

Consultation Paper on Modifications in Power Market Design: Evening Market, 15 minute Bidding time block and Ancillary market on Power Exchange

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CENTRAL ELECTRICITY REGULATORY COMMISSION

Objective of the Consultation paper

It has been a constant endeavour of the Commission to create liquid, efficient and competitive power markets. Markets keep evolving based on the needs of the market participants. The objective of this consultation paper is to discuss three proposed modifications related to power market design. These are as follows:-

- A. Introduction of Evening Market on Power Exchange
- B. Change of bidding time block from 1 hour to 15 minutes on Power Exchange
- C. Introduction of Ancillary market for active power as a follow on of Evening Market

A. Evening Market

I. Introduction

The Commission has received a proposition from POSOCO, the system operator regarding “Introduction of Evening Market on Power Exchanges”.

Essentially, the proposition addresses the issue of opportunity loss due to uncleared and unmatched volume on power exchange in the morning day ahead market. The evening session would provide a mechanism to clear the uncleared orders in the morning session. Evening market will serve as a balancing market and help utilities balance out their demand supply portfolios for the next day.

II. Transmission Congestion on Power Exchanges

To put things in perspective, the opportunity lost due to uncleared and unmatched volume is much higher than the volume lost due to transmission congestion. A snapshot of the data for Indian Energy Exchange on 26th – 28th June 2010 is as follows:-

Date		Purchase Bid	Sale Bid	Unconstrained MCV(MWh)	Constrained MCV(MWh)	Unconstrained MCP(Rs/MWh)	Volume Lost[Min (Buy, Sell)-UMCV](MWh(A))	Volume Lost due to Congestion(B)	Ratio (A/B)
26-06-10	Total	30136	46252.8	17139.6	15456.4	-	12996.4	1683.2	8
	Max	1864.7	2563.5	1140.7	1009.1	4193.17			
	Min	516.1	1265.6	457.1	457.1	1889.55			
	Avg	1255.67	1927.2	714.15	644.02	2724.60			
27-06-10	Total	26155	45742.4	17862.77	17471.17	-	8292.23	391.6	21
	Max	1614	2734.6	1056.2	956.6	3594.04			
	Min	624.5	1199.8	592.6	592.6	1999.44			
	Avg	1089.79	1905.93	744.28	727.97	2651.70			
28-06-10	Total	36183.2	37917.8	23631.79	22517.11	-	12551.41	1114.68	11
	Max	1753.3	2620.3	1663.1	1565.5	5000.04			
	Min	597.8	767.6	416.6	416.6	1879.90			
	Avg	1507.63	1579.91	984.66	938.21	2838.21			

Power Exchanges have in the recent past raised issue related to transmission corridor congestion leading to uncleared transactions on power exchange. Transmission Congestion presently is handled through a mechanism of market splitting leading to different prices in surplus and deficit regions. The power price increases in the power deficit area and decreases in the power surplus area. There are twelve transmission corridors between different regions and these used to schedule collective transactions on power exchanges. The corridors and bid areas are:

Sl No	Corridor Name (Bi Directional)	Region	Bid Area	States
1	WR- NR	North East Region(NER)	A1	Meghalaya, Tripura, Mizoram, Manipur, Nagaland
2	NR- WR	North East Region (NER)	A2	Arunachal Pradesh, Assam
3	NR- ER	North Region (NR)	N1	Himachal Pradesh, Jammu and Kashmir, Chandigarh, Punjab, Haryana
4	ER- NR			North Region (NR)
5	WR-ER	South Region (SR)	S1	Karnataka, Andhra Pradesh, South Goa
6	ER-WR	South Region (SR)	S2	Kerala, TamilNadu, Pondicherry
7	WR-SR	West Region(WR)	W1	Chhattisgarh, Madhya Pradesh
8	SR-WR	West Region(WR)	W2	Maharashtra, North Goa, Gujarat, Daman and Diu, Dadra and Nagar Haveli
9	ER-SR			East Region(ER)
10	SR-ER	East Region(ER)	E2	Orissa
11	ER-NER			
12	NER-SR			

It is observed that in case there is transmission congestion, it occurs in two or three specific corridors only: the S1- S2, South – Rest of India, North – Rest of India corridors and congestion happens in specific seasons. It happens in Southern

corridor in winters (December – January period) and in Northern Corridor in summers (June-July period). There are no instances of congestion in the other ten corridors.

A snapshot of effect of transmission congestion in the power exchange is shown below:-

Details of Congestion in Power Exchanges for May 2010			
	Details of Congestion	IEX	PXIL
A	Unconstrained Cleared Volume* (MU)	598.04	80.83
B	Actual Cleared Volume and hence scheduled (MU)	591.86	78.53
C	Volume of electricity that could not be cleared as hence not scheduled because of congestion (MU) (A-B)	6.18	2.30
D	Volume of electricity that could not be cleared as % to Actual Cleared Volume	1%	3%
E	Percentage of the time congestion occurred during the month (Number of hours congestion occurred/Total number of hours in the month)	7.53%	8.06%
F	Congestion occurrence (%) time block wise		
	0.00 - 6.00 hours	21%	23%
	6.00 - 12.00 hours	48%	47%
	12.00 - 18.00 hours	14%	13%
	18.00 - 24.00 hours	16%	17%

* This power would have been scheduled had there been no congestion.

Source: Market Monitoring Report May2010

It is observed that:-

- In IEX congestion occurred about 7.53% of the hourly time blocks, whereas in PXIL it occurred about 8.06% of the hourly time blocks.
- Congestion occurred in most number of times during 6.00-12.00 hours of the day in both the exchanges.
- Volume of electricity that could not be cleared due to congestion was only about 1% of the actual cleared volume in IEX and only about 3% of the actual cleared volume in PXIL.

III. Essential Features of the Evening Market

1. Evening market will have a double sided closed bid auction with collective scheduling of all transactions. All rules, procedures, price discovery mechanism could remain exactly the same as the morning day ahead market. It can be viewed as another iteration of the morning market conducted in the evening hours.

2. The process will be totally independent of the morning market and participants will have to bid again in the evening session. All the process including trading session, risk management, clearing and settlement, physical settlement will be handled separately by the power exchanges and system operator.
3. Application, Transmission and Operating charges will be the same as morning day ahead markets.
4. Transmission Corridor for evening market will be the balance corridor available after morning day ahead market schedule is completed.
5. The Short Term Open Access day ahead bilateral transaction market scheduling will open after the closure of morning and evening power exchange day ahead markets. Hence both morning and evening day ahead markets on power exchange will have a priority over bilateral day ahead transactions
6. Trade executed in both morning and evening market session shall be scheduled by the system operator.
7. The tentative timelines for evening markets are suggested below:

SI No	Process Flow	Timeline
1	Trading Session: Market participant to place bids in Power Exchange	16:00-17:00 Hrs
2	Power Exchange to send provisional unconstrained solution to NLDC	17:30 Hrs
3	NLDC to check for congestion. In case of congestion shall intimate PX regarding the period of congestion and available margins	18:00 Hrs
4	PX to send Scheduling Request to NLDC based on margin specified by NLDC/SLDCs	18:30 Hrs
5	NLDC to send details to RLDCs for scheduling	19:30 Hrs
6	NLDC to confirm acceptance for Scheduling of Collective Transactions PX to send files to SLDCs for scheduling	21:00 Hrs
7	RLDCs/SLDCs to incorporate Collective Transactions in the Daily Schedule (Revision 1)	23:00 Hrs

IV. Benefits of Evening Market

The proposition would provide several benefits to the market participants:-

1. This will help DISCOMS to take a more informed decision in the market especially with respect to weather related information and hence the expected

load pattern the next day. It will thus facilitate demand-supply balancing of their portfolios for the next day.

2. This will lead to better utilization of available margins on unutilised transmission corridors.
3. This will provide all participants another opportunity to optimize their portfolio which is one of the purposes of a balancing market.
4. This will shift transaction volumes from the Unscheduled (UI) to the scheduled market which will improve grid reliability and hence help system operator release additional transmission corridor margin in the market.
5. This will provide more choice to consumers and higher consumer satisfaction as it provides participants a second chance to bid.
6. It is likely that more volume will be cleared in the market as this may help uncleared energy of morning session to be cleared in the evening session.

V. Possible Fallouts of Evening Market

1. Since evening market would provide another opportunity bidding to market participants, it may lead to non serious bidding in the morning session.
2. Evening market may increase bid-ask spread in morning session and lower the liquidity in morning session leading to poorer price discovery in morning day ahead markets
3. It is possible that with introduction of evening market a large proportion of morning market may turn completely to an evening market with a shift in volumes. However, the counter argument for is since the morning session has a priority in corridor allocation (by virtue of the session happening early) over evening session participants may like to lock into trades in the morning session itself.
4. There would be two benchmark reference prices - Morning market price and Evening market .This may confuse the market participants.

VI. Implementation Issues

1. This will require realignment of timelines of operation of power exchange and system operator and their communication with respect to information related transmission corridor. Some of them could be :-
 - Change in the time for commencement of the morning session
 - Closure of evening session to be latest by 10 PM to be in time for issue of schedule Revision1 by system operator
2. Since the markets will run in the evening, non-availability of banking hours will be an issue for power exchanges. From risk management perspective exchanges shall have to make their arrangements for collecting margins earlier or collect extra margins for trades to ensure no default post trade.
3. The power exchanges have already launched an intra-day contingency market but these contracts have low liquidity. Presently in the intraday market, the cleared transactions are scheduled in a manner similar to bilateral transactions whereas the transactions cleared in evening markets will be scheduled as collective transactions. It is planned that these contracts shall be suspended when the pilot phase of evening market commences to avoid too many parallel markets and contract running simultaneously.
4. From the regulatory perspective, some modifications to procedures laid down by System operator under Open Access in Interstate Regulations, 2008 will be required. The window for evening market scheduling will need to be added and scheduling Bilateral Day ahead transactions will need to be modified accordingly.

VII. Implications and Deliberation Points

The staff of the CERC had a preliminary meeting with POSOCO and the two operating power exchanges viz Indian Energy Exchange Ltd and Power Exchange of India Ltd to understand their view points. Various issues were discussed. The following issues require further deliberation and we seek views from all market participants:-

1. Will the evening markets lead to shift of volumes shift from morning day ahead market to evening market or will the evening market bring in additional

volumes and new participants? This may depend on the strategy of participants with unsuccessful offers / bids in morning day ahead market like
Sellers: Do they Sell through UI or Bilateral market or Back down generation?
Buyers: Do they Purchase through UI or bilateral market or undertake Load Shedding for its consumers?

2. Evening markets will provide another opportunity to market participants. This will lead to significant change in participant's dominant bidding strategy in morning session (like untruthful / non serious bidding in morning, not bidding at marginal cost /marginal utility).
3. From Market structure perspective, is it a good idea, by design, to operate a market close to actual delivery time. This may be pertinent especially if all the morning market volume moves to evening market. Will the system operator be comfortable with scheduling Power Exchange market closer to real time?
4. There could be some speculative trades undertaken by participants by taking one position in morning and reversing that in the evening e.g. Buy in morning rate low and sell in evening at high price (or vice versa) and there is no physical delivery as delivery gets netted out. However the participants will need to factor in charges like transmission losses and scheduling charges while undertaking such trades. This can be handled by keeping the bidding in day ahead market in hourly time block and making the bidding in evening market in 15 minute time block.
5. It may be argued that unmatched order in morning session market is actually not a lost volume or opportunity loss since it can be interpreted as :-
 - There is no consumer ready to buy at that suppliers offered price
 - There is no supplier ready to sell at that consumers bid price
6. Evening markets will require the Day ahead bilateral transaction scheduling window to be shifted to post evening markets. Hence effectively the day ahead bilateral transaction scheduling is closed from beginning of morning session to closure of evening session on power exchanges.
7. Are participants especially DISCOMS geared for evening market? The general practice followed to changes a price bids (in DISCOM) is to take a price modification approval from higher authority. Can this be done for the

evening session when normal office hours are closed? Do participants perceive any additional utility in evening market?

8. The impact of the evening market on the UI transactions needs to be understood.

VIII. Proposition

It is suggested that the evening market model be tried out on a pilot basis for a period of six months to observe the response of the market. This shall be reviewed thereafter.

B. Change of bidding time block from 1 hour to 15 minutes on Power Exchange

1. Introduction

The Commission has received a proposition from POSOCO, the system operator regarding bidding on power exchanges in time blocks of 15 minutes instead of 1 hour time blocks. Essentially this proposition will bring harmonisation between the bidding in power exchanges and scheduling for physical delivery by system operator as prescribed in the IECG. It is observed worldwide that the markets are aligned with the scheduling philosophy.

2. Rationale for 15 minutes bidding time blocks

1. One of the major benefits will be attracting wind generators and solar generators to power exchanges. Wind generator and solar generators which are untamable resources and dependent on wind velocity and sunlight availability respectively for carry a higher risk in bidding and committing supply for time blocks of 1 hour. Further, these generators are small in size and loss of opportunity for even a single time block of 15 block has a high impact on the generators in terms of UI liability. Smaller bidding time blocks will increase their comfort to bid and will attract them to the day ahead market. This is also relevant especially in the context that there is a greater push towards renewable at all policy making levels.
2. Hourly bids results in the high ramp rates at the hour boundary (kink), particularly

at the start and the end of the morning and evening peak hours. In real time load ramp is seasonal and linked to sunrise/sunset etc which is a gradual process. Implementation of 15 minute bidding interval in the Power Exchange(s) would increase the operational flexibility, accommodate the ramp rate and reduce the UI.

3. This will increase the operational flexibility of the system operator and the utilities. As the utilities move closer to the day of operation, the uncertainty in forecasted demand is reduced and maximum flexibility is needed in the day - ahead procurement to balance their portfolio. This inflexibility manifests as imbalances in real time operation thereby posing a threat to grid security. This will get address with 15 minute bidding time block.
4. It is well know that value of electricity is dependent on the time when it is consumed. At a granular level it means that the value does not necessarily remain the same for each 15-minute time block and hence 'hourly bids' do not truly reflect the perceived value. Allowing 15-minute bidding to participants will help them manifest their value for electricity with time more precisely and would thus result in better price discovery.
5. The 15 minute bidding could also help in handling transmission congestion issue. If the corridor is available for a period shorter than the hour the corridor can then be used which is not possible presently.

3. Implication for the market

1. It is argued that the hourly bidding model is simple, elegant and intuitive to understand and handle. With introduction of 15 minutes time block for the market participants will have to bid for 96 time blocks which may be cumbersome to handle manually. However with usage of software systems this process can be automated.
2. The power exchanges will have to undertake price discovery for 96 time blocks instead of the present 24 time blocks.
3. Presently, as an ad-hoc arrangement, the hourly bids in the Power Exchanges are being interpolated by the Power Exchanges to 15-minutes to map them on to

the 15-minute scheduling by the NLDC/RLDCs/SLDCs. This practice will be done away with as scheduling for 15 minute for power exchange transaction will also be undertaken.

4. Implementation Issues

1. The power exchange trading software application shall require modifications. The bidding window shall require modification to accommodate 15 minute bidding time blocks.
2. The software applications in the trading system used by the exchanges use iterative process to find price – volume solution instead of closed form solution. Extra time may be needed to run and find solutions in all 96 time blocks. Since there are block bids present, which interspersed over a series of time blocks the solutions has to be found simultaneously for these hours. This would entail more iterative runs and extra hardware resources for the exchanges.
3. Block bid definition will need to be suitably modified by power exchanges

5. Proposition

It is proposed that the morning session continues with hourly bidding and the evening market which is designed to serve the purpose of balancing market and will be used for portfolio optimisation shall have the feature of 15 minute time block for bidding.

Power exchanges need to be given sufficient time to make modifications in their trading system. The evening market and 15 minute time block for bidding can be adopted simultaneously from a pre defined date.

C. Ancillary market for active power as a follow on of evening market

1. Introduction¹

One of the most fundamental requirements of the electricity market is that its design should be such that it complements the reliability and security of the system. The balancing market keeps supply and demand in balance until the system operator is forced to intervene.

In a market oriented electricity industry, commercial mechanisms need to be in place for procurement of various services and to have prompt response from the entities. As a result ancillary services also should be separated from basic system services and remunerated appropriately. This gains additional strength from the fact that a structured ancillary service market would complement reliability of the power system. In an unbundled power system, the system operator often has no direct control over individual power stations and has to purchase these services from other service providers. In such a scenario, issues pertinent to the pricing and procurement of these services become extremely important for proper functioning of the system.

Ancillary services costs are generally socialized over all grid connected entities as the system reliability affects all connected entities equally.

Presently, the real time active power imbalance is handled through the UI mechanism which is a part of the Availability Based Tariff. UI mechanism works on the principle of a pre defined frequency and price relationship and is a regulatory fiat.

2. Proposition

It is suggested that the ancillary active power market be developed as a follow on of the evening market. This would be a move in the direction of developing a market based mechanism for ancillary active power from the present regulated tariff based system (UI). The supply bids that do not get cleared in the respective hours in the evening market (i.e. costly supply) will be considered by default available as ancillary generation with system operator for that particular time block. The uncleared supply bids of both power exchanges will be aggregated and stacked as per their price bids

¹ Approach Paper by NLDC on Ancillary markets published in July 2010

and will be available with the system operator as ancillary real power service. The system operator may call these generators to supply power at a pre defined notice period.

The generators who shall be called to supply power shall be selected on an economic merit order principle with lowest priced generator being called first and in that order till the complete real time demand shortfall is met. All generators who get called in will get paid the same uniform price as is paid to the costliest generator who was called in last for that respective time block. The price paid by the system operator will be recovered from all grid connected entities that have deviated from their schedule. Such a model adheres to both the principles – traditional engineering practice of economic dispatch and results of competitive markets.

It is possible that for certain time block there are no supply bids available due to low liquidity in the market. The fallback mechanism available to the system operator in such instances has to be explored. The effect of ancillary real power market on the UI mechanism also needs to be studied further.

Market for other ancillary services (voltage control / reactive power, black start etc) which are independent of this will have to be developed separately. Presently the exchange traded market is for energy only and the existing exchange infrastructure can be harnessed with minimal modification and cost to develop this.

This model and it related operationalization issues needs to be debated extensively.

Conclusion

Finally, additions of these elements in the market structure are expected to create complete markets that allow more flexibility to buyer and sellers to transact in electricity. The ultimate test of a good physical power market design is if the generation assets in a centralised security constrained economic dispatch model as well as in a decentralised market based model (which provide choice, freedom and flexibility to market participants) are dispatched in a similar pecking order.