Intermittency remains the foremost issue

Recent policy measures are encouraging private sector investment and technology innovation, says **MANISH DABKARA**, Chairman and Managing Director, EKI Energy Services and President Carbon Markets Association of India

As India crosses 180 GW of installed renewable capacity, effective integration into the grid demands advanced energy storage solutions. How is India enhancing its battery storage infrastructure to support round-the-clock renewable power?

India's achievement of over 180 GW in installed renewable capacity marks a pivotal moment in the nation's energy transition. However, to unlock the full potential of this capacity especially for round-the-clock clean power, robust energy storage infrastructure is essential. Renewable sources like solar and wind are inherently variable, and advanced battery storage bridges the gap between generation and demand, ensuring grid stability and reliability. The government has recognised this imperative. Initiatives such as the National Green Hydrogen Mission and dedicated Battery Energy Storage System (BESS) tenders are driving large-scale deployment. The Ministry of Power has set a target of installing 41 GW/152 GWh of BESS by 2030, with projects increasingly being integrated into renewable parks and hybrid plants. Recent policy measures, including viability gap funding and mandatory storage components in renewable energy auctions, are encouraging private sector investment and technology innovation. India is also exploring diverse chemistries ranging from lithium-ion to sodium-ion and flow batteries to balance cost, efficiency, and resource availability. Coupled with pumped hydro storage development, this diversified approach strengthens resilience against supply chain risks. At EKI, we see battery storage not as a standalone technology but as part of a broader decarbonisation ecosystem, enabling corporates, utilities, and communities to access clean power when they need it most. By supporting projects with integrated storage, we aim to accelerate India's journey towards 24x7 renewable energy and a net-zero future.

With the global battery energy storage market projected to surpass $190 billion by 2030, how are Indian investments aligning with this trajectory? What are the national targets, and how are domestic companies and global players contributing?

The global battery energy storage market's projected growth to over $190 billion by 2030 aligns closely with India's

own ambitions. Recognising storage as a cornerstone of its clean energy transition, India has set a target of 41 GW/152 GWh of battery energy storage capacity by 2030. This is being advanced through policy support such as viability gap funding, tax incentives, and mandatory storage integration in renewable energy tenders. Indian corporates are making substantial commitments - energy majors, renewable developers, and power utilities are commissioning standalone and co-located battery projects across solar and wind farms. Domestic manufacturing is gaining momentum under the Production Linked Incentive (PLI) scheme for Advanced Chemistry Cells, aimed at reducing import dependence and strengthening supply chains. Global technology providers and investors are also entering the Indian market, bringing capital, expertise, and proven large-scale solutions. Joint ventures between Indian firms and international battery manufacturers are emerging to accelerate capacity building and localisation of technologies.

Despite the acceleration, challenges like intermittency, transmission bottlenecks, and grid integration remain. What are the most pressing obstacles today, and how is the national grid evolving to accommodate variable renewable power?

While India's renewable energy growth is remarkable, integrating large volumes of variable solar and wind power presents distinct operational challenges. Intermittency remains the foremost issue - generation often peaks when demand is low and drops when demand surges. This mismatch creates strain on balancing supply and demand in real time. Transmission bottlenecks are another pressing concern. Renewable-rich states like Rajasthan, Gujarat, and Tamil Nadu often generate surplus power, but limited interstate transmission capacity can restrict its flow to demand centres. Delays in building high-capacity transmission corridors and synchronising them with renewable project timelines can result in curtailment. Grid flexibility is also critical. The national grid, historically designed for centralised fossil fuel generation, is being reconfigured to handle distributed and variable inputs. The Green Energy Corridor projects, expansion of high-voltage direct current (HVDC) lines, and deployment of smart grid technologies are key steps in this evolution. Battery energy storage systems, pumped hydro, and demand response measures are being integrated to smooth fluctuations and maintain frequency stability.

From Green Hydrogen Mission and PM-KUSUM to updated feed-in tariffs and Viability Gap Funding (VGF), what recent policy interventions are having the greatest impact? How does India's regulatory strategy compare with global leaders?

India's policy landscape for clean energy has become increasingly comprehensive, targeting both large-scale infrastructure and decentralised solutions. The National Green Hydrogen Mission is positioning India as a future exporter of green fuels, while PM-KUSUM empowers farmers to deploy decentralised solar, reducing diesel dependence and feeding surplus power into the grid. Updated feed, in tariffs for rooftop and distributed solar are improving project viability, and Viability Gap Funding (VGF) for battery storage and hybrid projects is accelerating deployment at scale. Compared to global leaders, India's regulatory approach is uniquely multi-pronged, balancing industrial-scale ambitions with rural energy access. While advanced economies focus heavily on decarbonising existing grids, India is simultaneously building new capacity, upgrading transmission, and scaling manufacturing through schemes like the PLI for Advanced Chemistry Cells. This integrated, growth-driven strategy ensures that clean energy expansion supports economic development alongside emissions reduction.

Innovations like smart grids, IoT-based energy management, and AI for predictive maintenance are transforming how renewable energy is generated, stored, and distributed. How are Indian firms leveraging these to improve efficiency and resilience?

Indian firms are increasingly harnessing digital innovations to enhance efficiency, reliability, and resilience. Smart grids enable real-time monitoring and automated load balancing, reducing curtailment and optimising transmission of variable solar and wind power. IoT-based energy management systems allow granular tracking of generation, storage, and consumption, providing actionable insights for operators and improving decision-making. Artificial intelligence is being applied for predictive maintenance, identifying potential equipment failures before they occur, extending asset life, and minimising downtime. Hybrid projects combining storage with AI-driven forecasting can better match supply with demand, supporting 24x7 renewable power delivery. Leading Indian corporates are also integrating these solutions with battery storage, microgrids, and distributed generation projects, creating more resilient, decentralised energy networks.

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