

**CENTRAL ELECTRICITY REGULATORY COMMISSION  
NEW DELHI**

**Petition No. 159/MP/2022**

**Coram:**

**Shri I. S. Jha, Member  
Shri Arun Goyal, Member  
Shri P. K. Singh, Member**

**Date of Order: 27<sup>th</sup> June, 2022**

**IN THE MATTER OF:**

Petition under Regulation 28 of Central Electricity Regulatory Commission (Power Market) Regulations 2021 for approval of the technology to be used by the Petitioner. The Petition is being filed in accordance with the Central Electricity Regulatory Commission (Conduct of Business) Regulations, 1999.

**And in the matter of**

Hindustan Power Exchange Limited  
(Formerly Pranurja Solutions Limited)  
25th Floor, P J Towers  
Dalal Street, Mumbai 400 001

**...Petitioner**

**Parties Present:**

Shri Ravi Kishore, Advocate, HPX  
Shri Akhilesh Awasthi, HPX



## ORDER

The Petitioner, Hindustan Power Exchange Limited (in short ‘HPX’) has filed the present petition under Regulation 28 of Central Electricity Regulatory Commission (Power Market) Regulation 2021 (hereinafter “PMR 2021”) for approval of the technology to be used by the Petitioner’s platform. The Petitioner has filed the present petition in compliance of the Order dated 16.02.2022 in Petition No 160/MP/2021 and in accordance with the Central Electricity Regulatory Commission (Conduct of Business) Regulations, 1999.

### **Background**

2. On 07.09.2018, the Petitioner filed the Petition 287/MP/2018, seeking grant of registration to establish and operate a Power Exchange. In the Order dated 12.05.2021, the Commission granted registration to the Petitioner’s company to establish and operate a Power Exchange subject to the directions passed by the Commission. In the Order, the Commission directed that after getting approval on Bye-Laws, Rules, and Business Rules and the technology including trading software, the Exchange would be able to commence its operations. The relevant extract of the Order has been reproduced as under:

“  
.....  
*45. The commencement of operation of the Power Exchange is subject to approval of the Bye-Laws, Rules, and Business Rules and the technology including trading software in accordance with various provisions of the PMR 2010.*  
.....”

3. On 10.08.2021, the Petitioner filed the Petition 160/MP/2021 seeking approval on its draft Bye-Laws, Rules, and Business Rules. In the Order dated 16.02.2022, the Commission accorded approval to the Bye-Laws, Rules, and Business Rules subject to the directions passed by the Commission. In the Order, the Commission directed the Petitioner to file a separate petition with details on the proposed transaction platform. The Commission also directed the Petitioner to get its algorithm audited in terms of Regulation 28(4) of the PMR 2021 and furnish the results along with the petition. The relevant extract of the Order has been reproduced as under:

“  
.....

*12. It is observed that HPX is required to seek the Commission's approval on the transaction platform and its technical aspects in accordance with the Order dated 12.05.2021 in Petition No. 287/MP/2018. Also, in terms of Regulation 28(4) of the PMR 2021, the Petitioner is required to get the algorithm audited before the commencement of the operations of the Power Exchange. Therefore, we direct the Petitioner to submit details on the proposed transaction platform, including the software to be used through a separate Petition. The Petitioner is also directed to get the algorithm audited in terms of Regulation 28(4) of the PMR 2021 and furnish the results along with that Petition.*

.....”

4. Regulation 28 of the PMR 2021 provides requirements for information technology infrastructure and trading system of a Power Exchange wherein in terms of Regulation 28(4), before commencement of its operation, a Power Exchange is required to get its algorithm audited and submit the findings to the Commission.

5. As required in the Orders in the matter of Petitions 287/MP/2018 and 160/MP/2021 and Regulation 28 (4) of PMR 2021, the Petitioner has filed the present petition on 26.05.2022 providing details of the technology platform including its technical aspects, and the audit report of the algorithm. The Petitioner has made the following prayers in the petition:

- a) allow the present petition;
- b) approve the transaction platform and its technical aspects in accordance;
- c) grant the consent for commencement of operation the power exchange by the Petitioner; and
- d) pass such other and further order(s) as this Hon'ble Commission may deem fit and proper under the facts and circumstances of the present case and in the interest of justice.

***Petitioner's submission on salient features of the Technology platform***

6. The transaction platform (an electronic trading platform) of HPX has been developed by reputed technology vendors in India and abroad. The matching engine has been taken from one of the renowned technology providers. The transaction platform has a module based flexible architecture for efficient operations, reliable order flow and integration of price discovery with clearing and settlement. The platform is designed to provide the member admin terminal, trader

workstations to its members and admin terminal to the Exchange users. The platform is enabled with standard security protocols and real time surveillance, which is sufficient to mitigate any risk related to market abuse or errors by the participants.

7. The transaction platform provides the capability to monitor trading margin utilization of trading members and participants with continuous check on their exposure limits and availability of funds. The module of clearing and settlement takes care of the margin utilization based on the available balance and collateral. The platform ensures integrity of trades by limiting the exposure of participants in case of margin issues.

8. The transaction platform facilitates the price discovery for different contracts based on the price discovery and matching methodology they follow, viz., i) Double sided closed bid uniform price auction with congestion management module for Day Ahead Contracts and Real Time Contracts, ii) Continuous Matching for Intraday Contracts, Day Ahead Contingency Contracts, Daily Contracts and Weekly Contracts, and iii) Double sided closed bid uniform price step auction for Renewable Energy Certificates and Energy Saving Certificates. The transaction platform has flexible architecture and ensures the maximization of social welfare as envisaged in PMR 2021.

9. The transaction platform has seven modules: i) bid submission, ii) bid aggregation at exchange side, iii) matching engine's robust algorithm for all energy and certificate products, iv) collateral management and risk management system, v) clearing and settlement system, vi) reporting portal for different users, and vii) miscellaneous works.

10. The transaction platform and its modules are based on the following technologies:

a. **For DAM & RTM:** Frontend – Dotnet framework 4.6.2; App Server – Core Java (OpenJDK 14), JSP, REDIS 6.2.1 or above, Tomcat; Database – Microsoft SQL Server (Version can be taken from SysAdmin team); OS – Windows for App Servers & Redhat Linux 7.x

b. **For TAM, Intraday, Day Ahead Contingency:** Frontend – JSP / HTML / Dotnet framework 4.8; App Server – Java (JDK 1.8+), JRE 1.8+, HTML, JSP, Tomcat; Database – Microsoft SQL Server, MS SQL 2019; OS – MS Windows OS 2019

c. **For RECs & ESCerts:** Frontend – Dotnet framework 4.8; App Server – IIS; Database – Microsoft SQL Server, MS SQL 2019; OS – MS Windows OS 2019

11. The clients and members of the Power Exchange are to be assigned with unique code with the maximum length of 15 characters. This unique code inter-alia denotes the: i) Exchange Initials, ii) Sub region/Area, iii) State/Regional Entity, iv) Broker (Participant) Short Name, and v) Client Code.

12. The transaction system has been set up both at the Primary Site and Disaster Recovery site. All relevant systems as set up in the Primary Site to execute the operations, are also available at the designated Disaster Recovery site. In case of any exigency, Primary Site will switch over to Disaster Recovery site which has all the facilities for allowing bidding and related works without hampering the speed and connectivity of the end user.

***Salient points of the report on the algorithm audited by Deloitte***

13. The Petitioner has got its transaction platform audited by Deloitte Touch Tohmatsu India LLP (in short ‘Deloitte’) with special focus on the price discovery algorithms and process of creating member and client code. Deloitte has reviewed the pricing algorithms maintained in the trading work station of Petitioner’s transaction platform which includes bid placing, matching and price discovery for respective market segments. It has also reviewed applications for creating member and client code.

14. Deloitte has performed 68 test cases covering each market segment to review price discovery for all types of contracts (as per the approved Business Rules of the HPX) with the limitation that the outcome of the review may not be exhaustive and representing all possibilities. These test cases were performed for different scenarios as follows:

Contract	Price Discovery Methodology	Scenarios	Test cases	Result
DAM & RTM	Double sided closed bid uniform price auction with congestion management module	Single bids only	21	No deviations noted between price and quantity computed by the trading algorithm and manual re-computation.
		Single and block bids	20	
		Minimum quantity block bids	4	
		Profile block bids	2	
		Linked block bids	6	
		Congestion	7	
Intraday, Day Ahead Contingency	Continuous Matching	Each IOC order gets cancelled immediately if not matched	1	
		Continuous partial matching of Day orders	1	
Daily & Weekly Contract	Continuous Matching	Continuous partial matching of Day and IOC orders	1	
		Matching for FOK orders	1	
RECs	Double sided closed bid uniform price step auction	REC (Solar) case where Auction uniform price is determined at the point of Maximum Tradable Volume.	1	
		REC (Solar and Non – Solar) case where Auction uniform price is determined at the point of Maximum Tradable Volume. Additionally, a scenario is tested where bid for both REC Solar and REC Non-Solar are placed, and 2 separate Auction uniform prices are determined for each segment.	1	
Auction uniform price is determined at the point of Maximum Tradable Volume.		1		
Auction uniform price is determined at the point of Maximum Tradable Volume. Additionally, a scenario of Time Priority is tested where 2 bids are placed with same price and quantity, and 1 bid is fully cleared, and the other bid is partially cleared.		1		
ESCerts				

15. Deloitte has submitted its audit report on 24.05.2022. In the report, it has concluded that based on the analysis performed, no significant deviation from the approved Business Rules of HPX related to price discovery in the trading platform has been found.

### ***Hearing dated 14.06.2022***

16. The first hearing of the Petition was held on 14.06.2022 wherein the Petitioner reiterated its written submissions on the prayers of present petition. The Petitioner submitted that it would be in position to commence operation within a day from the approval of the Commission in the present matter. In addition, the Petitioner submitted that it has also filed Petition No. 88/MP/2022 for approval of the transaction fees which is pending consideration of the Commission and till the time Commission approves the transaction fees therein, the Petitioner may be permitted to operate its Exchange by charging the transaction fees in line with the other Power Exchanges and PMR 2021.

### **Analysis and Decision**

17. While granting registration to the Petitioner's Power Exchange, we, in our Order dated 12.05.2021 in the matter of Petition 287/MP/2018 held that the commencement of operation of the Power Exchange is subject to approval on Bye-Laws, Rules, and Business Rules and the technology, including trading software. Subsequently, in the Order dated 16.02.2022 in the matter of Petition 160/MP/2021 we had approved the Bye-Laws, Rules, and Business Rules of the Petitioner's platform and directed the Petitioner to submit details on the proposed transaction platform, including the software to be used through a separate petition. The Petitioner was also directed to get the algorithm audited in terms of Regulation 28(4) of the PMR 2021 and furnish the results along with the petition.

18. We note that in compliance of the Commission's directions in the Orders dated 12.05.2021 and 16.02.2022 in the matter of Petition 287/MP/2018 and Petition 160/MP/2021 respectively, the Petitioner through the present petition, has provided the details on transaction platform and its technical aspects which, inter-alia, includes details on front end, server, database and operating systems to be used for various contracts. We further note that the Petitioner has also got its algorithm audited in terms of Regulation 28(4) of the PMR 2021 and has furnished the results along with the petition.

19. We have considered the submissions of the Petitioner and perused the documents on record. We observe that under Regulation 28(4) of the PMR 2021, the algorithm of the software application for price discovery, for the respective contracts, should be in compliance with Regulation 5 of the PMR 2021 and the Business Rules of the Power Exchange. Regulation 28(4) of the PMR 2021 provides as under:

“  
*28. Information Technology Infrastructure and Trading System of Power Exchange*  
.....  
*(4) The algorithm of the software application for price discovery and market splitting shall be in compliance with the requirement specified in Regulation 5 as applicable and methodology mentioned in the bye-laws, rules and business rules of Power Exchange. The Power Exchange shall get the algorithm audited before commencement of operations and thereafter, once in every two years and submit the findings of the audit to the Commission.*  
.....”

20. Regulation 5 of the PMR 2021 provides details of the contracts transacted on a Power Exchange and conditions for price discovery for the collective transactions, such as maximisation of economic surplus, market splitting, etc. The relevant extract of the Regulation 5 has been reproduced here as under:

*“5. Contracts transacted on Power Exchanges*  
*(1) Day Ahead Contracts and Real-time Contracts*  
*(a) Price discovery:*  
.....  
*(ii) Price discovery mechanism shall adopt the principle of maximisation of economic surplus (sum of buyer surplus and seller surplus), taking into account all bid types.*  
*(iii) The bidding mechanism shall be double sided closed bid auction on day ahead basis or on real time basis, as the case may be.*  
*(iv) The price discovered for the unconstrained market shall be a uniform market clearing price for all buyers and sellers who are cleared:*  
*Provided that in case of congestion in transmission corridor, market splitting shall be adopted.*  
.....”

21. As may be drawn from the above, the audit of the algorithm is expected to ascertain, inter-alia, compliance of Regulation 5 of the PMR 2021 and the Business Rules of the Petitioner. We note that during the audit, 60 test cases were run by the auditor covering different scenarios including the market splitting which fulfills one of the conditions of Regulation 5 as provided



above. Further, we observe that the approved Business Rules of the Petitioner provide details on maximization of economic surplus and market splitting, and the findings of the audit report reiterate no significant deviation from the approved Business Rules of HPX related to price discovery.

22. Therefore, on the basis of findings of the audit report submitted by the Petitioner as discussed above, we find that the Petitioner's transaction platform complies with Regulation 28(4) of the PMR 2021. Therefore, we approve the proposed transaction platform and its technical aspects as submitted by the Petitioner, subject to the directions in Paragraph 24 and Paragraph 25 of this Order. We also direct the Petitioner to submit a detailed report within one month after completion of six months of its operations regarding operational experience and compliance of the requirements specified in PMR 2021 and its Business Rules. Post that, we may also consider auditing the transaction platform of the Petitioner in accordance with the Regulation 28(5) of the PMR 2021 reproduced as below:

“  
28. *Information Technology Infrastructure and Trading System of Power Exchange*  
.....  
(5) *The Commission may audit or appoint an agency to audit the software applications used by the Power Exchanges for price discovery and market splitting on a random basis. The Power Exchanges shall provide to the Commission results of test cases and scenarios given by the Commission.*”

23. We hereby accord permission to the Petitioner to commence operation of its Power Exchange from the date to be notified to the market participants well in advance. The operation of the Power Exchange shall be in accordance with prevailing directions and regulations of the CERC such as CERC (Conduct of Business) Regulations, 1999 as amended from time to time including reenactment thereof, CERC (Payment of Fees) Regulations, 2012 as amended from time to time including reenactment thereof, CERC (Open Access in inter-State Transmission Regulations), 2008 as amended from time to time including reenactment thereof; CERC (Indian Electricity Grid Code) Regulations, 2010 as amended from time to time including reenactment thereof; CERC (Sharing of Inter-State Transmission Charges and Losses) Regulations, 2020 as amended from time to time including re-enactment thereof; CERC (Power Market Regulations), 2021 as amended from time to time including reenactment thereof; Procedure for Scheduling of Bilateral

Transaction and Procedure for Short Term Open Access in inter-State Transmission System through National Open Access Registry (NOAR) as amended from time to time including reenactment thereof.

24. The Commission has recently approved physical delivery based forward contracts and/or non-transferable specific delivery (NTSD) Contracts in the matter of Petition 219/MP/2021 and Petition 229/MP/2021 for the existing operational Power Exchanges. The Commission, vide its Orders dated 7.06.2022 in the matter of the said petitions, directed to run Daily Contracts and Weekly Contracts on Uniform Price Step Auction considering its merits over the Continuous trade Session in terms of transparency and efficiency in price discovery. Therefore, in order to create a level playing field amongst the Power Exchanges and in view of the merits of Uniform Price Step Auction, we are inclined to follow a similar approach in the present petition. Accordingly, we direct the Petitioner to use Uniform Price Step Auction as a matching methodology for price discovery in Daily and Weekly contracts. We further direct the Petitioner to use open auction for Uniform Price Step Auction so that the participants while bidding for these contracts can take informed decisions after seeing buy and sale bids offered by other anonymous participants. We also direct the Petitioner to make Daily and Weekly Contracts available only for pre-specified time blocks notified to the market participants well in advance with the help of circulars. The matching methodology approved in this Order for price discovery in Daily and Weekly contracts will supersede the approval given in the matter of Petition 160/MP/2021. However, other physical delivery-based contracts in Integrated Day Ahead Market, Real Time Market, Intra-Day and Day Ahead Contingency will remain unaffected and shall be offered as per the contract specifications approved in the matter of Petition 160/MP/2021. The table given below summarizes the physical delivery-based contracts and their price discovery methodologies as under:

<b>Name of the Contract</b>	<b>Price Discovery Methodology as per the contract specifications approved in 160/MP/2021</b>	<b>Price Discovery Methodology approved through present Order superseding the approval given in 160/MP/2021</b>
Integrated Day Ahead Market	Double Sided Close Bid Auction	Double Sided Close Bid Auction
Real Time Market	Double Sided Close Bid Auction	Double Sided Close Bid Auction
Day Ahead Contingency	Continuous Trade Session	Continuous Trade Session
Intra-day	Continuous Trade Session	Continuous Trade Session
Daily Contract	Continuous Trade Session	Uniform Price Step Auction
Weekly Contract	Continuous Trade Session	Uniform Price Step Auction

25. We direct the Petitioner to charge transaction fee in accordance with the CERC (Power Market Regulations), 2021 till the Commission decides on its transaction fee in the matter of Petition 88/MP/2022. We also direct that the Commission's Orders in the matter of Petition 4/SM/2022 and Petition 5/SM/2022, shall also be applicable to the Petitioner's Power Exchange.

26. We further direct the Petitioner to make appropriate changes in its software and to align its Business Rules, Rules and Bye-Laws before the commencement of operations of its Power Exchange in accordance with the directions of this Order and upload these documents on its website before commencement of operation of its Power Exchange. Needless to mention, if any discrepancy is noticed or if it appears that the revised Business Rules, Rules, and Bye-Laws do not conform to the Regulations in any respect, necessary directions may be issued for such non-compliance.

27. Petition No. 159/MP/2022 is disposed of in terms of the above.

**Sd/-**  
(P.K. Singh)  
Member

**Sd/-**  
(Arun Goyal)  
Member

**Sd/-**  
(I.S. Jha)  
Member