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Pathways for Meeting India's Power Sector Decarbonization Targets for 2030

THEMATIC TRACK SUMMARY

Venue: Jacaranda II

Date: February 23, 2023

Time: 04:00 PM – 05:30 PM (IST)

Suggested Citation

World Sustainable Development Summit (2023), Pathways for Meeting India's Power Sector Decarbonization Targets for 2030, Thematic Track Summary (Rapporteurs: Nayeem Khan and Robin Mazumdar), New Delhi: The Energy and Resources Institute.

Actionable Messages

Message 1: To achieve decarbonization targets for 2030, the pace of installations of renewables would have to be accelerated with a growth of about 40GW per year.

Message 2: There is a requirement of large-scale long duration storage such as pumped storage to provide resilience and greater flexibility in grid management with increasing share of variable renewable energy (VRE).

Message 3: For achieving greater flexibility, newer and more efficient thermal power stations will need to support two-shift operation, as it is being demonstrated by Tamil Nadu at a few vintage thermal stations.

Message 4: Demand-side response being the most efficient and cost-effective resource, needs to be captured as compared to supplying the costly peak power.

Message 5: Resource adequacy mechanism is a necessity and adds to resource optimization and ensures adequate capacity in the grid.

Narrative

The thematic track session titled, “Pathways for Meeting India’s Power Sector Decarbonization Targets for 2030” was conducted as part of the World Sustainable Development Summit (WSDS) - the annual flagship initiative of The Energy and Resources Institute (TERI). The aim of the session was to explore the global perspective towards India’s power sector decarbonization targets for 2030 and achievements made so far and suggest ways to accelerate development of renewable energy and storage.

The moderator for the session was **Mr. Ajay Shankar, Distinguished Fellow, TERI; Former Secretary, Department of Industrial Policy and Promotion, Government of India.** Discussions on various topics unfolded, which included: challenges and the way forward for deployment of various forms of RE (specially decentralized solar rooftop, floating solar and off-shore wind) and storage (pumped storage, concentrated solar thermal and BESS), developing demand and supply side flexibility, integrating value proposition of electricity supply in retail tariff design, becoming ‘Aatmanirbhar’ in clean energy-related manufacturing and procurement of green carbon-free electricity by consumers.

The session started with the introductory address and presentation by **Mr. A. K. Saxena, Senior Director, TERI** who highlighted the context of the discussion paper and presented the way forward to achieving decarbonization target by 2030. Some of the points raised during the presentation included: increase in momentum of bids for solar and wind power projects, introduction of feed-in-tariff, implementation of storage projects, introduction of time-of-use tariffs, introduction of consumer choice for green power, and becoming a globally competitive RE manufacturing hub. Each of the proposed ways were discussed in detail. Mr. Saxena concluded by emphasizing on the role of private investment, financial health of DISCOMs, and competitive procurement as key factors in meeting the 2030 targets.

Following the introductory address, **Mr. Tim Gould, Chief Energy Economist, IEA** started by congratulating the colleagues at TERI for bringing out an insightful discussion paper. He said, India has a remarkable growth of renewable capacity, however, to meet the 2030 target, the growth of renewable energy capacity would need to be ramped up further. He emphasized that demand-side flexibility, much like supply-side is responsive to policy signals. Mr. Gould opined that the focus on demand-side management will play a key role in serving the peak power in cost-effective ways, and thereby reduce the load on the grid. Finally, he pointed out that the report has no mention of natural gas, whose price could continue to go up at least until the middle of the decade.

Following Tim Gould’s address, the discussion steered towards understanding the way forward for the 2030 goals from a regulator’s perspective. **Mr. S. R. Pandey, Member, Gujarat Electricity Regulatory Commission** talked about the importance of decarbonization and the role of various associated agencies to achieve the 2030 targets. He then listed out some key enablers for decarbonization in the Indian context: promotion of RE, green hydrogen, long duration energy storage and electric vehicles, and introduction of ancillary services and green energy markets. He emphasized the use of green hydrogen, methanol, ammonia on industrial scale at any level instead of conventional sources, could push the green hydrogen mission, with the role of the commission being to frame the regulations to support the implementation of the mission. With the growing market for EVs in India, the charging time of EVs is an important factor when it comes to adoption of electric vehicles by any consumer, and it is important to take it into consideration when framing policies and regulations. In India, the major contributor to carbon emissions is the power sector, followed by the industrial sector, and the transport sector. There are various models to achieve decarbonization in these sectors. On industry level, hydrocarbons, either at the refinery level or plant level, are used to produce hydrogen or ammonia. Using RE with storage instead of hydrocarbon results in the production of green hydrogen. So, to achieve decarbonization targets, a shift from conventional fuel to the use of hydrogen,

methanol, ammonia for industrial use is necessary. Also, various forms of storages technology (PSP, BESS, CSP, etc), with each having their own limitations, costing, and other aspects must be verified so as to find the best suited application for each type/form. Mr. Pandey, much like Mr. Gould, also emphasized the importance of demand-side variation, which is a challenge for the licensee. To meet the peak demand, a huge and expensive capacity addition is required, which can be avoided to an extent with different DSM techniques. He concluded by stating that agricultural load shifting can reduce the burden on the grid and help meet evening peak, and such practices could be explored.

Mr. Y. K. Sehgal, Executive Director, Greenko Group talked about the importance of pumped storage plants (PSPs) in today's India where flexibility is an important concern. He mentioned that one of the main challenges in the grid is the trend of a growing gap between off peak and peak power over the years. This calls for the need of flexibility from two sides – power supply side and demand side. Now, due to the high cost of gas and low ramp rate of hydro, PSPs can serve for this flexibility by integrating with RE. By combining the high capex of PSP and competitive prices of RE, power can be offered at a competitive price during peak hours. Additionally, PSP along with RE can provide customized power, which thermal power plants cannot do. He then proceeded to clarify some myths about PSPs which the public have, such as low CUF, large capex, high tariff, and long gestation period. Greenko has developed two models: off stream close loop, off stream open loop, which if built in a suitable location, can reduce the gestation period to 2-2.5 years after concurrences. He added that the new guidelines by the Government of India have reduced such concurrences to favour the uptake of environment-friendly PSPs. Apart from the peak power, PSPs can provide power for ancillary services, spinning reserves, black starts, among other services. Mr. Sehgal also opined that PSP is as good as a large-scale battery storage installation.

The next speaker on the panel was **Ms. Surbhi Goyal, Senior Energy Specialist, World Bank**. Ms. Goyal proceeded by reiterating that PSPs are critical in achieving the 500GW target as coal goes out, and briefed the audience on the solutions the World Bank is attempting while working with the government. Similar to the Greenko model, another innovative model considering bundling of hydropower with non-hydro RE in another state is under development to match the demand profile with the supply side. She mentioned the challenges faced by the electricity markets and termed the wholesale electricity markets in India as shallow as long-term PPAs dominate the contracts, and financial institutions do not support short-term PPAs / renewal-based PPAs, which are the need of the hour and hence this needs innovation for solutions. She opined that without hydro and PSP in the mainstream, and relying on only one solution for energy storage, the RE journey in India will continue to be very slow. Regarding hydro, Ms. Goyal hinted at the use of expensive yet efficient bifacial floating solar modules to add to the 2030 RE targets. Towards the end, she mentioned that beyond hydro and bundling, the World Bank supports the green hydrogen mission, offshore wind in Gujarat and Tamil Nadu, solar rooftop, solar parks, and the Spiti solar project among other initiatives, which aim to decarbonize the Indian power sector.

Mr. Samir Chandra Saxena, Executive Director and Head, National Load Despatch Center (NLDC), Grid Controller of India Ltd initiated the discussion by mentioning that in energy terms, Karnataka has 72% RE penetration, and states like Andhra Pradesh, Tamil Nadu, Gujarat, and Rajasthan have exceeded 45% in terms of RE penetration. He added that in today's India, each state is like a country in Europe in terms of the degree of penetration of RE. On a daily basis, India is observing around 20-30% non-fossil fuel penetration. During COVID-19 outbreak, when the demand itself had come down, this penetration had even crossed 35%. One significant contributor to this ability to absorb such a huge quantum of RE is the robust grid. Additionally, another enabler to facilitate harnessing more RE is flexibility of all kinds. One major attribute when it comes to flexibility is the two-shift operation. For flexibility, newer and more efficient thermal power stations need to support two-shift operation, as is being demonstrated by Tamil Nadu at a

few vintage stations. As a system operator, Mr. Saxena also extended his support to the PSP initiative, and stressed the need for capturing the most efficient and cost-effective resource – demand-side response as compared to supplying the costly peak power. He also emphasized the need for all types of studies and simulations, including Resource Adequacy studies, in order to ensure reliability in the grid. Moreover, digitization is of utmost importance to maintain grid flexibility and stability, he added.

The last speaker on the panel was **Ms. Ammi R. Toppo, Chief Engineer (Integrated Resource Planning Division), Central Electricity Authority**. Ms. Toppo initiated the discussion by presenting some results from the generation expansion planning studies for 2030 carried out by CEA. She mentioned that CEA will be revising the report in view of the change in demand, newer technology, capacity additions, etc., over the past years. In terms of storage technology, besides mature technologies, particular focus on other promising technologies, which are still in their nascent stage like redox flow battery, which has a large storage life, is the need of the hour to strengthen the future options. Resource Adequacy mechanism is a necessity and adds to resource optimization and ensures adequate capacity in the grid. In this context, CEA will publish national long-term RA plans for 10 years, and revise the same annually, where they will specify the states' contribution to the national peak and the planning reserve margin. NLDC will also undertake short-term RA plans for operational purposes. She concluded by stating that planning should be done at the DISCOM level so that demand at every instant can be met reliably and effectively.

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“	<p>To scale up renewable capacity to meet the 2030 targets, renewable capacity addition needs to be ramped up to about 35GW per year on an average from the current level.</p> <p style="text-align: right;">Mr. Tim Gould <i>Chief Energy Economist, IEA</i></p>
“	<p>To achieve decarbonization targets, a shift from conventional fuel to the use of hydrogen, methanol, ammonia for industrial use is necessary. Decarbonization can be achieved through the promotion of RE, green hydrogen, long-duration energy storage, electric vehicles, introduction of ancillary services and green energy markets.</p> <p style="text-align: right;">Mr. S.R. Pandey <i>Member, Gujarat Electricity Regulatory Commission</i></p>
“	<p>High capex of pumped storage plants (PSPs) and cost competitiveness of RE can be integrated to provide flexibility at a competitive price in peak hours. PSPs are environment-friendly and can be built indigenously to promote the ‘Aatmanirbhar Bharat’ initiative.</p> <p style="text-align: right;">Mr. Y. K. Sehgal <i>Executive Director, Greenko Group</i></p>
“	<p>Similar to the Greenko model, another innovative model considering bundling of hydropower with non-hydro RE in another state is under development to match the demand profile with the supply side. Digitization is extremely important for real-time monitoring and data collection to maintain grid stability and flexibility.</p> <p style="text-align: right;">Ms. Surbhi Goyal <i>Senior Energy Specialist, The World Bank</i></p>
“	<p>For flexibility, newer and more efficient thermal power stations need to support the two-shift operation, as is being demonstrated by Tamil Nadu at a few vintage stations. The demand-side response being the most efficient and cost-effective resource needs to be captured as compared to supplying the costly peak power.</p> <p style="text-align: right;">Mr. Samir Chandra Saxena <i>Executive Director & Head, National Load Despatch Center (NLDC), Grid Controller of India Ltd.</i></p>
“	<p>Resource Adequacy mechanism is a necessity and adds to resource optimization and ensures adequate capacity in the grid. Planning should be done at the DISCOM level so that demand at every instant can be met reliably and effectively.</p> <p style="text-align: right;">Ms. Ammi R. Toppo <i>Chief Engineer (Integrated Resource Planning Division), Central Electricity Authority</i></p>