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Sector update

INDIA

Power

One Nation, One Grid and towards One Price

Ministry of Power (MoP) has recently released a discussion paper on the implementation of Market-Based Economic Dispatch (MBED). The paper argues for redesigning of day-ahead scheduling of electricity markets in the country on a market based / integrated approach in order to realise the 'One Nation, One Grid, One Frequency, One Price' framework. It also proposes the implementation of MBED phase-I starting with the entire fleet of NTPC's thermal stations from 1st Apr'22. Although there may be changes once stakeholders share comments, as per our initial understanding, MBED is a wider scoped SCED, which is already operational, and will result in more efficient utilisation of low cost generating capacity across the country, and thereby, reduce tariffs for discoms and consumers. Earlier, it was only for 'cost-plus' assets but will now be for all power plants. Gencos (central and private) and discoms are expected to benefit from this move. NTPC, CESC and PTC India remain our top picks in the sector.

- **Draft paper argues for a market-based approach for scheduling and operations of electricity markets in India**: CERC had first highlighted the constraints in the current practice of self-scheduling and the rationale for a market-based approach to scheduling in its discussion paper on MBED in Dec'18. It had proposed redesigning of day-ahead scheduling and operations of electricity markets based on the following objectives: 1) Meeting the system load with least-cost and efficient-generation plants, 2) uniform pricing framework to encourage efficient capacity generation addition in the future and 3) facilitate increased variable RE integration through larger balancing area and reserve sharing. With India no longer constrained on inter-regional transfer of electricity, a national merit-order and a country-wide balancing area should be the next step, as per the paper.
- **MBED is a wider-scoped version of SCED with modifications**: Currently, SCED's scope (valid till Sep'21) covers system cost optimisation only after final schedules are prepared and units are committed. The framework does not alter the commitment of generating units on a day-ahead basis and thus, costlier generators once committed, continue to operate. But the proposed MBED mechanism shall schedule and commit generation on day-ahead basis, purely on economic principles (subject to technical constraints). This will lead to further optimisation and cost savings, as costlier generating units committed currently may not be scheduled at all under MBED. As per the paper, implementation of a full-fledged MBED requires policy, regulatory and operational changes, which is why a phase-wise approach is being adopted. (See Annexure-2)
- **Phase-I will start from 1st Apr'22 with NTPC thermal stations:** Proposed phase-I implementation starts from 1st Apr'22 with NTPC's thermal stations, with the following objectives: 1) Test the efficacy of the proposed mechanism, 2) identify the potential issues/deficiencies prior to nation-wide implementation, 3) familiarise participants and stakeholders with market dynamics and 4) test the value drivers of MBED.
- **Substantial cost savings estimated:** CERC's estimate of cost savings for five states, viz., Andhra Pradesh, Telangana, Maharashtra, Karnataka and Chhattisgarh, post phase-I implementation is Rs18.3bn p.a., at average 3.74% benefits in power procurement costs (more than double vs SCED benefits estimated at Rs9bn p.a.). If extended to the entire country, estimated savings are Rs123bn p.a. Optimisation benefits can reach 12-15%, if unit commitment related benefits are also captured in day-ahead mechanism.
- **Our view:** MBED still being at a draft stage, stakeholders' comments will be important. We do not expect any changes in PPAs; however, it will be interesting to see whether PPA-based buyers will be ready to pay exchange charges. Further, working capital funding for buyers will be key as the entire power tied-up with NTPC plants will be transacted on exchanges and require upfront payment from discoms (up to Rs1.5bn/day) rather than 45-days post monthly billing practice. WCap funding rates will not only depend on the quantum of power purchased but also in the state's credit-worthiness. States which still do not follow merit-order will be the most impacted. Key beneficiaries will be central as well as efficient low-cost private generating stations, while discoms will benefit on account of lower power purchase costs. Implementation of this proposal remains a challenge as states may oppose their gencos losing out on PLF, as well as legal issues related to multiple operational PPAs. Also, as demand increases going ahead, and we achieve a demand-supply equilibrium in medium term, prices discovered may increase significantly in spot markets.

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Draft discussion paper on MBED implementation – key highlights

Instead of self-scheduling on day-ahead basis by discoms among their portfolio of contracted generators, MoP has suggested implementing a Market-Based Economic Dispatch (MBED) framework (floated first by CERC in Dec'18). This is planned to be implemented in a phase-wise manner, with the first phase to start 1st Apr'22 onwards, involving NTPC's fleet of thermal stations.

Key benefits of MBED:

For discoms:

- Dispatch optimisation increases utilisation of low-cost generators while reducing and backing down expensive generators in certain cases
- Additional revenue received from market by cheaper generating stations would be shared with discoms
- Discoms and consumers benefit as overall procurement cost reduces

For generators:

- Promotes cheaper and more efficient plants
- Pit-head stations run to their full capacities. This leads to the dual benefit of:
  - less requirement of coal movement and thus saving in coal transportation cost
  - decongestion of railway traffic.
- Generators, who sell their unreserved sector power, will earn additional revenues (upper cap to be decided suitably by CERC).

For others:

- Demand for reserves (ancillary services) could be assessed suitably
- Mechanism will lead to enhanced RE integration due to enlargement of balancing area from state to national level. This will lead to reduced RE curtailment. As more RE gets added in the portfolio, overall system cost and power procurement cost reduces. Enhanced RE also leads to reduced dependence on imported fuel and increase in energy security of the country.
- Improved discipline in merit-order based scheduling and transparency of system marginal price
- Key step towards enabling uniform clearing price for procurement of power and transitioning towards the concept of "One Nation, One Grid, One Price"

Chart 1: Estimated overall benefits due to MBED mechanism in a day-ahead time-frame for FY17

Net benefits for all the states	All figures in Rs crs		
	Total cost of generation		
	Base case	With Market based economic dispatch	Net benefits
For FY 2016-17	58948	52728	6220

Source: Draft paper, I-Sec research

Chart 2: Total estimated benefits in FY20 if entire country's generation is mandated to follow MBED (MBED pilot with NTPC plants will bring benefits to the tune of Rs18.3bn p.a. for the entitled states)

Total Energy Generation (2019-2020)	Weighted average price of plants	Average benefits form MBED	Total estimated benefits from MBED
1393 BU	Rs 2.36/kWh	3.74%	12295 Cr

Source: Draft paper, I-Sec research

Key changes implemented for introduction of MBED phase-I:

Scheduling mechanism:

- Discoms continue to self-schedule for which bilateral contract settlement will be carried out. However, both discoms and generators have to mandatorily participate in DAM for bidding.
- Generators to submit offers which shall be cleared based on the total demand bid into the DAM.
- Once the bids and offers are received, the market clearing engine will seek to optimise the dispatch of generation sources taking technical constraints into account.
- The entire demand from NTPC stations shall be met by dispatching the least-cost generation mix while ensuring that security of the grid is maintained. Cheaper NTPC plants shall be dispatched to the maximum extent whereas costlier plants will run optimally as required.

Actions by buyers, sellers & power exchange:

- Generators shall be required to offer their capacities in the DAM-based on self-determined energy charge rate with no retrospective revisions.
- National merit order to be formed and all generators subsequently dispatched.
- Discoms / buyers shall be required to submit bids for all the time-blocks of the upcoming day
- Discoms may choose to submit fixed demand in each time-block (price inelastic and to be mandatorily served). Flexible demand, over and above the fixed demand in each block will be price-sensitive.
- Buyers and sellers, based on their mutual preference, shall submit bids and offers on a particular power exchange.
- Once the bids and offers are received, the market clearing engine of the exchanges will schedule the generating stations following optimal dispatch principles. MCP shall be discovered for each 15-minute time block of the upcoming day.

Schedule revisions (see Annexure-2):

- Right to Revision (RTR) for the complete fleet of NTPC plants shall cease to exist for the period until the results of DAM are announced, but reinstated for the quantum not cleared in DAM from those plants.
- Further, if there is any need for beneficiaries to buy / sell additional power closer to real-time, they can participate in the Real Time market (RTM) and correct their day-ahead positions suitably.

Payment and settlements:

- Discoms / buyers will pay the market operator at MCP for the day-ahead demand. All generators will be paid at MCP according to the execution of their selected bids.
- Buyers, under LT contracts, will be refunded the difference between MCP and the contracted price as per the quantum of power self-scheduled through the Bilateral Contract Settlement.
- NTPC generators with long-term contract will continue to be paid the fixed cost separately outside the market.
- NTPC generators can sell the URS power in the market. Net revenue earned will be shared with respective beneficiaries on 50:50 basis subject to a ceiling of 7p/kWh to the generator and balance to the concerned beneficiary.

Key issues and suggested mitigation measures:

Relinquishment of Right to Revise schedule by discoms:

Suggestion: Right to Revision (RTR) for NTPC plants shall cease to exist only for the period until the results of DAM are announced but reinstated for the generation quantum not cleared in the DAM from these plants. Discoms shall meet their day-ahead demand reliably by placing price inflexible bids through RTM.

Working capital management for discoms

Suggestion: With MBED, instead of monthly billing and 45-day payment period as per the current practice, discoms will be required to pay upfront. The estimated daily funding requirement will be to the tune of Rs1.5bn (Rs510-550bn p.a.). To ensure discoms are not burdened with such huge upfront payments, a centrally designated agency viz. PFC or REC could provide a line of credit to discoms which requires working capital. The discom / borrowers could repay such amount along with interest within a maximum period of 45-60 days from the date of disbursement.

Need for price coupling

Suggestion: Since multiple power exchanges will compete, uniform clearing prices are essential to iron out variances. As an interim measure, it is suggested that buyers and corresponding sellers submit bids and offers on a particular power exchange. However, implementation of price coupling should be done, as envisaged under the Power Market Regulations, 2021. (See Annexure-1)

Additional relief for upfront payments by discoms

Suggestion: Instead of current practice of rebate on early payment post billing, a total rebate of 2% could be offered to discoms on payment for the quantum of power procured through exchange.

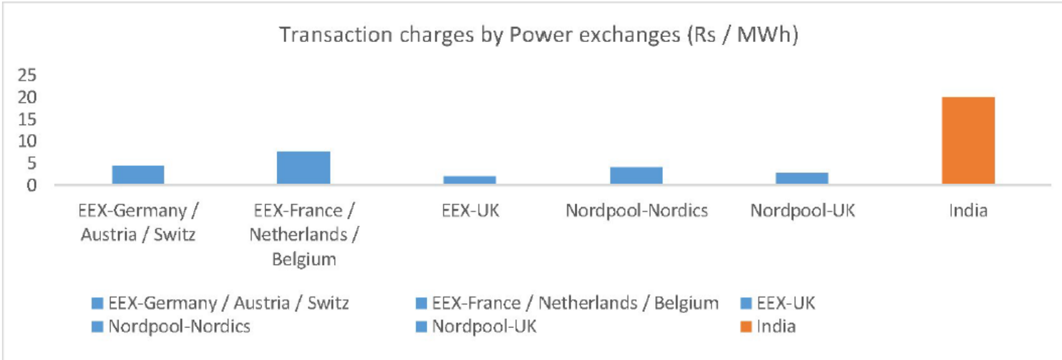
Treatment of Bilateral Contract settlement

Suggestion: For the pilot with NTPC thermal stations, this could be achieved through a regulatory order outlining the process of adjustment of market-based payments against fixed charges to be paid by discoms.

Relaxation/ reduction of transaction charges levied by power exchanges

Suggestion: Appropriate regulatory interventions could be taken by CERC based on merits and further discussions/ consultations with stakeholders. Reduced / concessional transaction charges per unit be levied for both up to and above self-scheduled quantum.

Chart 3: Comparison of transaction charges by power exchanges



Source: Draft paper, I-Sec research

Applicability of transmission charges

Suggestion: Currently, Short Term Open Access (STOA) charges and transmission losses are applicable for trade in the power exchange. Payment of LT charges could be adjusted against the STOA charges paid by the generators, which have long term contracted volumes traded in power exchange. Other regulatory changes may be brought in (including CERC's draft notification for Grant of Connectivity and General Network Access to the inter-State transmission system).

Table 1: Daily demand performance: State-wise trends (MU)

S. No.	Activity	Timeline
1	Receiving comments from stakeholders on the Discussion paper by MoP	May'21
2	Analysing stakeholder comments	May'21
3	National level workshop on MBED: - Overview and proposed mechanism for phase 1 of implementation - Discussion on key challenges perceived by stakeholders - Devising mitigation mechanism and obtaining suggestions	Jun'21
4	Preparing draft regulations, stakeholder consultations and final regulations by CERC	Sep'21
5	- Formulation of procedures by POSOCO - Operational changes to be effected by Power exchanges - Addressing key issues in implementation	Mar'22
6	Conduct of mock exercise	Mar'22
7	Go-LIVE of phase 1 of MBED	1st Apr'22

Source: Draft paper, I-Sec research

Annexure-1

CERC regulations allow multiple power exchanges to ensure competition in day-ahead markets. Structurally, the same can continue. However, for better system efficiency, there will be a need to combine the bids and offers of both the exchanges to arrive at the following outcomes:

- Discovery of uniform area clearing prices (instead of multiple ACPs due to multiple power exchanges)
- Achieving higher social welfare compared to the sum of maximum social welfare in multiple power exchanges

Following are the key issues which are expected to arise in case a seller and a buyer, who are tied up through LT PPAs, go to separate exchanges without coupling of exchanges being implemented:

1) One entity gets cleared whereas the other does not:

For instance, say seller A is tied up with buyer B for a variable cost of Rs3/unit. Seller A places an offer in PX-1 and buyer B places an inflexible bid in PX-2. Buyer B gets cleared in PX-2, however, seller A, due to lack of liquidity, does not get cleared in PX-1. In this case, Buyer B pays Rs4/unit as MCP and is expected to get a refund of Rs2/unit (MCP-contract price). However, BCS is not possible for Buyer B since its corresponding seller has not been cleared with whom BCS needs to be done. Had there been price coupling which could have allowed Seller A to get cleared in case MCP is more than Rs3/unit, the BCS mechanism would have been possible and the buyer would have got the refund of Rs2/unit.

2) Both entities get cleared at different clearing prices leading to disparity in BCS settlement:

For instance, say seller A is tied up with buyer B at a variable / energy price of Rs2/unit. Seller A places an offer in PX-1 and buyer B places an inflexible bid in PX-2 for the same quantum. Buyer B gets cleared in PX-2 at a MCP of, say, Rs4/unit however, seller A, gets cleared in PX 1 at a MCP of, say, Rs3/unit. In this case, Buyer B pays the MCP of Rs4/unit and need to obtain a BCS refund of Rs2/unit (Rs4/unit - Rs2/unit). However, the seller has received an MCP of Rs3/unit, i.e. an additional revenue of Rs1/unit only and hence it will not be able to refund back Rs2/unit to the buyer.

Suggested measure: As an interim measure of resolving the above issue, it is suggested that buyers and corresponding sellers, based on their mutual preference, will need to submit bids and offers on a particular power exchange. This would ensure that both the parties are subject to the same clearing price and liquidity. However, CERC / MoP is exploring the feasibility of undertaking price coupling and the same could also be implemented in due course of time, as envisaged under the Power Market Regulations, 2021.

Annexure-2

Consider a total demand of 70MW to be met across four states, each state is tied up with one generator. All generators have a declared capacity of 25MW and technical minimum of 10 MW (say). Considering self-scheduling done for a particular slot for each of the four generators, the increase in optimisation possible as we move from SCED to MBED is highlighted below:

Chart 4: Optimisation possible on transiting from SCED to MBED

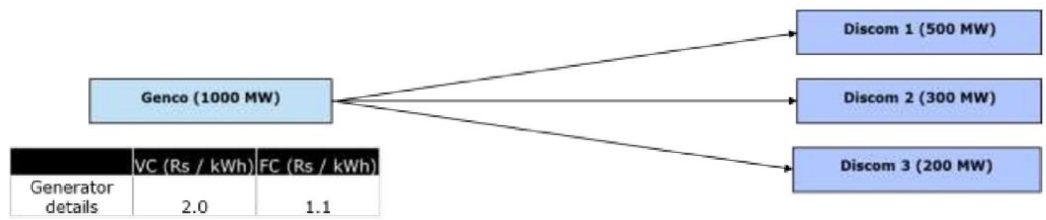
Generators (with variable cost)	DC (MW)	Schedule as per self-scheduling mechanism (MW)	Revised schedules as per SCED (MW)	Revised schedules as per MBED (MW)
Gen 1 @ Rs 1 / kWh	25	20	25	25
Gen 2 @ Rs 2 / kWh	25	20	25	25
Gen 3 @ Rs 3 / kWh	25	15	10	20
Gen 4 @ Rs 4 / kWh	25	15	10	-
Total system cost (Rs)		20x1+20x2+20x3+20x4= Rs 200	25x1+25x2+10x3+10x4= Rs 145	25x1+25x2+20x3+0x4= Rs 135

Source: Draft paper, I-Sec research

Annexure-3

Adjustment of fixed charges against BCS liability

Chart 5: Consider a generator with a declared capacity of 1000MW tied up with 3 discoms as shown below (ratio of 5:3:2)



	VC (Rs / kWh)	FC (Rs / kWh)
Generator details	2.0	1.1

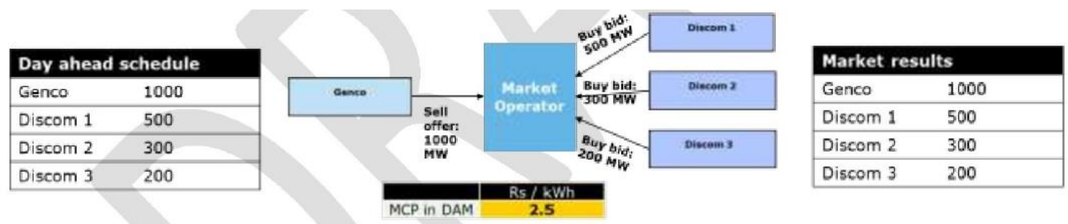
Source: Draft paper, I-Sec research

Chart 6: Assuming the above scheduling profile, following payments will be made to the generator for a particular 15-min time block (as per extant practice of self-scheduling)

Payments to Generator for a particular 15 min time block		Discom 1 (500 * 1000 * 15*2/60)	Discom 2 (300 * 1000 * 15*2/60)	Discom 3 (200 * 1000 * 15*2/60)	Total
Variable cost payment	Rs	2,50,000	1,50,000	1,00,000	5,00,000
Fixed cost payment	Rs	1,37,500	82,500	55,000	2,75,000
Total payments by the discoms	Rs	**3,87,500**	**2,32,500**	**1,55,000**	**7,75,000**

Source: Draft paper, I-Sec research

Chart 7: Overall scenario of quantum self-scheduled by discoms, bidding and market clearing for a particular 15-min time block in case the generator participates in MBED and sell 1000MW through DAM



Day ahead schedule	
Genco	1000
Discom 1	500
Discom 2	300
Discom 3	200

	Rs / kWh
MCP in DAM	2.5

Market results	
Genco	1000
Discom 1	500
Discom 2	300
Discom 3	200

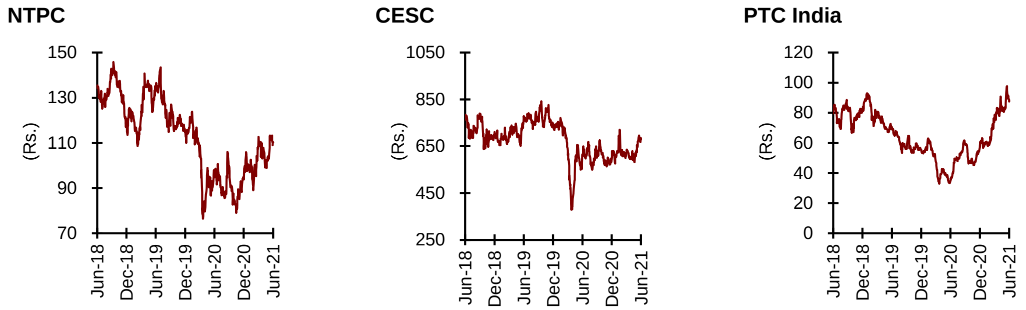
Source: Draft paper, I-Sec research

Chart 8: Summary of payment and settlements in case the amount to be refunded back as BCS to discoms is netted off against their fixed cost liability

Payments to / from Generator		Particulars (Rs)
Payment from Market operator @ MCP	a = 1000 * 250 * 2.5	6,25,000
BCS liability of genco	b = 1000 *250* (2.5-2)	1,25,000
Gains realized for URS power	c	0
Fixed cost liability of discoms	d	2,75,000
Adjusted fixed cost liability of discoms	e=d-b	1,50,000
Adjusted Fixed cost payment by discoms		**Discom 1: 75,000** **Discom 2:, 45,000** **Discom 3: 30,000**
Total payment received by generator	f=a+e	7,75,000

Source: Draft paper, I-Sec research

Price charts



Source: Bloomberg

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