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Power Chronicle

Power System Overview & Analysis

Power Market Overview & Analysis

Regulatory & Policy Perspective

EAL News

Editorial

Uncertainty associated with demand and generation from Renewable Energy Sources (RES) remain a cause of concern for the system operators worldwide. The mechanism for Unscheduled Interchange (UI), a pioneering approach based on economic signals, transformed later into the Deviation Settlement Mechanism (DSM) as the pre-defined deviation pricing curve was replaced with that related to market prices. The mechanism has become increasingly complex (see detailed comments in this issue), with varying applicability for buyer and seller entities. The proposed draft seems to leave gate open for windfall gain for merchant power plants and those based on municipal solid waste due to either information asymmetry about cost or very high tariffs. Absence of block-wise/daily deviation limit, there would be incentive to withhold capacity for pecuniary gains.

The peak RE generation accounts for 20-28 % of the overall nation's electricity demand. Mainstreaming of RE generation into imbalances management is crucial in integrating larger share of RES. Calculation of deviation by RE generators should be gradually aligned with that for general sellers. Intriguingly RE plants continue to offer 'same' available capacity across the day/seasons. Maximum Potential Generation Profile (MPGP), to be a self-declared by the RE generator, should replace plant availability in the denominator for computation of deviation.

Higher deviation limit for RE Super-Rich state (more than 5 GW RE capacity) and RE Rich state (1-5 GW RE capacity), availing a 'lenient' deviation regime, remains short-lived as most of the larger states may soon cross the RE-rich state definition. Generation schedule or MPGP offers a more meaningful definition as the current approach entitles such states to avail undue benefits even during low RE hours.

Improvement in RE forecasting, which has a potential to significantly reduce deviations, continues to be challenged by reliable data. Pooling of weather station data from various RE generation sites, as a public good, can help alleviate this concern. Upgrading them to IMD standards could improve data quality and reliability.

Volatility in the power market in recent years calls for greater regulatory oversight on market monitoring. Analytics of the market bid data is crucial to identify potential risk to market outcome, and device regulatory oversight to pre-empt/address the same. Nation-wide monitoring of available capacity of power plants is required to identify capacity withholding and profiteering. A Market Monitoring Committee with oversight over a Market Monitoring Cell under CERC, would address the prevailing institutional gap. Additional human resources with best technical capabilities are key to strengthening the regulatory capacity.

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Founder & Coordinator, Energy Analytics Lab

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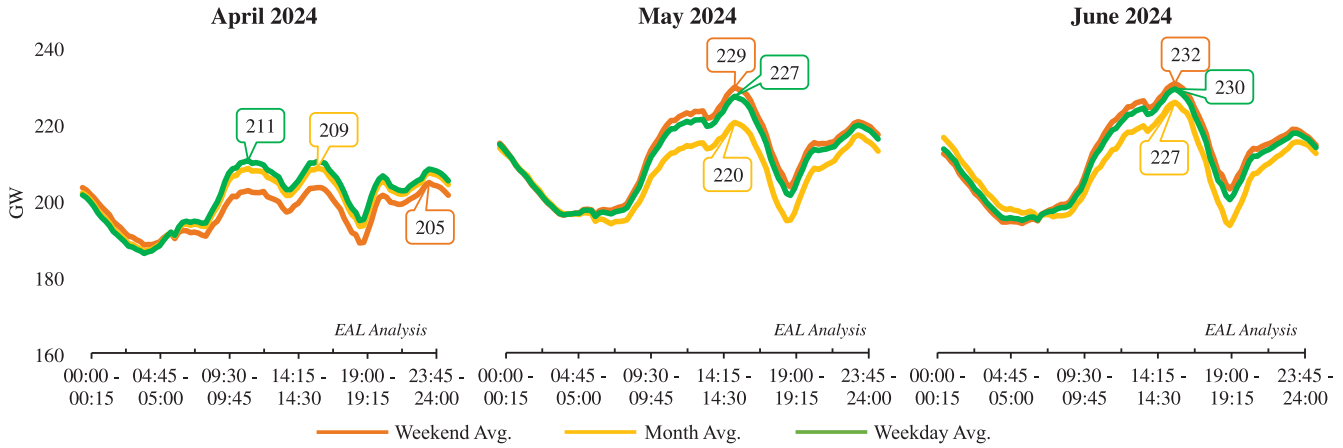
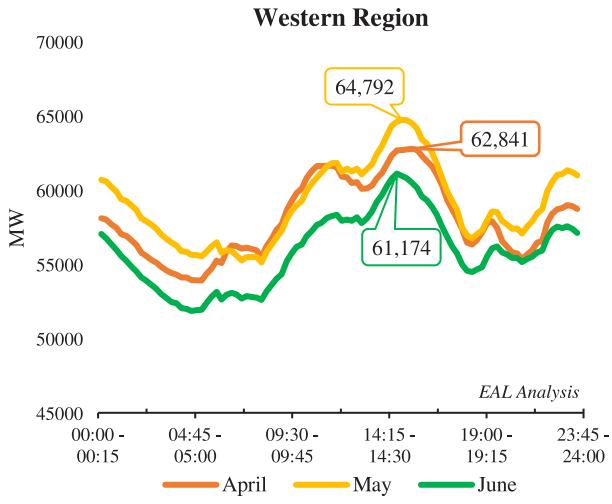
Power System Overview & Analysis

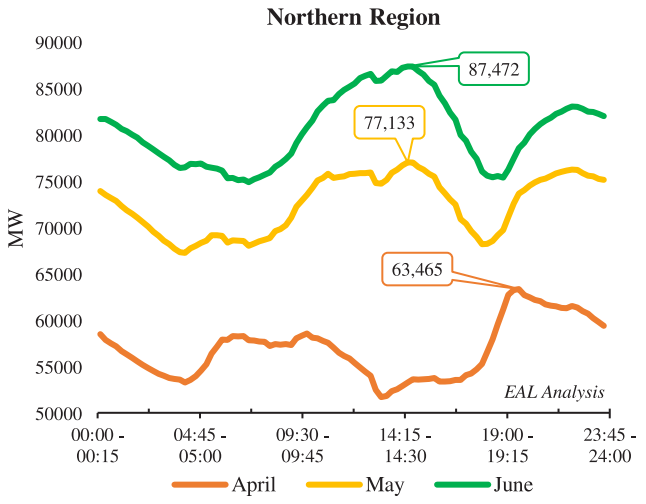
All India Demand Met Profile

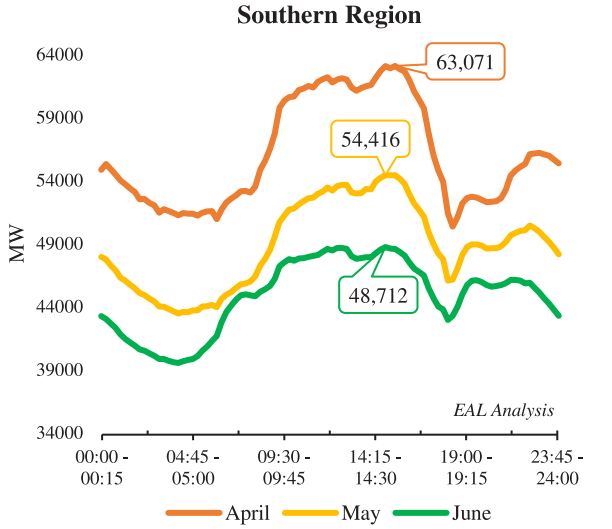


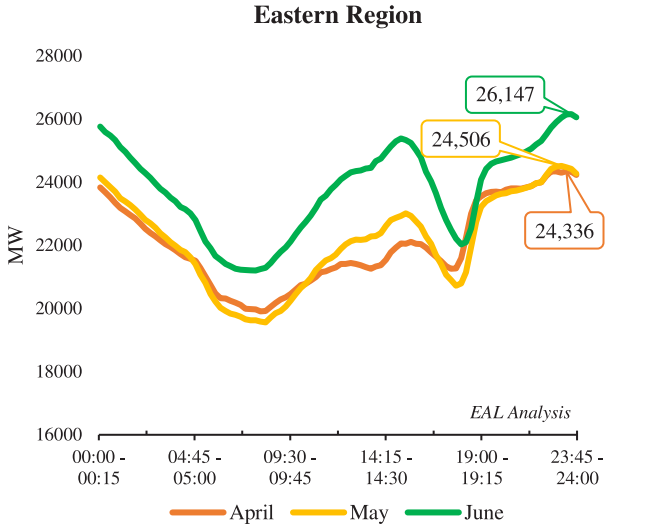
From April to June quarter, all India peak demand reached 249.98 GW (14:30-14:45) on 30th May, 2024, about 13.13 % higher than the previous year's peak demand recorded at 221 GW (14:45 - 15:00) on 23rd May, 2023, during the same quarter.

Region-wise Demand Met Profile



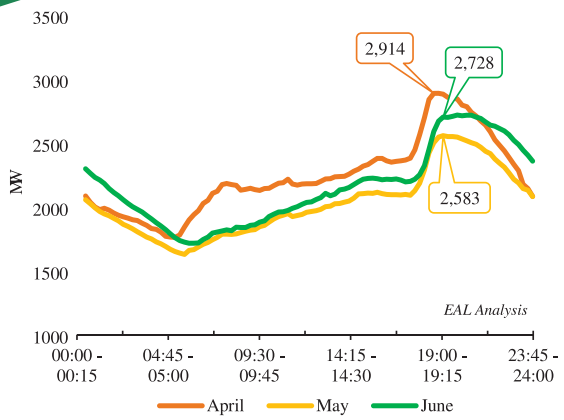






For more information Click here

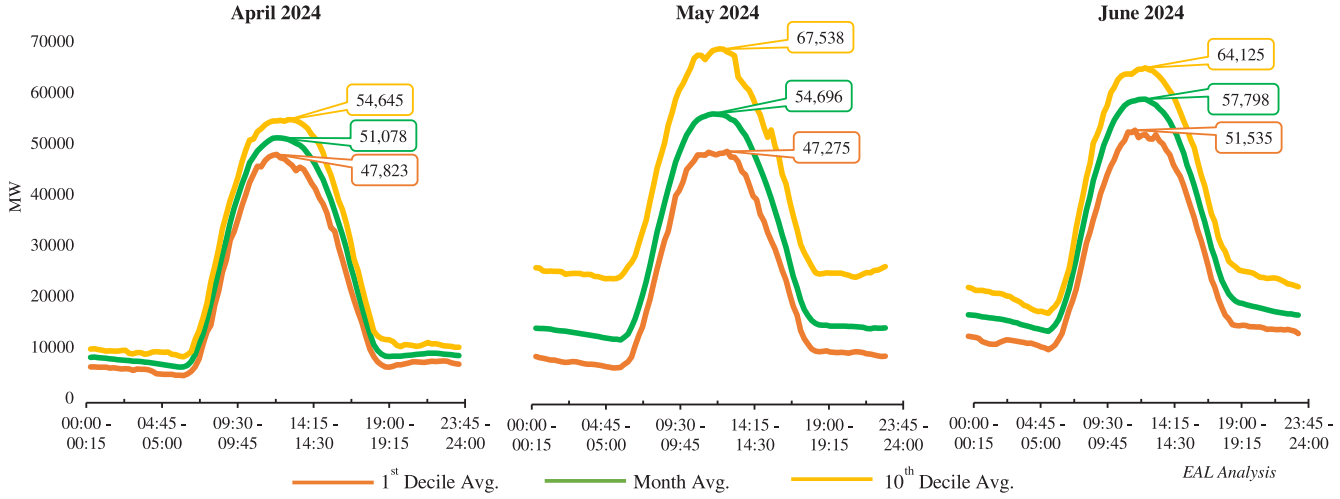
North Eastern Region



- A notable increase in demand month over month in Northern region, driven by heat waves experienced during this quarter.
- Steep increase in demand during evening block can be observed for Eastern regions compared to morning block.
- Average demand is found to be higher for Northern region as compared to the other regions in April-June 2024.

Demand and generation profiles at National, Regional and State-level can be accessed on EAL's web portal.

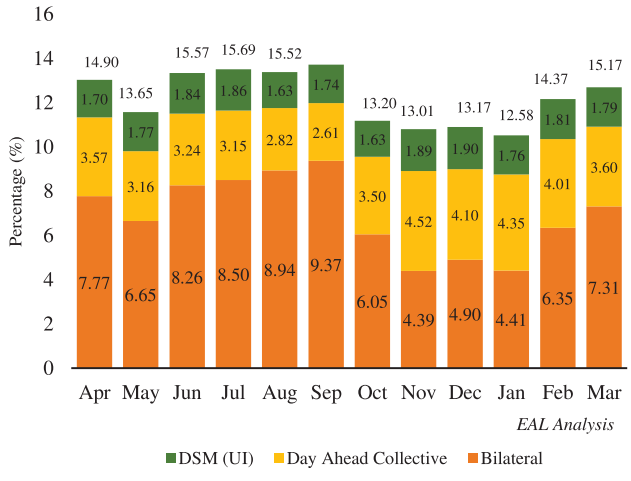
All India Renewable Energy (RE) Generation Profile



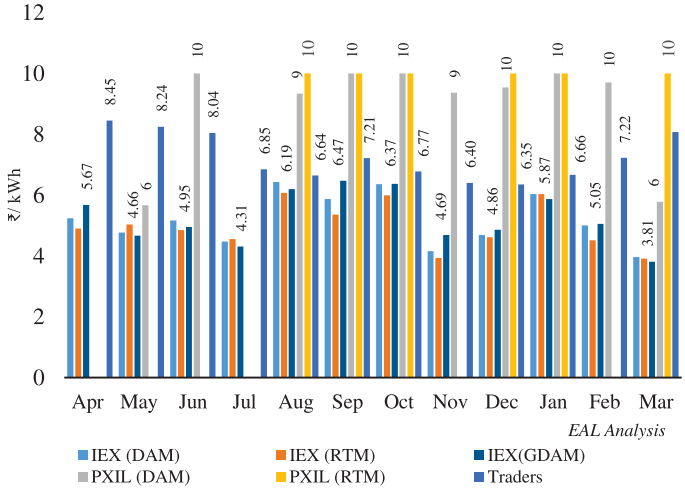
All India peak RE generation reached 72.99 GW (12:00 – 12:15) on 28th May, 2024 about 12.51% higher than the previous year's peak of 64.87 GW (12:45 - 13:00) on 14th June, 2023.

Short-term Energy Transactions

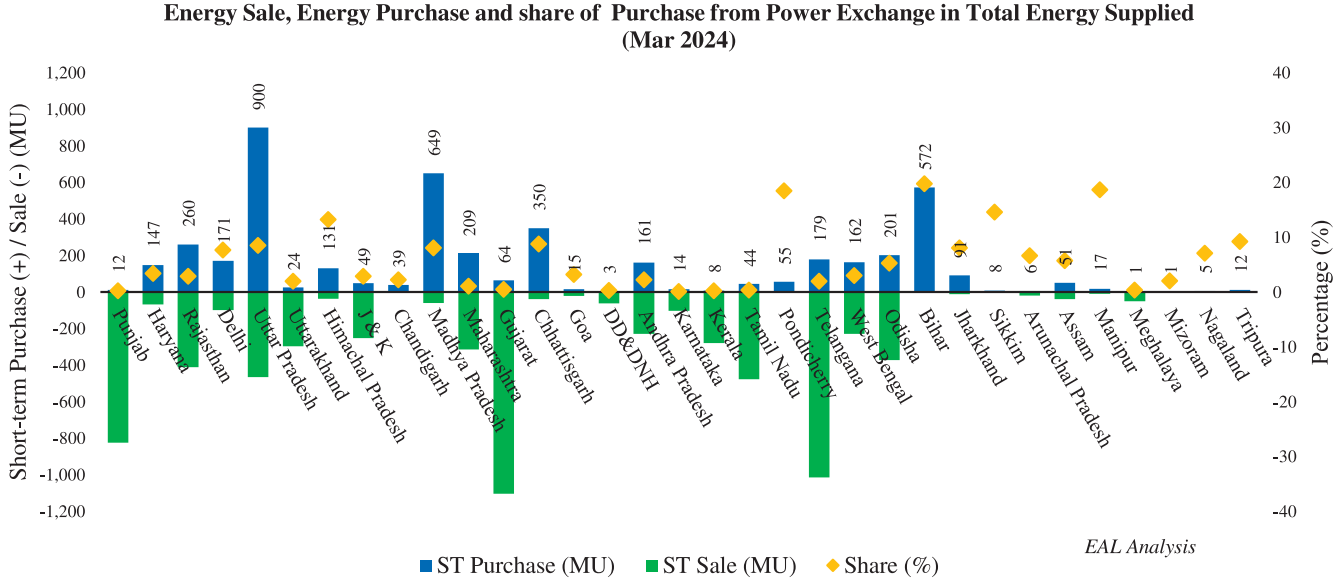
Share of Short-term Energy Transaction of Total Electricity Generation (FY 2023-24)



Weighted Average Prices of Short-term Transactions (FY 2023-24)

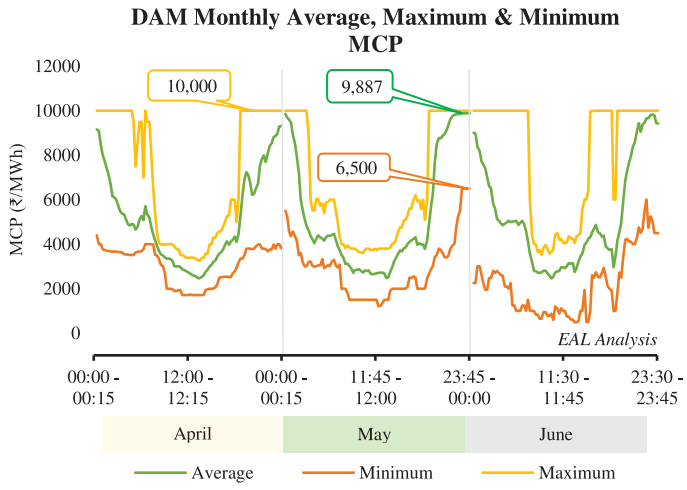


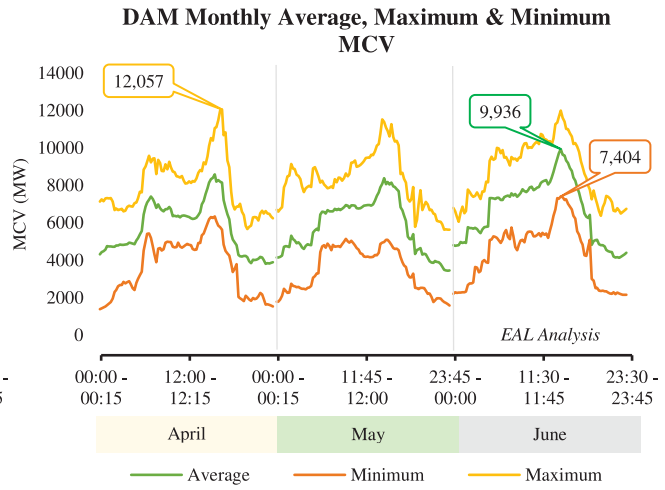
Monthly Power Purchase and Sale Quantum through Power Exchange across States



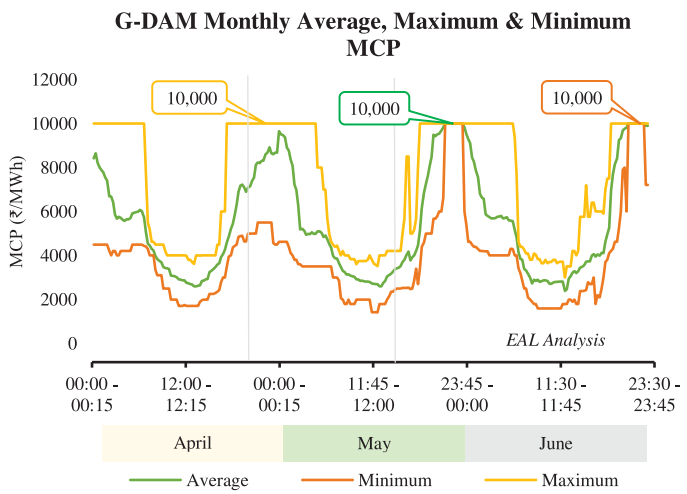
Power Market Overview & Analysis

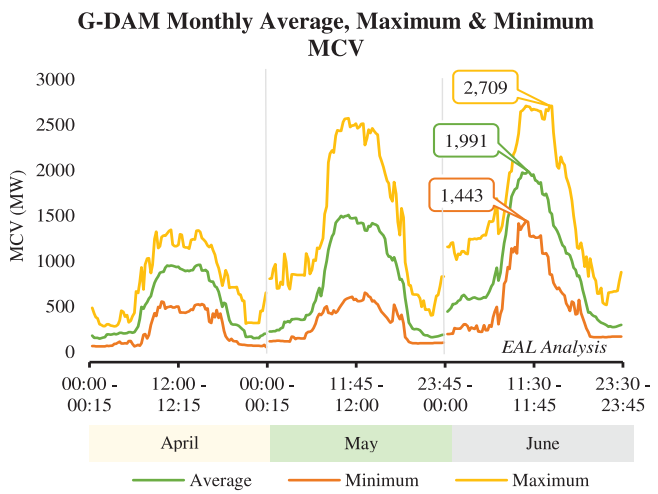
DAM - Market Clearing Price (MCP) & Market Clearing Volume (MCV)





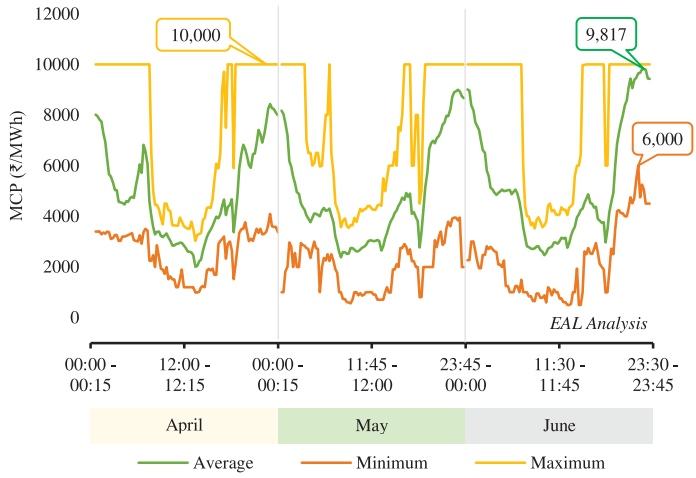
G-DAM - Market Clearing Price (MCP) & Market Clearing Volume (MCV)



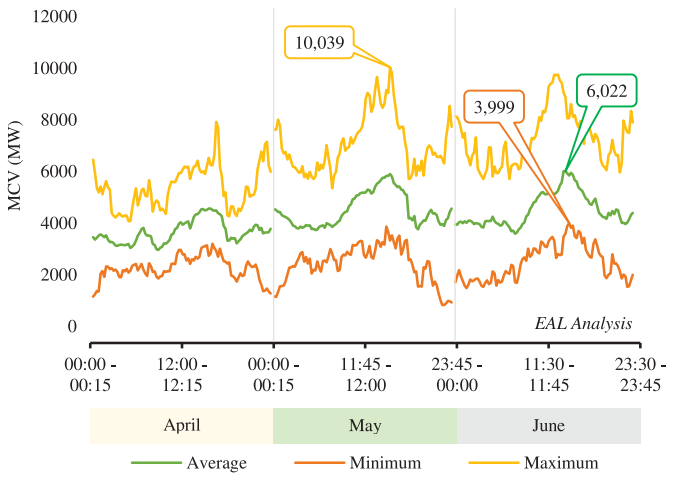


RTM -Market Clearing Price (MCP) & Market Clearing Volume (MCV)

RTM Monthly Average, Maximum & Minimum MCP

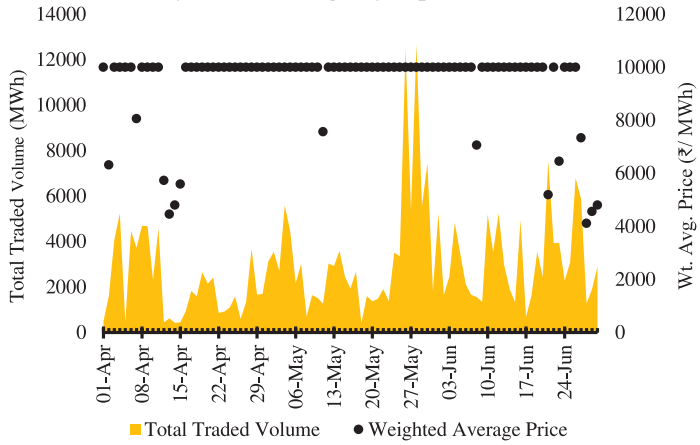


RTM Monthly Average, Maximum & Minimum MCV



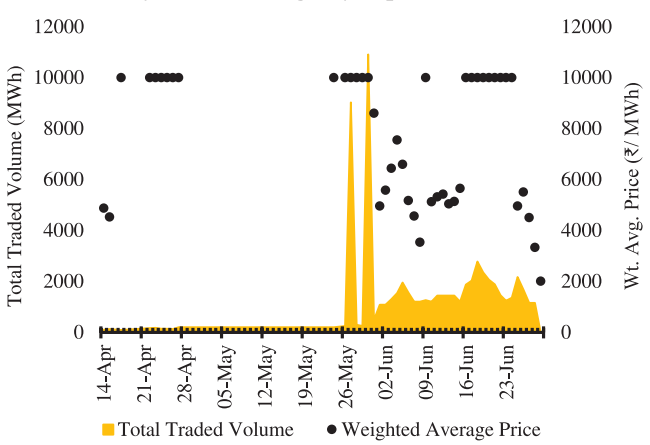
Term-Ahead Market

Day-Ahead Contigency (Apr-Jun 2024)



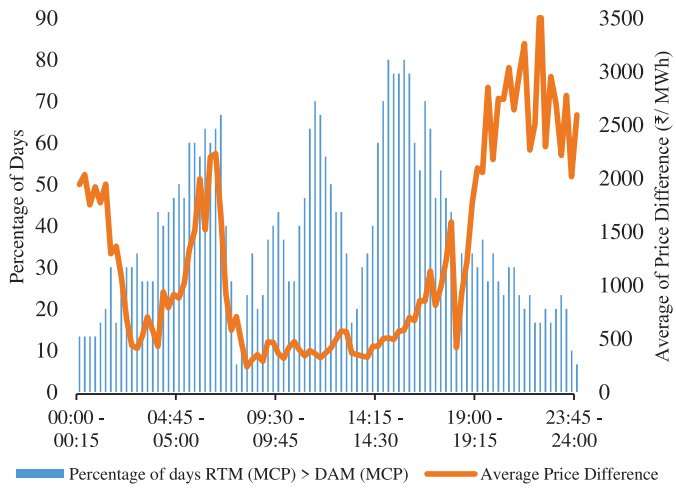
Green Term-Ahead Market (G-TAM)

Day-Ahead Contigency (Apr-June 2024)

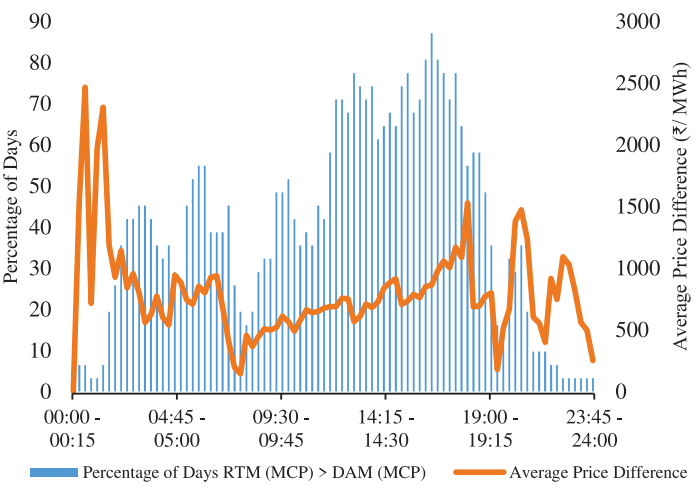


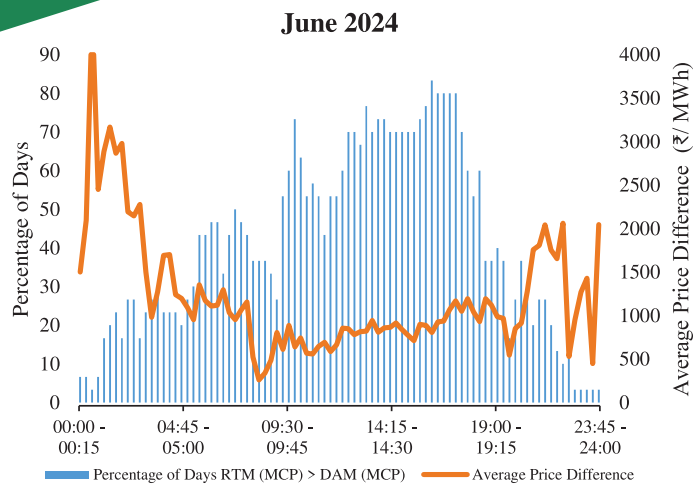
Price Difference between RTM vs DAM

April 2024



May 2024

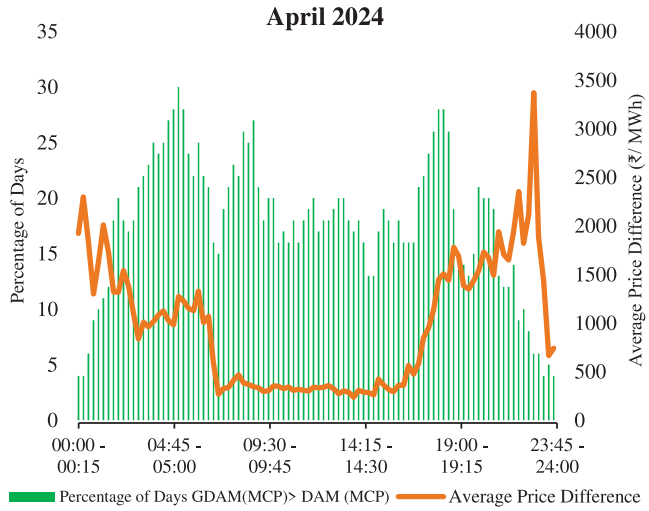


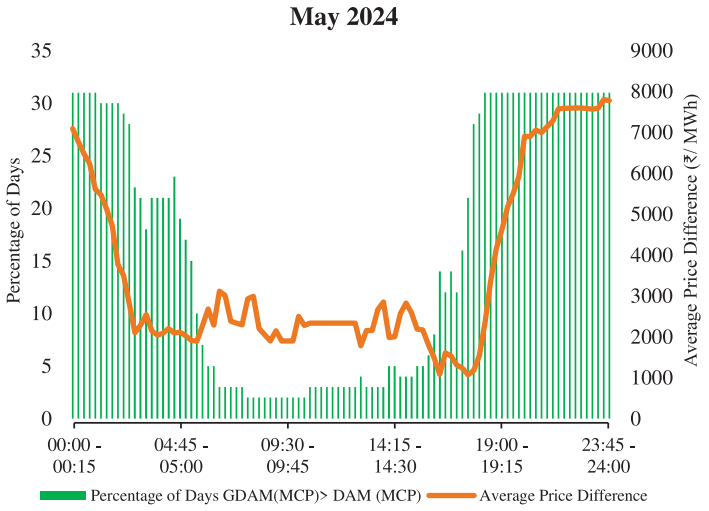


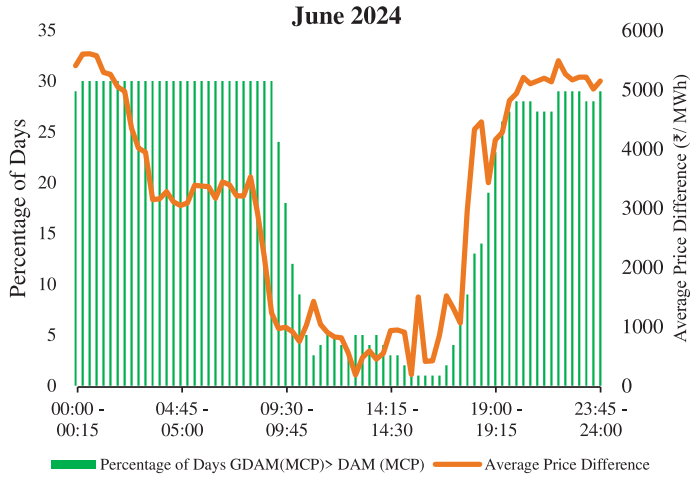
EAL Analysis

- The analysis is based on comparison between the average price difference of RTM and DAM, when MCP of RTM is greater than DAM for the first quarter of FY 2024-25.
- The graph shows the percentage of days, price for RTM is greater than DAM on the primary axis and the average price difference between the two on secondary axis.
- The maximum price difference between RTM and DAM has been observed in the blocks for the month of June.
- The maximum price difference between RTM and DAM is ₹ 5.99/ kWh in the 16:00 - 16:15 block in the month of June.

Price Difference b/w G-DAM & DAM







EAL Analysis

- The analysis is based on comparison between the average price difference of G-DAM and DAM, when MCP of G-DAM is greater than DAM for the first quarter of FY 2024-25.
- The graph shows the percentage of days, price for G-DAM is greater than DAM on the primary axis and the average price difference between the two on secondary axis.
- The highest price difference between G-DAM and DAM is observed to be ₹ 8.80/ kWh in May.
- It can be inferred from May 2024 that the increase in energy generation by solar have resulted, decrease in difference between DAM and G-DAM prices for solar time.

Regulatory & Policy Perspective

CERC (Deviation Settlement Mechanism and Related Matters) Regulations, 2024 [Draft]

CERC notified draft regulations for Deviation Settlement Mechanism (DSM) and Related matters on 30th April 2024. The key highlights of this draft is mentioned below:

- **Objective:** The revised draft regulations aim to bring regulatory control and protect the interests of stakeholders by ensuring compliance with the provisions under the Electricity Act, 2003 and Electricity Rules, 2005. The governing body have monitoring the grid events namely frequency excursions and frequency fluctuations. To ensure smooth and secure grid operation the new regulation have been designed accordingly.
- New component added to definations of Contract rate: An alternative method of calculation have been introduced. It is weighted average ACP of the Day Ahead Market segments of all power exchanges for that time block.
- To allow high cost power generate to participate in the DSM, High Price-Day Ahead Market (HP-DAM) have been included in Integrated-Day Ahead Market (I-DAM).
- The states with RE installed capacity of more than 1000MW less than 5000 MW will be identified as 'RE Rich State' and state with more than 5000 MW as 'RE Super Rich State'.
- Normal rate will be calculated based on summation of fraction I-DAM, Real Time Market and Ancillary service charges.

EAL Opinion

- **Approach to Deviation Settlement Mechanism (DSM):** The rising RE penetration and associated uncertainty of generation, along with uncertainty of electricity demand remains key challenges in ensuring power system stability. Power system stability is influenced by two critical and dynamic parameters – **(i) System frequency and (ii) Market prices.** To ensure that DSM is able to provide appropriate signal to minimize power system imbalance thus ensuring power system stability, it is suggested that the above two ingredients should be integral part of the DSM structure for all system constituents with limited exceptions.

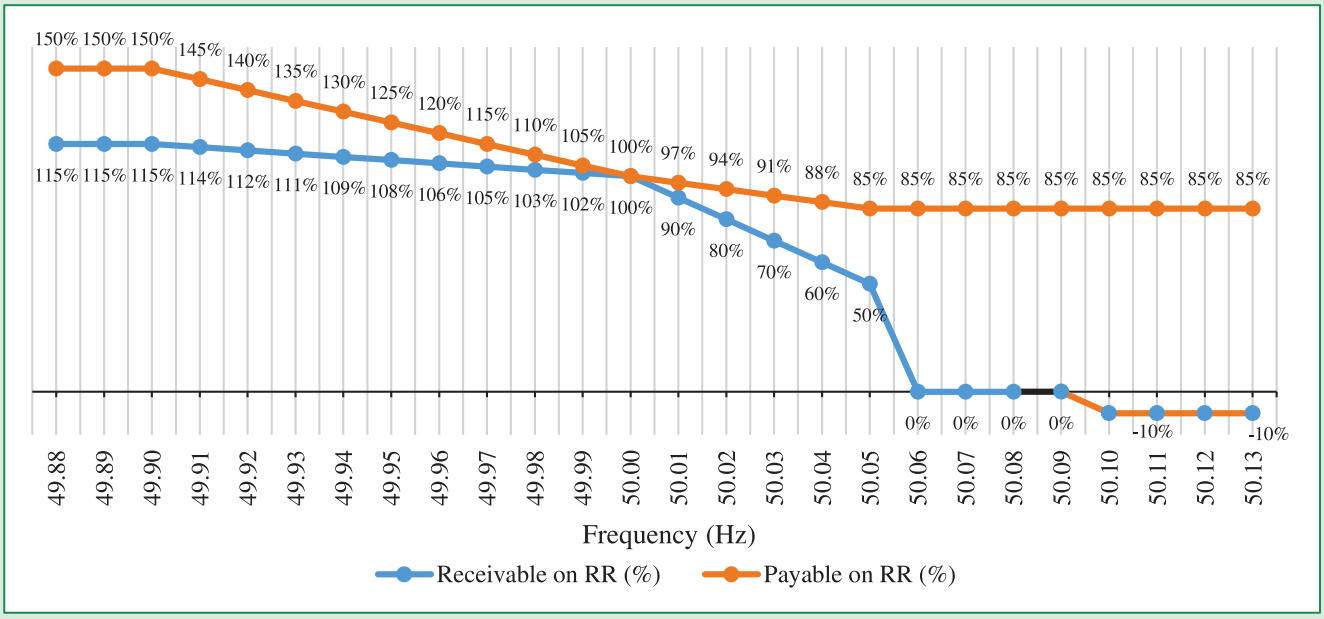


Figure 1: Deviation charges for General Seller (Upto 10% of D_{GS} or 100MW)

The evolution of DSM regulations has witnessed numerous turns in it approach to address the immediate as well as emerging problems of power system stability. **It has become a rather complex mechanism providing differentiated signals for system participants (Figures 1 & 2) for arresting deviation even while the system is**

affected the same way irrespective of the source of deviation. Greater uniformity, with few exceptions, would ensure its simplicity and would provide long-term regulatory certainty.

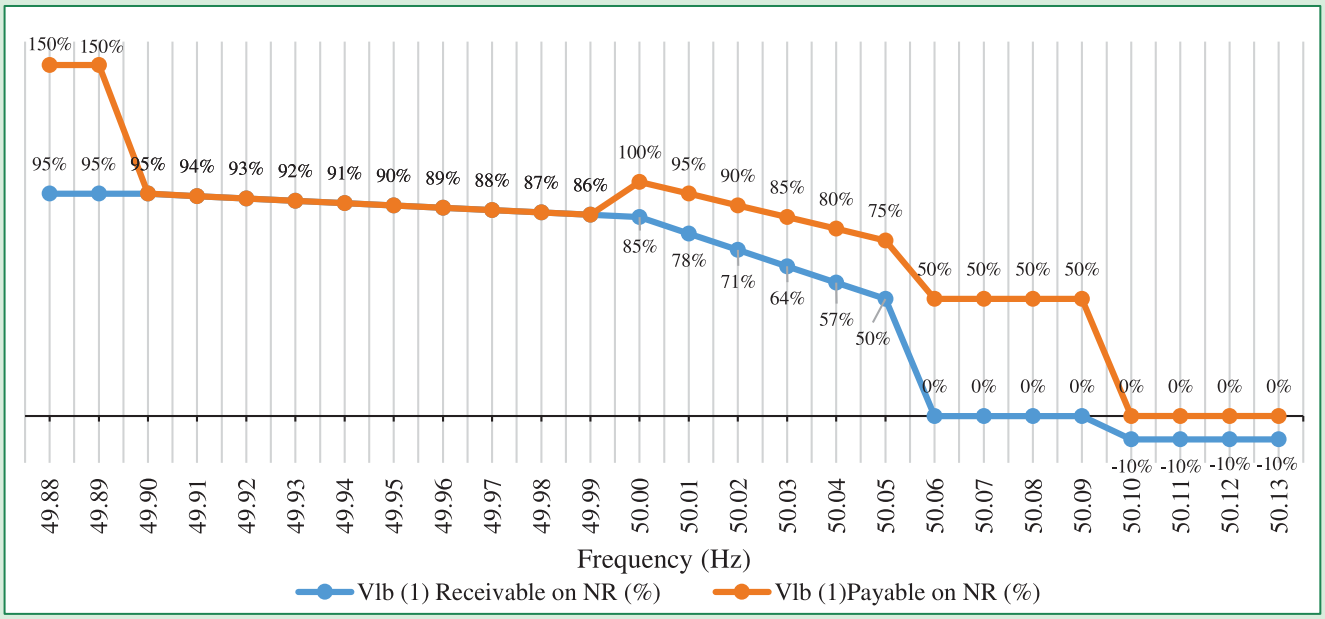


Figure 2: Deviation Charges for Buyers

- **DSM for Wind-Solar (WS) Generators:** Given rising share of RE, it is imperative that greater responsibility of addressing the deviation are now passed on to the RE generators, which have hitherto being subject to a light-handed approach both in term of approach to determine percentage deviation as well as applicability of DSM charges. Increasing burden for DSM falls on the final consumers who would pay for deviations as the cost of Ancillary Services deployment is socialized. Given higher RE target, there is a **need to adopt a tighter tolerance for error band with graduated DSM charges for WS generation.**

- **New Definition of RE Rich and RE Super Rich state:** Use of renewable capacity (connected to the intra-state system) as basis for definition is inadequate in addressing the challenges posed by Variable Renewable Energy (VRE). For example **a RE rich state with solar capacity would have no impact on its imbalances during non-solar hours.** Similarly state with higher wind potential will have limited impact of lean winter months. **RE Rich and RE Super Rich state should be defined on the basis of RE injection rather than RE capacity, and be differentiated across high/low RE injection periods of day.** Such definition should be dynamically updated on weekly basis, based on actual RE generation share across time blocks of the day of the preceding week. The respective RLDCs may periodically update the same every week on an identified day.

- **Methodology for Calculation of Deviation for Renewable Energy Projects:** Proposed Clause 6 (2) states that *"Deviation in a time block for WS seller shall be computed as follows ..... Deviation- WS seller (DWS) (in %) = 100 x [(Actual Injection in MWh) - (Scheduled generation in MWh)]/* ***[(Available Capacity)]*** *"(emphasis added).*

  All deviations, irrespective of the source, have the same impact on the stability of the grid. Going forward, renewable generators, which would contribute significantly to the energy basket, are expected to reduce deviations through better forecasting or through technological means including energy storage system.

  Given the rising share of renewable capacity in the near future, variability and uncertainty associated with WS generation would place even greater stress on the power system. Share of energy generation from such sources would be significant, particularly during solar hours/ high wind season, making the power system vulnerable to forecast errors. Thus, increasing emphasis should now be placed on tightening the DSM regulations for the variable renewable energy sources so as to ensure grid security along with greater RE penetration.

  Use of available capacity as a denominator for forecasting error reduces the percentage error while the absolute error (in MW) remains the same. This influences the applicability of penalty as per (percentage) error band while actual penalty payable would still depend on the rate of penalty and the quantum of deviation. Apart from using a 'pseudo' definition for scheduling error, WS generators were also been subject to a wider error band. As a next step,

it is suggested to use a true or near true definition of scheduling (forecasting) error. As a transition, the Commission may consider a graded path for implementation of weighted average of the available capacity and schedule generation for the denominator (Table 1). Alternate approach is to continue with the existing definition but tighten the error band and applicable penalty for deviation. A new approach base on Maximum Potential Generation is suggested below.

Table 1: Proposed methodology for computation of deviation for WS seller

Year	Applicable Weightage		Minimum Allowable Volume Limit
	Available capacity	Scheduled generation	
2025-26	75%	25%	Wind: 12%, Others: 6%
2026-27	50%	50%	Wind: 14%, Others: 7%
2027-28	25%	75%	Wind: 15%, Others: 8%

In case of change in the definition of deviation, the percentage volume limits should also be aligned so as to make the transition smoother. Analysis of past data can help evaluate the impact of change in definition of deviation. Transition from existing approach to suggested one may be graduated over a year with higher cut-off percentage for lower band percent deviation. For example, deviation for buyer at maximum volume for solar can be set at 8% (in place of the proposed 5%) and for wind this can be set at 15% (in place of the proposed 10%) with firm timeline for implementation. The deviation band for wind and solar generators, as suggested in the draft, should thus be applicable within one year.

- **Maximum Potential Generation Profile - An alternative proposal for calculation of deviation for WS seller:** The assessment of deviation for wind and solar generators is undertaken with respect to available capacity This has artificial effect of reducing percentage deviation as available capacity is higher, and remains the same across the year. Interestingly, the **available capacity for WS generators remain constant throughout the day/year (Figure 3).** Due to higher numerical value of declared capacity for the early morning hour and late afternoon, the calculated percentage deviation is significantly and artificially lower. This anomaly should be addressed.

  A new concept of **Maximum Potential Generation Profile (MPGP)** can replace existing provision for available capacity as a reference for estimation of deviation by wind and solar generators. WS generators would self-declare daily time-block wise MPGP to be used as the reference in place of available capacity for calculation of deviation. MPGP would be declared on a weekly basis and would remain constant for entire week. **This would be a significant improvement over the current approach, which treats the denominator to be constant throughout the day/year, while keeping providing a time block-wise fixed denominator for a week.** This is illustrated in Figure 3. Adoption of such methodology would bring about conceptual clarity to the definition of percentage deviation while still providing a firm and known denominator for calculation of the same.**

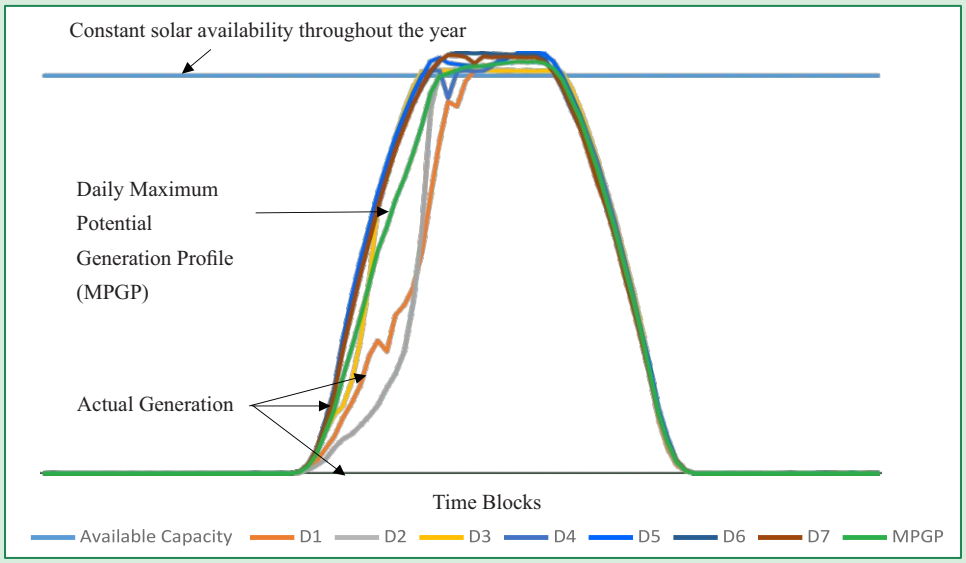


Figure 3: Proposed Denominator for Deviation Calculation – MPGP

- **Common Deviation Portfolio for Conventional Generators?:** SCED is an optimization layer that allows the system operator to determine 'optimal' schedule for the power system by 'rescheduling' marginal conventional plants. A mechanism for 'common deviation portfolio' across the generation assets of a generation company within region would assist generators in addressing deviations as well as meet the flexibility requirement, especially during the 'partial outage' conditions. 'Beyond reasonable control' mentioned in the context of'partial outage' needs greater definitional clarity. Online system to record 'partial outages' with searchable archive would bring greater transparency in the existing approach. **Deviation can be partially or fully offset through a common pooling arrangement across the stages of a generating station. Implementation of the similar offset mechanism may be explored for pooling deviations of multiple stations of a generating company within a region.** Data analysis of past performance may help reveal potential impact of the same.

- **Localised 'Market' for depooling Deviation Charges at the pooling Station: 'Common deviation portfolio'** for WS generators connected at a common ISTS sub-station would help reduce risk for WS generators. Depooling disputes due to differing forecasting efficiency (incentive not to improve?), delayed payment of DSM charges, localized 'outages' for some WS generators etc. can be addressed through the proposed mechanism. In case of pooling of deviation within WS generators, settlement of deviation among the generators participating in a 'deviation portfolio' can be done through a **localized 'market' for deviation settlement.** Generators with better forecasting accuracy (thus lower deviation) can 'trade' deviations with 'others'. **This would provide greater incentive for improvement in forecasting efficiency as well as investment in energy storage system by participants in the common pool.** This may also help address common issue of using 'contract rate', which is calculated based on contract rate of individual RE generators (for the purpose of deviation charges). The mechanism would be useful for the QCA and the participating RE generators.

- **Improving Forecasting for Wind and Solar Generators - Pooling of Weather Data and Public Data Access:** The weather forecast data and models provide daily forecast within every 6 hour interval. This is based on data collected across the IMDs weather stations. Each WS generator also has their own 'weather stations'. **Pooling of weather data across all Wind, Solar, Hydro and other generators is the need of the hour.** This should be made available and archived **as a public good,** thus helping to significantly improve forecasting accuracy. Capturing cloud movement (particularly through ground based instruments) with socialised data can further help improve solar forecasting.

  The generation schedule as well as actual injection RE generation data across the REMCs located in different regions could provide significant insights and empower stakeholders in developing better forecasting tools and research. **Unavailability of such data, especially for intra-state RE generators, restricts the capability of the stakeholders including researchers to develop better forecasting tools for RE generation. Hence, the availability of data in public domain from REMCs should be prioritised.**

  It is suggested that the deviation for WS generators during the **'declared' extreme weather events** (e.g. cyclones, in consultation with IMD) in the **impact zone** and for the **impact duration should be exempted for WS sellers in such region.**

- **Deviation for Energy Storage Services (ESS):** As per the Clause 8(5), *"Charges for Deviation, in respect of a Standalone Energy Storage System (ESS), shall be at par with the charges for Deviation for a **general seller other than an RoR generating station or a generating station based on municipal solid waste or WS seller** as specified in Clause (1) of this Regulation" and Clause 8(6) "Charges for Deviation, in respect of an ESS co-located with WS Seller(s) connected at the same interconnection point, shall be as follows:*

  i) Such seller shall provide a separate schedule for WS and ESS components through the Lead generator or QCA at the interconnection point;

  *ii) **Deviation corresponding to WS component** shall be charged at the **same rates as applicable for WS Seller** being a generating station based on solar or hybrid of wind-solar resource in accordance with clause (4) of this regulation; and*

  *iii) **Deviation corresponding to the ESS component** shall be charged at the same rates as applicable for **a standalone ESS** in accordance with clause (5) of this regulation" (emphasis added).*

It is to be noted that there can be the following four possible configurations of the ESS -

a) ESS co-located with the respective RE (WS) generator
b) Co-contracted ESS (but not co-located, especially for PSP)
c) Shared ESS Asset within a common pooling area (by QCA)
d) Standalone ESS (without any contractual linkages)

It is suggested that the deviation for an ESS bundled with RE, under configurations **(a), (b) and (c),** should be calculated **as per the methodology defined for the respective technology.** Separate deviation calculation for the ESS and the RE technology would severely penalise the generators as they would not be able to mitigate the RE resource variability and the corresponding DSM penalty. This may further discourage the installation of/ bilateral contract with the ESS by the RE generators.

In case of **standalone ESS** without having any contractual linkages with RE generators (configuration (d)), the lowest deviation band for the BESS should be 0.5 %. Furthermore, it is also suggested that the deviation range for pumped storage plants (PSPs) may be differentiated from the battery energy storage system (BESS) as PSPs cannot respond as fast. **Adoption of deviation charges for standalone (untied) ESS capacity (in part or full) at par with a WS seller or a general seller would provide significant gaming opportunity for the ESS.**

- **Shifting Gate Closure Nearer to the Despatch:** Uncertainty with respect to WS forecast would remain a challenge. Hour-ahead RE forecast is more reliable than about 2 hour ahead forecast. Long- term target should be to **move gate closure for WS generators near to the block of delivery (4 blocks)** with simultaneous shift in the SCED and Ancillary Services market. The prevailing Grid Code provides for a gate closure, beyond which, revision in schedule is not permitted. Since RTM market closes 6-7 blocks ahead, gate closure can happen only soon after that. **To enable WS generators to provide better forecast, the gate closure may be moved close to the block of delivery. This would mean that the RTM timeline would also need to be moved closure to the block of delivery. Realignment of gate closure would also further assist tightening of DSM regulation for the WS generators.**

- **Extending the Scope for the Definition of Contract Rate:** In the proposed clause 3 (j) *"Contract rate means the tariff for sale or purchase of power, as determined under Section 62 or adopted under section 63 or approved under section 86(1)(b)……"*

  The definition covers the prices of electricity discovered u/s 62 and u/s 63 or price discovered in the Power exchanges. It is suggested that the definition should also include in its scope, the **prices discovered from other market segments** such as other products traded on power exchanges, Discovery of Efficient Electricity Price (DEEP) and Surplus power portal (PUShP).

- **Correction in the Definition of Reference Rate (RR):** Proposed clause 3 (x) states that *" Reference Charge Rate or RR means (i) in respect of a general seller whose tariff is determined under section 62 or section 63 of the Act, Rs/kWh energy charge as determined by the appropriate Commission, or (ii) in respect of a general seller whose tariff is* ***not determined under section 62 or section 63 of the Act,*** *the daily weighted average ACP of the Day Ahead Market segments of all the Power Exchanges, as the case may be" (emphasis added).* The section 63 of the EA 2003, the Commission is empowered to adopt and approve the tariff discovered though a bidding process. The proposed clause may thus be rephrased as below.

  "Reference Charge Rate or RR means (i) in respect of a general seller whose tariff is determined under section 62 or section 63 of the Act, Rs/kWh energy charge as determined by the appropriate Commission, or (ii) in respect of a general seller whose tariff is not ***determined under section 62 or a under section 63 of the Act,*** *the daily weighted average ACP of the Day Ahead Market segments of all the Power Exchanges, as the case may be"* (emphasis added).

- **Windfall Gain to MSW for Under-injection:** The proposed deviation band and the applicable DSM charges for MSW generators provide windfall gain to such generators, who can under inject by 20% while still receiving 50% of their approved tariff, which are significantly higher (Rs. 8+ per kWh). This would incentivise MSW generators to give artificially higher schedule thus influencing deviation across the grid and thus collect windfall gain (Table 2). The 20% deviation band for MSW should be reduced to at least 10%.

Table 2: Windfall gain to MSW generator for under-injection

Available Capacity (kWh)	Schedule (kWh)	Actual Generation (kWh)	Deviation (kWh) Under-injection	Reference Rate (Rs./kWh)	Receipt as per @RR (Rs.)	Actual generation cost (Rs.)	Payable to the pool @0.5*RR (Rs.)	Windfall gain (Rs.)
a	b	c	d = c-b	e	f = e*b	g = e*b	h = 0.5*e*d	i = f-g-h
100	100	80	20	10	1000	800	100	100

- **Normal Rate (NR) of Charges for Deviations:** As per the draft regulation, determination of Normal Rate of Charges (NR) for deviation considers the following:

  (a) 1/3 [Weighted average ACP (in paise/kWh) of the Integrated-Day Ahead Market segments of all the Power Exchanges];
  (b) 1/3 [Weighted average ACP (in paise/kWh) of the Real-Time Market segments of all the Power Exchanges]; and
  (c) 1/3 [Ancillary Service Charge (in paise/kWh) computed based on the total quantum of Ancillary Services deployed and the net charges payable to the Ancillary Service Providers for all the Regions].

  The key **difference between energy market (power exchange) and ancillary service** is that the market outcome of the former is dependent on competing buyers and sellers, whereas in the latter case, the decision for quantity of procurement is undertaken by the system operator, while 'price discovery' is primarily dictated by the 'regulated' tariffs. Integrated-Day Ahead Market (I-DAM) does not capture the uncertainties close to the real time and does not provide correct value of resources for the NR. It is suggested that Commission shall consider **providing higher weightage to Ancillary service and Real Time Market** for determination of NR and gradually decrease weightage of I-DAM over-time.

- **Windfall Gain for Merchant Seller for Over-injection:** During periods of high market prices discovered in I-DAM or RTM (especially when MCP = Price cap) and actual system frequency is below 50 Hz1, a general (merchant) (particularly coal based merchant power plant) whose ECR may range Rs. 3-4/ kWh will find it lucrative to over inject and make windfall gain. A merchant generator may even be tempted to withhold capacity as this would also 'improve' the chances for a higher market price. In the absence of a block-wise or daily deviation limit, such withholding of capacity and over-injection may be gamed consistently as merchant capacity is significantly lower to overall generator capacity of system during such time blocks and some over-injection by a MPP would not have much impact on system frequency. In contrast, a TPP whose tariff is approved u/s 62 or adopted u/s 63 of EA 2003, would be incentivised in a limited and desirable manner to over inject.

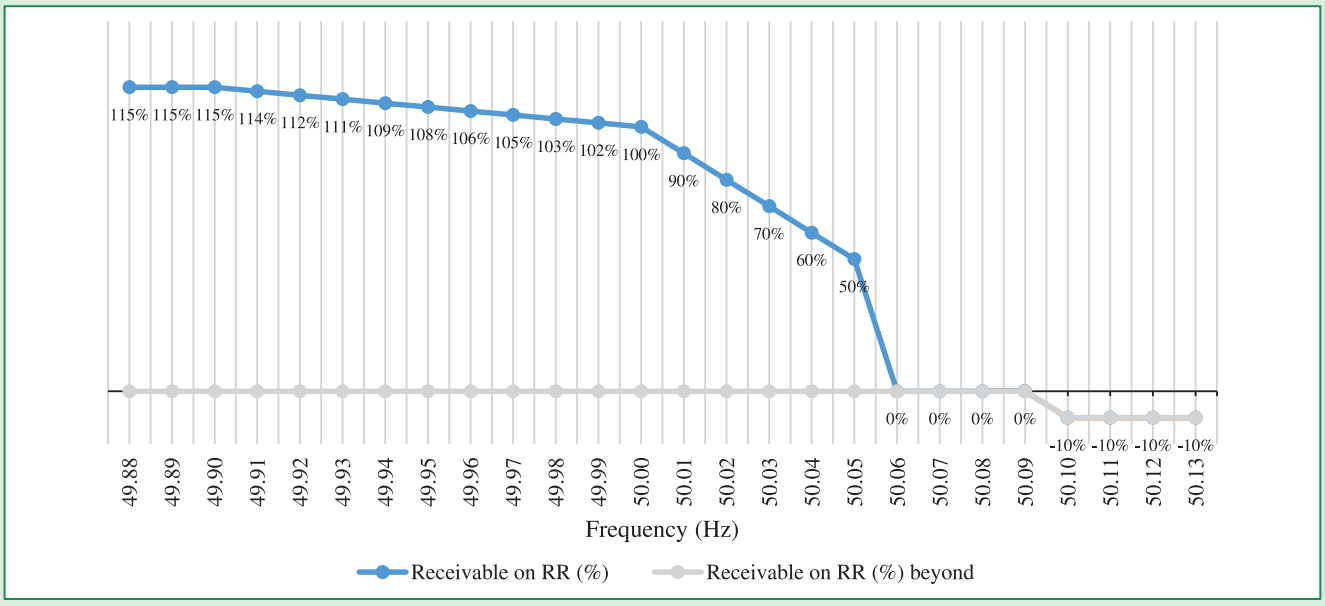


Figure 4: Deviation for General Seller (upto 10% of DGS or 100 MW and beyond)

CERC Staff Paper on Regulatory Oversight on Bidding Behaviour in Power Exchanges, 2024

Central Electricity Regulatory Commission notified Staff Paper on Regulatory Oversight on Bidding Behaviour in Power Exchanges on 4th May, 2024.

- **Objective:** The Central Electricity Regulatory Commission (CERC) has prepared a Staff Paper on Regulatory Oversight on Bidding Behaviour in Power Exchanges, which outlines a proposed framework for monitoring and regulating bidding behaviour in India's power markets. The paper, which is not a formal CERC policy but rather a discussion document, aims to ensure fair and transparent market operations by addressing issues such as bid price manipulation and quantity withholding. The paper discusses the current price discovery mechanism in collective transactions, which operates on a Uniform Market Clearing Price (UMCP) and Pay-as-Bid (PAB) system. It highlights concerns about the UMCP mechanism, particularly during supply shortages or high demand, and suggests the need for regulatory intervention to maintain market integrity.

  To prevent market abuse, the paper proposes a screening process for both sell and buy bids. Sellers are required to declare variable costs and technical parameters, and an ex-ante screening mechanism would ensure that bids do not exceed a specified multiple of the Benchmark Supply Offer (BSO). An ex-post screening would use the Pivotal Supplier Index and Pivotal Supplier Test to evaluate bids for potential market manipulation. For buy bids, the paper suggests limiting the total quantum bid to the residual Available Transmission Capacity (ATC) of the state to prevent excessive bidding at the price ceiling. This is intended to ensure that buyers' bids reflect their true requirements and marginal utility of consumption. The paper also discusses the use of competitive benchmark models and simulation models to assess market power and the need for measures to incentivize demand response and energy storage systems.

  In summary, the Staff Paper presents a comprehensive approach to enhancing regulatory oversight of bidding behaviour in power exchanges, with a focus on transparency, fairness, and efficiency in the electricity market.

EAL Opinion

- **Market Monitoring Framework (MMF):** The evolutionary journey of the Indian power market has so far had limited regulatory oversight in terms of market monitoring. The Market Monitoring Report (MMR), published by the Central Electricity Regulatory Commission (CERC), is a market reporting exercise that is published with a significant lag. While it is a useful compendium of the market outcome and broad market power indices, there is an urgent need to set up a robust Market Monitoring Framework (MMF) with continuous monitoring of the market outcome as well as bidding and operational behaviour of the power system constituents. This should provide for timely analysis of bids on daily, weekly as well as monthly basis with clear set rules for identifying divergent market outcome and suspicious participant behavior for further analysis. A summarized report of such daily, weekly and monthly analysis should become an integral part of the MMR published by the CERC.

  The MMF should ensure compliance with timely data disclosure by the power exchanges, trading licensees, generators, discoms, open access consumers as per a template /format to be developed for the same. Such data compliance report should form an integral part of the MMR.

- **Market Monitoring Committee (MMC):** The staff paper raises several important questions but lacks significant discussion on the institutionalization of market monitoring. To ensure effective oversight, a dedicated Market Monitoring Committee (MMC) be setup by the CERC. Such committee should hold quarterly meetings to discuss market outcome and suspicious behaviors of power system/market participants, especially those of the suspicious participant behavior for recommendation for further action.

- **Market manipulation:** In the proposed staff paper section 4.2 (iv) states *"some DISCOMs have offered both sell and buy offers within the same bid in the same time block at varying prices. For instance, in the same time block (time block 44), a DISCOM offered to sell a low quantum (121 and 79 MW) at a low price (~Rs. 5/kWh) and put a high quantum buy bid (150 MW) at a higher price (Rs. 10/kWh) (refer Table 1)"*.

  It is suggested that the Commission may set clear **guidelines for fare and reasonable bidding behavior of market participants.** Furthermore, transparency in terms of bidding data disclosure would help foster trust and

accountability in the market. It is notable that some of the power markets disclose detailed trade bids after a lag of about a month or so. A beginning can be made by identifying dominant market players and impact of their participation on market outcome. The Commission should establish a formal mechanism for public disclosure of the analyses and reports. By doing so, the stakeholders can have greater visibility into market dynamics, enabling them to make informed decisions. This would also enable the Commission to hold the market participants accountable for their actions. This approach not only enhances market integrity but also promotes fairness and efficiency in market operations. Security and Exchange Board of India (SEBI)'s approach to market monitoring, surveillance, disclosure and penal action thereof provides an example to emulate.

- **Bidding Data Collection Timeline:** In the proposed staff paper section 4.8. II (ii) states that *"Ex-post Screening - All the sell bids shall be evaluated by CERC for any possibility of market manipulation. The power exchanges shall be required to submit their bid order books to CERC for each month by the last day of every month."*

  It is suggested that date for data collection may be revised to 10th day of each month instead of last day of the month. This will ensure that the data collected reflects the actual generation costs incurred by the generator. This proposed change stems from the observation that generators routinely generate their invoice for preceding month by the 7th of the subsequent month (Figure 1), capturing the billing details for the month prior. By making this adjustment, the Commission can streamline the data collection process, ensuring access to critical information for analysis and decision-making purposes.

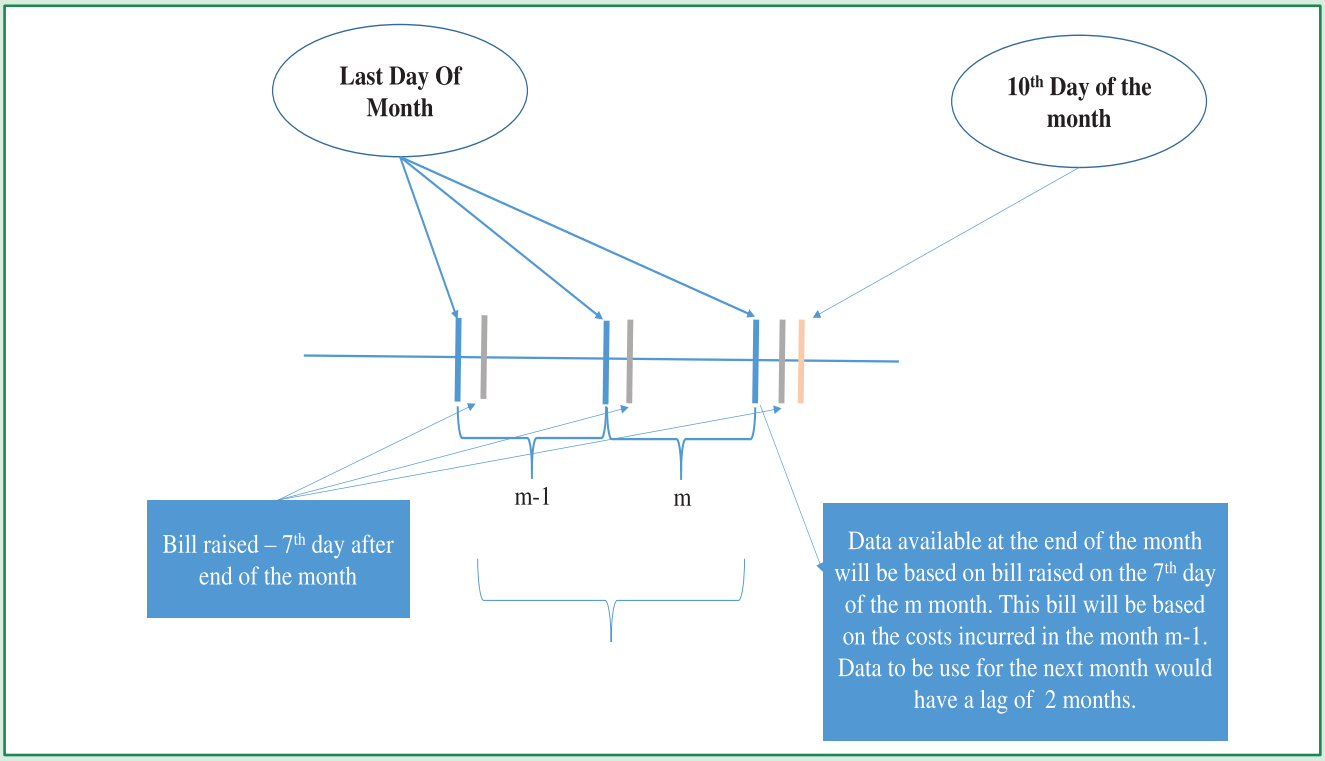


Figure 1: Timeline for the bidding data

The Figure 1 illustrates the timeline of raising of the bills by the generator and corresponding costs incurred by the generator

- **Proposed Framework for data collection for Bid Supply Offer:** In the proposed staff paper Section 4.18 (i), (ii), (iii), (iv) & (v) states that *"The above-discussed mechanism of market screening would broadly involve the following:*

  (i) All suppliers shall be required to declare their variable costs to the designated agency on a monthly basis.
  (ii) The designated agency shall develop and host software to verify the declared variable costs against the estimated variable costs of the merchant suppliers.
  (iii) The introduction of software by Power Exchanges for evaluating sell bids and buy bids before feeding them into the market clearing engine.

(iv) Power Exchanges shall be required to submit their order books to CERC for each month by the last day of each month.

(v) Development of APIs by Power Exchanges, through which the results of the market monitoring screen can be shared with CERC."

While archiving information for generating station whose tariff is determined under sections 62 or adopted under section 63 of the EA, 2003, will pose minimal challenges for the designated agency, a notable issue arises with merchant power plants due to significant information asymmetry. It is important to note that generating plants which are tied-up under a PPA would have limited participation in the market. Unlike regulated entities, **merchant power plants who can influence the market outcome, particularly during the period of power shortage.** A strategically coordinated play of such plants, capacity withholding by others and buyer's 'support' can vitiate market outcome.

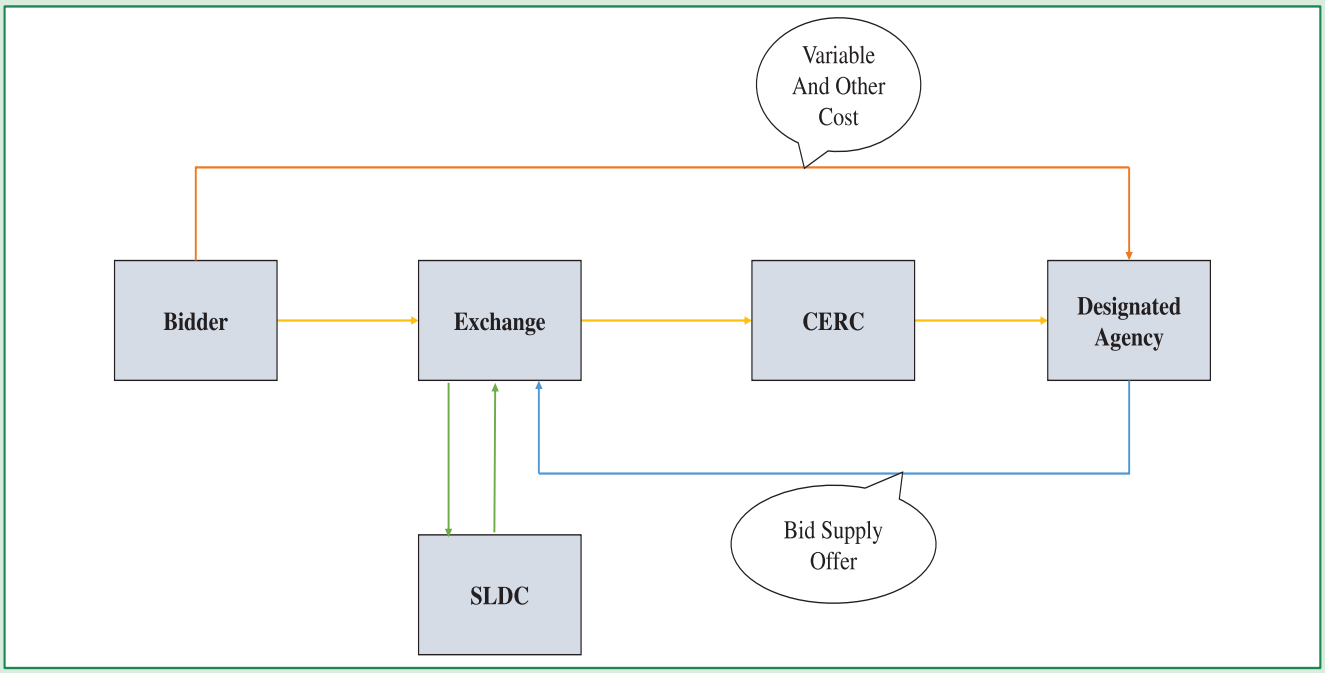


Figure 2: Proposed framework for Bid Supply Offer (BSO)

Given this complexity, it becomes imperative to delve into how the designated agency will ensure the timeline and reliability of information supplied by the merchant power plants. Traditional verification methods may prove insufficient due to the diversity of fuel sources with limited avenues of its verification, reporting structures and operational models among these entities. Therefore, the agency must develop robust mechanisms tailored to the challenges of information asymmetry in the sector.

These mechanisms could include rigorous data validation processes, independent audits, and the establishment of standardized reporting framework. Additionally, leveraging advanced analytics and technology-driven solutions may enhance the agency's ability to detect inconsistencies and anomalies in the information provided by the merchant power plants.

- **Residual ATC and Limit on Bid Quantum:** As given in section 4.17 (vii) & (viii) the staff paper states *"The Power Exchanges shall ensure that the buyer's total quantum bid, at the start of the bidding session of the DAM or the RTM, as the case may be, does not exceed the residual ATC of the state." And "In the case of intra-state buyers, the total quantum bid shall be restricted to the drawl limit or the intra-state entity- wise ATC limit as stipulated by the SLDC, as the case may be."*

  Such a limitation would restrict flow of critical information about true demand and signaling for additional transmission capacity. Even if implemented, it would offer operational challenges as the market participants in market area may include inter as well as intra-state entities. The above stipulation should account for participation of intra-state entities when comparing with residual ATC. For example, a sell bid by intra-state generator (including

captive/ merchant generator) may provide additional 'residual ATC' than as compared to the ATC accounted for (Figure 3).

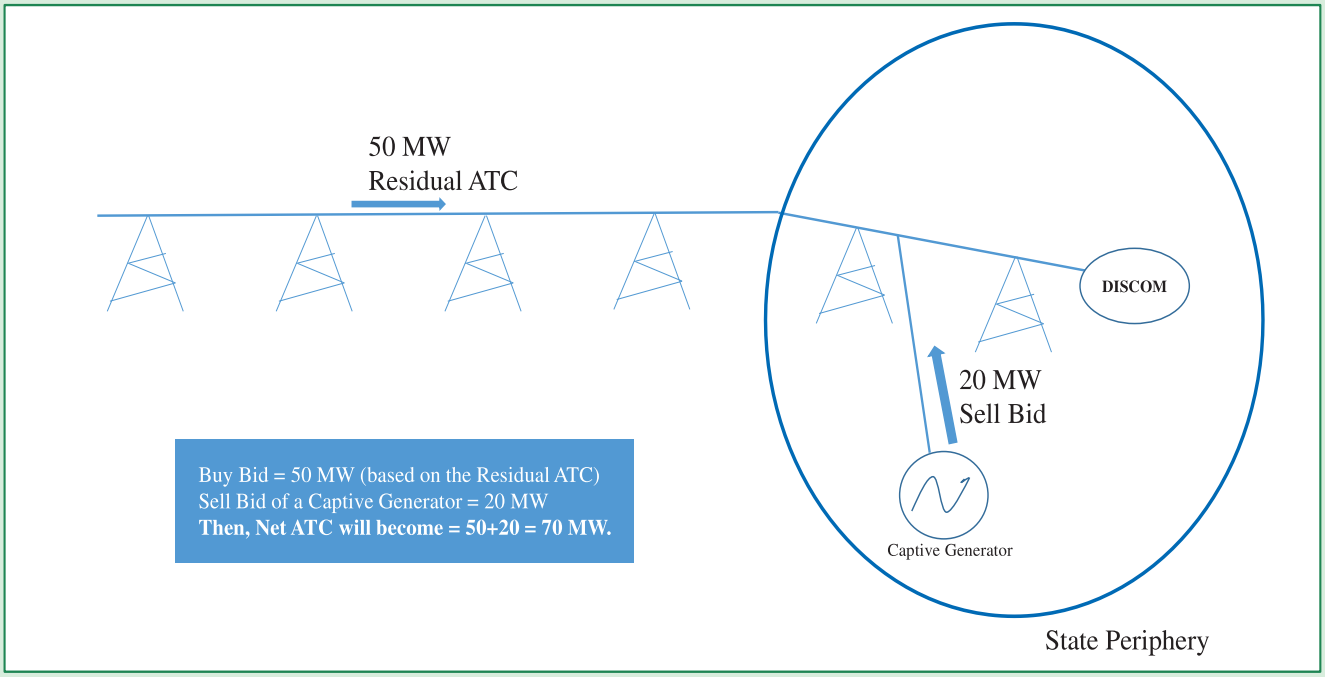


Figure 3: Concept of Net Residual ATC

- **Capacity Monitoring:** Withholding of generation capacity is one of the key factors that can be used to influence market outcome. The regulatory framework in the sector, currently has very limited capability to provide sector-wide monitoring of declared/ available capacity. Strategic withholding of capacity by a few generators can tilt the demand-supply balance and lead to artificial scarcity, eventually influencing the market prices. CERC, through NLDC, should ensure day ahead as well as real-time capacity monitoring across the sector. This can be incorporated in the Indian Electricity Grid Code, which could subsequently be adapted across the country. Energy Analytics Lab (EAL) can provide necessary technical support to provide capacity monitoring capability across the sector. Analysis of such data can help reveal strategic/ foul play to influence the market outcomes.

  Moreover, the Commission needs to assess the strategic withholding performance of General Network Access (GNA). This evaluation is crucial to identify and mitigate any potential market manipulation or inefficiencies. By addressing these gaps, the Commission can enhance transparency, ensure fair competition, and maintain the integrity of the market.

UERC Tariff and Others Terms for Supply of Electricity from RE Sources and non-fossil fuel based Co-generating Stations (First Amendment) Regulations, 2024 [Draft]

The UERC notified "Amendments on Tariff and Others Terms for Supply of Electricity from Renewable Energy Sources and non-fossil fuel based Co-generating Stations (First Amendment) Regulations, 2024". The key highlights of this draft is mentioned below:

- **Objective:** The draft amendment regulation aims to issue revised targets of Renewable Purchase Obligation (RPO) to the distribution licensee, open access consumers and captive users. A new category "Distributed RPO", the distributed RPO is limited to power generated from renewable energy power plants with installed capacity less than 10 MW including solar installation (net metering, virtual metering, group net metering, behind the meter and any other configuration) the compliance will be measured in kWh/kW/day. It also addresses the time frame for Technical Feasibility Study and successful commissioning of grid interactive Rooftop and small solar PV plants installed under net metering.

EAL Opinion

- **State Specific CUF for RPO compliance:** In proposed amendment to Principal Regulations Clause 10 (1) (c) proviso 2 *"Provided further that in case the obligated entity is unable to provide generation data against distributed renewable energy installations, the reported capacity shall be transformed into distributed renewable energy generation in terms of energy by a multiplier of 3.5 units per/kW/day."*

  The multiplier factor of 3.5 units considered according to the MoP[1] notification must be tailored to the resources available in the state of Uttarakhand. For example the solar irradiance varies according to geography and seasons. During period of low intensity radiation, there will be no incentive for solar power producer to provide actual energy production data as 'deemed' generation calculated using the multiplication factor would result in higher amount of solar energy generated. This would result in ghost RPO met by such entities.

  It is suggested to provide a monthly multiplier factor based on benchmarked capacity utilisation factor (CUF) of solar plants located in the state. This can later be revisited based on more reliable data collected from the projects located across the state. Such a benchmark can be defined for different regions across the state. Continued non-reporting of data can be further penalised by applying a factor of 0.9 – 0.8 over and above benchmarked CUF for the applicable month(s) for non-reporting of data for more than 3 months in a span of 5 years. This would incentive the generators to report actual electricity generation data.

- **Obligation to purchase Wind RPO:** Clause (10) of the proposed amendment is aligned with MoP order dated 20 October 2023 . The Commission must take into consideration the topography of the state i.e. hilly terrain covered with forest and glaciers. Installation of new any wind power plant may not be economically viable. Furthermore, purchasing electricity generated from wind power plant from any other RE-rich state is expensive as the discom will have to bear the cost of transmission loss for energy imported from other states. While Renewable Energy Certificate's (REC) would also enable the obligated entities to meet their RPO, additional flexibility may be provided for the obligated entities to fulfil their RPO from other sources which are in abundance in the state.

[1] https://powermin.gov.in/sites/default/files/Notification_Regarding_Renewable_Purchase_Obligation_RPO.pdf

EAL News

Centre for Energy Regulation hosted a high level delegation led by Secretary, Ministry of Power

Shri Pankaj Agarwal (IAS), Secretary, Ministry of Power, Government of India along with team of senior officials Shri Piyush Singh (Joint Secretary, MoP), Shri Hemant Pandey (Chief Engineer, MoP) and Shri Shaswattam (Executive Director, NETRA) travelled to Kanpur for meeting with Prof. Anoop Singh (Founder and Co-ordinator, Centre for Energy Regulation (CER) and Energy Analytics Lab (EAL)) and research scholars of CER and EAL, IIT Kanpur.

Professor Anoop Singh, Department of Management Sciences, IIT Kanpur extended a warm welcome to the delegation for the round table discussion and gave a thorough presentation on the accomplishments and research area of CER and EAL on economic aspects and regulatory framework of the Indian power sector. Prof. Singh mentioned the initiative of Department of Management Sciences in digital education with programs like e-Masters degree program and Regulatory Certification Program. Admiring the philosophy of Dr. R S Sharma with respect to data democratization, Mr. Agarwal praised the initiatives of CER and EAL regarding the compilation of power sector's data from different sources and making it available in public domain. (for more details of EAL activities and studies please visit https://eal.iitk.ac.in/)

Mr. Pankaj opened the discussion by providing key insights on topic covering Government of India initiatives for solar rooftop program, co-location storage and promotion of inclusive infrastructure. This sparked an in-dept conversation on current and emerging subjects in the Indian power sector including retail competition, electricity market design and development, MBED and SCED impacts on energy price, economic aspect of ISTS waiver, green trading, smart metering technologies, circular economy, climate change and incentives within power sector.

The post lunch meeting started with presentation by Department of Sustainable Energy presentation on Enroute to commercialization of Sodium-ion batteries and economical hydrogen production. The meeting was concluded with visit to Smart grid control centre, research facilities on thermal storage and battery lab at IIT Kanpur.

Regulatory Certification Programme on "Renewable Energy: Economics, Policy and Regulation"

CER in collaboration with EAL, conducted the Regulatory Certification Programme titled **"Renewable Energy: Economics, Policy and Regulation"** from 07th June 2024 to 23rd June 2024. Hosted under the aegis of the Centre for Continuing Education at IIT Kanpur, the inaugural session was honored by the presence of Shri. Sudeep Jain (IAS), Additional Secretary, MNRE. The program aimed at bulding economic foundation and better understanding of evolving regulatory and policy framework for RE, along with opportunity to learn best practices from academia, leading national experts on RE related subjects. Further details about upcoming programs available here: https://cer.iitk.ac.in/olet/RCP

Distinguished speakers such as Mr. Indu Shekhar Chaturvedi (Former Secretary, MNRE), Mr. Satyajit Ganguly (MD & CEO, PXIL), Prof. Anoop Singh (Founder & Coordinator, CER & EAL, IIT Kanpur), Mr. Ghanshyam Prasad (Chairperson, CEA), Dr. S.S.V. Ramakumar (Former Director (R&D), IOCL), Mr. Kaustav Roy (Ex. GM, SECI), Mr. Saurabh Diddi (Director, BEE) among others facilitated enlightening lectures throughout the programme.

The valedictory session under the auspices of retired Indian Administrative Service officer Shri. Alok Tandon, (Chairman,JERC (Goa & UTs) marked the conclusion of the program, bringing together insights and reflections from the extensive discourse on power sector regulation.

Young Policy Professional Programme (YPPP)

The YPPP is a unique opputunity for doctoral candidates to work on challenges present in current power market. The primary role for Young Professional is to conduct extensive research to support his/her research topic. Young Professionals will be recruited from around the world and we welcome individual with diverse educational background, experience to apply for the position. Please check the website for updates: https://cer.iitk.ac.in/YPPP

We request your feedback for making EAL and this periodical more relevant to the sector.
Log on to our portal or write to us at:

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Other Initiatives

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