

Power Chronicle

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Editorial

The proposal to extend the scope of Security Constrained Economic Despatch (SCED) would expand the space for optimisation. DA-SCED may play an important role in addressing information symmetry for the sector constituents and thus improve optimization of individual portfolio of the discoms. Expansion of the SCED ambit would bring about a solution closure to MBED, which seems difficult to implement due to a variety of reasons. However, nation-wide SCED would be more valuable close to the block of delivery as the beneficiaries retain right to recall. The SCED mechanism, as highlighted in previous issues of Power Chronicle, should adopt rolling block-based solution for better optimization. It should also provide for participation of the Energy Storage Systems, particularly the pumped storage plants.

Pumped storage has significant potential offering economic storage by shifting mid-day peak solar generation to meet the demand peak witnessed non-coincidental to it (say in the evening). While making investment climate attractive for pumped storage plants (PSPs), a tolling based competitive bidding or Swiss Challenge approach can be adopted. This would enhance economy of cost and competition among potential competitors to optimize their costs. Specific exemption to PSPs for payment of inter-state transmission charges, and applicability of electricity duty for electricity duty during pumping mode, would provide further impetus to development of PSPs.

Evolution of the market for Ancillary Services is seem to be reaching another milestone with market based price discovery for Tertiary Reserve Ancillary Service (TRAS). However, we feel that the draft procedure faces certain challenges as far as implementation of price discovery algorithm for a product that would be of 'floating block bid' nature. Further, to ensure reasonable participation in TRAS-Up market segment, commitment charge should be dynamic with respect to peak hours of the day.

The G-DAM markets has been attracting greater attention as average as well as maximum price in this market segment has been consistently higher than that in the DAM market segment with MCV being about one tenth of the later. Power shortages seem to have prompted higher MCP in the RTM market segment as compared to the DAM market segment.

Anoop Singh

Founder & Coordinator, Energy Analytics Lab



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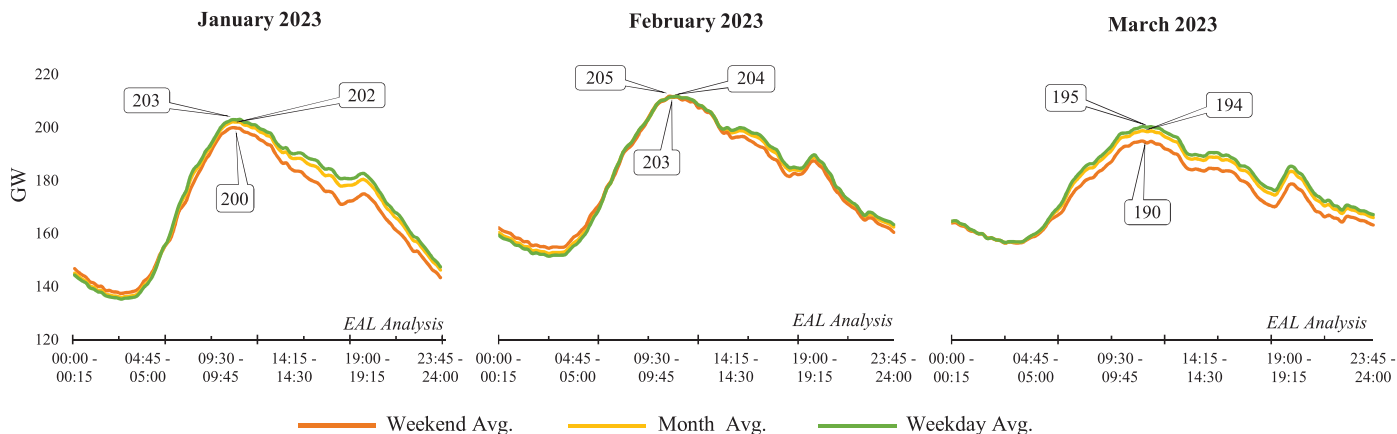
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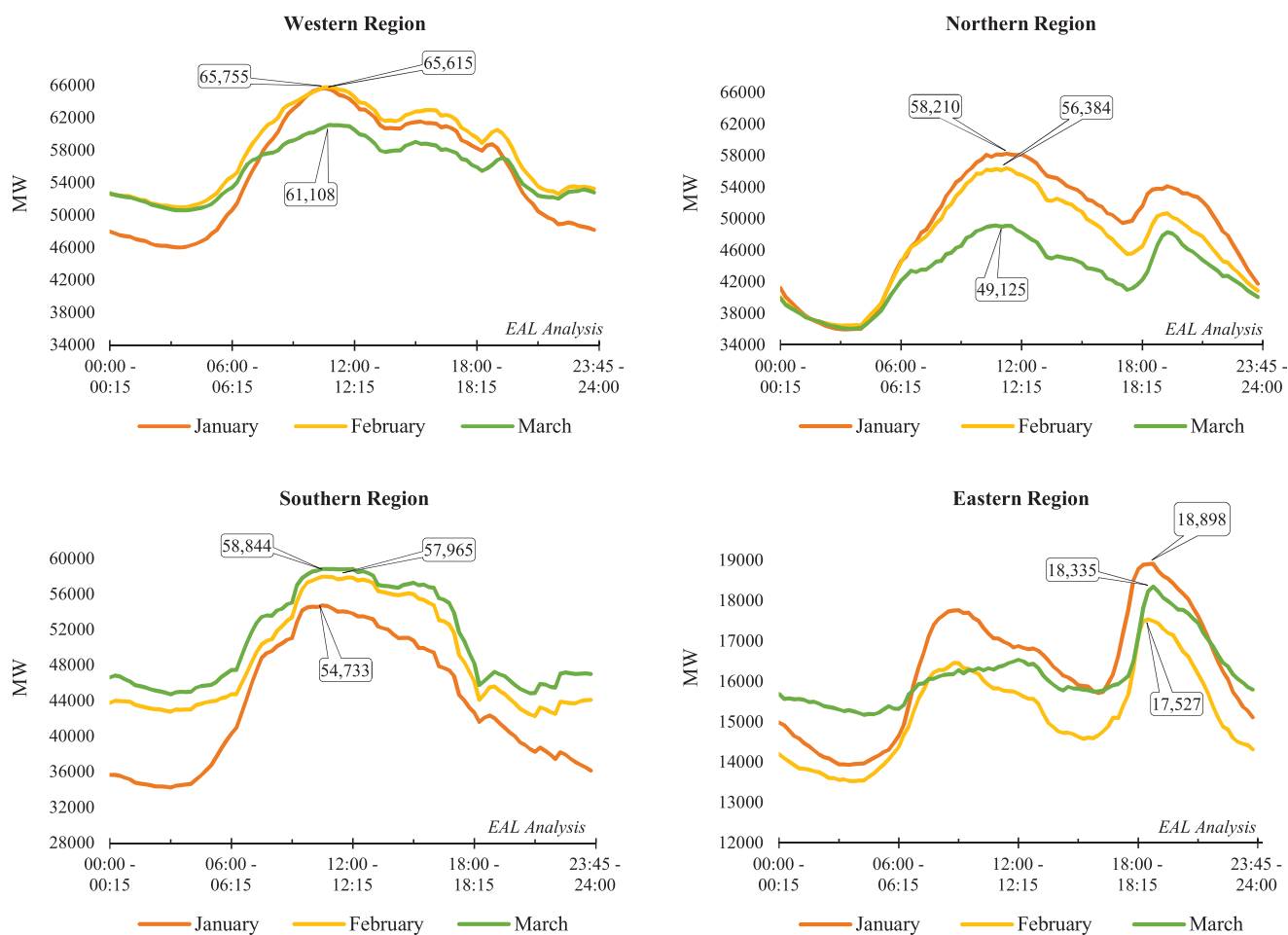
Power System Overview & Analysis

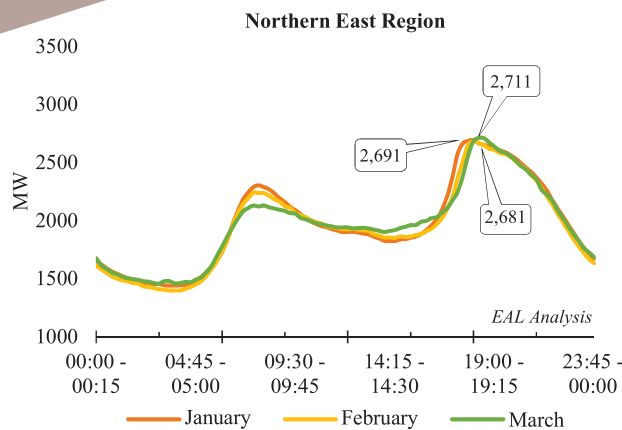
All India Demand Met Profile



From January to March quarter, all India peak demand reached 213 GW (09:30 - 09:45) on 10th March, 2023, about 7.5% higher than the previous year's peak demand recorded at 198 GW (11:45 - 12:00) on 16th March, 2022, during the same quarter.

Region-wise Demand Met Profile



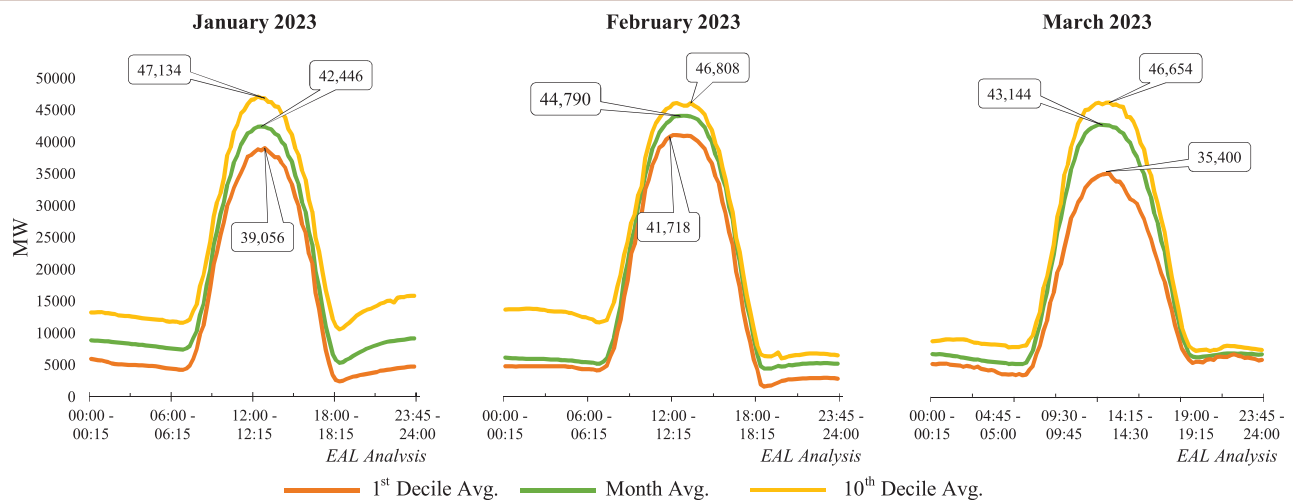


- Significant decrease in demand can be observed in the month of March for Northern region.
- Increase in demand is observed in the months of February and March.
- Significant higher demand can be observed during 18:30-19:00 hrs. for Eastern regions in the months of January to March.



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

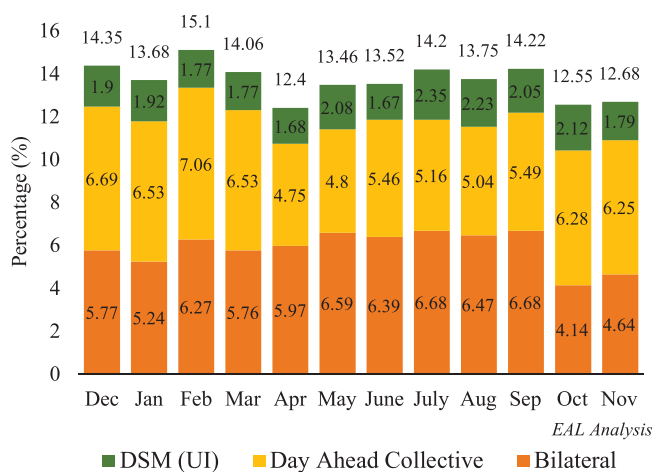
All India Renewable Energy (RE) Generation Profile



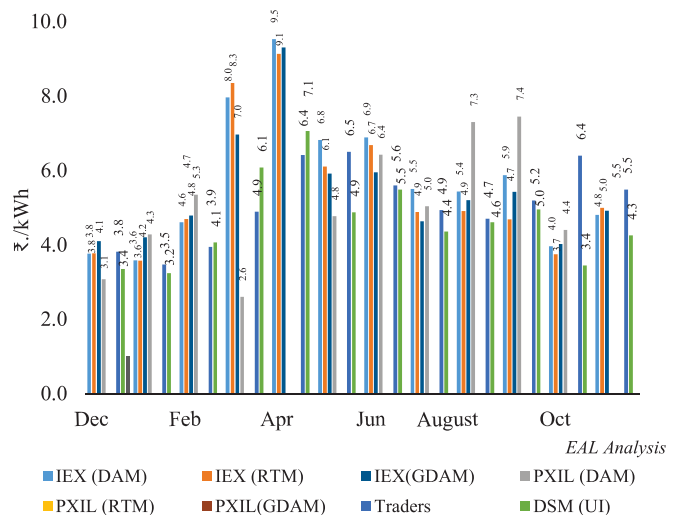
All India peak RE generation reached 49.48 GW (12:45-01:00) on 27th January, 2023, about 20.68% higher than the previous year's peak of 41.09 GW (12:15 - 12:30) on 03rd March, 2022.

Short-term Energy Transactions

Share of Short-term Energy Transaction of Total Electricity Generation (2022-23)

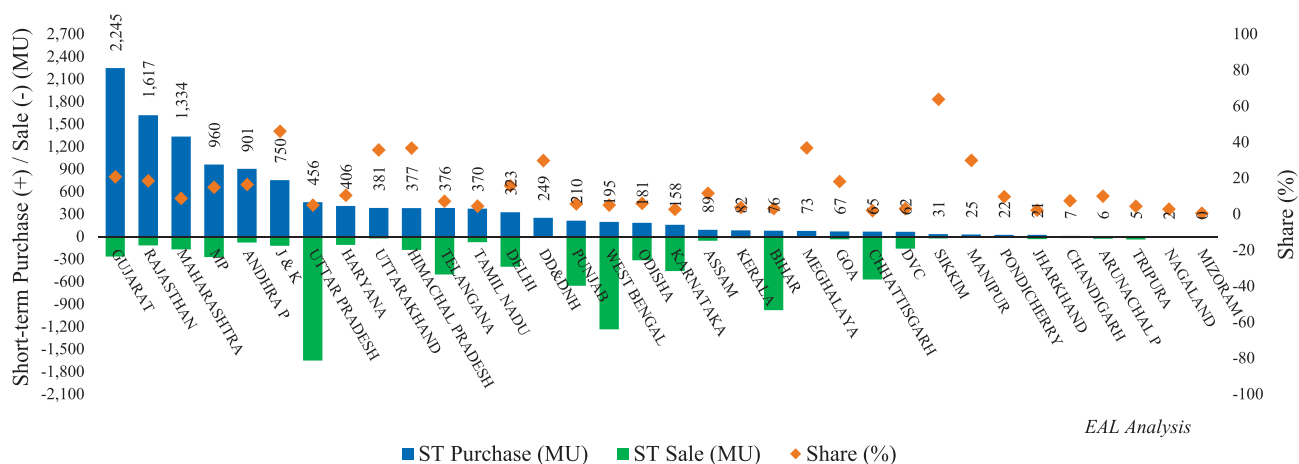


Weighted Average Prices of Short-term Transactions (2022-23)

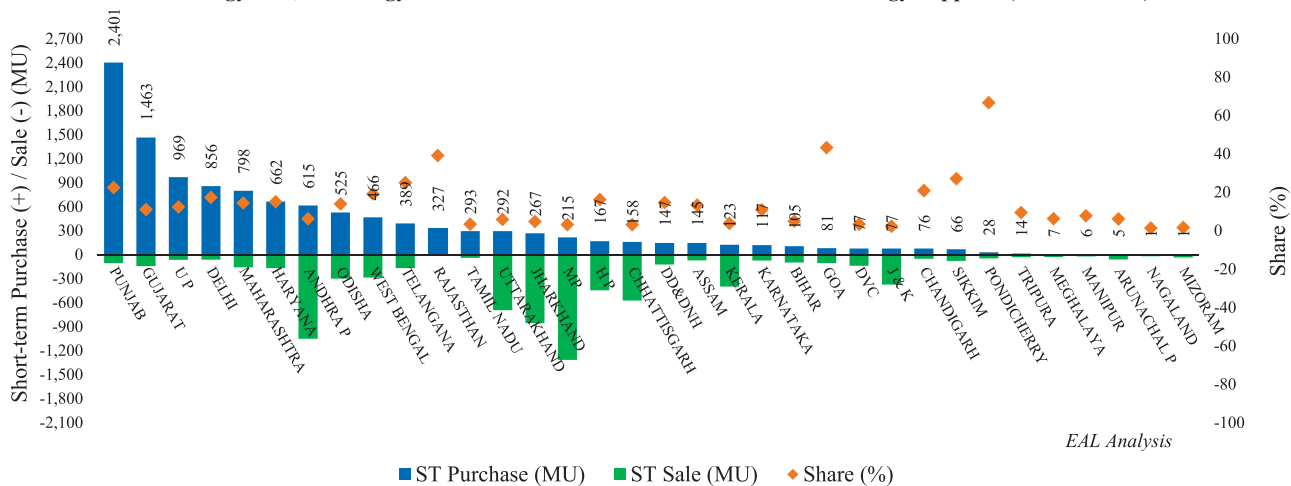


Monthly Short-term (ST) Purchase and Sale Quantum across States

ST Energy Sale, ST Energy Purchase and share of ST Purchase in Total Energy Supplied (November 2022)



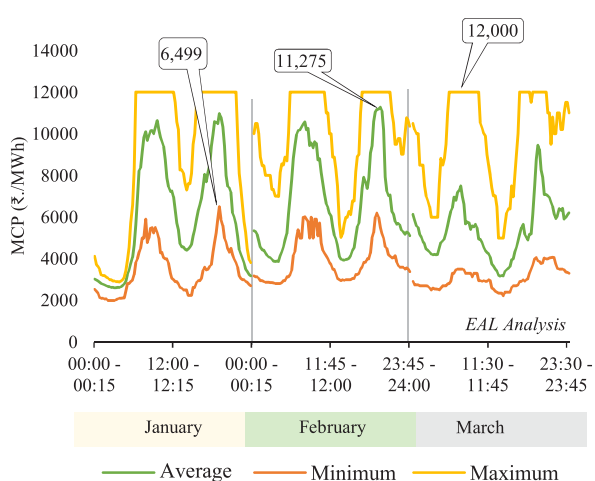
ST Energy Sale, ST Energy Purchase and share of ST Purchase in Total Energy Supplied (October 2022)



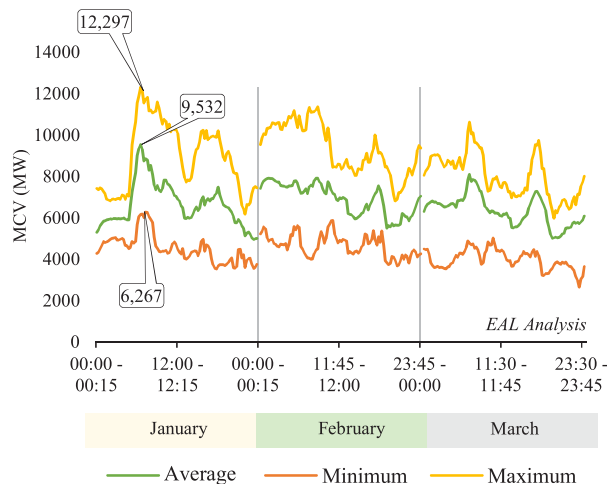
Power Market Overview & Analysis

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

DAM Monthly Average, Maximum & Minimum MCP

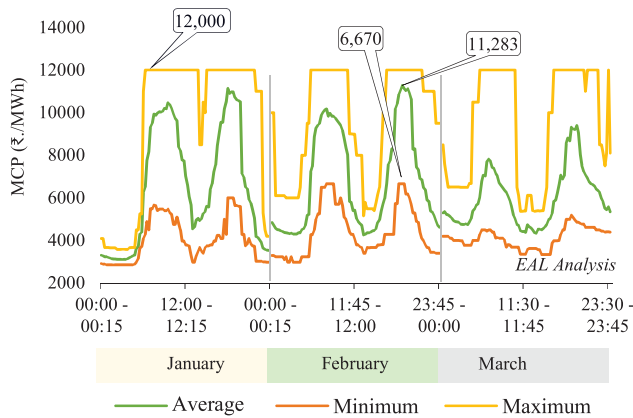


DAM Monthly Average, Maximum & Minimum MCV

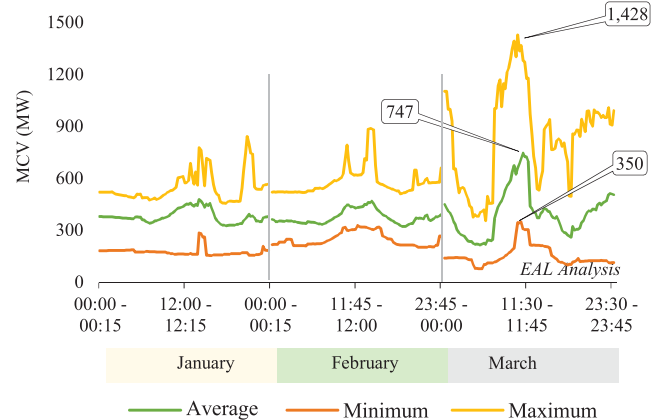


G-DAM - Market Clearing Price (MCP) & Market Clearing Volume (MCV)

G-DAM Monthly Average, Maximum & Minimum MCP

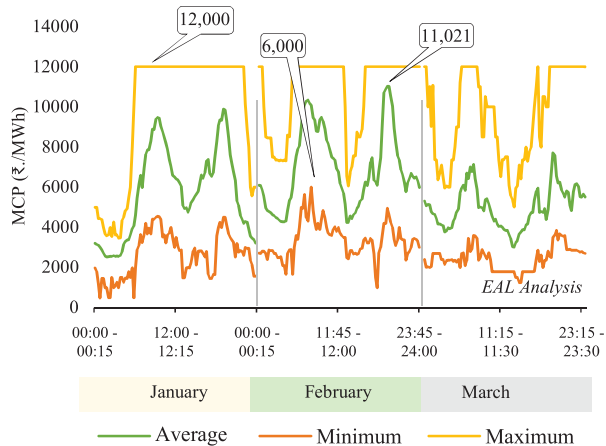


G-DAM Monthly Average, Maximum & Minimum MCV

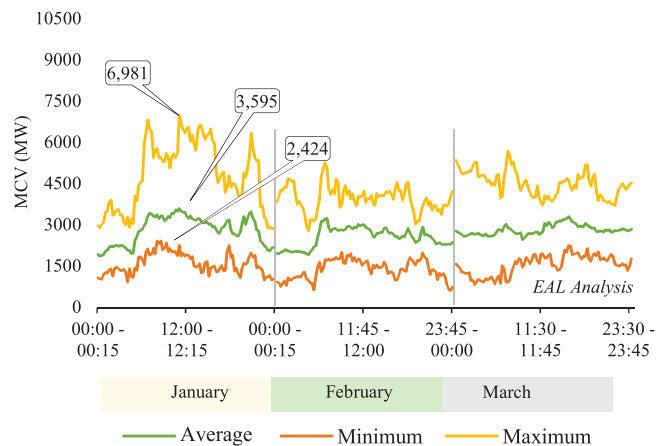


RTM - Market Clearing Price (MCP) & Market Clearing Volume (MCV)

RTM Monthly Average, Maximum & Minimum MCP

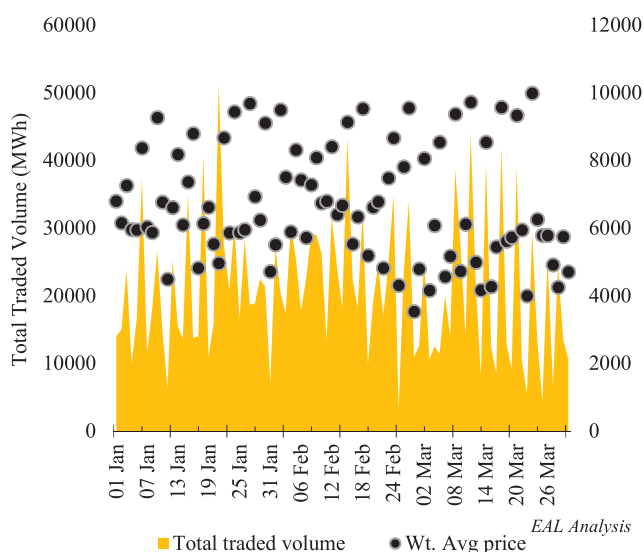


RTM Monthly Average, Maximum & Minimum MCV

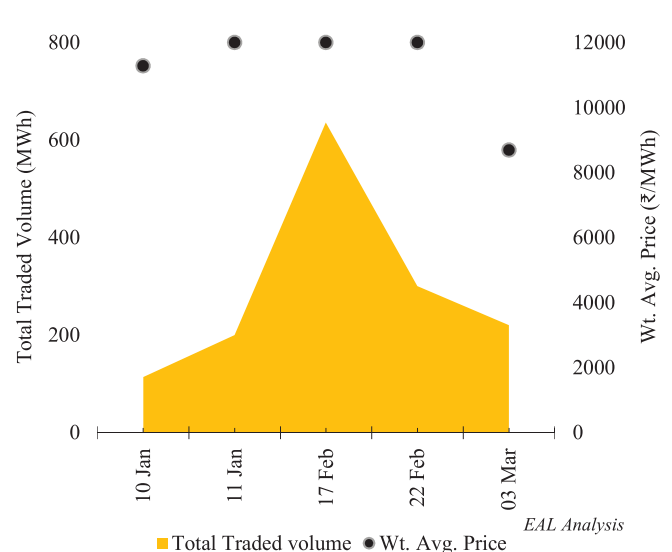


Term-Ahead Market (TAM)

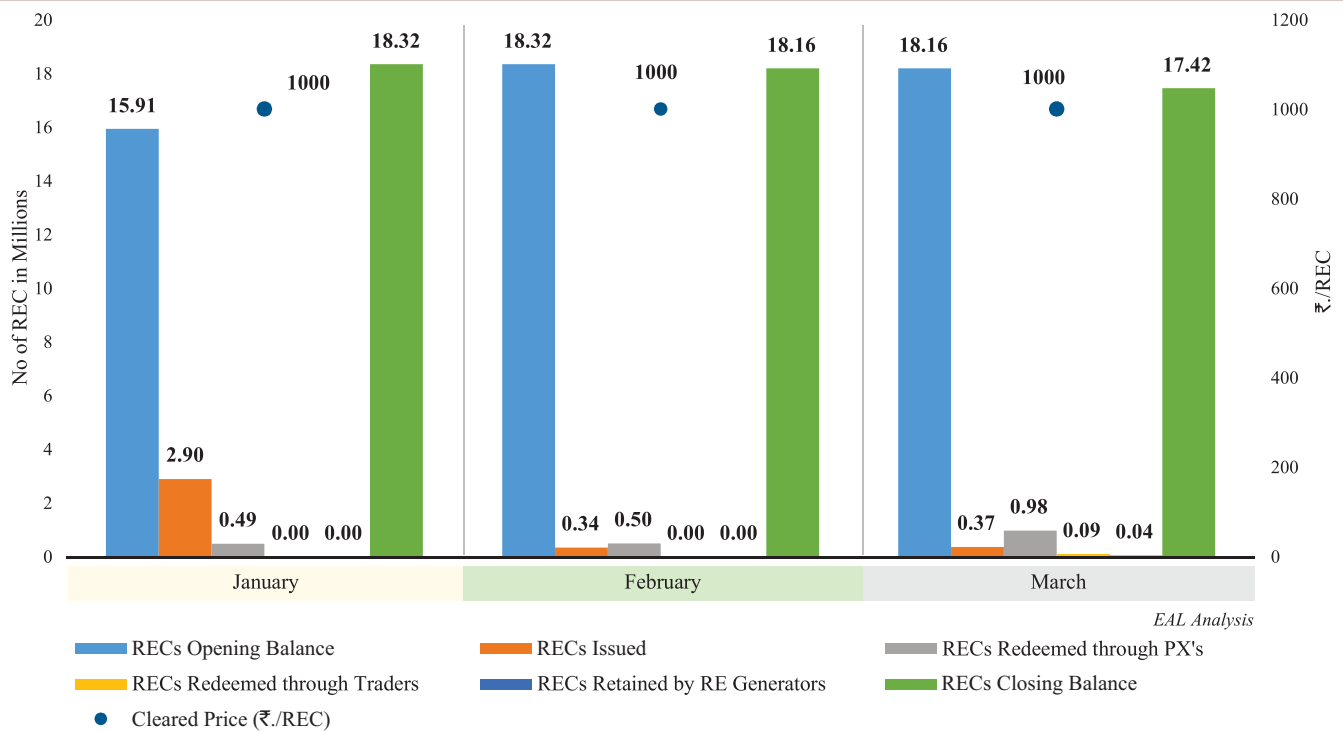
Day-Ahead Contingency Transactions



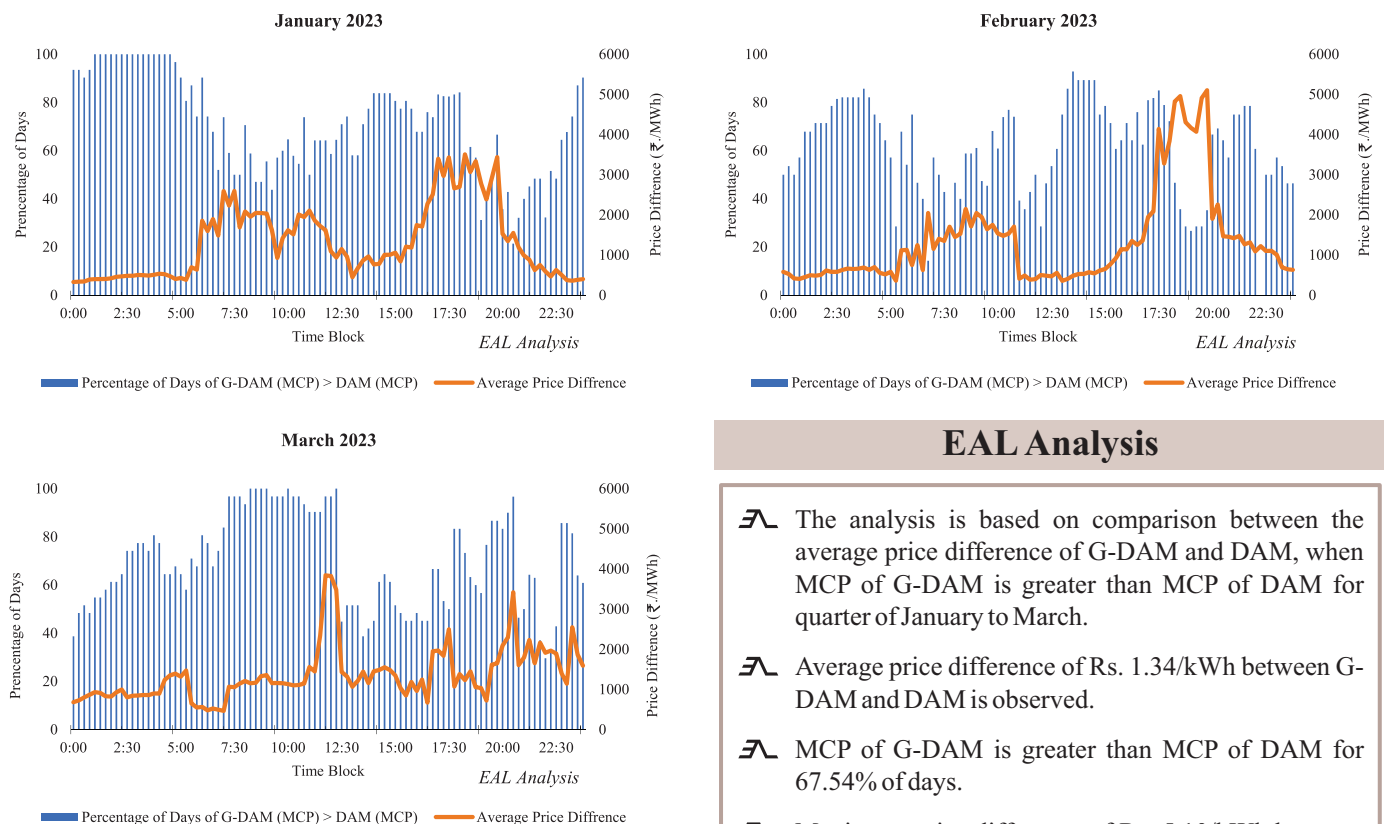
Intra-Day Transactions



Renewable Energy Certificates (RECs)



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 MCP of DAM for quarter of January to March.
- Average price difference of Rs. 1.34/kWh between G-DAM and DAM is observed.
- MCP of G-DAM is greater than MCP of DAM for 67.54% of days.
- Maximum price difference of Rs. 5.10/kWh between G-DAM and DAM is observed during the time 19:45-20:00 hrs for month of February 2023.

Regulatory & Policy Perspective

MoP (Draft Proposal on Day Ahead Operation of Security Constrained Economic Despatch), 2023 [Draft]

Ministry of Power (MoP) notified a draft on Day-ahead (DA) Operation of Security Constrained Economic Despatch (SCED) on 24th January, 2023. The key highlights of the draft are mentioned below:

➤ Objective: The main objective of DA-SCED is to expand the scope of SCED by involving more plants and run the SCED on a DA basis for providing a look-ahead schedule. The draft proposes to expand national-level merit order scheduling under SCED by including all inter-state generating station (ISGS), which can declare their compensation charge on a monthly basis.

➤ Proposed procedure of DA-SCED:

- ISGS participating in DA-SCED shall submit their declared capacity along with ramp rate and minimum turndown level for the next day (D) on D-1 by 06:00 hrs.
- The entitlements and the share of beneficiaries shall be declared by respective RLDC on D-1 by 07:00 hrs.
- The beneficiaries shall submit their requisitions/schedules from ISGS on D-1 by 08:00 hrs.
- The injection and drawl schedules shall be prepared by respective RLDC, based on availability and schedules submitted by 09:30 hrs.
- The first run of DA-SCED shall be carried out on D-1 at 09:45 hrs before the opening of the bidding window of DAM. Based on the results, the ISGS have a choice to participate in Day Ahead Market (DAM) as well as Real Time Market (RTM).
- The second run of DA-SCED shall be carried at 17:30 hrs. This will help in re-assessing the SCED schedules for the next day (D) and the committed reserve capacity available through DAM-AS.
- If available reserves are less than the required quantum then additional units would be deployed which shall be included in the third run of DA-SCED for 96-time blocks done by NLDC at 22:00 hrs.
- The payments for the stations where incremental power is scheduled (shall be paid their equivalent energy charges) and beneficiaries of those stations to ensure Resource Adequacy, shall be made to/from the Deviation and Ancillary Services, Pool Account.

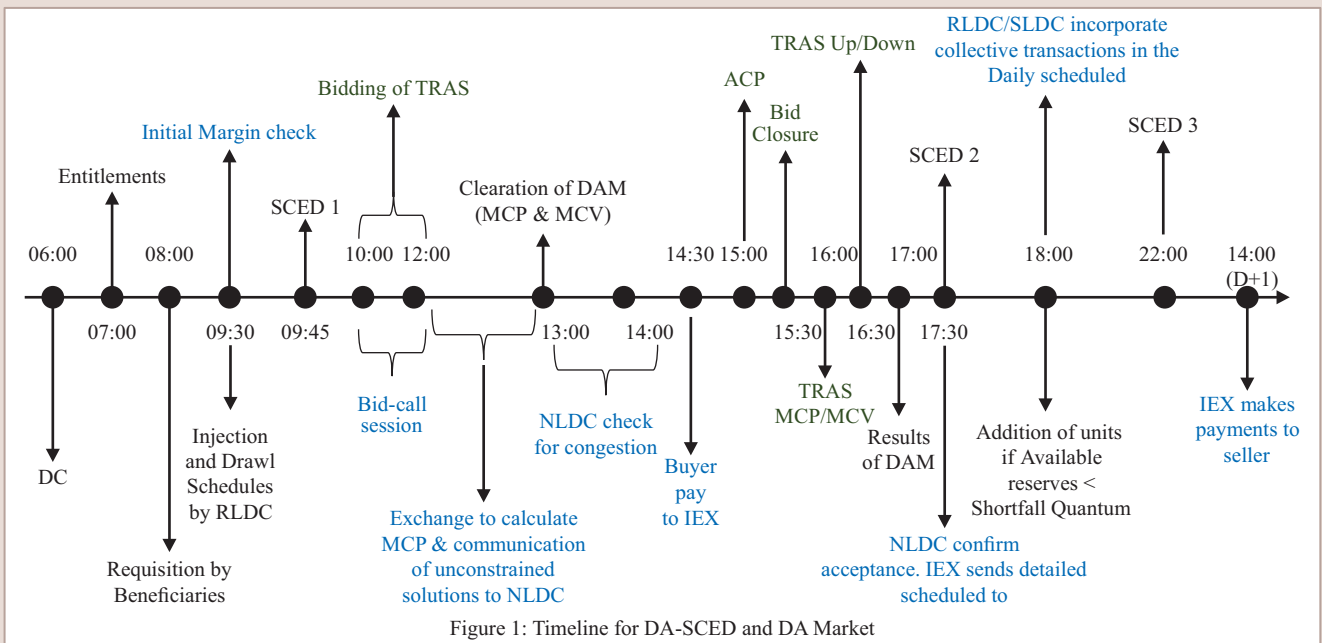
➤ Benefits of DA-SCED:

- Maintain resource adequacy in an optimal manner.
- Provides real-time control.
- Ensure balance between supply and demand.
- Sharing of benefits between the generating stations and their beneficiary states, thus incentivizing the entities.

EAL Opinion

➤ Purpose and Nomenclature of the Proposed Mechanism: The SCED, as the name suggest is the despatch mechanism implemented few time blocks before the actual time block of delivery. Given this context, **the terminology used to describe the three ‘day ahead’ interventions as DA- SCED may not be warranted as these are neither binding on the parties nor these result in despatch instruction. It is suggested that a different terminology may adopted for the proposed three DA interventions. Since the proposal has used the SCED nomenclature, we continue to use it for the rest of the discussion herein.** As per the proposed draft, SCED is run three times in addition to the current SCED mechanism, which is run on a two-block ahead basis. Let us call these, temporarily, as SCED-1, SCED-2 and SCED-3 respectively.

➤ Relevance of DA-SCED – Key to Address Information Asymmetry and Assist Planning by Discoms: SCED-1



is run just before the closing of bids for the DAM. The SCED participants capacity is available for offer on DAM, thus there is no commitment to the SCED-1 solution as it would be overridden by the market outcome of the DAM at 17:00 hrs. The SCED-1 thus only serves a purpose of disseminating information about economics of demand and supply in public domain as compared to private information that is generally associated with the individual stakeholders in the market. This information is very valuable, especially to the discoms, who can do better planning for short-term power procurement. The SCED-2 is implemented before the unit commitment solution to be worked out in the evening of the previous day (say, post 18:00 hrs). The SCED-2 solution is of no direct consequence to the market outcome as the UC solution would override the SCED-2 solution that was arrived at post DAM outcome. The SCED-3 would provide the solution at 22:00 hrs a day earlier for each of the time-blocks. This would also not be a committed solution as this would be overridden by the RTM solution. This would also serve the important role of disseminating market information before the RTM, thus improving market efficiency.

✍ **Multi-block Rolling SCED:** All the DA-SCED should be run for the whole set of 96-blocks together considering all technical constraints of the system constituents including technical minimum, ramping constraints, fuel availability etc. The current mechanism for SCED is still based on a single block based optimisation. As demonstrated through research at EAL, IIT Kanpur and, suggested earlier in previous issues of the Power Chronicle Vol 02 Issue 02¹, a multi-period modelling exercise provides more optimal solution as compared to individual block solution. It is suggested that multi-period rolling block based optimisation may be adopted for a more efficient solution for the sector.

✍ **Special Treatment of Energy Storage Systems especially Pumped Storage Plants (PSPs) in SCED:** The PSPs run both as a load as well as generator as per the operational strategy of the PSPs. Under current mechanism for SCED implementation, PSPs under generator function would only be eligible for participation. Economics of storage of energy in PSPs can also be part of the SCED mechanism, wherein all, the only run that can truly be called SCED would be the existing one which gives the despatch instructions after optimization across all the participating demand and supply side contracts.

MoP (Guidelines to Promote Development of Pump Storage Projects), 2023 [Draft]

MoP notified the guidelines entitled 'Draft to promote development of PSPs' on 15th February, 2023. The key highlights of the draft are mentioned below:

¹ Suggested by Singh et al, "Security Constrained Economic Despatch – India: A Rolling Block Implementation Framework" accepted in ICPS 2019, IEEE Conference at MNIT Jaipur, (2019) <https://ieeexplore.ieee.org/document/9067641> which demonstrated that effective cost savings from few blocks look-ahead, but implemented on block-wise basis to be higher. This was also covered in Power Chronicle, EAL's quarterly newsletter https://eal.iitk.ac.in/assets/docs/power_chronicle_vol_2_issue_2.pdf.

Note: The solution has not yet been implemented for the current 'real-time' SCED solution.

- ✍ India for clean energy transition by NDC targets of 50% of installed capacity to be renewable and 45% reduction in emissions by 2030 and going net zero carbon emissions by 2070.
- ✍ Considering large amount of VRE integration, PSPs are of importance for greater inertia and balancing power to the grid. They are well-suited to address dynamic supply and demand in the country. Peaking operation and reliability while battery storage solutions are still evolving and address only short duration storage needs in grid management.
- ✍ As per planned RE capacity addition of India as per NEP has set a target for 51.5 GW of BESS and 18.8 GW of PSPs addition till 2032. It is worth noting that on-river pumped storage potential is 103 GW. As of now, 8 projects are presently in operation of 4745.60 MW.
- ✍ Appropriate guidelines are required basically for execution of this long term plan effectively for PSPs promotion as well as to whom and how the development projects would be allocated.
- ✍ In short, the allocation would be to State PSU and Central PSUs based on predefined criteria specified, based on competitive bidding under which the tariff would be determined as per Section 62 in EA 2003 and based on TBCB whose tariff would be determined as per Section 63 in EA 2003.
- ✍ There are certain benefits provided to PSPs related to tax, charges and many more. Also, the participation of PSPs into market and specifically HP-DAM is discussed considering their timely support for ancillary services and offer suitable monetization.

EAL Opinion

- ✍ **Competitive Bidding and Swiss Challenge Approach to PSPs:** Rising share of variable renewable energy sources requires interventions in terms of flexible operation of the conventional power plants as well as deployment of energy storage systems. PSPs offer a relatively cost effective way to help implement a storage solution especially for absorbing higher RE generation, particularly solar generation. The efforts should be made to ensure that such projects are developed on competitive bidding basis.

In case a project developer seeks to develop an identified site u/s 62 of the EA, the same should be subject to Swiss Challenge Approach wherein a competitive project developer may offer lower capital cost/levelised cost/tolling charge as applicable. The Ministry should develop guidelines for implementing Swiss Challenge Approach for the Indian power sector.

- ✍ **GNA Regime and Waiver for ISTS charges:** As per the Clause 2.3 of the draft document proposes, “...waiver of ISTS and other transmission charges have also been made available to Pumped Storage Projects...”. The PSPs operate in ‘generator’ as well as ‘consumer’ mode. As of the transmission pricing regime under General Network Access (GNA), the drawing entity pays for transmission charges. It may be clarified that whether the waiver of ISTS charges will be applicable to the PSPs while operating in the pumping mode and to the beneficiary while the PSPs is operating in the generating mode.
- ✍ **Power Sector Development Fund (PSDF) for Support for Enabling Infrastructure for PSPs:** The PSDF created under the CERC’s Regulation and operated as per guidelines issued by the MoP, may be used for providing infrastructural/connectivity support or other similar support as per the CERC regulation. This may also be included in the proposed draft Clause 2 and Clause 4.3.
- ✍ **Tolling Based Competitive Bidding for PSPs:** The PSPs projects may be awarded to the project developers based on tolling charges, i.e. charge for conversion of energy fed in an off-peak hour to be converted into energy delivered during the peak hours. Such **Tolling Based Competitive Bidding would reduce the energy price risk for the project developers.** This would also not have adverse impact on the beneficiaries as they would now have a **cost effective solution to ‘convert’ off-peak (including solar power generated during the day) into peak power to be delivered to the beneficiary.**
- ✍ **Allotment through Tariff Based Competitive bidding:** As per the draft Clause 3.1(iii)(a) “Composite tariff (including the cost of input power) in case input power is arranged by the developer;”. The composite tariff should only be applicable for the power injected during the generation mode of the PSPs.

Further, the competitive bidding guidelines should also ensure that the **time period for drawal of input power by**

the PSPs should not overlap with the delivery period (see figure below), which if allowed, would result in the supply of the input power drawn by the PSPs directly to the beneficiary without any value addition through the PSP, and hence would impose additional avoidable cost to consumers.

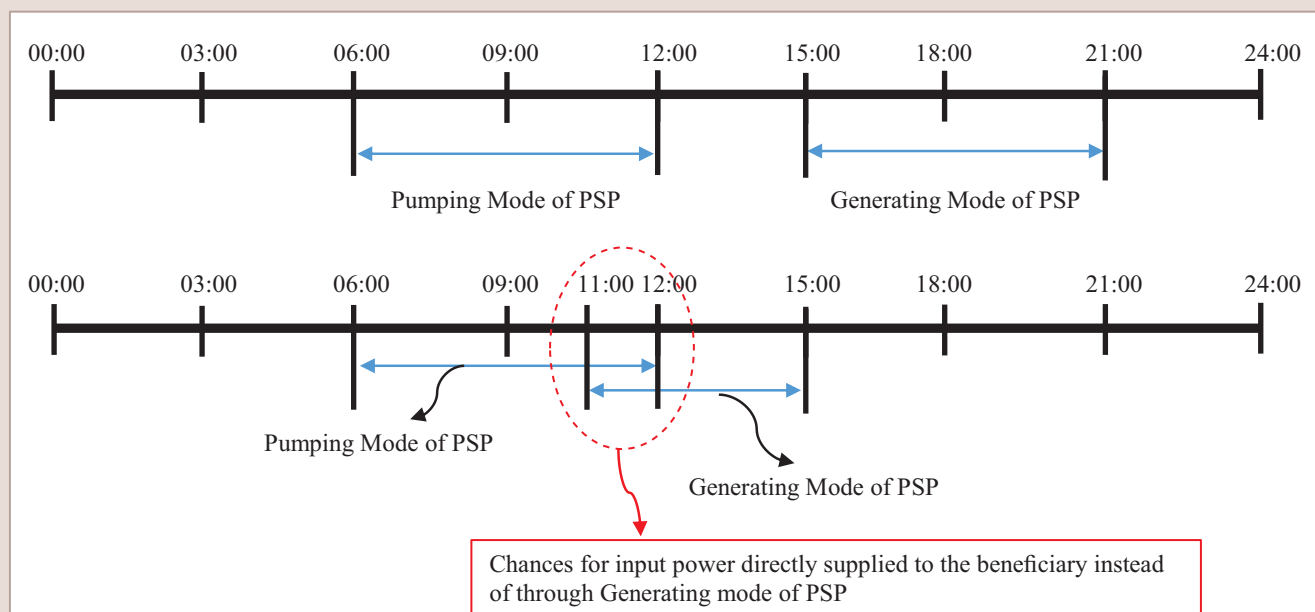


Figure 2: Disjointed & Overlapping timelines for Power delivery and Consumption PSP

✍ **Issue of Allotment Letter:** As per the draft Clause 3.2 “Developers shall begin construction within a period of 2 years from the date of allotment of the project, failing which, allotment of the project site shall be cancelled by the State.” Along with the time to begin the project development for PSPs from the date of allocation of the project that is within 2 years, there should also be a **time limit specified for issue of allotment letter to the project developer for ensuring timely start of the project. This would reduce risk for the project developers.**

✍ **Term and Conditions for PSP tariff and, Notification for peak and off-peak tariffs:** As per the draft Clause 3.3 (ii), “Appropriate Commission shall notify Peak and Off-Peak tariffs for Generation to provide appropriate pricing signal to Peak and Base Load Generating Plants. (emphasis added)”

As per EA 2003, the tariff is ‘determined’ (u/s 62) by the respective Commission. To ensure that the PSPs are operated in the most efficient manner, tariff for PSPs be determined with a normative assumption that almost 80-90% of electricity ‘generated’ from PSPs would be supplied through the ‘charging’ cycle and be supplied during the designated peak hours. This may differ based on specific project design as varying amount of energy (across seasons) would be produced by PSPs functioning purely as a hydro-electric plant.

An equivalent treatment of peak/off-peak energy injection while determining tariff whereas actual payment being done on the basis of energy injected during peak hours may lead to significant over-recovery imposing higher cost to the consumers. Thus, **separate regulations defining terms and condition for determination of tariff for PSPs should be put in place by the respective Commissions.**

✍ **Participation of PSP in HP-DAM:** As per the draft Clause 3.3 (iii) “PSPs and other storage projects shall be allowed to participate in the proposed high price segment of the day ahead market (HP-DAM) so that they can take suitable advantage of the price differential between Peak and Off-Peak tariffs.” The option for PSP to participate in electricity market should only be available after fulfilling the commitments under contract between the PSP developer and the beneficiary.

Since PSP projects are to be developed, under this policy, through any of the three options mentioned in the draft document, the associated power would be tied up in PPAs and hence a PSP project developer itself would not be able to participate in HP-DAM. However, the signatories to the PPA with PSPs can sell the associated power on HP-DAM.

As highlighted above, it would be important to specify that **only power ‘stored’ in HP-DAM through the RE sources would qualify for participation in HP-DAM**, rather than the directly selling the RE power, which is to be ‘stored’ by the PSP through pumping mode. In absence of such a criteria, cheaper RE power (associated with RE integrated PSPs) could be directly sold in HP-DAM. However, merchant PSPs and other storage projects may be allowed to participate in HP-DAM to trade ‘stored’ energy so that they can take suitable advantage of price differential between off-peak and peak tariffs.

- ✍ **Special Treatment of PSPs in SCED:** The PSPs run both as a load as well as generator as per the operational strategy of the PSP. Under current mechanism for SCED implementation, PSPs under generator function would only be eligible for participation. The pumping action of PSPs, which would use energy from identified source, can also be optimized through the SCED mechanism, If the PSP-Pumping is allowed as a ‘load’ along with its source of supply to be integrated in the SCED mechanism. **The SCED mechanism would thus need to be modified to allow dual role of PSPs (and other storage technologies).** Furthermore, co-optimisation of SCED and RRAS would also have to accommodate dual role of PSPs and other storage technologies.
- ✍ **Capex Limit of PSPs:** As per the draft Clause 3.4 “...the Central Government may notify a benchmark **cost of storage** for investment decisions of CPSUs for PSPs considering 6-8 hours of operation.....(emphasis added)” It is suggested that the benchmark cost of pumped storage specifically should be considered for reference and investment decision making. Consequently, the projects having higher benchmark costs should be avoided. An overall limit for capital investment may also be put so that cost effective PSPs are selected for development and the expensive ones are excluded wherever their tariff is to determined u/s 62 of the Act.
- ✍ **Operational Strategy for PSPs:** It has been observed that some of the existing PSPs have not been utilized effectively for the intended purpose in the past. The discoms as well as the SLDCs/RLDCs would have to cross the learning curve under the applicable framework to ensure that such assets are efficiently utilized for the intended purpose. SERCs would play a very important role in ensuring such a framework. Given that storage obligation limits the use of non-renewable power (up to 25% only), the same should be incorporated in the **respective regulation to be amended/introduced by the respective SERCs for optimal operation of PSPs.**
- ✍ **Applicability of CSS and Electricity Duty:** As a ‘consumer’ of electricity, the PSPs may be subject to cross subsidy surcharge. The respective regulation of the SERCs would have to **exclude the electricity consumed by PSPs from the ambit of CSS.** Furthermore, the state governments, where electricity duty is applicable on its consumption, should also **exempt such consumption from applicability of electricity duty.**

POSOCO (Detailed Procedure for Tertiary Reserve Ancillary Service) (TRAS) [Draft]

POSOCO notified a draft entitled ‘Detailed Procedure for Tertiary Reserve Ancillary Service (TRAS)’ on 20th February, 2023. The key highlights of the draft are mentioned below:

- ✍ **Objective:** Frequency maintenance is a point of concern in integrated operation of large power systems. Frequency response of any power system is generally characterized by responses like primary response, secondary response, and tertiary response. Primary response will be used as first line of defence, backed by secondary response and so on, reserves of which should be greater than one another. NLDC has been appointed as nodal agency which in coordination with RLDC and SLDC would estimate the quantum of requirement of TRAS (Day-Ahead as well as RTM) and communicate the same to power exchange through NOAR. All the generating stations whose tariff is determined u/s 62 of EA, can be used for providing TRAS services in case of any shortfall or grid security reasons, settlement for which will be provided from **Regional Deviation and Ancillary Service Pool Account.** The entities desired to participate in the ancillary services need to get standing clearance from respective SLDCs and RLDCs (minimum quantum for which is 1 MW) and register on the NOAR portal after which every registered provider will be assigned a unique code. After registration the TRAS providers can submit bids for TRAS Up as well as TRAS Down, scheduling details for which can be obtained from NLDC or respective SLDCs and RLDCs.
- ✍ **Eligibility of TRAS Provider:** The generating stations satisfying following conditions is eligible for participating:
 - Storage system and capable of providing demand response on standalone basin.
 - Vary active power and is able to deliver within 15 minutes and sustain for next 60 minutes.

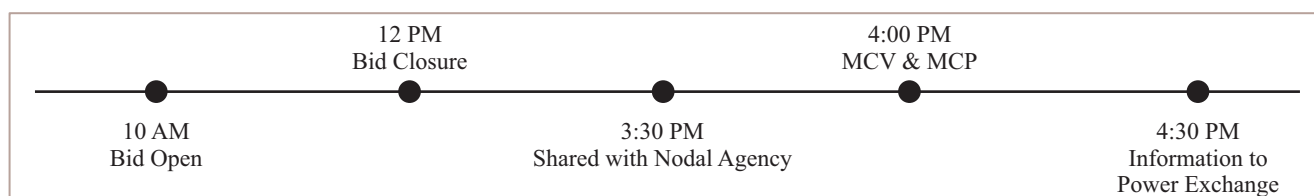
Criteria for Activation: TRAS will be activated if:

- SRAS is supplying continuously 100 MW for 15 minutes.
- There occurs extreme weather conditions like storms, fog etc.
- In case of outages of generating stations or transmission systems.

TRAS providers have open choice to participate in Day-Ahead AS or Real Time AS through combined bidding both for TRAS Up and TRAS Down. The bid for TRAS Up will be monotonically increasing and for TRAS Down it will be monotonically decreasing. The minimum volume for bidding will be 1 MW with a step volume of 0.1 MW. The floor price will be Rs. 100/MWh and the ceiling price will be Rs. 50000/MWh. The bids should be submitted for every time block in case of DAM (AS) and in case of RTM (AS) bids should be submitted for two consecutive blocks. The bids not cleared in DAM, and who are ready to carry on their bids will be transferred to Day-Ahead AS Market and the bids cleared in Day-Ahead AS market will be allowed to place incremental bids in RTM AS Market.

Price Discovery: The price discovery for TRAS-Up shall be based on the principle of Uniform Market Clearing Price subject to market splitting in case of congestion and for TRAS-Down it shall be based on the principle of Pay-as-bid.

Timeline for Day-Ahead AS Market:



Shortfall in Procurement: Any generating station with URS after RTM results and whose tariff is determined u/s 62, shall be used for TRAS by paying them 110% of the energy charges.

Emergency Conditions: The generating stations used to provide ancillary service under emergency conditions shall be compensated the energy charge as determined for them u/s 62 or 63 or as provided by the AS provider (who need to declare their compensation charges on monthly basis by 12th of every month from 16th of the month to 15th of the next month, otherwise last available compensation charges will be taken into consideration).

Settlement: The payment to the TRAS Provider(s) shall be made from the surplus available in Deviation and Ancillary Service Pool Account of the concerned Region where the TRAS Provider(s) is located i.e. from the concerned RLDCs "Regional Deviation and Ancillary Service Pool Account" before transfer of any residual amount to the PSDF.

EAL Opinion

Market Coupling under TRAS: The power exchanges would only collect bids for the TRAS market from the respective power exchanges and communicate the same to the Nodal Agency, which would combine those bids to determine market outcome. This is essentially market coupling and is deemed desirable as the underlying product is to be deployed for the sake of system security.

Available Capacity for Despatch under RRAS: Clause 1.3 of the proposed draft states that, "....65 power plants with an installed capacity of around 68,000 MW are getting despatched under RRAS on day to day basis." (emphasis added). This may be rephrased as below to provide correct perspective, "....65 power plants with an installed capacity of around 68000 MW are available for despatch under RRAS on day to day basis".

Capacity building of SLDCs for Developing Procedure and Accounting for Intra-state Participants of TRAS: For intra-state entities participating in TRAS, procedure, metering and accounting mechanism at SLDC level would need to be modified to take into account timely communication of the TRAS triggering and accounting thereof. This would require adequate capacity building of the SLDCs as well as the intra -state generators to enable participation of the later.

Ancillary Service Market Segment on PXs: Clause 4.5.2 states that "Power Exchange(s) would design a separate market segment namely "Ancillary Services" contracts for TRAS".

It is suggested that a separate category of products under a broad market segment of ‘Ancillary Services’ be created at the PXs. TRAS products would be the first such products to be traded under such a mechanism. More products may likely be added later.

✍ **Capacity Commitment by TRAS Providers:** Clause 5.1.2 describes the eligibility of TRAS provider as “....it is capable of providing TRAS within 15 minutes and sustaining the service for at least next 60 minutes”. This means that a resource (especially for TRAS-Up) whether deployed or not, once committed under ancillary services will be blocked at least for next 3 time blocks and thus cannot participate in the TRAS offering for the next three 15 minute blocks.

✍ **Floating Block Bid’s for TRAS:** In case of TRAS, a capacity and its bid are tied up for up to four time blocks. This kind of bid can thus be called a ‘Floating Block Bid’. **The MCP of such a bid is to be applicable for the anchor block (the first time block with which the bid is to be recognised) and the subsequent three blocks for the ‘cleared capacity’.**

For example, bid for block ‘t’ would effectively block resources from t to t+3 block. Hence, a generator cleared for a particular capacity for block t would then be excluded for participation for the next three blocks, even if it had submitted bid for TRAS from ‘t+1’, ‘t+2’ and ‘t+3’ blocks. **This would thus differentiate the bidding as well as market clearing procedure for the TRAS market segments. This would also influence the choice of price discovery algorithm as highlighted below.**

✍ **Price Discovery Algorithm:** Due to the floating block bid nature of the TRAS bid structure, an interesting paradox would emerge as to the choice of price discovery algorithm. In case a bid can be cleared for two separate time blocks with overlap in the ‘availability of resources for TRAS’, the payoff to the generator would differ under the two alternate algorithms identified here (See Figure 3).

The two alternate Price Discovery Algorithms are:

- A. Minimise cost of TRAS Procurement
- B. Maximise Social Surplus

The nodal agency may like to minimise cost of procurement of TRAS services. This would likely not lead to maximization of social surplus, and vice-versa. This leads to a paradoxical situation as to which of the Price Discovery Algorithms be adopted for market clearing of TRAS. It is also important to mention that the bidding behaviour of generators would be altered as they would take a call on participation based on expectation of their payoff. This is explained through Figures 3 to 6 below in case of market clearing price of second floating bid (MCP1) to be higher than that for the first one (MCP1), and vice versa.

✍ **Dynamic Commitment Charge for TRAS-Up:** The value for TRAS-up services would be higher during the period of expected shortages and is likely to see deployment of the same. Generators would attach different value to the capacity that they may like to offer for the TRAS market. A single commitment charge for TRAS-Up may not be able to incentivize the generators to offer their capacity for the TRAS-Up market. Given the dynamic situation in the market, the commitment charge payable to generators should not be static but dynamic. For example, higher commitment may be offered for peak hours.

✍ **Deviation Penalty for RE Sources:** Renewable energy sources, participating in TRAS-Down market, would likely benefit from weaker DSM penalty regime at inter-state as well as intra-state level at the cost of the consumers. Participation in TRAS-down (during peak RE generation) would further incentivise overestimation of RE generation and injection. In case deployed for the TRAS-down, participating RE generators, who would have overestimated generation, would get paid 90% of their energy charges while also avoiding DSM penalty if it would have been applicable. The pricing mechanism should thus ensure that such incentives are minimized. This also further strengthens the argument for urgent applicability of DSM structure to RE generators, whose share is on the rise.

✍ **Maximum Ceiling for Bidding in TRAS Market Segment:** Clause 10.5 states that “The minimum quotation step or price tick would be Rs. 100 per MWh subject to maximum ceiling of Rs 50000 per MWh...”. For clarity this may be modified as “The minimum quotation step or price tick would be Rs. 100 per MWh subject to maximum ceiling of Rs 50000 per MWh for the bid...”

✍ **‘MoD’ based Despatch of TRAS Across DAM and RTM:** Clause 13.6.2.1 states that “In the event of the MCP

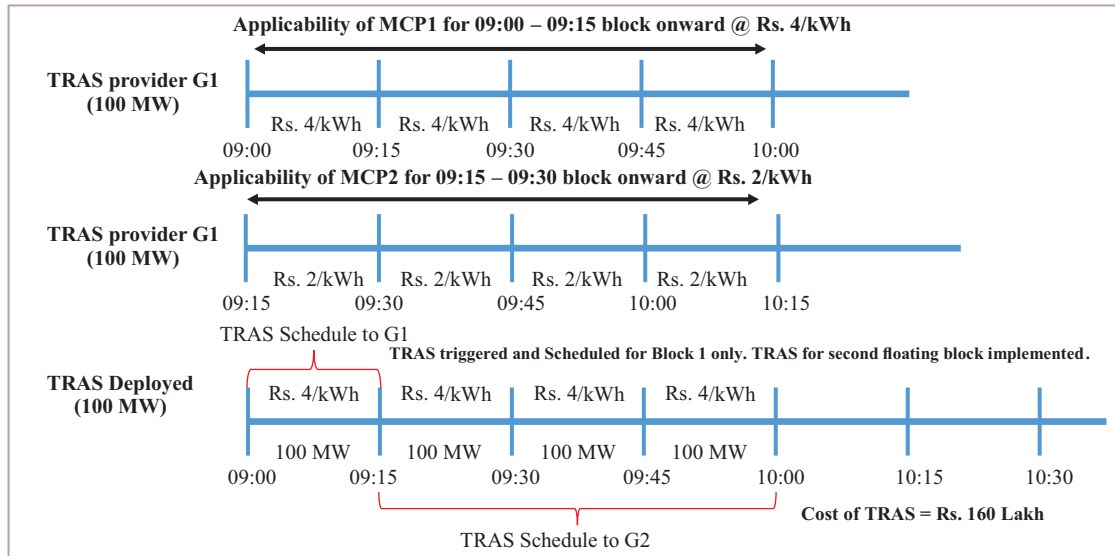


Figure 3: Floating Block Bid – Maximise Social Surplus (MCP 1 > MCP 2)

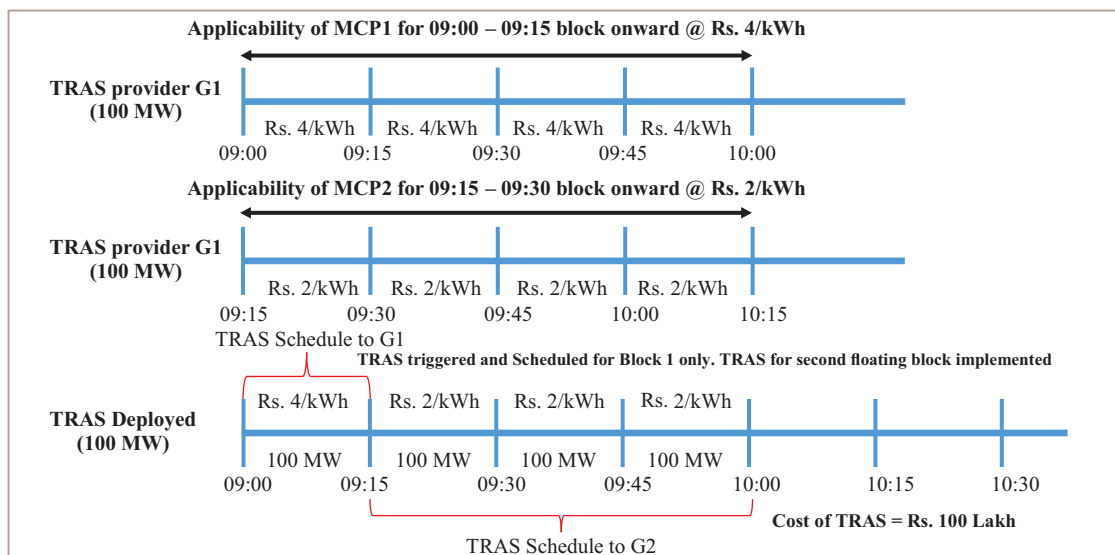


Figure 4: Floating Block Bid – Minimise cost of TRAS Procurement (MCP 1 > MCP 2)

Energy-Up-DAM being equal to the MCP-Energy-Up RTM, TRAS-Up shall be despatched on pro-rata basis”.

Deployment of TRAS-Up/Down should be undertaken on the basis of coupled MCV of the DAM and the RTM segments. If the market segment, say TRAS-Up-DAM, has lower discovered price than the TRAS-Up-RTM, the former should be deployed in full and the rest of the requirement be deployed from the later market segment. In doing so, **the principle of ‘economic despatch’ would be followed across the two market segments**². In case of part deployment to a TRAS market segment, the pro-rata approach be followed for allocating rest of the TRAS-Up requirement amongst the cleared generators in that segment.

✍ **Transmission Losses:** Clause 14.1 states that “No inter-state transmission charges and transmission losses shall be applicable for the TRAS-Up and Down delivery. (emphasis added)” The statement should also clarify whether inter-state transmission losses, intra- state transmission losses or both are exempted.

✍ **Part Load Compensation:** In line with other similar provisions associated with ancillary services, part load

² It is clarified that the merit order comparison would only be across the aggregated cleared block of DAM and the RTM market segments of TRAS respectively

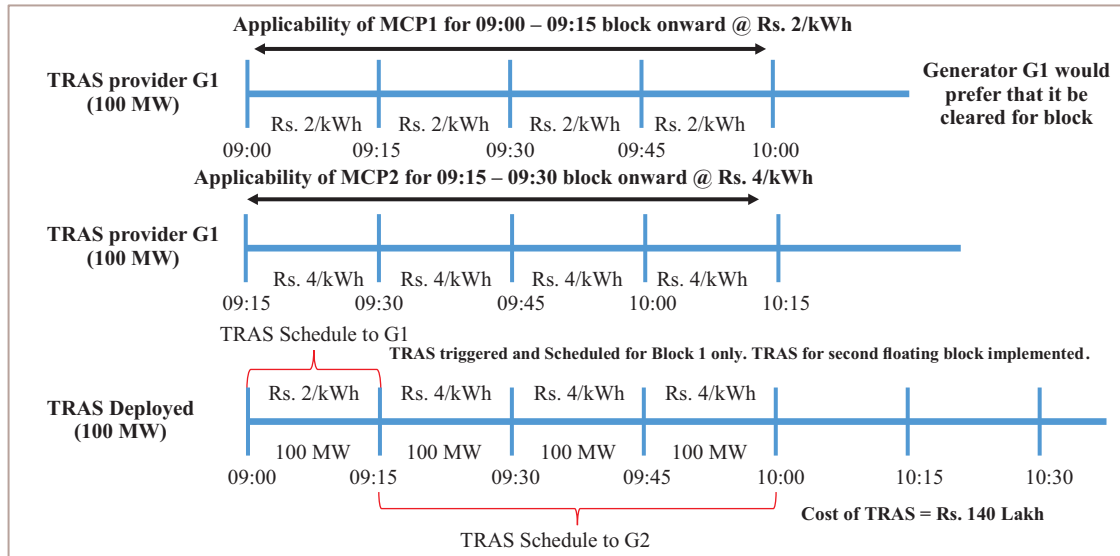


Figure 5: Floating Block Bid – Maximise Social Surplus (MCP 2 > MCP 1)

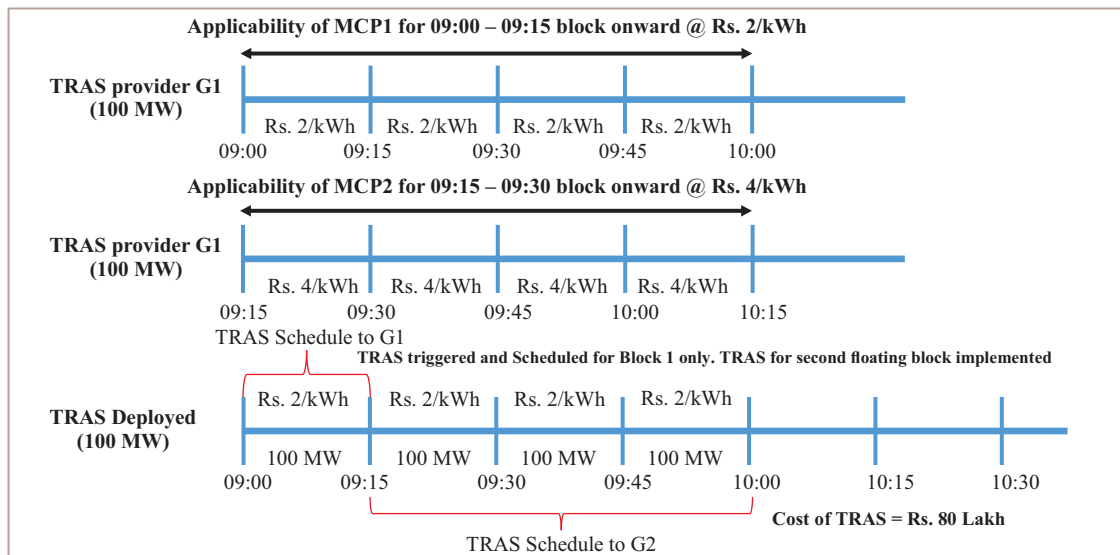


Figure 6: Floating Block Bid – Minimise cost of TRAS Procurement (MCP 2 > MCP 1)

compensation should be adjusted for TRAS-Down (TRAS-Up), which would result in lower (higher) plant loading part load operation.

Deployment of Generating Stations falling u/s 62: Clause 15 states that “All generating stations, whose tariff is determined by the Commission under Section 62 of the Act including those having Un-Requisitioned Surplus (URS) power after declaration of the Real Time Market (RTM) results, shall be deemed to be available for use by the Nodal Agency for TRAS, subject to technical constraints of such generating stations”. Also “The above said generating stations, whose URS is despatched for TRAS-Up, in the event of short-fall in procurement of TRAS-Up through the Market, shall be paid at the rate of **110% of their energy charges for the quantum of TRAS-Up despatched**”. It is suggested that the generating stations whose tariff is determined u/s 62 of EA, 2003 and whose URS is being used in case of shortfall of TRAS-Up, should be placed as one of the bidders, so as to displace the market volume (instead of giving them 110% energy charge), at a bid equal to the their energy charge, thus improving overall market efficiency.

It is important to highlight that while TRAS is being introduced through a market mechanism, any further adjustment in price to be paid is against the market philosophy and is not fair to other market participants.

EAL News

Capacity Building Program



CER IIT Kanpur in association with Forum of Regulators, successfully completed the 16th Capacity Building Program (CBP) for officers of SERCs and CBP for JERCs & CERC on “**Regulatory Perspectives on Network, Renewable Energy and Market Development**”. The session was held at IIT Kanpur Noida Outreach Centre from 3rd February to 4th February, 2023 & Melbourne, Australia from 7th February to 9th February, 2023. The program was designed to help all SERCs officers to understand and analyse the key issues in the power sector from Economics on Governance Structure, Energy Market & regulatory perspective. The distribution of prizes was officiated by Dr. Sushil Kumar (Consul General, Australia). The key speakers were Mr. G. Srinivasan (CEO, Tata Power), Ms. S. Agarwal (Jt. Chief (Engg.), CERC), Mr. C. Popple (Comm'r, AEMC), Ms. C. Eddy (G.M., (Dist.), Ausnet Services), Dr. J. Hamill (CEO, ESC), Mr. K. Funston (Exec. G.M., AER), Mr. K. Huynh (Director, AER) & Ms. S. Sheppard (Director, ESC). For further program details including program duration, key topics, please visit <https://cer.iitk.ac.in/cbp16>.

Regulatory Certification Program - Power Sector Regulation



CER in association with EAL, successfully completed the Regulatory Certification Program (RCP) on “**Power Sector Regulation: Theory and Practice (PSR)**” dated 19th February, 2023 to 5th March, 2023. The valedictory session held on 15th March, 2023 was graced by “Dr. M. V. Rao, (Chairperson, WBERC)” along with other eminent speakers. The program was designed to help the understanding of the participants and the analysis of key issues in the power sector from economic, legal and regulatory perspective. The speakers included Mr. G. Prasad (Jt. Sec, MoP), Mr. S. C. Shrivastava (Jt. Chief (Engg.), CERC), Mr. H. T. Gandhi (Sr. Advisor, CERC), Prof. J.M. Glachant (President, IAEEE), Mr. Buddy A. Ranganathan (Lawyer, Supreme Court), Mr. A. Dutta (Director (Engg.), WBERC), Prof. T. Jamasb (Prof., CSEI), Mr. B. K. Sahoo (

Project Exec. officer, IIT Kanpur) & Dr. Anoop Singh (Prof., IIT Kanpur). The Program was hosted at CER's Online Learning Environment and Tools (OLET) platform under the aegis of Centre for Continuing Education, IIT Kanpur. For further program details including program duration, key topics, etc. please visit https://cer.iitk.ac.in/psr_reg?id=1.

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