Renewable 4 Min Read

Accelerating India's Energy Transition Through Customised State-Level Action Plans

While decisions and actions at the central level are crucial, there is a need to focus on sul national efforts as India is a diverse country with each state having unique challenges an opportunities that are shaped by its geography, resources, and consumer mix.

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India is ranked fourth globally in installed renewable energy (RE) capacity. Yet, the country has achieved only 32% of its RE target (500 GW by 2030) as of 30 November 2024. While decisions and actions at the central level are crucial, there is a need to focus on sub-national

efforts as India is a diverse country with each state having unique challenges and opportunities that are shaped by its geography, resources, and consumer mix.

The state scenario States such as Kerala, Gujarat, Tamil Nadu, and Chhattisgarh have already announced their net-zero goals, showcasing their readiness to spearhead India's green transition. Gujarat aims to achieve 68 GW of RE capacity by 2030, while Tamil Nadu has committed to reducing its emissions intensity significantly over the same period. Similarly, Rajasthan, blessed with abundant solar potential, is targeting 90 GW of RE capacity by 2030. While this is critical, there is a need to develop clear state-level action plans for an accelerated and smooth energy transition.

Such action plans will also help in overcoming hurdles specific to each state. For example, Kerala, known for its high literacy rate and human development indices, is uniquely positioned to lead the energy transition. However, the state's dependence on energy imports and limited land availability for large-scale renewable projects pose challenges. West Bengal, with its rich coal-mining legacy, has a significant share from thermal in the overall installed capacity. Punjab, with low solar and wind potential, experienced a substantial rise in its electricity consumption post COVID-19 and due to the implementation of the subsidised power supply policy to domestic and agricultural consumers. Assam needs solutions that can be aligned to its dispersed population and hilly terrain, making centralised energy systems less effective and creating a case for decentralised renewables.

State-level action plans: A case study

Realising the importance of state-level action plans for energy transition, the Center for Study of Science, Technology and Policy (CSTEP) carried out a study in Kerala, West Bengal, Punjab, and Assam. Collectively, these states have utilised only 11 GW of their 40 GW RE potential, with thermal power still contributing 60%–80% of their energy mix.

Analysing the state's future energy demand landscape is crucial for the design of any action plan. The study estimated that the electricity demand in the four states will grow at a compound annual growth rate (CAGR) of 5%–6% under the influence of policy levers such as penetration of electric vehicles and solar rooftops, energy efficiency measures in domestic and commercial sectors, and solarisation of the agriculture sector. The consolidated demand for the four states is expected to reach 350 billion units by 2040, with peak demand touching 50 GW.

To cater to this demand, 35 GW of additional non-fossil fuel capacity with a storage requirement of 11 GW will be needed in all four states, increasing the RE share in these states' energy mix to 30%–60% from the current levels of 15%–30%. With such RE penetration, a reduction in

greenhouse gas emissions by 46% and the grid emission factor by 21% (from current levels) are expected by 2030.

State energy transition: Roadblocks and solutions

States such as Kerala, Assam, and Punjab should tackle specific challenges of land availability by identifying suitable land parcels through the creation of land bank aggregation tools or district-wise priority matrix of land parcels, considering criteria such as right of way (RoW), environmental clearance, and ease of grid integration. Further, the states need to push the uptake of decentralised RE sources and the deployment of hybrid systems (solar with small wind turbines). With high RE integration in the state grid, it is crucial that each state has a specific storage policy aligned with its RE targets/projected capacities. They should also leverage suitable energy storage technology (battery or pumped hydro). In the absence of coal-based plants, nuclear plants will have to cater to the base load and provide the required flexibility to the grid. The states therefore need to initiate steps to allocate increased generation share from the upcoming nuclear plants in the country.

Electric vehicles and solar rooftops are going to play a crucial role in states' energy transition. With both technologies being connected to the low-voltage grid, it is important to analyse the impact by carrying out distribution grid feasibility studies. The states also need to take more energy efficiency measures as it will aid them in managing the increasing peak demand in future with changing consumer behaviour.

Further, states can create a single window clearance system for ironing out the operational and procedural issues and commission state-level

transmission grid planning studies for efficient execution of the action plans.

In conclusion, with centre–state alignment, collaborative efforts, and state-level action plans, India will be able to achieve its net-zero targets much sooner than the targeted time frame, progressing towards a secure and sustainable future.

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