MINUTES OF THE 65th MEETING
OF THE
FORUM OF REGULATORS (FOR) HELD AT BHUBANESWAR, ODISHA

Venue	**:**	**Empress Hall** **Hotel The Crown, Bhubaneswar**
Day / Date	**:**	**Tuesday, the 13th November, 2018**
List of Participants	**:**	**At Annexure-I (Enclosed)**

The meeting was chaired by Shri P.K.Pujari, Chairperson, Central Electricity Regulatory Commission (CERC) and Forum of Regulators (FOR). The Chairperson, CERC/ FOR welcomed all the Members of the Forum to the Meeting. He specifically welcomed Chairperson, Uttar Pradesh Electricity Regulatory Commission and Chairperson, Chhattisgarh Electricity Regulatory Commission who were attending the meeting for the first time after they took over charge in their respective offices. He also informed the Forum that Chairpersons of Karnataka and Meghalaya would be demitting office before the next FOR meeting. He placed on record the valuable contribution by both the Chairpersons to the FOR meetings

Thereafter, the Forum took up the agenda items for consideration.

BUSINESS SESSION – I

AGENDA ITEM NO. 1: CONFIRMATION OF THE MINUTES OF THE 64th MEETING OF THE FORUM OF REGULATORS HELD ON 24th AUGUST 2018 AT NEW DELHI.

Chairman, Tamil Nadu Electricity Regulatory Commission referred to Agenda Item No 3 pertaining to "Launch of Report of POSOCO on Renewable Energy Certificate Mechanism in India" and stated that currently there are no takers for REC as the prices of RE have shown a declining trend and hence, there should be a rethink on the REC mechanism. Chairman, SERC, Odisha argued on the other hand that the mechanism provides an alternative route for RPO compliance and the obligated entities decide based on cost of compliance whether to go for RECs or green power. Chairperson, CERC/ FOR informed the Forum that as CERC has already taken an initiative to conduct the Regulatory Impact Assessment of RECs, the study can also examine the relevance of RECs in the current market conditions.

After deliberations, the Forum while endorsing the minutes of the 64th Meeting of FOR, held on 24th August, 2018 at Ranchi, Jharkhand, stated that the relevant extract of the minutes of the said agenda Item may be amended as follows:

" .....In this matter, the Forum was informed that CERC is in the process of taking up a Study on Regulatory Impact Assessment of RECs and the issues as raised by the members regarding relevance of REC mechanism in the context of current scenario will get covered in the said study. ....."

AGENDA ITEM NO. 2: REPORT OF 'FOR' TASK FORCE FOR NORTH-EASTERN REGION

A. Shri Anand Kumar, Chairman, GERC and Chairman of the Task Force for North Eastern Region gave a brief background on the constitution and objective of the Task Force.

B. The recommendations of the Task Force included Functional Segregation of Generation, Transmission and Distribution Business , Bridging the Gap between ACOS and Per unit average revenue realized (ARR), Issuance and Implementation of DSM Regulations, Preparation of a roadmap for catering to future growth in demand, Energy Audit at Sub-Station and Feeder level, Reduction in AT&C Losses, Region specific Data Portal, Strengthening of SLDCs of N-E States, Region specific Core Groups for knowledge exchange and capacity building and Institutional Strengthening of State Regulatory Commissions in the N-E Region.

C. The Way Forward recommended by the Task Force included the North-Eastern States to take up a continuous process for performance enhancement by periodic monitoring of the performance parameters discussed in this Report during ARR/APR processing of Utilities; SERCs and other stakeholders such as State Utilities and State Governments in the N-E Regions to undertake effective and time bound implementation of schemes like UDAY, UJALA, implementation of SAMAST, DSM to implement grid discipline in the N-E Region and Creation of Knowledge exchange platform for sharing regulatory developments/ innovations amongst NE States

which can include core groups of Discoms and SLDCs in the N-E region.

D. After deliberations on the report, the Forum endorsed the recommendations and Way forward of the Task Force. Additionally, they recommended that:

i. North-Eastern SERCs/ JERC should direct their Utilities to regularly monitor progress against the parameters specified in the report through a compliance format as part of the ARR process. SERCs could use the formats/ templates used for this exercise to undertake quarterly/ six monthly review in case of some of the technical parameters e.g. distribution loss/ ATC loss, distribution transformer failure rate, defective meter replacement, pending connections etc.
ii. The FOR Standing Technical Committee will monitor the progress of implementation of parameters (discussed in the report) periodically and submit a status report to the FOR.
iii. The Report of the FOR on the North East Region may be sent to all the State Governments of the North-Eastern Region for their reference.

AGENDA ITEM NO. 3: 'FOR' WORKING GROUP ON EVOLVING RATES OF DEPRECIATION FOR DISTRIBUTION ASSETS, RETURN ON INVESTMENT AND OPERATING NORMS ON DISTRIBUTION SECTOR

Joint Chief (RA), CERC updated the Forum on the deliberations and recommendations finalised in the 1st meeting of the Working Group of FOR. The Working Group of FOR headed by Chairman, CERC/ FOR and comprising Chairpersons/ Members of AERC, BERC, GERC, KSERC and WBERC are mandated to evolve standard rates for Depreciation,

Standards for Return on Investment and Operating Norms for distribution sector based on the provisions in the Tariff Policy, 2016.

During discussions, classification of distribution assets, applicability of depreciation rates on these assets, salvage value of assets, Return on Investment currently prescribed by SERCs, basis of arriving at ROI (Bond rate or G-Sec rate along with risk premium rates) were deliberated. After discussion, the Forum endorsed the recommendations of the Working Group which included:

a. Depreciation: To be calculated as per Straight Line Method; Weighted average method for calculation of useful life; 12 years for loan repayment; Asset salvage value to be 10%; 70% debt recovery to be considered.

b. Return on Investment: RoE approach with 16% ceiling rate to continue.

c. Operating norms: Linking recovery of fixed and variable cost to availability index.

d. Conduct the following studies:

i. To ascertain useful life of different components of distribution assets
ii. Update 2009 Study of FOR on " Evolve an appropriate model for distribution margin" along with a study on Depreciation
iii. Study on "Benchmarking of financial norms for distribution companies"

AGENDA ITEM NO.4: IMPLEMENTATION OF E-COURT WEBTOOL FOR ALL SERCs/ JERCs

The FOR members were updated on the revised proposal received from NIC for developing a webtool for implementation of E-Court in all SERCs/ JERCs. While the revised proposal from NIC was at a cost of Rs 50.86 lacs (excluding taxes), NIC had also informed of retaining copyrights on the webtool with them. Additionally, NIC had stated that if FOR members wanted any changes in the webtool, written permission is required to be sought from the NIC for effecting the same.

The members were also appraised that as FOR Secretariat had made a provision of only Rs. 30 lakhs from the Plan Funds of MoP for this project (based on the earlier estimate received from NIC), FOR does not have requisite balance funds to pay NIC for the new proposal received from them. Therefore, FOR Secretariat had sent a proposal to the Ministry of Power for a one-time grant of Rs. 62 lakhs (inclusive of taxes) to fund this E-Court initiative under the Digital India Program.

The Forum members felt that as NIC is a government organisation handling all IT initiatives of the Government, NIC would ensure effective, reliable and timely implementation of the project for the SERCs/ JERCs. However, on the issue of copyrights and written permissions to be taken from NIC by SERCs each time a change was sought in the webtool, the FOR members felt that this would be cumbersome. Hence, they felt that the copyrights should ideally be retained with FOR. FOR Secretariat

was also asked to follow up with the Ministry of Power for early release of funds so that the proposal submitted by NIC could be finalised and the exercise of implementation of E-Court in all the SERCs/ JERCs could commence at the earliest.

AGENDA ITEM NO. 5: APPLICABILITY OF GST ON FORUM OF REGULATORS

Deputy Chief (RA), CERC apprised the Forum of the applicability of GST on the FOR and as concurred by FOR, FOR has registered itself for GST and is paying GST on the membership fees since January 2018. In view of the recent notification dated 01.10.2018 regarding applicability of TDS on GST on value of supply under a contract exceeding Rs. 2.50 lakhs per annum, FOR would be deducting TDS on GST for the respective vendors in FOR.

The Forum endorsed the applicability of TDS on GST on FOR w.e.f. the date of registration (November 2018).

AGENDA ITEM NO. 6: MODEL REGULATIONS AND REPORT ON "GAP ASSESSMENT FOR COMPREHENSIVE METERING AND ACCOUNTING FRAMEWORK FOR GRID CONNECTED SOLAR ROOFTOP PV IN INDIA "

Joint Chief (RA), CERC informed the Forum that this was previously discussed in the 64th FOR meeting held on 24th August 2018 at

Ranchi. Certain issues were raised during the meeting and the Report was subsequently discussed in the 21st and 22nd meeting of the Standing Technical Committee meetings of FOR. Based on the feedback received in these meetings, the consultant (M/s E&Y engaged by World Bank under the Technical Assistance program) made a presentation **(*Annexure II)*** on the Model Regulations and the revised Report.

The discussions centred on defining premises which will qualify for Roof top/ ground mounted solar installations, scope of demand aggregation and compensation on net billing as the Standing Technical Committee had made some recommendations on these issues. The Forum was apprised that the Technical Committee had made the following recommendations:

a. Definition of Premises: Only residential consumers be allowed to interconnect ground-mounted solar systems under net-metering/ net-billing and that it should be limited to their maximum contracted demand.

b. Scope of demand aggregation: Discoms to do demand aggregation and such aggregation be restricted to residential consumers only.

c. Compensation for Net billing: Each State may decide to choose appropriate option such as Commission determined reference price or price discovered from SECI/ discom RTS bids.

After deliberations, the Forum endorsed the Model Regulations and Report subject to the following modifications in the Report and Regulations:

a. Focus should be on Roof Top installations and their treatment.

b. Net billing concept will be adopted for the Roof top.

c. The treatment of Distributed Energy Resources (other than rooftop) should be studied further and presented to the FOR.

BUSINESS SESSION – II

SHRI NAVEEN PATNAIK, HON'BLE CHIEF MINISTER OF ODISHA JOINED THE "FOR" MEETING

Shri P.K.Pujari, Chairperson, CERC/ FOR in his welcome address extended a warm welcome to the Hon'ble Chief Minister of Odisha and thanked him for accepting the invitation to grace the 65th Meeting of FoR. He stated that Odisha has been a pioneer in bringing regulatory reforms in the electricity sector by unbundling the erstwhile vertically integrated State Electricity Board and setting up separate entities for generation, transmission and distribution. He informed that the FOR is a body consisting of the State Electricity Regulators of the country and that the objective of the Forum was to provide a common platform to the electricity regulators to share their experiences and best practices. In pursuance of its mandate under the Act, the Forum has undertaken various studies on important issues in the electricity sector. The Forum has also brought out model regulations on important issues crucial in the power sector. Though the Forum does not have the powers to enforce its regulations or decisions on individual State Commissions, it has succeeded

in putting in place several reforms with far reaching consequences. As the power sector is transitioning gradually to market based operation and the Regulators are responsible for market development, CERC has initiated discussions in several futuristic regulatory initiatives such as reforms in the Deviations Settlement mechanism and Redesigning the real time energy market. Market monitoring and market surveillance have also become the crucial responsibility of the regulators. Hence, regulators have the responsibility of balancing the interests of the utilities and consumers. In this context, the Forum looked forward to the thoughts and insights of the Hon'ble Chief Minister.

Shri Naveen Patnaik, Hon'ble Chief Minister, in his address to the Forum stated that he was delighted to inaugurate the meeting of Regulators in the capital city of Odisha. During his address, he stated that Odisha was the 1st State to unbundle the Electricity Boards and to establish the 1st Electricity Regulatory Commission in the country. He also took pride in the fact that Odisha is a power surplus State and that it had achieved 100% village electrification while 100% electric connections to households will be achieved by December 2018. On the proposed amendments in Electricity Act 2003, he remarked that as Electricity is a concurrent subject, some of the proposed amendments to the Electricity Act are not in conformity with the federal structure of the country. He stated that the views of the State Government should be given due importance and requested the Forum of Regulators to make valuable recommendations to the Centre keeping the State and consumer interest in mind. He invited the Forum to visit Make-in-Odisha conclave to witness the

socio-economic growth of the State. He stated that he wished the Forum would have fruitful discussions during the course of the meeting.

On conclusion of this session, Shri U.N.Behera, Chairperson, OERC proposed vote of thanks. In his address, he thanked the Hon'ble Chief Minister for taking time out of his busy schedule to address the FOR. He thanked Chairperson, CERC/ FOR and Chairpersons of all SERCs/ JERCs, Officers of CERC, OERC and the State Government for their association with this meeting. He remarked that the State Government is supporting the power sector of the State in a massive way to provide economic and reliable electricity to the consumers and infrastructure support to the generators. He thanked the Hon'ble Chief Minister for addressing and interacting with the Members of the Forum and other delegates of the meeting for making it a success.

BUSINESS SESSION – III

AGENDA ITEM NO. 7: REPORT OF SUB-GROUP OF 'FOR' TECHNICAL COMMITTEE ON LOAD DESPATCH CENTRES – INSTITUTIONAL BUILDING AND STRENGTHENING

The Report on Capacity building of LDCs (CABIL) was formally released by Chairperson, CERC/ FOR, Chairperson, GERC, Chairperson, OERC and Secretary, CERC. Thereafter, Advisor POSOCO and Chairman of the Sub-Group of the FOR Standing Technical Committee presented the report **(*Annexure III)*** and highlighted the following points:

a. Institutional capacity building of LDCs is essential for implementation of various regulatory initiatives such as framework for forecasting, scheduling and deviation settlement of RES through SAMAST, National Open Access Registry (NOAR), Ancillary services, valuing flexibility services etc.

b. The report is an outcome of extensive consultation and collaboration with the various stakeholders. It provides a 365 days road map for implementation of recommendations on financial and functional autonomy of LDCs through adequate man-power with appropriate skillset, strengthening real time operation desks, robust infrastructure, information and communication systems, automation and decision support tools, appropriate working environment, HR capacity building, collaborative learning through FOLD, provision for LDC empowerment reserve, certification retainer-ship, KPI linked incentives, benchmarking and reward programs etc.

c. The resources required would vary for emerging, medium and large sized LDCs. At All India level, it would be in the range of 3500-4000 persons and Rs. 900-1400 crores per annum which would be less than 1% of the resources deployed in the electricity sector.

d. A model regulation on LDC fees and charges evolved by deriving the best practices of existing Fees and Charges regulations of the CERC/ SERCs could be suitably adopted by the Appropriate Commissions.

The Forum appreciated the efforts of the sub-group and acknowledged the role of load dispatch centres in the sector. The Forum while adopting the

report of the sub-group (as endorsed by the FOR Technical Committee) also advised as under:

a. The Report may be disseminated to the SERCs/ JERCs

b. The FOR Standing Technical Committee to monitor the implementation of the Report at regular intervals in its meetings

AGENDA ITEM NO. 8: REFERENCE FROM OERC, PSERC AND UPERC REGARDING PROPOSED AMENDMENTS TO TARIFF POLICY AND ELECTRICITY ACT, 2003

The Forum discussed the provisions in the proposed amendments to the Tariff Policy 2016 and Electricity Act 2003. Some of the members viz. Chairpersons of OERC, PSERC and UPERC, opined that some of the which were previously being handled by SERCs are now proposed to be under the purview of the Central Government as per the draft amendment to the Policy and the draft amendment to the Act . They felt that as these issues are purely pertaining to the States, the jurisdiction on these issues should remain with SERCs.

After deliberations, the Forum decided as under:

a. In order to study the amendments proposed in the Tariff Policy and Electricity Act 2003, a Working Group may be constituted under the Chairmanship of Chairman, CERC/ FOR. Other members of the Working Group would be Chairpersons of Andhra Pradesh Electricity

Regulatory Commission, Odisha Electricity Regulatory Commission, Punjab State Electricity Regulatory Commission, Delhi Electricity Regulatory Commission and Uttar Pradesh Electricity Regulatory Commission.

b. The Working Group would recommend the comments to be adopted by FOR and to be conveyed to the Ministry of Power.

AGENDA ITEM NO. 9: ANALYZING THE RECENT SURGE IN ELECTRICITY PRICES ON THE POWER EXCHANGES

Advisor (Power Markets), CERC made a presentation ***(Annexure IV)*** on the movement of electricity prices on the Power Exchange in the month of September-October 2018. The analysis showed that the electricity prices in the DAM (day-ahead market) segment had surged towards the end of September 2018 and remained at an increased level during the month of October 2018 touching an all-time high price of Rs. 18.29 per unit in a particular time block.

The Forum after deliberations opined that the transactions on the Power exchanges should be monitored by CERC. Joint Chief (RA), CERC confirmed that CERC conducts regular audit of the Power Exchanges as a part of the monitoring mechanism. It was agreed that a detailed presentation on the price discovery mechanism would be arranged in a future meeting of FOR.

AGENDA ITEM NO. 10: ANY OTHER ITEMS WITH THE PERMISSION OF THE CHAIR

Reference from Gujarat ERC regarding Capacity building program in "Legal, Regulatory and Policy framework for Power sector in India"

Chairperson, GERC apprised the Forum about the need for capacity building program on legal aspects of Regulations, especially for the new Chairpersons and Members for all SERCs/ JERCs. He informed that GERC has collaborated with Gujarat National Law University to design a two day workshop to cover topics such as legal interpretation and drafting, regulatory and policy changes in the power sector etc. He requested FOR Secretariat to conduct the workshop under the aegis of FOR as the cost of the program is expected to be Rs. 5 lakhs.

The Forum discussed this proposal and also suggested that eminent practicing advocates from Supreme Court may also be invited to take sessions. GERC was requested to formally send a proposal to FOR Secretariat so that the same can be presented as an agenda item in the next FOR meeting.

On conclusion of the meeting, Shri Shankarlinge Gowda, Chairperson, Karnataka Electricity Regulatory Commission informed the Forum that he is demitting office on 19th December 2018. He recalled that every FOR meeting was an occasion of learning where issues of importance to the power sector were discussed and deliberated. He

thanked the Forum for the interactions during his tenure and Chairperson OERC for his hospitality during the 65th FOR meeting.

Shri Sanoj Kumar Jha, Secretary, CERC/ FOR thanked the Chairperson, Members, Secretary and staff of the Odisha State Electricity Regulatory Commission (OERC) for their painstaking efforts to host the 65th Meeting of FOR at Bhubaneswar. He also thanked all the dignitaries present in the meeting. He thanked the staff of FOR Secretariat for their arduous efforts in organizing the meeting.

The Chairperson, CERC/ FOR conveyed to the Members of Forum that the next FOR Meeting will be held in New Delhi, date and time of which would be informed in due course of time. The meeting ended with a vote of thanks to the Chair.

/ ANNEXURE – I /

LIST OF PARTICIPANTS OF THE 65TH MEETING
OF
FORUM OF REGULATORS (FOR)

HELD ON 13TH NOVEMBER, 2018 AT BHUBANESWAR (ODISHA)

S.N.	NAME	ERC
01.	Shri P.K. Pujari Chairperson	CERC / FOR – in Chair.
02.	Justice (Shri) G. Bhavani Prasad Chairperson	APERC
03.	Shri R.P. Singh Chairperson	APSERC
04.	Shri Subhash Chandra Das Chairperson	AERC
05.	Shri S.K. Negi Chairperson	BERC
06.	Shri D.S. Misra Chairperson	CSERC
07.	Justice (Shri) S.S. Chauhan Chairperson	DERC
08.	Shri Anand Kumar Chairperson	GERC
09.	Shri Jageet Singh Chairperson	HERC

10.	Shri S.K.B.S. Negi Chairperson	HPERC
11.	Dr. Arbind Prasad Chairperson	JSERC
12.	Shri M.K. Goel Chairperson	JERC (State of Goa & UTs)
13.	Shri Ngangom Sarat Singh Chairperson	JERC for M & M
14.	Shri M.K. Shankaralinge Gowda Chairperson	KERC
15.	Shri U.N. Behera Chairperson	OERC
16.	Ms. Kusumjit Sidhu Chairperson	PSERC
17.	Shri S. Akshayakumar Chairperson	TNERC
18.	Shri Ismail Ali Khan Chairperson	TSERC
19.	Shri Raj Pratap Singh Chairperson	UPERC
20.	Shri Subhash Kumar Chairperson	UERC
21.	Shri Mukul Dhariwal Member	MPERC
22.	Shri Prithviraj Member	RERC

23.	Shri Durgadas Goswami Member	WBERC
24.	Shri Sanoj Kumar Jha Secretary	CERC
25.	Dr. Sushanta K. Chatterjee Joint Chief (RA)	CERC
26.	Ms. Rashmi Somasekharan Nair Dy. Chief (RA)	CERC
SPECIAL INVITEES		
27.	Dr. M.K. Iyer Member	CERC
28.	Shri Aswini Kumar Das Member	OERC
29.	Shri Sauri Kant Parhi Member	OERC
30.	Shri S.K. Soonee Adviser	POSOCO
31.	Shri Jogendra Behera, Adviser (Power Markets)	CERC
32.	Shri Ajit Pandit, Director	Idam Infrastructure Advisory (P) Ltd

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Developing Comprehensive Metering Regulations & Accounting Framework for Grid Connected Rooftop Solar Deployment in India

Presentation to Forum of Regulators

November, 2018

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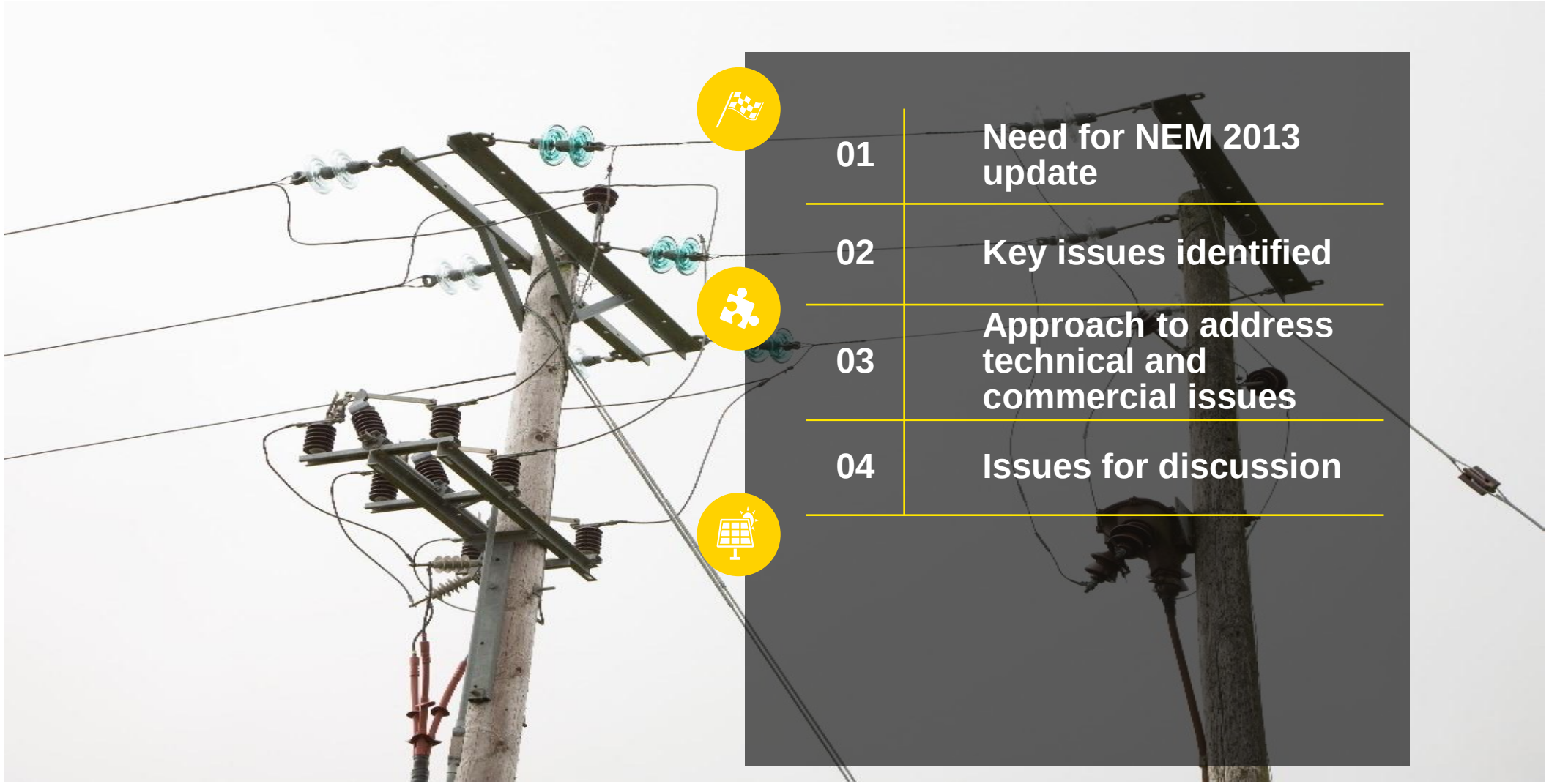

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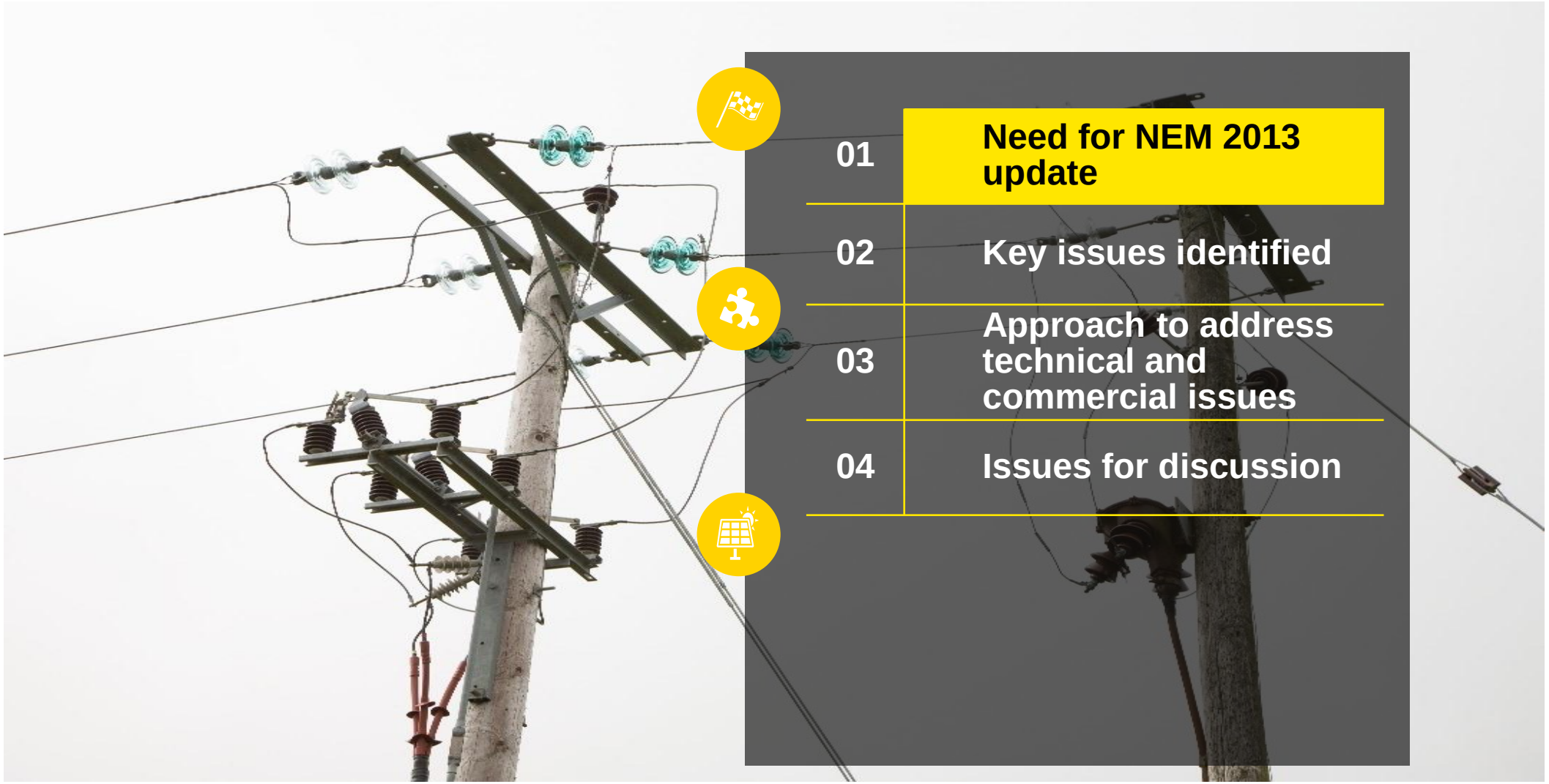

Need for NEM 2013 update

- **Changing landscape** as higher capacities coming-up in India, available advanced metering and communication capabilities
- **Enabling regulatory framework** to support ambitious government targets and support relevant policies
- **Introducing new business models** to Improve GRPV penetration; based on international experience
- **Need of remunerative commercial arrangement** to increase consumer participation

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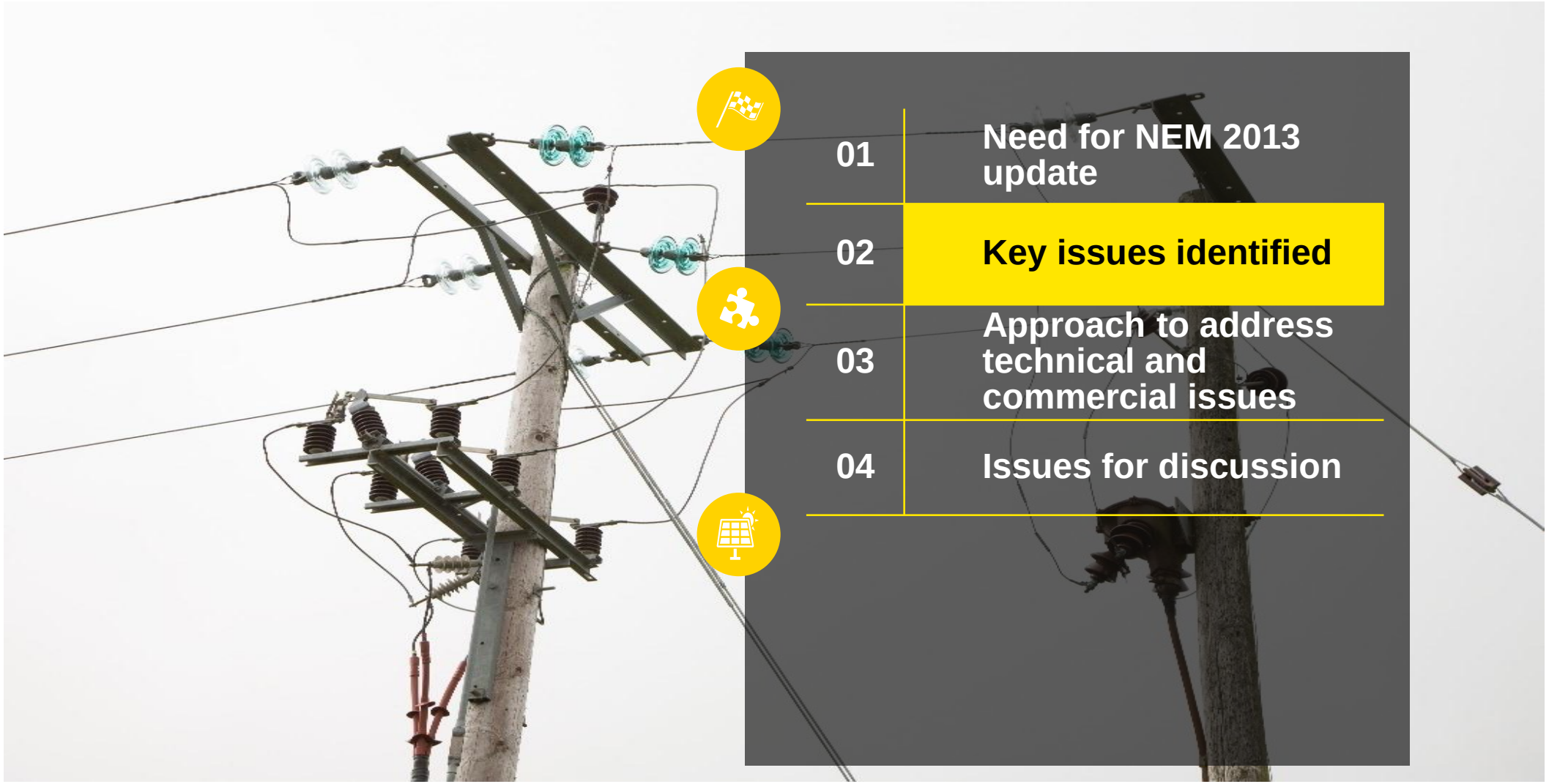

Key issues in the existing regulation

Sr. No.	Issues identified	Type
T-1	Need for relaxing the maximum individual capacity that can be deployed based on sanctioned load	Technical
T-2	Need for clarifying the interconnection limits on GRPV capacities connected to DT	Technical
T-3	Need for provisioning for real time monitoring of solar generation and participation in system operations; required in case of large penetration of GRPV systems	Technical, grid stability & safety
C-1	Need for accommodating newer business models available to consumer and developers, limited scope to DISCOMs in present scenario	Commercial
C-2	Present PPA or connection agreement need additional aspects related to change in ownership and flexibility in existing PPA/connection agreement	Commercial
C-3	Need for compensating for excess generation in present energy accounting and commercial settlement principles	Commercial
O-1	Definition of premises and Solar roof-top PV systems needs review owning to future possibility of different scenarios	General definition & others
O-2	Metering and communication requirements needs review to provide greater visibility on solar generation to DISCOMs and system operations	Communication, metering & safety

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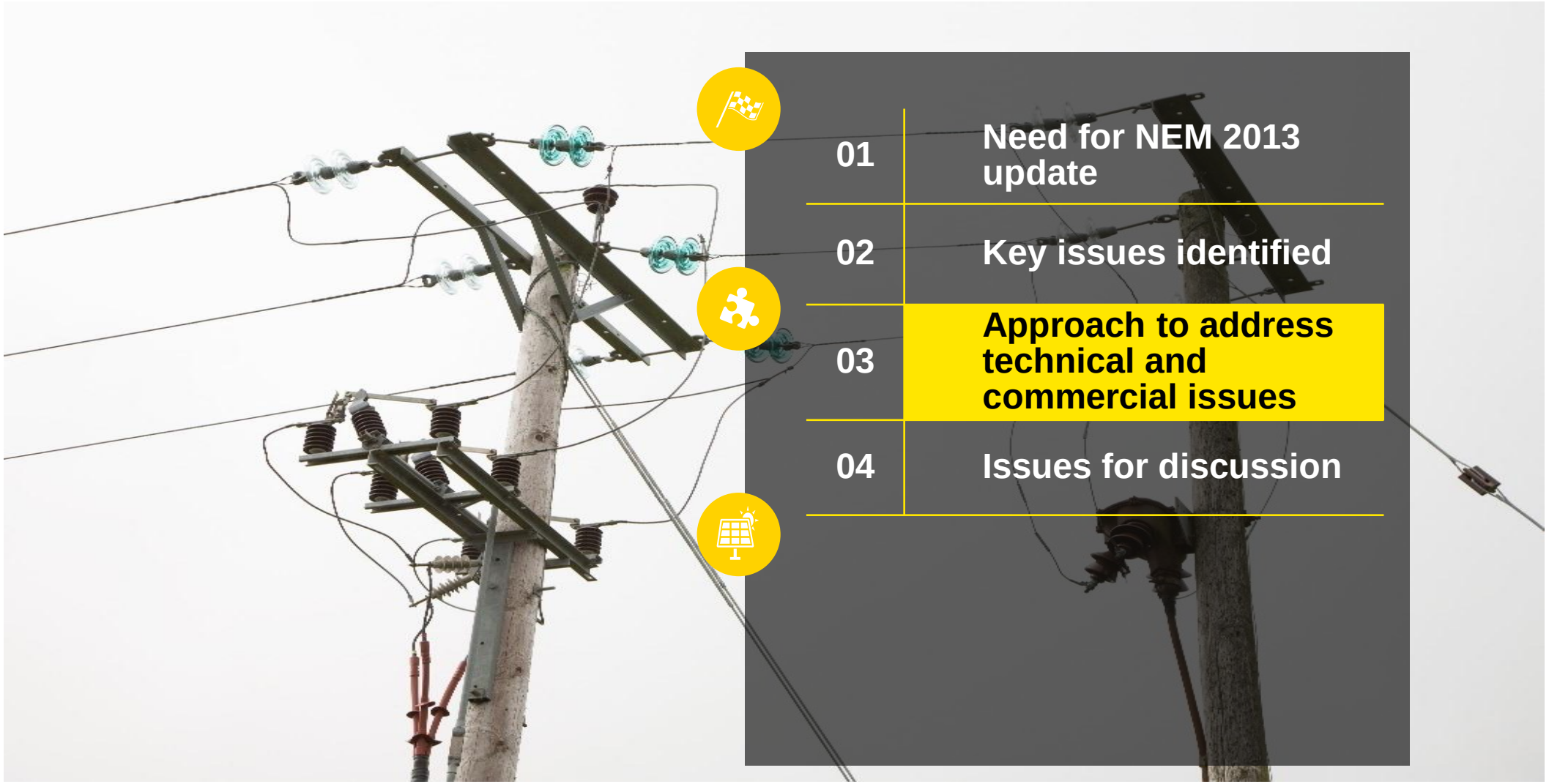
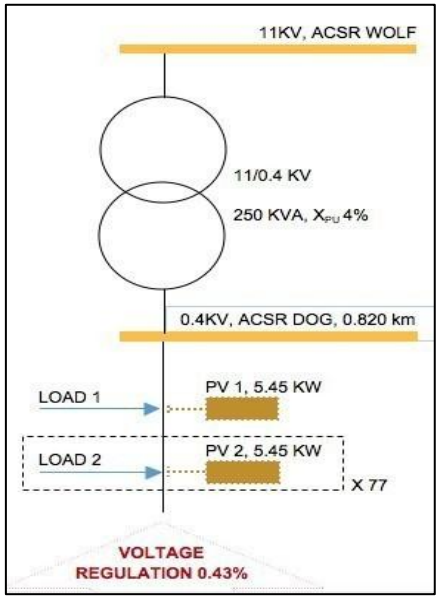


Approach to address technical issues

- A simulation analysis has been conducted to assess maximum aggregated capacity of solar PV rooftop plants that can be connected to grid without impacting system operation within existing control and infrastructure configuration
- Impact assessment considering two key limiting parameters
  - Feeder/Grid asset thermal capacity
  - Over-voltage at point of interconnection
- Simulation model to conduct maximum capacity under different scenarios:
  - Different voltage level (0.4KV, 11 KV and 33KV)
  - Different DT capacity
  - Different loading conditions (rural, urban)



- The connected PV system size can go up to 100% of the sanctioned load (even if the sanctioned load is beyond 1 MW, there is no problem)
- DT interconnection limit can go from 0-100%

Approach to address commercial aspects

- The concept of net-metering was proposed in the FoR 2013 regulation considering the following two scenarios:
  - Rooftop PV systems were primarily aimed for self-consumption
  - The solar tariff was also quite high
- However, in the current changing landscape of falling tariffs, a new concept – net billing through which the settlement will be done at State Regulatory Commission determined rate is introduced
- Total 6 business models for adoption in the upcoming regulation are suggested:

S. No.	Business model
A. Consumer-centric	
1.	Consumer Owned (Cap-Ex model)
2.	Third Party Owned (RESCO Model)
B. Utility-centric	
3.	Consumer Owned (Utility only aggregates)
4.	Consumer Owned (Utility aggregates and acts as EPC)
5.	Third Party Owned (Utility aggregates and acts as trader between the RESCO and Consumer)
6.	Third party Owned (Utility aggregates and acts as RESCO)

Net metering and Net Billing

Sr. No.	Particulars	Net Metering	Net Billing
1	Interconnection point	• Prosumer side of meter	• Licensee side of meter
2	Metering	• Bi-direction meter + Generation Meter	• Two Uni-directional Meters
3	Commercial Settlement	• Energy Units based during the billing cycle	• Financial settlement at reference rate during the billing cycle
4	Settlement rate	• APPC (Proposed) for Excess generation settled at the end of settlement period • No Carry forward of credit units in next settlement period	• Reference rate - APPC / Discovered through competitive bidding (SECI/ DISCOMs) • No Billing Credit payable at the end of settlement period

Net billing Energy Bill of Consumer =
*Fixed charges + other applicable charges and levies + (E_{DL} * EC_{RST}) – (E_{RE} * T_{PSA}) – $Billing_{Credit}$*

Where:

- E_{RE} means the energy units recorded for the billing period by the DRE Plant's generation meter;
- T_{PSA} means the energy charges as per the energy sale agreement signed between the consumer and distribution licensee;
- E_{DL} means the energy units supplied(i.e. Gross Electricity Consumption) by the distribution licensee as recorded by the consumer meter for the billing period;
- EC_{RST} means the Energy Charge (EC) component of retail supply tariff including Fuel Cost Adjustment Charge (FAC) as applicable for the concerned consumer category as per the retail supply Tariff Order of the Commission;
- Billing credit is the amount by which value of DRE generation in the previous month was more than value of all other components of consumer bill

Sample cases for net billing

	Case 1	Case 2	Case 3
Total consumption (in kWh)	100	100	100
Generation (in kWh)	100	200	300
Grid Tariff (in INR / kWh)	8	8	8
Net-billing Tariff (in INR / kWh)	4	4	4
Monthly Electricity Bill to consumer (in INR)	**400**	**0**	**400 (billing credit)**

Commercial impact of Solar roof-top on DISCOM ARR : Case studies

- Commercial impact of rooftop solar on two DISCOMs has been assessed – JBVNL (Jharkhand Bijli Vitran Nigam Limited) and BYPL (BSES Yamuna Power Limited, New Delhi) using the model.
- The overall benefit / loss has been computed by considering the revenue loss, RPO benefits, benefits due to reduced procurement and benefits due to reduced AT&C losses.

Case Study 1 – New Delhi - BSES Yamuna Power Limited (BYPL)

- In case of BYPL, the overall reduction in revenue due to rooftop solar is limited to INR 9.93 Cr. (**0.25% of the approved ARR**) for 2019.

Case Study 2 – Jharkhand - Jharkhand Bijli Vitran Nigam Limited (JBVNL)

- In case of JBVNL, an **overall benefit of INR 1.3 Cr.** (**0.017% of the approved ARR**) for 2019 is observed.

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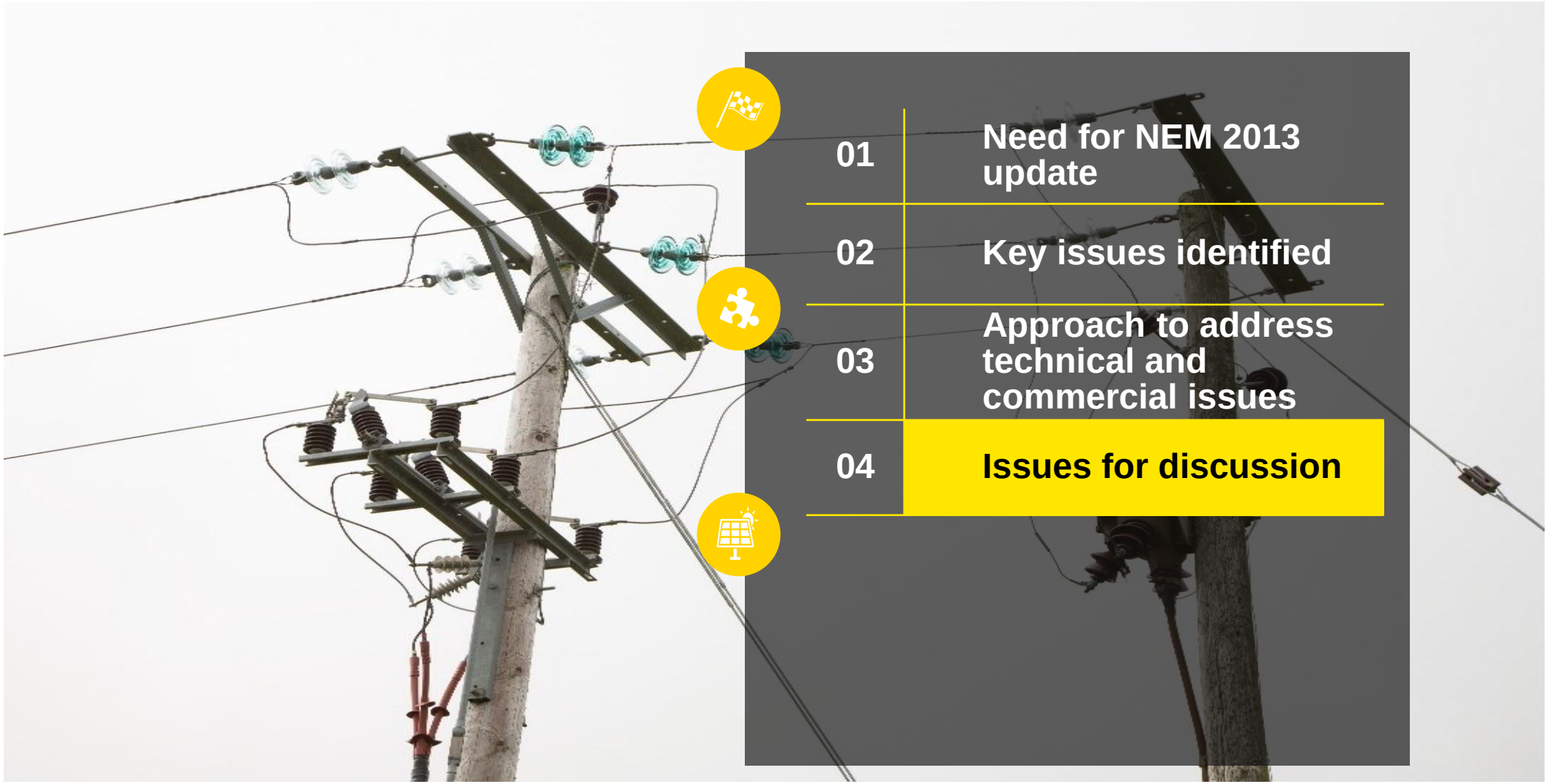

Issues to be discussed… (1/2)

The draft Report and draft Model Regulations were presented to the Technical Committee. After two rounds of discussions, the Report and the Model Regulations have been recommended with deliberation on the following issues in next FOR meeting:

1. **Definition of "Premise"**

2. **Scope of Demand Aggregation**

3. **Allowable Compensation for net billing**

Issues to be discussed… (2/2)

Issue	Remarks
Premise **"Premise"** means rooftops or/and elevated areas on the land, building or infrastructure or part or combination thereof in respect of which a separate meter or metering arrangements have been made by the licensee for supply of electricity	• It was suggested that only "residential" consumers be allowed to interconnect ground-mounted solar systems under net-metering / net-billing subject to further discussions at the Forum of Regulators
Demand Aggregation Distribution licensees may explore appropriate utility-driven business models such as demand aggregation.	• The Model Regulations should provide demand aggregation by distribution utility only and such aggregation be restricted to "residential" consumers only. Final view may be taken by Forum of Regulators
Compensation Distribution licensees shall procure the energy generated by the prosumers under net-billing at the Average Power Procurement Cost	• It was decided that Model Regulations will provide different options to decide rate of procurement from solar rooftop projects. • It was proposed that each State may decide to choose appropriate option such as commission determined reference price or price discovered from SECI/discom RTS bids.

WORLD BANK GROUP

SBI

GOVERNMENT OF INDIA
MINISTRY OF NEW AND RENEWABLE ENERGY

SUPRABHA
SUSTAINABLE PARTNERSHIP FOR ROOFTOP SOLAR ACCELERATION IN BHARAT

Thank you

Mr. Nithyanandam Yuvaraj Dinesh Babu
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Contact:9560719349

EY

GSES

SCGJ SKILL COUNCIL FOR GREEN JOBS

EVI

Idam

Edelman

Assumptions for net metering & net billing comparison

Business As Usual (hereinafter referred to as BAU)

- No rooftop solar installation
- Total consumption in the billing period – 200 kWh
- Monthly consumer electricity bill – 200 kWh x 10 INR / kWh = INR 2000

	Net Metering	Net Billing
No. of units consumed from grid	50	200*
No. of units generated by rooftop plant	150	150

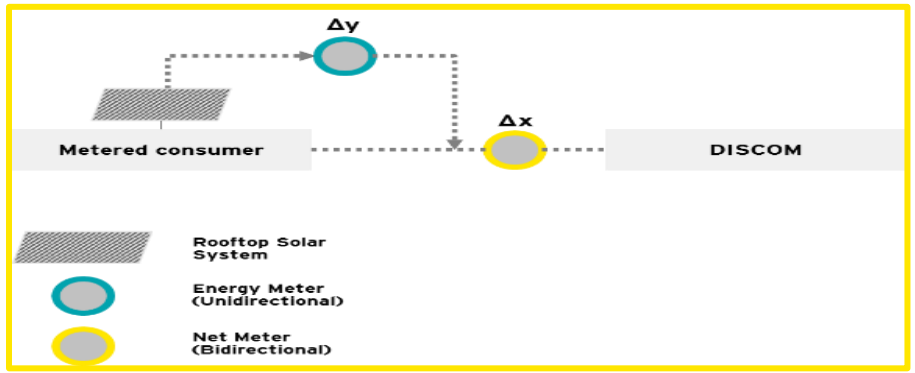
* Recorded by the consumer meter for the billing period

Rooftop solar system installed

- System Capacity – 1 kW
- Number of units generated per day – 5 kWh
- Settlement period – 30 days
- Total consumption in the settlement period – 200 kWh
- Total generation by the rooftop solar plant in the settlement period – 150 kWh (5X30)
- Grid tariff – 8 INR / kWh
- Net billing tariff – 4 INR / kWh

A sample case for net metering

Net Metering Arrangement



Assuming that

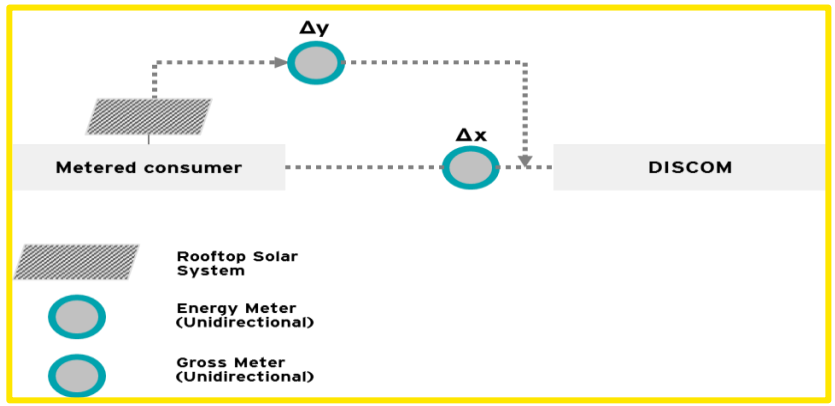
- xn – Net meter reading for month “n”
- yn – Energy meter reading for month “n”
- Δx – Number of units (kWh) consumed from the grid i.e. xn – xn-1
- Δy – Number of units (kWh) generated by the rooftop solar plant
- T – Grid tariff

Electricity bill = Fixed charges + Δx*T

	Case 1 (BAU)		Case 2 (Net Metering)	
	Cash inflow	Cash outflow	Cash inflow	Cash outflow
Utility	200 kWh X 8 INR / kWh = 1600 INR		50 kWh x 8 INR / kWh = 400 INR	
Consumer		200 kWh X 8 INR / kWh = 1600 INR	-	50 kWh x 8 INR / kWh = 400 INR

A sample case for net billing

Net Billing Arrangement



Assuming that

- xn – Gross meter reading for month “n”
- yn – Energy meter reading for month “n”
- Δx – Total number of units (kWh) consumed i.e. xn – xn-1
- Δy – Number of units (kWh) generated by the rooftop solar plant
- T – Grid tariff
- T’ – Net Billing tariff

Electricity bill = Fixed charges + Δx*T - Δy*T’

	Case 1 (BAU)		Case 2	
	Cash inflow	Cash outflow	Cash inflow	Cash outflow
Utility	200 kWh x 8 INR / kWh = 1600 INR		200 kWh x 8 INR / kWh = 1600 INR	150 kWh x 4 INR / kWh = 600 INR
Consumer		200 kWh x 8 INR / kWh = 1600 INR	150 kWh x 4 INR / kWh = 600 INR	200 kWh x 8 INR / kWh = 1600 INR

Commercial impact of rooftop solar penetration on a DISCOM

For assessing the commercial impact of rooftop solar penetration on a DISCOM, an analytical tool capturing the actual revenue loss due to rooftop solar and the benefits due to RPO, reduced procurement and reduced losses has been developed.

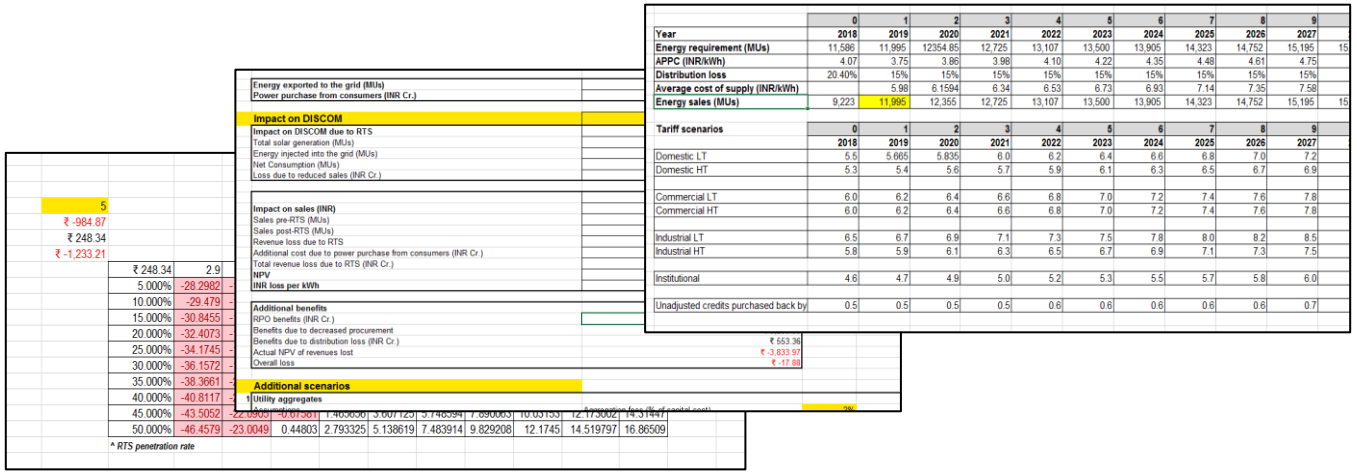
The tool captures

- Consumer categories
- Existing and expected rooftop solar penetration
- Assumptions such as
  - Tariff escalation
  - Energy sales annual escalation
  - Average cost of supply and annual escalation
  - Distribution loss escalation
  - APPC escalation
  - RPO targets and RPO deficit
  - Solar EPC costs and other financials
  - Grid injection percentage (% energy injected by the rooftop solar system back into the grid)

Outputs

- Estimation of total revenues lost by the DISCOM due to rooftop solar penetration
- Estimation of benefits due to rooftop solar to the DISCOM
  - RPO benefits
  - Reduced AT&C losses
  - Overall reduced procurement
- Estimation of benefits due to rooftop solar to the DISCOM
- Overall loss / benefit for the utility considering the proposed business models

Snapshots of the model



To provide recommendations to the regulations the impact of excess rooftop solar generation on the grid has been assessed

Simulation study

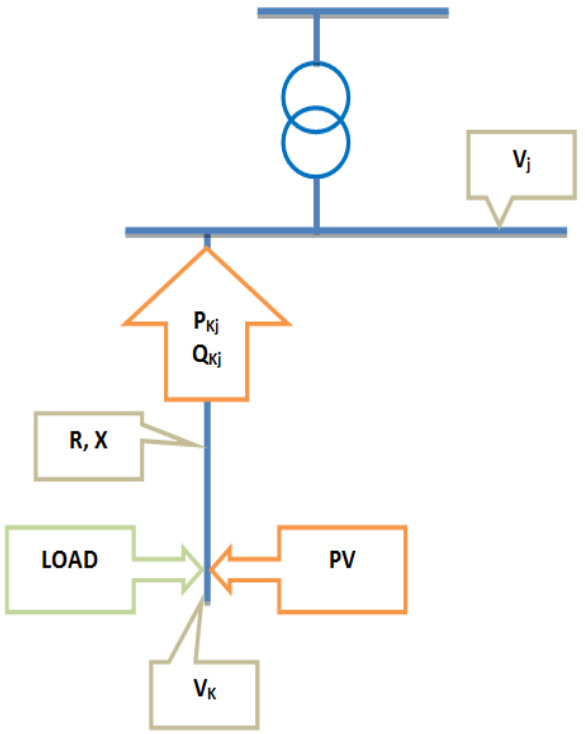
1. Reverse Power Flow will occur when Solar PV Generation goes beyond minimum running load (at consumer's place).

2. When such scenario occurs, Reverse Active Power 'Pkj' and Reverse Reactive Power 'Qkj', will enter into the Grid, and start feeding the neighbouring consumers.

3. If all loads are fed, the 'Pkj' and 'Qkj' will enter the 11 KV, through 'Distribution Transformer' itself, to feed the neighboring DTs, through 11 KV.

The basic equation to define Reverse Power Flow is -

Reverse Power Flow ($P_{reverse}$) = $P_{PV\ max}$ - $P_{LOAD\ min}$



11/0.4 KV FEEDER BLOCK DIAGRAM

Reverse Power Flow: Grid Asset(s) Loading How and Consequences

Simulation study

- When Photovoltaic generation exceeds ‘Minimum Running Load’, the excess generated KVA enters into the grid, to feed the neighboring consumers.

PV GENERATION > ‘MINIMUM RUNNING LOAD’, INVERTER INJECTS BACK INTO GRID

CONSEQUENCES

1. Excess heating of Grid Asset(s).

2. Reduced life of Transformers.

3. Permanent failure of Power Cables.

4. Worst - Grid Asset(s) Burnout

- During Injection, if Inverter's reverse current exceeds the Asset(s) rated amperage, the above mentioned points could be the outcome.

Reverse Power Flow: Feeder Voltage Rise How and Consequences

Simulation study

- When Photovoltaic generation exceeds ‘Minimum Running Load’, the excess generated KVA enters into the grid, to feed the neighboring consumers.

PV GENERATION > ‘MINIMUM RUNNING LOAD’, INVERTER INJECTS BACK INTO GRID

CONSEQUENCES

1. Stress on Grid Asset(s) Insulation, such as that of Transformers and Power Cables.

2. Damage to Electronics, and other Voltage Sensitive equipments, at consumer’s places.

3. Again, heating of Grid Asset(s).

- With Injection, goes up the Voltage.
- Even with 5% Injection, Voltage rises notably.
- Voltage Regulation (VR) must be less than 8.43%, always.

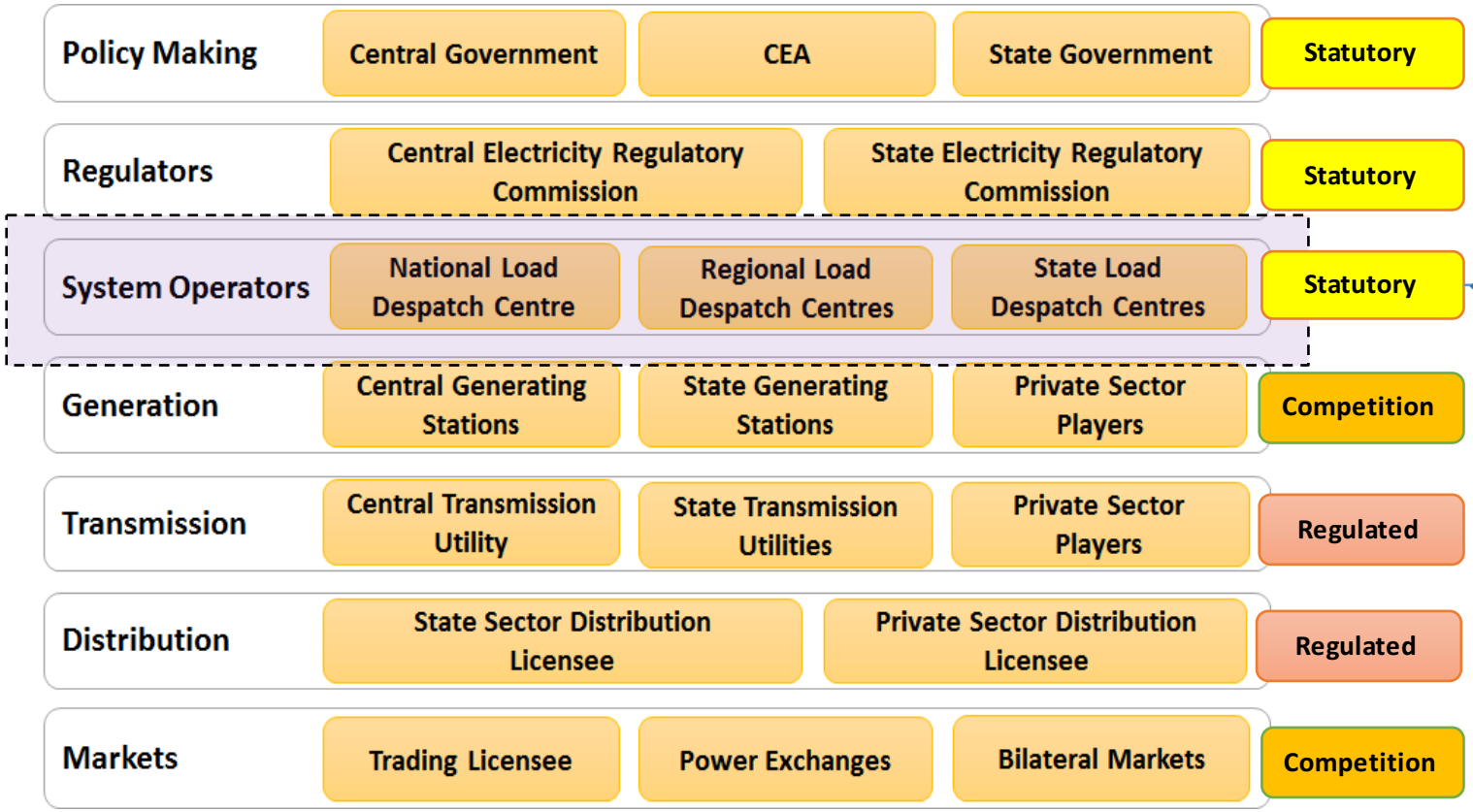
Annexure-III

Report of the FOR Technical Committee Sub-group on LDCs - Institution Building and Strengthening

65th Meeting of the Forum of Regulators

Venue: Bhubaneswar; Date: 13th November, 2018

Role of System Operators in Indian Power Sector



'Vital link' between the administrators, planners & regulators on one end and physical system and market players on the other end

CAPACITY BUILDING

OF

INDIAN

LOAD DESPATCH CENTRES

क़ाबिल

CABIL

October 2018

Report of the FOR Technical Committee sub-group

SALIENT FEATURES

- 7 Terms of References
- 12 Members
- 42 Indian contributors
- 2 International contributors
- 16 SLDC visits
- 11 Global ISO practices
- 5 Surveys questionnaires
- 24 Fee and charge regulations
- 28 Fee and charges orders
- 28 LDC websites
- 71 Questions for deliberations
- 11 Meetings
- 2 FOLD meetings
- 111 References
- 8 Videos on control centres
- ~ 40,000 man-hours

294 pages, 12 chapters

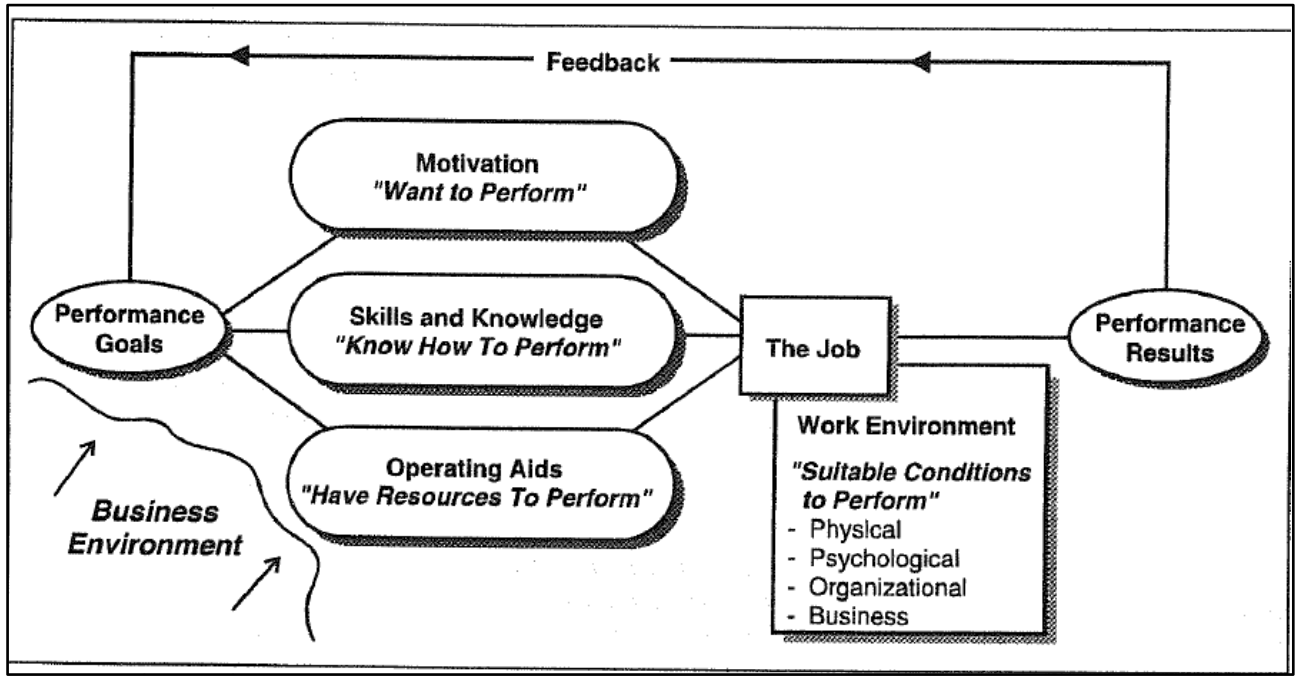
Chapters

- Executive Summary

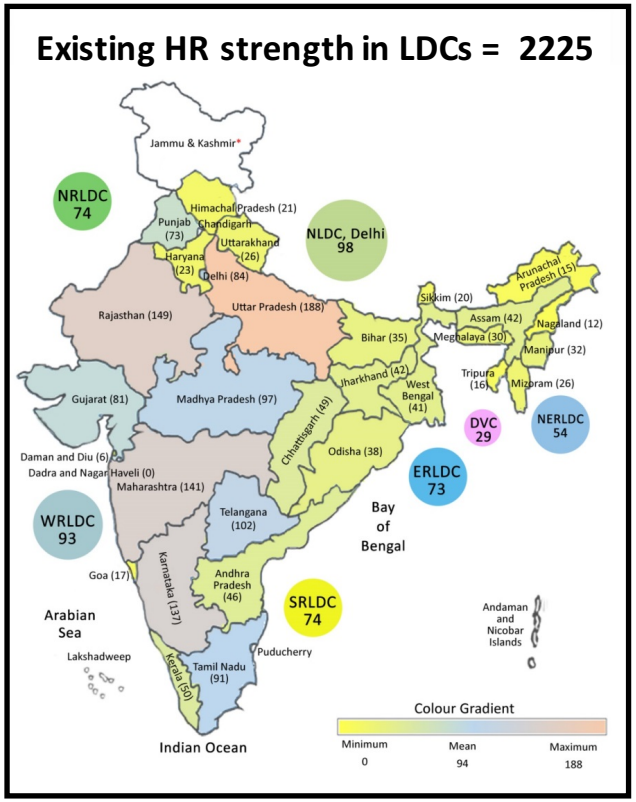
1. Introduction
2. Interface with stakeholders
3. Functional Activities
4. Human Resource
5. Infrastructure & Ergonomics
6. Decision Support System
7. Information & Communication Tech.
8. Governance Aspects of Data
9. Capacity Development through FOLD
10. Business Model
11. Key Performance Indicators
12. Recommendations (20)

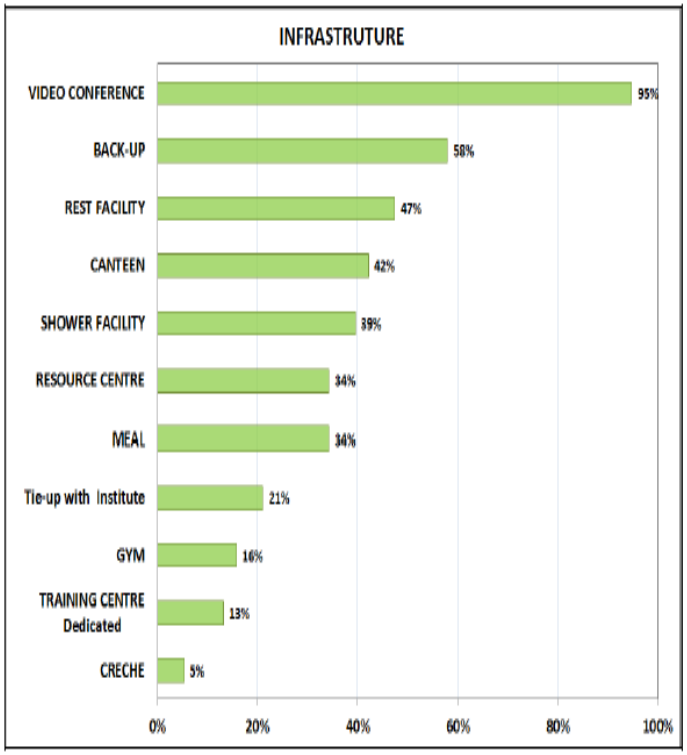
- 2 Road-maps
- Bibliography (111)
- Annexures (19)
- 38 tables
- 48 figures

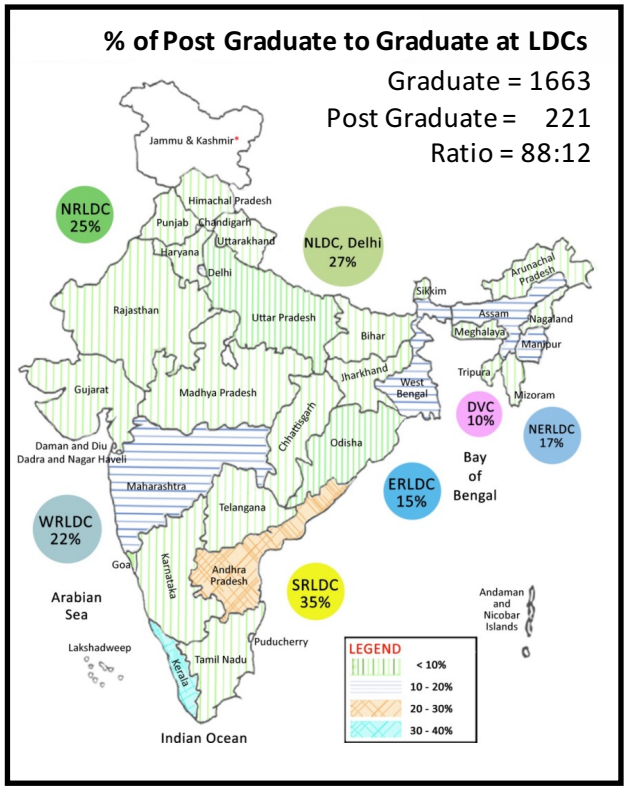
Framework for Human Performance in Control Centers –



(Ref. CIGRE WG 39.03)



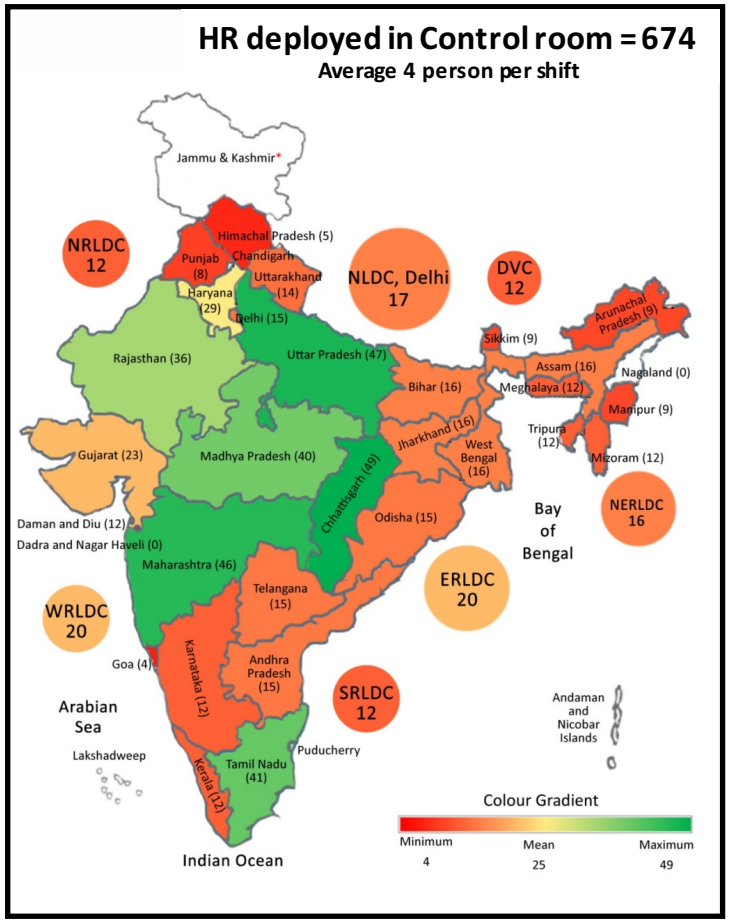




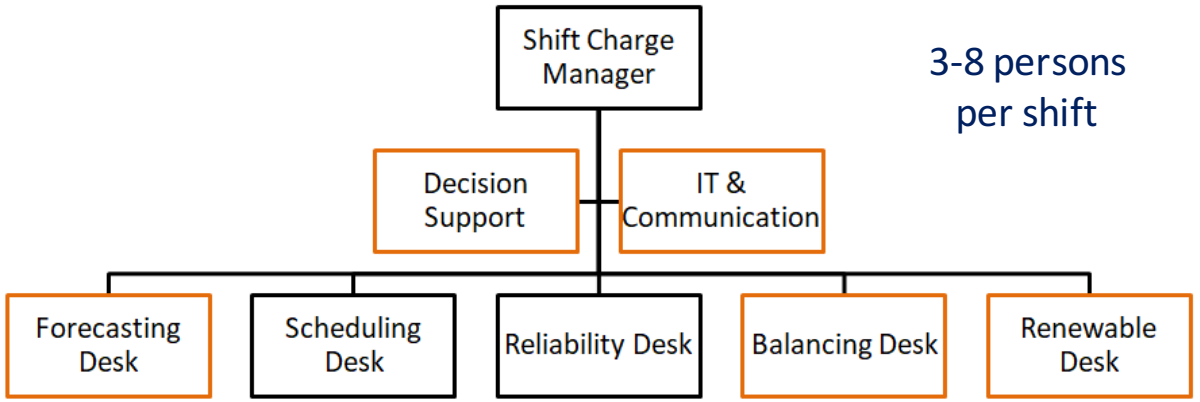
Sustainable institutional capacity building is required by suitable interventions in

- <u>Tangible</u>: physical assets, resources, organization structure, systems, regulatory framework

- <u>Intangible</u>: skills, experience, creativity, tacit knowledge, values, motivation and culture

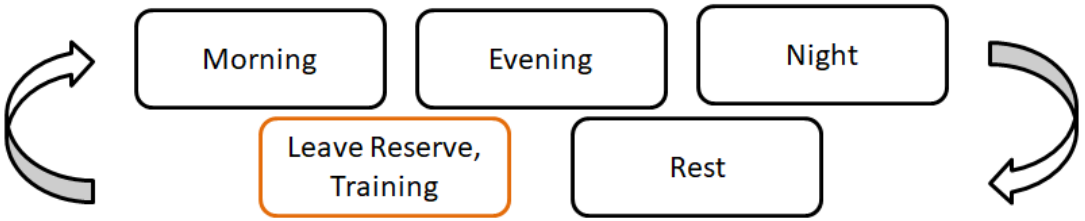


Recommended Organization of the real-time team



3-8 persons per shift

Typical Rotation of Groups



HR budgeting must factor training, business travel, official nominations, special assignments, leave entitlements, contingency leaves, leaves on extended weekends/Festivals

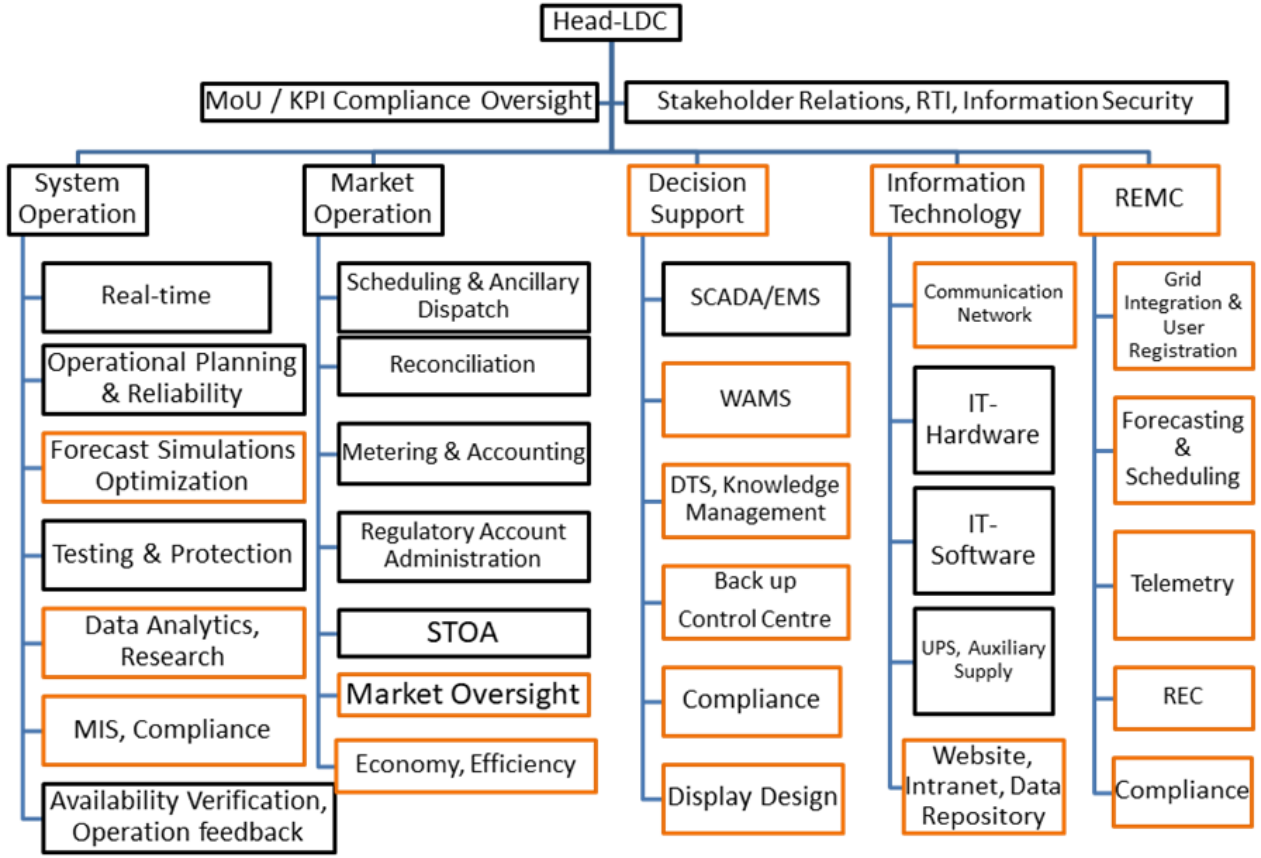
Accommodation
Rewards, recognition
Job enrichment
Professional engagement

Night shift pick-up/ drop
Compensatory off
Study leave
Social security benefits

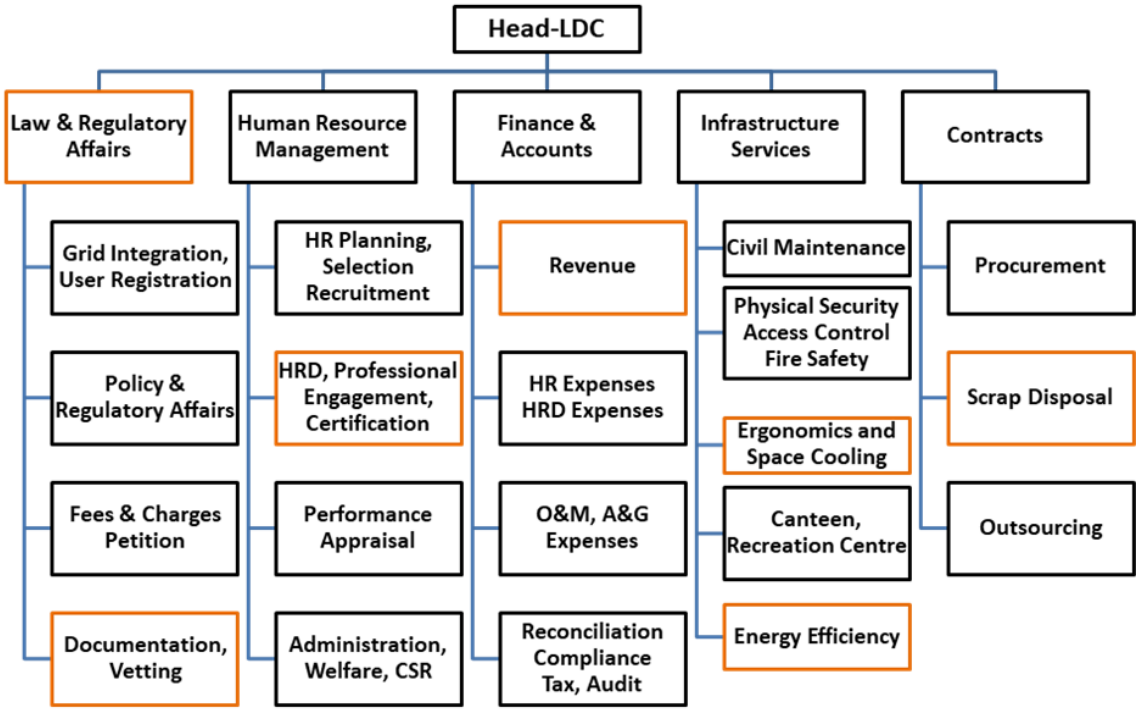
Emerging challenges

- Automation Controls, Optimization
- Compliance Monitoring, Testing
- RE, DER, QCA, DSO, EV, BESS
- REC, PAT, Others
- Aggregators, Virtual Producers
- WAMS, Visualization
- Artificial Intelligence
- Cyber Security
- New Market Products
- Regulatory Changes, Reforms
- Data Analytics
- Data Sharing
- Collaborative Activities,
- Amendment of Electricity Act

Recommended Organogram (1/2)



Recommended Organogram (2/2)



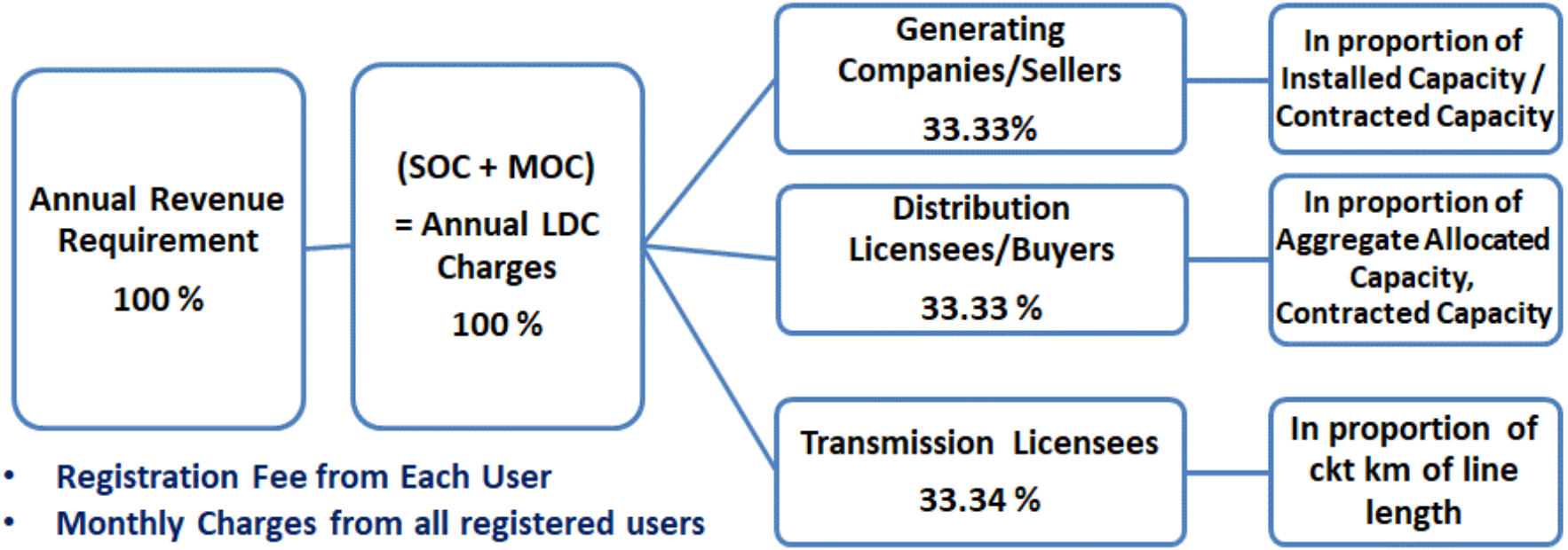
HR Requirement

1	Emerging LDC	30 to 50
2	Medium LDC	70 to 100
3	Large LDC	100 to 150
4	Total All India	3500 – 4000
	Less than 1% of the sector	
5	REMC	25 to 30
6	Sub-LDC	15 to 25
7	Exec : Non-Exec	95:5
8	SO : Total	35 – 45 %
9	MO : Total	20 – 30 %
10	SL : Total	15 – 20 %
11	Real-time : Total	30 %
12	Support : Total	10 - 15 %

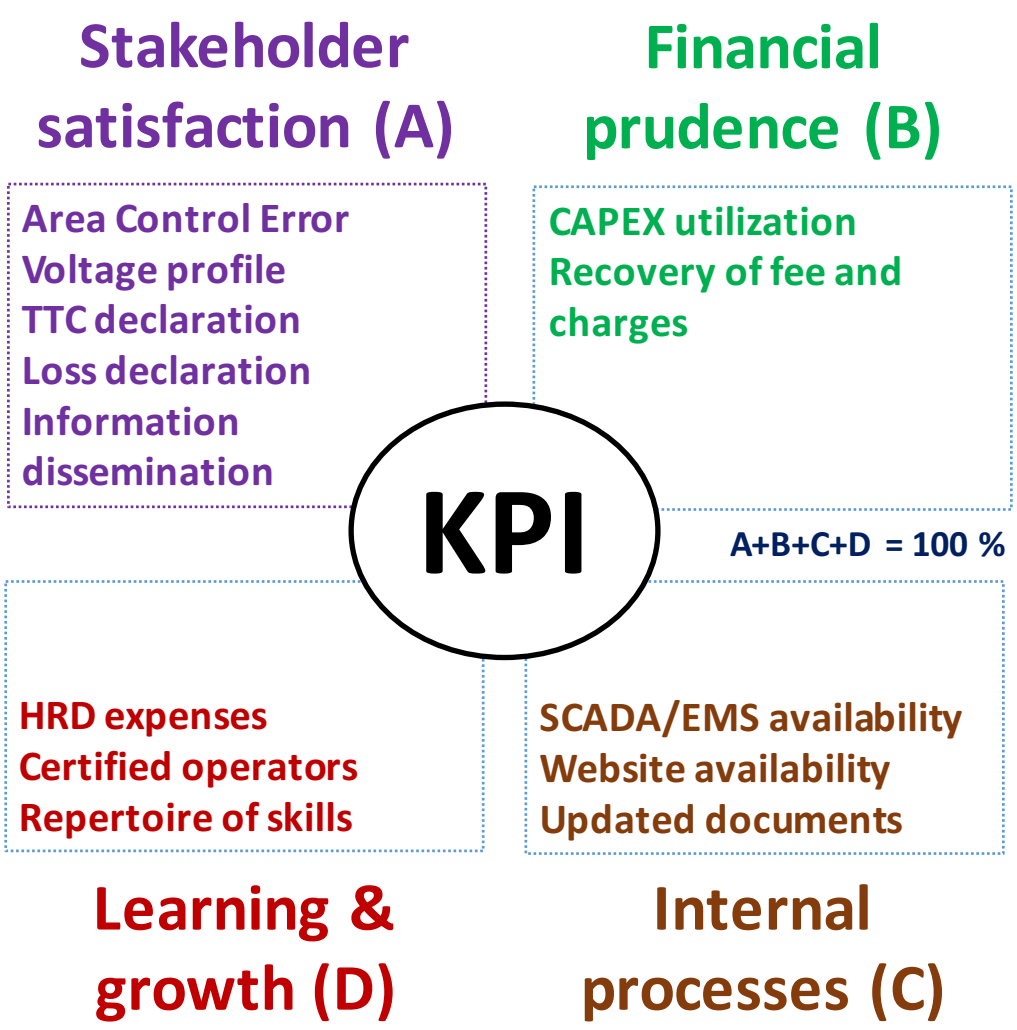
Principles for Model fee and charges regulation

Segregation of SLDC accounts from STU	**Harmonization of ARR components /Heads**	**Expanding the existing user base**	**Equitable sharing of LDC charges**
Monthly Charge for other Users	**Simple Computation & billing of LDC charges**	**Objective KPIs & performance linked incentive**	**Certification & Retainership**
	LDC Empowerment Reserve	**Empowerment of Heads of LDCs**	

Proposed Model for Revenue Recovery



- Registration Fee from Each User
- Monthly Charges from all registered users
- Adhoc Monthly Charge for Grid Reliability Service Users
- Performance Linked Incentive on achieving KPI targets
- Fees & Charge Petition & Final True-up once in every 5 years control period
- Yearly Reconciliation with Users
- Option for Mid Term Review Petition

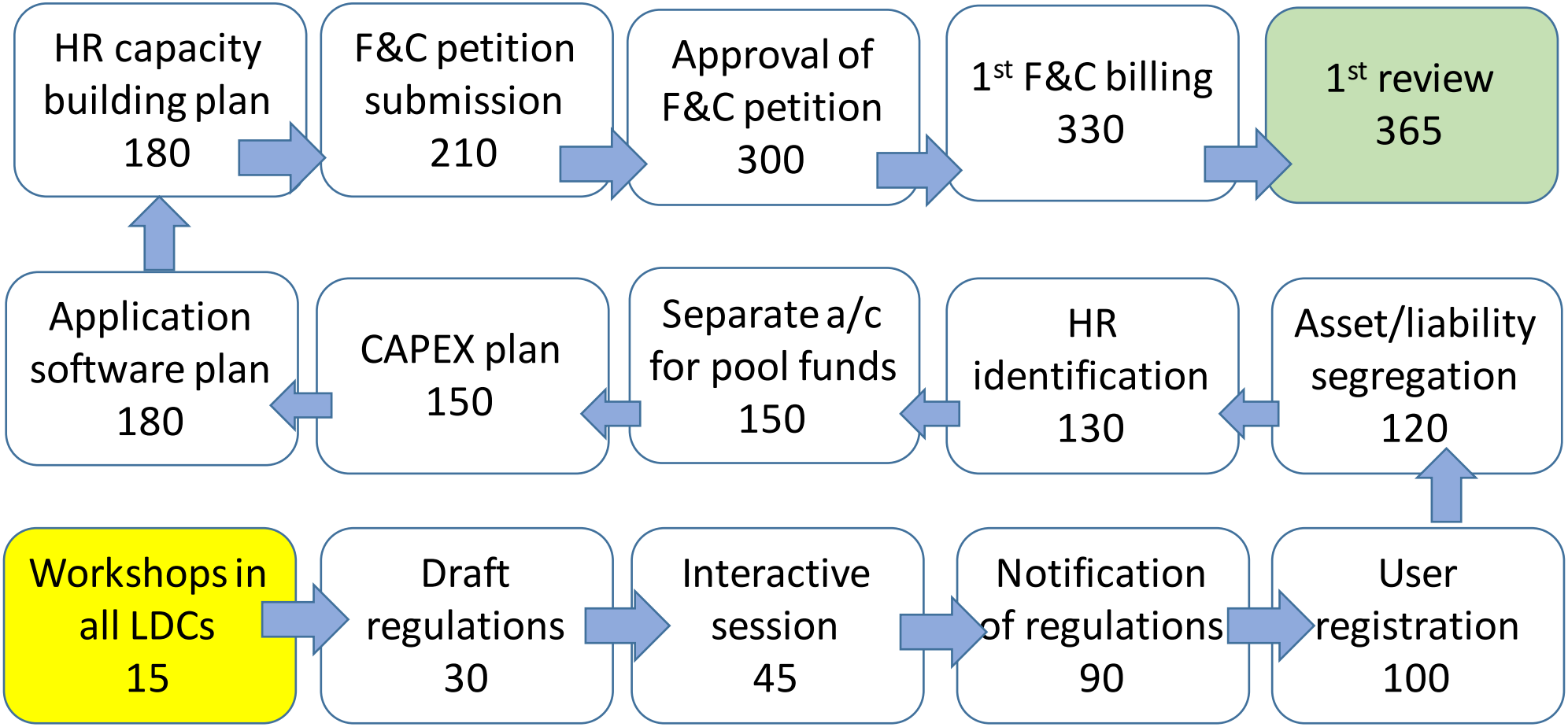


	Expenses	Typical fig.
1	HR : ARR	70-80 %
2	CAPEX : ARR	20-30 %
3	LDC ARR All India	₹. 900 – 1400 cr
	Less than 1% of the sector	
	Certification	**% of Total executives**
4	Basic level	75 %
5	Specialist level	10-15 %
6	Training (Min)	7 days /person
7	Incentive kitty	10 % of turnover

Recommendations - LDC Institutional capacity building

Human Resource Diversity, Adequacy	**5 Real-time Operation desks**	**Adequate Infrastructure, Ergonomics**	**Robust Decision Support System, Thematic Maps**	**Reliable Communication Technology**
IT & Automation	**HRD – Regular Skill Upgradation**	**Modelling & Simulation**	**Certification**	**HR Expense (incl. HRD) as separate head**
Harmonization & hand-holding by FOLD	**Governance of Data**	**Model Regulations LDC Fees & Charges**	**Performance Evaluation - KPI**	**Benchmarking & Rewards**

ROAD MAP


HR capacity building plan 180
F&C petition submission 210
Approval of F&C petition 300
1st F&C billing 330
1st review 365
Application software plan 180
CAPEX plan 150
Separate a/c for pool funds 150
HR identification 130
Asset/liability segregation 120
Workshops in all LDCs 15
Draft regulations 30
Interactive session 45
Notification of regulations 90
User registration 100

Thank you for your kind attention !

Uttar Pradesh SLDC

Maharashtra SLDC

Back-up NERLDC

SLDC Meghalaya

Guwahati

Shillong

Gujarat SLDC

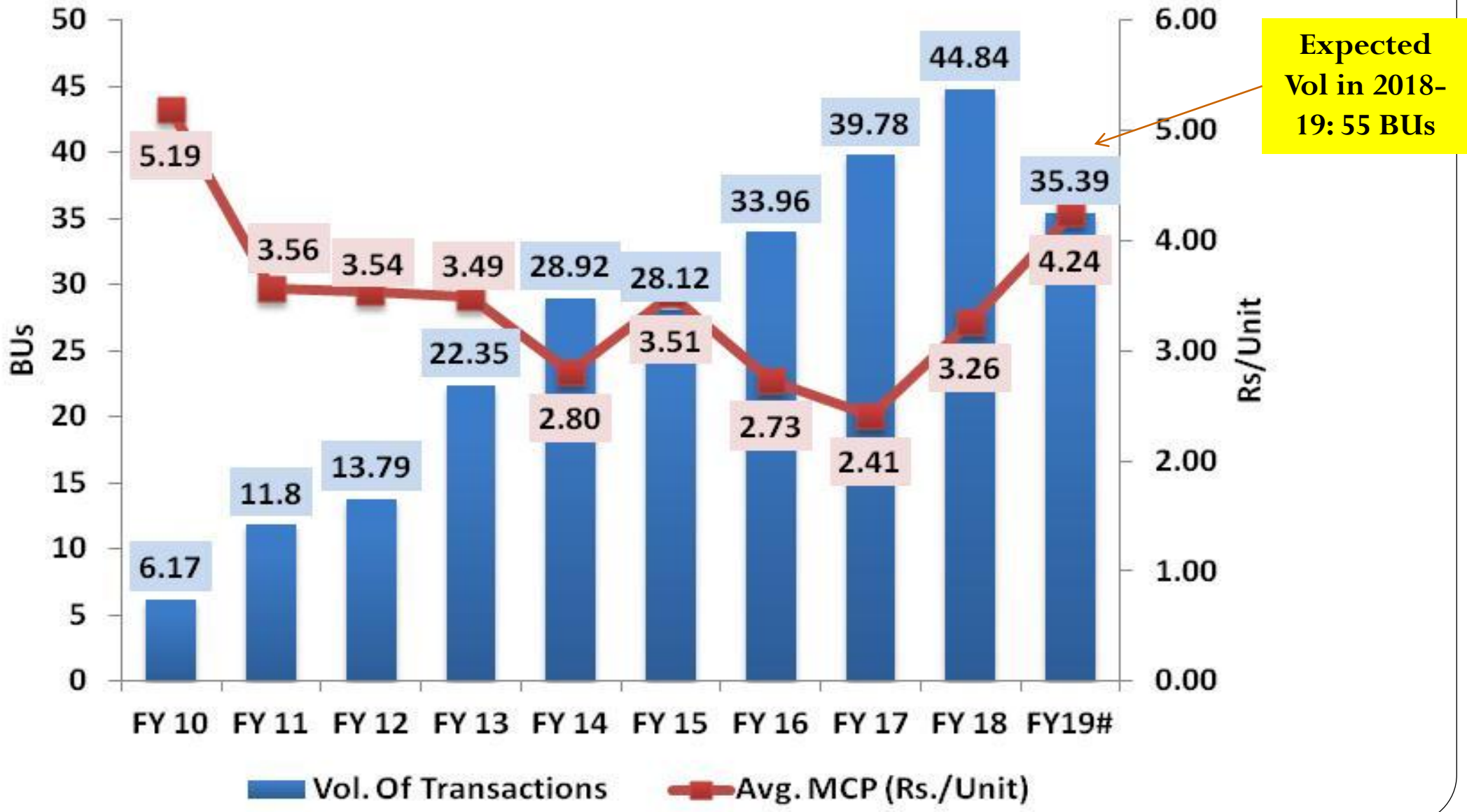
Annexure-IV

Analyzing the Recent Surge in Electricity Prices at Power Exchanges

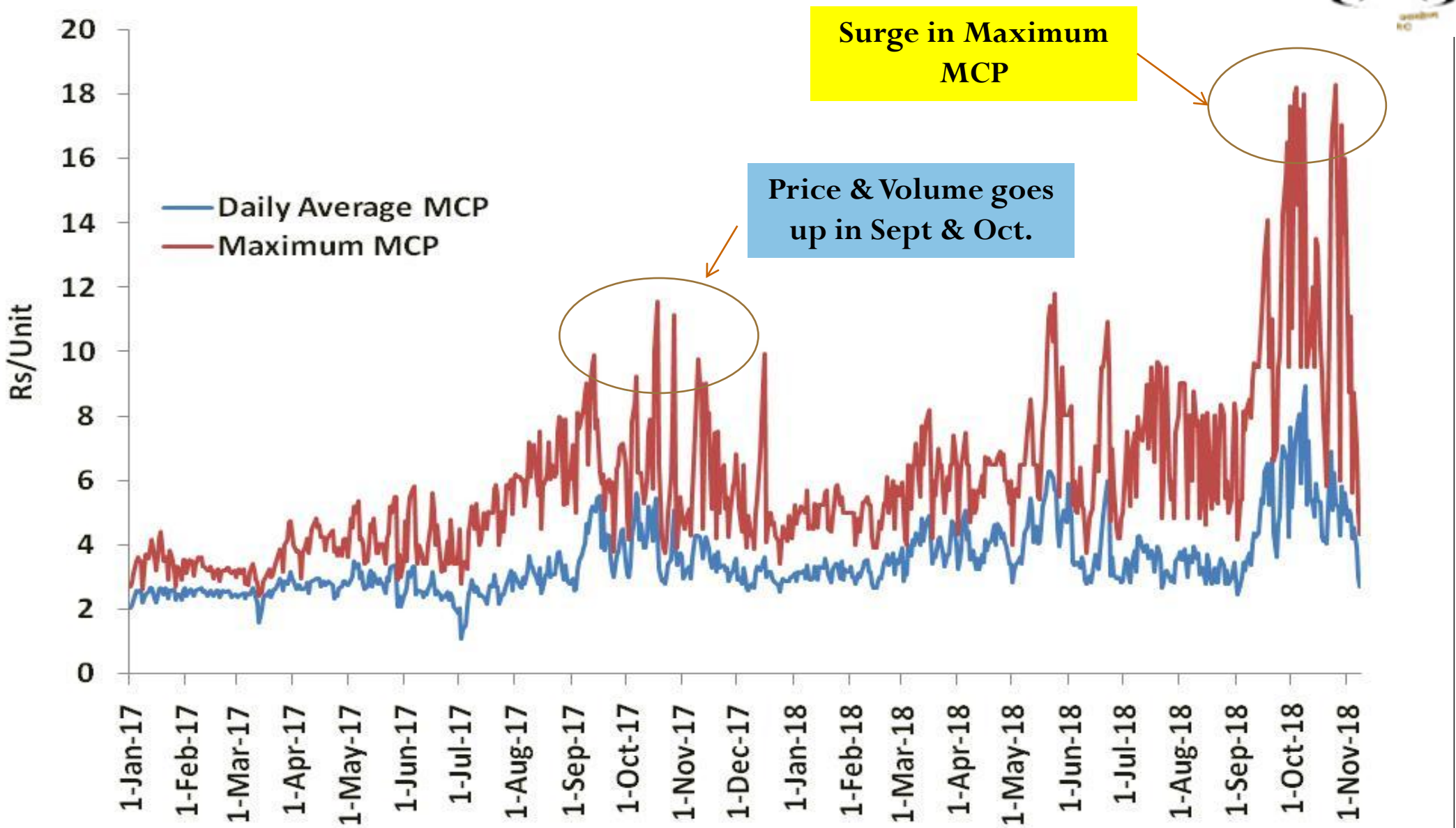
65th FOR Meeting Bhubaneswar

13th November, 2018

Day Ahead Market Overall Trend (IEX)



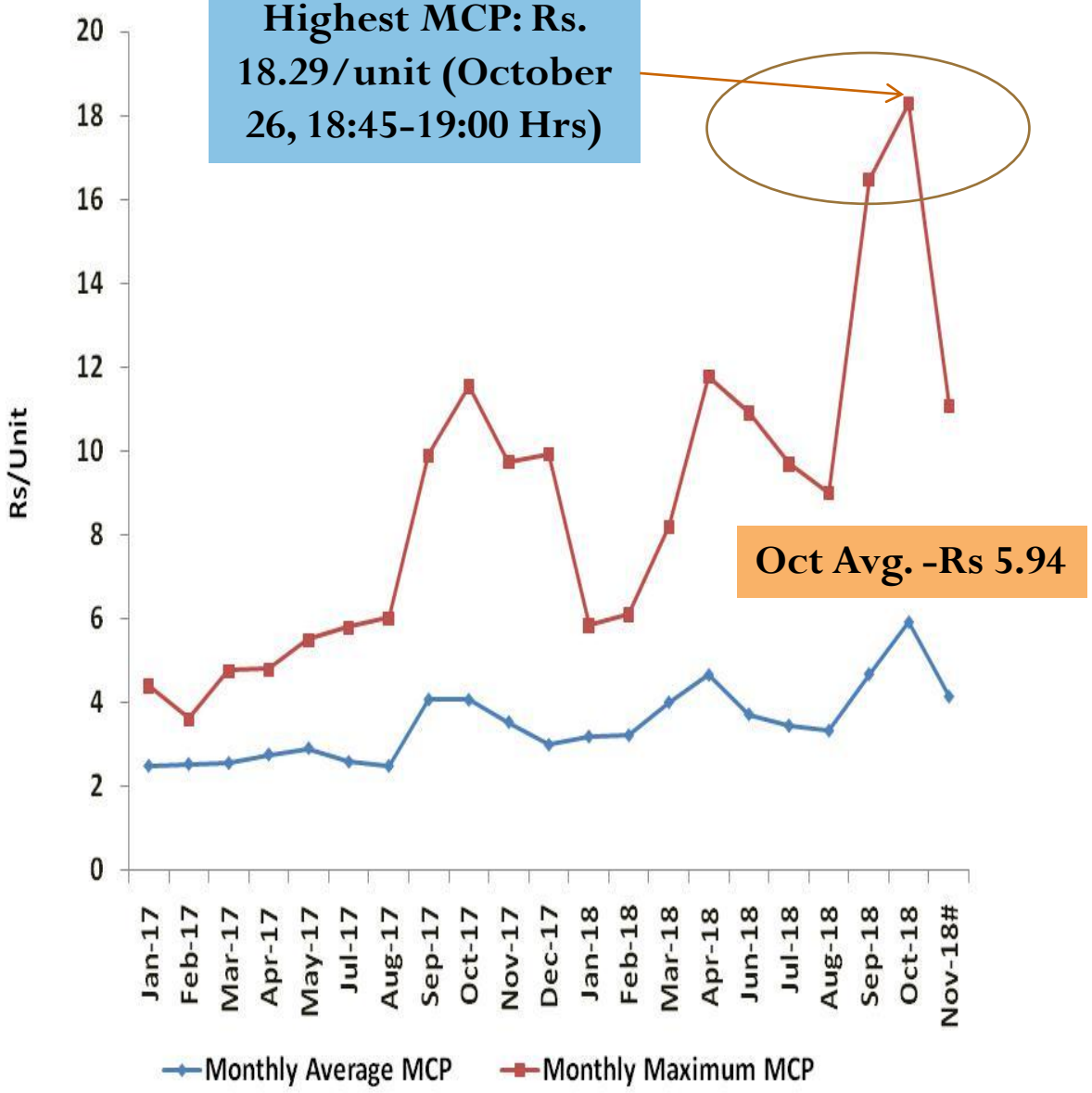
Recent Trend in Market Clearing Price



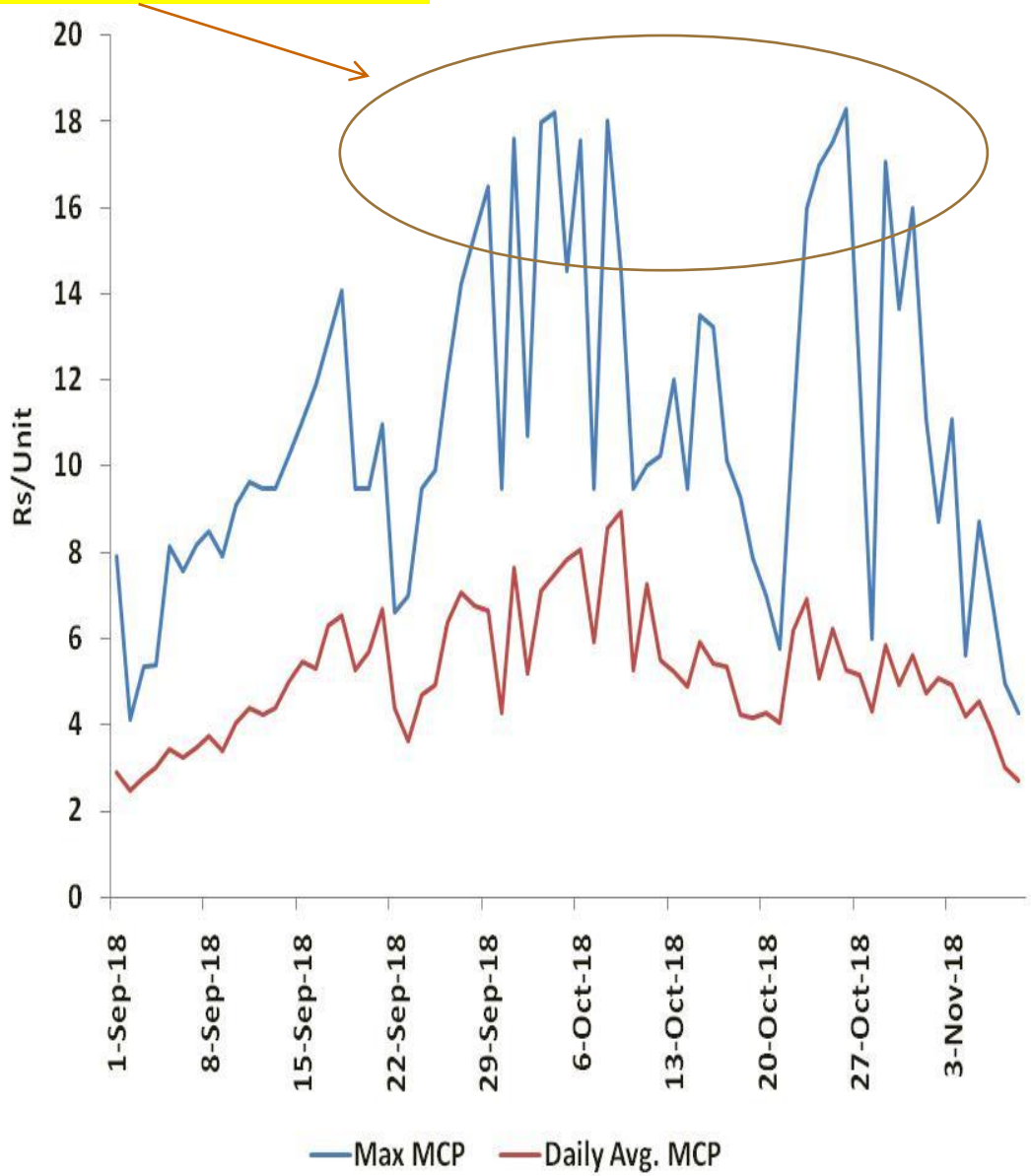
Recent Trend in Market Clearing Price

Highest MCP: Rs. 18.29/unit (October 26, 18:45-19:00 Hrs)

Oct Avg. -Rs 5.94

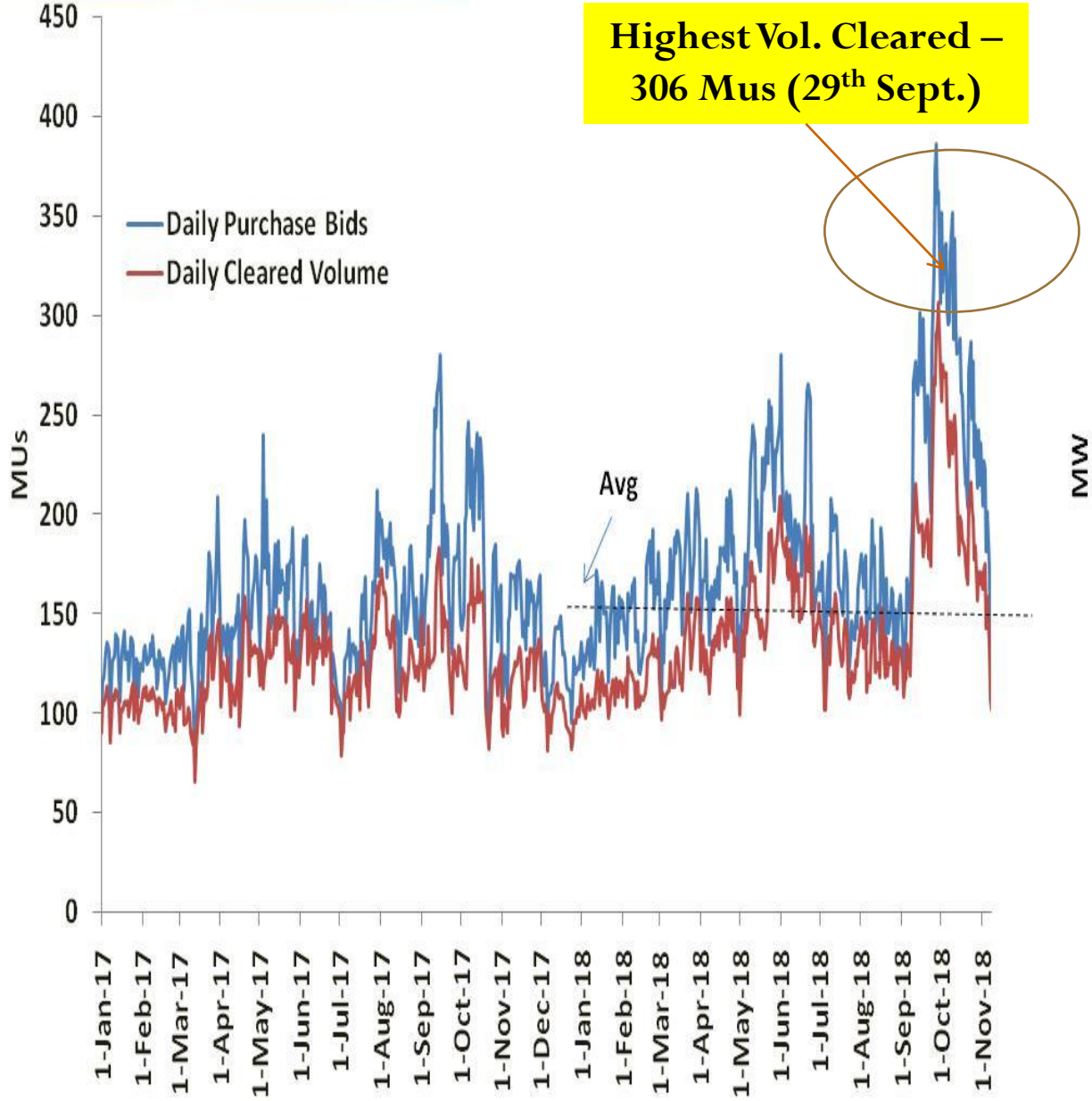


Max MCP : Rs 15-18/unit

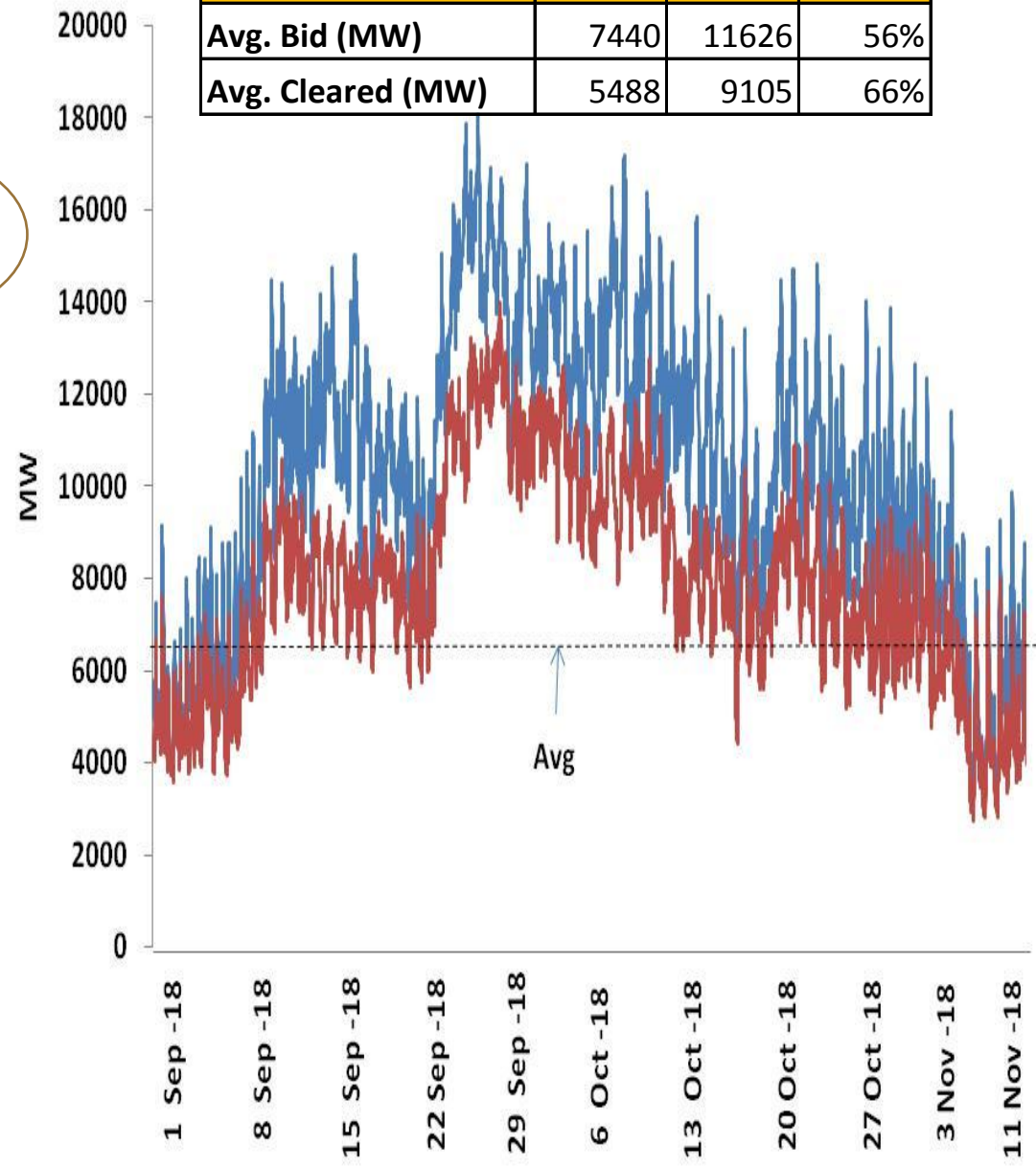


Increase in Demand

Highest Vol. Cleared – 306 Mus (29th Sept.)



	Oct-17	Oct-18	%
Avg. Bid (MW)	7440	11626	56%
Avg. Cleared (MW)	5488	9105	66%



Leading Buyers & Sellers

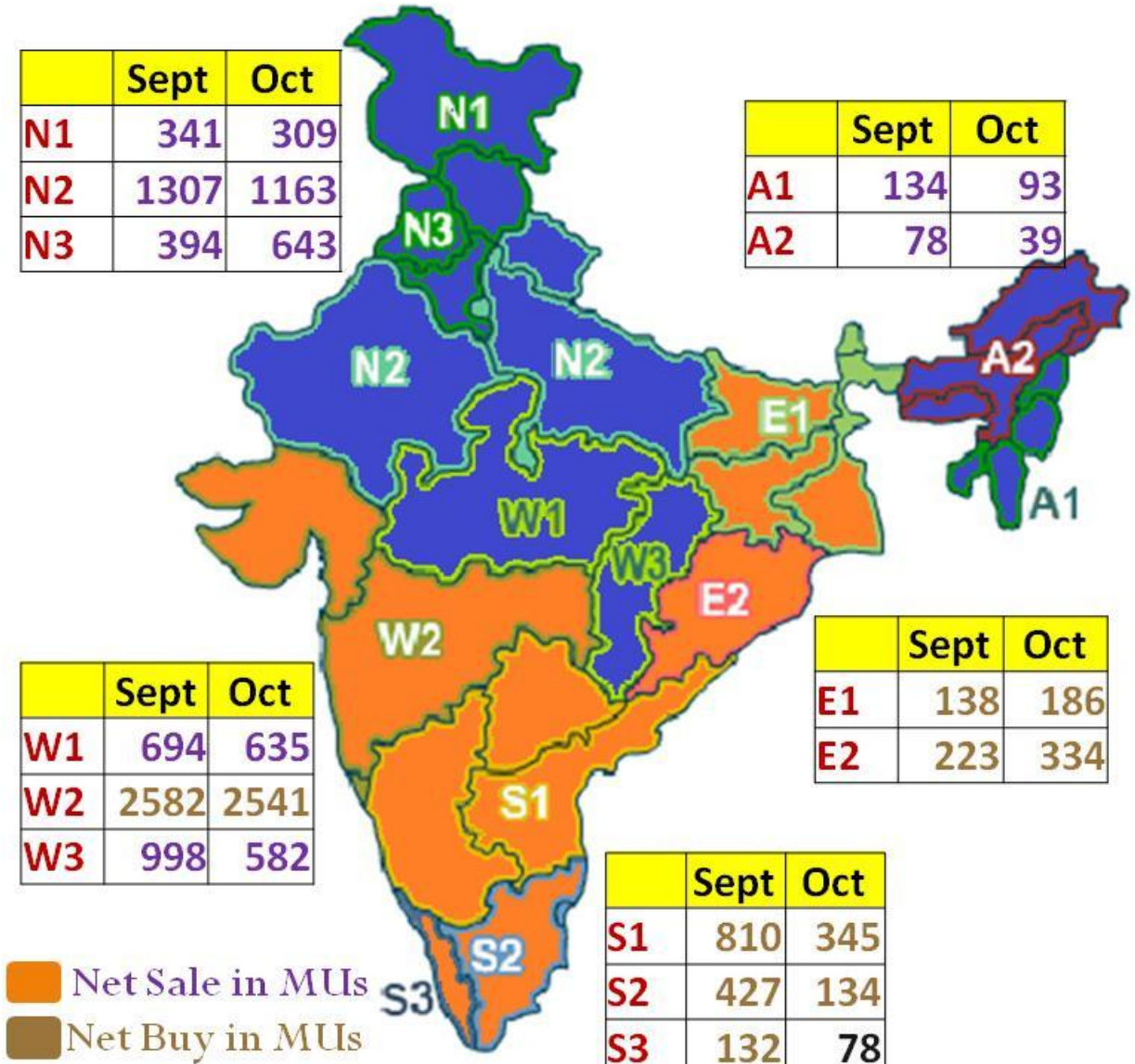
	Sept	Oct
N1	341	309
N2	1307	1163
N3	394	643

	Sept	Oct
A1	134	93
A2	78	39

	Sept	Oct
W1	694	635
W2	2582	2541
W3	998	582

	Sept	Oct
E1	138	186
E2	223	334

	Sept	Oct
S1	810	345
S2	427	134
S3	132	78

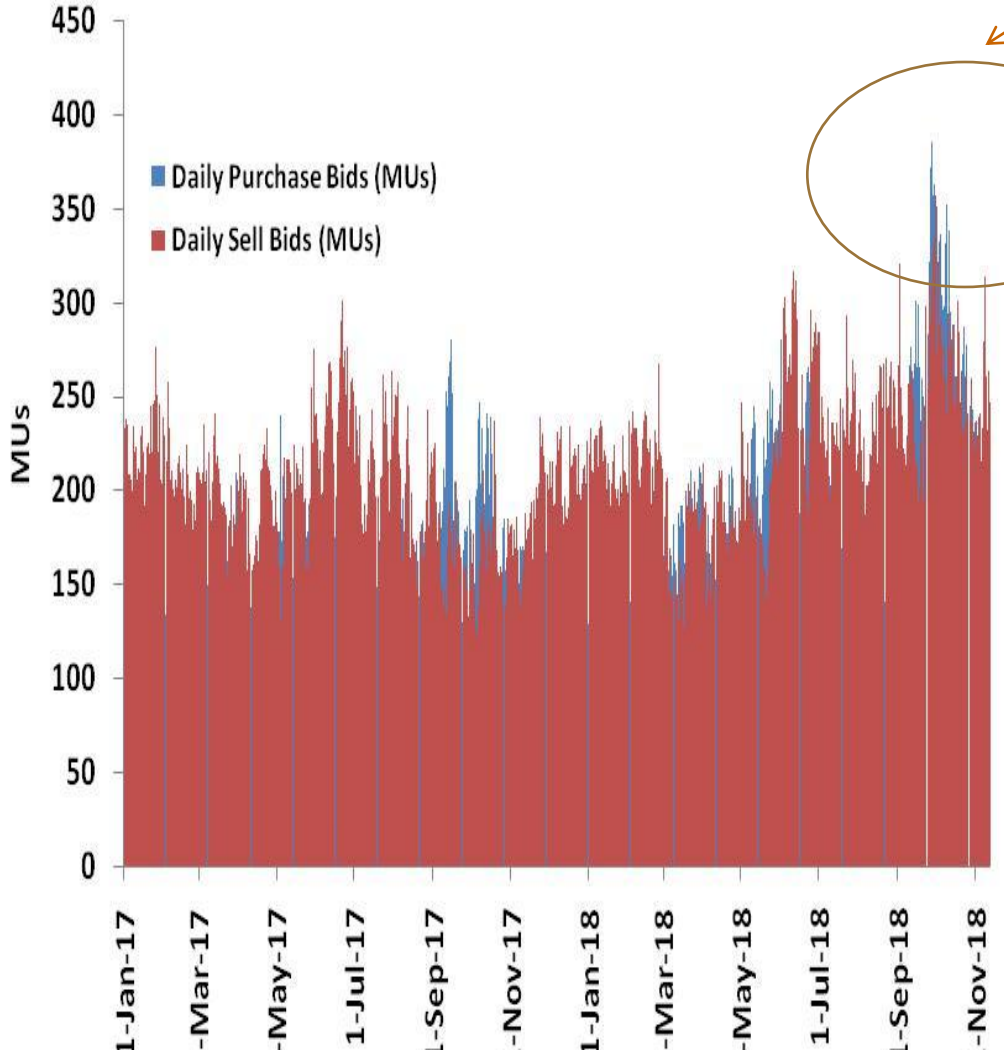


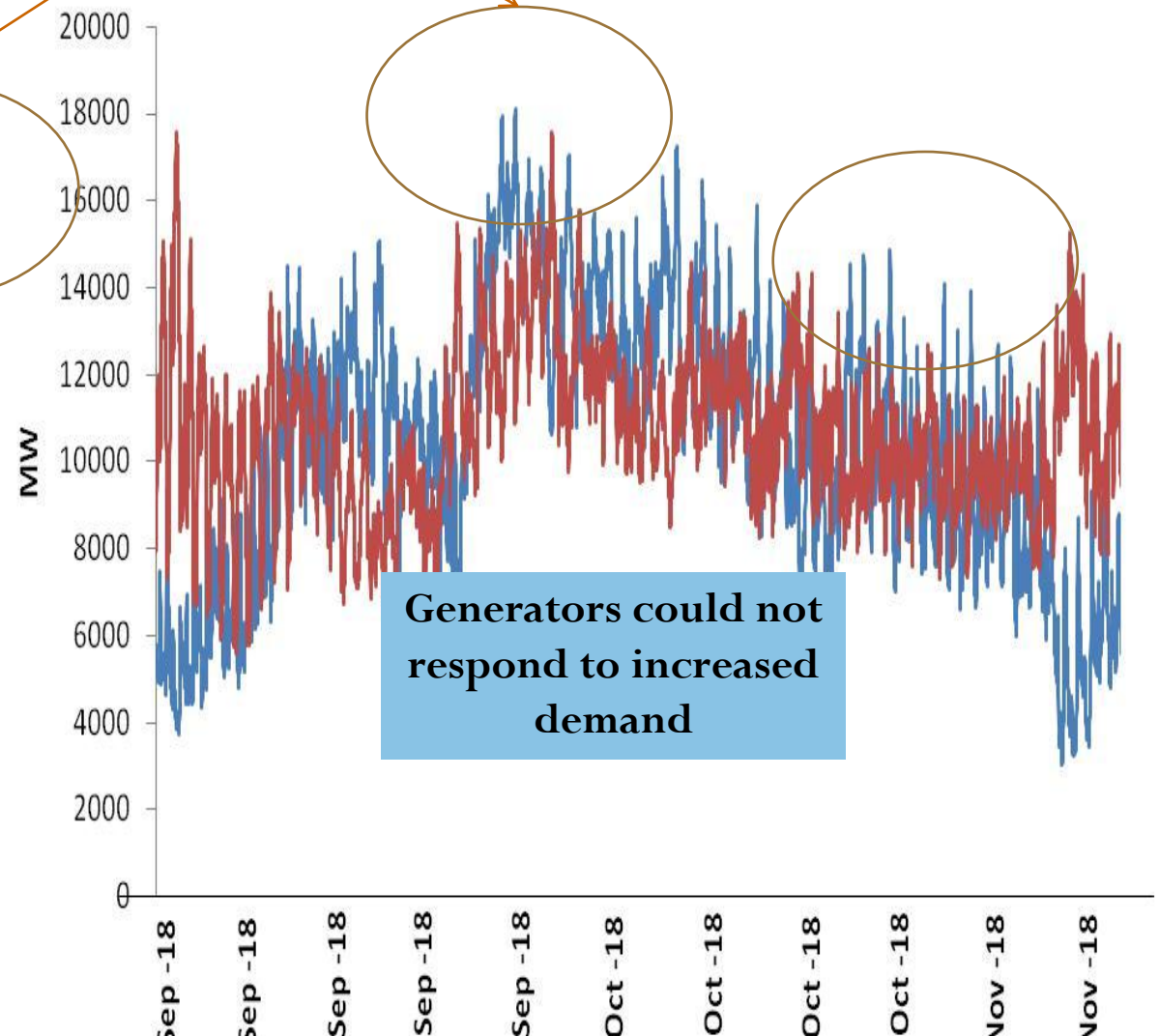
Leading Buyers	Mus (Sept & Oct)
Maha Discom	2332
Gujarat Urja	1657
Telangana South Discom	1170
Bihar Holding	983
West Bengal Discom	810
Tamilnadu Discom	734
Vedanta CPP	693
AP Southern Discom	370

Leading Seller	Mus (Sept & Oct)
Punjab State Power Corp.	1382.18
Jaipur Discom	905.53
Teesta Urja	786.59
Haryana Power Purchase Center	478.70
Tata Power Distribution Delhi	403.01
BSES Yamuna	347.31
JSW Energy	346.38
Himachal Pradesh Govt.	343.82

Purchase & Sell Bids

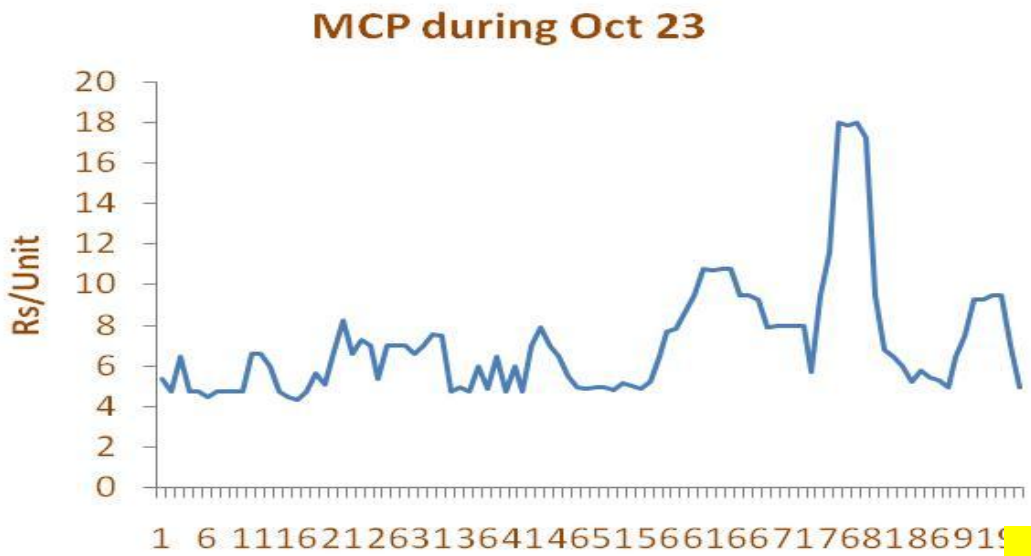
Purchase Bids > Sell Bids

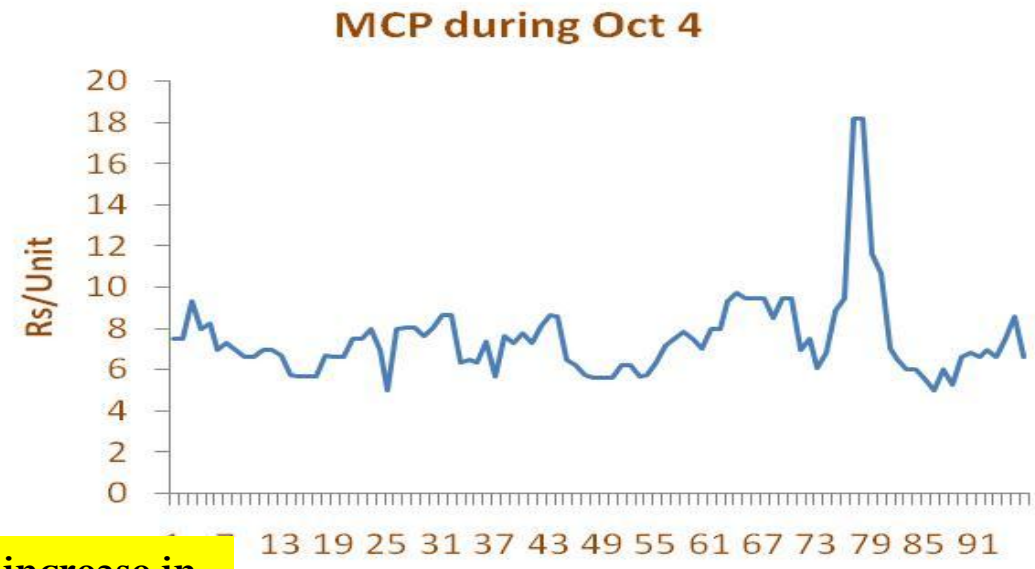




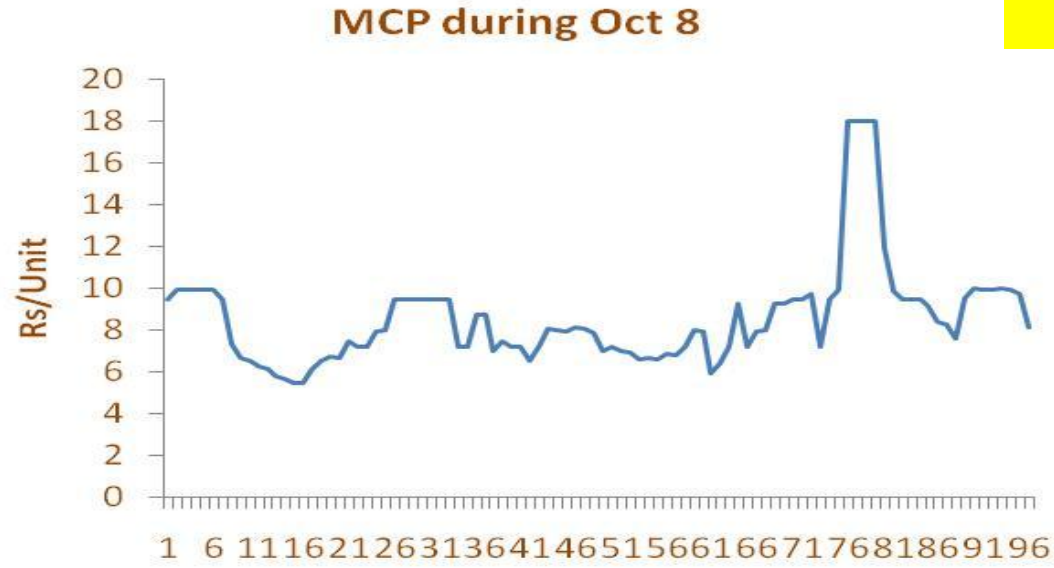
Generators could not respond to increased demand

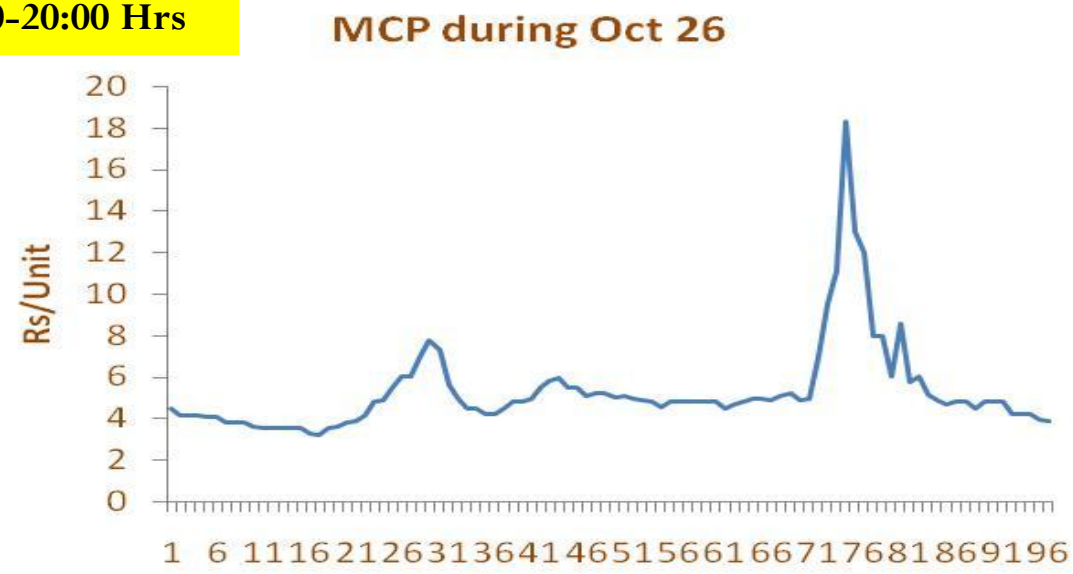
Diurnal Variation in MCP



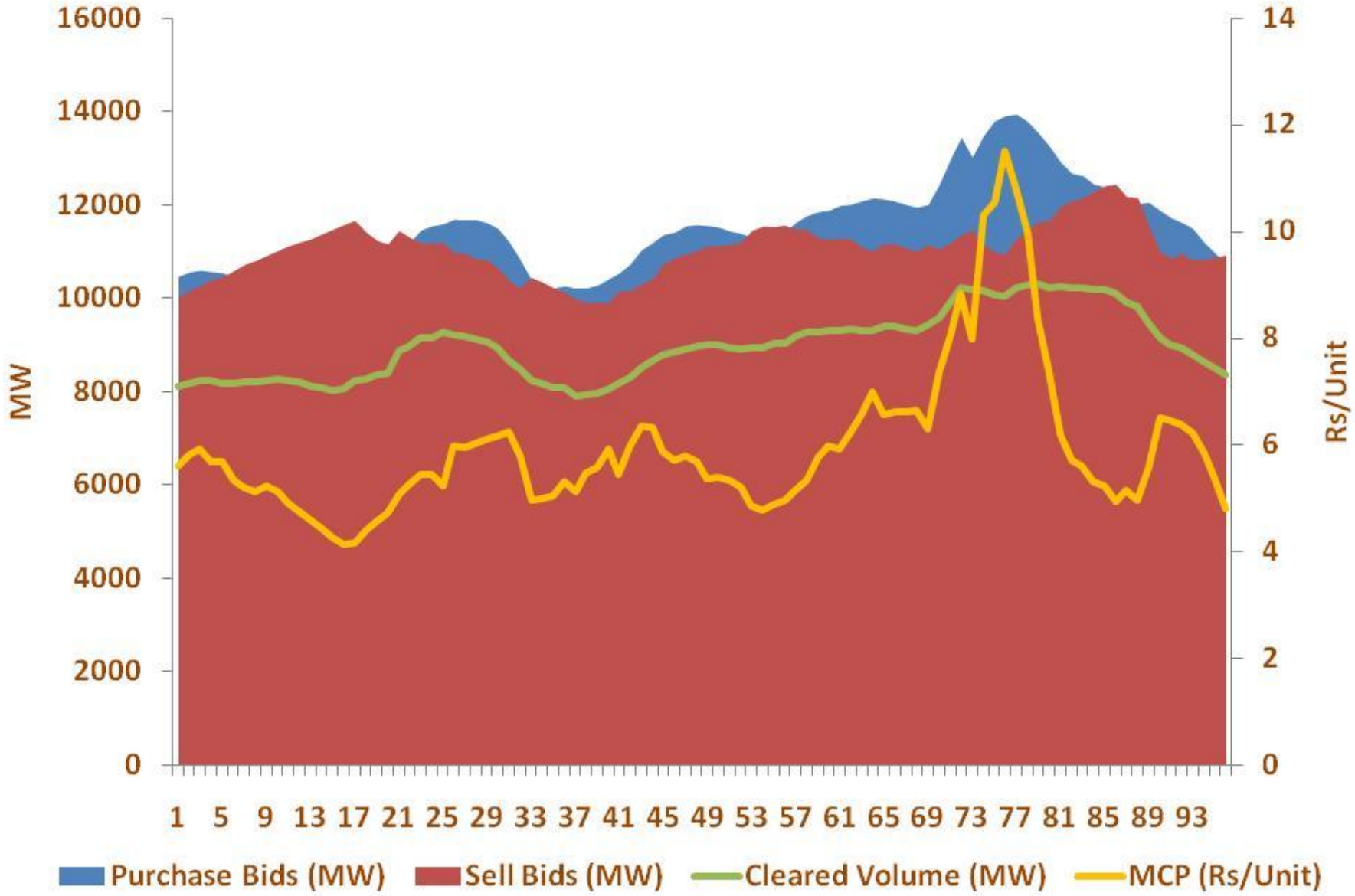


Steep increase in MCP during 18:00-20:00 Hrs





Avg. MCP & MCV during October



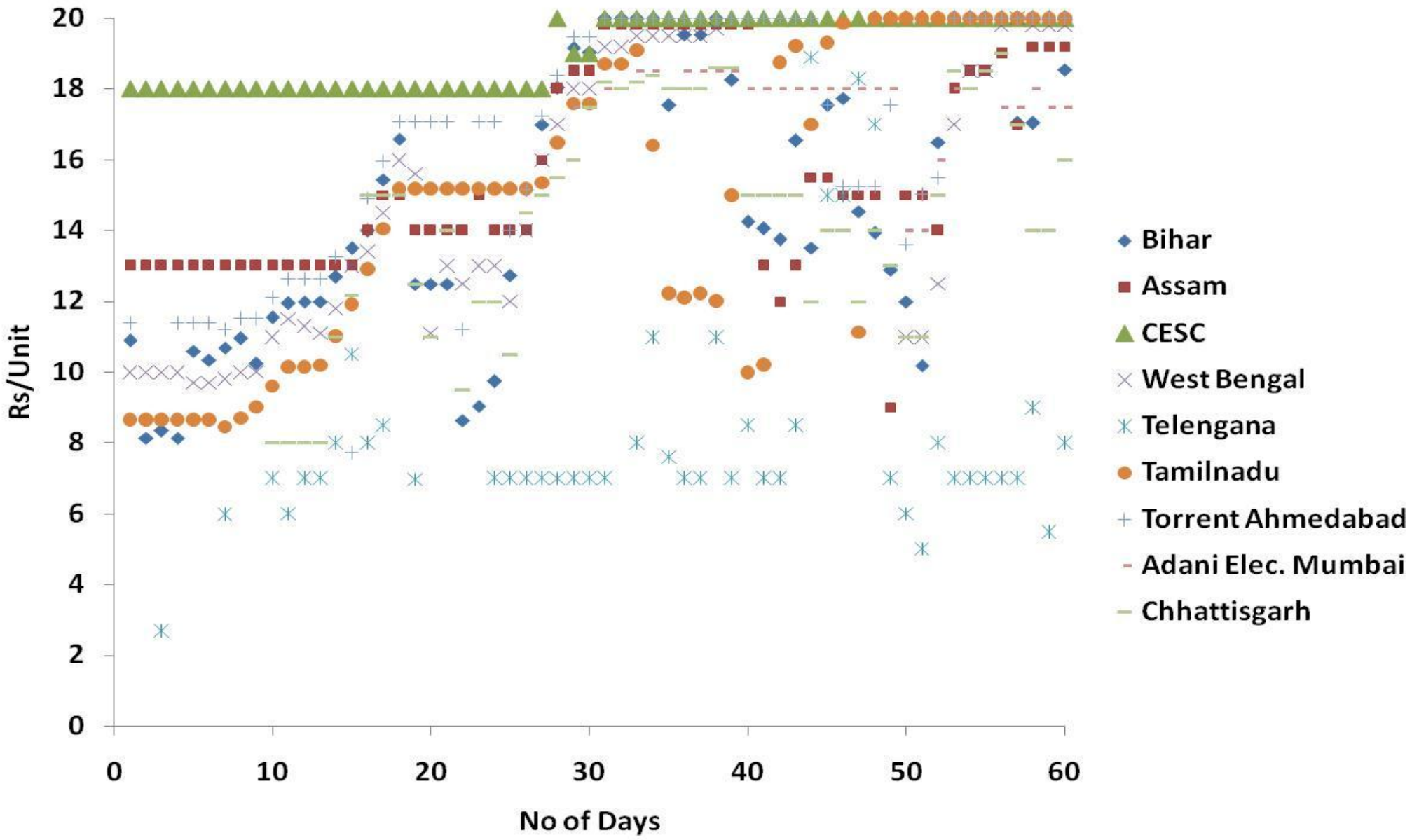
Bidding Pattern (Oct 8, 18:45-19:00 Hrs)

Bidding Pattern (Oct 26, 18:15- 18:30 Hrs)

Bihar, Tamilnadu, Torrent Ahmedabad

Assam, West Bengal, Adani Electricity Mumbai, chhattisgarh

Bidding Pattern



Key Reasons for Surge in MCP

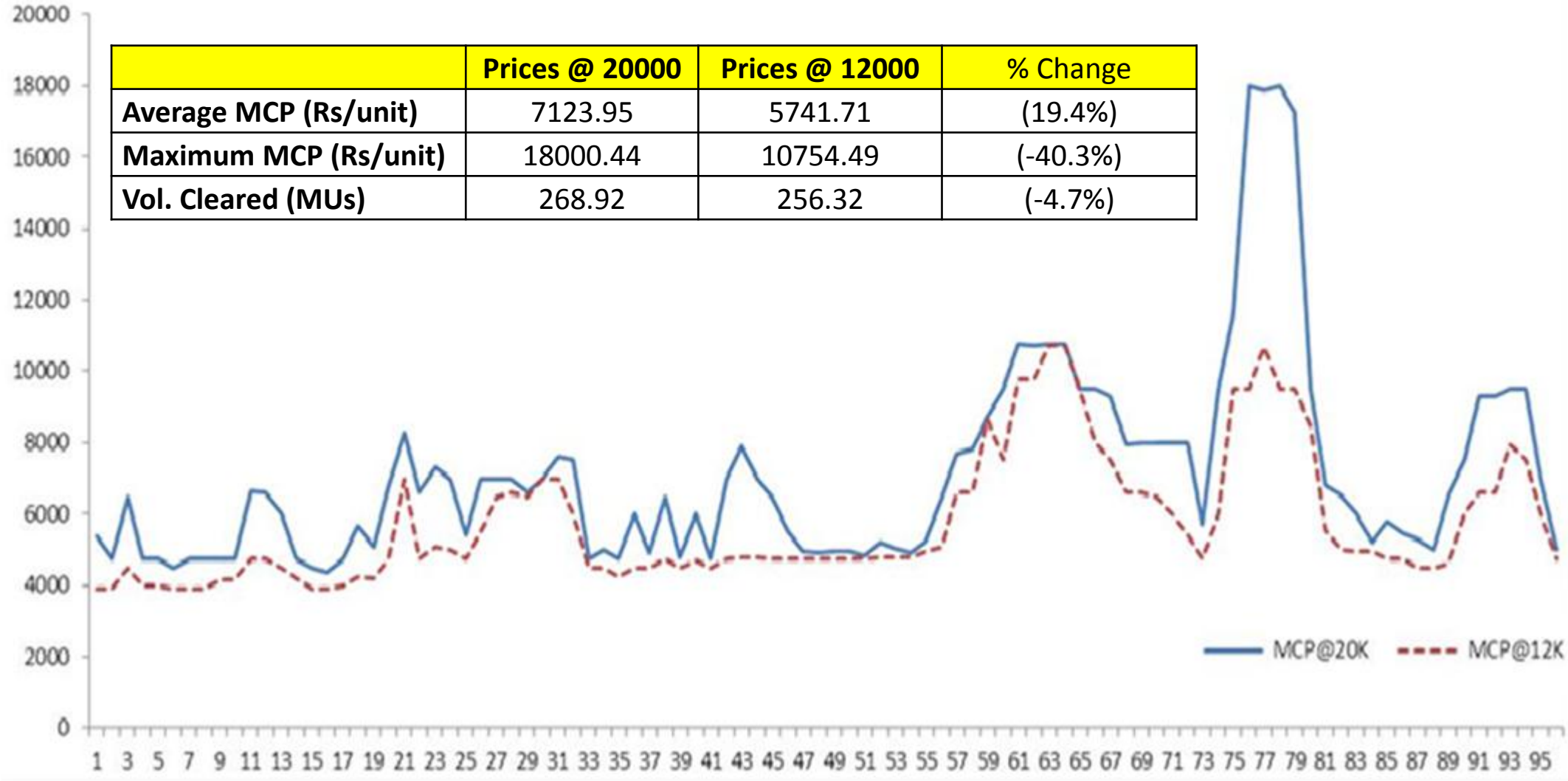
- Increased Demand from States
  - Insufficient Coal Stock (E-Auction/Import price are on high)
  - Decline in Hydro & Wind Generation (Wind generation dropped by 57% in Oct)
  - Festive Seasons – Maharashtra, West Bengal etc.
  - Temperature & Humidity

- Proportionate increase in Sell bids could not take place on account of unavailability of fuel

- Compulsory Buy Bids from Discoms at Rs 18-20/unit during peak hours

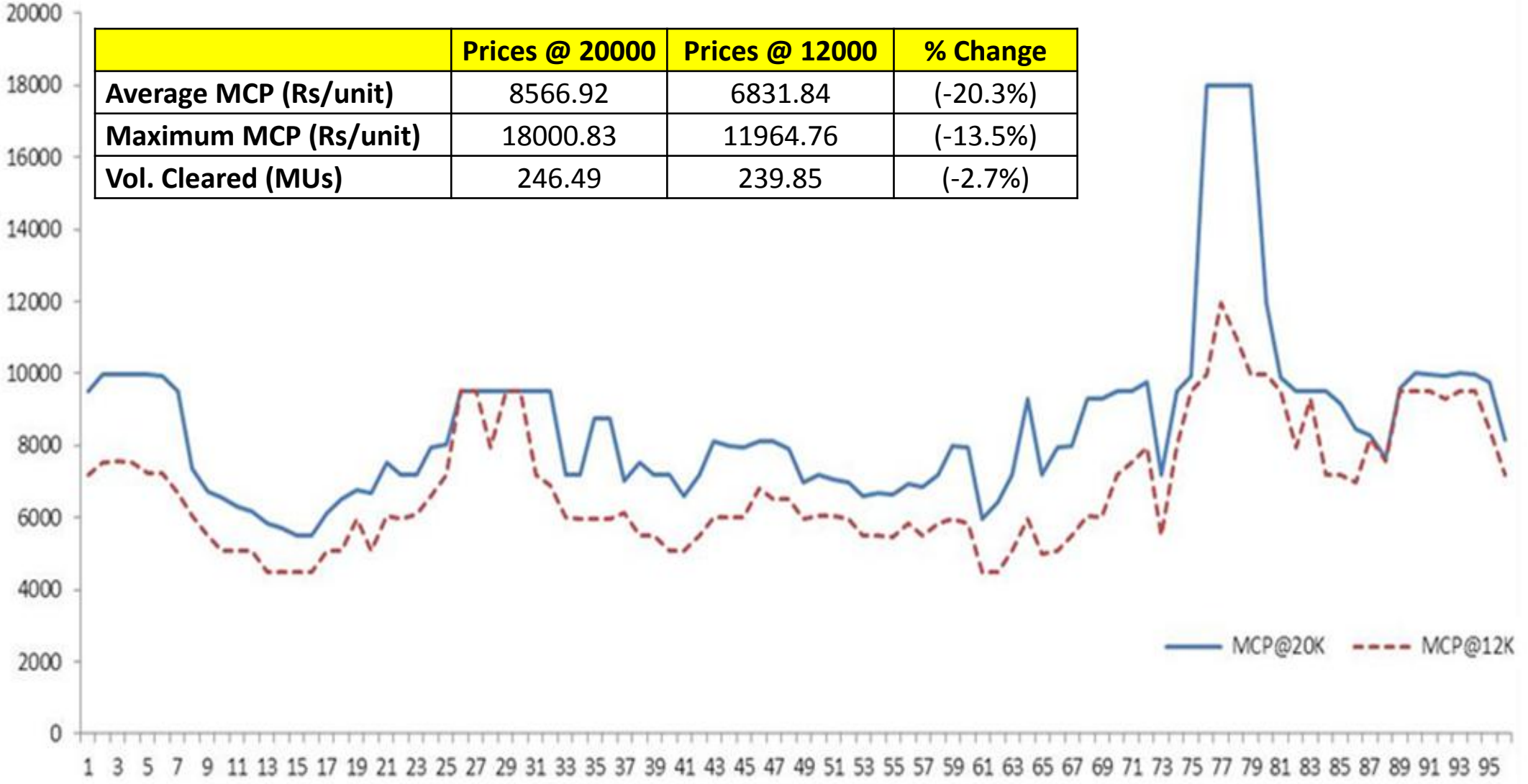
Price Ceiling at Rs. 12/unit (Oct 3)

	Prices @ 20000	Prices @ 12000	% Change
Average MCP (Rs/unit)	7123.95	5741.71	(19.4%)
Maximum MCP (Rs/unit)	18000.44	10754.49	(-40.3%)
Vol. Cleared (MUs)	268.92	256.32	(-4.7%)



Price ceiling at Rs. 12/unit (Oct 8)

	Prices @ 20000	Prices @ 12000	% Change
Average MCP (Rs/unit)	8566.92	6831.84	(-20.3%)
Maximum MCP (Rs/unit)	18000.83	11964.76	(-13.5%)
Vol. Cleared (MUs)	246.49	239.85	(-2.7%)



Thank You