



# TRANSFORMING INDIA'S POWER LANDSCAPE

## Benefits modelling and technical assistance: Supporting CERC on key electricity market interventions

*The Government of India is working to deploy unprecedented levels of renewable energy (RE) on its power grid. Getting a large quantum of RE on the grid will allow India to greatly reduce its economy's carbon intensity and substantially strengthen the country's energy security. Global experience shows that when RE penetration reaches significant levels, the power grid's capacity to manage RE must be bolstered by implementing market-based mechanisms of power procurement. The planned large-scale integration of RE by India warrants that the country address the existing barriers to effective power procurement.*

### EXISTING BARRIERS TO EFFECTIVE POWER PROCUREMENT

Distribution companies (DISCOMS) in India currently schedule generators on a day-ahead basis from among their contract portfolio. This is a sub-optimal approach since states do not have the visibility of cheaper generators outside their state control areas. It also leads to reduced RE integration, as any surplus generation within state control area is not utilized and gets curtailed. Variability in RE generation also leads to scenarios where states are left with demand-supply imbalances to manage. Historically, imbalances on intra-day basis have largely been managed within state control areas, resulting in reduced flexibility to accommodate RE. Major barriers to participation in the intra-day market include lack of collective market transactions, significant lead-time to conclude trades, and absence of flexible products. Further, there exists no market-based framework for procurement of ancillary services such as frequency support, voltage support, etc., which are needed to enhance the reliability of the power system. Presently, there is no market-based framework for procuring these services that could enable fast-responding technologies to participate.

### SHAPING EFFECTIVE POWER MARKET INTERVENTIONS

The Central Electricity Regulatory Commission (CERC), India's central regulator, is responding proactively to the need for market-based mechanisms that enable RE integration. Taking a data-driven approach, CERC called for a benefits demonstration study of select market models in day-ahead and real-time horizons to evolve consensus on the best model to effectively enlarge the balancing area from individual states to a regional or national market. CERC also issued a regulation on National Open Access Registry (NOAR) to automate the open access approval process and bring down the lead-time (gate-closure) to conclude trades in power exchanges.

*As a long-standing partner in India's reform agenda, USAID has been supporting India's Ministry of Power and its key regulatory bodies adopt innovative, evidence-based solutions to emerging energy-sector needs. In line with this commitment, USAID's Greening the Grid-Renewable Integration and Sustainable Energy (GTG-RISE) program lent technical assistance to CERC for benefits demonstration and implementation of an enhanced system for intra-day energy exchange to enable coordination among states.*

GTG-RISE conducted a modelling study and assessment of benefits for stakeholders participating in various models of revamped intra-day market operations that CERC has been deliberating. The exercise aimed to demonstrate the rationale for implementation of an enhanced system for intra-day trading. GTG-RISE also assisted CERC in analyzing stakeholder comments on the staff papers issued on redesigning of intra-day markets, addressing stakeholder concerns, drafting and finalizing the key amendments to various regulations, and preparing the statement of reasons for implementing the real-time market (RTM).

## BENEFITS MODELLING STUDY POINTS TO SIGNIFICANT SAVINGS

GTG-RISE supported CERC in undertaking benefits modelling of centralized market operations in the day-ahead market as well as in RTM. Data on historical scheduling and dispatch was collected from select six states — Telangana, Andhra Pradesh, Maharashtra, Karnataka, Chhattisgarh, and Madhya Pradesh — and combined to assess the scope of savings if different market models were to be implemented. Using a Python-based co-optimization algorithm, simulations were conducted to demonstrate the benefits for the select states for FY 2016-17.

Results show that significant benefits would accrue if centralized day-ahead market and RTM were to be implemented: system cost savings to the tune of ~INR 6,200 crore for a market-based mechanism in day-ahead market and savings of ~ INR 2,900 crore in RTM. The study established that inter-state sharing of reserves, when dispatched on system marginal price, would lead to substantial reduction of power procurement cost of DISCOMS. Details of the accrued benefits were part of the discussion paper CERC issued on market-based economic dispatch (MBED). GTG-RISE further supported CERC in preparation review of stakeholder comments on the MBED discussion paper, preparation of draft RTM regulations, identifying key changes in extant regulations for implementing RTM, etc. Based on these inputs, CERC incorporated the additional observations, finalized the regulations, and implemented RTM in India with effect from June 1, 2020 — a critical milestone in the history of the power sector in India.

## RTM: A HUGE STEP FORWARD

Launch of RTM by CERC in June 2020 has placed the Indian electricity market in the league of advanced wholesale electricity markets globally. DISCOMS can now purchase millions of units of power in spot markets just an hour before delivery, a process as simple as booking a cab online just an hour before travelling. This is a major development to drive India's shift from long-term generation contracts to short-term contracts and electricity spot markets. As of April 2021, the RTM in India has already witnessed a volume of 11 BUs, i.e., ~20% of existing volumes traded in the day-ahead market. The growing volume in the real-time electricity market has shown its acceptance by generators, distribution utilities, and industrial consumers as a last mile resort to address imbalances in real time.

## THE WAY AHEAD

The benefits of a national power exchange-based intra-day market have been successfully demonstrated to each state through the GTG-RISE demonstration. Such a market can act as a building block for devising appropriate governing regulations and operational procedures for larger market-based implementations, such as MBED, ancillary services market, and capacity markets. The GTG-RISE team has also assisted CERC in benefits demonstration of a day-ahead MBED for the country as a whole, where all generators are dispatched purely on merit order, subject to technical and transmission constraints. The team has also assisted in drafting a discussion paper on MBED, analyzing stakeholder comments on it, and preparing an issue-wise summary of the comments shared by stakeholders for further consideration by CERC.

As a scale-up of the support it gave through benefits demonstration and technical assistance to implement RTM, the GTG-RISE team is currently assisting CERC in drafting and finalizing the regulations for market-based procurement of secondary and tertiary ancillary services, analyzing international best practices, and simulating possible models for India.



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