Central Electricity Regulatory Commission (Staff Paper on Power Market Pricing), October 2022

Central Electricity Regulatory Commission (CERC) notified the "Staff Paper on Power Market Pricing" in October, 2022. The last date to submit comments on the same is 4th November, 2022. The key highlights of Staff Paper are as follows:

The document gives brief introduction about the functioning of electricity market, the role of power exchanges and percentage share in volume of transactions taking place through power market, bilateral, DSM, Long Term Agreements (PPAs). In the power market section, the segregation with respect to the different markets is explained that includes DAM (incl. GDAM), TAM (incl. GTAM), RTM. Brief overview regarding the procedure for transaction taking place that are collective transactions and continuous are explained. The Uniform Price Auction and Pay as Bid Auction are explained in detail.

The global electricity market scenario is explained in brief. This includes the scenario of Australia, Europe and India. It shows that the unprecedented high prices in electricity markets coupled by increase in demand as well as unavailability of fuel or supply related issues are addressed and explained in the paper. Certain important questions are raised regarding the same that are to be addressed by the stakeholders as per their approach.

The document came up with open ended questions to address this issue of high prices in the electricity markets across the globe. The major reasons behind the price spikes country wise was explained in brief and few documents have been shared for reference to address such issues on high prices and avoid such unprecedented price spikes in future. It raised four major questions, first question was about the change in pricing methodology that is the way in which the price discovery takes place in electricity market needs any change or not. It has proposed PABA and UMCP and associated advantages and disadvantages with them. Question 2 raised was regarding introducing regulatory intervention – what should be the state that such an intervention to be initiated by the regulator. This includes exploring types of possible interventions to be introduced, tolerance level, capping, etc. Question 3 raised was regarding addressing the negatives of price cap introduced by the regulator in the power markets that includes what about the generators having high variable cost and the consumers that are willing to fulfil their demand at any cost. Question 4 raised was regarding the modification in the electricity market design to bring up demand response and energy storage system.

The document can be accessed here

CER Opinion

1. **Pay as Bid Auction (PABA):** As per the question raised in section 3.1, *Does Pricing Methodology need a change?* The above question is being raised in the context of recent spike in power market prices and price cap placed to address the same. There seems to be a concern that uniform market clearing price (UMCP) seems to result in 'windfall' gain for the low cost generators (bidders) (Figure 1). **The very nature**

of the UMCP is to generate producer surplus allowing recovery of fixed cost and also incentivizing investment in capacity creation. While the price spike is an outcome of multiple aspects, wherein CERC can play a role in the context of market monitoring and incentivizing/penalizing low fuel inventories[1] and addressing the supply chain issues for thermal generation.

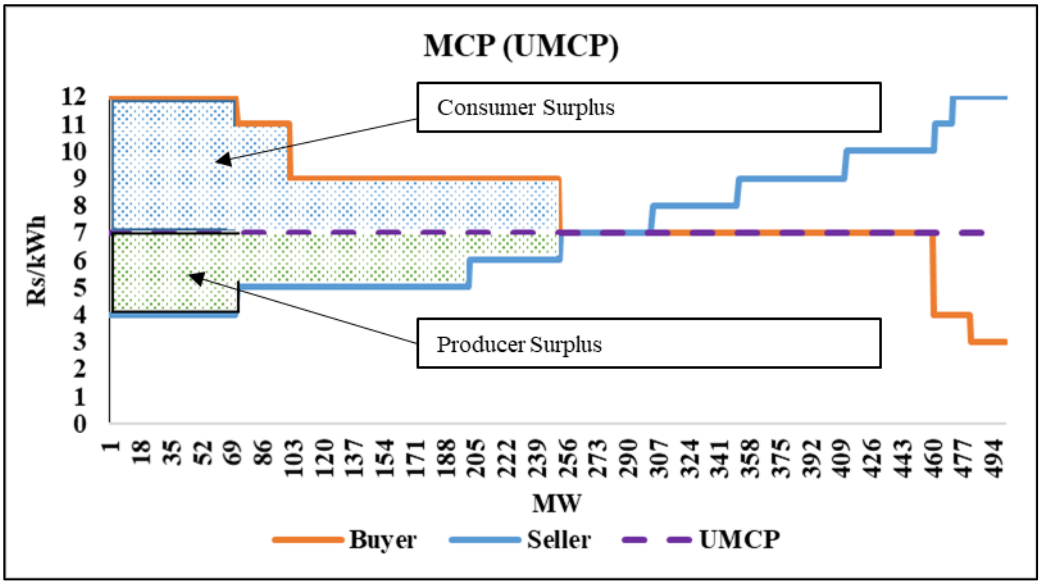

Figure 1: Uniform Market Clearing Price (UMCP)

The suggestion to consider Pay as Bid pricing mechanism as an alternate to UMCP would have other implications for the market outcome and the sector as a whole. Under Pay as Bid methodology, sellers are paid as per their bid in the market. While this may suggest a reduction in the windfall gain for low cost producers (bidders) (Figure 2), it would have adverse implications as highlighted below.

[1] CER Comments on "CERC (Terms and Conditions of Tariff) Regulations, 2019", Power Chronicle Volume 03 Issue 04 https://eal.iitk.ac.in/assets/docs/Power_Chronicle_Vol_01_Issue_03.pdf

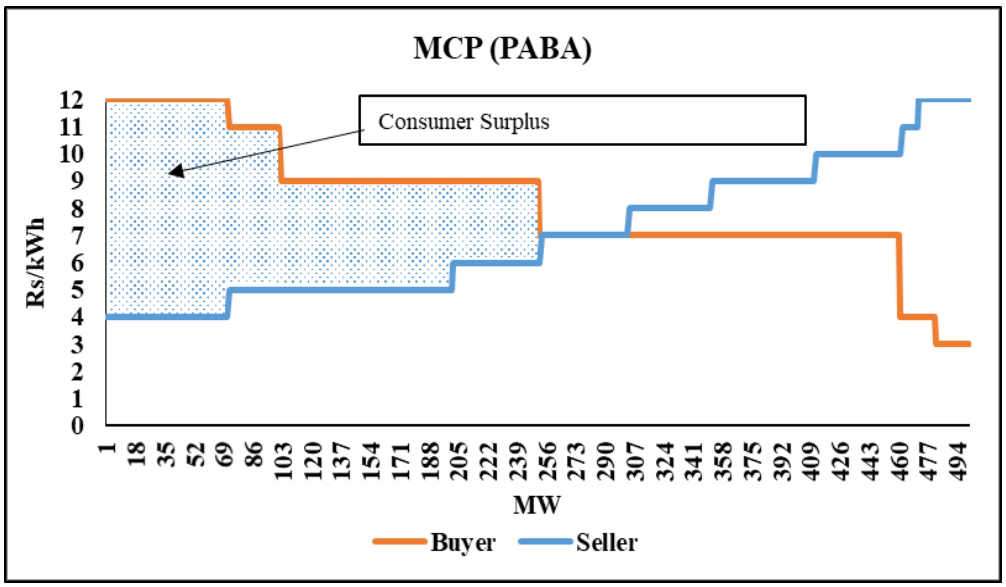

Figure 2: Pay As Bid Auction (PABA)

Adoption of the PABA would lead to change in the bidding behavior of the sellers as they would no longer bid close to their marginal cost, but would try to bid a bit lower than their expectation of market clearing price (Figure 3). This would reduce the gain to consumer surplus as producers would be able to regain the producer surplus, they may have lost as compared to UMCP. **The expected benefit of reducing the 'windfall' gain to low cost producers would be diminished soon.** This would also reduce the incentive for investment due to less recovery of fixed charges.

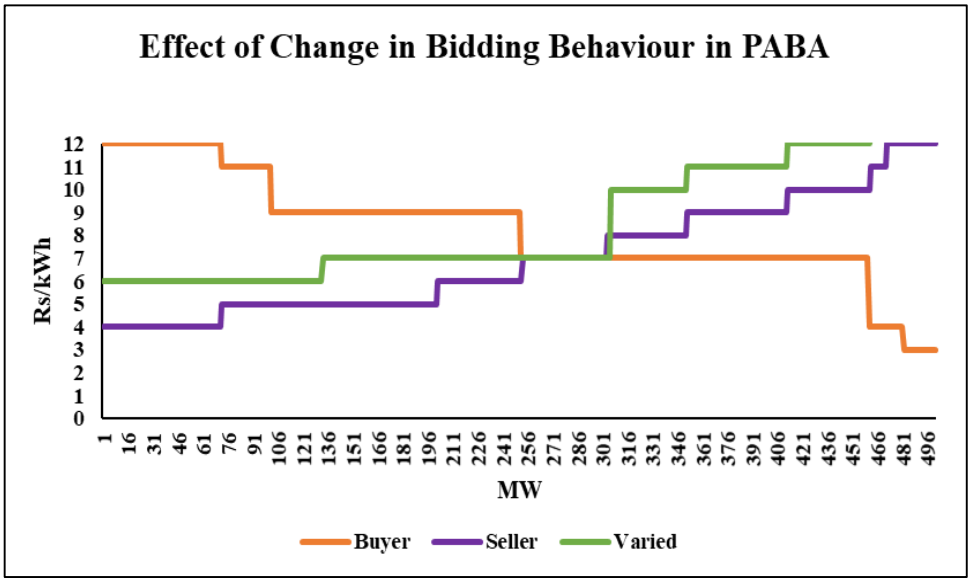

Figure 3: Effect of Change in Bidding Behavior of Seller in PABA

2. **Pay as Bid without Capacity Market:** Adoption of pay as bid mechanism, in the absence of a capacity market, would be characterized by the above outcome. **Pay as Bid mechanism can be adopted if there is a capacity market that allows for part recovery of fixed cost of generators[2].** However, some of the above side effects would still leave its mark on the outcome.

3. **Cap on Supernormal Profits:** The proposal to cap the additional or supernormal profits made by the inframarginal generators, and park the 'denied' surplus to a pool may have limited effectiveness and for a limited period. It is proposed that the pool can then be used to address identified priority areas of the sector. However, change in the bidding behavior of the sellers (bidding at a higher price compared to their previous bids) would reduce the scope for the pool. In such a scenario the consumers would continue to pay the 'uniform price' and hence would not be benefited from the market intervention.

   There would also be implementation issues in identifying the limit beyond which sellers would be denied the additional surplus[3]. Such a criteria cannot be static due to variation in the demand-supply interaction and the market outcome across time blocks within a day and across days.

[2] EAL Comments on "Discussion Paper on Market Based Economic Dispatch", Power Chronicle Volume 04 Issue 01 https://eal.iitk.ac.in/assets/docs/Power_Chronicle_Vol_04_Issue_01.pdf

[3] The approach to tax windfall gain (due to high international prices) has been adopted in the domestic crude oil production in India.

4. **Dynamic Price Cap: The issue of price spikes in the electricity market can also be addressed through a dynamic price cap**, which would be updated based on the market outcome (Figure 4). In case MCP hits the predefined (lowest) price cap, based on a pre-defined criteria (say, MCP for a time block being equal to price cap for two consecutive days) price cap would be set at a higher level. The price cap would be lowered again to Rs.12/kWh (the lowest price cap), in case the MCP is lower than the lowest price cap for a single day for the same time block. This would mean that price cap could also differ across time blocks, with most of the time blocks having a price of Rs.12/kWh, while a few time blocks may have a price of Rs.14 per kWh.

   The mechanism should be supplemented with an effective market monitoring mechanism to identify, monitor and investigate suspected instances of market abuse/manipulation and, take corrective measure thereof.

   Acronyms used corresponding to the Figure 4 are as below:
   MCP = Market Clearing Price
   D = Day
   Pc= Price Cap
   dx = Additional Price Capping

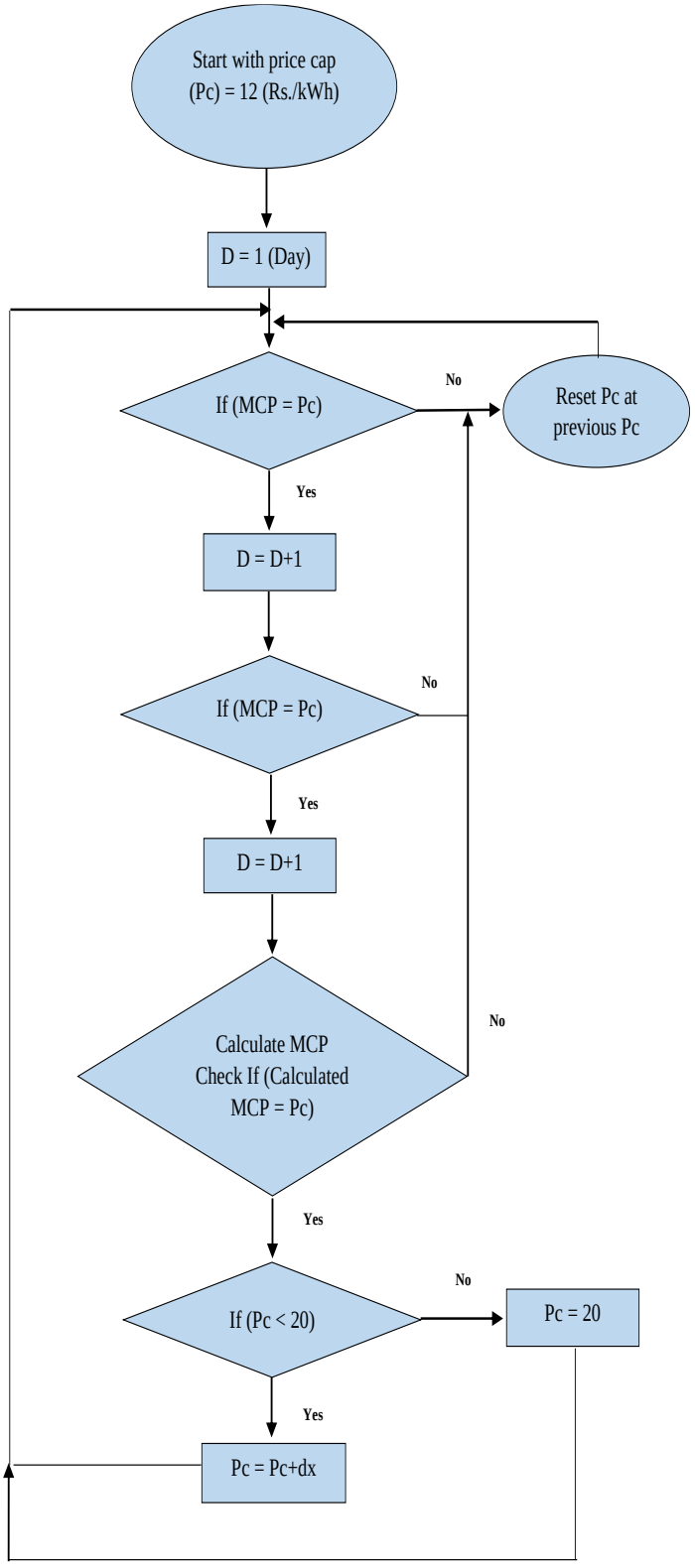

Figure 4: Flowchart on Dynamic Price Cap

5. **Hybrid Approach to Market Clearing:** A hybrid approach, wherein **'Uniform Market Price' based approach is applied to all trades cleared below the price cap** (say Rs. 12 /kWh) and **the rest** of the higher bids are cleared **at pay-as-bid approach** (See Figure 5 below). In case the market price is below Rs. 12/kWh, Uniform market clearing is adopted. When market clearing price (MCP) is above Rs. 12/kWh, the sellers whose bid was Rs. 12 or below, are paid a uniform price of Rs. 12/kWh. Sellers whose bid was above Rs. 12 per kWh are paid on 'Pay-as-Bid' basis. This addresses the concern for 'windfall gain' for low bid sellers (i.e. those below Rs. 12/kWh), but some of the above highlighted concerns regarding incentive for capacity creation remain but in a limited manner.

   The part of the producer surplus (shown by shaded area in Figure 5(b), is accumulated in a pool account, may be called as Market Premium Pool Account. CERC would issue regulations for operating and utilization of the said pool account. This fund can be used to fund demand response programs across discoms in the country. **This approach would have lesser distributional impact as compared with 'uplift payment', where premium due to higher prices is socialized.**

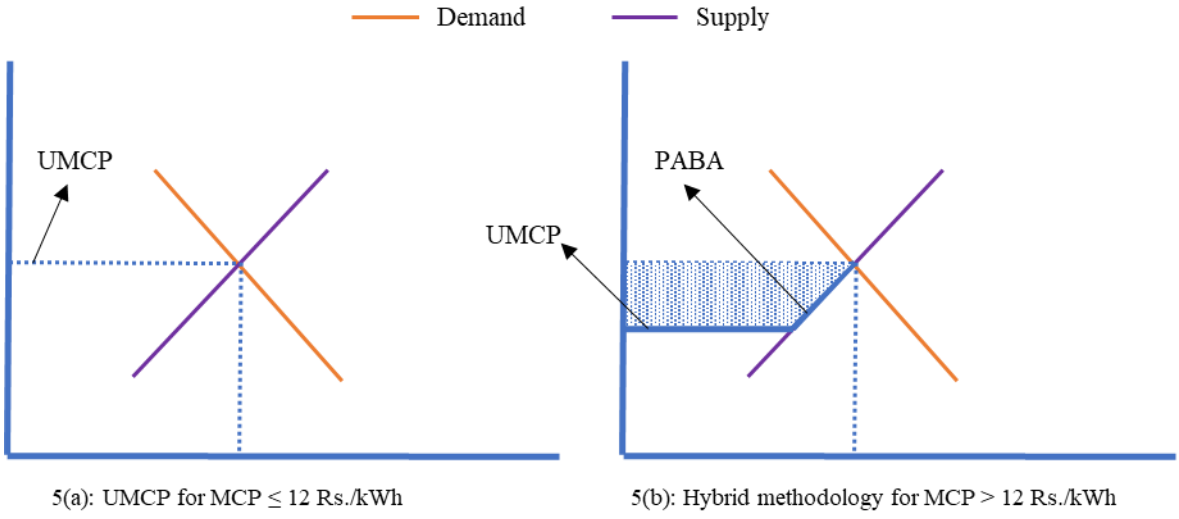

Figure 5: Hybrid Approach to Market Clearing

6. **Demand Response:** As per the question raised in section 3.4, *How to incentivize Demand Response?* Demand response will play a very important role in addressing price spike in the power market. This was highlighted in The same can be referred in *Power Chronicle* Vol. 5 Issue 1 in response to comments on **Price Capping of Rs.12/ kWh on 7th April, 2022**. [4]

[4] EAL Comments on "Price Capping of Rs. 12/kWh on 7th April, 2022",Power Chronicle Vol. 05 Issue 01

Forum of Regulators (FoR) may develop a model regulation for designing and implementing a demand response program. It would make economic sense to design a demand response program that would incentivize demand curtailment than paying significantly higher price for ST power procurement. Separate and detailed comments can be provided for the same, when required.

7. **Recommended Measures to be undertaken by Regulatory Commission:** As per the question raised in section 3.2, *What should be the criteria for Regulatory Interventions?* Power purchase cost is pass-through and is trued-up by the respective SERC, who place a limit on short-term (ST) power procurement, both in terms of quantum and price limit. To ensure that the discoms do not undertake significant ST market purchase beyond the limits set by the regulator, a mechanism to disincentivize expensive power procurement, without prior approval, may be set up. The SERCs may specify average as well as maximum price of ST power procurement. Given the poor financial state of the utilities, and their inability to recover all the cost from the consumers in a timely manner, such measures are necessary to protect long-term interests of the consumers.
   Furthermore, the additional cost of power purchase should be timely be passed through Fuel and Power Purchase Adjustment charge.

8. **Term Ahead Market (TAM):** The question raised in section 3.3 *How do we address the negative impact of price cap?* TAM includes the contracts such as Day Ahead Contingency Contracts, Intraday Contracts, Daily Contracts, Weekly Contracts, Monthly Contracts and Any Day Single Sided Contracts. The brief information related to the contracts in TAM, DAM and RTM is given in the table below. The question is raised in the discussion paper in which the generators having higher variable cost to be allowed to participate in TAM.

   The TAM transactions are continuous in case of intraday and day ahead contingency contracts and hence the high price in TAM will not affect the other buyers. The other contracts as specified in the table below have price discovery using uniform price step auction. Specific type of contract in TAM (Intraday, DAC, Daily, etc.) may be identified to allow the high variable cost generators to participate in the market. The duration of contract and bidding varies in this market when compared to DAM and RTM. However, longer time block (hourly or for consecutive hours) for transactions would affect participation and thus impact liquidity as well.

https://eal.iitk.ac.in/assets/docs/Power_Chronicle_Vol_05_Issue_01.pdf

Some of the contracts on TAM already suffer from low liquidity. If markets are efficient, the spillover effect of market segments with high price participation would be cast on other market contracts to a varying extent.

Table 1: Summary of Market Products and respective contracts available in Electricity Market

Name of the Contracts	Commencement of Bidding	Last Day of Bidding	Bidding Time	Delivery Duration	Price Discovery	Remarks
Daily	Daily	Two Days Before Delivery Day	0 to 24 hrs	T+2 to T+90	Uniform Price Step Auction	For the Pre-specified Time Blocks notified to the market participants well I advance through circulars
Weekly	Monday of the week prior to delivery	Friday of the one week prior to delivery	12 to 17 hrs	TW+1 to TW+12 Weeks		
Monthly	First day of the zero Month	For the 1st month contract- ten days prior to the close of zero month; For the 2nd month contract five days prior to close for zero month; For the 3rd month contract last day of zero month.	12 to 17 hrs	TM+1 to TM+3 Months		
Any Day Single Sided	Daily	Two Days Before Delivery Day	0 to 24 hrs	T+2 to T+90	Reverse Auction	For User defined days and Time Blocks
Intraday	Daily	-	00:30 to 20:30 hrs	04:00 to 24:00 hrs	**Continuous Auction**	
DAC	Daily	-	15:00 to 23:00 hrs	00:00 to 24:00 hrs		
Integrated DAM	Daily	-	10:00 to 12:00 hrs	Next Day 00:00 to 24:00 hrs	Double Sided Closed Bid Auction	
RTM	Half Hourly	-	15 minutes	30 minutes		