# Interview with S.R. Narasimhan

## "POSOCO is playing a key role in ensuring reliable and resilient operations"

Power System Operation Corporation Limited (POSOCO) has been efficiently managing grid operations, facilitating the integrated operations of regional and national power systems, and ensuring grid security, stability and resilience. In a recent interview with *Power Line,* S.R. Narasimhan, CMD, POSOCO, spoke about the steps needed to prepare the grid for integrating 500 GW of renewable energy capacity by 2030, the outlook for the ancillary services market, as well as the issues and challenges in grid operation. He also discussed POSOCO's key focus areas and top priorities in the coming years. Excerpts…

**How do you assess the current state of the power sector? How has the role of POSOCO evolved over the years?**

The Indian energy system is undergoing a transition towards clean energy sources. The challenges posed by the growth of utility-scale solar and wind power, distributed rooftop solar, electric vehicles and battery storage systems in the grid call for innovative solutions. It is necessary that the rules and governing institutions of the system adapt and evolve to support and enable this energy transition.

As a trusted and expert body at the centre of the Indian power system, POSOCO is playing an important role in coordinating and ensuring reliable and resilient operations across the power sector. POSOCO is facilitating the implementation of various initiatives at the policy and regulatory levels. The introduction of frequency control through automatic generation control and reserve regulation ancillary services has been key to ensuring operational security and reliability. The Security constrained economic dispatch (SCED) pilot project by POSOCO has led to a more complex algorithm-based optimisation paradigm, and a diverse resource and demand mix.

Refinements in imbalance pricing and real-time electricity markets have been facilitated by POSOCO. Situational awareness in the control centre is being enhanced by the deployment of phasor measurement units and establishment of renewable energy management centres. Inertia monitoring and assessment is now being focused upon. The National

Open Access Registry as a digital platform for the pan-Indian electricity market has been operationalised. From a regional grid era in the first decade of this century, which was plagued by power shortages, the country has now moved to a single synchronous national grid with flexible generation and transmission resources as more and more renewables are getting added to the system. POSOCO has played a key role in shaping the grid of today and has evolved over the years with the right blend of youth and experienced personnel in its ranks.

**What is the current status of the SCED project? What have been the key takeaways?**

The prime driver behind the SCED pilot was to explore the scope of optimisation and, therefore, the possibility of minimising the total production costs without disturbing the prevailing decentralised scheduling mechanism. Since its inception in April 2019, SCED has resulted in a reduction in the variable cost of power generation by over Rs 21 billion.

The implementation of SCED required the enforcement of gate closure, establishment of robust communication infrastructure and automation of exchange of scheduling information between the National Load Despatch Centre (NLDC) and the five regional load despatch centres. The application software of SCED has been developed by the in-house team of experts with regular updation/customisation as and when required. Thus, implementation of the SCED pilot has helped POSOCO to understand the IT challenges and possible solutions for extending this mechanism further.

SCED highlighted the immense scope for optimisation of production costs by enhancing thermal flexibility (ramping capability, turndown level, maximum generation limit, etc). The experience provided key lessons in unit commitment for maintaining reserves in the grid. At the power station level, reduced perturbations in the injection schedule enabled better fuel management. One of the major learnings on the system operation front has been the support to system reliability along with signals for technology interventions. On the generator front, a key learning has been the introduction of operational flexibility with ease of generator operations. It has led to better portfolio management by state utilities. Notwithstanding the introduction of the real-time market with effect

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from June 1, 2020, which has provided more opportunities to market players for portfolio optimisation, SCED still operates as a backstop to mop up further savings, if any.

The draft Indian Electricity Grid Code, 2022, issued by the Central Electricity Regulatory Commission (CERC), has provided for the optimisation of scheduling through SCED. Security constrained unit commitment (SCUC) has also been proposed for committing or decommitting generating units while respecting limitations of the transmission system and unit operating characteristics.

**How is the market for ancillary services shaping up? What is the way forward?**

The CERC notified the Ancillary Services Regulations, 2022 on January 31, 2022 which provided market-based mechanisms for procurement as well as deployment and payment of ancillary services at the regional and national levels.

As the nodal agency for secondary reserve ancillary services (SRAS) and tertiary reserve ancillary services (TRAS), the NLDC has already submitted the draft interim detailed procedure for assessment of reserves for SRAS and TRAS to the CERC. The draft detailed procedure was floated for public stakeholder consultations and regional-level workshops were also held. Post incorporation of stakeholder inputs, the revised draft procedure was submitted to the CERC for approval. Work is going on for implementing the market-based mechanism for procurement and deployment of TRAS resources while also specifying the qualifying requirements for resources to participate in SRAS.

The draft Indian Electricity Grid Code, 2022 has also provided for primary, secondary and tertiary reserves to be deployed for the purpose of frequency control, reducing area control error and relieving congestion.

**What are the steps required to prepare the electricity grid for 500 GW of renewable energy by 2030?**

As more and more inverter-based resources (IBRs) in the form of solar PV, wind, battery energy storage systems (BESSs) and electrolysers for green hydrogen get connected to the grid, there is a need for a forward-looking set of technical standards and grid codes specifying the behaviour of these IBRs. This is important because for a large country like India, retrofits to take care of any new aspect with respect to the grid would be a serious challenge. Ensuring that the new resources follow the standards and continue to do so in the future calls for a high level of compliance monitoring. Grid forming inverters would also be required in the near future and the standards must keep pace with these developments. There is a need to be nimble-footed in this respect as these changes involve extensive stakeholder consultations. A shared vision becomes important.

The next key issue would be ensuring resource adequacy (RA) as more and more intermittent renewable energy resources get added to the grid. No longer does the RA have to be checked for only meeting peak demand but the entire diurnal and seasonal load profiles over 8,760 hours in a year need to be evaluated. The capacity value of each resource becomes important. On August 30, 2022, there was a record low wind generation with the all-India figure below 400 MW and the daily wind energy at 34 TWh – all this during what is considered the high wind season. The flexibility of conventional resources becomes important and energy storage has a great value here as it adds to flexibility as well as provides capacity value. Demand response should be considered a part of the RA exercises. Fuel security is also an important component of RA.

With large solar parks and wind farms coupled with energy storage, transmission planning would be the next key issue. The application of high voltage direct current and flexible alternating current transmission system devices to cater to variable and bidirectional power flows will become important. Inertia, short circuit strength as well as reactive power control through synchronous condensers will also be essential. Cross-border transfer of electricity and its coordination will be pertinent here.

On the operational front, there is a need to increase conventional generation flexibility so that it can withstand fast ramping, variability, intermittency, potential grid instabilities resulting from loss of inertia, loss of visibility and controllability of behind-the-meter resources. Evolution of ancillary service products would become important. At the control centre level, deployment of artificial intelligence-based algorithms for demand and renewable energy forecasting as well as other decision-making processes in real time would become important. How can the entire power system be made more resilient is a question that needs to be continuously debated to explore solutions. The cybersecurity aspects also need to be kept in mind while designing systems and processes. The wholesale and retail electricity markets must be designed around the above requirements and actually help in complementing reliability. While deploying these technologies, the human behind the machine is to be always kept in mind. Capacity building across all stakeholders is an area on which POSOCO is placing great emphasis.

**What are the biggest issues and challenges in grid operations?**

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The next big transformation to be witnessed is a significantly scaled-up storage battery fleet. The central government has initiated the implementation of 500 MW/1,000 MWh of BESSs in India. A first-of-its-kind tender in the country, it will provide discoms with storage facilities to be used on an "on-demand" basis. About 150 MW/300 MWh will be earmarked to be used by NLDC and POSOCO for grid ancillary services. The tender marks the first tranche of the government's immediate target of setting up 4,000 MWh of battery storage capacity as part of achieving increased penetration of renewable energy in the national grid.

The original definition of "peak" has changed, especially during summers. The typical peak, which would historically be around 6-8 p.m., has migrated to earlier in the afternoon, around 3 p.m. With the increased requirement for space cooling, regions such as the north are seeing the highest demand around 10-11 p.m. when the challenge of meeting this demand is much more as it is the off-solar hours. Anticipating the future demand and ensuring adequate resources to meet the demand will become important.

**What are the key focus areas and top priorities of POSOCO for the coming years?**

The areas meriting attention have been covered above. In the coming years, POSOCO system operators would need to enhance and upgrade their skills focused on system security, reliability, resilience through resource adequacy, network modelling and simulation studies, forecasting, assessment and deployment of reserves and optimisation. POSOCO will work towards enhancing transparency, stakeholder coordination and collaboration with academia. POSOCO's internal policies would focus on talent management, empowering our system operators and keeping them motivated to meet the growing stakeholder expectations. The mindset and skill set need to take into account the integration of new actors such as electric vehicles, storage, green hydrogen, and distribution system operators. The skills in digital infrastructure, cybersecurity and way of work scalable with interoperable information and communication systems have to be emphasised in the "new normal". The modernisation of control centres with AI tools and maximisation of system performance are among the key areas for ensuring efficient system operations.

It is and will become even more important to be able to self-study, perform in-depth analysis, learn and adapt fast and be able to work in multi-domain projects. Sound knowledge of machine learning and AI will play a key role in enabling our employees to tackle future challenges because as renewable energy penetration increases, maintaining supply-demand balance will pose a major challenge. I think knowledge of AI will enable us in taking grid operations to the next level.

**What is your medium-to long-term outlook for the power sector?**

Strong economic growth, combined with climate change events, has increased global electricity demand, which has put exceptional pressure on electricity markets around the world. The fast rebound in overall energy demand has strained supply chains for coal and natural gas, and this is pushing up wholesale electricity prices. Energy and capacity procurement with physical and financial market structures in various time horizons will need to be evolved.

There was a lukewarm response by many of the discoms in terms of signing power purchase agreements for new wind and solar projects. This would change as RA takes centre stage. An equally interesting development would be the adoption of renewable energy by commercial and industrial consumers. Electricity regulatory commissions of stats such as Maharashtra have already announced a green tariff whereby consumers can migrate to this tariff by paying a small premium to discoms. This space holds a lot of potential. In addition, the Green Open Access Rules recently notified by the central government should give a push to renewable energy.

On the distributed energy resources front, the situation is still evolving in India as compared to other parts of the world. This would change as there would be more rooftop solar and energy storage devices at the consumer level (behind the meter). These devices would be accessible to load despatch centres for demand response through aggregators, a new set of players that the electricity market would see.

There is going to be profound innovation in generation, transmission and distribution technologies over the next 10-20 years – stuff that cannot even be imagined today. Expansion of the regional footprint with cross-border trade through initiatives such as OSOWOG, BIMSTEC, BBIN, etc. would gain prominence. Digital infrastructure, cybersecurity and way of work scalable with interoperable information and communication systems would need to be developed. Modernisation of control centres with AI tools and maximisation of system performance are also important. Risk-based probabilistic transmission planning processes and criteria along with non-wire alternatives have to be evolved. Offshore wind and hybrid renewables (wind-solar, wind-solar-storage, etc.) would have to be seamlessly integrated into grid operations.

Last but not least, energy efficiency and energy conservation would take centre stage. Hitherto a less glamorous cousin in the decarbonisation objective, the energy efficiency sector would grow in importance as the world realises that one just cannot keep satisfying global energy demand. ■