Ref: PXIL/S&R/11112022/1 Date: November 11, 2022

To
The Secretary
Central Electricity Regulatory Commission
3rd and 4th floor, Chanderlok Building
36 Janpath
New Delhi- 110001

Sub: Public notice issued by CERC titled 'Staff paper on Power Market Pricing' – Observations, comments and suggestions from Power Exchange India Limited

Ref: Public Notice No. Eco-4/2022-CERC dated 12th October 2022

Dear Sir,

The Electricity Act 2003 mandates the Commission to develop a framework that provides for competitive markets in electricity. Power exchanges provide a fair and transparent platform for transacting in electricity, the platform operated by Power exchanges has enhance competition, enabled quick dissemination of discovered prices to foster more innovations and investments in Power sector.

The intent for issuing the Staff paper provides an opportunity to review the status and structure of the present power market thoroughly. This would be beneficial for the entire market as it benefits all the stakeholders, including market participants, and at the same time develops the right competitive framework for unhindered growth of the power market itself.

We take this opportunity to welcome this review exercise that will promote market based transactions in non-discriminatory manner.

We request Hon'ble Commission to kindly take our suggestions on record and grant us an opportunity to present them to the Commission and its Staff.

Thanking You,

Yours faithfully,
For Power Exchange India Limited

ANIL VITTHAL KALE Digitally signed by ANIL VITTHAL KALE Date: 2022.11.11 22:29:10 +05'30'

Anil V. Kale
AVP and Head – Strategy and Regulatory

CERC vide Public notice no Eco-4/2022-CERC dated 12.10.2022 has issued a Staff paper titled 'Power Market Pricing'

The staff paper proposed to review the framework, especially the pricing methodology applicable for closed bid auctions prevalent in existing collective Contracts available only on Power exchange i.e. the Integrated Day Ahead Market (IDAM) and Real time Market (RTM) Contracts.

Please find listed below few suggestions to implement price discovery mechanism that strengthens and deepens the market and provides equal opportunity for market participants to transact in such Contracts.

Specific Suggestions

1) Clause 3.1 Does Pricing Methodology need a change:

3.1. Does Pricing Methodology need a change?

3.1.1. As inferred on comparison of the two pricing methodologies, in a competitive market, any difference in cost, due to the two methodologies, becomes a function of the bidding behavior of the sellers.

3.1.2. It is imperative to mitigate the concern of super normal profits which may apparently be achieved through pay-as-bid auction. While participating in the market, generators quote price to receive their marginal costs and in addition, recover part of their fixed cost. Pay-as-bid auction may encourage sellers to offer high bid price (higher than marginal cost) to earn a profit and also recover fixed costs (business rationale).

3.1.3. Given these facts, would it make sense to switch to pay-as-bid pricing methodology and would it address the concerns regarding super normal profits for infra-marginal generators under Uniform Market Clearing Price?

Suggestions

Power Exchanges are market infrastructure institutions that have been established to offer contracts in power trading that ensures social welfare maximisation in the market. Under the provision of CERC (Power Market) Regulations, 2021 ('PMR 2021'), different Contracts are offered by Power exchanges, the transaction in these Contracts are scheduled as Collective or Bilateral transaction. From 2008 onwards, Power exchange has evolved as a market-based

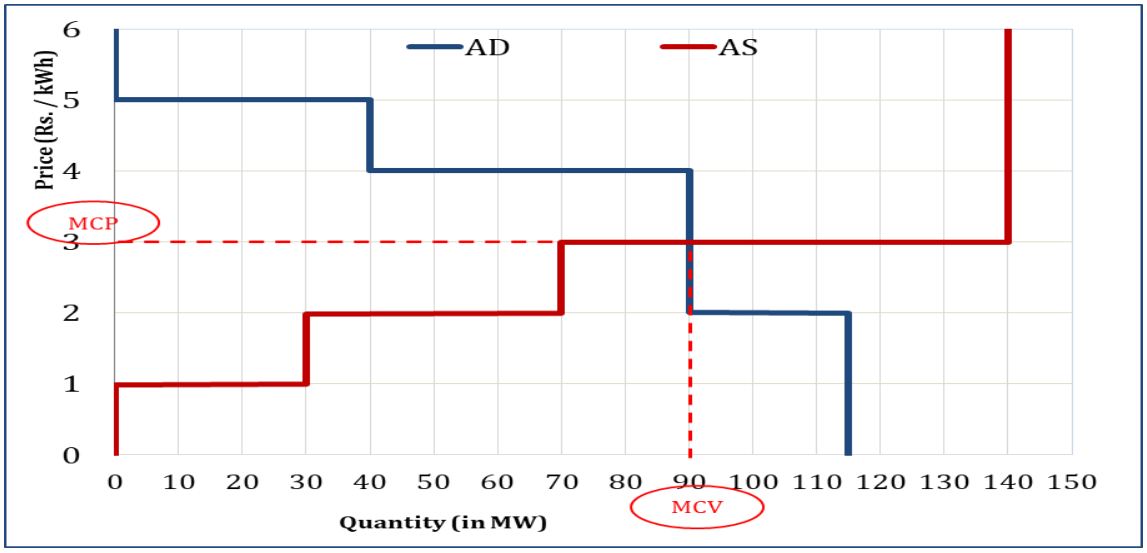
institution providing price-discovery and price-risk management to the generators, distribution licensees, traders, commercial and industrial consumers and other stakeholders e.g. Ministry of Power/State Government, investors and lending institutions.

PXIL submits that Clause 2 of discussion paper analyses two matching methodologies i.e., 'Uniform Price' mechanism vs. 'Pay-as-bid' mechanism

a. Uniform Price mechanism

PXIL submits that most of the Power exchanges across the world work on the principle of Uniform pricing for clearing Day Ahead Market which gets cleared as 'Collective' transaction. In this method, the clearing price and clearing volume of electricity corresponds to the point of intersection of the Aggregate Demand curve and Aggregate Supply curve. All the suppliers to the left of point of intersection get paid at the clearing price, irrespective of their offer. The Uniform price is set by the last accepted offer of supply.

Fig-1: Uniform Price

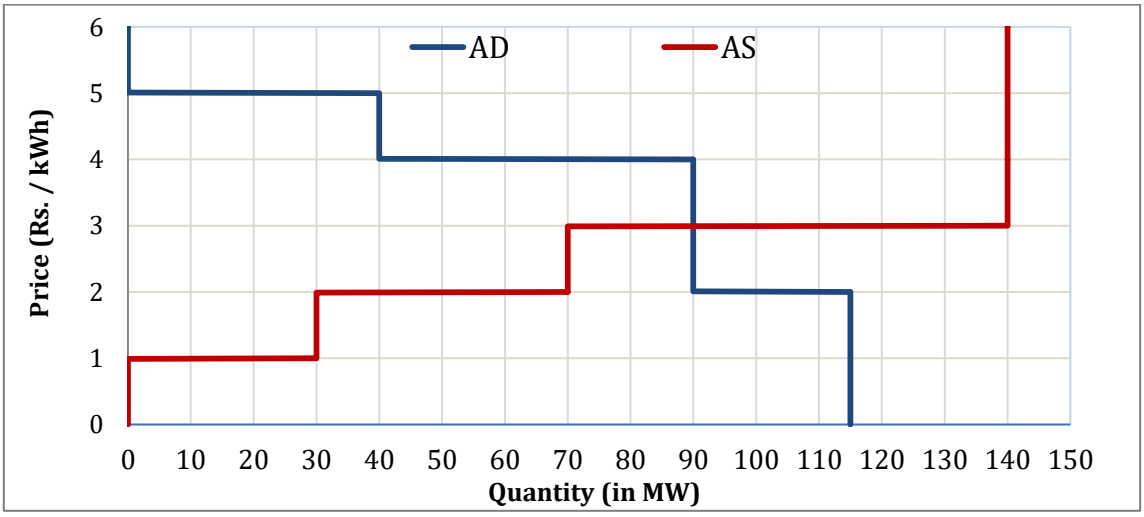


In fig-1 above, the MCP is Rs. 3/kWh and MCV is 90 MW.

b. Pay-as-bid mechanism

In the alternate 'Pay-as-bid' mechanism, each supplier gets paid as per its Offer. Since, I-DAM and RTM are collective transactions, allocation of Seller to a Buyer plays critical role in clearing trades, as all buyers at the left of intersection point would be keen to procure and schedule power from the cheapest seller.

Fig-2: 'Pay-as-bid'



In case the same Order book is to be cleared under 'Pay-as-bid' following would be applicable

a. Cleared volume 90 MW
b. Cleared prices: Rs. 1/kWh, Rs. 2/kWh and Rs. 3/kWh

Implementation of 'Pay-as-bid' would require 'Rules to identify and allocate' sell quantum equitably to buyers, since the Contracts are to be cleared as 'Collective transaction' as provided in Regulation 5(1) of PMR 2021. Equitable allocation of purchase cost to all buyers left of the intersection point can be made when the cost of power is allocated in proportion to cleared bids of each buyer.

The downside of this mechanism being, Sellers may benefit from likely profiteering by placing bids higher than their variable charge resulting in reduction of consumer surplus and may game the Order book.

Further, in both the market based clearing mechanisms, verification of variable charge for each seller is necessity to avert the possibility of gaming by sellers.

- Any change will have an impact on bidding behaviour, 'Pay-as-bid' would push sellers to try and forecast marginal cleared volume so that they can bid closer to it.
- Few sellers may even strategically withdraw their generation to force priced clearances

It is submitted that, unless variable costs are rigorously examined and followed, 'Pay-as-bid' would be difficult to implement. The contingency Contracts operating under provisions of Regulation 5(2) of PMR 2021, are cleared on 'Continuous matching' mechanism, where the clearing price reflects the 'Pay-as-bid' type of price mechanism as settlement is made at prices quoted by participants

To dissuade Sellers from placing bids at price other than their variable charge it would be beneficial when self-regulation is made applicable by allowing Order entry as 'Double Side Open Bidding' instead of the existing 'Double Side Closed Bidding'.

PXIL submits that under provision of PMR 2021 participation on Exchange platform is voluntary, in closed bid auction buyers and sellers place their bids based on demand-supply assessment while accepting its consequences as fait accompli when results are announced. However, Open auction would compel market participants to make informed decisions regarding their bids resulting in realistic bidding by all market participants.

2) Clause 3.2 What should be the criteria for Regulatory interventions?

3.2. What should be the criteria for Regulatory Interventions?

3.2.1. Market power is what should be a matter of concern. That is, as a matter of principle, is intervention in the market is justified when the price spike is a result of market power or misuse of market position by suppliers.

3.2.2. One school of thought would argue that if the price rise is caused by demand behaviour, we need to correct demand side and not further scuttle supply side. Options include demand reduction (by demand reduction we don't mean load shedding) through pre-notified demand response programme. Studies prove that compensating demand for load reduction is more cost and operation effective than procuring peak power. The signals that occasional price spikes give - in terms of the need for proper load forecasting, reserve margin, resource adequacy, demand response and other fast response reserves like ESS, should not be lost sight of.

3.2.3. However, the other school of thought believes that India cannot afford very high price caps or the standard scarcity pricing framework.

Suggestions

The provision invites suggestion on interventions that can be made by Hon'ble Commission to avert situations of profiteering or misuse of market position by sellers. Few suggestions in this regard are:

a. Under Clause 3.2.2, Utilities / Discoms should be incentivised to lower their demand during peak periods / anticipated spikes in clearing price by encouraging large scale implementation of demand response programs and by developing/engaging fast response reserves like Energy Storage System (ESS).

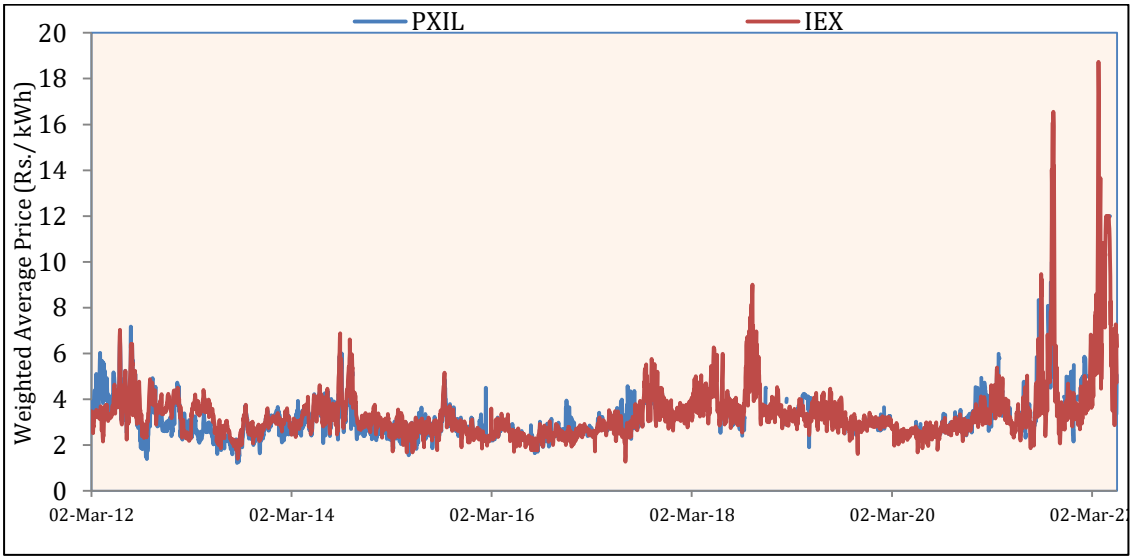
b. Clause 3.2.4 of query prescribes whether there should be tolerance level on daily basis for exchange to monitor the prices and if for certain period prices keep hitting ceiling

price then whether a trigger for price cap can be provided in the market. After that if for certain period prices stopped hitting celling price then such price cap should be withdrawn. This will keep monitoring the pricing system of market and provide control over the tolerance level.

PXIL submits that both increasing and decreasing trends in clearing prices need to be over seen, in the past clearing prices were hitting rock-bottom of 50 or 75 paise/kWh, this is not healthy for the market.

The figure below provides information about daily weighted average price prevalent in DAM during the period 01.02.2012 to 01.05.2022

Fig-3: Weighted Average Price in DAM



(Source: CERC MMC report from March-2012 to May-2022)

It observed that clearing price above Rs. 12/kWh is observed in recent past during, however, for more than 90% of time over the past 10 years, the clearing price were in the range of Rs. 2 to 3.50/kWh, with prices during off-peak time blocks being discovered as low as 50 paise.

Further, PXIL submits that regulatory interventions should also be made to check market power of both buyer and seller.

- Such buyers who have consistently submitted bids at extremely high prices should also be analysed
- Such sellers who have submitted offers far above or below their variable charge should also be analysed
- Market platforms that have monopoly in certain Contract segments should also be monitored much closely

PXIL submits that equity exchanges NSE and BSE have implemented 'circuit breakers' from July 02, 2001 onwards based on SEBI Circular no SMDRPD/Policy/Cir-37/2001 dated 28.06.2001. The index-based market-wide circuit breaker system applies at 3 stages of the index movement, either way viz. at 10%, 15% and 20%. These circuit breakers when triggered bring about a coordinated trading halt in all equity and equity derivative markets nationwide. The market-wide circuit breakers are triggered by movement of either the BSE Sensex or the Nifty 50, whichever is breached earlier.

PXIL suggest assessment of discovered price at frequent intervals to trigger price limit interventions in the market, few possibilities of time period based assessment are as under:

E.g.

i. Approach-1: Fortnightly assessment

a. For two week period (i.e. of Monday of Week-1 to Sunday of Week-2) the price discovered by Power exchanges in all the time blocks will be submitted to CERC/NLDC daily. Based on submitted information CERC / NLDC will compute and declare a threshold price for predefined time slots i.e. RTC / Peak (18:00 to 23:00 hours) / Morning peak (06:00 to 12:00 hours) / Night off peak (23:00 to 06:00 hours) / Morning off-peak (12:00 to 18:00 hours) etc.

b. When discovered price exceeds the threshold price then from Monday of Week-3 CERC / NLDC will issue a cap for such time slots for a period of seven (7) days. On completion of seven days (i.e. on Sunday), CERC / NLDC will analyse information for previous two weeks (i.e. Week-2 and Week-3) and later provide directions for the forthcoming week (i.e. Week-4)

c. If prices are remain with in pre-defined limits, then from Monday of Week-4 no price limits would be applicable. If prices breach pre-defined limits then price limits would be applicable for Week-4 based on threshold limits provided by CERC / NLDC

d. This assessment of price information for two (2) preceding weeks will continue till supply bids are more than demand bids. When supply is more than demand, the price limits may be withdrawn by CERC / NLDC

ii. Approach-2: Weekly assessment

- In this approach, instead of fortnightly assessment of discovered price as provided at Approach-1 above, the information would be assess for the preceding week
- The assessment of discovered price across different time slots will enable CERC / NLDC to provide directives on price limits application for forthcoming week i.e. from Monday of Week-2.
- CERC / NLDC will analyse discovered price information on rolling basis till supply bids are more than demand bids for withdrawal of price limits

iii. Approach-3: Daily assessment

- Power exchange will submit discovered price information to CERC / NLDC daily. This price will be analysed with information for previous two weeks, along with assessment of other information e.g. average price in the market, demand-supply deficit, number of instances when peak price on consecutive days is within +/- 10% during same time block
- If average price and demand-supply deficit is assessed as acceptable/normal condition than no price limits will be made applicable
- When average price information portrays an increasing trend, along with increase in demand-supply deficit then for the next day price limits would be imposed to all the market participants.
  i.e. when price on Day-'D' is above average price for previous 15-days, then price limits will be applicable for bidding on Day-'D+1' for delivery of power applicable for Day-'D+2'
- On Day 'D+1' if price is lesser than or equal to average price for previous 15-days, then price limits would be removed, else price limits would continue

PXIL submits that above graded approach will provide adequate directions to market participants to make informed decision regarding their bids and help CERC / NLDC to make timely interventions depending upon demand-supply conditions prevalent in the market.

Further, the graded approach will ensure price regulation and avert market manipulation by participants. Price limits for certain time blocks will enable reduction in market clearing price and avert supernormal surpluses accrued to seller.

3) Clause 3.2 What should be the criteria for Regulatory interventions?

3.2.4. Given these realities,

- *Would it be advisable to define a tolerance level (for instance, how many times during a day or over the week/month are we tolerant with the price touching the ceiling) beyond which intervention is justified?*
- *What should be the basis for such intervention and tolerance level in the Indian context?*
- *Would it be advisable to define a dynamic price cap - for example, if the prices breach the tolerance level as defined above,*
    - *the price cap is automatically reduced to a point where say 90% or 95% of the supply is cleared? or*
    - *generators are mandated to run and are compensated under administered route or based on some pre-specified norms, till the situation (breaching the tolerance level) normalizes?*
- *Can a cap be considered on the excess revenues made by power plants that do not use gas or other high cost fuel to produce electricity, such as solar, wind, domestic coal, nuclear, hydropower and lignite? The cap could be uniform and set in advance based on the marginal generator amongst these inframarginal generators and all revenues that exceed the said cap may be collected by system operator.*
- *To partially capture the surplus profits made by the inframarginal generators, would it be advisable to impose a levy on supernormal profits, as was done by the Government for Petroleum?*
- *If price cap for inframarginal generators is levied, should the other supramarginal generators like gas based generating stations be left without a cap or a separate price of Rs 20 or so be levied for this segment as well?*
- *Any other suggestion?*

Suggestion:

The provision invites suggestion on interventions that can be made by Hon'ble Commission to avert situations of profiteering or misuse of market position by sellers. Few suggestions in this regard are:

a. To reduce the negative impact of price limits, incentives should be provided to generators that ensure consistent supply during the year
b. Generating stations running on imported coal should be provided benefits of concessional haulage of fuel or reduction in levies imposed on import and usage of coal, this would enable increase in supply side participation leading to reduction of price discovered across transactions

Generating stations running on imported coal do not have any recourse to recover their fuel cost, hence, concessional support should be in-built in market based transaction

c. To encourage capacity addition in Renewable energy space, price limits should not be applicable in Green Day Ahead Market (G-DAM) and Green Term Ahead Market (GTAM) and Hydro Contracts for transacting in Wind, Solar, Hydro and other types of Renewable energy

4) Clause 3.3 How do we address the negative impact of price cap?

3.3.1. While imposition of price cap ensures that the market prices remain reasonable and within bounds, the generators with variable cost higher than the price cap tend to go out of market. In order to attract more supply volume different countries have proposed measures of segmenting the market. While in Europe a price cap for only inframarginal technologies has been suggested, in India a proposal for introducing a separate High Price Market Segment within the existing day ahead market has been floated.

3.3.2. The following issues emerge in this context:

- *What should be the basis for defining supramarginal or high cost generators? Technology or fuel source?*
- *Would there be enough liquidity in this small segment for collective transactions (demand and supply curve intersection) to take place?*
- *Would it lead to market power by these small sets of generators?*
- *If the high cost/marginal generator setting the market clearing price is a concern and a cause for market intervention, would Term Ahead Market (TAM) be a better option for such transactions to take place without affecting the rest of the buyers?*
- *Any other suggestion on mitigating the negative impact of price cap*

Suggestion:

The provision invites suggestion on proposing a market for such generating stations that are left-out after imposition of price limits in existing DAM and RTM. This situation arises when price limits ensure that discovered prices remain within threshold value, however few generating stations with variable cost higher than the price limits are unable to submit their Offers that later tend to go out of the market.

PXIL submits that functioning of such high price market is dependent on the benchmark ceiling price applicable in relevant market, further, few operations rules would be required to design functionality of such market:

Exclusive market segment for participation by high variable charge plants

a. The Sellers need to be identified for enabling Power exchange(s) to register such entities for participating in exclusive market segment
b. The NOC of such Sellers needs to declared in advance and such Sellers should be directed to transact full quantum of power as provided in NOC to generate adequate liquidity in such segment
c. No ceiling price should be prescribed and the same should be left to demand-supply dynamics of market participants
d. The minimum or floor price for buy orders in such market should be the ceiling price of the existing I-DAM market, vis. Rs. 12/kWh at the moment. This would enable Power exchanges to reject any buy Order less than the floor price at Order entry stage

Forward Auction Contracts on Term Ahead basis

e. The Hon'ble Commission vide Order in Petition no 229/MP/2021 dated 7th June 2022, approved introduction of 'Any Day Single Sided Contracts with Reverse auction' enabling purchase of power up to 90-days with scheduling and delivery of power under provisions of CERC (Open access in inter State transmission) Regulations, 2008 ('STOA 2008'). PXIL introduced 'Any Day Single Sided Contract' on 'PRATYAY' software system on 26.09.2022.

   PXIL submits that Forward auction Contracts on behalf of such high cost power plant can be introduced wherein scheduling and delivery of power shall be under provisions of STOA 2008 and such auction contracts would operate as Term Ahead Market Contracts under provisions of Regulation 5(3) of PMR 2021.

   Under such auction Contracts multiple buyers would participate to purchase power from such high cost power plant to meet their demand requirements for specified duration. Further, Forward auction of capacity available with high cost power plant would avert fragmentation of liquidity in case same capacity is to be split by Seller across multiple power exchange for participation in exclusive market segment as Collective transaction

5) Clause 3.4 What should be the market design for incentivising demand response and energy storage system (ESS)?

3.4. What should be the market design for incentivising demand response and energy storage system (ESS)?

3.4.1. Record-breaking temperatures (summer/winter) and increased level of economic activities after lifting of pandemic restrictions have pushed up the energy demand across globe, putting pressure on energy prices. A reduction in demand may ease this pressure on prices.

3.4.2. In EU, a region wide plan to introduce power savings is propsed which includes

- *a mandatory 5% target during peak hours, when gas plays a bigger role in price-setting, and*
- *a voluntary 10% reduction in overall electricity demand*

3.4.3. As witnessed, prices were driven high due to high demand coupled with low supply, Demand-side response in such crisis situations would help lower prices.

3.4.4. Given these realities,

i. What should the appropriate market structure/design to encourage flexible resources like Demand Response and ESS?

ii. Apart from Time-of-Day (ToD) tariff or dynamic tariff for varied consumer categories, what are the mechanisms that can be considered for encouraging such resources? Can we think of bringing aggregators to pool together such resources and participate in the market? If yes, what should be bidding criteria or the cost recovery mechanism for such resources given that their usage is going to be limited to a very small duration during the year?

Suggestion:

The provision invites suggestion on developing Demand Response (DR) and Energy Storage System (ESS), these elements are a necessity to ensure safety and security of the grid, also provide market efficiencies resulting in lower system procurement for such market segments.

PXIL submits that to design market around DR and ESS elements

a. An assessment of size of procurement and market based compensation mechanism for such services is a necessity
b. All responders in such segments need to be provided higher compensation that enables most efficient resource get deployed first
c. Price limits for participation in such segments should not be imposed
d. The market mechanism should encourage participation of different technologies to ensure higher performing assets are deployed on the grid that will further enhance the grid as more variable renewable energy gets connected to the grid

e. Appropriate incentive structure related with speed of response should be built-in along with penalty for non-performance to promote market wide efficiency in such market segments

f. Successful deployment of such segment will result in lower deviation, ensure grid stability, less outages and more positive operations/less penalty for DISCOMs by averting power purchase during high volatility periods. This can be achieved by formulating Regulations / Procedures / Guidelines that provides for integrating faster response systems and increasing coordination around market clearing to ensure right systems are participating in the market to support the grid.

g. Formulation of Regulations would enable DISCOMs to implement DR based ancillary services considering the challenges in approval of compensation charges for DR to be validated and approved by respective SERCs.

h. Proposed Regulations on DR and ESS should provide market based mechanism for recovery of fixed costs for investments made by such participants

Other suggestions

6) Different matching mechanism in Collective transaction

PXIL submits that the Clause 3.1 ad 3.2 of the discussion paper proposes two pricing mechanism, e.g. 'Uniform Price' and 'Pay-as-bid' mechanism. PXIL has suggested for amendment to Regulation 5 (1) (a) (iv) proposing 'Double Side Closed Bidding' to be amended to 'Double Side Open Bidding' this would enable market participants to make informed decisions regarding submission of bids when auction commences. The open auction will enable make market participants to make informed decisions while submitting their orders and accept the consequences of such bidding behaviour.

Further, an alternate to current price discovery mechanism in I-DAM can be considered as under:

Alternate-1: Different matching mechanism in Integrated Day Ahead Market

Existing design feature	Proposed design feature
Green Day Ahead Market and Conventional Day Ahead Market – 'Uniform Price' mechanism	Green Day Ahead Market - 'Pay-as-Bid' mechanism Conventional Day Ahead Market- 'Uniform Price' mechanism

Alternate-2: Different price discovery in I-DAM and RTM

Existing Bidding	Proposed
Integrated Day Ahead Market – 'Uniform Price' mechanism	Integrated Day Ahead Market- 'Uniform Price' mechanism
Real Time Market – 'Uniform Price' mechanism	Real Time Market – 'Pay-as-bid' mechanism

Alternate-3: Different price discovery in I-DAM and proposed HP-DAM

Existing Bidding	Proposed
Integrated Day Ahead Market – 'Uniform Price' mechanism	Integrated Day Ahead Market- 'Uniform Price' mechanism
Proposed High Price Day Ahead Market – 'Uniform Price' mechanism	Proposed High Price Day Ahead Market – 'Pay-as-bid' mechanism

PXIL submits that in Alternate-1, Alternate-2 and Alternate-3, when 'Pay-as-bid' mechanism is implemented, the allocation of purchase cost would be in proportion to the volume cleared by buy side participants, this allocation mechanism will enable all Buyers to receive benefits of cheaper sellers equitably. Further, learning from the above approach will enable evolution of market design in Collective contracts and also provide critical insights for developing new Contracts for large scale integration of renewable energy.

7) Abridged Order book information prior to close of auction session

PXIL submits that in the existing IDAM Contract, auction window for order entry is from 10:00 to 12:00 Hrs. It is submitted that abridged order book information in the form of aggregate volumes on buy and sell side be displayed to the participants prior to close of auction session. The same is proposed to be implemented as under:

Existing IDAM Contract design		Proposed IDAM Contract design	
Time	**Particulars**	**Time**	**Particulars**
10:00 to 12:00 Hours	Double Sided Closed Bid	10:00 to 11:00 Hours	Order submission as 'Double Sided Closed Bid'
		11:00 to 11:15 Hours	Aggregate Buy and Sell side information for all

Existing IDAM Contract design		Proposed IDAM Contract design	
Time	**Particulars**	**Time**	**Particulars**
			time blocks displayed by Exchange to market participants
		11:15 to 12:00 Hours	Order fine tuning as 'Double Sided Closed Bid'
After 14:30 Hours	Result declared by Exchange - result accepted as consequence of market behaviour	After 14:30 Hours	Result declared by Exchange - result accepted as consequence of market behaviour

The following benefits can be observed:

a. In existing 'Double Sided Closed Bid' market participants place their Orders based on demand-supply assessment and are unable to view the Order placed by other market participants. Buyer and Seller accept result declared by Exchange platform as consequence of market behaviour

b. In proposed IDAM Contract, the operating mechanism would be
   - 10:00 to 11:00 Hours – 'Double Sided Closed Bid' based Order submission by market participants
   - 11:00 to 11:15 Hours – The Exchange will display the aggregate buy and aggregate sell quantum received for each time block, this would enable market participants to fine tune their bids
   - 11:15 to 12:00 Hours – 'Double Sided Closed Bidding', market participants can fine tune their Orders to increase probability of clearing

The proposed change in Order submission would enable market participants to make informed decision regarding their Orders.
