



**Ref:** PTC/Mkt Coupl/Oct-11

**Date:** October 16, 2023

To  
**The Secretary**  
**Central Electricity Regulatory Commission (CERC)**  
3<sup>rd</sup> & 4<sup>th</sup> Floor, Chanderlok Building,  
36, Janpath, New Delhi - 110001

**Subject: Comments on the CERC Staff Paper on “Market Coupling”**

Dear Sir,

This is with reference to your letter (No. Eco-14/1/2023-CERC dated. 21 August 2023) regarding seeking comments on **Staff Paper on “Market Coupling”**.

You are requested to kindly consider the enclosed annexure (Annexure-A) of our comments for your kind reference and perusal. If deemed appropriate, we are also available for an in-person interaction to clarify any aspect.

Thanking you,

Yours faithfully,  
For **PTC India Ltd**

A handwritten signature in black ink, appearing to read 'Rajesh Cherayil', written over a horizontal line.

(Rajesh Cherayil)  
**Chief Strategy Officer**

**PTC India Limited**

(Formerly known as Power Trading Corporation of India Limited)

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(Annexure-A)



PTC India Limited  
New Delhi

**Subject: Comments on the CERC Staff Paper on “Market Coupling” as defined under Power Market Regulations 2021**

1. **Background:** We welcome the initiative by the staff of Central Electricity Regulatory Commission (CERC) to seek views on an important need for the Indian Power Markets which is specified in the Power Market Regulations ,2021 (PMR 2021). We also echo the sentiment that is expressed in Clause 1.4, Page 5 of the Staff Paper where the issue associated with the intrinsic nature of the collective transactions segment (DAM and RTM), which leads to concentration of liquidity in one power exchange, due to which benefits of competitive efficiency do not percolate to the market participants. There are several aspects associated with such a design.
  - a. In the case of collective transactions (DAM and RTM) which are based on the double-sided closed auction, the decision of an electricity buyer/seller is influenced by the certainty of getting his bids/offer cleared, which depends on the level of liquidity in an exchange. Thus, the liquidity on one dominant exchange helps attract more liquidity over time.
  - b. Additionally, a more liquid exchange is likely to discover lower prices compared to other exchanges resulting in attracting the buyers in subsequent trades (after the initial trade) forcing the sellers also to migrate to the dominant exchange. Consequently, a lower liquidity exchange, despite offering better quality of services, will never be able to retain customers for such collective transactions.
  - c. Additionally, multiple exchanges may have one sided bids of buy and sell which are eliminated due to this design and such volumes never get expressed in the collective segments.
  - d. The primary need of a “One Market One Price” in the collective segment can only be achieved through market coupling. The launch of an electricity

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derivatives segment, implementation of market based economic dispatch (MBED) etc. require that collective segments be coupled together.

Given that as a country, we have adapted a multi-exchange model, any design that results in one exchange to dominate the segment purely due to design should be reexamined and modified accordingly.

While there are several primary and second-order benefits of market coupling, we have tried to respond to the specific queries raised in the Staff Paper in the Indian power market context. However, our unequivocal view remains that Market Coupling needs to be implemented in the prevailing context in the collective segments of the power exchanges for the benefit of the power markets and the Indian consumer of electricity.

**5.2. Does the current Indian power market scenario form a compelling case for Market Coupling?**

- We believe that the current market scenario where the power exchanges have crossed the threshold of 6% of the overall electricity market trading more than 100 billion units and are poised to considerably increase traded volumes on the platform(s) makes a compelling case to introduce Market Coupling. This will ensure that as the volumes increase, essential principles of transparent price discovery backed by competition are not compromised.
- Additionally, there are three competing power exchanges who have significant market share in the continuous auction segments whereas the collective segment is a virtual monopoly due to a network effect. This is because the closed double sided auction which forms the underlying process of price discovery of the collective segment favours the exchange with existing liquidity in such segment thwarting any attempt by another exchange to launch trades in the segment. Therefore, in the current Indian power market scenario, ensuring a level playing field to encourage competition within the market requires implementation of market coupling.
- The Indian power market is also mature enough for the launch of the electricity derivatives segment which requires a single reference price for the settlement of

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derivative contracts. Given the current state of liquidity and the number of market participants, a coupled market will generate a correct reference price for the settlement of derivative contracts.

- Market Coupling integrates and harmonizes electricity market segments across competing platforms. It aims for “One Market One Price” to enhance market efficiency, competition, and price convergence:
  - Market Fragmentation: There are 4 segments (GDAM,DAM, HP-DAM and RTM) in each of the three exchanges ( 12 possible discovered prices). Market coupling will create a larger, efficient market.
  - Price Convergence: Market coupling reduces price disparities by efficient allocation of resources and decreases price volatility because of larger number of bids getting aggregated.
  - Capacity Utilization: Facilitates optimal use of transmission capacity based on a single aggregate collective bid.
  - Market Efficiency: Larger trading partner pool enhances competition, leading to better price discovery and ensuring the most efficient dispatch.

**5.2.5. Under such scenario, what significant benefits can be derived in terms of uniform price discovery, and which model suits best for India.**

- There are several advantages of implementing a uniform market clearing price through Market Coupling in the collective segment(s) of the power exchanges. Under the current design, varying prices will be discovered across the three operational power exchanges for the same time block of collective transactions. Establishing a uniform market clearing price through the Market Coupling process would create a single reference price for the entire market. This would also reduce the potential for arbitrage between the deviation settlement mechanism (DSM) and the market since DSM charges are currently tied to the clearing price of the day-ahead market (DAM).
- Additionally, the introduction of financial products in the electricity market would benefit from a single, uniform price discovery process.

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- Regarding the optimal utilization of transmission infrastructure, it is noted that the allocation of transmission corridors among power exchanges has not been efficient due to the uneven market share of these exchanges. In a coupled market scenario, of the collective segments where bids from all power exchanges are merged and cleared simultaneously, optimal utilization of transmission infrastructure is expected, eliminating the need for reserved transmission corridors.
- Market Coupling is anticipated to maximize economic surplus by matching aggregate buy and sell bids, leading to the creation of a surplus for both buyers and sellers. This economic surplus is calculated as the difference between the bidding price of accepted bids and the clearing price per unit of electricity multiplied by the total volume of electricity in the cleared bids.
- Given the limited volumes traded on power exchange(s), it is important to aggregate every single bid on any exchange. In terms of improving liquidity and prices, merging bids and offers from all exchanges in the coupled scenario would result in higher volumes being cleared, leading to increased market liquidity and ensuring the most efficient dispatch. Additionally, this could enhance price efficiency, with the market clearing price (MCP) potentially being discovered at a lower level. This, in turn, might encourage the entry of new participants into the market.
- There has been a view expressed in the Staff Paper that the price discovery will not change post coupling of the collective segments of power exchanges as the volumes are already concentrated on one power exchange. However, we believe that the view is not strictly correct. The only reason why the volumes in collective segment(s) migrate to the incumbent exchange is due to a network effect. To illustrate, if a competing exchange starts with limited buy/sell bids, the price discovery on these exchanges is likely to be higher than the price discovered on the dominant exchange because of the underlying closed double sided auction process. This will cause the buyers to migrate to the dominant exchange pulling the sellers along with them. Therefore no competing exchange will be able to launch sustained trades in the collective segment(s).

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- Additionally, a competing exchange might have only one side of the bid “buy or sell” which does not get translated into a real trade under the present scenario. However, post implementation of Market Coupling under a gross bid structure aggregation, all these bids will participate in the price discovery mechanism yielding lower prices which will be to the benefit of buyer as well as increase the overall economic surplus in the system. Therefore, we advocate that the Market Coupling structure should be based on a uniform price discovery mechanism by aggregating the bids from the collective segment(s) of all the exchanges, (whether single sided or double sided). We believe that given the current liquidity and the number of participants; such a coupling will be the most suited to the Indian context.

**5.3.1 Effect of coupling on technological innovation and competition.**

- Market Coupling will promote competition for the market and in the market in the context of power exchanges. The inherent design of the collective segment based on a closed double-sided auction process discourages introduction of such trades on competing exchanges. Introduction of Market Coupling in the collective segments will encourage volumes for trades from competing exchanges which is in the overall interest of the power market. Additionally, power exchanges will now compete on providing higher level of services for retention of clients and client servicing investing in technology and tools for analytics.
- In terms of innovation, product innovation in the collective segment need not stop although once introduced, products in such segments will have to be standardized in a coupled market. Also, the purpose of the collective segment is to offer a standardized route of procurement (segments like DAM, G-DAM, HP-DAM and RTM exist in the collective segment as several categories to suit specific requirements) and all the product innovation has happened primarily in the continuous segment of trades offered by the power exchanges. Therefore, innovation will be democratized for the benefit of the entire power market in the collective segment. New designs to accommodate complex bid structures can also be implemented, since the complex block bids can be

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standardized across the exchanges and coupled. If deemed necessary, incentives for any power exchange that successfully launches a new product can also be designed if such products increase the liquidity on the power exchange platform. This incentive can be structured in the form of an incremental transaction margin that will be funded by the other exchanges for a defined period or through a period of exclusivity to the innovating exchange. Such mechanisms are easily designed. Fundamentally, the volumes traded in the collective segment are still limited in the context of the overall power market. Therefore, if bidding structures are lacking, it is in the interest of the power exchanges to ensure development to increase participation on the power exchanges.

- Additionally, the gains to the power market would be in terms of increase liquidity, efficiency, and competition among the exchanges. Such competition may also result in lowering of transaction fees which will reduce the overall cost to the participants.

**5.4. Who shall be the Market Coupling Operator (MCO)?**

- The purpose for the introduction of Market Coupling is to ensure transparent price discovery by aggregating bids generated in the collective segment(s) across all the power exchanges. One of the principal objectives of Market Coupling is that the market clearing price discovered should generate confidence amongst the market participants as being a true and fair representation of the demand-supply scenario prevailing in the market. Therefore, any external entity designated as a Market Coupling Operator (MCO) should inspire confidence amongst the market participants as being an unbiased and independent operator providing such services. One possible entity that is eminently qualified to fulfill the role is Grid Controller of India (Grid India). Grid India is already providing such aggregation from the power exchanges and price setting (albeit under a different structure) for the Ancillary Services Market. By adopting a closed double-sided auction algorithm for price discovery that has already been implemented on all power exchanges, Grid India can fulfill the role of the MCO as envisaged in Power Market Regulations, 2021. The legal aspect of the role of MCO being a statutory

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function may also be examined although we do believe that the MCO as a distinct entity under the PMR 2021 is already governed by CERC.

**a) Third-Party Market Coupling Operator/Super-Exchange**

- If any nodal agency say Grid India is designated as a MCO, it should issue detailed procedures for standardization of input data and common formats.
- Additionally, it would have to develop its own double-sided auction algorithm to couple the bids from the various exchanges.
- The same set of checks and balances would need to be implemented by the Central Electricity Regulatory Commission to ensure the fair price discovery, data integrity and security.

**b) Power Exchanges to perform the function of Market Coupling Operator:**

- Alternatively, in the initial phase until Grid India develops and implements the price discovery algorithm, given that the price discovery under the collective segment is based on a double sided anonymous auction algorithm and all three exchanges have in place the algorithm duly vetted by the Regulatory Commission, it may be cost effective to implement Market Coupling by having the power exchange(s) perform the function of MCO on a rotational basis as an interim measure.
- To ensure a smooth and fair operation, bids from all the participating exchange(s) shall be masked before submitting to the designated MCO. Additionally, checks and balances should be put in place to ensure proper monitoring and surveillance of the Market Coupling operation.
- Finally, the Commission should conduct periodic audits and analysis of the results of the Market Coupling as a part of its market monitoring and surveillance.

**5.4.1 Given these requirements, what should be the ideal institutional/ structural design for market coupling and the extent of autonomy of various parties in such a design?**

- An external entity, preferably owned by Government of India, should be the MCO.



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- For Market Coupling, the Market Coupling Operator (MCO) as defined in CERC Power Market Regulations 2021, Part 1, clause 2 (ag) “an entity as notified by the Commission for operation and management of Market Coupling” shall be governed by CERC.
- For collective segment the services provided by Power Exchange(s) (PXs) shall be split-up into following:
  - a. Bid Collection & Submission
  - b. Bid aggregation
  - c. Price Discovery
  - d. Information/Result dissemination
  - e. Clearing & Settlement
- Wherein, the PXs shall be responsible for Bid Collection & Submission to MCO and the final clearing & settlement and the MCO shall be responsible for Bid Aggregation & Price Discovery.
- The Commission shall conduct periodic audits and analyses of bid data as part of market monitoring and surveillance. Since all participants (including PXs and MCO) are governed by the Power Market Regulations, 2021, the Central Electricity Regulatory Commission will continue to act as the overseer for governance as well as the dispute redressal authority.
- **Market Coupling- Structure**



### 5.5 Which Algorithm should be adopted for a coupled market?

- In the context of a coupled market, it is advisable to implement the same algorithm based on the closed double-sided auction mechanism for the purpose of anonymous uniform price discovery. This algorithmic approach has already been embraced by all three power exchanges operating in India. In fact, two out of the three operating exchanges have sourced the algorithm from a single vendor. All that Market Coupling seeks to achieve is to segregate “bid collection and submission” (individual exchanges) and “bid aggregation and price discovery” (MCO) in the initial phase of implementing trades on the collective segment(s) of the power exchanges.
- This auction mechanism is designed to facilitate efficient price determination while maintaining anonymity for market participants. In such an auction, buyers and sellers submit their bids and offers independently, allowing market forces to determine the equilibrium price at which trades are executed. This approach fosters transparency and fair competition within the market, ensuring that electricity prices are established in a manner that reflects supply and demand dynamics.
- In the context of electricity trading on a power exchange, the uniform price discovery model is a commonly used mechanism for determining the clearing price at which electricity trades are settled (“Pay as Clear” model). This model ensures that all successful buyers and sellers pay or receive the same price, which is the equilibrium market-clearing price.
- Objective Function: The objective function of the optimization problem is to maximize the total economic surplus or social welfare, which represents the overall benefit to society. The economic surplus considers the differences between the value that buyers (consumers) place on electricity and the price that sellers (generators) desire to sell the electricity.
- Market Rules: Market-specific rules, such as minimum bid prices and quantity requirements, are also enforced as constraints.

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- **Market Clearing Price:** The uniform price discovery model determines a single clearing price that applies to all successful buyers and sellers. The clearing price is set at the level where the supply of electricity equals the demand, optimizing the overall economic surplus.
- The uniform price discovery model with network flow optimization ensures that electricity trades are settled at a price that maximizes overall welfare while respecting market constraints. This mechanism helps maintain market integrity, transparency, and fairness by providing a single, uniform price for all market participants.
- By utilizing this established method, market participants can rely on a robust and widely accepted mechanism for pricing discovery, promoting a level playing field and enhancing overall market efficiency.
- A well designed algorithm should have the capability to accommodate different bid types.

**5.6 How will the clearing & settlement be carried out?**

- After the market coupling operator (MCO) shares the results of the market clearing process with each exchange, there will be a clear requirement of pay-in and pay-out of the market participants. This pay-in and pay-out may be implemented by the clearing and settlement division of the individual power exchanges. This may require an inter-se transfer between the power exchanges backed by electronic transmission/receipt of information. Alternatively, the three existing exchanges can create a pooled account for settlement of contracts under the collective segments. All margin calls and pay-in and pay-out of funds under the coupled transactions will be routed through this account. Additionally, it may be explored if the MCO can take up the clearing and settlement (C&S) process for the Market Coupling of the collective segment. But if we consider that C&S is retained by the power exchanges under a scenario, the clearing and settlement procedures for each exchange will typically involve the following steps:
  - **Confirmation of Results:** Each exchange receives the results from the market coupling operator, including the market clearing price (MCP) and the details of

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allocated contracts. Exchange operators and market participants review the results to ensure accuracy and consistency with their submitted orders.

- Contract Allocation: Each exchange allocates the cleared contracts to the relevant market participants based on the results received from the market coupling operator. Contracts are allocated at the MCP, and each market participant is informed of their allocated contracts, including the quantity and price.
- Financial Settlement: Market participants are required to settle their financial obligations resulting from the cleared contracts. This involves the exchange ensuring that payments are made by buyers and received by sellers. For participants who bought electricity, payments are typically made at the MCP to sellers. For participants who sold electricity, they receive payments at the MCP from buyers. In case the sellers and buyers are on different exchanges, the exchanges will be responsible for the communication and pay-in and pay-outs including inter-se transfer between power exchanges.
- Margin Calls and Collateral: Power Exchanges require market participants to maintain margin accounts or provide collateral to cover their financial obligations. This helps mitigate the risk of default. Margin calls may be issued if a participant's financial position falls below a certain threshold, and additional collateral may be required to cover potential losses.
- Physical Delivery: In electricity markets where physical delivery is involved (e.g., in day-ahead markets), grid operators and market participants coordinate the actual delivery of electricity.
- Reporting and Documentation: Each Power Exchange maintains records and documentation of the cleared contracts, settlement transactions, and financial obligations. These records are crucial for auditing, compliance, and regulatory purposes.
- Dispute Resolution: Power Exchanges have mechanisms in place to resolve disputes that may arise during the clearing and settlement process. Market

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participants can raise concerns about contract allocation, pricing, or other related issues. The governing regulations are defined in the PMR 2021 and the power exchanges then have bye-laws that are approved by the commission.

- Regulatory Compliance: Each Power Exchange ensures compliance with relevant regulatory requirements, including reporting to regulatory authorities and maintaining transparency in the clearing and settlement process.
- Post-Settlement Activities: Power Exchanges may engage in post-settlement activities, such as reconciliations, to verify that all financial transactions have been completed accurately.

**5.6.4. Thus, in the scenario of coupled market,**

- **While the power exchanges will be the counterparty to the market participants, would the Market Coupling Operator act as a counterparty to the power exchanges with regard to settlement rights and obligations?**
- The MCO is envisaged to be a service provider operating the price discovery algorithm post collection of bids from the individual Power Exchanges. Subsequently, the MCO will disseminate the information of the Market Clearing Prices and Volumes (MCP and MCV). The Clearing and Settlement will continue to reside with the individual Power Exchanges who will implement structures for inter-se clearing based on the information received from the MCO. Therefore, the MCO need not act as a counterparty to the power exchanges with regard to settlement rights and obligations. The Price Discovery by the MCO would be a regulated process overseen by the Regulatory Commission. However, this aspect may be examined in detail because it entails making the MCO a super exchange for the collective segments but with a limited disaggregated role of power discovery. All other functions like bid collection, submission to the MCO, clearing and settlement, information reports, dispute resolution etc. shall continue to be handled by the individual power exchanges.

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- **Would it be advisable to allow the Market Coupling Operator to charge transaction fees from the power exchanges, which in turn charge related transaction fees from the market participants?**
- The MCO function should be a cost-based function provided as a service to the individual power exchanges for the collective segments. By design, the MCO is a monopoly function, therefore it needs to be regulated by the Regulatory Commission ensuring the recovery of costs.
- It is proposed that the MCO should charge a nominal fee for the price discovery algorithm that is implemented. The fee when levied should be phased out based on an amortization schedule from the individual power exchanges and be retained at a nominal level for maintenance only. Given that liquidity across the power exchanges is expected to increase in aggregate, the power exchanges can share a part of their transaction fees generated in the collective segment with the MCO for a specified period. However, the charge from the market participants should not be increased in the interest of the consumer. Subsequently, once derivatives are launched, the MCO can be paid a fee for publishing the reference price index for the entire market.
- **What should the grievance handling framework be?**
- Since the MCO and the Power Exchanges are governed by the Power Market Regulations, 2021, the Central Electricity Regulatory Commission would be the dispute resolution authority for any power market participant trading in the collective segment on the power exchanges. The grievance handling framework currently in place for trades in the power market shall continue to be operative under this structure post implementation of market coupling.
- A separate ombudsman as in the case on banking and financial services may also be considered for addressing grievances related specifically to Market Coupling, if deemed necessary.

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**5.7 Changes in the settlement process.**

- At present, we do not anticipate the need for any significant modifications to the existing clearing and settlement procedures of individual exchanges. This is because the market coupling operator (MCO) will disseminate comprehensive information to each Power Exchange, encompassing crucial elements such as the market clearing price (MCP) and the specifics pertaining to the allocation of contracts to each respective exchange. Even with each power exchange retaining their clearing and settlement process, there are two possible ways to implement the pay-in and pay-out associated with the cleared bids on multiple exchanges.
  - The inter-se clearing associated with the pay-in and pay-out of funds will be handled by an electronic communication between the three power exchanges. To illustrate, if there is a buyer with a cleared volume on one exchange and the seller with corresponding cleared volume on the other exchange, the exchanges based on the data shared by MCO will raise a pay-in or pay-out query electronically through a common settlement account. All three exchanges will then net-off the pay-in and pay-out and settle the individual cleared bids as per their existing mechanism including inter-se transfer.
  - Alternatively, for the collective segment, the three power exchanges can create a joint/pooled account which collects all the margin and is subsequently used to make a pay-in/ pay-out as per the data shared by the MCO.

**5.7.1 Traders are already collecting bids from clients, submitting bids to exchanges, and doing the clearing and settlement. In fact, security maintained by traders is double the cost of power purchased i.e. maintain a weekly average margin equivalent to power purchased while maintaining a sufficient margin for net cleared volume for tomorrow. Under such a scenario, should traders be allowed to submit their bids directly to the market coupler to reduce the cost of power for trader clients, as the clients are presently paying margins to the traders and also bearing fees and margins of exchange?**

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- Trader Members have a distinct role on the power exchanges as they trade on behalf of the clients. Also, they provide credit intermediation for those buyer entities who want to transact at a short notice on the Power Exchange platforms. Therefore, there is no element of cascading costs as the trading margins of a trader only reflect this service cost towards assisting the procurement of buyer entities.
- In the first phase, coupling every type of collective bid may not be prudent. Once, market coupling of the collective segments as it currently exists is implemented, the next phase of evolution may look at introducing entities like an “Aggregator”, in effect a Trading Licensee, that could submit balanced schedules to the MCO. However, since these are bilateral contracts, they may be submitted only for implementation as price discovery has no role in such contracts.

**5.8 In which market segment should the coupling be introduced first?**

- While there is a clear-cut rationale for implementing market coupling in the collective segment based on double-sided closed auctions, to introduce phase-wise coupling, we believe that coupling should be first implemented in the RTM segment which is the closest to a balancing market segment. Subsequently, the integrated Day-Ahead Market (iDAM) segment should be coupled.
- Alternatively, the more liquid of the segments in the collective segment (DAM) may be considered for first implementation. Essentially, all collective segments would need to be coupled for the benefit of the overall market.

**5.8.6. Is it imperative that market coupling be introduced in collective transactions segment to begin with?**

- The category characterized by the utilization of double-sided closed auctions necessitates the implementation of Market Coupling. In contrast, the segments employing continuous auctions witness exchanges vying for market share through service quality, with each exchange holding a significant portion of the overall market segment. The prevalence of a dominant network effect, entailing its associated inherent design, introduces challenges within the collective segment(s) by inhibiting competing exchanges from providing sustained trading opportunities. Moreover, an auction





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mechanism founded on double-sided aggregation consistently benefits from each aggregated bid, thereby enhancing liquidity and facilitating more accurate price discovery. Consequently, the introduction of Market Coupling becomes imperative in the collective segments such as the Day-Ahead Market (DAM) and the Real-Time Market (RTM)."