layered service delivery. He underlined the importance of a robust regulatory framework to build trust and drive adoption, drawing parallels with digital payment systems where regulatory certainty underpins widespread participation.

From a financial perspective, he pointed to the potential for new business models and value-added services, including alternatives to conventional net metering frameworks through peer-to-peer transactions. He noted that such mechanisms could create additional revenue streams for utilities while offering greater choice to consumers.

He explained that the architecture of IES rests on four core building blocks: identity and addressing, registries and directories, transaction protocols, and energy data exchange. These foundational elements, he said, would support a wide range of applications and play a key role in advancing intelligent electrification and the next phase of sectoral transformation.

Indu Shekar Jha described the IES as a unifying digital layer that can connect assets, stakeholders and transactions across the power system. Drawing on his initial assessment, he noted that the platform has the potential to enable seamless peer-to-peer exchanges, allowing surplus power to be traded directly through digital applications, thereby reshaping conventional market structures.

He observed that the sector is undergoing a fundamental shift from a centralised to a distributed architecture, with consumers evolving from passive recipients to active participants capable of generation, storage and demand response. In this context, he flagged the need to clearly define the future role of distribution companies, as their function may transition from electricity suppliers to service-oriented entities.

Jha highlighted that grid operations would increasingly become data-driven, leveraging technologies such as IoT, artificial intelligence and real-time analytics to manage variability and complexity. He pointed out that such capabilities could significantly enhance renewable energy integration through automated responses such as storage dispatch and demand-side management. He also emphasised the potential of IES to improve system planning by capturing granular data on distributed resources, storage and consumption patterns, areas where current frameworks remain limited.

At the same time, he identified key challenges, such as cybersecurity risks in an increasingly digital ecosystem, the need for strong institutional coordination across central and state agencies, and varying levels of digital readiness among utilities. He stressed that IES should be viewed not merely as a technology initiative but as an integrated regulatory framework, requiring clear economic signals, defined incentives for utilities and consumers, and alignment across stakeholders to ensure sustainable sector transformation.

TECHNICAL CONFERENCES

ESG and Workforce Transformation (Enablers of Power Sector Transformation)

The session on "ESG and Workforce Transformation (Enablers of Power Sector Transformation)" featured remarks by Munish Sharma, Head of Group, ESG, ISO Standards and Consumer Connect, BSES Rajdhani Power Limited; Sai Shankar G. Nair, Senior Executive, Ministry of Industry and Commerce; Anand Mayank, Manager, Power Grid Corporation of India Limited; Sachin Gupta, HoD (BE&TQM), Tata Power Delhi Distribution Limited; and Amresh Ray, Corporate Sustainability Officer, Saatvik Green Energy Limited. The session focused on the role of environmental, social and governance (ESG) frameworks and workforce transformation as key drivers of change in the power sector. It highlighted the importance of sustainable practices, digital integration and continuous skill development in enabling this transition.

A key focus of the discussion was the ongoing transformation of the workforce within the sector. It was observed that the industry is witnessing a transition in required skill sets, moving away from traditional, silo-based roles towards more integrated and multidisciplinary capabilities. There is an increasing emphasis on digital skills, data-driven decision-making and the ability to adapt to emerging technologies. This also entails a transition from transactional, process-oriented operations to more customer-centric, sustainable and data-focused models. The discussion highlighted that several modern utilities have already begun adopting such approaches, setting examples for others in the sector. These organisations are demonstrating how new technologies, improved skill sets, and evolved operational practices can enhance efficiency and service delivery. However, this progress also raises important questions regarding the broader adoption of such practices across the sector.

One of the key concerns raised was how to effectively align environmental, social and governance (ESG) goals with day-to-day utility operations. Integrating these objectives into routine functioning remains a challenge, particularly in a rapidly changing energy landscape. Another important issue is how to adequately prepare and equip the workforce to handle these changes, given the pace of technological and operational transformation.

The need for learning from best practices across industries was also emphasised. It was suggested that knowledge-sharing and training should not be limited to the power sector alone but should also incorporate insights from other industries, such as automotive and manufacturing. Such cross-sector learning can help build more resilient and adaptable systems. Overall, the discussion underscored the importance of continuous skill development, technological adoption and strategic alignment in ensuring that the sector remains prepared for future challenges.

Grid Technology, Infrastructure and Planning (Transmission and Grid Operations)

The technical session on "Grid Technology, Infrastructure and Planning" featured Rajmohan T., Head, Technology and Renewable Power, Essar Power; Yashpal Choudhary, DGM, POWERGRID; Akshay Sharma, Manager, POWERGRID; Radha Manohar T., Chief Manager, POWERGRID; and Bharath Kumar Sundar, Business R&D and Senior Professional, Hitachi Energy, Technologies Services Private Limited.

The session focused on emerging challenges in transmission systems amid rising renewable energy penetration, as well as evolving approaches to system strengthening and asset management.

A key issue highlighted was the increasing vulnerability of renewable-rich transmission corridors to voltage instability and large-scale generation loss. In Rajasthan, nearly 50 renewable plants have been interfaced, with power transmitted over distances of 900-1,000 km to the northern load centres. Between January 2022 and May 2023, around 31 major grid disturbances were recorded, involving renewable generation losses of 1,000-7,000 MW. These events were attributed to low fault levels, weak short-circuit ratios, reactive power imbalances and inadequate plant response.

The transition from synchronous generation to inverter-based resources is also altering system behaviour. Fault current levels are declining, fault directionality is becoming more complex and conventional protection schemes are proving less effective. Distance protection, in particular, may underperform in renewable-connected lines due to insufficient fault current contribution from the plant end.

The session also highlighted challenges related to aging HVDC infrastructure. While HVDC links continue to support stable power transfer, assets commissioned in the 1990s are facing increasing maintenance issues, particularly in converter transformers and control systems. Targeted refurbishment strategies – such as overhauling using spare units, component-level repair of control cards, selective replacement of obsolete equipment and enhanced cooling systems – are being adopted to extend asset life and reduce outage durations.

Overall, transmission planning and grid operations are entering a new phase. Grid resilience will depend not only on adding new infrastructure, but also on improving reactive power management in weak corridors, redesigning protection for low-infeed conditions, extending the

life of legacy HVDC assets through targeted interventions and adopting grid-forming technologies suited to inverter-dominated systems. As renewable penetration continues to rise, the transmission system will need to become more adaptive, more digitally aware and more responsive to dynamic operating conditions.

Decarbonisation and Net Zero Strategies (Enablers of Power Sector Transformation)

At the technical session on "Decarbonisation and Net Zero Strategies", the discussions moved across three very different but connected themes: dry bottom ash handling in thermal plants, climate resilience in hydropower, and demand flexibility in a high renewable power system. The power sector is no longer only trying to add capacity; it is also trying to reduce water use, improve operational efficiency, manage climate risk and lower system cost through better planning.

In the presentation by Manish K. Tewari, AGM, NTPC Limited, he discussed how how dry bottom ash handling systems are increasingly replacing wet ash systems in thermal plants. Two main designs were described: steel mesh belt-driven metallic conveyors and sprocket-chain-driven metallic conveyors. The second type uses pans connected through flight connectors, with ash falling onto a grating and then moving through a chain-driven conveyor. In this arrangement, ambient air is used for cooling, and that air is then recovered as secondary air in the boiler. This improves boiler efficiency because sensible heat from the ash is no longer lost through water, as in wet systems. The chain-sprocket design was presented as better for heat recovery because most of the heat transfer happens in the first stage itself.

Shubhra Shah, Deputy General Manager, NHPC Limited, discussed how rising temperatures and changing rainfall patterns are affecting hydropower operations in the Himalayan region. The data cited was stark: global temperature has already risen by 1.09 °C, surface lake expansion in glacial areas has grown by 33.7 per cent, and around 51 cases of cloudburst and heavy rainfall were reported in the Himalayan region during the 2023 monsoon season, especially in Uttarakhand, Himachal Pradesh and Jammu & Kashmir. The point is not only that generation is affected, but also that dams, spillways, underwater structures and nearby communities face structural and safety risks.

NHPC's resilience strategy includes real-time monitoring across river basins, automatic weather stations, early warning systems, SCADA-based control and cascade operation management. Shah also touched upon glacier lake outburst flood monitoring using satellite-based data and AI-based prediction tools. The proposed workflow combines cloudburst information, glacier lake data and ground-level sensors into a decision support system.

In the presentation by Nikhil Thejesh Venkataramana, Prime Minister's Research Fellow, IIT Bombay, demand flexibility in Maharashtra under high renewable scenarios was discussed. The research, based on a deterministic power system planning model, looked at how shifting demand can reduce the need for batteries, coal and other balancing resources by 2030.

Asset Management (Transmission and Grid Operations)

The technical session on "Asset Management (Transmission and Grid Operations)" featured remarks and presentations from Sulabh Shrivastava, Senior Principal Engineer, Hitachi Energy India Limited; Vijay Doijadkar, Lead Engineer, Tata Power Company Limited; G.S. Papneja, National Sales Manager, OMICRON; Sunil Bansod, Executive Engineer, Automation, MSETCL India; and Shivanjali Singh, Lead Engineer, Transmission Lines, Tata Power Company Limited, on a wide range of topics, including key trends, challenges and emerging practices in transmission operations and maintenance. They highlighted advanced approaches such as machine learning (ML)-based testing and digital twin frameworks for switchgear monitoring, distributed acoustic sensing (DAS)-enabled extra-high-voltage (EHV) line tripping analysis, asset-centric substation test data visibility, analytics-driven automation for ageing asset reliability and AI-enabled drone inspections for condition assessment.

The security and reliability of transmission infrastructure are emerging as critical concerns, particularly with instances of unauthorised access to transmission towers and theft of structural components such as tower bracings. Such activities pose risks to tower stability and can lead to operational disruptions. Traditionally, utilities have relied on periodic manual patrolling to detect such anomalies. However, this approach has inherent limitations, including delayed detection and dependence on human intervention, highlighting the need for more robust, real-time monitoring solutions.

To tackle this, utilities are increasingly exploring advanced technologies such as DAS for continuous surveillance of transmission networks. DAS enables real-time detection of intrusions and third-party interference along infrastructure corridors, thereby enhancing system security and reliability. Key advantages include faster identification of potential threats, reduced reliance on manual inspections, elimination of the need for additional field sensors and minimisation of faults caused by external factors.

Likewise, analytics-driven automation for aging EHV asset management and reliability has gained traction in recent years. Growing load demand, renewable energy integration, grid complexity and reliability needs have placed unprecedented stress on legacy infrastructure. Hence, utilities are increasingly adopting automation and digital technologies to modernise aging assets while extending their operational life.

Further, AI-enabled drone-based inspections for condition assessment have witnessed gradual adoption by utilities and developers in recent years. As conventional inspection methods offer limited visibility, drone inspections have shown promising results in eliminating risks of high-voltage exposure and falls, especially on remote or hard-to-reach towers. AI-enabled drone inspections cover kilometers in hours instead of days or weeks, enabling frequent monitoring. They integrate ML with unmanned aerial vehicles for automated fault detection, real-time analysis and predictive maintenance on transmission infrastructure.

In addition, a key innovation discussed was the use of digital twins, which generate synthetic data to simulate different operating conditions, complementing real-world data collected from the field. This approach enables better model training even when actual fault data is limited. Additionally, the predictive algorithms can be deployed across platforms, including edge devices and mobile applications, through IoT-based communication systems. This allows engineers to receive real-time insights and alerts, enabling timely intervention. ■

A New Approach

SHANTI Bill redefines India's civil nuclear energy pathway

The Sustainable Harnessing and Advancement of Nuclear Technology for India [SHANTI] Bill, 2025, marks a decisive shift in India's approach to civil nuclear energy. Passed by Parliament, the bill repeals the Atomic Energy Act, 1962, and the Civil Liability for Nuclear Damage Act, 2010, replacing a fragmented and dated legal architecture with a consolidated, forward-looking framework. The legislation aligns nuclear energy policy with broader objectives of energy security, grid stability and decarbonisation, including the government's stated target of achieving 100 GW of nuclear capacity by 2047. Currently, India's installed nuclear power capacity stands at about 8.78 GW, with nuclear contributing a steady 3 per cent of the total electricity generation. The government projects this to rise to around 22.38 GW by 2031-32, through a mix of indigenous 700 MW and international cooperation reactors.

Beyond consolidation, the SHANTI Bill seeks to correct the structural bottlenecks that have constrained the sector so far, including the state-dominated operating model, investment-deterring liability regime and the regulatory architecture designed for a closed, single-operator ecosystem.

Components of the bill

A central feature of the SHANTI Bill is the calibrated liberalisation of the nuclear sector. The bill opens the sector to Indian private companies, joint ventures and other permitted entities, allowing them to apply for licences to build, own, operate and decommission nuclear power plants and reactors. Participation is also enabled across parts of the nuclear value chain, including manufacturing, fuel transport, storage and approved imports and exports. At the same time, the bill clearly delineates activities that remain under exclusive government control. Sensitive and strategic domains such as uranium enrichment, isotopic separation, spent fuel reprocessing, recycling, radionuclide separation, high-level waste management and heavy water production continue to be reserved for the central government or its wholly owned institutions. This ring-fencing reflects the government's intent to preserve sovereign control over the nuclear fuel cycle and security-sensitive operations. The bill also establishes a structured licensing and safety authorisation framework, setting out conditions for the grant, suspension and cancellation of licenses. Activities involving radiation exposure require prior safety authorisation, reinforcing the primacy of safety and regulatory compliance even as participation broadens.

Additionally, under the Civil Liability for Nuclear Damage Act, 2010, operator liability was capped at Rs 15 billion, while statutory rights of recourse against suppliers created uncertainty and deterred international technology providers. The new framework replaces this with a graded liability structure. Operator liability limits are calibrated to the size and nature of the installation, with larger reactors subject to higher caps, extending up to Rs 30 billion, while smaller reactors and fuel cycle facilities fall under lower liability slabs. The bill also provides for a dedicated nuclear liability fund, financed through levies on nuclear power operations, to support compensation mechanisms. Moreover, the operators were earlier granted a statutory right of recourse against suppliers for defective equipment or services, independent of contractual provisions. This departure from international practice created open-ended risk exposure for suppliers and deterred foreign technology participation. The SHANTI Bill limits supplier recourse to cases explicitly provided for in contracts or involving intentional wrongdoing, aligning India's framework with global norms. Another key component is the consolidation of regulatory, enforcement and dispute resolution mechanisms. The SHANTI Bill grants statutory status to the Atomic Energy Regulatory Board, which previously functioned under executive authority. Statutory recognition is intended to enhance institutional independence, transparency and credibility, while providing clear legal backing for licensing, inspection, enforcement and penalties.

To strengthen governance, the bill establishes new redressal mechanisms, including an Atomic Energy Redressal Advisory Council for dispute resolution, and designates an appellate authority for regulatory decisions. Dedicated provisions are also included for claims commissioners and a nuclear damage claims commission to handle compensation-related matters in the event of any nuclear incidents.

Government initiatives

The SHANTI Bill complements a broader set of government initiatives aimed at scaling nuclear capacity and positioning nuclear energy as a key pillar of India's clean energy transition. The government has announced the Nuclear Energy Mission, with the objective of achieving 100 GW of nuclear capacity by 2047. This long-term target reflects the recognition of nuclear power's role in providing reliable baseload generation alongside rapidly expanding renewable capacity.

In Union Budget 2025-26, the government allocated Rs 200 billion to support the design, development and deployment of SMRs. The stated objective is to have at least five indigenously designed SMRs operational by 2033. Research and development efforts are being led by institutions such as the Bhabha Atomic Research Centre, including projects such as the 200 MWe Bharat Small Modular Reactor, a 55 MWe SMR design and a high-temperature gas-cooled reactor for hydrogen generation. These initiatives are aimed not only at capacity expansion but also at strengthening domestic technological capabilities and positioning India as a participant in the global advanced nuclear technology ecosystem. The SHANTI Bill provides the legal and regulatory scaffolding required to support these initiatives at scale.

Impact

The most immediate impact of the SHANTI Bill is on the investment environment for nuclear power in India. By addressing long-standing concerns around liability, regulatory certainty and market structure, the bill seeks to make nuclear projects more bankable and attractive to both domestic and foreign investors. Supporting mechanisms such as mandatory insurance cover and dedicated nuclear liability and compensation funds will balance victim compensation and public safety with predictable, bankable risk allocation. From an operational perspective, the bill's emphasis on regulatory strengthening is expected to improve oversight, while reducing uncertainty. Granting statutory status to the regulator and clarifying its powers is intended to enhance confidence among project developers, lenders and insurers.

The opening of the sector to private participation is also expected to ease fiscal constraints. Nuclear power expansion is capital-intensive and reliance on public finance alone is unlikely to support the scale required to meet long-term targets. By enabling private capital, technology and execution capability, the bill aims to accelerate capacity addition, while maintaining government oversight.

Outlook

The SHANTI Bill lays the groundwork for a structural transformation of India's nuclear sector, but its success will ultimately hinge on execution. Subordinate legislation, detailed regulations and contractual frameworks will determine how effectively the bill's provisions translate into projects on the ground.

Regulatory capacity will be a key factor. As the sector moves towards multiple reactor designs, private operators and advanced technologies, the regulator will need to develop expertise, processes and manpower at pace. Delays in licensing and approvals could otherwise emerge as the next major bottleneck. Investor response will also depend on clarity and predictability in implementation. From a system perspective, nuclear power is increasingly being viewed as a complement to renewables rather than a competitor. As India's power system integrates higher shares of solar and wind, the role of firm, despatchable, low-carbon generation is expected to grow. The SHANTI Bill positions nuclear energy to play that role over the long term.

Overall, the legislation represents a significant recalibration of India's nuclear policy framework. By consolidating laws, enabling private participation, reforming liability and strengthening regulation, the SHANTI Bill seeks to move the sector from a controlled, capacity-constrained model to an investment-grade, scalable ecosystem aligned with India's energy and climate objectives. ■

Under-construction nuclear projects in India

State	Location	Project	Capacity (MW)
Rajasthan	Rawatbhata	RAPP-8	1 x 700
Tamil Nadu	Kudankulam	KKNPP-3 & 4	2 x 1,000
Tamil Nadu	Kudankulam	KKNPP-5 & 6	2 x 1,000
Haryana	Gorakhpur	GHAVP-1 & 2	2 x 700
Tamil Nadu	Kalpakkam	PFBR – Prototype fast breeder reactor	1 x 500

Source: Lok Sabha answers

Projects under pre-project activities

State	Location	Project	Capacity (MW)
Karnataka	Kaiga	Kaiga-5 & 6	2 x 700
Haryana	Gorakhpur	GHAVP-3 & 4	2 x 700
Madhya Pradesh	Chutka	Chutka-1 & 2	2 x 700
Rajasthan	Mahi Banswara	Mahi Banswara-1 & 2*	2 x 700
Rajasthan	Mahi Banswara	Mahi Banswara-3 & 4*	2 x 700

**Being implemented by ASHVINI, a joint venture of NPCIL and NTPC Limited*
Source: Lok Sabha answers

Steady Gains

Distribution segment sees gradual progress amid policy-led reforms

India's power distribution segment remains at the centre of ongoing power sector reforms, as its operational efficiency and financial viability ultimately determine the sustainability of the entire electricity value chain. In recent years, policy efforts have increasingly focused on improving cost recovery, strengthening accountability and accelerating technology adoption to address long-standing structural issues such as high losses, tariff distortions and delayed subsidy payments. At the same time, the growing penetration of renewables, electrification of end-use sectors and rising power demand are reshaping the role of distribution utilities, requiring more agile planning, smarter networks and stronger regulatory oversight.

Power Line presents a round-up of the key trends and developments in the power distribution segment…

Operational and financial performance

As per PFC Limited's 14th Integrated Rating and Ranking Report, the aggregate technical and commercial (AT&C) losses declined from 15.97 per cent in 2023-24 to 15.04 per cent in 2024-25. During 2024-25, 38 utilities, comprising 33 discoms and five power departments (PDs), reported AT&C losses below 15 per cent. Further, 22 utilities registered an improvement of more than 2 percentage points in AT&C losses compared to the previous year.

Billing efficiency improved marginally from 86.99 per cent in 2023-24 to 87.59 per cent in 2024-25. As many as 21 utilities achieved billing efficiency at or above the upper scoring threshold – 92 per cent for discoms and 90 per cent for PDs. Overall, billing efficiency improved across 46 utilities, with 13 utilities recording a significant increase of more than two percentage points. However, among the 65 rated utilities, billing efficiency remained below the lower threshold for 10 utilities, at 82 per cent for discoms and 75 per cent for PDs.

Additionally, collection efficiency across power distribution utilities improved from 96.60 per cent in 2023-24 to 97 per cent in 2024-25, indicating better revenue realisation across the sector. In 2024-25, 17 utilities achieved 100 per cent collection efficiency, while 29 utilities recorded an improvement over the previous year.

The average cost of supply-average revenue realised (ACS-ARR) gap (cash adjusted) improved by Re 0.25 per kWh, narrowing from Re 0.32 per kWh in 2023-24 to Re 0.07 per kWh in 2024-25, indicating a notable strengthening of the sector's overall cost recovery position.

The power distribution sector achieved a positive profit after tax (PAT) on an accrual basis at the all-India level for the first time, posting a combined PAT of Rs 27.01 billion in 2024-25, compared to a loss of Rs 270.22 billion in 2023-24. The ACS-ARR gap on a tariff-subsidy-received basis narrowed sharply to Re 0.06 per kWh in 2024-25 from Re 0.20 per kWh in 2023-24, underscoring improved cost recovery. Subsidy realisation rose to 98.9 per cent in 2024-25 from 97.45 per cent in 2023-24, with full subsidy dues for the past three years cleared in multiple states.

Performance of the power distribution segment (FY 2023 to FY 2025)

Parameter	FY 2023	FY 2024	FY 2025
AT&C losses (%)	15.22	15.97	15.04
Billing efficiency (%)	86.88	86.99	87.59
Collection efficiency (%)	97.59	96.60	97.00
ACS-ARR gap (Re per kWh)	0.46	0.32	0.07
Accumulated surplus/(deficit) (Rs billion)	(6,563.45)	(6,914.16)	(6,472.10)
Total borrowings (Rs billion)	6,769.39	7,589.96	7,263.78
PAT on accrual basis (Rs billion)	(604.31)	(270.22)	27.01

Source: PFC Limited's 14th Integrated Rating and Ranking Report

Best practices for distribution utilities

Utilities across the country are adopting a range of digital and operational best practices to strengthen performance and service delivery. A major focus area is end-to-end digitalisation, with discoms migrating legacy systems to cloud-based ERP and SAP platforms for billing, asset management, HR and project monitoring. E-office systems, centralised billing and online portals have enabled paperless workflows, faster decision-making and better visibility across operations.

On the consumer and revenue side, utilities are enhancing efficiency through omnichannel customer engagement and cashless payments. AI-enabled chatbots, 24/7 call centres, WhatsApp-based grievance redressal, and multilingual, accessible billing formats are improving customer experience, while UPI, Bharat Bill Pay System, dynamic QR codes, virtual account numbers, kiosks and mobile payment vans are driving higher collection efficiency. At the same time, smart metering, AMI deployment, and smart grid automation – integrating SCADA, GIS and advanced distribution management systems – are improving billing accuracy, real-time network monitoring and fault management.

Utilities are also prioritising loss reduction, sustainability and safety. AT&C losses are being addressed through network upgrades, anti-theft drives, citizen-reporting platforms and AI/ML-based vigilance tools. Energy efficiency and demand side management initiatives, including rooftop solar facilitation, LED and BLDC appliance programmes, EV charging infrastructure, and schemes such as PM Surya Ghar and PM-KUSUM, are supporting the clean energy transition. In parallel, stronger safety protocols, digital training tools, and simplified, fully online consumer and contractor processes are improving workforce capability and ease of doing business.

Source: PFC Limited's 14th Integrated Rating and Ranking Report

Progress under the RDSS

In terms of sanctions and disbursals, as per the Revamped Distribution Sector Scheme (RDSS) portal (accessed on February 18, 2026), the total sanctioned cost under the RDSS stands at Rs 2,834.4 billion. Of this, Rs 1,306.37 billion has been allocated for smart metering works, while Rs 1,502.45 billion has been earmarked for loss reduction works. The total gross budgetary support (GBS) sanctioned under the scheme amounts to Rs 1,212.69 billion, with Rs 244.42 billion allocated for smart metering and Rs 955.2 billion for loss reduction works. So far, Rs 329.93 billion of the GBS has been released, comprising Rs 17.89 billion for smart metering works and Rs 312.04 billion for loss reduction works.

As of February 13, 2026, over 224 million smart consumer meters have been sanctioned nationwide, of which 150.2 million meters have been awarded. Further, 5.3 million distribution transformer (DT) meters and 206,929 feeder meters have been sanctioned, of which 4.94 million DT meters and 197,070 feeder meters have been awarded.

While actual deployments remain behind schedule, considerable progress is being made. Across India, 54.67 million smart consumer meters, 1.42 million DT meters and 164,981 feeder meters have been installed, which takes the total number of deployed smart meters to over 56.26 million. State-wise, the key states leading consumer meter installation are Maharashtra with 8.6 million, Bihar with 8.5 million, Uttar Pradesh with 7.9 million and Assam with 5.4 million meters installed.

Draft National Electricity Policy, 2026

Notified in January 2026, the draft National Electricity Policy 2026 notes that tariffs in several states remain below the cost of supply, leading to persistent revenue gaps and rising debt in the distribution segment. The plan places tariff rationalisation and loss reduction at the centre of reforms, focusing on cost optimisation, particularly power procurement, alongside AT&C loss reduction and improved governance to achieve financial sustainability. It proposes the phased deployment of prepaid smart meters, time-bound energy audits and robust accounting to target single-digit AT&C losses, while promoting shared distribution networks, geographic information system (GIS)-based asset mapping and automation to enhance efficiency and service delivery. The plan also recommends establishing a distribution system operator to facilitate the integration of distributed renewables, storage and vehicle-to-grid systems, and to enable local energy trading. Reliability is to be strengthened through network redundancy, including N-1 redundancy at the distribution transformer (DT) level in cities with populations above 1 million by 2032, along with undergrounding in congested areas and continued focus on universal electricity access, particularly in border regions.

Draft Electricity (Amendment) Bill, 2025

In October 2025, the Ministry of Power (MoP) published the Draft Electricity (Amendment) Bill, 2025. Among its key provisions, the draft bill proposes the sharing of distribution networks to promote efficiency and competition. It proposes to explicitly allow distribution licensees to supply power through their own or shared networks, with non-discriminatory open access mandated under Section 42. Apart from this, the bill emphasises cost-reflective tariff determination by electricity commissions to empower state commissions to determine tariffs suo motu, ensuring timely implementation. The bill proposes that state electricity regulatory commissions, in consultation with the state governments, may exempt distribution licensees from the obligation to supply power to consumers with demand exceeding 1 MW.

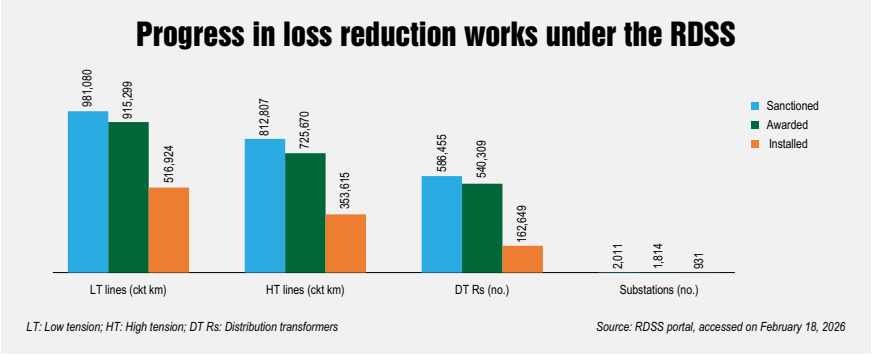
Technology adoption

The distribution segment is witnessing an accelerated digital shift aimed at modernising infrastructure, improving operational efficiency, and accommodating rising renewable capacity while preserving grid stability. Technologies such as artificial intel-

ligence (AI), machine learning (ML) and advanced analytics are central to this transition. Utilities are increasingly leveraging digital twins, drones and robotics for site selection, route optimisation and real-time asset inspections, enhancing precision, safety and execution speed while minimising construction risks.

On the operations front, AI-enabled predictive maintenance, internet of things (IoT) sensors, cloud-based dashboards and advanced analytics are strengthening asset health monitoring, enabling real-time visibility and improving risk management. Discoms are also applying AI for fault detection, load forecasting, transformer condition monitoring, predictive maintenance and theft analytics, which together enhance reliability, reduce losses and optimise scheduling and restoration processes. In addition, these digital tools are improving consumer engagement and overall service delivery.

The MoP has initiated work on the India Energy Stack, envisaged as digital public infrastructure for the power sector to enable interoperable and consent-based data exchange and provide common digital building blocks for utility operations and consumer services, with pilot demonstrations planned for 2026-27. In late 2025, the MoP also issued policy advisories encouraging the integration of AI and ML applications in distribution operations to strengthen predictive maintenance, analytics and decision support. In addition, it suggested the adoption of smart meter data analytics, integrated information technology and operational technology systems, demand forecasting, revenue protection and cost optimisation, while also highlighting emerging applications such as blockchain, IoT and smart home automation, to strengthen operational efficiency, grid reliability and consumer service delivery.



Digitalisation across distribution assets is transforming how utilities monitor and manage network reliability. Towers are now being equipped with IoT sensors, edge computing and digital monitoring systems that track structural health and electrical parameters in real time, capturing stress, vibration, tilt, temperature and environmental conditions while enabling predictive analytics to flag emerging risks. For cables and conductors, digital asset registers and GIS-based network models, integrated with outage history and inspection data, allow utilities to identify bottlenecks, ageing spans and recurrent fault zones, supporting a shift towards risk-based maintenance and targeted replacements; and advanced tools such as thermography and drone inspections further help detect hotspots, loose joints and sagging early. Meanwhile, substations are evolving into intelligent, remotely operated hubs through fibre-based communication, digital protection and process bus technologies, enabling unmanned operations, faster fault response and improved integration of renewable power as grid complexity increases.

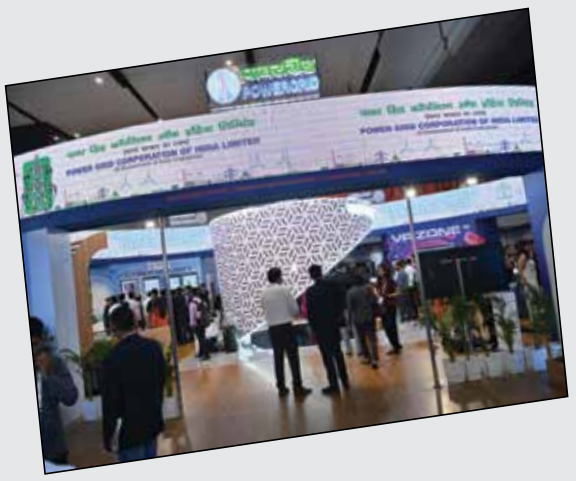
Challenges and outlook

The power distribution segment continues to face a complex set of structural, financial and operational challenges that constrain its performance. Persistent financial stress remains a key concern, driven by high AT&C losses, delayed subsidy payments, and gaps between the cost of supply and realised tariffs. Ageing infrastructure and inadequate network investments contribute to frequent outages, voltage fluctuations and limited system resilience. The rising share of variable renewable energy is adding pressure on distribution utilities to strengthen forecasting, balancing and grid management capabilities. In addition, issues such as power theft, billing inefficiencies, limited consumer metering coverage and slow adoption of digital technologies continue to affect revenue realisation and service quality. Regulatory uncertainties and the need to align tariffs with evolving cost structures further complicate the operating environment. Resistance by consumers in shifting to prepaid meters, issues in the implementation of the direct debit mechanism, delays in the disbursement of grant funding, and delays in timely payments from state discoms are impeding the growth of the distribution sector. Further, regulatory complexities and skill shortages continue to test the sector's resilience. Overcoming these obstacles requires steadfast policy support, targeted capital investments and robust capacity building to foster a culture of modernisation.

As per the Central Electricity Authority's Draft Distribution Perspective Plan 2030, about Rs 4.28 trillion will be required for the upgradation of distribution infrastructure during 2022-27, of which about Rs 1.89 trillion will be available to discoms, including funds sanctioned under the RDSS. The available funds will be around 44 per cent of the total investment required up to 2027.

Overall, the latest trends indicate gradual but tangible progress in improving operational metrics, narrowing financial gaps and advancing digitalisation. However, sustained gains will depend on timely tariff reforms, continued loss reduction and accelerated infrastructure modernisation. The evolving policy and regulatory initiatives signal a clear push towards a more financially viable, technology-driven and consumer-centric distribution ecosystem in the coming years. ■

Snapshots from Day 1



Snapshots from Day 1

Bharat Electricity Summit 2026

AGENDA: SATURDAY, MARCH 21, 2026 (DAY 3)

STRATEGIC CONFERENCE: HALL BRAHMAKAMAL

Time: 10:00 – 10:50
OSOWOG market mechanisms for high-renewable energy integration and global energy integration
- Dr Vibha Dhawan, DG, The Energy and Resources Institute
- Hitendra Dev Shakya, MD, Nepal Electricity Authority
- Dr Puneet Chitkara, SVP, Strategy, India Energy Exchange
- Ashish Khanna, DG, International Solar Alliance

Time: 10:50 – 11:40
Next-generation transmission infrastructure and operations: Real-time optimisation, automation and system-strength management
- Naveen Srivastava, Director, Operations, Power Grid Corporation of India Limited (POWERGRID)
- Sandeep Zanzaria, CEO, GE Vernova T&D India Limited
- Akilur Rahman, CTO, India and Market Innovation Lead, South Asia, Hitachi Energy
- Samir Chandra Saxena, Chairman and MD, GRID-India
- Dr Ram Prasath Manohar, IAS,
- MD, Karnataka Power Transmission Corporation Limited

Time: 11:40 – 12:40
Re-engineering transmission delivery: RoW innovation and infrastructure execution
- Dr D. Saibaba, Additional Secretary, Ministry of Power, Government of India
- Eng. Kipkemoi Kibias, Ag. MD and CEO, Kenya Electricity Transmission Company Limited
- Upendra Pande, MD, Gujarat Energy Transmission Corporation Limited
- Mayur Maheshwari, IAS, MD, UPRVUNL and UPPTCL
- Kanwaljeet Singh Kukreja, Global VP, Infrastructure Segment, Energy Management, Schneider Electric

Time: 12:40 – 13:20
Pumped hydro renaissance: Unlocking long duration storage for renewable dominance
- M.G. Gokhale, Member, Hydro, Central Electricity Authority (CEA)
- Suprakash Adhikari, Director, Technical, NHPC Limited
- Shubhra Thakur, Director, Policy and Markets, APAC and Country Director, India, Long Duration Energy Storage Council
- Ankur Vashishta, Head, Pumped Storage Projects, JSW Energy
- Shouvik Dey, VP, Voith Hydro

Time: 14:30 – 15:20
Building intelligent grid systems: From smart metering and ADMS-DERMS platforms to next-generation TSO-DSO coordination
- Anil Rawal, CEO and MD, Intellismart Infrastructure Pvt. Ltd
- Madan Mohan Chakraborty, MD and CEO, GridCrest Technologies Private Limited, Kaynes Group
- Abhishek Ranjan, CEO, BSES Rajdhani Power Limited
- Hemant Jain, Member, Grid Operation and Distribution, Central Electricity Authority (CEA)

Time: 15:20 – 16:10
Powering the digital economy: Clean energy for data centres and emerging digital infrastructure
- Sarit Maheswari, CEO, NTPC Green Energy Limited
- Venkat Mynam, Senior Engineering Director, Schweitzer Engineering Laboratories, Inc.
- Simon Evans, Director, Global Digital Energy Leader, Arup
- Dr Lawrence Jones, Co-Founder and President, Energy Plexus Institute
- Michel Augonnet, Former President, CIGRE

Time: 16:10 – 17:00
Scaling alternative fuels in India's power mix: Unlocking flexibility and economic potential
- Rajinder Singh Ahuja, CEO Power, Vedanta Limited
- Vikas Kikan, CEO, Beyond Drilling
- Suresh Kumar Narang, Director, Nabha Power Limited

Time: 17:00 – 17:50
Hydropower reimagined: Advancing innovation and resilience for future clean energy system
- Bhupender Gupta, Chairman and MD, SJVN Limited
- Sanjay Kumar Singh, Director, Projects, NHPC Limited
- Dr Enrique Cifres, Hon. VP, International Commission on Large Dams
- R.K. Chaudhary, Chairperson, Joint Electricity Regulatory Commission, UT of J&K and Ladakh
- Arun Kumar, Professor, IIT Roorkee

TECHNICAL CONFERENCES: EXHIBITION HALL 1 AND HALL 2

Time: 10:00 – 12:00
Renewable and Clean Energy Generation
- Sujay Karmakar, CGM, NETRA, NTPC Limited
- Jaganath Pani, Senior Manager, NHPC Limited
- Pranay Pranay, Manager, NETRA, NTPC Limited
- Dinesh Mistri, B.Tech 4th Year Student, Department of Electrical Engineering, Dumka Engineering College
- Aryan Dhiman, M.Tech, Electronics and Communication Engineering (Research), University Institute of Technology (H.P.U.), Shimla

Time: 10:00 – 12:00
Grid Decentralisation and Modernisation
- Sumedh Agarwal, Director, Smart and Resilient Power and Mobility Alliance for an Energy Efficient Economy
- Roshan Yadav, DGM, NTPC Limited
- Sonal Mahapatra, Team Lead, PSCC, TP Central Odisha Distribution Limited
- Rajiv Pharlia, CGM, RDSS, PFC Limited

Time: 13:00 – 15:00
Energy Efficiency and Sustainability
- Ramandeep Singh, Practice Head and COO, Mercados Energy Markets India Private Limited
- Ketan Khanna, Senior Manager, ARVOS Ljungstrom Energy India Private Limited
- Dr Rajendra Kumar Saini, Senior Manager, NTPC Limited
- Goutam Khankari, Senior Manager, Damodar Valley Corporation
- Tania Guha, Senior Manager, Engineers India Limited
- Vinod Kotra, Senior Manager, Secure Meters Limited

Time: 13:00 – 15:00
Digital Technologies and Business Models
- Neeraj Tiwari, Senior Manager, NTPC Limited
- Abhishek Martand, GM, IT, Madhya Kshetra Vidyut Vitaran Company Limited, Bhopal
- Hemanth Kumar H.B., Assistant Manager, Power Grid Corporation of India Limited

Time: 15:30 – 17:30
Energy Storage and Circularity
- Priya Shrivastava, Research Manager, Wood Mackenzie
- Priyansh Mohan, Co-Founder and CEO, Meine Electric Private Limited
- Suhas Bhagwat, VP, India OperationsThemes LLC
- Eshita Gupta, Technical Director, KPMG in India
- Nilotpal Banerjee, Senior Manager, NTPC Limited
- Dr Sourav Das, Assistant Professor, Institute of Engineering and Management, Kolkata
- Rupali Brahmachary, Project Associate, National Institute of Technology, Durgapur

SPECIAL PROGRAMMES

Location: Hall Amaltas A, Convention Centre

Time: 10:00 – 18:00
CABLETECH 2026
- Sheri Dhalke, VP (R&D), Polywater
- Jaise Mathew, Product Manager, Cable Infrastructure, Megger India Private Limited
- Maurice Alphonso, Plexchem Technologies Pte Ltd, Singapore
- Dillip Kumar Puhan, Joint Director, Cables & Diagnostics Division, Central Power Research Institute (CPRI), Bengaluru, India
- Yogendra S. Tiwari, VP, Technical, Universal Cables Limited
- Dr Moumita Naskar, Scientific Officer, CPRI, Regional Testing Laboratory
- Kaibalya Kumar Khuntia, Manager, New Product Development, KEC Asian Cables Limited
- Jagdish Sandhanshiv, Knowledge Cluster
- Nayan Degda, Director, PCA Technologies Private Limited
- Pratik Kumar Nayak, Manager, Quality, Shakun Polymers Private Limited (Part of Alphagary, an Orbia Business)
- Gorachand Sahoo, Asst. Manager, Design and New Product Development, KEC Asian Cables Ltd
- Hemanta Chandure, DGM, Adani Electricity Mumbai Limited
- Priti Misra, C.C Reddy, Indian Institute of Technology, Ropar
- Lijo Joseph Oliprakkattu, Application Engineer, Technical, Trident Techlabs Limited
- Sandeep Singh Tagore, Student, IIT Ropar
- Neha Kumari, Ph.D. Scholar, High Voltage Engineering, IIT Ropar
- Bere Sivananth Kumar, CPRI
- R. Arunjothi, Joint Director, Power Systems Division, CPRI, Bengaluru, India
- V. Vaidhyanathan, Engineering Officer, CPRI, Bengaluru, India
- Patthi Chandrasekhar Reddy, Engineering Officer, Short Circuit Laboratory, CPRI, Bengaluru, India

Location: Amaltas B, Convention Centre

Time: 10:00 – 12:00
Women in Electricity: Current and Courageous
- Chief Guest: Annapurna Devi, Union Minister of Women and Child Development, Government of India
- Chief Guest: Daggubati Purandeswari, Member of Parliament, Government of India
- Guest of Honour: Pankaj Agarwal, Secretary, Power, Government of India
- Guest of Honour: Dr R.K. Tyagi, CMD, Power Grid Corporation of India Limited
- Parminder Chopra, CMD, PFC

AGENDA: SATURDAY, MARCH 21, 2026 (DAY 3)

SPECIAL PROGRAMMES

- S. Usha, Director, Market Operations, Grid-India
- Dr Tal Katz, CIGRE WiE Chair, Isreal
- Dechen Dema, Director Transmission, BPC, Bhutan
- Julia Souder, CEO, LDESC, Belgium
- Vaishali Nigam Sinha, Co-Founder, ReNew Power, India
- Anamika Bhargava, Global Head, L&T Semiconductor, India
- Bani Varma, Director, IS&P, BHEL, India
- Arti Dogra, CMD, JVVNL, Chairman, Rajasthan DISCOMS, Government of Rajasthan, India
- Manju Gupta, Executive Director, POWERGRID, Chair, CIGRE WIE, India
- Neo Mapapanyane, Chair, CIGRE WIE, South Africa
- Dr Vibha Dhawan, DG, TERI, India
- Kristina OZGAN, Chief Adviser, Rosseti, PJSC

Location: Parijat Hall, 2nd Floor, Convention Centre

Time: 10:00 – 12:00

Africa50 - Power to All: One Africa-One Grid

Location: Mogra Hall A and B, 4th floor, Convention Centre

Time: 10:00 – 18:00

Vendor Development Session

- V.K. Singh, Member (Power Systems), CEA
- R.K. Rohilla, Executive Director (Contract services), POWERGRID
- Pankaj Pandey, Executive Director (TBCB), POWERGRID
- Abhay Kumar, Executive Director (Engg.-S/S,TL ,Civil &Cost), POWERGRID
- Dr Puneet Tyagi, CGM I/c (Engg.-HVDC), POWERGRID
- Vijay Kumar Soni, AGM USSC, NTPC
- Amithabh Jha, Executive Director – Contract (E&M) Division, NHPC Limited (A Government of India Navratna Enterprise)
- LAKHMI CHAND, Group General Manager-Contract E&M Division, NHPC Limited (A Govt. of India Navratna Enterprise
- Babitendra Kumar,, General Manager, Renewable Energy & Green Hydrogen Division, NHPC Limited (A Government of India Navratna Enterprise)
- ARNADA PRASAD SAMAL, Chief Executive Officer (NPUNL) & Chief General Manager, NTPC Ltd
- Shri Shantimoy Nandan, GM USSC, NTPC

Location: Hall Amaltas B, Convention Centre

Time: 14:40 – 17:55

Legal and Regulatory Framework in the Power Sector

- Harish Dudani, Member, Law, CERC
- P. Ravi Kumar, Chairperson, Karnataka Electricity Regulatory Commission
- M.G. Ramachandran, Senior Advocate, Supreme Court of India
- Sh. Surender Babbar, Member, Delhi Electricity Regulatory Commission
- Ajay Kumar Singh, Member, Technical, Chhattisgarh State Electricity Regulatory Commission
- Ramesh Babu Veeravalli, Member, CERC
- Hemant Verma, Chairperson, Tripura Electricity Regulatory Commission
- Raj Kumar Chaudhary, Chairperson, Joint Electricity Regulatory Commission for the UTs of J&K and Ladakh
- Lt. Gen. Rana Pratap Kalita, Retd., Chairperson, Assam Electricity Regulatory Commission
- Vivek Ganodwale, Member, Law, Chhattisgarh State Electricity Regulatory Commission
- Ravinder Singh Dhillon, Member, Finance, CERC
- D. Sai Baba, Additional Secretary, Ministry of Power
- Ghanshyam Prasad, Chairperson, Central Electricity Authority
- R.N. Singh, Member, Delhi Electricity Regulatory Commission
- Sushanta Kumar Ray Mohapatra, Member, Technical, Odisha Electricity Regulatory Commission

Location: Palash A and B, Grand Ballroom (GBR)

Time: 10:00 – 18:00

2nd International Conference on Carbon Markets

Location: Suryamukhee and Moulshree, 4th floor, Room 401+402

Time: 10:30 – 18:00

State Sessions

AGENDA: FRIDAY, MARCH 20, 2026 (DAY 2)

SPECIAL PROGRAMMES

Time: 10:00 – 16:30

Industry 4.0 Technologies in the Transmission Sector

- Pankaj Agrawal, Secretary, Ministry of Power, Government of India
- Dr Sameer Saran, Head, RRSC, Indian Space Research Organization
- Venkat Mynam, Senior Engineering Director, Schweitzer Engineering Laboratories, Inc.
- Andrea Fraioli, E&U Business Advisory and Strategic Asset Management Lead, Be Shaping the Future, an ENG Company
- David McDonald, Grid Automation System Architect, GE Vernova
- C.Y. Chung, President, IEEE Power and Energy Society
- Prof. Ashok Jhunjhunwala, Chairman, Immersive Technology and Entrepreneurship Labs, and Institute Professor, IIT Madras, Immersive Technology and Entrepreneurship Labs
- Dr Dmitrii Kretov, Department of Advanced Research and Energy Efficiency, Rosseti R&D Center, Russia

Time: 10:00 – 18:00

Stationary Energy Storage India (SESI) 2026

- Shripad Yesso Naik, Minister of State for Power and New and Renewable Energy, Government of India
- Ajitabh Sharma, IAS, Additional Chief Secretary, Government of India
- S.C. Saxena, Chairman and MD, Grid Controller of India Limited
- Richie Stephen, Senior Manager, ULSE
- Venugopal Rao, Chairman and MD, Pacedigitek
- Mahadevan Srinivasan, Head, BESS, Renewables IC, India, LGT
- Mani Khurana, Senior Energy Specialist, World Bank
- Naveen Munjal, Director, BDGC, Apraava Energy
- Sivakumar Vepakomma, PS Director, SECI
- Akash Kaushik, Co Founder, Good Enough
- Satish Reddy, Founder and CEO, Xbattery
- Shatanshu Agrawal, VP, Greenko
- Himanshu Jadhav, CEO, Jendamark India Private Limited
- Kumar M., Founder and CEO, SmartGrid Analytics
- Chandan Rastogi, VP, Juniper Green Energy
- Naresh Baluja, MD, Engie
- Samir Patel, Chief, Technology and Operations, BESS Energy Division, SPML
- Avinash Rao, MD and CEO, Mahindra Susten
- Brajesh Kumar, SVP, Navayuga Group
- Pradnyil Usgaonkar, Director, Millenium Manufacturing Systems
- Subhadeep Dey, Senior Manager, Strategy, NTPC
- Udyut Goyal, Head of BD, Amperehour
- Kartikeya Sharma, CBO, Sunsure Energy
- Abhishek Ranjan, SVP and CEO, BSES Rajdhani
- Darshan Joshi, DGM, BD, Radiance Renewables
- Sushmita Ajwani, VP, Aditya Birla Renewables
- Alekhya Dutta, Director, TERI
- Sindhu Sharma, GM, Nxtra
- Hiren Shah, Founder MD and CEO, REPLus
- Homesh Deshmukh, VP, NaBIfD
- Saurav Mitra, Director, Sumitimo SHI FW
- Jacob Seet, CCO, VFlowtech
- Kishan Bhargava, Founder, Alaknanda System
- Bharat Chhittarka, MD, Trex Energy
- Devesh Singh, Operations Officer, IFC

Time: 17:00 – 18:30

From Assets to System Value: How Storage Will Reshape Utilities, Markets and Investments

- Laura Aylett, First Secretary Climate and Energy, British High Commission
- Laura Sandys CBE, Member of EPRI Advisory Council, Vice-President of the Energy Institute and Former Chair of the UK Energy Data and Digitalisation Taskforces
- Akash Tripathi, Managing Director, Solar Energy Corporation of India Limited
- Shashank Misra, Joint Secretary, Ministry of Power, Government of India
- Mayank Tiwari, Additional Secretary, Ministry of New and Renewable Energy, Government of India
- Debmalya Sen, President, India Energy Storage Alliance
- Ian Ellerington, Technology Transfer Director, The Faraday Institution, UK (Virtual)*
- Bruce Herzer, Director of Marketing, Invinity Energy Systems, UK (Virtual)*
- Saptarshi Ghosh, General Manager – Power & Projects, Exide Industries*
- Purnendu Chaubey, Senior Vice President (Strategic Business Development & Policy Advocacy), ReNew
- Sanket Srivastava, Head (Power Purchase), Noida Power Company Limited (NPCL)*
- Surbhi Goyal, Senior Energy Specialist, The World Bank*
- Archana Chauhan, Head-Energy Sector Reforms, British High Commission

Time: 16:45 – 17:45

Powering Bihar's Growth: Innovation, Inclusion and Investment

Day 2 Agenda continued from Page 16

Bharat Electricity Summit 2026

Agenda: Friday, March 20, 2026 (Day 2)

STRATEGIC CONFERENCE: HALL BRAHMAKAMAL

Time: 10:00 – 10:50

Hydrogen, ammonia and green molecules: Building competitive industrial value chains for India and the world

- Abhay Bakre, Mission Director, Green Hydrogen Mission, Ministry of New and Renewable Energy (MNRE)
- Sangeet Jain, MD, Lanzatech
- R.R. Sonde, Professor, IIT Delhi, and Chairman, Hydrogen Valley, Jodhpur
- B.C. Tripathi, Vice Chairman, AM Green Ammonia
- S. Shaswattam, ED, NTPC, and Head, NETRA

Time: 10:50 – 11:40

AI for power and power for AI: Revolutionising performance, upgrading distribution and elevating grid intelligence

- Gerhard Salge, Global CTO, Hitachi Energy
- Dr Kwok Wai Ma, Senior Director, Industrial and Infrastructure, Infineon Technologies
- Rajiv Ranjan Mishra, MD, Apraava Energy
- C.Y. Chung, President, IEEE Power and Energy Society

Time: 11:40 – 12:30

Nuclear power for energy security: Delivering scalable and reliable clean power

- Ranjay Sharan, President, Nuclear Energy Business, Reliance Industries Limited
- Dr Thierry Advocat, Nuclear Counsellor, Embassy of France
- K. Shanmugha Sundaram, Director, Projects, NTPC, and Chairman, NTPC Parmanu Urja Nigam Limited

Time: 13:30 - 14:30

Unified power for a new India: Aligning centre-state strategies for energy transition and acceleration

- Arun Goyal, Former Member, CERC, and Former Secretary, Government of India
- Hon. Shripad Yesso Naik, Minister of State for Power and New and Renewable Energy, Government of India
- Narendra Bhooshan, Additional Chief Secretary, Energy and Additional Resources of Energy Department, Government of Uttar Pradesh
- Chowna Mein, Deputy Chief Minister, Arunachal Pradesh
- R.M. Dhavalikar, Minister for Power, Government of Goa
- Gaurav Gupta, IAS, Additional Chief Secretary, Energy Department, Government of Karnataka
- Ajitabh Sharma, IAS, Additional Chief Secretary, Energy, Government of Rajasthan

Time: 14:30 – 15:20

Electrification at scale: Power trading systems and growth trajectories for a low carbon future

- Sonam Tobjey, CEO, Bhutan Power Corporation
- Harish Saran, MD, Hindustan Power Exchange
- Neha Aggarwal, MD, Arunachal Pradesh Power Corporation Private Limited (APPCPL)
- Shailendra Shukla, MD, Mobility Group, India, Eaton Industrial Systems
- Vishal Vij, Head, Energy Services, Tata Power Trading Company Limited

Time: 15:20 – 16:10

Financing global power transition: Converting ambition into bankable projects

- Parminder Chopra, Chairman and MD, Power Finance Corporation Limited (PFC)
- Shashank Joshi, Deputy CEO, MUFG India and Head of Global Corporate Banking (GCIB), India, MUFG Bank Limited
- Kaniaru Wacieni, Senior Investment Director, Africa 50
- Ravisankar Ganesan, Director, Finance Power Grid Corporation of India Limited (POWERGRID)
- Dr Katan Hirachand, Chief Executive and Chief Country Officer, Societe Generale Bank

Time: 16:10 – 17:00

Energy storage revolution: Scaling to enable 500+ GW of renewable power systems

- Chris Fitzgerald, Group Director for International Affairs, Octopus Energy Group
- Pratyush Thakur, Investment Director and Country Head, Blueleaf Energy
- Dr Vishal Mittal, Founder and CEO, Delectrik Systems Private Limited
- Madhusudhan Rao, Founder and CEO, Oorja Energy Limited

Time: 17:00 – 18:00

India's global clean energy supply moment: Transforming "Make in India" into "Make for the World"

- Pankaj Agarwal, Founder and CEO, Panitek Green Ventures
- Atul Choudhari, CTO, Tata Consulting Engineers Limited
- Gaurav Makhija, VP, Switchgear and EPD, CG Power and Industrial Solutions Limited

TECHNICAL CONFERENCES: EXHIBITION HALL 1 AND HALL 2

Time: 10:00 – 12:00

Financial Models and Risk Management (Finance, Regulatory and Policy)

- Ashvini Kumar, Technical Co-Chair, Former MD SECI; and Adviser, Shakti Sustainable Energy Foundation
- Trusha Biswas, Head Technology and Quality, Tata Power Company Limited
- Preethi C.C., Deputy Executive Engineer, NLC India Limited
- Himanshu Mittal, Manager, POWERGRID
- Ruchi Shukla, Head, Energy, Multi Commodity Exchange of India Limited (MCX)
- Kaarthika Maheswaran, AGM, Engineers India Limited

Time: 10:00 – 12:00

Digital and Resilient Grid Operations (Transmission and Grid Operations)

- Vineeta Agarwal, CEO, Power Grid Corporation of India Limited
- Manish Patel, GM, Siemens Energy India Limited
- Akshay Sharma, Manager, POWERGRID
- Sanjay Kumar Gupta, COO, POWERGRID
- Karan Katariya, PMRF, IIT Kharagpur

Time: 13:00 – 15:00

Governance and Policy for Energy Transition (Finance, Regulatory and Policy)

- Prabodh Bajpai Professor, Department of Sustainable Energy Engineering, IIT Kanpur
- Pankaj Pandey, Executive Director, POWERGRID
- Tushar Upadhyay, Legal Consultant, Clifford Chance Business Consultancy
- Anand Kumar Singh, Advocate, Supreme Court of India
- Kushagra Goyal, Senior Research Associate, Centre for Science and Environment

Time: 13:00 – 15:00

Integration of New Energy Resources and Flexibility (Transmission and Grid Operations)

- Abhishek Gupta, Head, Appliances and International, Energy Efficiency Services Limited
- Karthik Patlolla, Chief Manager, Grid Controller of India Limited
- Anuj Verma, Manager, NTPC Limited
- Stuti Gandotra, Senior Manager, Wartsila India Private Limited

Time: 15:30 – 17:30

Digital and Technological Enablers (Finance, Regulatory and Policy)

- B.N. De Bhowmick, Technical Co-Chair CIGRE India
- Tarun Raj, CEO, REint AI
- Qasim Anwar, DGM, NTPC Limited
- Radhika Kotecha, Professor and Head, Department of Information Technology, K.J. Somaiya Institute of Technology, Mumbai

Time: 15:30 – 17:30

Transmission Market Design and System Economics (Transmission and Grid Operations)

- Raman Garg, DGM Rural Electrification Corporation Limited (REC)
- Ankur Chakraborty, Chief Manager, POWERGRID
- Dileep Kumar, Senior Manager, Siemens Energy India Limited
- Chitikena Abhijith, Chief Manager, POWERGRID
- Saanya Vashishtha, Energy Policy and Regulatory Consultant, Firstgreen Consulting Private Limited

Day 2 Agenda continued on Page 15

As of 6:00 PM on March 19, 2026