

Power Chronicle

Power System Overview & Analysis

- ❖ All India Demand Met Profile 2
- ❖ Region-wise Demand Met Profile 2
- ❖ All India Renewable Energy (RE) Generation Profile 3
- ❖ Region-wise Unscheduled URS 3
- ❖ Short-term Energy Transactions 4

Power Market Overview & Analysis

- ❖ DAM – Market Clearing Price (MCP) & Market Clearing Volume (MCV) 5
- ❖ Term – ahead Market 5
- ❖ POSOCO's Security Constrained Economic Despatch (SCED): EAL's Analysis 5

Regulatory & Policy Perspective

- ❖ CERC – Proposed Framework for Real Time Market (RTM) for Electricity 6
- ❖ POSOCO – Revised Procedure for Security Constrained Economic Despatch (SCED) 7

Data Download Feature on EAL's Web Portal 8

Editorial

Expected to further broaden and deepen the short-term electricity market in India, rollout of Security Constrained Economic Despatch (SCED) and the upcoming introduction of Real Time Market (RTM) are steps in that direction. The SCED optimises power procurement across ISGS plants, once state entities have finalised their respective schedule. The benefits of SCED are measurable and highlight the benefit of adopting broad-based market framework.

EAL is pleased to note that one of its key recommendations, adoption of the multi-period optimisation framework, is being adopted by POSOCO under the revised SCED procedure. In this issue of Power Chronicle, we identify some additional issues that deserve attention. Under the benefit sharing mechanism, adjustment towards reduction in part load operation on account of an increment in schedule needs to be incorporated to ensure that the DISCOMs do not end up paying for the part load plant operation that did not finally happen.

Absence of a liquid and broad based market product, which can help buyers as well as sellers to take market decisions closer to the time block, is being addressed through the RTM. Availability of a more reliable demand forecast, and latest known availability of the generation resources as well as the transmission network closer to the time block bridges the information gap in making 'real time' market decisions.

While theoretical underpinning of the RTM concept are established, the market outcome depends on the rules for market design and its operation. RTM being voluntary in nature, should be able to entice the URS capacity across the country. Mandating bidding of URS at their VC (plus the 7 paise margin) would ensure participation of generators which fully recover their fixed charges. This would enhance competition and liquidity in the RTM. Capacity building of DISCOMs and the SLDCs, enhancement of in-house skills and regulatory nudge to optimise cost of power procurement can enhance participation of the distribution utilities.

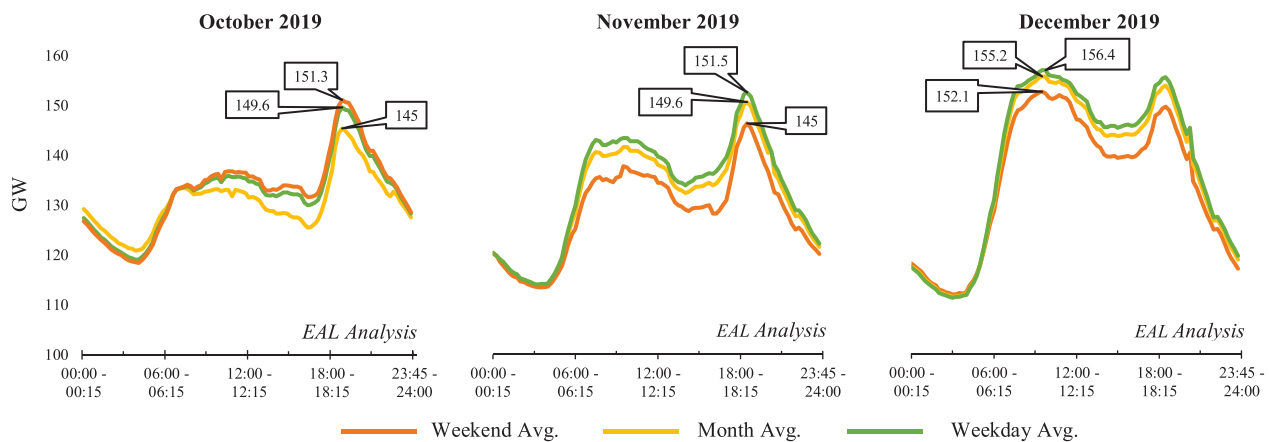
Anoop Singh
Coordinator, Energy Analytics Lab



Register at eal.iitk.ac.in to access data and resources

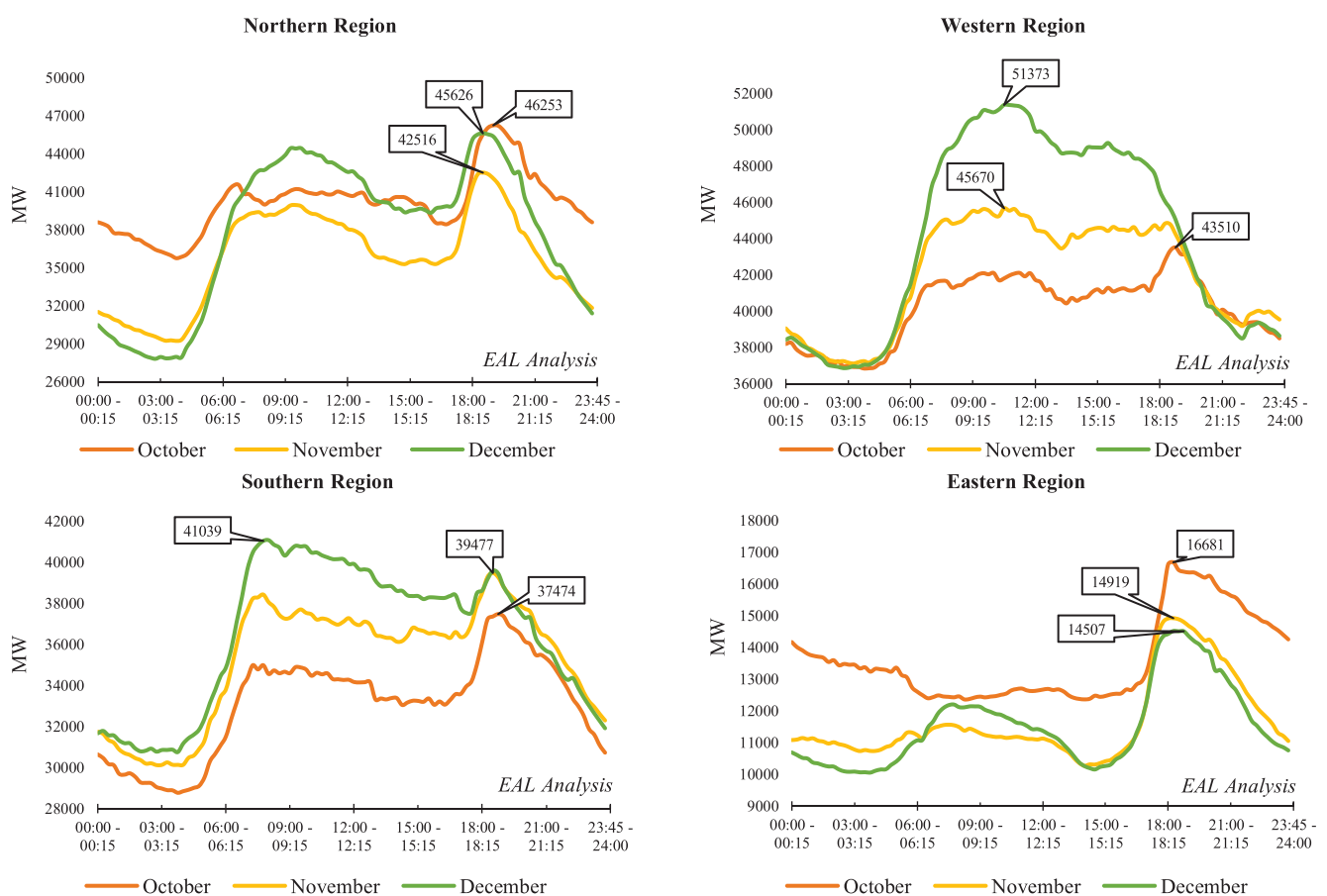
Power System Overview & Analysis

All India Demand Met Profile



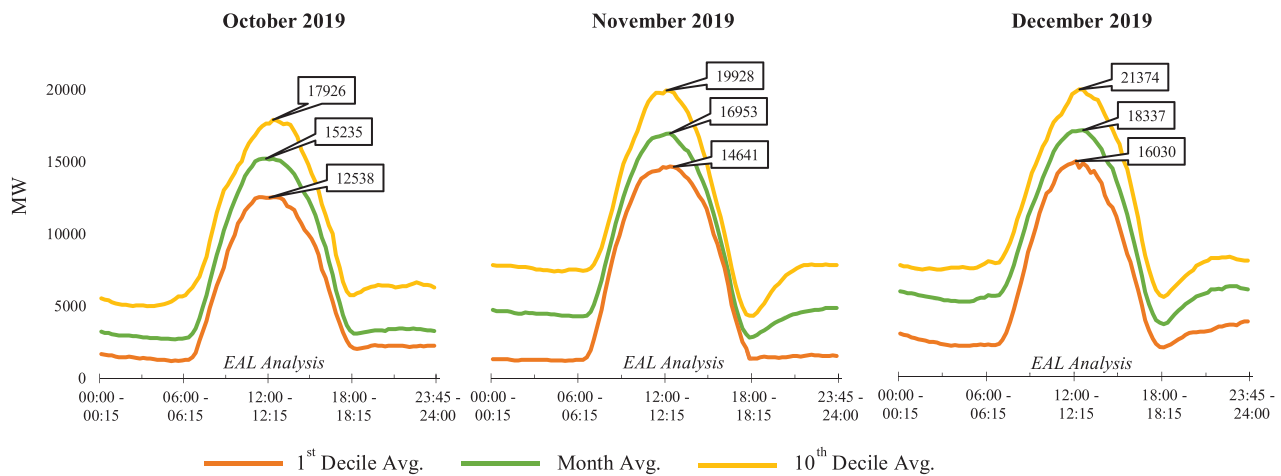
For October to December quarter, all India peak demand reached 170.49 GW (11:45 - 12:00) on 26th December 2019, about 0.1 percent lower than the previous year's peak demand recorded at 170.68 GW (19:00 – 19:15) on 3rd October 2018 during the same quarter.

Region-wise Demand Met Profile



Demand and generation profiles at national and state level can be accessed on [EAL's web portal](#).

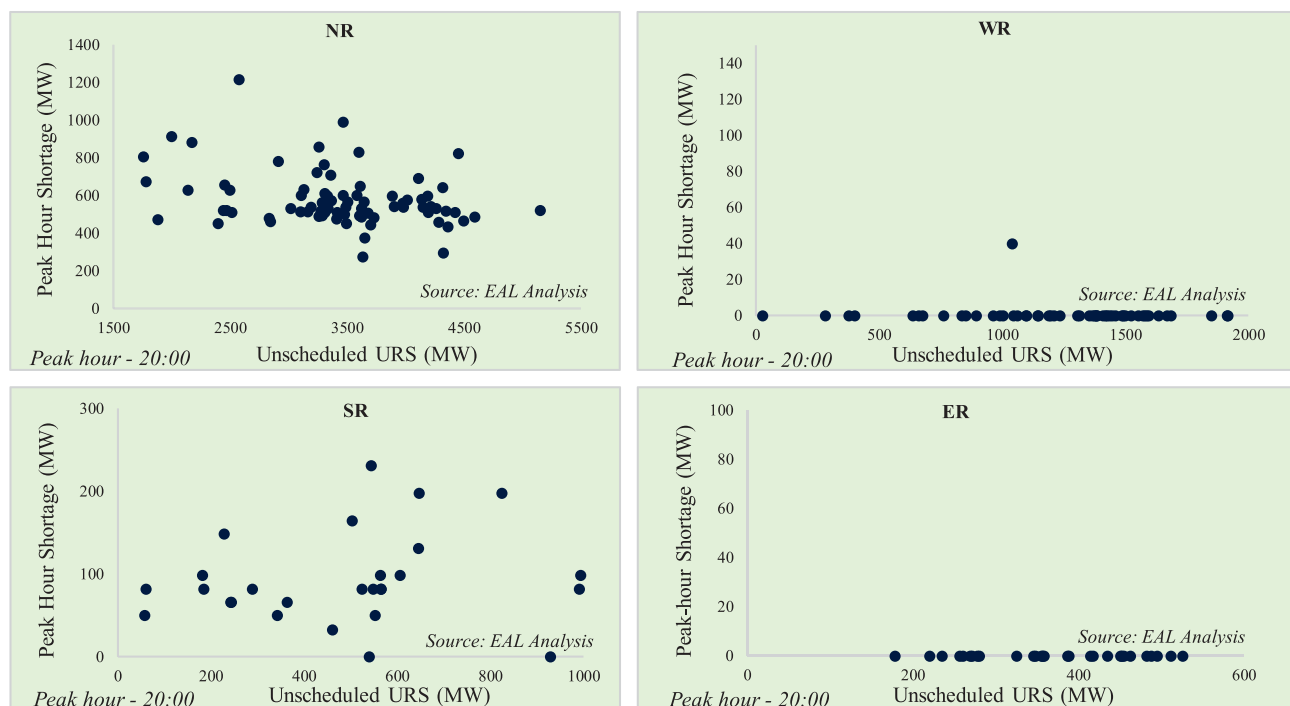
All India Renewable Energy (RE) Generation Profile



All India RE generation reached 22.43 GW (14:30 - 14:45) on 23rd December 2019 during October to December, about 19 percent higher than the previous year's highest recorded RE generation which was 18.83 GW (12:00 - 12:15) on 15th December 2018 during the same quarter.

Region-wise Unscheduled URS (Excluding Gas Power Plants)

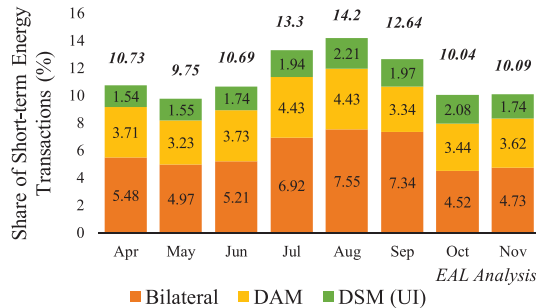
All India highest peak-hour demand shortage during October to December 2019 was recorded to be 1765 MW, on 4th October 2019 in NR. RTM is expected to improve URS utilisation on account of demand side participation and also provide greater space for optimisation through SCED.



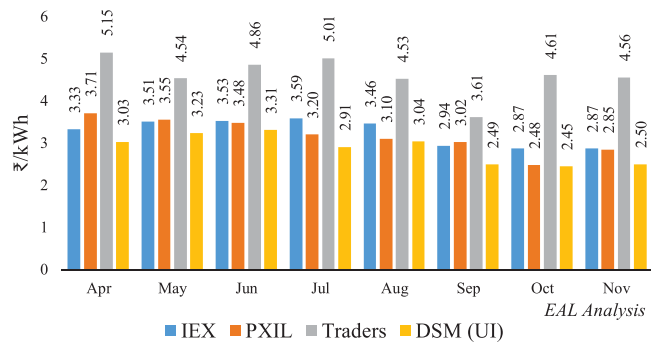
Northern Region (NR) is exhibiting higher peak hour shortage in comparison to the other regions because of the higher peak hour shortage in Jammu & Kashmir which accounts for approximately half of the peak hour shortage in NR. There should be a clear visibility of available URS and its merit order so that utilities can make arrangements to include this URS in their short-term power procurement planning.

Short-term Energy Transactions

Share of Short-term Energy Transactions in Total Electricity Supply (2019)

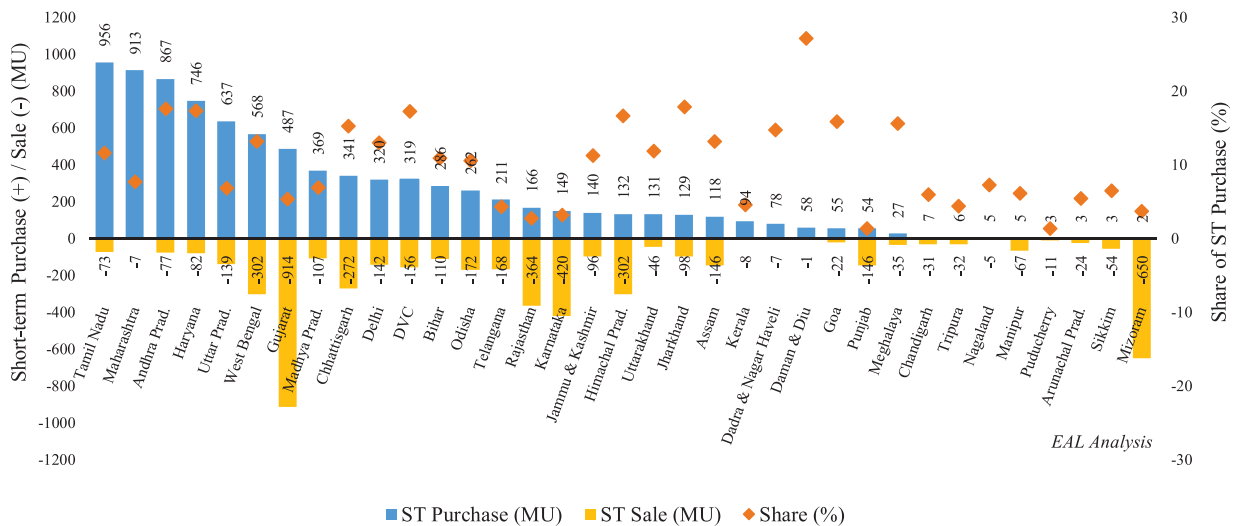


Weighted Average Price for Short-term Transactions (2019)

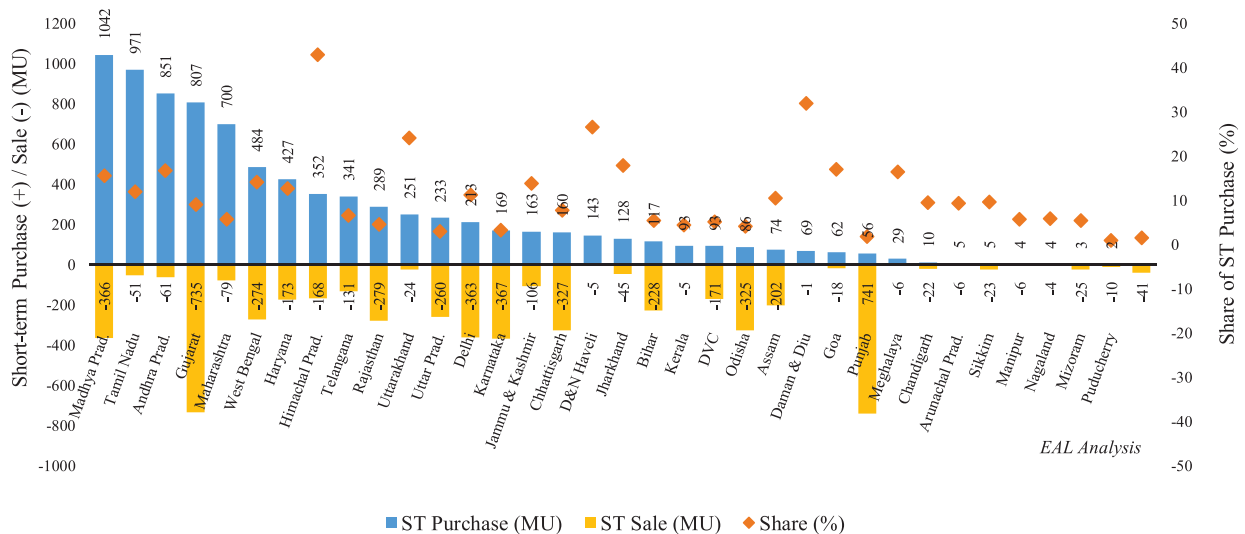


Monthly Short-term (ST) Purchase and Sale Quantum across States

ST Energy Sale, ST Energy Purchase and Share of ST Purchase in Total Energy Supplied (October 2019)

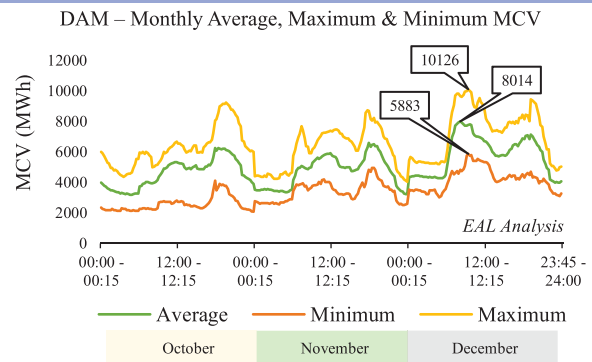
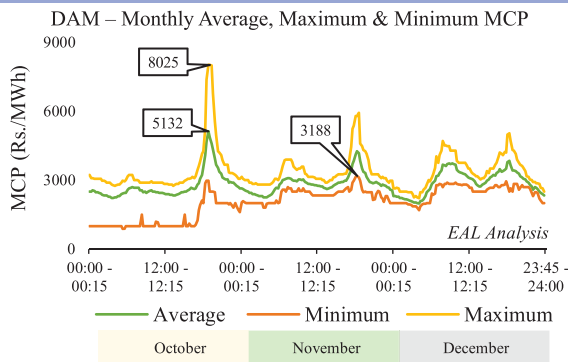


ST Energy Sale, ST Energy Purchase and Share of ST Purchase in Total Energy Supplied (November 2019)



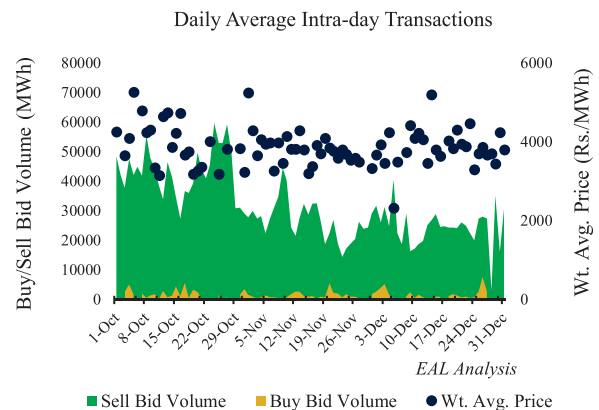
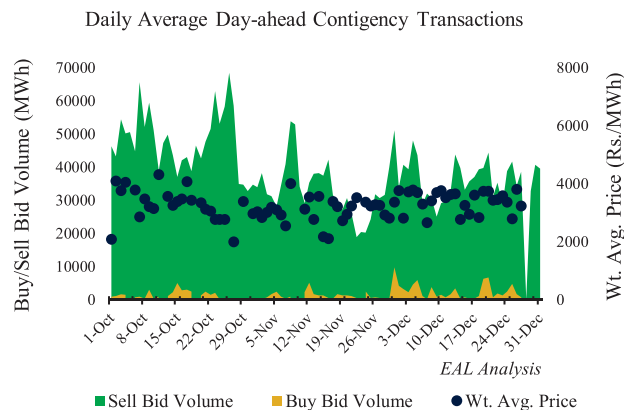
Power Market Overview & Analysis

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



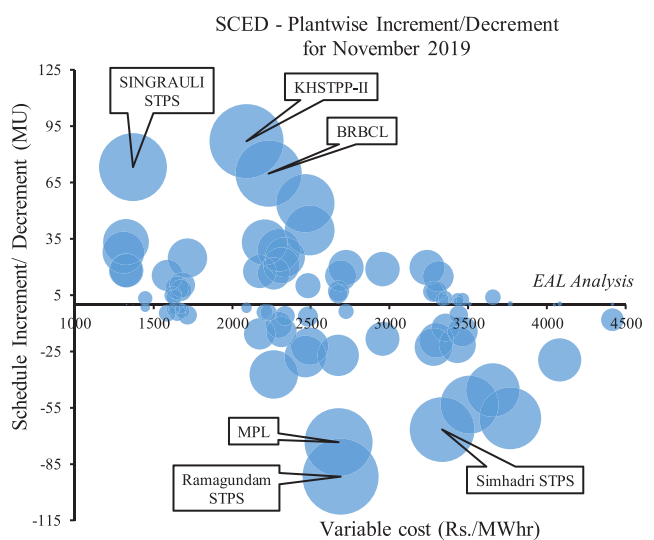
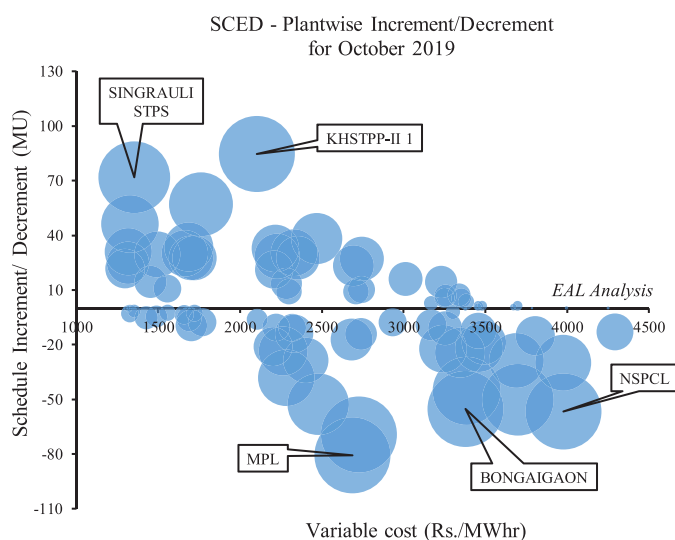
December 2019 experienced lower price in DAM. The highest MCP at Rs. 8025.31 per MWh, was witnessed on 7th October 2019.

Term-ahead Market (TAM)



The weighted average clearing price observed in the Intra-day market during October to December quarter is higher in comparison to the Day-ahead contingency market. Also, the proportion of sale bids is much higher when compared to the buy bids.

POSOCO's Security Constrained Economic Despatch (SCED): EAL's Analysis



Regulatory & Policy Perspectives

Proposed Framework for Real Time Market (RTM) for Electricity

CERC released a "[Statement of Reasons](#)" on 12th December 2019, stating the rules and regulations to be implemented for operation of RTM, after taking into account the suggestions received from various stakeholders.

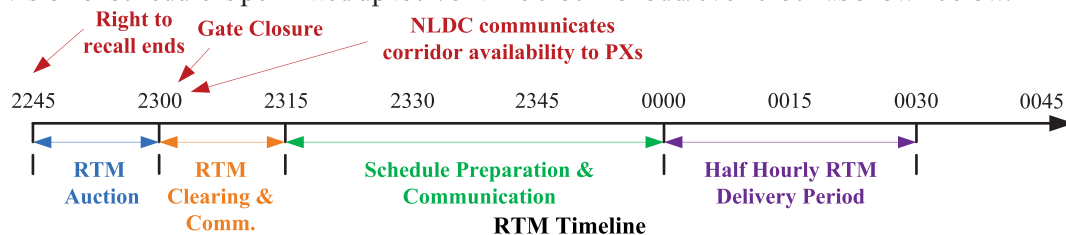
RTM, the half hourly market to commence from 1st April 2020, provides a platform to optimise the power procurement portfolio of DISCOMs and derive optimal value for generation assets across the country.

Eligibility and Design

- ❑ Eligibility – All GENCOs with URS including RE generators having un-tied capacity, and DISCOMs with capacity share in a generating station. Participation in RTM is voluntary.
- ❑ Auction design and price discovery – Double-sided closed auction with uniform pricing.
- ❑ Gate Closure – 4 time blocks before actual delivery.

Procedure and Timeline

- ❑ NLDC will assess the transmission margin and will communicate transmission corridor availability to Power Exchanges for clearing and settlement of RTM.
- ❑ Power Exchanges to frame suitable market rules and bye-laws for proper implementation of RTM.
- ❑ Revision of schedule is permitted up to 7th/8th time block for odd/even block as shown below.



Transmission Curtailment

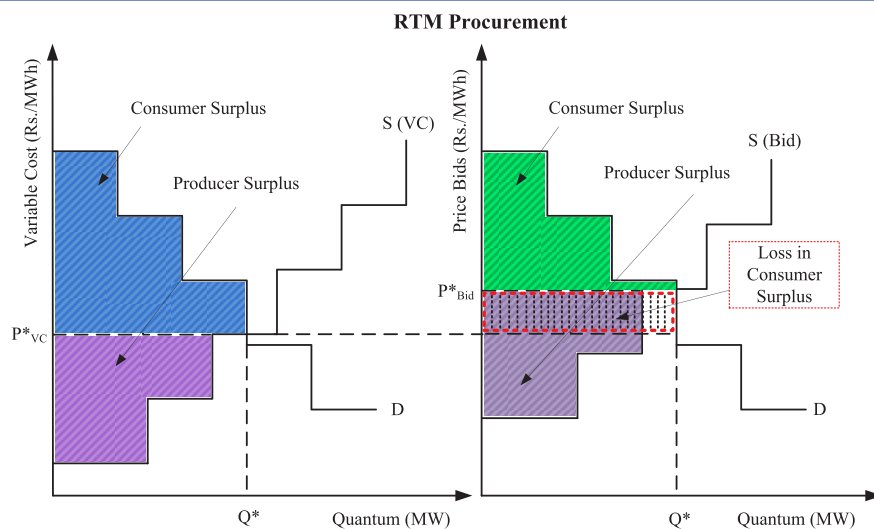
- ❑ In the extreme event of curtailment of collective transactions, the Day-ahead collective transactions would be curtailed first followed by the Real time collective transactions.

Profit Sharing

- ❑ Participant Generators under Section 62 will share the net gains with the DISCOMs in 50:50 subject to a ceiling share of 7 paise/kWh to the generator and the balance to the beneficiary.
- ❑ Generators under Section 63 might need to sign a supplementary PPA with the buyer in order to implement the above gain sharing mechanism.
- ❑ DISCOMs selling their share of capacity in a generating station can retain entire net gains.

EAL OPINION

- ⚡ Alternate Auction Design - Since fixed cost for all the ISGS generators is borne by the beneficiaries, an alternate auction design, wherein their URS capacity is mandated to bid at their VC (plus 7 paise margin), can be considered. Merchant capacity can bid as per their economic value. Discovery of market price would thus become more competitive, and would help recover loss of consumer surplus (see figure below), thus benefitting the DISCOMs and the final consumers.
- ⚡ Active participation of generators and DISCOMs is crucial to the vibrancy of RTM. The current incentive structure across market segments especially the URS and the RRAS, which provides for recovery of associated fixed charges, may need to be finetuned. Initial experience with RTM may further help assess the need and direction for the same.



- ✍ A high proportion of sell side liquidity (as compared to buy bids) in the Day-ahead contingency and Intra-day transactions is observed (Refer to TAM charts on page 5). RTM, a competitive auction mechanism by design, should be able to attract participation of DISCOMs to ensure that there is sufficient buy side liquidity, further enhancing the competitiveness envisaged through RTM.

Revised Procedure for Security Constrained Economic Despatch (SCED)

- ❏ CERC has directed POSOCO to extend pilot on SCED till 31st March 2020. Revised procedure would follow multi-period optimisation. Based on a modelling exercise undertaken, EAL suggested the same (*Power Chronicle*, Vol.2 Issue1 & 2) and also discussed it with POSOCO.
- ❏ In the revised model, violation and the associated penalty for Ramp up, Ramp down and ATC have been considered in the constraints. The penalty, benchmarked to schedule violation, will be the highest variable cost rounded to nearest Rupee. Ramp violation will be one-third of schedule violation and penalty for ATC violation will be twice of the schedule violation.
- ❏ Benefits on account of increment/decrement to schedule of a generator would be shared on 50:50 basis between generators and DISCOMs on the basis of their final schedule. The generators' share would be further bifurcated on 60:40 basis for increment and decrement generators respectively.
- ❏ In the case of delay in payment from SCED generator to the SCED National Pool, a generator is liable to pay 0.04% interest per day of delay and vice versa.
- ❏ Pre-SCED schedule would be applicable in the case of a failure or interruption in the SCED software, or a communication failure.

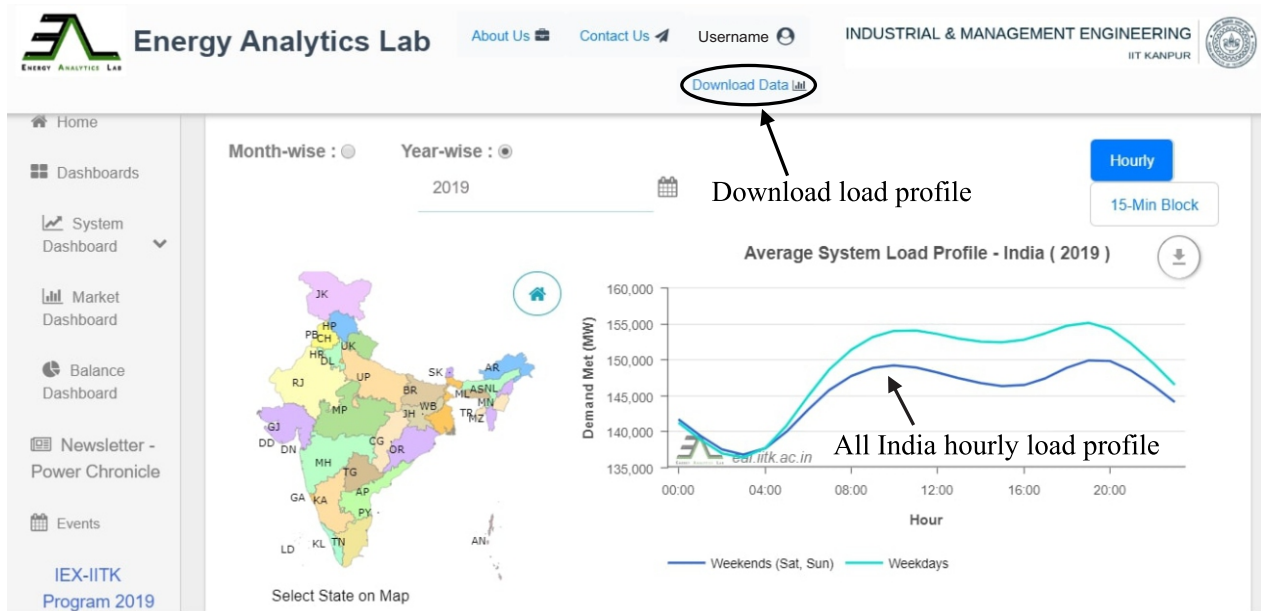
EAL OPINION

- ✍ The revised procedure provides for violation of ramping and transmission constraints for obtaining the optimal solution to avoid infeasible or non-convergent cases. Impact of such violations, if recurrent, should be scrutinised and addressed appropriately.
- ✍ From a modelling perspective, violation penalties should at least be equal to the highest VC. Higher penalties are generally recommended. In any case, the highest VC (used in this context) should be rounded to the next Rupee rather than the nearest one, thus ensuring a more optimal outcome.

- ✎ Opposing ramping requirement across two regions, as mentioned in the revised procedure, should generally assist a solution unless the transmission links connecting the two regions face a constraint.
- ✎ State beneficiaries are to be billed by their respective generator on the basis of RLDC schedule issued prior to SCED optimisation. SCED settlement provides for adjustment towards part load compensation due to decrement issued to the SCED generators. Such an 'adjustment' should also be provided against 'reduction' in part load operation post increments issued to the generators. Otherwise, beneficiaries face unsymmetrical settlement thereby causing higher burden to the end consumers.
- ✎ As SCED is closer to the delivery period (in comparison to DAM), in the event of a communication failure in providing the SCED schedule to the generators, the applicability of/waiver from the resultant DSM charges should be clarified.

Data Download Feature on EAL's Web Portal

To assist research, EAL's portal now provides for downloading hourly and block-level all India and state-specific load profile data. Data is available for monthly and annual profile for weekdays and weekends. It can be downloaded after registering on the [EAL's web portal](http://eal.iitk.ac.in). Acknowledgement to EAL, IIT Kanpur is requested.



We request your feedback for making EAL and this newsletter more relevant to the sector. Please write to us at:

Team Power Chronicle

Energy Analytics Lab (EAL)

Department of Industrial and Management Engineering
Indian Institute of Technology Kanpur
E-mail: eal@iitk.ac.in
Phone: 0512-259 6448



eal.iitk.ac.in

Dr. Anoop Singh

Professor, Dept. of IME
Indian Institute of Technology Kanpur
Founder & Coordinator, CER and EAL
Website: www.iitk.ac.in/ime/anoops

Other Initiatives



Centre for Energy Regulation



cer.iitk.ac.in



ems.iitk.ac.in

Disclaimer: Though due care and caution has been taken during the compilation and reporting of data, EAL or IIT Kanpur do not guarantee the accuracy, adequacy or completeness of any information published herein. Any opinions, analyses or estimates contained in this document represent the judgement of Energy Analytics Lab at this time and are subject to change without notice. Readers of this newsletter are advised to seek professional advice before taking any course of action or decision based on the contents presented here. EAL or IIT Kanpur do not accept any responsibility for the consequences of the same.