MINUTES OF THE MEETING OF 77TH MEETING OF FORUM OF REGULATORS(FOR)

Date: 17th December, 2021 (Friday) – Hybrid
Venue: Conference Hall, UPERC, Lucknow, Uttar Pradesh
& on MS Teams

Chairperson, CERC & FOR welcomed all the members to the 77th meeting of the FOR. He thanked Chairperson of UPERC for hosting the FOR meeting and providing excellent arrangements. He thanked Chairpersons of OERC and KERC who would be demitting office before the next FOR meeting for their valuable contributions to the FOR deliberations. Chairperson, OERC and Chairperson, KERC thanked the members of FOR for their support and appreciated the quality of discussions in the meetings, which resulted in informed decision making.

2. Chairperson, UPERC, welcomed all the members of the FOR and made a presentation **(Annexure-1)** on the various initiatives taken by UPERC and achievements. The presentation detailed various regulatory initiatives and adjudication and tariff petitions handled and disposed of.

3. Thereafter, the agenda were taken up for discussion.

AGENDA ITEM NO 1: CONFIRMATION OF THE MINUTES OF THE 76TH FOR MEETING HELD ON 01ST OCTOBER 2021

4. Sharing the minutes of the meeting of the 76th FOR meeting held on 01st October, 2021, Deputy Chief (RA), CERC updated the members on the action taken on the minutes of the meeting.

5. On the issue of capacity building programs during the current financial year, the Forum decided that due to paucity of time and as per past practice, NPTI and IIT- K may be approached for organizing the training programs on online mode. It was also decided that the capacity building programme for the regulators with overseas component be organized preferably in the month of April, 2022, on emerging issues such as energy storage and financial derivatives.

6. With the above observations, the Forum approved the minutes of 76th FOR meeting held on 01.10.2021.

AGENDA ITEM NO 2: CONVERGENCE CONCEPT AROUND PM KUSUM SCHEME: REFERENCE FROM CONVERGENCE ENERGY SERVICES LTD. (CESL)

7. The Forum was informed that CESL is a wholly owned subsidiary of EESL Ltd. and the presentation is on the decentralized solar generation model using PM KUSUM.

8. MD & CEO of CESL made a presentation **(Annexure-2)** on the model being implemented in Goa and other States by CESL as tail wind for solarization of feeders, highlighting the benefits accruing to the Discoms.

9. The Forum noted the details of the presentation and suggested that CESL may get in touch with individual SERCs for disseminating the success story and demonstrating the savings which will accrue to Discoms through the scheme.

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

10. Based on the recommendations of 63rd meeting of the FOR, a Working Group was constituted to evolve standard rates of depreciation for distribution assets by suitably modifying the depreciation rates for generation and transmission assets evolved by CERC, along with defining standards for "Return on Investment" and "Operating norms in distribution sectors". On the recommendation of the working group, M/s Deloitte was engaged to assist the Working Group and the report of the Working Group was placed before the FOR for its consideration and approval.

11. The Consultant made a presentation **(Annexure-3)** on the major findings and suggestions in the report.

12. After deliberations, the FOR accepted the report. FOR Secretariat was requested to take further necessary action on the Report

AGENDA ITEM NO 4: UNLOCKING DEMAND SIDE FLEXIBILITY - PRESENTATION BY IRADE

13. Director, IRADe (which provides knowledge support to SAFIR Working Groups on various issues) in the presentation **(Anneure-4)** highlighted the benefits of Demand side flexibility and the need for allowing aggregators for capturing Demand side flexibility. He suggested that though the CERC Draft Ancillary Services Regulations do not prohibit any agency to be an aggregator for demand side response, it would be beneficial if it is made amply clear in the Regulations that an individual person or the Discom can act as an aggregator for the purpose of demand side response.

14. The Forum noted the contents of the presentation and appreciated the suggestions made. Chairperson, CERC observed that CERC will look into the suggestions while finalizing the Regulations on Ancillary Services.

AGENDA ITEM NO. 5: POWER MARKET DEVELOPMENT IN INDIA WITH REFERENCE TO DEVELOPMENT ON FINANCIAL DERIVATIVES – UPDATE

15. Chairperson, CERC informed the Forum that the Supreme Court of India on October 6, 2021 vide Order No C.A. No(s) -5290-5291/2011 in the matter between SEBI and CERC regarding regulatory jurisdiction of electricity derivatives disposed of the matter in terms of the agreement reached between SEBI and CERC. Going forward, physical delivery-based contracts (of any duration) through OTC or Power Exchange, would be regulated by CERC and the financial derivatives in electricity would be regulated by SEBI.

16. Thereafter, a presentation (**Annexure-5)** covering major highlights of the decision was made by the representative of CERC. Chief (RA), CERC informed the FOR that subsequent to the Order of Supreme Court, a Joint Working Group comprising of officials of CERC and SEBI has been constituted to

(a) Coordinate the regulatory role of SEBI and CERC with regard to trading of electricity derivative products;
(b) Suggest modalities for physical or cash settled contracts under Future segment;
(c) Suggest product design, margin requirement and other risk mitigation measures for electricity derivative products on ongoing basis;
(d) Suggest surveillance mechanism and dissemination of market information; and
(e) Consider any other issue related to electricity derivatives market, as may be jointly agreed by the Working Group.

17. The members observed that the decisions on the above would likely to impact the Discoms and hence, there is a need for capacity building of all ERCs so that ERCs can take appropriate action as required when financial derivatives are introduced.

18. In response, Chief (RA), CERC apprised the Forum that CERC has received a proposal from USAID to organize a series of webinars in association with USEA in the month of January 2022 and all ERCs and their staff are being invited to attend these webinars.

AGENDA ITEM NO. 6: ESTABLISHMENT OF CONSUMER GRIEVANCE REDRESSAL FORUM (CGRF) AND AMENDMENTS IN THE SUPPLY CODE - REFERENCE FROM MINISTRY OF POWER

19. Deputy Chief (RA), CERC apprised the Forum on a reference received from the Ministry of Power (MoP) wherein FOR Secretariat was requested to expedite the matter with SERCs for timely setting up of Consumer Grievance Redressal Forums by the distribution licensees at least at each district level to start with. The reference also requested SERCs to align the Supply Code with the Electricity (Rights of Consumers) Rules, 2020. She also informed that MoP has requested FOR Secretariat to send the status in respect of each SERC on the above points on quarterly basis until all the SERCs have complied with the provision of the Rules.

20. After deliberation, it was decided that the SERCs would look into the suggestions received from the Ministry of Power in the light of the provisions under the Electricity (Rights of

Consumers) Rules, 2020 and send status to the Ministry directly under intimation to the FOR Secretariat.

AGENDA ITEMNO. 7: APTEL ORDER DT 2.8.2021 REGARDING GUIDELINES FOR RE CURTAILMENT

21. After a detailed discussion on the APTEL Order dated 2.8.2021 regarding directions on the issue of curtailment of power generated from renewable energy sources, it was decided to constitute a working group to formulate guidelines with respect to curtailment of renewable energy.

22. It was decided that the Working Group would be headed by Chairperson, APERC with Chairpersons of TNERC, RERC, HPERC, CSERC as members. Member (Technical), CERC would be a special invitee. It was also agreed that the Working Group can co-opt Chairperson/ Members of any other ERC and engage experts or consulting agency for technical assistance, if necessary.

AGENDA ITEMNO. 8: GENERAL NETWORK ACCESS (GNA)

23. Chairperson, CERC, briefed the Forum about the salient features of the draft CERC (Connectivity and General Network Access to the inter-State Transmission System) Regulations, 2021 published by CERC for soliciting public comments. He apprised the Forum that the need for GNA Regulations was realized as the Commission had been witnessing a large number of litigations pertaining to Long Term Access (LTA) and grant of connectivity to renewable energy projects. The proposed Regulations are expected to address these challenges in view of the increasing penetration of renewables in the grid.

24. The Joint Chief (Engg.), CERC made a presentation **(Annexure-6)** on the CERC Draft (Connectivity and General Network Access to the inter-State Transmission System) Regulations, 2021 and highlighted the important concepts/provisions of the draft Regulations.

25. The Forum deliberated on different provisions of the GNA and noted the same.

AGENDA ITEM NO 9: Residual Current Device (RCD) GUIDE – REFERENCE FROM TNERC

26. Chairperson, TNERC informed the Forum that TNERC mandated that all new connections will be effected only after provision of Residual Current Device (RCD) inside the premises of consumers, in line with the draft CEA Regulations relating to Safety and Electric Supply with some modifications. He further added that installation of RCD will help in preventing electrical accidents and tripping of equipments in consumer premises and will save the life. He also shared and discussed about a guide on RCD, written by a retired engineer of the DISCOM and recommended that it may be followed by the other SERCs as well.

27. The Forum noted the initiative.

AGENDA ITEM NO 10: INDIAN RAILWAYS – REFERENCE FROM CSERC

28. Chairman, CSERC informed the Forum that Indian Railways has submitted a petition wherein it has claimed to be identified/treated as a deemed distribution licensee without obtaining licence. He sought views and guidance of the members of the Forum in this regard.

29. The Forum observed that it is the prerogative of the appropriate Commission to grant license. And once the licence is granted by the State Commission, the licensee is obligated to comply with all the conditions stipulated in the licence.

CONCLUSION

Secretary, CERC/FOR thanked all the members of the Forum participating in the meeting for their contributions in the discussions. He also thanked the officials of the FOR Secretariat and the officers of UPERC for coordinating and organizing the meeting in a hybrid mode.

Secretary, CERC/FOR informed that the date of the next meeting of the Forum which is scheduled to be held in West Bengal (Kolkata, Sunderbans) will be decided based on the how the situation unfolds in the context of Covid-19 and O-micron pandemic.

The meeting ended with a vote of thanks to the Chair

APPENDIX-I

LIST OF PARTICIPANTS OF THE 77TH MEETING

OF

FORUM OF REGULATORS (FOR)

HELD ON FRIDAY, THE 17TH DECEMBER, 2021.

[PHYSICAL AT LUCKNOW (UP) AND THROUGH VIDEO CONFERENCING (MS TEAM)]

S. No.	NAME	ERC
01.	ShriP.K. Pujari Chairperson	CERC / FOR –in Chair.
02.	Justice (Shri) C.V. Nagarjuna Reddy Chairperson	APERC
03.	Shri Kumar Sanjay Krishna Chairperson	AERC
04.	Shri Hemant Verma Chairperson	CSERC
05.	Justice (Shri) Shabihul Hasnain 'Shastri' Chairperson	DERC
06.	Shri D.K.Sharma Chairperson	HPERC
07.	Shri Lokesh Dutt Jha Chairperson	JERC for the UTs of J&K and Ladakh
08.	Shri Lalchharliana Pachuau Chairperson	JERC for Manipur and Mizoram
09.	Shri Shambhu Dayal Meena Chairperson	KERC
10.	Shri S.P.S. Parihar Chairperson	MPERC
11.	Shri Sanjay Kumar Chairperson	MERC
12.	Shri P. W. Ingty Chairperson	MSERC
13.	Shri U.N. Behera Chairperson	OERC
14.	Shri Viswajeet Khanna Chairperson	PSERC
15.	Dr. B.N. Sharma Chairperson	RERC

16.	Shri K.B. Kunwar Chairperson	SSERC
17.	Shri M. Chandrasekar Chairperson	TNERC
18.	Shri T. Sriranga Rao Chairperson	TSERC
19.	Shri D. Radhakrishna Chairperson	TERC
20.	Shri Raj Pratap Singh Chairperson	UPERC
21.	Shri D.P. Gairola Chairperson I/c.	UERC
22.	Shri Sutirtha Bhattacharya Chairperson	WBERC
23.	Shri Naresh Sardana Member	HERC
24.	Ms. Jyoti Prasad Member (Law)	JERC (for State of Goa & UTs)
25.	Shri Sanoj Kumar Jha Secretary	CERC/FOR
26.	Dr. Sushanta K. Chatterjee Chief (RA)	CERC
SPECIAL INVITEES		
27.	Shri Indu Shekhar Jha Member	CERC
28.	Shri Arun Goyal Member	CERC
29.	Shri Pravas Kumar Singh Member	CERC
30.	Shri Ajay Gupta Member	JERC (for UTs of J&K and Ladakh)
31.	Mr. Kaushal Kishore Sharma Member	UPERC
32.	Mr. V.K. Srivastava Member	UPERC
33.	Shri Pankaj Batra Project Director	SARI/E , IRADE
34.	Shri Jayanta Bora Associate Director	Deloitte
35.	Shri Amit Goenka Associate Director	Deloitte

36.	Ms. Mahua Acharya, MD & CEO	CESL
37.	Shri Proteek Chakraborty, Chief (Finance)	CERC
38.	Shri Shilpa Agarwal Jt. Chief (Engg.)	CERC
FOR SECRETARIAT		
39.	Ms. Rashmi Somasekharan Nair Dy. Chief (RA)	CERC
40.	Shri Sanjeev Tinjan Asst. Chief (RA)	CERC
41.	Shri Rajiv Kumar Asst. Secretary.	CERC/FOR
42.	Shri Gagan Diwan Asst. Chief (Eco.)	CERC
43.	Shri Ravi Kadam Advisor (RE)	CERC
44.	Shri Saurabh Principal Research Officer	CERC
45.	Shri Manavendra Pratap Research Officer	CERC

UPERC welcomes you to 77th Meeting of Forum of Regulators (FOR)

COMMISSION

Sh. R.P. Singh
(IAS Retd.)
Chairman

Sh. K.K. Sharma
Member

Sh. V.K Srivastava
Member (Law)

OFFICERS

Sh. Sanjay Kumar Singh

Secretary

Sh. Vikas Chandra Agarwal

Director (Distribution)

Sh. Amit Bhargava
Director (Tariff)

Sh. Manoj Rastogi

Director (Generation)

Sh. Shailendra Gaur Director (Transmission & SLDC)

Regulations

UPERC (Merit Order Despatch and Optimization of Power Purchase) Regulations, 2021

UPERC (Fees & Charges of State Load Despatch Centre and other related matters) Regulation, 2020

UPERC (CGRF & Electricity Ombudsman) Regulations (2nd Amendment), 2020

First Amendment/Addendum to UPERC CRE Regulations, 2019

UPERC (Standards of Performance) Regulations, 2019

Regulations

UPERC Open Access Regulations, 2019

UPERC (Multi Year Tariff for Distribution and Transmission) Regulations, 2019

Uttar Pradesh Electricity Regulatory Commission (Conduct of Business) Regulations, 2019

UPERC (Terms and Conditions of Generation Tariff) Regulation, 2019

UPERC (Captive and Renewable Energy Generating Plants) Regulations, 2019

Regulations

UPERC (Promotion of Green Energy through Renewable Purchase Obligation) (1st Amendment) Regulations, 2019

UPERC (Recruitment, Control and Service Conditions of Staff) Second Amendment Regulations, 2019

UPERC (Rooftop Solar PV Grid Interactive System Gross / Net Metering) Regulations, 2019 (RSPV Regulations, 2019)

First Addendum- Amendment to UPERC (FEES AND FINES) Regulations, 2018

UPERC (Forecasting, Scheduling, Deviation Settlement and Related Matters of Solar & Wind Generation Sources) Regulation 2018)

Regulations under consideration

Regulation regarding CGRF in line with Right of Consumer Rules issued by MOP

Regulation on Reduction on ROE on late filing of ARR/Tariff petition

* Public hearings held

Key Initiatives taken

- Introduced provision for conversion to multi-point connection in existing multistorey societies
- Provision of 100% metering of rural domestic consumers
- Abolished Regulatory Surcharge levied on consumers
- Abolished system loading charges for new connections

Key Initiatives taken

Security deposit waived-off under Saubhagya scheme

To encourage solar power, waived off transmission charges and cross-subsidy surcharge for Intra & Intra-state sale of solar energy

Approved smart meter roll-out plan for installation of 40 lakh smart meters across Uttar Pradesh

Implementing contemporary technological solutions in Distribution including Blockchain and Time of Use concept

Conferences organized by UPERC

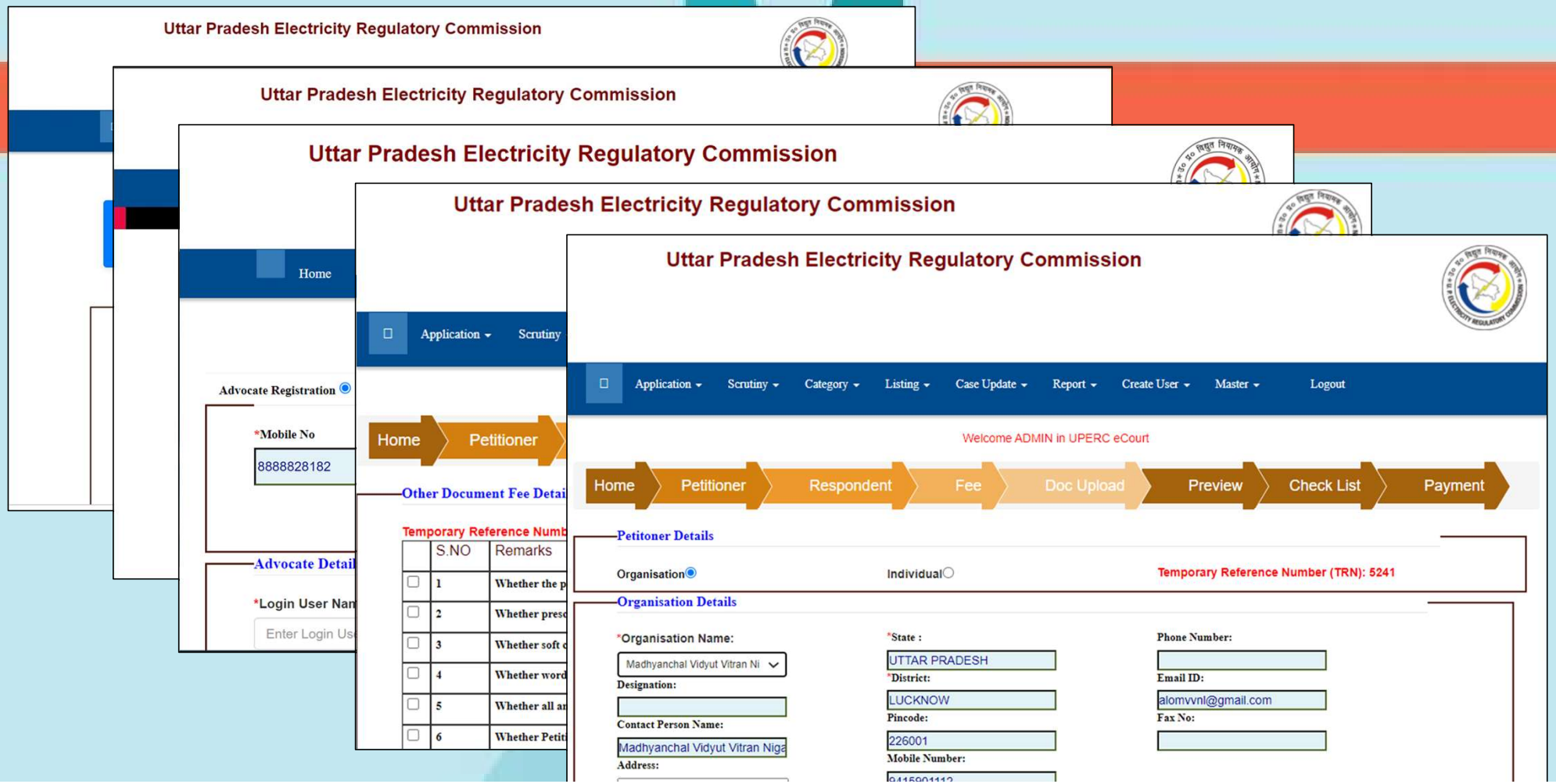
Technosphere of EVs, Charging Infrastructure, Power Demand Estimation & Pricing (2019)

Creation of Eco-System using Blockchain Technology for Renewable Energy, Distributed Energy Generation & Supply (2018)

YEAR	HEARINGS CONDUCTED	CASES DISPOSED
2017 – 18	392	149
2018 – 19	360	112
2019 – 20	526	140
2020 – 21*	414	141
2021 – till now*	402	90

*Online hearings since May 2020

Soft Launch of UPERC e-Court portal – 1st Nov 2021



Thank You
Have a pleasant stay!

Annexure-2

CONVERGENCE ENERGY SERVICES LIMITED
(A wholly owned subsidiary of Energy Efficiency Services Ltd. (EESL))

CONVERGENCE Concept Around PM KUSUM Scheme

17/12/2021

Index

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Introduction

KUSUM: Enabling National Scheme For Feeder Solarization

Component-A

Setting up of 10,000 MW of Decentralized Ground Mounted Grid Connected Solar power plants of individual size up to 2 MW

Component-B

Installation of 20 Lakh Stand-alone Solar Agriculture Pumps

Component-C

Solarisation of 15 Lakh Grid Connected Agriculture Pumps and Feeder Level Solarisation

- Reducing agricultural electricity subsidy burden
- Increasing farmer's income and water security
- Improving operational efficiencies of utilities, reducing T&D loss through decentralized offtake, RPO compliance

All 3 components of the scheme aim to add solar capacity of **30.8 GW** by FY 2022 with total CFA of INR **34,035** Cr

Component C

CESL is the preferred partner by states for implementation of Component C

Pump Solarization

- **Subsidy contribution** of 30% by the center and 30% by state
- CFA for pump solarization is available for up to two times pump capacity in kW up to pump capacity of 7.5 HP.
- Surplus power will be purchased by DISCOM, augmenting farmer income

Agriculture Feeder Solarization

- **CFA of 30%** of the estimated cost of installation of solar power plant i.e., **INR 1.05 Cr/MW.**
- CFA for feeder level solar project is applicable only for capacity of solarization for Agri pumping load.

Why CONVERGENCE: Utilizes PM KUSUM & Delivers Cost Savings to DISCOMs

- ***Primary Offering – Decentralized Solar Project in line with Feeder Solarization as under KUSUM C***

Electricity Sale to DisCom at a tariff of lesser than Average cost of power supply (ACoS), ACoS between INR 4-7/kWh across states*

Proposed value addition: Agri pumps and LED Lights for Demand Side Management and lowering cross subsidy

Additional offerings – Energy efficient applications

Add-on 1 – Energy Efficient Agriculture pumps

- Energy efficient agriculture pumps of capacity upto 7.5 HP can be distributed across the areas near the solar project sites

Add-on 2 – Energy Efficient LED Lights

- Energy Efficient LED bulbs can be distributed as a bundled solution along with the solar projects within the state

*

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Convergence Benefits- Cost Savings, RPO & Subsidy Savings to States

Benefits to Central Government

- Project is aligned with the central government's vision **of 175 GW RE power by 2022** and MNRE targets
- No subsidy from central government for execution of solar projects (other than the KUSUM related projects)

Benefit to State Government

- Small Scale Distributed solar projects aligned with various state govt. policy at such scale
- **Reduced state Government subsidy** for enhancing agricultural irrigation system in Rural areas and solar tariff at very competitive rates
- Utilization of degraded unutilized lands of DISCOM.

Benefits to Distribution Utilities

•Savings to Electricity board/DisCom on account of the followings:

- **Low tariff** in comparison to ACOS at LT feeder
- DisComs's **RPO obligations** will be met through solar projects. Solar projects will also help in meeting regulatory targets.

Benefits to People, Society and Environment

- Free distribution of energy efficient agriculture pumps to farmers
- Employment generations in rural areas
- **Single Entity Approach** Distribution and maintenance of energy efficient appliances
- GHG emission reductions

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Cost economics, basics of tariff estimation

Important parameters to be considered for financial assessment

- **CUF basis site co-ordinates**
- **Project cost**
- **Financial parameters – Interest rate, repayment and moratorium period**
- **O&M cost**
- **CESL PMC Cost**
- **Others: Construction period, site logistics,**

Tariff Estimation

- ✓ **Based on above parameters, financial model is prepared with suitable IRR to arrive at required tariff.**
- ✓ **Add-on of Energy Efficient Appliances along with solar project will also impact tariff**
- ✓ **Decentralized solar policy in state and previous precedent's decentralized projects to estimate tariff range**

Cost Benefit Assessment and other Benefits

- ❑ Savings from low solar tariff compared to ACoS for DisComs and grid tariff for other clients.
- ❑ State's can reduce agriculture subsidy burden as well as meet its RE targets
- ❑ Distribution Utilities can meet RPO, reduce expenditure for REC purchase, improve T&D losses
- ❑ Other Benefits: Reduce carbon emissions, create local employment, improve sustainability

Convergence Project in Goa:

Scope of Convergence Project in Goa:

- **110 MW Decentralized Solar Projects at LT Level** – Setting up cumulative 110 MW (AC) decentralised solar power projects ranging from 0.5 MW to 2 MW at degraded land next to DISCOM substations on 11kV feeders
- Project being planned under KUSUM C with Subsidy of INR 1.05 Cr/MW.
- **11,000 energy efficient Agriculture Pumps** – Replacement and Maintenance of 11,000 Nos. Conventional Agricultural Pumps with BEE star rated energy efficient Agricultural Pumps ranging from 0.1 HP to 10HP. (basis: all agri pumpsets in the State of Goa as per JERC)
- **9 W LED Bulbs** – Distribution of 16 lakh 9W LED bulbs. (basis: universal coverage)

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Financial Parameters

Parameters	*Unit*	*Value*
Total project capacity	**MW**	**110.00**
Life of the project	**Years**	**25**
Construction period	**Months**	**6**
Solar Plant Cost	**Rs MN/MW**	**36.58**
Pumps Capital Cost	**Rs MN/MW**	**4.2**
LED Bulb Capital Cost	**Rs. MN/MW**	**1.01**
Total Capex Cost (including GST)	**Rs. MN/MW**	**46.77**
Debt	**%**	**80%**
Equity	**%**	**20%**
Income tax	**%**	**25.17%**
Depreciation - Straight line method	**%**	**4.00%**
Interest rate	**%**	**7.50%**
CUF	**%**	**18.00%**
Tariff	**Rs/kWh**	**3.60**

*The CAPEX: price discovered through open tender by CESL.

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Rationale for Proposed Tariff

- The proposed tariff of Rs. 3.60/kWh is lower than the Generic Tariff for Solar PV for the state of Goa which is Rs. 4.68/kWh as determined by this Hon'ble Commission as per the Generic Tariff Order for Renewable Energy Sources for FY 2021-22 dated 28th April 2021.

- Break Up for Tariff:
  - **Decentralized Solar**: The tariff of Rs.3.25/kWh has been arrived at considering the cost of implementing 110 MW of aggregated solar projects (0.3 MW - 2 MW) spread across various locations.
  - **Energy efficient agriculture pumps:** 25 paise/kWh is for the installation and maintenance of 11,000 energy efficient agricultural pumps to farmers.
  - **LED lights:** 10 Paise/kWh is for distribution of 16 Lakh LED lights with 3 years warranty

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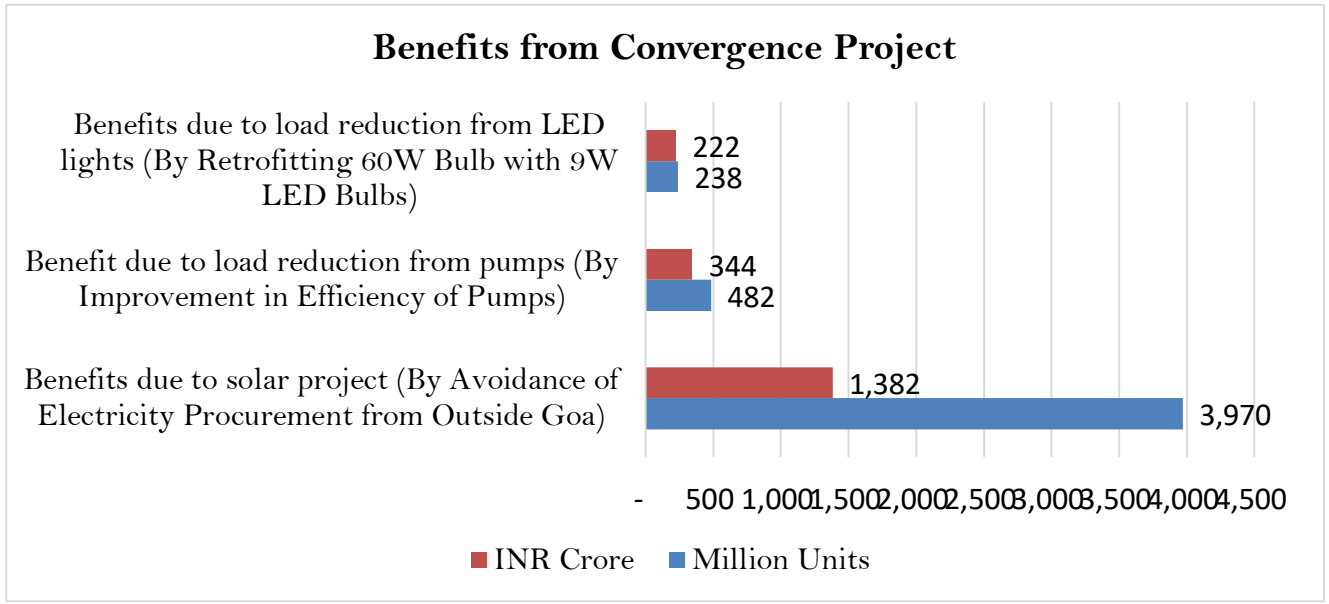
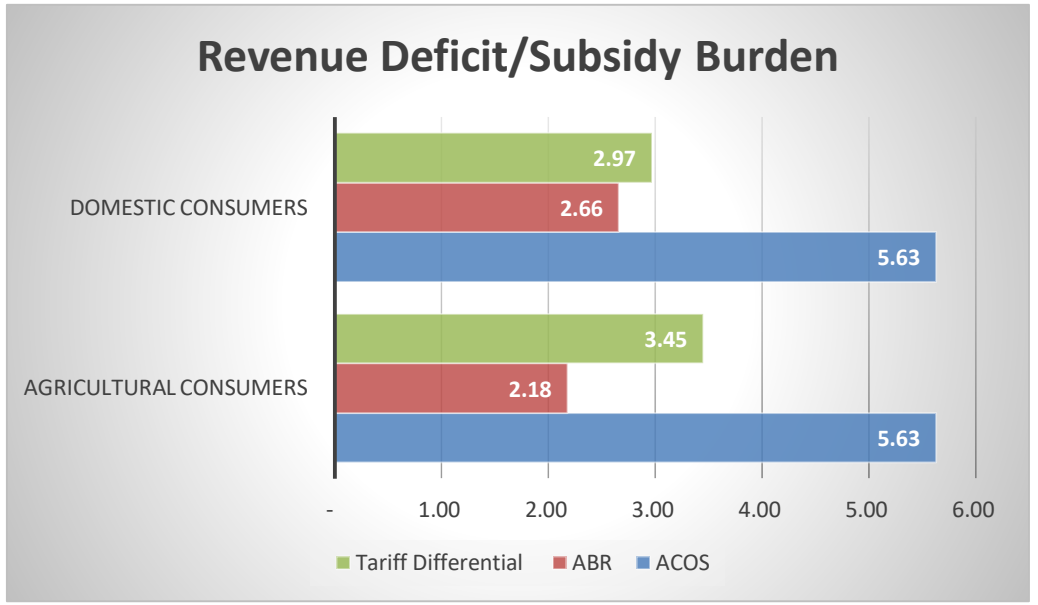
Envisioned Energy & Monetary Savings:





- **The total benefits through savings are approximately Rs. 80 Crores per year**
- **Annual DISCOM subsidy saving of INR 3.5 Crs for LT-AG: irrigation and pump-sets (basis: JERC ACoS of INR 5.63/kWh, ABR INR 2.07/kWh for AG LT and proposed CESL tariff of INR 3.6/kWh)**

Assumptions:

1) Considering the cost of power supply to the consumers @ Rs.5.57/kWh.
2) The pumps are considered to run 6 hours in a day, for 300 days in a year.
3) The Energy Savings on the Bulbs has been calculated based on 8 hours of operations.

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Benefits to the State:

The Project shall flatten the demand and load curve by adoption of consistent DSM being replacement of agriculture pumps and distribution of LED lighting.

- **Solar Powered LT Feeders**
  - Average cost of Supply to the different consumers in the State of Goa is Rs.5.63/kWh*
  - Supply of Power from decentralized solar projects to the LT Feeders would be Rs.3.60/kWh
- **Energy Efficient Agriculture Pumps**
  - Energy efficient agriculture pumps distributed by CESL would consume 30% less energy
  - Annual DISCOM subsidy saving of INR 3.5 Crs for LT-AG
- **LED Lights**
  - LED lights distributed by CESL consume upto 50% less energy than existing lighting solutions
  - Load reduction by 9.52 MUs per year

* The Average Cost of Supply is as per JERC Tariff Order FY 21-22

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Additional Benefits to the State:

- **Support DISCOMS in meeting RPO target**
  - GED has been able to achieve only 69% of the set RPO targets of 8% in FY 20-21
  - RPO targets have been revised to 10.50% for the FY 21-22.
- **Reduced T&D losses**
  - The decentralized generation would help in decrease of tariff by more Rs. 1 per unit considering overall T&D losses.
- **Development of Degraded lands**
  - This project would secure 4 Acres/MW near existing substations for DISCOM future expansion.
- **GHG emission reduction**
  - Reducing overall Green House Gas (GHG) emission reductions. This leads to emission reduction of 0.9357 tCO_2 per 1000 units generated from the decentralized plants.
- **Job creation**
  - Employment generations in rural areas will be additional benefit from the mini-grid solar project. Local staff and local hiring of labor for O & M activities.
  - Each decentralized plants create average 24.7 job years per MW of local employment. (basis: Down to Earth)

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Convergence with KUSUM C Scheme:

Furthering the objectives of KUSUM C Scheme:

- The installation of the cumulative capacity of 110 MW Grid Interactive Solar PV Power Projects will reduce the reliance on conventional sources of energy.
- It will help reduce the T&D losses and the subsidy burden to rural and agricultural consumers.
- The proposed replacement of existing agricultural pump sets with energy efficient pumps will greatly reduce the energy consumption of the agriculture sector, and conserve water.

Benefits under KUSUM C scheme to the State:

- Free replacement of conventional agricultural pumps with installation & maintenance of the BEE star rated agricultural pumps for 5 years as incentive to the farmers.
- Ensure Water conservation due to efficient pumping of upto 30%.
- Energy saving of upto 40% by replacement of pumps with BEE star rated pumps.
- The total benefits of around Rs. 40 Crores as under KUSUM C scheme of feeder level solarization.

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THANK YOU

CASE STUDY: CESL ODISHA AGRI-FEEDERS

CASE 1: INTRA-STATE TRANSMISSION & WHEELING CHARGES

Savings on Intra-State Transmission Charges and Losses

- Savings of ***INR 19.5 Lakh/MW/Year*** (~Rs1.36/unit- Gross Transmission and wheeling charges and losses); 1.46 MUs/MW/Yr)**
  - **Savings of INR 4.87 Cr/MW over 25 years**
  - for **500 MW Decentralized Solar-** Savings will be **INR 97.5 Cr/Year**
- CESL has already **executed 160 MW in MH**: Savings to **MSEDCL- 29.3 Cr/Yr** (~Rs1.3/unit- Gross Transmission and wheeling charges; ; 1.4 MUs/MW/Yr)

CASE 2: SOLARZING AGRICULTURAL FEEDERS FOR RPO COMPLIANCE

RPO Compliance

- The solar RPO target during FY 17, 18 & 19 was 3%, 4.5% and 5.5%; GRIDCO was only able to achieve 1.02%, 1.26% 1.86% respectively.**
- Solarizing 100% of the agricultural feeders can help in generating ~ ***730 MUs*** annually, which is around **49% of 2021-22 solar compliance** for GRIDCO (1490 MU)*
  - The equivalent **RECs** for 730 MUs would cost **INR 73 Cr/Yr** (1 MWh=1 REC, floor price of 1 REC= Rs 1000)
- State can also adopt **arbitrage mechanism** for RE Compliance as offered by Adani Power in MH.
  - Where consumers can opt for green power by paying additional tariff of **INR 0.66/unit**

CASE 3: PPA +CONVERGENCE STACK UP MODEL

Savings on Decentralized Solar +E.E. Pumps +LEDs

- If under Convergence stack up model, CESL installs, Decentralized solar power + Energy Efficient Pumps + LEDs @ Rs 3.6/unit tariff, as compared with **Rs 5.48**/unit AcoS*** The annual savings will be
  - Rs **29.64** Lakh per MW of installing Dec. solar plant (power procured at 3.6/unit instead of AcoS);
  - Rs **11,038** per E.E. Pump installed (savings due to 30% load reduction as compared to non E.E. pumps)
  - Rs **230** per LED installed (60% reduction in load as compared to non LEDs), 10 thousand LEDs can save 23 lakh annually

*ORIERC Gridco Tariff Order 2021-22 (Case 72 of 2020); and Open Access Charges; ** ORIERC ARR and Retail Tariff Petition 2021-22 (Case no 75-78 of 2020); ***http://www.orierc.org/Orders/2020/C-43-2020.pdf

ODISHA: Large solar at Rs 1.7 /kWh= Agri solar at Rs 3/kWh

Particulars	UoM	OD*Large Solar	CESL
Cost of generation (ex-bus)	**Rs/kWh**	**2.49**	**3.00**
Transmission charges	Rs/kWh	0.28	NA
Transmission losses (at EHT level)	%	3.00%	NA
Grossing up of Transmission losses	Rs/kWh	0.35	NA
Cost at Discom Substation	**Rs/kWh**	**2.84**	**3.00**
Wheeling charges	Rs/kWh	0.76	NA
Wheeling losses (at HT Level)	%	8%	NA
Grossing up of Wheeling losses	Rs/kWh	0.99	NA
Cost of delivery	Rs/kWh	**3.83**	**3.00**
Gross Transmission and Wheeling Charges (Including Losses)	**Rs/kWh**	1.34	

SECI has signed PSA with GRIDCO for 500 MW Solar @ **Rs 2.61/kWh****; The landed cost of power will be more than Rs. 4/kWh (intrastate and interstate transmission/wheeling charges)

OD*- ORIERC GRIDCO Tariff Order FY21-22; **https://mercomindia.com/regulator-allows-odisha-discom-solar-seci/

CASE STUDY: CESCL KARNATAKA AGRI-FEEDERS

CASE 1: INTRA-STATE TRANSMISSION & WHEELING CHARGES	

Savings on Intra-State Transmission Charges and Losses	• Savings of ***INR 21.5 Lakh/MW/Year*** (~Rs1.47/unit- Gross Transmission and wheeling charges and losses); 1.46 MUs/MW/Yr)**
	  • **Savings of INR 5.37 Cr/MW over 25 years**
	  • for **500 MW Decentralized Solar-** Savings will be **INR 107.5 Cr/Year**
	• CESL has already **executed 160 MW in MH**: Savings to **MSEDCL- 29.3 Cr/Yr** (~Rs1.3/unit- Gross Transmission and wheeling charges; ; 1.4 MUs/MW/Yr)

CASE 2: SOLARZING AGRICULTURAL FEEDERS FOR RPO COMPLIANCE	

RPO Compliance	• Decentralized solar of 500 MW can help in generating ~ ***730 MUs*** annually and meeting the compliance of solar purchase. (equivalent RECs would cost INR 73 Cr/Yr (1 REC=1MWh=floor price of INR 1000).
	  • The current solar RPO is 10.5% for FY 2021-22.
	• State can also adopt **arbitrage mechanism** for RE Compliance as offered by Adani Power in Maharashtra.
	  • Where consumers can opt for green power by paying additional tariff of **INR 0.66/unit**

CASE 3: PPA +CONVERGENCE STACK UP MODEL	

Savings on Decentralized Solar +E.E. Pumps +LEDs	• If under Convergence stack up model, CESL installs, Decentralized solar power + Energy Efficient Pumps + LEDs @ Rs 3.6/unit tariff, as compared with **Rs 5.82**/unit AcoS** The annual savings will be
	  • Rs **35** Lakh per MW of installing Dec. solar plant (power procured at 3.6/unit instead of AcoS);
	  • Rs **11,723** per E.E. Pump installed (savings due to 30% load reduction as compared to non E.E. pumps)
	  • Rs **244** per LED installed (60% reduction in load as compared to non LEDs), 10 thousand LEDs can save **INR 24.4 lakh** annually

*APPC Source: CERC APPC Rate Determination 2021-22 ; **Forum of Regulators Analysis Report and KERC Tariff Oder 2020

ANNEXURES

Assumptions and methodology for Calculations

Case1: Calculations for Savings on Transmission and Distribution Charges (Odisha)

- The gross transmission and wheeling charges (including losses) is around INR 1.34/unit
- Considering solar power to generate 1.46 MU/MW/year, The savings are calculated by multiplying units generated with gross transmissions and wheeling charges.

Case1: Calculations for Savings on Transmission and Distribution Charges (Karnataka)

- The gross transmission and wheeling charges (including losses) is around INR 1.47/unit
- Considering solar power to generate 1.46 MU/MW/year, The savings are calculated by multiplying units generated with gross transmissions and wheeling charges.

Case2: Calculations for Savings on RECs Avoidance

- 1 REC= 1MWh, Cost of 1 REC= INR 1000 (floor price)

ANNEXURES- Odisha

Assumptions and methodology for Calculations

Case 3: CESL Stack Up Model

If under Convergence stack up model, CESL installs, Decentralized solar power + Energy Efficient Pumps + LEDs @ Rs 3.6/unit tariff, as compared with **Rs 5.48**/unit AcoS. The annual savings are calculated as per below assumptions

Assumption Head	Head	Unit	Actual
Part 1: Solar Plant	Installed Solar Power Plant	MW	1
	Annual Deration Factor	%	0.75%
	CUF	%	18%
	total hours in an year	Years	8760
	Average cost of Supply	Rs/kWh	5.48
	CESL Tariff (solar+EE Pumps+LEDs)	Rs/kWh	3.6
Part 2: Energy Efficient Pumps	No. of pumps	No.	1
	Rating	HP	5
	Rating	kW	3.73
	Daily hours of operation	Hrs	6
	Operational no. of days in an year	Days	300
	Electricty savings due to energy efficient pumps	%	30%
Part 3: LEDs	No of LEDs	No.	1
	Load reduction due to LED lights	%	60.00%
	Ratings of LED	Watts	9
	No. of hours of operation	Hrs	8
	Days of operation in an year	Days	365
	Domestic tariff	Rs/kWh	2.48

Output	Head	Unit	Actual
Generation from Solar	Net units generated per year from solar	MUs	1.58
	Amount spent as per Acos	Mn. Rs	8.64
	Amount spent as per CESL Tariff	Mn. Rs	5.68
	Savings through solar power (AcoS-CESL Tariff)	Mn. Rs	2.96
	Savings through solar power(AcoS-CESL Tariff)	Cr. Rs	0.30
	Savings trough solar power(AcoS-CESL Tariff)	Lakh Rs.	29.64
Savings due to EE Pumps	Electricity required to run pump annually	kWh	6714
	Electricity required to run EE pump annually (30% Reduction)	kWh	4700
	Annual savings of electricity acquired by EE pump	kWh	2014
	Savings through EE pumps	Rs	11,038
Savings due LEDs	Electricity required to run LEDs annually	Wh	26280
	Electricity required to run LEDs annually	kWh	26.28
	Electricity required to run non LEDs (annually) (60% less efficient)	kWh	42.048
	Savings on load reduction with LEDs(60% more efficient)	INR	230.42

ANNEXURES- Karnataka

Assumptions and methodology for Calculations

Case 3: CESL Stack Up Model

If under Convergence stack up model, CESL installs, Decentralized solar power + Energy Efficient Pumps + LEDs @ Rs 3.6/unit tariff, as compared with **Rs 5.82**/unit AcoS. The annual savings are calculated as per below assumptions

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Output	Head	Unit	Actual
Generation from Solar	Net units generated per year from solar	MUs	1.58
	Amount spent as per Acos	Mn. Rs	9.18
	Amount spent as per CESL Tariff	Mn. Rs	5.68
	Savings through solar power (AcoS-CESL Tariff)	Mn. Rs	3.50
	Savings through solar power(AcoS-CESL Tariff)	Cr. Rs	0.35
	Savings trough solar power(AcoS-CESL Tariff)	Lakh Rs.	35.0
Savings due to EE Pumps	Electricity required to run pump annually	kWh	6714
	Electricity required to run EE pump annually (30% Reduction)	kWh	4700
	Annual savings of electricity acquired by EE pump	kWh	2014
	Savings through EE pumps	Rs	11,723
Savings due LEDs	Electricity required to run LEDs annually	Wh	26280
	Electricity required to run LEDs annually	kWh	26.28
	Electricity required to run non LEDs (annually) (60% less efficient)	kWh	42.048
	Savings on load reduction with LEDs(60% more efficient)	INR	245

Brief on Financials

- **Major project and financial parameters considered in the calculations are as below:**

Major assumptions	Unit	Value
Total project capacity	MW	10
Life of the project	Years	25
Construction period	Months	6
Total project cost (Hard cost)	Rs MN/MW	38.8
O&M (25 years)	Rs Mn/MW	11.5
Interest rate	%	8.00%
Repayment tenure	Years	20
Moratorium period	Years	1
CUF	%	19.00%
Tariff	Rs/kWh	3.11

- For INR 3.11 /kWh tariff, No KUSUM Subsidy considered
- If KUSUM-C subsidy of INR 50 Lakh/MW is availed then tariff will go down to INR 3/kWh

Annexure-3

Deloitte.

FOR Working group

Evolving Principles of Depreciation for Distribution Assets and Operating and Financial norms for Distribution

Sep 2021

Scope of the engagement

1. Study and analyze methods and **principles used for calculating depreciation** in the distribution sector including the useful life of different components of distribution assets.

2. Study singular practices in other **infrastructure sectors** and suggest **principles** and the appropriate **useful life of distribution assets** in light of the emerging technological and structural changes in the electricity sector.

3. Study the **FOR Report of 2009 on Distribution Margin** and suggest suitability of the principles of availability based cost recovery in the context of the **current and emerging scenario** in the **distribution** sector

Depreciation norms

Background

Framework for Depreciation under Electricity Act

Tariff Policy

The Tariff Policy notified by the Ministry of Power lays down principles / framework based on which Tariff shall be determined by the Regulatory Commission. Depreciation being a key element has been addressed in the Tariff Policy as below:

"5.3 c) Depreciation

The Central Commission may notify the rates of depreciation in respect of generation and transmission assets. The depreciation rates so notified would also be applicable for distribution with appropriate modification as may be evolved by the Forum of Regulators.

The rates of depreciation so notified would be applicable for the purpose of tariffs as well as accounting.

There should be no need for any advance against depreciation.

Benefit of reduced tariff after the assets have been fully depreciated should remain available to the consumers."

Companies Act 2013

Section 123 of the Companies Act 2013 provides for depreciation to be charged as per section II of the Companies Act, and defines depreciation as:

"Depreciation is the systematic allocation of the depreciable amount of an asset over its useful life. The depreciable amount of an asset is the cost of an asset or other amount substituted for cost, less its residual value. The useful life of an asset is the period over which an asset is expected to be available for use by an entity, or the number of production or similar units expected to be obtained from the asset by the entity."

Depreciation Methodology as per Regulations

Similar approach for depreciation as followed by CERC

SERCs	Methodology	Depreciation Rate	Residual/ Salvage Value		Years of Acc. Dep	Depreciation as per useful life
			All Assets	IT Assets		
CERC	**SLM**	**As per Regulations**	**10%**	**Nil**	**12**	**NA**
MERC	SLM	As per Regulations	10%	Nil	Yes	Dep rate upto 70%
UERC	SLM	As per Regulations	10%	Nil	12	NA
RERC	SLM	As per Regulations	10%	NA	12	NA
JSERC	SLM	As per Regulations	10%	NA	Yes	Dep rate upto 70%
APERC	SLM	As per CERC				
HPERC	SLM	As per Regulations	10%	Nil	NA	Yes
DERC	SLM	As per Regulations	10%	Nil	12	NA
OERC	SLM	Pre-1992 rates as notified by the GoI	10%	NA	NA	Yes
KERC	SLM	As per CERC				
TNERC	SLM	As per Regulations	10%	NA	NA	Yes
AERC	SLM	As per Regulations	10%	NA	12	NA
GERC	SLM	As per Regulations	10%	NA	12	NA

- Most State regulations provide for similar process as laid down by CERC in tariff
- Accelerated depreciation (for initial 12 years) in line with CERC Regulations
- Few Commissions (JSERC & MERC) provide for applicability of depreciation rates upto 70% of asset value and remaining 30% to be considered as per useful life

Depreciation Methodology as per Regulations

Issues in accounting for depreciation as per regulations

Regulatory Classification	• No distribution specific assets defined in majority of regulations • Most regulations follow similar asset classification as prescribed under CERC Regulations • Specific depreciation rates for distribution assets are covered only under few regulations like Maharashtra and Delhi. • Depreciation rates also differ across specific state regulations
Non availability of Fixed Asset Registers	• Most utilities currently do not have FAR in place which restricts charging of different depreciation rates based of asset type • Difficultly in charging differential rates prescribed in the regulations post completion of 12 yrs • Many utilities therefore undertake adjustments or continue to levy higher depreciation rates as prescribed in the tariff regulations.
Useful life	• The useful life of distribution assets are not specifically prescribed for all asset categories in many tariff regulations. • As a result, the utilities continue to levy the depreciation rates on overall asset categories at the similar rates prescribed in the tariff regulations
Classification of assets	• Due to large number of assets, difficult to maintain data in segregated manner • Generally, utilities are not maintaining data at such component level and most assets are classified under plant and machinery in absence of FAR • Due to turnkey contracts, detailed asset class in unavailable

Determination of Useful Life of Distribution Assets

Approach

Identification

- Detailed list was developed for assessing the useful life
- Aspects such as major cost items, voltage level (HT/ LT), type, etc. were considered

Consultation

- Discussions with manufacturers / contractors were carrier out
- List for further refined based on responses

Analysis

- Propose appropriate useful life based on responses
- Identify and reduce the number of asset categories/ sub-categories based on identical useful life

Depreciation Methodology

Useful Life determination - Transformers

Transformers

Sl.	Particulars	Useful Life (in years)						
1	**Power Transformers**	**Nucon**	**Toshiba**	**Tesla**	**Century Infra**	**MP Discoms**	**JVBNL**	**UP**
i.	Power transformers	25	25-30	25	25	25t-40	15-20	20
2	**Distribution Transformers**	**Sudarshan Transformers**	**Sai Electricals**	**SJ Transformers**	**Sarvoch India**	**MP Discoms**	**JVBNL**	**UP**
i.	<=25 kVA (Single Phase)	15	20	15	20	15-25	10	5
ii.	<=25 kVA (Three Phase)	15	20	20	20	20-25	10	5
iii.	>25- <100 kVA	15	20	20	20	20-25	10	7
iv.	>100 - < 500 kVA	15	25	20	20	20-25	10	7
v.	> 500 KVA	15	25	20	20	20-25	10	7

The Ministry of Power in 1994, prescribed 25 years of useful life for transformers with rating of 100kVA and above as well as for other transformer capacities. The standard bidding documents prepared by REC under DDUGJY scheme also prescribe 25 years of useful life for transformers. Studies on failure rates in transformers indicate life of about 20-22 years .

Proposed Useful Life

Sl.	Particulars	Useful Life (in years)
1	**Power Transformers**	25
2	**Distribution Transformers**	
i	<100 kVA	15
ii	>=100 KVA	20

Depreciation Methodology

Useful Life determination – Substation switchgear

Substation Switchgear

Sl.	Particulars	Wellman power	Powerline	JM Electricals	Rashtriya Electrical	Lamco Industries	MP Discoms	JVBNL	UP
i	Circuit Breakers (33kv S/s)	7	10	5	7-10	10	5-10	7	10
ii	Isolators	7	7	5	7-10	10	5-25	6	10
iii	Bus couplers	7	7	5	7-10	10	5-25	7	10
iv	Lightning Arrestor	10	10		5-7	10	5-25	7	10

As per the useful life prescribed by Ministry of Power in 1994, 25 years of useful life has been prescribed for switchgear in general circuit breakers and bus couplers typically last for 10-15 years and therefore can be considered to have useful life of 15 years. It may be noted that circuit breakers in lower voltage installation experience higher failure, thereby a lower useful life. As per CEAs input, LV Circuit breakers a useful life of 10 years may be considered.

Proposed Useful Life

Sl.	Particulars	Useful Life (in years)
1.	Circuit Breakers (33kv S/s),	15
2.	Circuit Breakers (LV)	10
3.	Isolators	10
4.	Bus couplers	15
5.	Lightning Arrestor	10

Depreciation Methodology

Useful Life determination – Overhead lines

Overhead Lines

Sl.	Particulars	Useful Life (in years)								
1.	Overhead lines	**Apar Conductors**	**Indoalusys**	**Havells**	**Mahavir Transmission**	**Lumino**	**Gupta Power**	**MP Discoms**	**JBVNL**	**UP**
i	33kV and above lines	30	25	25	28-30	30	25	15-40	15	50
ii	11kV lines	30	25	25	28-30	30	25	15-40	15	50
iii	LT lines	25	25	30	25-30	20	20	15-40	15	50
2.	Underground lines	**KEI**	**Polycab**	**Havells**	**Avocab**			**MP Discoms**	**JBVNL**	**UP**
i	33kV and above lines	30	40	35	30-35			20	15	50
ii	11kV lines	30	40	35	30-35			20	15	50
iii	LT lines	30	40	35	30-35			5	15	10

- All lines and cables on wooden/ steel/ concrete support structures have been provided a useful life of 25 years.
- Standard bidding documents issued with respect to procurement under DDUGJY prescribe 35 years of useful life for lines.
- For underground cables, MoP has revised the useful life to 25 years as the life reduces in higher temperature regions
- As per CEA – Life is dependent on its capacity to carry current efficiently, cables tend to fail mainly due to failure of insulation. Urban areas show higher degradation.

Proposed Useful Life

Sl.	Particulars	Useful Life (in years)
1.	**Overhead lines including supports:**	
i.	11kV and above	25
ii.	LT lines	20
2	**Underground lines including join box and disconnected boxes**	**25**

Depreciation Methodology

Useful Life determination – Meters

Meters

- MoP prescribed **15 years** of useful life in its amendment dated 27.03.1994, the same were considering the technology meters being used
- Standard bidding documents issued with respect to procurement of meters under **DDUGJY** prescribe **10 years** of useful life for meters

Sl.	Particulars		Secure	Genus	HBL	L&T	MP Dicosm	JBVNL	UP
1	**Electronic Meters**								
i.	Interface meter		10	7	10	10	7-15	10	10
ii.	Energy Accounting meters		5	7	7	10	7-15	10	10
iii.	Consumer meters	HT	5	5	7	10	7-15	10	10
		LT	5	5	7	10			
2.	**Electronic Smart Meters**								
i.	Consumer meters with communication infrastructure	HT	5	5	7	10	10	10	10
		LT	5	5	7	10	10	10	10

Proposed Useful Life

Sl.	Particulars	Useful Life (in years)
1.	**Consumer Meters**	
i.	Electronic meters	10
ii.	Smart meters	10
2	**Interface/ Energy Audit Meters**	**10**

Depreciation Methodology

Useful Life determination – IT Equipment

IT equipment

Proposed Useful Life

Sl.	Particulars	Proposed Useful Life (in years)
1.	I. T Equipment including software	
i.	Information and Communication system	7
ii.	Communication hardware	6
iii.	IT hardware (server equipment)	6
Iv	IT hardware (end use i.e. desktops / laptops)	3
iv.	IT software	5

Particulars	CERC	MERC	RERC	DERC	GERC
I.T. equipment & software	15.00%			16.67%	
IT hardware		15.00%	15.00%		15.00%
IT Software		30.00%	9.00%		30.00%

Depreciation Methodology

Useful Life determination – Other key asset classes

Others

Sl.	Particulars	Proposed Useful Life (in years)
1.	**Safety and Tools**	
i.	Tools and Tackles (wire strippers, pliars, flash arc equipment, drill, hammer etc)	10
ii.	Personal protective equipment PPE (shoes, gloves, glasses, protective gear etc)	5
2	**Buildings and Civil Engineering Works of permanent nature**	
i.	Office and showrooms	60
ii.	Buildings other than Offices & showrooms	30
iii.	Others	30
3	**Temporary structures and erections**	**1**
4	**Office furniture, equipment, fixtures, etc.**	
i.	Office furniture and fittings	10
ii.	Office equipment	10
iii.	Internal wiring including fittings and apparatus	10
iv.	Street Light fittings	10
5	**Self propelled vehicles**	**5**

Review of other infrastructure sectors in India

Straight line method as been adopted across reviewed sectors

	Petroleum & Natural Gas	Ports	Telecom	Aviation
Agency	• Petroleum and Natural Gas Regulatory Board	• Tariff Authority for Major Ports (TAMP)	• Telecom Regulatory Authority of India (TRAI)	• Airport Economic Regulatory Authority of India (AERA)
Regulation	• CGD Network Regulations 2008 • Natural Gas Pipeline Tariff Regulations 2008	• Overall Tariff Guidelines 2005 (along with individual guidelines for diff. type of ports)	• Telecom Tariff orders with amendments • IUC Regulations with amendments • Accounting Separation Regulations	• Terms and Conditions for Determination of Tariff for Airport Operators) Guidelines, 2011
Mechanism	• Straight Line Method • Useful life /Depreciation rates as per Companies Act	• Straight Line Method • Useful life /Depreciation rates as per Companies Act • For PPP projects, useful life of asset limited to concession period	• Straight Line Method • Useful life set by regulator for an ideal service provider, basis assessment of audited accounts of telecom service providers • For calculation of IUC charges, 10 years average life taken for all assets	• Straight Line Method • Useful life /Depreciation rates as per Companies Act; Residual value 10% • Useful lives for assets not covered in Companies Act, determined by AERA through a specialized study conducted by ICAI

Depreciation determination

Asset life: is determined based on inputs from vendors and discoms. In case of DT, some states have recommended low useful life (mainly due to non availability of adequate repair).
Lower life for low-capacity DT is suggested , owing to chances of higher tripping and failure in them
In addition, the life of all assets have been arrived after due consultation with CEA.

Categories : Asset categories and subcategories to be based on the principles of asset componentization as per the Companies Act 2013. This involves defining the right grouping of assets and determination of the useful life of the assets under these asset categories / subcategories. For implementing this, discoms may need to standardize the Bill of Quantities (BOQ) of all capex programs which will help in componentization of the various sub-groups.

Method : The SERCs may review the current practice of having depreciation rates for initial 12 years, post which the balance depreciation is required to be spread over the remaining useful life of the assets, taking into consideration the debt repayment during the initial period of the project.

Recommendations

Asset Categorization

- Right grouping of assets and determination of the useful life of the assets under these asset categories / subcategories.
- Discoms may need to standardise the Bill of Quantities (BOQ) of all capex programs which will help in componentization of the various sub-groups

Norms of Depreciation

- Review of useful life of asset based on prevailing conditions of the state
- Review the asset salvage value –currently at 10%, most of the distribution assets do not fetch such high value on disposal
- Periodic review of the depreciation elements and asset class due to technological changes (Solar panels/EV chargers etc)

Transition

- transition rules may be put in place to ease the implementation issues, given that most distribution companies do not have a fixed asset register and will not be able to re-adjust the already charged depreciation as per the new useful life

Distribution Margins

Distribution Margin Study by FOR, 2009

Recommended formula adopted in Model MYT Regulations

A methodology for linking the returns of Discom with the performance through Distribution Margin was discussed as part of FOR Report 'Evolving an appropriate model for Distribution Margin' published in 2009

Target Availability and Recovery of ARR

(a) Recovery of the Annual Revenue Requirement determined as per the norms under these regulations shall be based on achievement of the target availability index as under: The Availability index shall be computed for both Wheeling Business and Supply Business of the Distribution Licensee on yearly basis as per following:

For Wheeling Business:

Wheeling Network Availability Index (%) = (1-(SAIDI/8760)) X 100

Where,

SAIDI = Sum of all customer interruption durations/Total number of consumers served

For Supply Business:

The Supply Availability shall be measured on the basis of power contracted by the Distribution Licensee on a long-term basis as per the power procurement plan under following heads:

Base Load Supply Availability = ((Actual Contracted Base Load Supply (MW)) X (Number of Off-Peak hours)) / ((Base Load in MW) X (Number of Off-Peak hours))

Peak Load Supply Availability = ((Actual Contracted Peak Load Supply (MW)) X (Number of Peak hours)) / ((Peak Load in MW) X (Number of Peak hours))

Supply Availability Index = 75% of Base Load Supply Availability + 25% of Peak Load Supply Availability

The additional ARR shall be considered as +/- 0.2% of ARR for every percentage point increase/decrease in Availability vis-à-vis the normative levels of availability.

Provided that the maximum additional return that can be earned/reduced shall be +/- 2% of ROE

Distribution Margin Approach

For enforcing performance based regulations on Discoms

General approaches of PBR

1. Price Cap

The tariffs are capped for a regulatory period, with suitable accounting for inflation, efficiency improvement and investment requirement. This practice has been adopted in United Kingdom for setting of power distribution network tariffs.

Price = Po x [1 + (I – X)] + Q

2. Incentive/ Penalty

Based on performance of utility on pre-determined parameters, a reward or penalty amount is determined and adjusted from the overall allowed revenues of power utilities. As per this approach, tariff is determined as per cost plus approach while the utility can earn incentive over the fixed returns in case of over-achievement of performance targets or be penalized in case of under-achievement.

- The ***Tariff Policy 2006*** discussed the ***inherent difficulties in going beyond regulated returns on the basis of scrutiny of costs*** for power distribution business
- Section 5.3 of the Tariff Policy 2006, also states that SERCs may consider **'Distribution Margins'** as one of the methods for implementing performance based returns for Discoms

Distribution Margins

- The concept of Distribution Margins, allows an incentive/ penalty on revenue recovery of Discoms (in % terms), based on its performance over pre-determined performance standards
- The approach was discussed by Group established in the Forum of Regulators (FOR) and also in FOR's report issued in 2009

Existing Mechanisms of incentive/ penalty by SERCs

Adoption across States

A. Tariff Regulations

- Apart from mechanism of controllable parameters in ARR, few SERCs have defined additional mechanisms to incentivise/ penalize Discoms on performance

B. SOP Regulations

- Few SERCs have defined penalty for not meeting overall target performance levels

Key Shortcomings in existing mechanisms:

1. **Lack of data reporting/ monitoring:** Discoms have failed to report SOP metrics periodically; audits are seldom conducted

2. **Adaptability to changes in prevalent issues:** while issues impacting Discoms have changed in recent past with States becoming power surplus and 100% electrification achieved, the mechanisms of incentive/ penalty also need to adapt

3. **No clear formula for calculating incentive/ penalty:** penalties are calculated on a case to case basis, without any specific formula for calculating the same. **Direct compensation** as envisaged in Consumer Rights Rules 2020 may be considered

Existing Mechanisms of incentive/ penalty by SERCs

Study of States

FOR Model MYT Regulations

Adjustment to ARR based on target availability

- Incentive or penalty in form of adjustment of +/- 0.2% of ARR based on availability of Discoms
- Availability index shall be computed for both Wheeling Business and Supply Business of Discoms on yearly basis:

  Wheeling Network Availability Index (%) = (1-(SAIDI/8760)) X 100

  Supply Availability Index = 75% of Base Load Supply Availability + 25% of Peak Load Supply Availability

  Where base/ peak load supply availability is based on power contracted by Discom vis-a vis their base/ peak demand

SERC Regulations

1. **Additional ROE | MERC**
   Base RoE + Additional RoE for each % point improvement in Wires Availability, Assessed Billing and Collection Efficiency

2. **Penalty on ROE | TNERC**
   For every under-achievement of 1% in composite availability (urban and rural areas), ROE shall be reduced by 0.1%

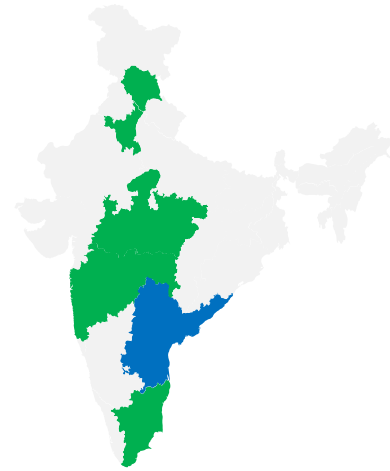
3. **Incentive/ Penalty in ARR | DERC & HERC**
   Incentive/ penalty on Discoms basis collection efficiency

4. **Incentive for metered sales | MPERC**
   For control period of FY11 to FY13, a rupees crore incentive was provided for each percentage point increase in metered sales, over the base level

5. **Incentive/ penalty based on availability | HPERC**
   Similar to formula prescribed by FOR model MYT regulations adopted

6. **Penalty for not meeting overall SOPs | DERC, APERC and TSERC**
   Regulations in DL, AP and TL have penalty provisions for not meeting overall SOPs

States with provision for incentive/ penalty



Formulating and Functionalizing Distribution Margin Framework for India

SERCs may deliberate on the following 4 aspects while defining the Distribution Margin framework

Performance Parameters

- For wires and supply business performance

Setting Weights and Targets for Parameters

- Based on importance of parameters for each state

Data Availability for Performance Parameters

- Initially the assessment could be done for IPDS towns/ feeders

Calculation of Incentive/ Penalty

- Incentive/ penalty can be built into monthly bills

Performance Parameters

Wires Business

Network Reliability

- SAIFI
- SAIDI
- CAIDI
- MAIFI

Power Quality

- Total Harmonic Distortion
- Voltage Variations

Supply Business

Metering, Billing & Collection

- Metered sales
- % of assessed sales
- Collection Efficiency

Consumer Service

- Supply hours
- Turn Around Time for complaints

Information Disclosure

- Periodicity and accuracy of SOP/ data reporting

Formulating and Functionalizing Distribution Margin Framework for India

Electricity (Rights of Consumers) Rules, 2020

- Rights of consumers and obligations of Discoms
- New consumer process and modification of existing connection
- Metering arrangement
- Billing and Payment
- Disconnection and Reconnection
- Reliability of Supply
- Consumer as prosumer
- Grievance redressal mechanism
- Compensation Mechanism
- Call centre for consumer services
- Standards of performance of Licensee

The distribution licensee shall supply 24x7 power to all consumers. However, the Commission may specify lower hours of supply for some categories of consumers like agriculture.

The distribution licensee shall put in place a mechanism, **preferably with automated tools** to the extent possible, for **monitoring and restoring outages.**

Automatic compensation shall be paid to consumers for which parameters on standards of performance can be monitored remotely

i. No supply to a consumer beyond a particular duration, as **specified by the Commission**;
ii. **Number of interruptions in supply** beyond the limits as **specified by the Commission**;
iii. Time taken for connection, disconnection, reconnection, shifting;
iv. Time taken for change in consumer category, load;
v. Time taken for change in consumer details;
vi. Time taken for replacement of defective meters;
vii. Time period within which bills are to be served;
viii. Time period of resolving voltage related complaints; and
ix. Bill related complaints.

Suggested framework for direct compensation to consumers

Approach

Pre-requisites

Consumers with smart meter integrated with billing system
Or
DT with Smart meters with accurate consumer indexing
AND
Areas with less than 10% or less T&D loss (or as determined by SERC)

Performance parameter

Supply duration at consumer level (Monthly)

- Time under breakdown
- Time with no Supply

No of interruptions at consumer level

Targets/Trajectory

Total Supply duration

- Max – time (in hours)under breakdown; to be reduced yearly as per operating conditions of the state
- Max – time (in hours)with no supply; to be reduced yearly

Target : Max time under breakdown and no supply to be average of Last one year and to be reduced every year by atleast 5%.

No of interruptions

- Max- Average of last year to be reduced by atleast 5% every year

Note : These target values are at consumer level and can be different for different consumer groups/discoms (at DT level or Feeder level)

Implementation

Composite index

For Supply duration:

$A= (H_t-H_a)/H_t$; 0 When $H_a>H_t$

H_a= Actual Hours of supply including breakdown hours

H_t= Target hours of supply including target breakdown hours

For Supply interruptions

$B= (I_a-I_t)/I_t$; 0 When $I_a<=I_t$

I_t= Target Interruptions in nos

I_a= Actual interruption in nos

Composite score: $Z= W_A(A)+W_B(B)$, where

W_A and W_B are weights determined by commission after due consultation with disoms and $W_A+W_B=100$. Initially W_A and W_B may be kept same at 50, Value of Z will be between 0 to 100, Higher Z means poor performance

Direct compensation

Rebate on monthly energy bills of consumers based on smart meter data;
Composite score (Z)
Suggested Rebate :
Fixed charges **reduction** by a fixed amount upto 10% of Fixed charges/Energy Charges (or any other value as determined by Commission) in proportion to the Z value.
Higher Z value means higher reduction in fixed charges.
Example: For a month : When Z= 10, Fixed Charges(F)= Rs 100 ,
Maximum reduction in FC=10% of FC
Reduction (R)= (Z/100)*(10% *FC) =>(10/100)*10%*100= Re. 1,
Revised Fixed Charge (RFC)= FC-R=> 100-1=Rs 99.
Using same logic, For Z=100 , RFC =Rs.90.

Suggested Targets for interruptions and supply hours

Consumer	Parameters	Target	Trajectory
Domestic	Supply Hours	24 hours in a day excluding breakdowns and maintenance.	**Breakdown hours including scheduled and unscheduled outages** For first year : Average monthly breakdown hours for last year Subsequent years : 95% of monthly average of preceding year.
	Supply Interruptions (No)	Maximum no of interruptions in a month = Last year's monthly average no of interruption.	**No. of Interruptions** • For first year : Average monthly no of interruptions of last year • Subsequent years : 95% of monthly average of preceding year. (Rounded down to nearest natural number). • Subsequent years : Minimum no of interruptions as per planned outage schedule of discom.
Industrial	Supply Hours	24 hours in a day excluding breakdowns and maintenance.	**Breakdown hours including scheduled and unscheduled outages** For first year : Average monthly breakdown hours for last year Subsequent years : 95% of monthly average of preceding year.
	Supply Interruptions (No)	Maximum no of interruptions in a month = Last year's monthly average no of interruption.	**No. of Interruptions** • Minimum no of interruptions as per planned outage schedule of discom.

Formulating and Functionalizing Distribution Margin Framework for India

1 Continue ROE

- The SERCs may continue to use RoE based margin determination. Further, the SERCs may carry out detailed diligence of existing performance parameters and fix suitable limits of performance parameters for determination of ROE.

2 Baseline

- It is seen that utilities show wide range of SAIFI SAIDI values. The SERCS may consider developing a framework for updating State level performance parameters through appropriate studies on a regular basis.

3 Transition

- SERCs may develop a roadmap for gradual transition into consumer level performance indices. Simultaneously, SERCs may phase out ROE based distribution margin and retain only consumer level performance parameters as a mechanism for rewards/penalties. Model guidelines may be drafted to reflect the changes necessary in SOP regulations and distribution code regulation which will enable the mechanism of direct compensation and migration to smart meter

Deloitte.

Formulating and Functionalizing Distribution Margin Framework for India

Existing performance standards and measures for ensuring compliance

	State	Power Supply	Power Quality	Reliability	Penalty Provision
1	Delhi	Power failure calls to be addressed within timelines, **95%** of the time	Voltage Imbalance does not exceed 3%; maintain supply frequency	SAIFI, SAIDI, CAIDI to be maintained within target set by SERC	Decided by DERC on case to case basis
2	Tamil Nadu	Scheduled outages to be restored within time limits in **75%** cases	Achieve 90% of the standards specified for Voltage fluctuation and voltage complaints	SAIFI, SAIDI, CAIDI to be maintained within target set by SERC	No Provisions
3	Karnataka	Scheduled outages to be restored within time limits in **99%** cases	Voltage variation does not exceed +/- 6% for LT, +6% & -9% for HT, +/- 12.5% for EHT	SAIFI, SAIDI, CAIDI to be maintained within target set by SERC	No Provisions

Formulating and Functionalizing Distribution Margin Framework for India

Existing performance standards and measures for ensuring compliance

	State	Power Supply	Power Quality	Reliability	Penalty Provision
4	Chhattisgarh	Power failure calls to be addressed within timelines, **95%** of the time	Voltage variation does not exceed prescribed limits in 90%-95% of the cases	No provisions	No Provisions
5	Odisha	Scheduled outages to be restored within time limits in **90%** cases	Voltage Imbalance does not exceed 3% & supply frequency should remain within +/-3% of 50 Hz	SAIFI, SAIDI, CAIDI to be maintained within target set by SERC	No Provisions
6	MP	Scheduled outage not to exceed more than **12 hours**	No Provisions	Reliability Index should be within 98%-99.5%	No Provisions

Depreciation Rates as per State Regulations

No major changes in depreciation rates specified by SERCs

Description of Assets	CERC
Transformers, transformer (Kiosk) sub-Station equipment & other fixed apparatus (including plant foundations)	
Transformers (including foundations) having a rating of 100 kilo volt amperes and over	5.28%
Others	5.28%
Switchgear including cable connections	5.28%
Lightning arrestors	
Station type	5.28%
Pole type	5.28%
Synchronous condenser	5.28%
Batteries	5.28%
Underground Cable including joint boxes and disconnected boxes	5.28%
Cable duct system	5.28%
Overhead lines including supports:	
Lines on fabricated steel operating at nominal voltages higher than 66 kV	5.28%
Lines on steel supports operating at nominal voltages higher than 13.2 kilovolts but not exceeding 66 kilovolts	5.28%
Lines on steel or reinforced concrete supports	5.28%
Lines on treated wood supports	5.28%
Meters	5.28%
Self-propelled vehicles	9.50%
Office furniture and related equipment	
Office furniture and fittings	6.33%
Office equipment	6.33%
Internal wiring including fittings and apparatus	6.33%
Street light fittings	5.28%
Communication equipment:	
Radio and high frequency carrier system	6.33%
Telephone lines and telephones	6.33%
Fibre Optic	6.33%
I.T. equipment & software	15.00%
Any other assets not covered above	5.28%

- Majority of the State (including MERC, RERC, UERC, KERC, TNERC, GERC, AERC) follow the depreciation rates specified by CERC
- However, few states have included depreciation aspects specific for few assets:
  - IT software (MERC, GERC, RERC)
  - Rate of depreciation for meters (MERC)

Replacement Cost accounting

- Applying Financial Capital Maintenance Methodology (FCM). Financial Capital Maintenance considers that financial capital for the company is maintained in the current price terms.
- Capital is assumed to be maintained in real terms at the same level as at the beginning of the period.
- limiting cost adjustment to the fixed assets;
- ignoring replacement cost adjustment for assets having life of less than three years;
- taking cost of modern equivalent asset when existing asset is not available due to change in technology ;
- indicating holding gain or loss and supplementary depreciation;
- indicating the change in operating expenditure when an old asset is replaced by a modern equivalent asset.

Principles of Asset Valuation

- The assets items where major programs of modernization are underway in the next 3-4 years should be valued based on the concept of Modern Equivalent Asset. Generally equipment such as exchanges, transmission equipment, etc. should be valued based on MEA
- Specialized buildings, which are generally used for housing exchanges, should be valued at current cost of reconstruction as per the space requirements of modern equivalent asset.
- General use buildings should be valued at current cost of reconstruction
- Land should be valued at land rates applicable for the same land use in the area.
- The assets with low value or short life may be valued at their historical price only as they may not have material impact. Accordingly, asset items with life of less than three years or value upto ` 1 lakh may be stated at their historical costs.

Other sectors > City Gas distribution

1. Petroleum and Natural Gas Regulatory Board (PNGRB) regulates utilities involved downstream activities of City Gas Distribution (CGD), natural gas pipelines and petroleum product pipelines business. PNGRB has formulated following regulations for determination of tariffs:

a. **City Gas Distribution** | Determination of Network Tariff for City or Local Natural Gas Distribution Networks and Compression Charge for CNG Regulations, 2008

b. **Natural Gas Pipelines** | Determination of Natural Gas Pipeline Tariff) Regulations, 2008

c. **Petroleum Product Pipelines** | Determination of Petroleum and Petroleum Products Pipeline Transportation Tariff Regulations, 2010

2. Under the regulations for City Gas Distribution and Natural Gas Pipelines, tariffs are determined on basis of Discounted Cash Flow basis. In both these regulations, the **PNGRB has not created any separate method/ rates** for regulatory depreciation, and has **adopted rates provided under Schedule VI to the Companies Act** and Income Tax Act, on straight line basis.

Other sectors > Ports

1. Tariffs for services provided at 11 major ports in the country, are determined by Tariff Authority for Major Ports (TAMP).

2. TAMP has issued an overall Tariff Guidelines of 2005, along with individual guidelines for different types of ports/ services including - Upfront Tariff Guidelines (for PPP projects at Major Ports) 2008, Tariff Policy 2015 and 2018 (for Major Ports), Tariff Guidelines 2019 (for BOT operators) etc. These guidelines have not created any separate method/ rates for asset depreciation, and have adopted **rates provided under Schedule VI to the Companies Act** and Income Tax Act, on straight line basis.

3. AERA conducted a study in 2018 to identify the airport specific assets which were not covered as part of the Part-C of Schedule II of the Companies Act 2013 and prescribe a useful life for these assets in-line with the industry practice and accounting principles. An important aspect also discussed as part of the study was to **consider the lower of the lease period of the airport or useful life prescribed as per Companies Act** for the purpose of depreciation.

Formulating and Functionalizing Distribution Margin Framework for India

Study of States

	State	Power Supply	Power Quality	Reliability	Penalty Provision
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Formulating and Functionalizing Distribution Margin Framework for India

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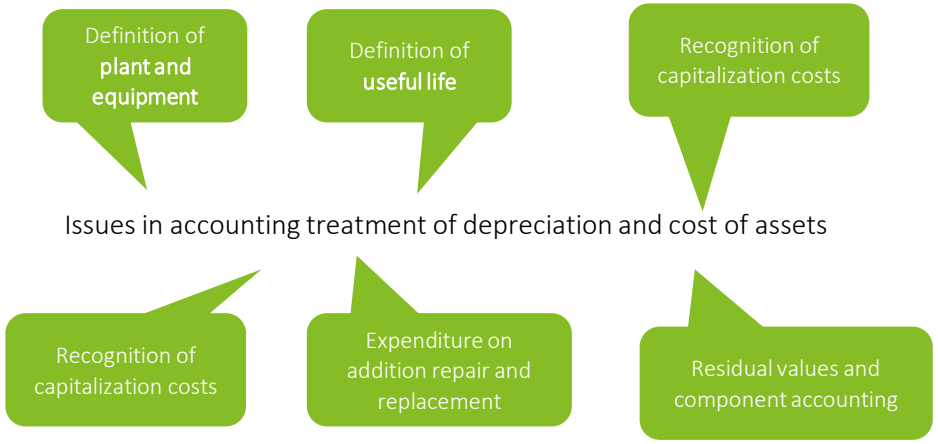
Our Understanding

Treatment of depreciation

Assets in accounting standards

All Distribution entities are governed by the Companies Act 2013 as regards accounting and preparation of financial statements. Section 133 of the Companies Act 2013 says that "the Central Government may prescribe the standards of accounting or any addendum thereto, as recommended by the Institute of Chartered Accountants of India, in consultation with and after examination of the recommendations made by the National Financial Reporting Authority".

Accordingly, on 16 February 2015, the Ministry of Corporate Affairs ("MCA") notified the Companies (Indian Accounting Standards) Rules, 2015



Treatment of depreciation by ERCs

Utilities	Accounting Policy for Depreciation
Himachal Pradesh – HPSEBL, HP	Depreciation is charged at rates notified by the Commission for the purpose of fixation of tariff. In respect of asset, where rate has not been notified by regulation of HPERC, depreciation shall be provided at the rates corresponding to the rates laid down under the Companies Act 2013 except in case of Computer and peripherals, which are depreciated @15%.Depreciation on vehicles is charges by the units to the extent of 90% of the cost of the asset, life of vehicle is taken as 7 years.
APSPDCL, AP	The Company is charging Depreciation at the rates notified under G.O No.265 (SE) dated 27.03.1994 issued under Electricity Supply Act, 1948.
JBVNL, Jharkhand	Depreciation on fixed assets is calculated at the rate prescribed in JSERC MYT Regulations, 2015 vide notification no. 33 & 34, dated 27th October 2010, notification no. 35 dated 1st November 2010 and notification no 46 dated 10th November, 2015.
JVVNL, JdVVNL, AVVNL Rajasthan	Depreciation on fixed assets is charged on Straight Line Method at the rates prescribed in RERC Tariff Regulations.
DGVCL, Gujrat	Depreciation is charged at the rates prescribed in GERC (MYT) Regulations, 2011.
MSEDCL, Maharashtra	The company has estimated the useful life of an item of PPE based on the techno-commercial evaluation. This estimation includes the pattern of usage of the PPE item. Accordingly, the company provides depreciation on straight line method.The techno-commercial evaluation of the useful life, residual value and pattern of depreciation is reviewed annually. The present estimation is similar to the method used by MERC to determine tariff through MERC (MYT) Regulation, 2015.
BESCOM, Karnataka	Depreciation is charged at the rates prescribed and notified by CERC.

Depreciation Methodology as per Regulations

Methodology used by ERC Kerala

Principles

Calculation	Two trajectory (12+x)	Salvage Value 10%
• Straight Line Method • Prorate for 1st year • Not on consumer contribution and grants	• Oee rate of depreciation for upto 12 years of operation • Depreciation is spread uniformly across remaining life	• Equipment have a salvage value of 10%. • It means only 90% of the value of the asset can be charged against depreciation.

Philippines

Performance Incentive Scheme (PIS) for Distribution Utilities

Energy Regulatory Commission (ERC) of Philippines has issued Rules for Setting Distribution Wheeling Rates (RDWR). The regulations set out the performance indicators, performance targets and reporting arrangements with which all Regulated Entities must comply with. Under these regulations, the Price Cap formula for Maximum Allowable Price (MAP) of distribution utilities is defined as follows:

$$MAP_t = [MAP_{t-1} \times \{1 + CWI_t - X\}] + \boldsymbol{S_t} - K_t + ITA_t$$

Where,

t represents this year and t-1 represents previous year

MAP is price per unit of electricity

CWI is index of consumer prices

X is smoothing factor

S is performance incentive factor

K is correction for under/ over recovery of revenue in previous years

ITA is correction for tax on under/ over recovery of revenue in previous years

S_t Performance Incentive Factor

Penalty/ reward is calculated by ERC for Distribution Utilities on not meeting/ meeting targeted performance levels on following metrics –

a. **Network performance –** SAIFI, SAIDI, CAIDI, Voltage Regulation, System Loss

b. **Service Performance –** time to process applications, time to connect premises, % of calls answered within prescribed timelines

$$S_t = \frac{[S_{SAIFI} + S_{CAIDI} + S_{SAIDI} + S_{Volt\,Var} + S_{Sys\,loss} + S_{Proc} + S_{con} + S_{call}] \times 0.025ARR}{FQt}$$

Where,

ARR is allowed revenue recovery for year

FQ is total amount of energy forecasted to be delivered

S_{xxx} refers to performance of DU on individual metrics, multiplied by their weights

1. Performance Level

- Value of +1 to -1 is given as follows:

Performance	Value
<< target	-1.0
<Target	-0.5
Target	0.0
> Target	+0.5
>> Target	+1.0

2. Targets

- Average of actual performance on each parameter, for last 5 years, is taken as targeted value

2. Weightages

- For each performance metric, weights are defined
- Performance level is multiplied with weight to calculate S_{xxx}

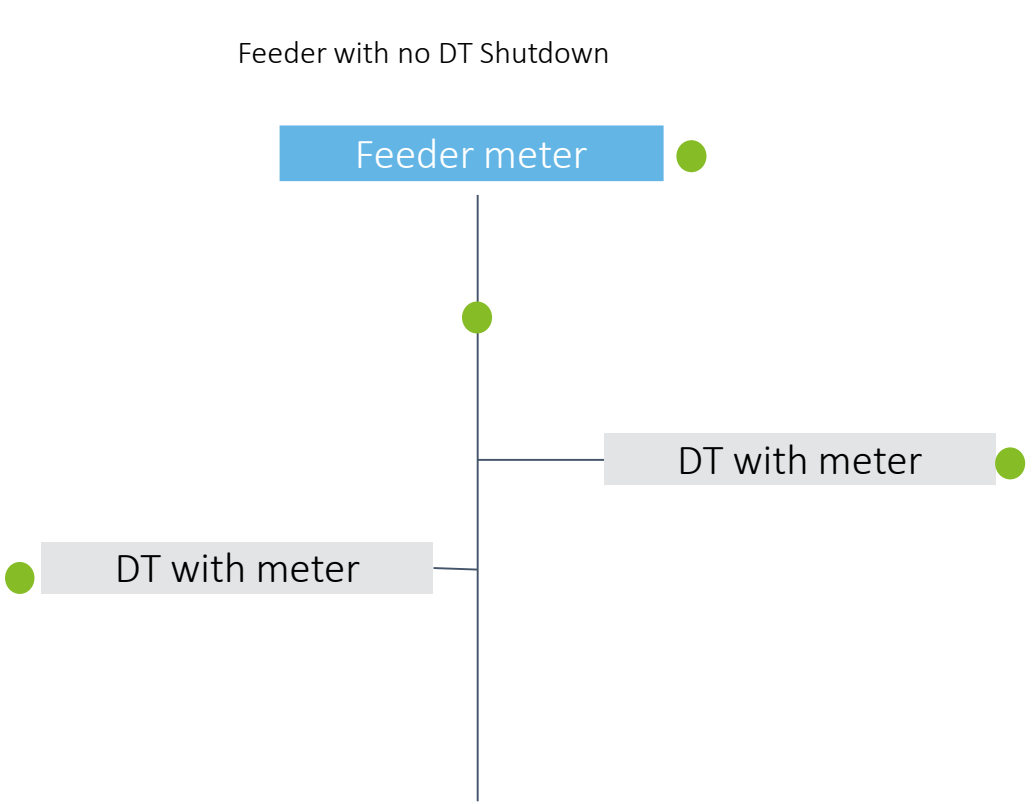
Formulating and Functionalizing Distribution Margin Framework for India

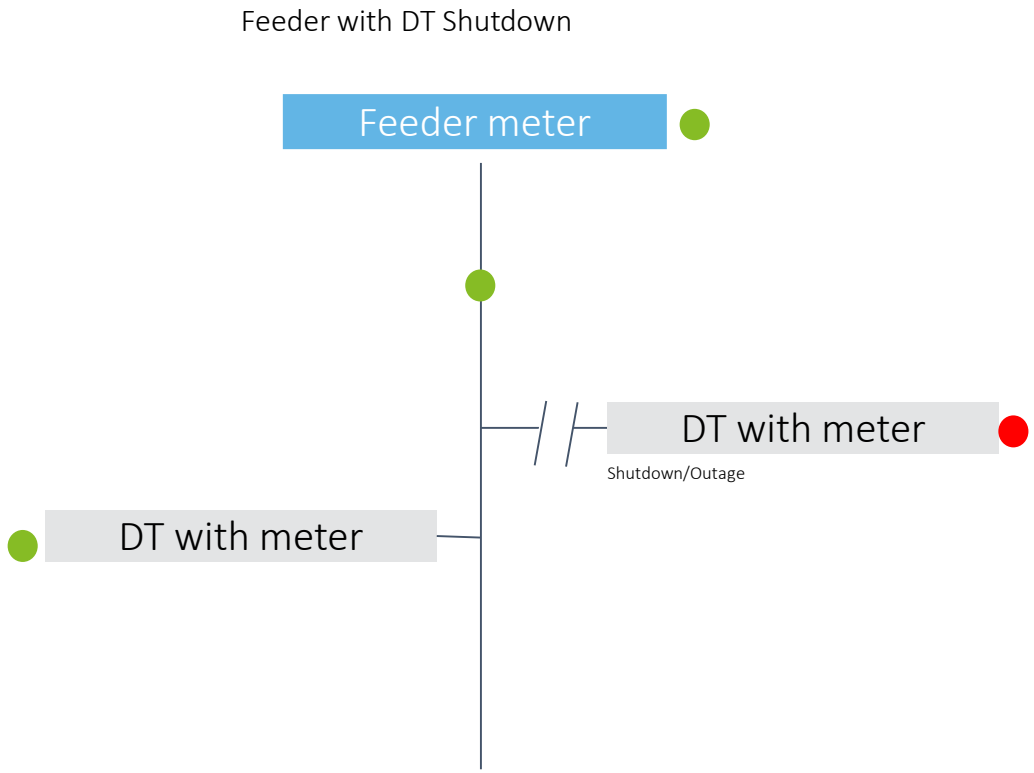
- SAIFI SAIDI values show large variations across states.

Sl	Utility	No of Interruptions per month	Duration of Interruptions (Hrs)
1	Assam Power Distribution Company Ltd	39.05	16.43
2	North Bihar Power Distribution Company Ltd	29.97	18.19
3	South Bihar Power Distribution Company Ltd	29.38	8.12
4	Dakshin Haryana Bidyut Vitran Nigam Ltd	19.96	11.52
5	Uttarakhand Power Corporation Ltd	18.14	7.23
6	Uttar Haryana Vidyut Bitaran Nigam Ltd	15.92	11.23
7	Electricity Department Goa	7.6	5.09
8	Mizoram Power Department	6.51	5.06
9	Punjab State Power Corporation Ltd	6.14	10.44
10	Tripura State Electricity Corporation Limited	5.88	4.06
11	West Bengal State Electricity Distribution Corporation	5.75	3.43
12	Chhattisgarh State Power Distribution Corporation	4.92	2.53
13	Mangalore Electricity Supply Company	4.48	3.34
14	Kanpur Electricity Supply Company	4.14	4.47
15	Dakshin Gujarat Vijli Company	3.77	0.41
16	Telangana State North power Distribution Company Ltd	2.4	1.37
17	Paschim Vidyut Vitaran Nigam Limited	2.28	6.35
18	Andhra Pradesh Southern Power Distribution Company Ltd	2.08	2.3
19	Uttar Gujarat Vijli Co. Ltd	1.95	2.03
20	MP Madhya Kshetra Vidyut Vitran Co Ltd.	1.91	0.37
21	Kerala State Electricity Board	1.8	2.12
22	Maharashtra State Electricity Distribution Company Ltd	1.65	1.18
23	Andhra Pradesh Eastern Power Distribution Co. Ltd.	1.01	1.03
24	Madhya Gujarat Vijli Co. Ltd.	0.69	0.17

Formulating and Functionalizing Distribution Margin Framework for India

Feeder meter data vs consumer meter data





Annexure-4

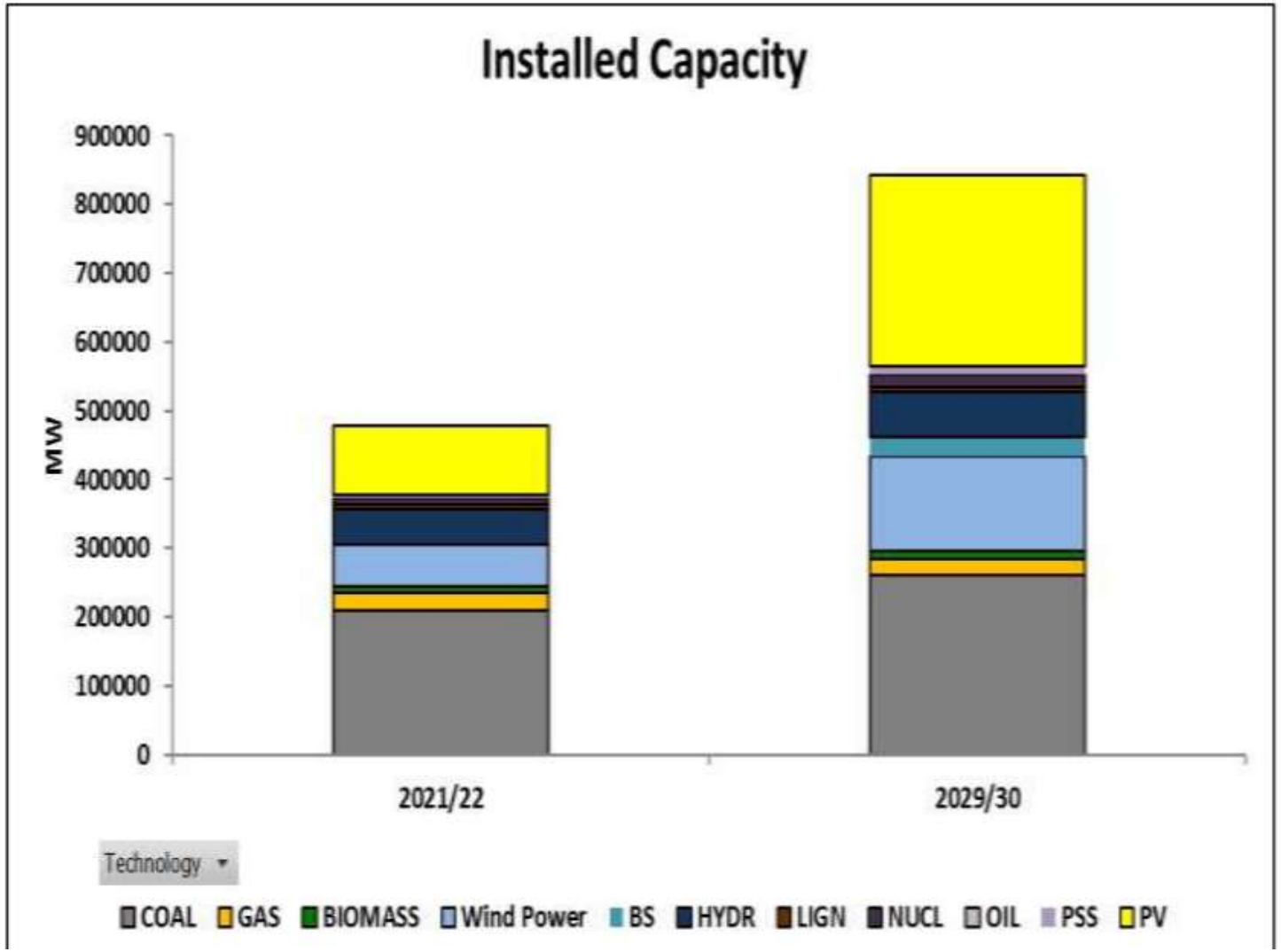
Integrated Research and Action for Development

Unlocking Demand Side Flexibility

Demand Response need for India and Sharing the European experience and potential application in India

Pankaj Batra, Project Director,
IRADe & Ex Chairperson, CEA

CEA REPORT ON OPTIMAL GENERATION CAPACITY MIX FOR 2029-30



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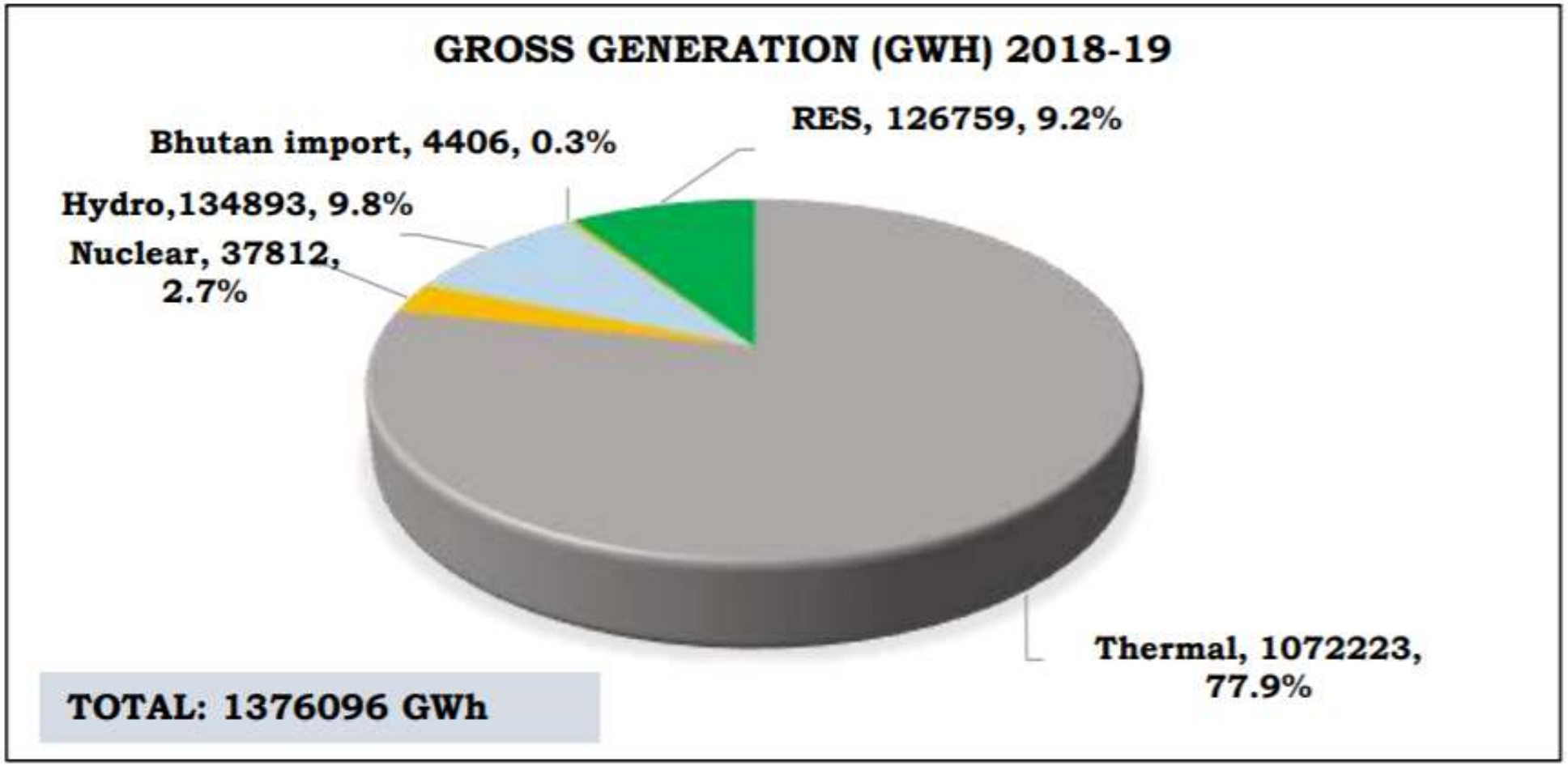

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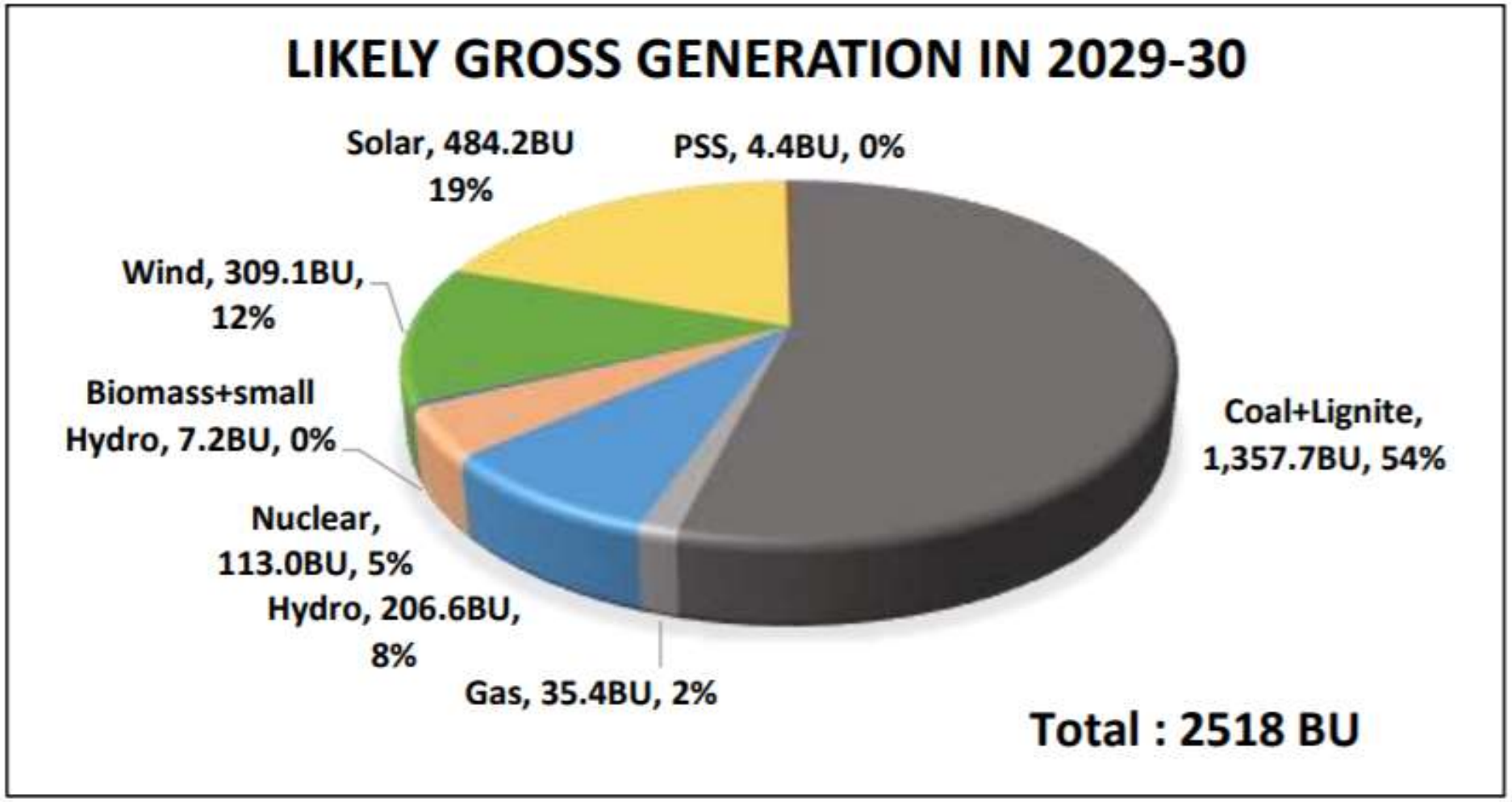

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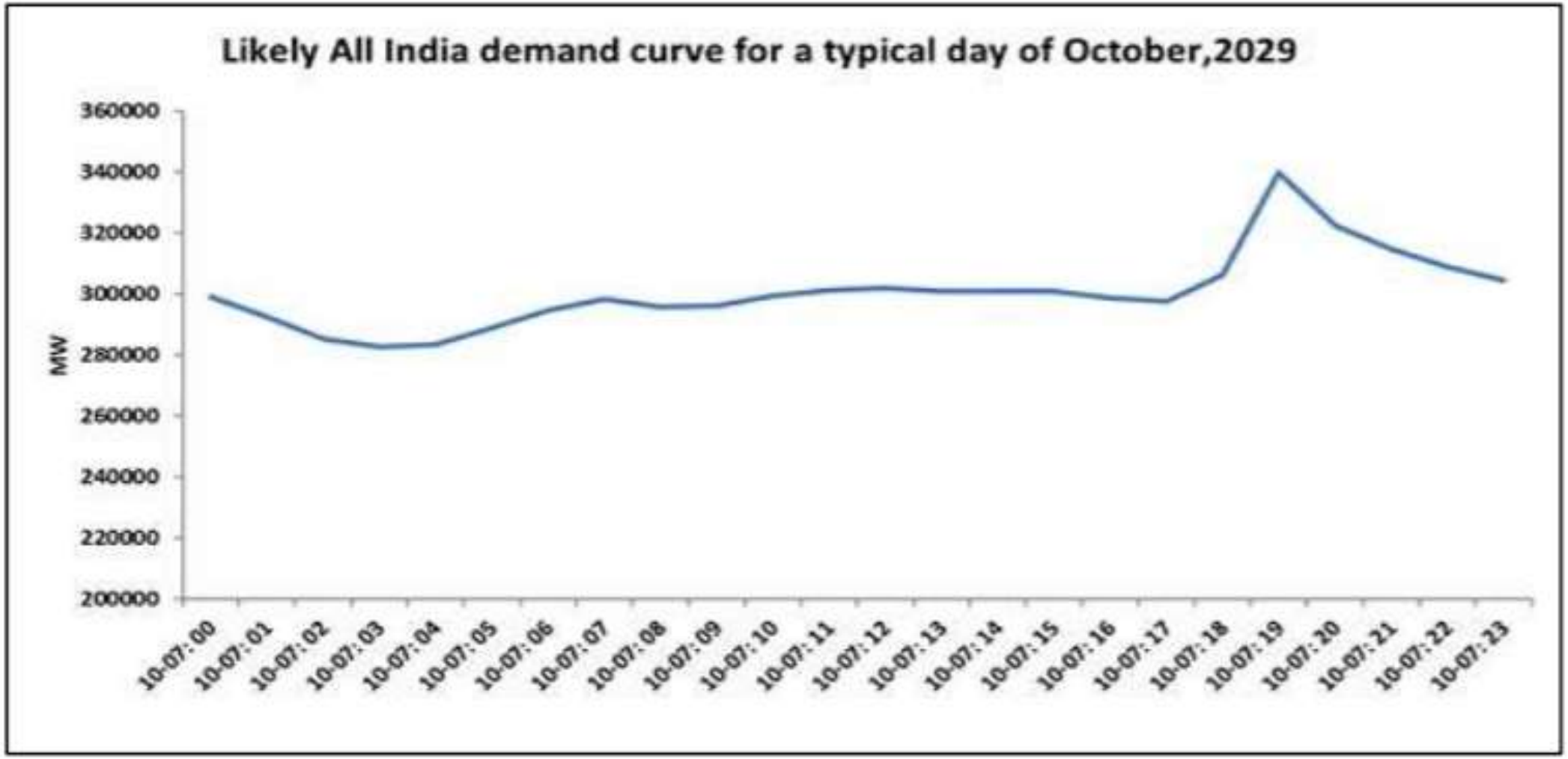

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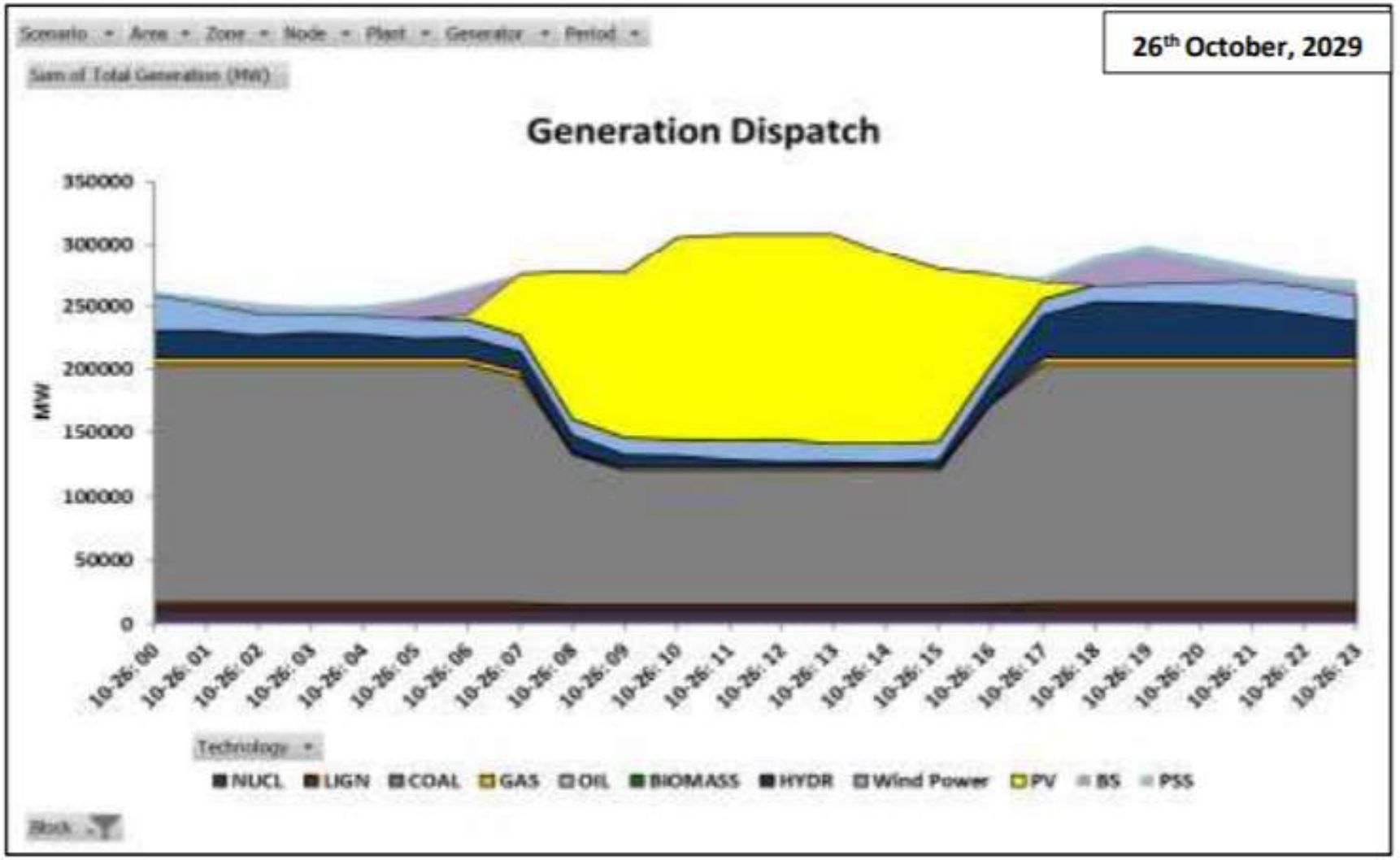


Demand side flexibility can help stabilise the power system

Residential & Commercial

- **HVAC & Cold Storage**:
  air conditioning systems, cold storage warehouses
- **Heat pumps & Electric heating**:
  building heating, storage heaters, water heaters
- **Fans & ventilation systems**:
  building air circulation
- **Lighting systems**:
  smart street lighting, artificial lighting in greenhouses, light treatment
- **Pump & Compressors:**
  water pumps
- **EV charging**:
  electric mobility charging equipment

Industry & Agriculture

- **Furnaces, ovens, boilers and reheaters:**
  heating ovens in rolling mills, electric arc furnaces for metal melting, electrode steam boilers
- **Dryers, evaporators and blowers:**
  process industry, distillers and reformers
- **Pumps and Compressors:**
  water pump motors for cooling towers, irrigation water pumps, pressurized air systems
- **HVAC units and heat pumps:**
  cold storage warehouses, process cooling in food industry
- **Hoist and conveyor drives, mills:**
  mineral and mining plants, milling processes

Policy initiatives for Demand Response

Tariff Policy 2016.

Smart meters have the advantages of remote metering and billing, implementation of peak and off-peak tariff and demand side management through **demand response**. These would become essential in future for load-generation balancing due to increasing penetration of intermittent type of generation like wind and solar power.

Definition of Demand Response

Indian Electricity Grid Code.

Demand Response means reduction in electricity usage by end customers from their normal consumption pattern, manually or automatically, in response to high UI charges being incurred by the State due to overdrawal by the State at low frequency, or in response to congestion charges being incurred by the State for creating transmission congestion, or for alleviating a system contingency, for which such consumers could be given a financial incentive or lower tariff;

Definition of Demand Response

Report of the Expert Group: Review of Indian Electricity Grid Code, Jan 2020

Demand Response means variation in electricity usage by end customers/control area manually or automatically, as per system requirement identified by concerned load despatch centre;

Draft National Electricity Policy, April 2021

“Incentives for Demand Response also shall be notified by all the SERCs. Consumers should be given a choice to offer their part or full load for interruption in case of exigencies in the grid in lieu of a lower tariff. Such consumers must have smart meters with appropriate features.”

Draft Central Electricity Regulatory Commission (Ancillary Services) Regulations, May 2021

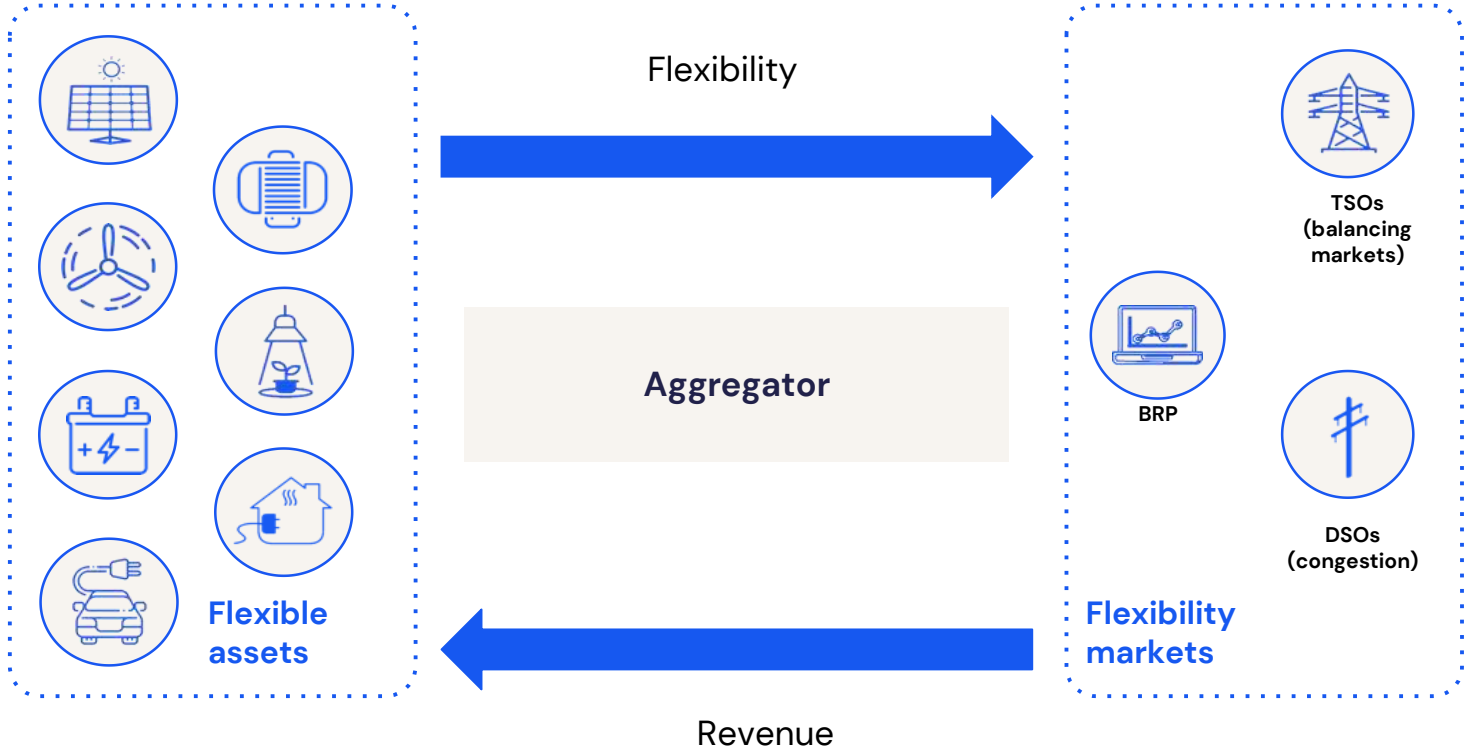
- "**Demand Response**" means variation in electricity consumption by end consumers or drawal by a control area, as per system requirement identified by the Nodal Agency;

- These regulations shall be applicable to regional entities, including entities having energy storage resources and **demand side resources** qualified to provide Ancillary Services and other entities as provided in these regulations

Aggregation of flexible assets would be helpful to enable and encourage demand side flexibility

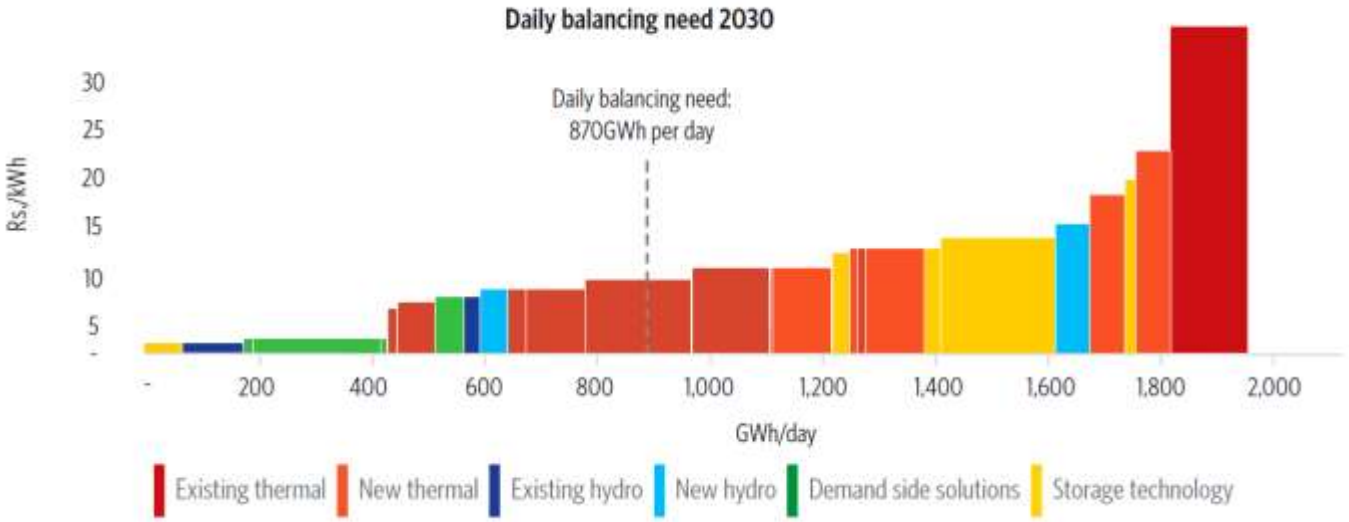
Multiple reasons for distributed assets not being able to provide flexibility services on their own:

- installed capacity too small
- lack of know-how
- lack of technological capabilities
- lack of investment resources



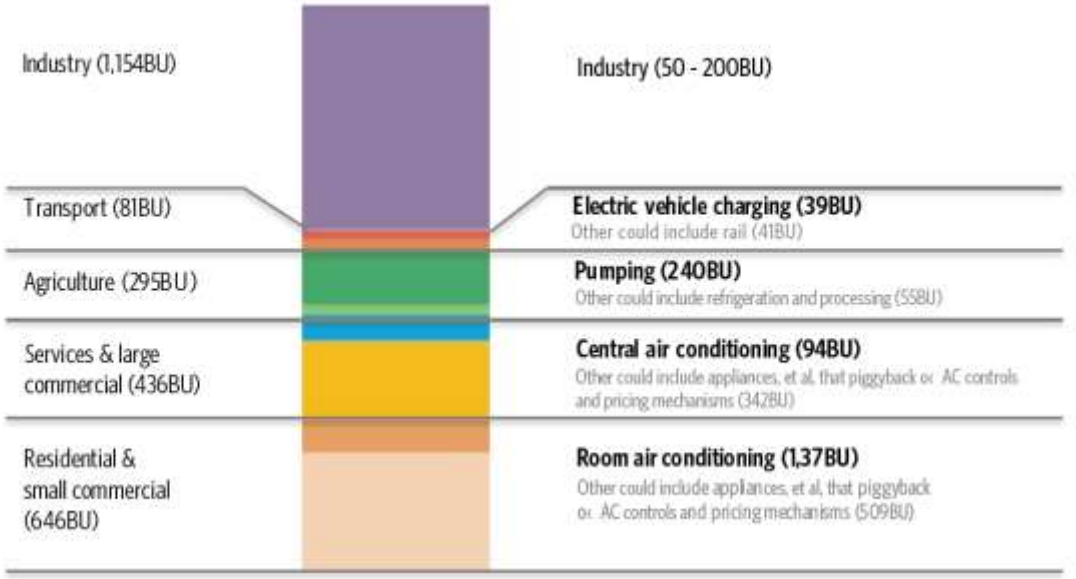
Potential of Demand Side Flexibility in India

Demand-side flexibility is more cost-effective than other balancing methods



Source: Based on CPI Energy Finance Report in collaboration with TERI and NREL, Feb'20

Sector-wise daily energy available for load shift

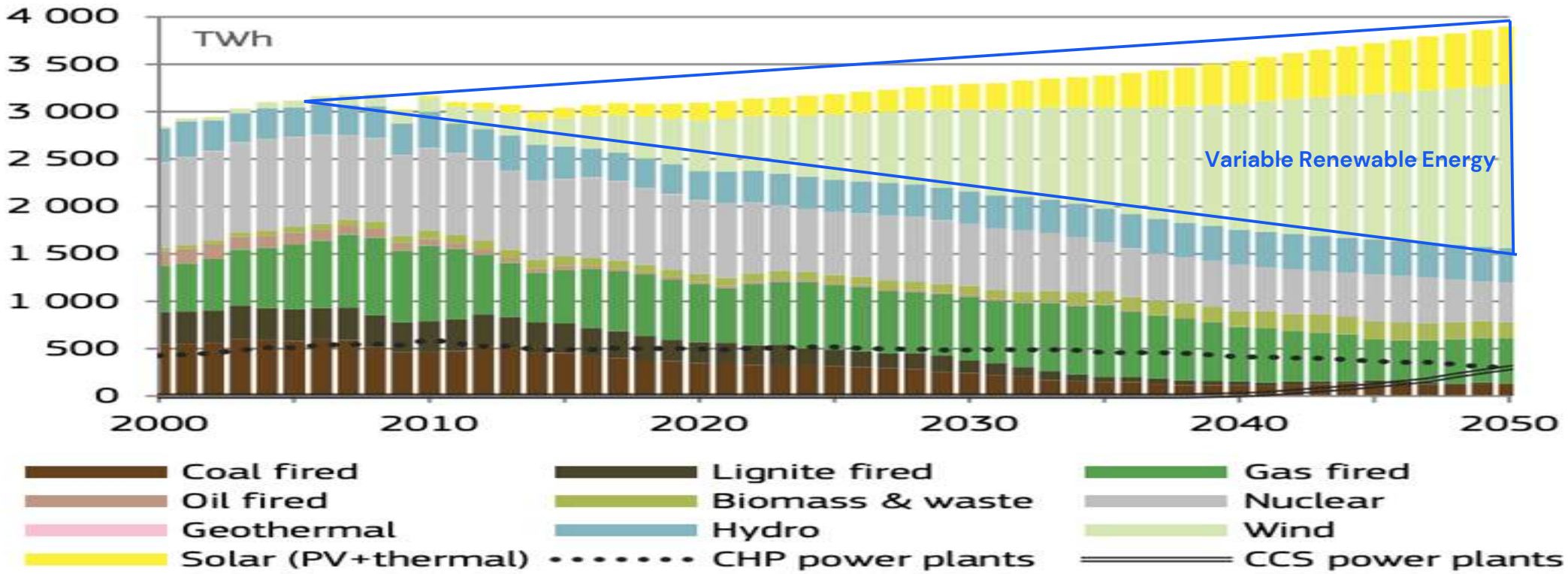


Source: TERI (baseline scenario) and CPI analysis

* BU = billion units (kWh)

In Europe, like in India, the electricity mix is increasingly dominated by Variable Renewable Energy technologies

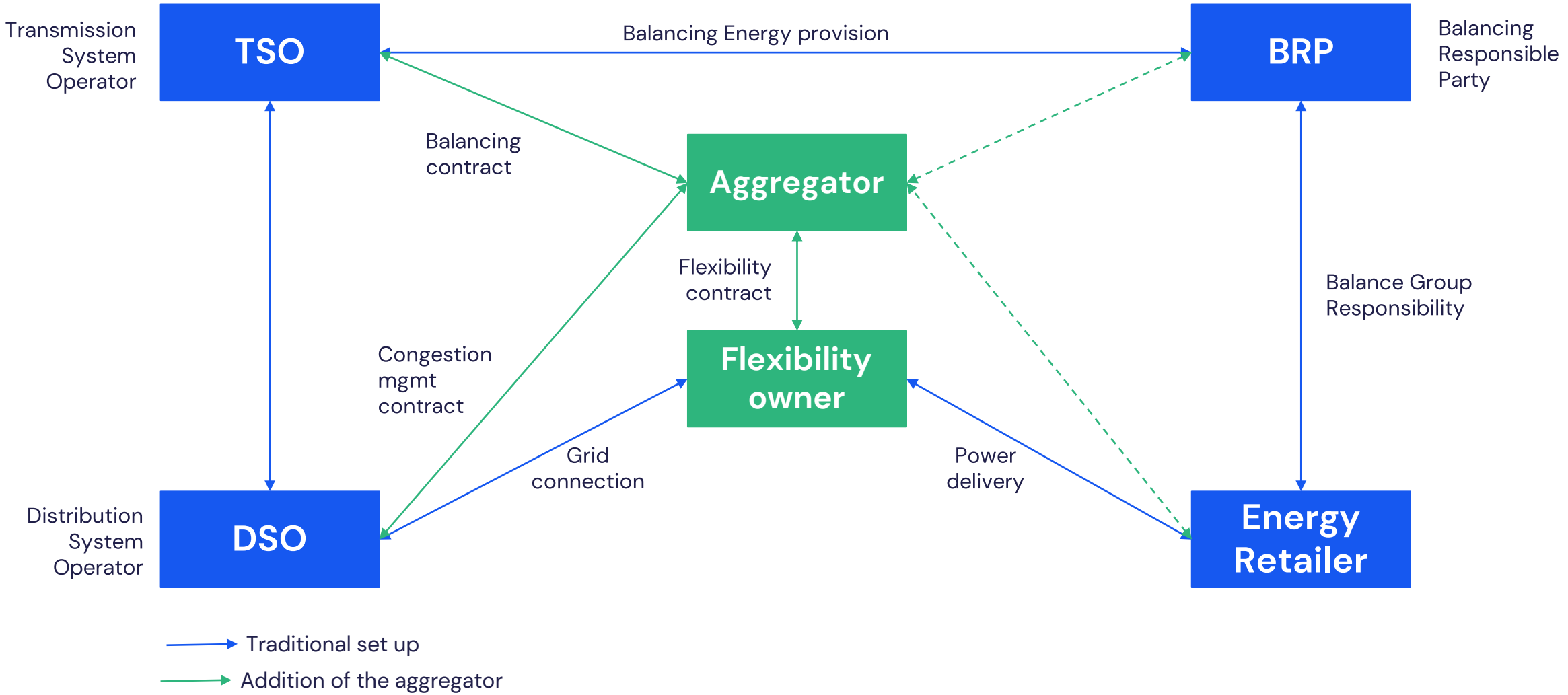
Europe - Net electricity generation until 2050 (TWh)



Source: The Potencia central scenario, an EU energy outlook to 2050. JRC POTEnCIA

Source: Rystad Energy Analytics, IRENA, IEA; Feb 2021

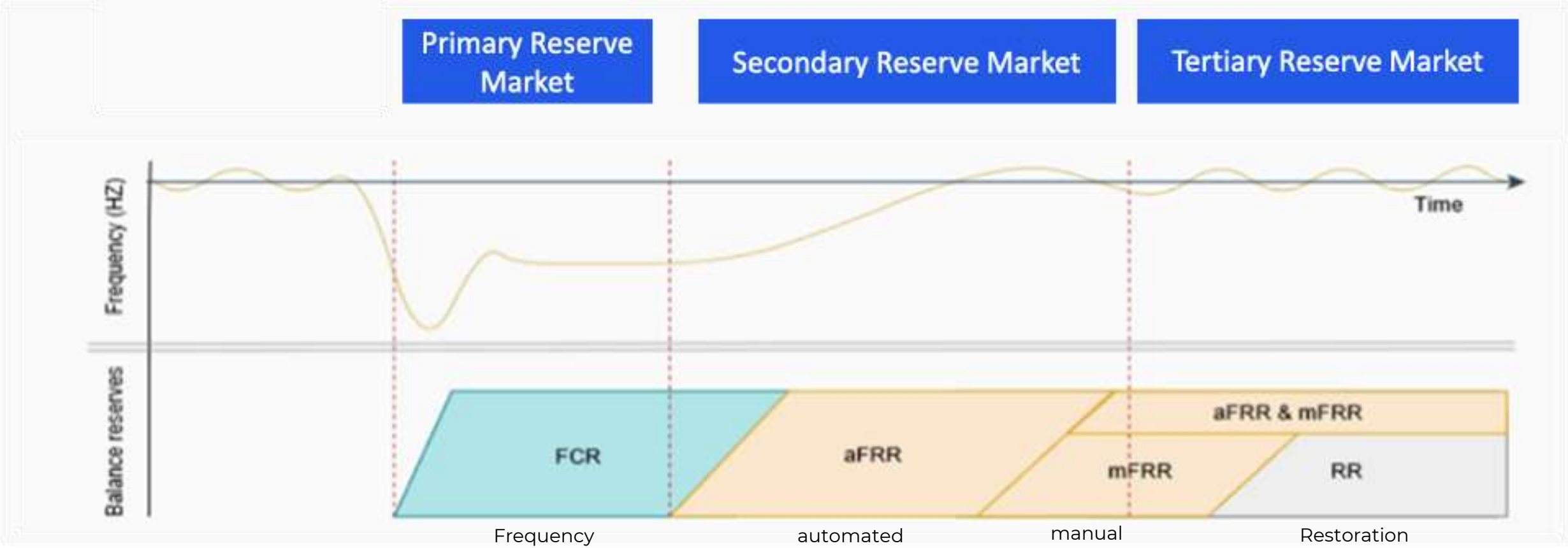
The European electricity markets define a number of separated roles



Various markets exist in order to keep the supply and demand of electricity in balance (Europe)

Balancing energy must be available immediately and is therefor put out to tender on balancing market, and contractually bound with balancing energy suppliers who are licensed (pre-qualified) for this purpose (control reserve = provision of balancing energy). The reserved capacity is only activated when it is actually required, resulting in an electricity flow (balancing = use of balancing energy).

Transmission System Operators procure various products in order to keep the frequency at 50Hz



Frequency Containment Reserve

automated Frequency Restoration Reserve

manual Frequency Restoration Reserve

Restoration Reserve

Energy Efficiency Directive of the European Union, 2012

- “Member States shall ensure that national regulatory authorities **encourage demand side resources, such as Demand Response, to participate alongside supply in wholesale and retail markets**.”

- “Subject to technical constraints inherent in managing networks, Member States shall ensure that transmission system operators and distribution system operators, **in meeting requirements for balancing and ancillary services, treat Demand Response providers, including aggregators, in a non-discriminatory manner, on the basis of their technical capabilities**.”

DR Status as in 2016

Belgium

ENTSO-E's terminology	Elia's terminology		Market size	Load Access & Participation[32]	Aggregated Load Accepted
FCR	Primary frequency control (R1)	R1-200mHz	28 MW	✗	✗
		R1-Down 100-200	27 MW	Yes	?
		R1-Load - 100 - 200(Up)	27 MW	27 MW	
FRR	Secondary reserve (R2)	R2-Down	140 MW	✗	✗
		R2-Up		✗	✗
FRR-M	Tertiary frequency control (R3)	R3-Prod	400 MW	✗	✗
		R3-DP		60 MW 200MW 2016-	
FRR-M	Tertiary frequency control Interruptible clients (R3 ICH)		261 MW	261 MW	
RR	Voltage control and reactive power control		2700 MVAr	✗	✗
RR	Black start		n/a	✗	✗
RR	Strategic Reserve (SR)	SGR	750 MW	✗	✗
		SDR	97 MW*	97 MW*	

Austria

ENTSO-E's terminology	APG's terminology		Tot. Capacity Contracted	Aggregated Load Accepted
FCR	Primary Control Symmetric	+/−	67 MW	No (symmetrical)
FRR	Secondary Control	+	200 MW	Yes
		−	200 MW	Yes
RR	Tertiary Control A-symmetric	+	280 MW	Yes
		−	125 MW	Yes

Source: European Commission
Link: https://publications.jrc.ec.europa.eu/repository/handle/JRC101191

UK

ENTSO-E's terminology	National Grid's terminology		Tot. Capacity Contracted	Aggregated Load Accepted
FCR	Firm Frequency Response (FFR)[68]	Dynamic	180 MW	*
		Non-Dynamic	0 MW	*
FRR	Fast Reserve Firm Service (FRFS)*[69]	Dynamic	2313 MW	*
		Non-Dynamic	54 MW	*
RR	Short-Term Operating Reserve (STOR)[70]	Committed	2420.6 MW	*
		Flexible	757.7 MW	*
RR	Demand-Side Balancing Reserve (DSBR)		318.7 MW	*
FCR	Frequency Control by Demand Management (FCDM)		Not public	*

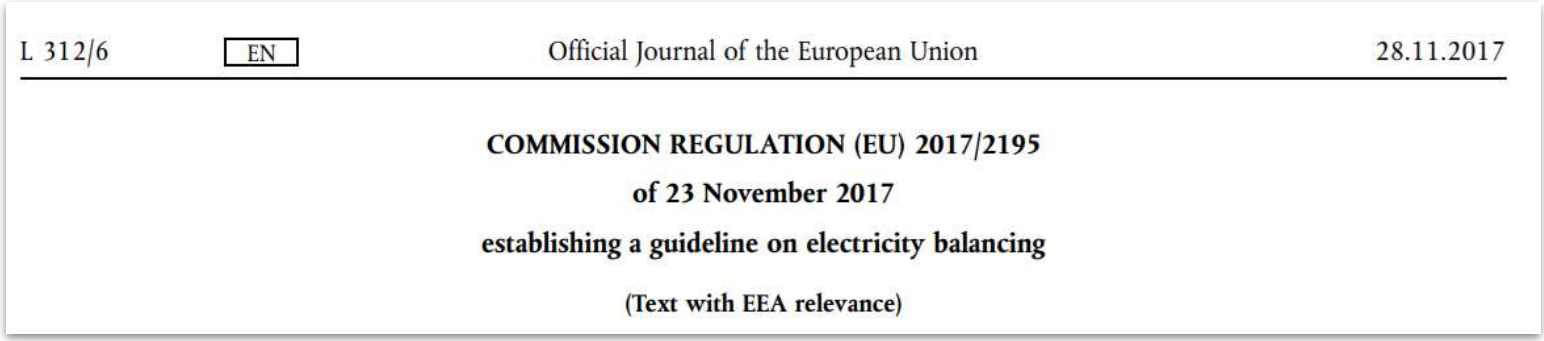
Denmark

ENTSO-E's terminology	TSO's terminology	Tot. Capacity Contracted	Load Access & Participation	Aggregated Load Accepted
FCR	Primary Reserve (DK1)	≈23 MW	*	*(23 MW[36])
FRRa	Secondary Reserve (DK1)	≈100 MW	*	*
FCR	Frequency-controlled normal operation reserve (DK2)	≈22 MW	*	*
FCR	Frequency-controlled disturbance reserve (DK2)	37 MW	*	*
FRRm	Tertiary (Manual) Reserve (DK1 and DK2)	≈868MW	* (555 MW)	*
RR	Short-circuit power, reactive reserves and voltage control (DK1 and DK2)	0 MW	*	*
-	Strategic Reserves (DK2)	200 MW	*	*

Source: European Commission
Link: https://publications.jrc.ec.europa.eu/repository/handle/JRC101191

ENTSO-e – the network of TSOs working towards harmonisation of balancing markets

Historically, electricity balancing market designs in Europe have followed **different principles**.



L 312/6 EN Official Journal of the European Union 28.11.2017

COMMISSION REGULATION (EU) 2017/2195

of 23 November 2017

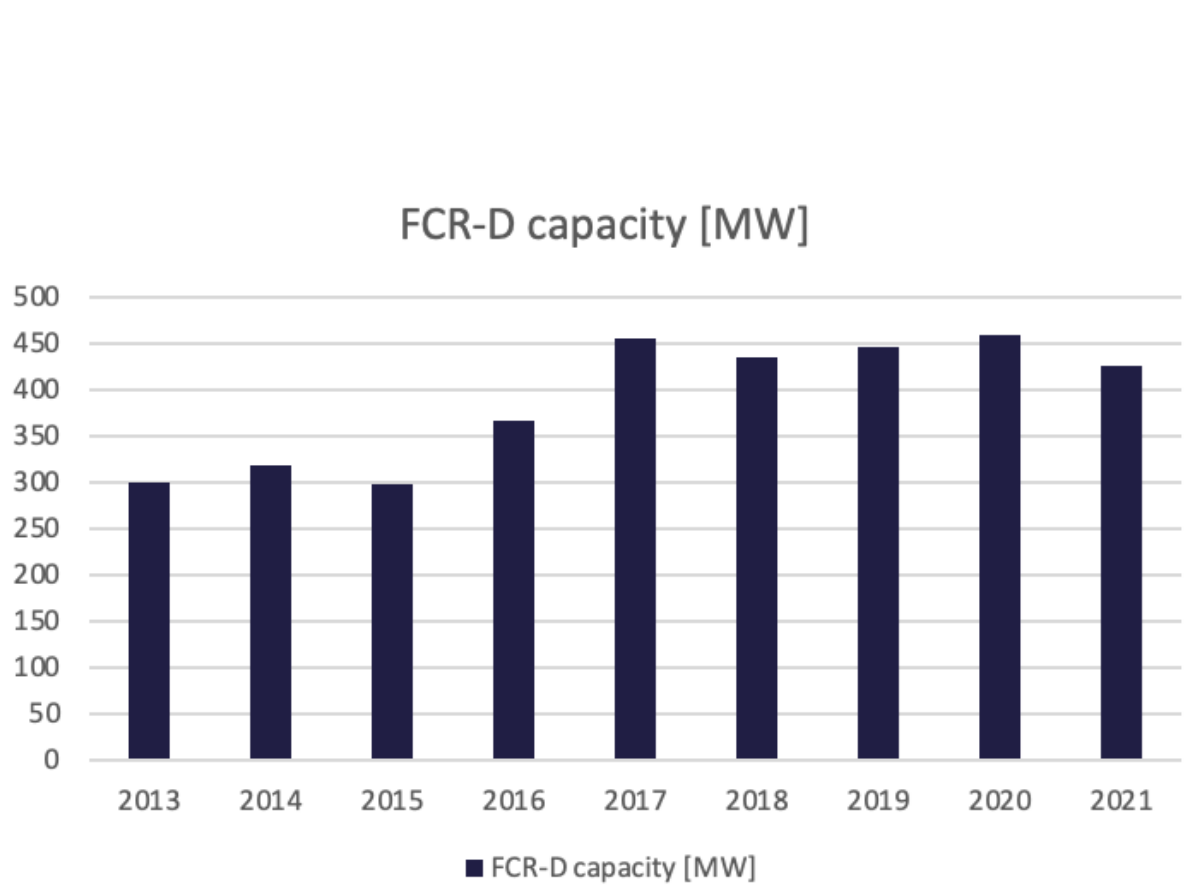
establishing a guideline on electricity balancing

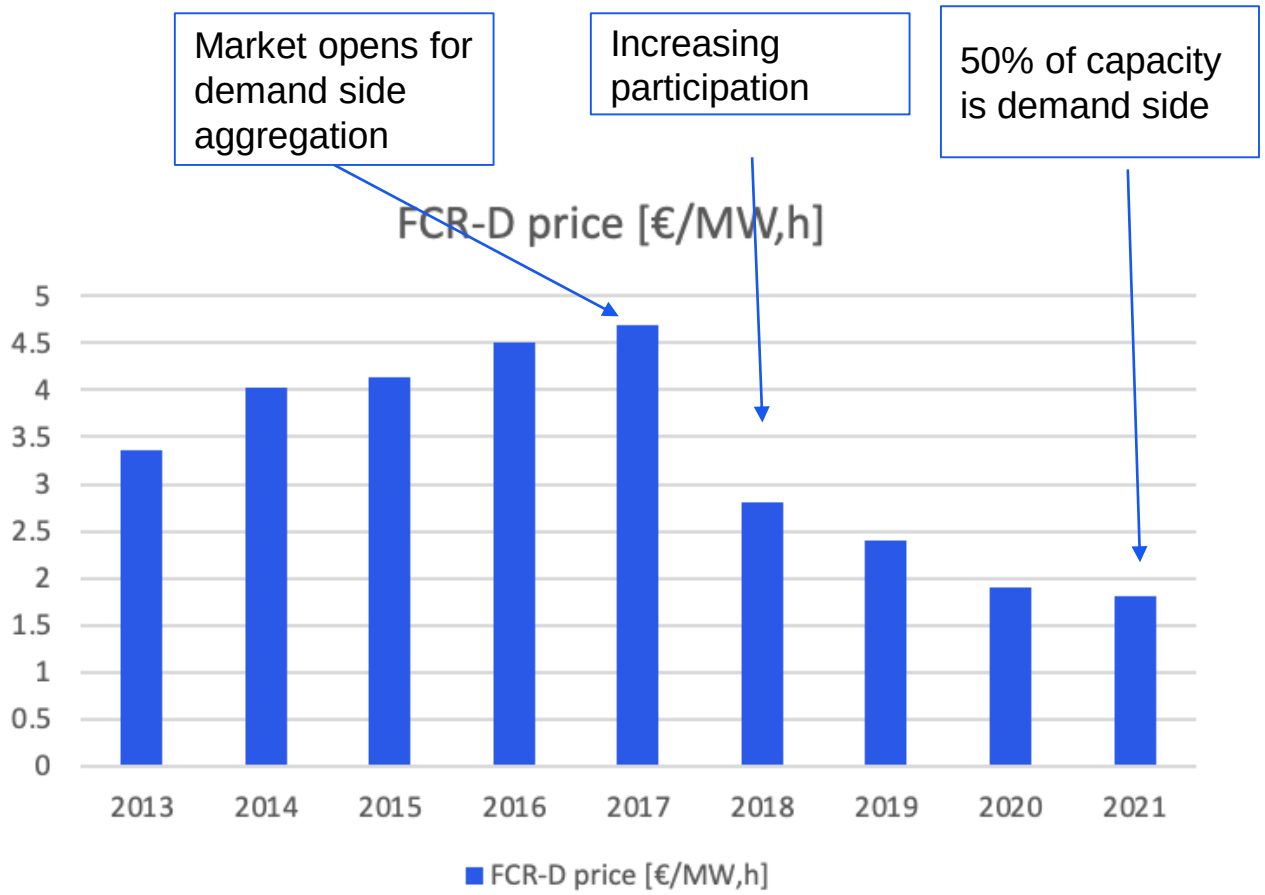
(Text with EEA relevance)

EU-wide set of **technical, operational and market rules** to govern the functioning of electricity balancing markets.

It sets out rules for the **procurement of balancing capacity, the activation and pricing** of balancing energy and the **financial settlement** of balance responsible parties.

Demand Side Flexibility can significantly lower the costs of balancing for TSOs (example from Finland)





There is a push from the European Union to allow and encourage demand response aggregation

1. **Energy efficiency first:** the revamped directive on energy efficiency sets a new, higher target of energy use for 2030 of 32.5%, and the new Energy performance of buildings directive maximizes the energy saving potential of smarter and greener buildings.
2. **More renewables:** an ambitious new target of at least 32% in renewable energy by 2030 has been fixed, with specific provisions to foster public and private investment, in order for the EU to maintain its global leadership on renewables.
3. **A better governance of the Energy Union:** A new energy rulebook under which each Member State drafts National Energy and Climate Plans (NECPs) for 2021-2030 setting out how to achieve their energy union targets, and in particular the 2030 targets on energy efficiency and renewable energy. These draft NECPs are currently being analysed by the Commission, with country-specific recommendations to be issued before the end of June.
4. **More rights for consumers:** the new rules make it easier for individuals to produce, store or sell their own energy, and strengthen consumer rights with more transparency on bills, and greater choice flexibility.
5. **A smarter and more efficient electricity market:** the new laws will increase security of supply by helping integrate renewables into the grid and manage risks, and by improving cross-border cooperation.

DIRECTIVE (EU) 2019/944 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 5 June 2019

on common rules for the internal market for electricity and amending Directive 2012/27/EU

Article 17

Demand response through aggregation

1. Member States shall allow and foster participation of demand response through aggregation. Member States shall allow final customers, including those offering demand response through aggregation, to participate alongside producers in a non-discriminatory manner in all electricity markets.

2. Member States shall ensure that transmission system operators and distribution system operators, when procuring ancillary services, treat market participants engaged in the aggregation of demand response in a non-discriminatory manner alongside producers on the basis of their technical capabilities.

3. Member States shall ensure that their relevant regulatory framework contains at least the following elements:

(a) the right for each market participant engaged in aggregation, including independent aggregators, to enter electricity markets without the consent of other market participants;

(b) non-discriminatory and transparent rules that clearly assign roles and responsibilities to all electricity undertakings and customers;

(c) non-discriminatory and transparent rules and procedures for the exchange of data between market participants engaged in aggregation and other electricity undertakings that ensure easy access to data on equal and non-discriminatory terms while fully protecting commercially sensitive information and customers' personal data;

(d) an obligation on market participants engaged in aggregation to be financially responsible for the imbalances that they cause in the electricity system; to that extent they shall be balance responsible parties or shall delegate their balancing responsibility in accordance with Article 5 of Regulation (EU) 2019/943;

(e) provision for final customers who have a contract with independent aggregators not to be subject to undue payments, penalties or other undue contractual restrictions by their suppliers;

(f) a conflict resolution mechanism between market participants engaged in aggregation and other market participants, including responsibility for imbalances.

Links to EU regulations & to other relevant pages

- Clean Energy Package
- Electricity Market Design (part of the Clean Energy Package)
- Entsoe FCR union
- Entsoe network codes
- Entsoe transparency platform - page with all prices and volumes of traded balancing capacity in Europe
- EU directive 2019/944 - on common rules for the internal market for electricity
- Publications of USEF (Universal Smart Energy Framework)
- SmartEn publications - good guides on market rules & markets' sizes in Europe


Thank You.

Annexure-5

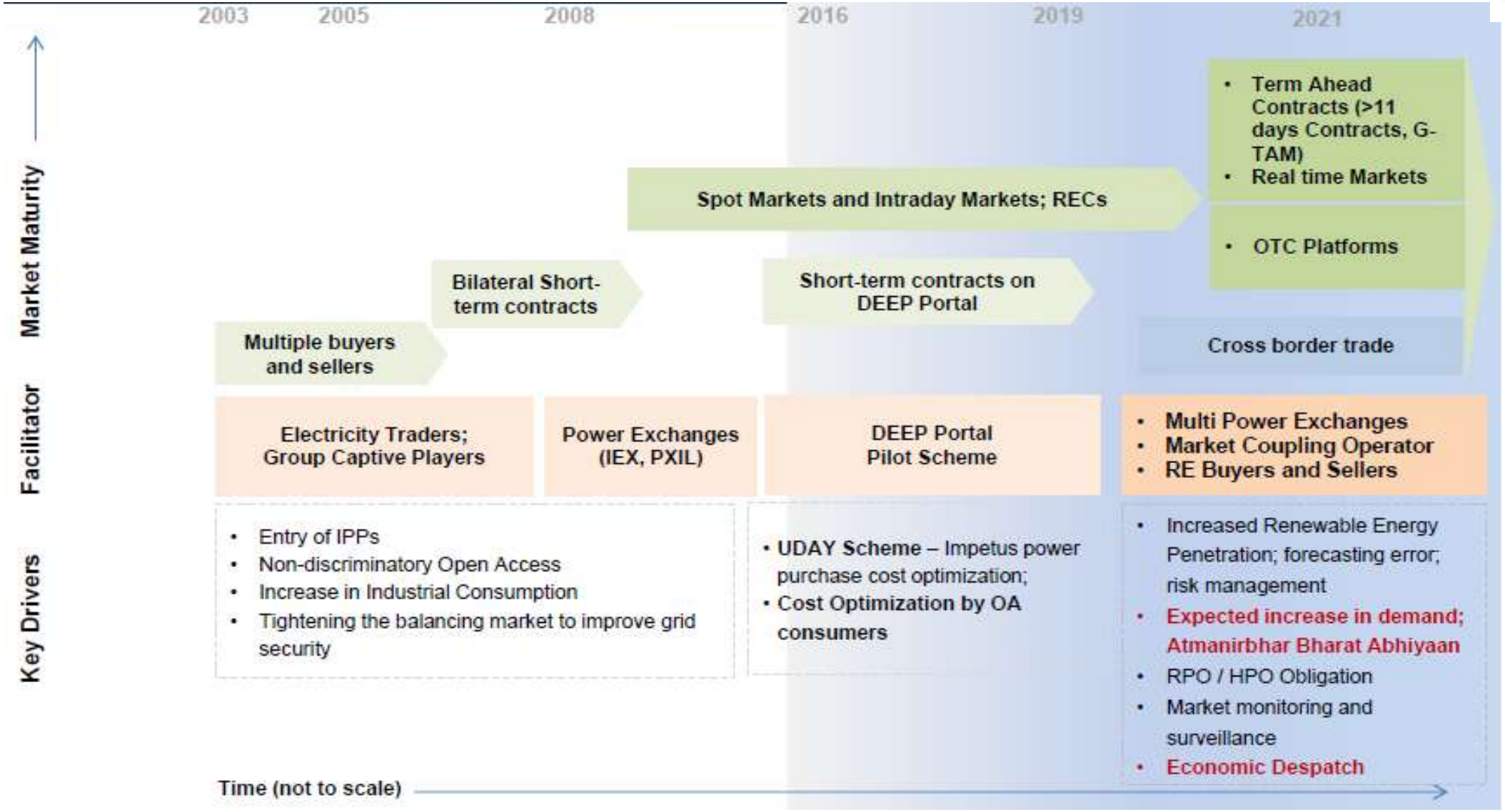
Power Market Development in India

with reference to

Development on Financial Derivatives

(Date 17.12.2021, Lucknow)

Evolution of Indian Power Market



Introduction

- The Hon'ble Supreme Court of India On October 6, vide Order No. C.A. No(s) -5290-5291/2011 in the matter between SEBI and CERC regarding regulatory jurisdiction of Electricity Derivatives has disposed of the matter in terms of the agreement reached upon by the SEBI and the CERC.
- This has opened the gate for introduction of longer duration delivery-based contracts on the power exchanges which has been currently restricted to upto 11 days.
- CERC will now have exclusive jurisdiction to regulate Ready Delivery / Non-Transferable Specific Delivery (NTSD) Contracts.
- SEBI shall have jurisdiction on financial derivatives, which are yet to be introduced in the power sector.

Introduction (contd.)

2005- MCX Flied Application to FMC for launching Electricity Future.

2009- FMC granted approval for trading electricity futures on MCX and Launch of derivative trading.

2010- CERC issued order restricting MCX to launch derivatives without prior approval of CERC. MCX moved to Bombay HC challenging CERC Judgement

2011- Bombay High Court Judgement – CERC & SEBI can not have exclusive jurisdiction over electricity derivatives. Both CERC and SEBI moved to SC.

2018- MoP Constituted a committee "Efficient Regulation of Electricity Derivatives" headed by Additional Secretary, MoP.

2019- Committee submitted report with recommendation with an intent to resolve the issue between both the regulators.

2021- Resolution of Pending Matter with Supreme Court disposing the matter in terms of agreement between CERC and SEBI

Joint Working Group

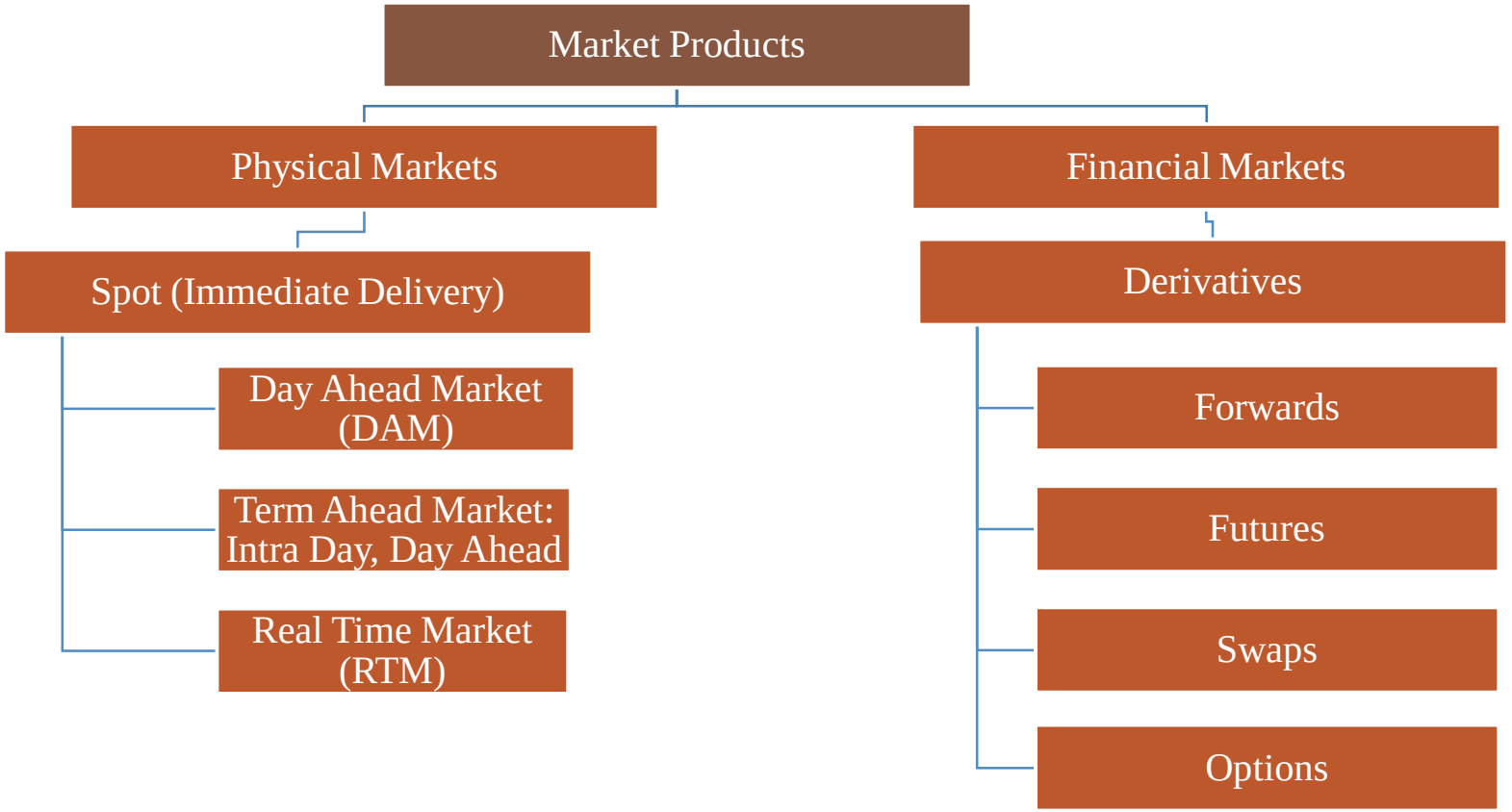
Committee Recommendations:

- **CERC Jurisdiction**: All-ready Delivery /Non-Transferable Specific Delivery (NTSD) Contracts in electricity.
- **SEBI Jurisdiction:** Commodity Derivatives in electricity other than NTSD Contracts.
- A **Joint Working Group** between SEBI and CERC to be constituted.

Way Forward:

- This has opened the gate for introduction of longer duration delivery-based contracts in the power exchanges which has been currently restricted to upto 11 days.
- The commodity exchanges can now introduce financial products viz. Electricity futures etc. which will enable the Discoms and other large consumers to effectively hedge their risks of power procurement.

Market Products-Electricity



Introduction to Electricity Derivatives

Introduction (contd.)

Derivatives:

- Financial instrument/Contract that derives it value from underlying asset.
- Primary economic role played by derivatives are risk management and price discovery

Underlying assets in Derivatives which are traded across globe

- Financial assets such as equities, debts, bonds, currencies and indices.
- Agricultural produce such as grains, coffee, pulses and cotton.
- Metals such as gold, silver, copper and aluminum.
- Energy sources such as crude oil, natural gas, **electricity** and coal.
- Interest rate.

Exchanges in India currently offering derivatives trading:

- Bombay Stock Exchange Ltd (BSE) (Equity, Currency, Commodity)
- Indian Commodity Exchange Limited (Commodity)
- Metropolitan Stock Exchange of India Ltd. (Equity, Currency)
- Multi Commodity Exchange of India Ltd. (Commodity)
- National Commodity and Derivatives Exchange Ltd. (Commodity)
- National Stock Exchange of India Ltd. (Equity, Currency, Commodity)

Introduction (contd.)

Obligation to buy/sell a fixed amount of electricity at a pre-specified contract price, for certain future time

Custom-tailored supply contracts between a buyer and a seller, where the buyer is obligated to take power and the seller is obligated to supply.

Electricity forward prices features are:

- Based on forward (long-term) expectations
- Have Stable behavior
- Correlation with fuels

Types of Electricity Forward Contracts in India

- **Power Purchase Agreements (PPA):** Agreement between seller and buyer, PPA's are done for tenure upto 25 years
- **Bilateral:** Short Term agreements (less than 1 year) entered between seller & buyer.

Forward Contracts currently traded on Exchange:

- **Daily**: Traded on all days, delivery starting from T+2 till T+11 days
- **Weekly**: Standard contracts for weekly delivery (Monday to Sunday)

Upcoming electricity forward contracts on Exchange

Fortnightly Contracts

- **Delivery**: Available for block of 15 Days of calendar months starting from 1st or 16th of month on a rolling basis
- **Price and quantum discovery**: Open uniform price auction/continuous

Any day(s) single sided Contracts

- **Delivery:** Will be available for user defined days(s) and duration(time block) or any combination thereof
- **Price and quantum discovery**: Reverse auction for buyers and forward auction for seller.

Monthly Contracts

- **Delivery**: Twelve monthly contracts starting from first day of the month till last day of the month will be available for trading on rolling over basis
- **Price and quantum discovery**: Open uniform price auction/continuous

Advantages of Exchange Traded Forward Contracts

- Provides market players an organized platform for actual energy trade on long duration basis along with delivery and on time settlement.
- Longer duration contracts such as daily, weekly, fortnightly, monthly, quarterly, seasonal and yearly contracts, up to 365 days of delivery.
- Opportunity to small participants (OA/CPP) to buy power at competitive rates to meet energy requirement for a longer period.
- Avenue to obligated entities participating in G-TAM segment fulfil their RPO.
- Compliance in a comprehensive manner.
- Lower Cartelization risk.
- Low counter party risk for both buyers and sellers.
- Transparent & Competitive Prices for participants.

THANK YOU

Annexure-6

DRAFT CENTRAL ELECTRICITY REGULATORY COMMISSION (CONNECTIVITY AND GENERAL NETWORK ACCESS TO THE INTER-STATE TRANSMISSION SYSTEM) REGULATIONS, 2021

Transmission Access- Prevailing regime

- Transmission system booking
  - Long term Access (LTA)- 7 years and above
  - Medium term Open Access (MTOA)– 3 months to 5 years
  - Short term Open Access (STOA) - 1 time block to 1 month
    (upto 3 months in advance)
  - Each Access comprise of booking of system from injection point till drawl point
- Availing of the booked transmission system by scheduling
  - Scheduling of power is under contract between buyer and seller
  - LTA – PPA for duration more than one year
  - MTOA and STOA- PPA for the duration of Access to be furnished along with the application

Need for change

- Realities of procurement of cheaper power
- Requirement of delinking of access to transmission system with fixed contract.
- Sharing of Access rights between States.
- Schedules under STOA cannot change 2 days hence.
  -Need to review inflexibility raised by stakeholders.
- Issues due to Delay / Abandonment of generating stations and consequent liability including relinquishment charges.

GNA for a State

- Each State shall have a General Network Access (GNA) to ISTS.
- To start with GNA for States shall be specified based on ISTS drawal for last 3 years.
- States shall be able to schedule power under long term or medium term or short term contracts based on its own assessment of merit order on day ahead basis within GNA quantum. This flexibility will help them optimise their overall procurement cost.
- Additional GNA may be sought by State as per their requirement.
- States shall pay transmission charges for GNA quantum in accordance with CERC(Sharing of inter-state transmission charges and losses) Regulations 2020.
- Any drawal beyond GNA shall be with additional charges.
- GNA once granted shall remain valid until relinquished.
- GNA can be applied for by
  - STU on behalf of intra-state entities or
  - intra-state entity

Grant of GNA

- For the first year GNA for states shall be considered based on historical data of last 3 years for yearly maximum ISTS drawl and daily maximum ISTS drawal.

- GNA shall be the average of 'A' for the financial years 2018-19, 2019-20 and 2020-21:

where,

- 'A' = {0.5 X maximum ISTS drawal in a time block during the year} + {0.5 X [average of (maximum ISTS drawal in a time block in a day) during the year]}

- States may apply for additional GNA to be added in next 3 years, every year in September.

- STU shall be the entity to whom GNA shall be deemed to be granted as per above on behalf of intra state entities. Transmission charges liability shall be with intra-state entities as per prevailing regime.

Use of GNA by another GNA grantee

- GNA capacity of a state shall be allowed to be used by another state/entity on mutually agreed terms.
- Liability to pay GNA charges shall be with original GNA grantee
- For example, Punjab may buy GNA capacity for a specific quantum from Delhi/Haryana in case there is diversity in their ISTS drawal requirement and optimise their transmission charges.
- Suppose UP has 10000 MW GNA and in a season, it may not need to draw for 2000 MW from ISTS. Punjab may have additional ISTS drawal requirement in that season. Punjab can use GNA of UP as per mutually agreed terms.
- Subject to availability of drawal capacity of the State.

Temporary GNA (T-GNA)

- Product akin to prevailing STOA.
- Can be availed over and above GNA.
- 1 time block to 11 months.
- Scheduling flexibility on day ahead basis.
- Priority to get corridor allocation after GNA grantees.
- Payment of transmission charges 1 month in advance.

Provisions for generating stations

- May seek Connectivity equal to Installed capacity
  - May seek Connectivity for less than Installed capacity in case of hybrid generating stations or when it is to be connected to both ISTS and intra-state system.
- Shall have GNA equal to Connectivity
- Connectivity Bank Guarantee to be paid for
  - Rs 50 Lakhs by all
  - existing system (Rs 2 lakhs/MW),
  - ISTS bay augmentation (Rs 2 Crore-Rs 12 Crore /bay),
  - Estimated cost of Associated transmission system
- Bank Guarantee to be returned in 5 years after COD of corresponding capacity.
- In case of relinquishment of capacity , bank guarantee shall be encashed in case associated system or ISTS basy has been awarded for implementation.

Curtailment

- For the reason of transmission constraints or in the interest of grid security, transactions already scheduled may be curtailed:
  - Transactions under T-GNA shall be curtailed first followed by transactions under GNA.
  - Within transactions under T-GNA, bilateral transactions shall be curtailed first followed by collective transactions under day ahead market followed by collective transactions under real time market.
  - Within bilateral transactions under T-GNA, curtailment shall be on pro rata basis based on T-GNA.
  - Within transactions under GNA, curtailment shall be on pro rata basis based on GNA.

Transition mechanism

- Connectivity, LTA, MTOA
  - Applications yet to be granted, can be withdrawn or converted into applications as made under these Regulations

- LTA granted to a generating station or its identified buyer shall be considered as GNA for the generating station.

- For the Connectivity quantum without any LTA , GNA may be applied by the generating station with submission of Bank Guarantees as per these regulations.

THANK YOU

State	Yearly Average of Daily Max ISTS drawal (X_1) (MW)	Yearly Max ISTS drawal (Y_1) (MW)	A_1= 0.5* X_1 + 0.5* Y_1 (MW)	Yearly Average of Daily Max ISTS drawal (X_2) (MW)	Yearly Max ISTS drawal (Y_2) (MW)	A2 = 0.5* X2 + 0.5* Y2 (MW)	Yearly Average of Daily Max ISTS drawal (X_3) (MW)	Yearly Max ISTS drawal (Y_3) (MW)	A_3= 0.5* X_3 + 0.5* Y_3 (MW)	GNA (MW)= Average of A_1 A_2 & A_3
	2018-19			2019-20			2020-21			
Northern Region										
Chandigarh	262	474	368	267	431	349	233	383	308	342
Delhi	3735	5626	4681	3954	6257	5105	3642	5646	4644	4810
Haryana	5004	7739	6371	5728	8117	6922	5756	9132	7444	6913→ 5418**
HP	793	1421	1107	743	1398	1071	751	1675	1213	1130
J&K	1605	2210	1907	1570	2305	1937	1728	2444	2086	1977
Punjab	3556	6608	5082	4198	6681	5440	4823	7119	5971	5497
Rajasthan	3946	5668	4807	4429	7834	6131	5144	7512	6328	5755
UP	7343	10648	8996	8551	12500	10525	8999	12952	10975	10165
Uttarakhand	1154	1654	1404	1016	1761	1389	1117	1709	1413	1402
Western Region										
Chhattisgarh	1320	2492	1906	1743	2626	2184	1716	3001	2358	2149
Dadra Nagar Haveli	757	825	791	776	839	807	664	894	779	792
Daman Diu	320	355	337	317	363	340	278	367	323	334
Goa	476	598	537	518	639	578	459	596	527	548
Gujarat	5491	8852	7172	4373	6547	5460	4731	8611	6671	6434
Madhya Pradesh	5363	8268	6815	5611	8521	7066	6639	9764	8202	7361
Maharashtra	6804	10488	8646	6751	9053	7902	7535	10344	8940	8496
Southern Region										
Andhra Pradesh	2994	5015	4004	3094	5791	4443	4095	6110	5102	4516
Karnataka	3225	5026	4125	3232	4805	4019	3658	6312	4985	4376
Kerala	2269	2913	2591	2548	3034	2791	2365	2946	2655	2679
Pondicherry	359	413	386	376	464	420	352	427	390	398
Tamil Nadu	6962	9732	8347	7673	10496	9085	7973	12227	10100	9177
Telangana	4511	6515	5513	4453	8145	6299	4720	8494	6607	6140

State	Yearly Average of Daily Max ISTS drawal (X_1) (MW)	Yearly Max ISTS drawal (Y_1) (MW)	A_1= 0.5* X_1 + 0.5* Y_1 (MW)	Yearly Average of Daily Max ISTS drawal (X_2) (MW)	Yearly Max ISTS drawal (Y_2) (MW)	A2 = 0.5* X2 + 0.5* Y2 (MW)	Yearly Average of Daily Max ISTS drawal (X_3) (MW)	Yearly Max ISTS drawal (Y_3) (MW)	A_3= 0.5* X_3 + 0.5* Y_3 (MW)	GNA (MW)= Average of A_1 A_2 & A_3
Bihar	4291	5036	4664	4520	5664	5092	4773	5973	5373	5043
DVC*	687	996	841	829	1,158	993	881	1,187	1,034	956
Jharkhand	919	1167	1043	927	1270	1099	1050	1325	1188	1110
Odisha	1909	3080	2494	1300	3166	2233	825	2661	1743	2157
Sikkim	88	111	99	92	132	112	92	149	121	111
West Bengal	2549	6710	4629	2719	5334	4026	2091	4274	3183	3946
North Eastern Region										
Arunachal Pradesh	135	155	145	119	155	137	107	134	120	134
Assam	1273	1583	1428	1304	1737	1520	1391	1885	1638	1529
Manipur	174	211	193	179	216	198	196	246	221	204
Meghalaya	167	319	243	170	327	248	147	298	223	238
Mizoram	72	115	93	77	110	93	79	119	99	95
Nagaland	118	153	135	124	144	134	119	149	134	134
Tripura	225	366	295	222	380	301	261	414	337	311

Relinquishment of Connectivity

- In case of relinquishment of full quantum of Connectivity, subsisting Conn-BG1 shall be encashed and subsisting Conn-BG2 shall be encashed corresponding to the ATS and terminal bay(s), construction of which has already been awarded for implementation.

- In case of relinquishment of part quantum of Connectivity, subsisting Conn-BG2 shall be encashed in proportion to the relinquished quantum of Connectivity corresponding to the ATS and terminal bay(s), construction of which has already been awarded for implementation. Conn-BG1 shall be returned in terms of Regulation 16.1 considering full capacity after excluding such relinquished quantum.

Relinquishment of GNA

- STU may relinquish GNA on behalf of identified intra-State entity. The relinquishment charges shall be equal to 60 times the transmission charges paid by such intra-State entity for the last billing month under the Sharing Regulations, corresponding to the relinquished quantum.