

MINUTES OF 23rd MEETING OF THE CENTRAL ADVISORY COMMITTEE

(CAC)

Date/ Day: 26.09.2023 (Tuesday)

Venue: Conference Room, CERC

Time: 11:00 hrs

List of Attendees: Annexure - I

1. Delivering his opening remarks, Shri Jishnu Barua, Chairperson, CERC, welcomed the members of the CAC to the meeting. Discussing the constitution of the CAC as per the Electricity Act, 2003, he expressed his appreciation for the advice and valuable suggestions given by the CAC in the past on several important issues facing the sector, which has benefitted the Commission immensely in making informed decisions. He added that the Commission places immense value on the insights, wisdom, and expertise that the CAC brings to the table and that the esteemed Committee serves as a vital pillar in our pursuit of sound and effective regulatory policies in the power sector.

Referring to the agenda of the meeting, he informed the Members that two important issues have been brought before the Committee for discussion: (a) Approach paper on Terms and Conditions of Tariff Regulations for tariff period 01.04.2024 to 31.03.2029 and (b) Market Coupling in Power Exchanges. He added that the process for framing Tariff Regulations for the next tariff period has already been initiated, and accordingly, the Approach Paper on Tariff Regulations for FY 2024-29 has been prepared by the staff of the Commission. India is at the crossroads of energy transition. The Approach Paper has been drafted with this vision in mind. The specific transition issues, such as the need for preserving the existing thermal fleet as capacities for system security; phasing down inefficient assets, promoting hydro, etc., have been discussed in the Approach Paper. He further added that the Tariff Regulations set today by CERC will not only impact the lives of millions of consumers but also influence investments and innovations in the power sector.

2. On the issue of Market Coupling, he informed the Members that the Commission has published a staff paper on “Market Coupling” with a view to discussing the regulatory provisions for market coupling, international experience, envisaged objectives of market coupling in India, issues and challenges in the implementation of market coupling. While the

pros and cons of market coupling have been highlighted in the staff paper, the Commission has yet to decide on this. As any reform brings with it the element of business process re-orientation, the Commission looks forward to the considered views of the Committee on this subject with the larger objective in mind.

AGENDA ITEM 1: APPROACH PAPER PREPARED BY CERC ON “TERMS AND CONDITIONS OF TARIFF FOR THE PERIOD COMMENCING FROM 1ST APRIL, 2024” - PRESENTATION BY CERC

3. A presentation (**Annexure – II**) was made by Shri Rajeev Pushkarna, Chief, CERC on the Approach Paper on Terms and Conditions of Tariff Regulations for Tariff Period 01.04.2024 to 31.03.2029. The presentation highlighted the simplification of the tariff determination process, Normative Add-Cap, Capital Cost, and Financial aspects impacting tariff viz. Depreciation, IOL, ROE, IOWC and O&M expenses as well as operational parameters impacting tariff viz. Operational norms, compensation for part-load operation, Gross Calorific Value (GCV) of fuel and blending of coal and other provisions, including Decommissioning Costs, Non-Tariff Income, Input price of coal–integrated mine and revision of useful life.
4. The presentation summed up the following issues for discussion:
 - a. Simplification of tariff determination:

Proposed Approach:1 (Normative tariff approach) vis-à-vis proposed Approach:2 (Further simplification of the existing performance-based hybrid approach)
 - b. Additional capitalisation on a normative basis
 - c. Reference cost for approval of Capital Cost – Benchmark Cost v/s Investment Approval Cost
 - d. Capital cost for the projects acquired through NCLT proceedings: Historical Cost or Acquisition Value
 - e. Allowing a special allowance or provision of R&M after 25 years
 - f. Extension of the cut-off date from 3 years to 5 years to close contracts and discharge liabilities
 - g. Components of AFC:
 - i. Lower depreciation rate in the initial years based on the mutual agreement between the generator and the beneficiaries

- ii. Revision of useful life in respect of coal-based thermal generating stations and transmission sub-stations: From 25 to 35 years
- iii. To continue with the ROE approach
- iv. Differential rate of RoE to thermal, hydro generation and transmission projects with further incentives for dam/reservoir-based projects including PSP
- v. Allowing additional incentive in the form of paise/ Kwh for old generating stations for generation beyond target PLF
- vi. Alternative ways to determine the quantum of working capital
- vii. Additional O&M Expenses for North Eastern and Hilly Regions
- h. Compensation for flexible operation of coal-based generating units
- i. Continuation of relaxed norms in respect of some old generating stations
- j. Peak and Off-Peak Tariff
- k. Ways to reduce the gap between GCV “as billed” and “as received”
- l. Encouraging the development of Hydro Generation Projects - Measures to accelerate the hydro construction period and enhance commercial acceptance, incentivizing timely completion of projects and incentives for dam/reservoir-based projects including PSP.

Discussion:

5. The Committee appreciated the Approach Paper prepared by the Staff of the Commission. The following observations were made by the members of the CAC committee.

a. General:

- 1. Simplifying the tariff determination process is a commendable approach for the CERC tariff regulation of 2024-29
- 2. One view was that the tariff framework should be uploaded on the website, and the approved tariff, along with an Excel version, should also be made available on the website for the convenience of all stakeholders.
- 3. Extending the cut-off date for additional capitalisation to 5 years may be considered.
- 4. Increasing the thermal plant life from the existing 25 years to 35 years may increase the risk associated with the plant. Therefore, plant life may be considered at existing 25 years.
- 5. Renovation and Modernization be allowed after reviewing its merit on a case-to-case basis.

6. Compensation for older power plants may be considered to encourage their continued operation
7. Time overrun and cost overrun disallowance to be decided firmly by the Commission.
8. Certain mechanisms may be developed for gas-based stations so that they can generate during the high energy demand period and during peakhours .
9. A self-incentive mechanism may be introduced, to provide more flexibility to power plants, thereby allowing them to adapt to the grid operation requirements on their own.
10. The sharing of grade slippage losses should be determined collaboratively among power generation companies, coal suppliers, and the railways.
11. There should be a provision for one-time reimbursement of unrecovered depreciation for assets that have been decommissioned due to reasons beyond the control of the petitioner.
12. Currently, no interim tariff is being approved by the Commission. The same may be approved by the Commission.

b. Specific Issues-wise discussion:

i. Simplification of Tariff Determination Process

- Between Approach 1 and Approach 2, Approach 2 appears to be feasible with normative additional capitalization.
- After the cut-off date, no Add Cap should be allowed. Only normative provisions should exist, within the useful life of the plant.
- The normative approach may not be suitable for Hydro plants.
- Unlike generating stations, additional capitalisation post-cut-off date is rarely required in the case of transmission projects. Therefore, additional capitalisation, as presently allowed, may continue.

ii. Applicability of revised Operation norms for existing projects and new projects:

- The stipulated norms applicable to a specific control period should remain in effect for a duration of 25 years for plants commissioned within the same control period.

iii. Interest on Loan:

- The loan repayment period may be extended. However, longer duration loans are not available in the market easily.
- Whether project level interest rates should be continued, should be debated.

iv. Rate of ROE:

- Review of the rate of ROE may include considering linking with G-sec rate plus premium.
- v. **Compensation for flexible operation of coal-based generating units:**
 - Additional provisions to encourage the flexing of thermal generating stations should be worked out and introduced in the Tariff Regulations.
- vi. **Peak & Off-Peak Tariff (High/Low demand season; National/Regional Peak):**
 - Peak and off-peak tariff framework should factor in the operational difficulties of the generators.
- vii. **Encouraging the development of Hydro Generation Projects**
 - Hydro-pumped storage projects may be incentivised if the plant is commissioned before SCOD.
 - Regarding the capital cost of hydro projects, necessary Local Area Development costs should be allowed. Currently, they are not permitted.
 - The life of hydro stations could be increased to 50 years for tariff rationalisation.

AGENDA ITEM 2: STAFF PAPER OF CERC ON “MARKET COUPLING” - PRESENTATION BY CERC

13. Dr. S.K. Chatterjee, Chief (Regulatory Affairs), CERC, presented an overview of the CERC Staff Paper on ‘Market Coupling’ (**Annexure III**). He briefly discussed the regulatory provisions under the Power Market Regulations, 2021 and the international experiences on Market Coupling. He further mentioned that CERC’s staff paper presents a balanced view on Market Coupling and attempts to initiate discussion with the market participants and other stakeholders on various issues and challenges involved in its implementation, including the technical and operational aspects.
14. Mr. Satyajit Ganguly, MD & CEO, PXIL, made a brief presentation on the genesis of the discussion on Market Coupling in the Indian power market, and the need for its introduction under the prevailing market conditions. He also presented the results of simulations done by PXIL in this regard.

15. Representatives from other Power Exchanges, including IEX and HPX, Chairperson, CEA, and other subject matter experts also expressed their views and concerns on Market Coupling.
16. There was a general consensus that the larger objective should be to increase the depth of the market, whether through market coupling or independent of the same.

Vote of Thanks:

17. At the end of the meeting, delivering the “Vote of Thanks”, the Secretary, CERC, thanked the members for giving divergent but very useful suggestions on the agenda items. He appreciated the insight provided by the members on a wide spectrum of issues. He thanked the officers of the Commission for their arduous efforts in organizing the meeting and Chairperson, CERC for steering the meeting.

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Annexure-1

LIST OF PARTICIPANTS OF THE 23rd MEETING OF CENTRAL ADVISORY COMMITTEE (CAC) OF CENTRAL ELECTRICITY REGULATORY COMMISSION (CERC) HELD ON TUESDAY, THE 26TH SEPTEMBER, 2023

S. No.	Name & Designation	Organization
1.	Shri Jishnu Barua, Ex-Officio, Chairperson, CAC	CERC
2.	Shri Arun Goyal, Ex-Officio Member, CAC	CERC
3.	Shri Pravas Kumar Singh, Ex-Officio Member, CAC	CERC
4.	Shri Ghanshyam Prasad, Chairperson	CEA
5.	Shri R.V. Shahi	Secy.(Power), Retd.
6.	Shri Ajay Shankar, Distinguished Fellow	TERI
7.	Ms. Jyoti Arora, Information Commissioner	Haryana State Information Commission
8.	i) Shri Manish Gupta, Executive Director ii) Shri Sanjay Singh, General Manager	Railway Board RENCL
9.	i) Shri Gurdeep Singh, Chairman & Managing Director ii) Shri Ajay Dua, Executive Director (Commr.) iii) Shri Jaikumar Srinivasan, Director	NTPC
10.	Dr. Anoop Singh, Centre for Energy Regulation (CER) Department of Industrial & Management Engineering (DIME)	Indian Institute of Technology, Kanpur
11.	i) Shri K.Ravi Kumar Reddy, Chairman ii) Shri Ashwary Sharma	NSEFI
12.	Prof. Arun Kumar	IIT, Rourkee

S. No.	Name & Designation	Organization
13.	Shri K.Sreekant, Chairman & Managing Director	PGCIL
14.	i) Shri S.N.Goel, Chairman & Managing Director ii) Shri Gaurav Maheshwari, AVP (Regulatory Affairs) iii) Shri Rohit Bajaj, Executive Director	IEX
15.	i) Shri Satyajit Ganguly, MD & CEO ii) Shri Anil V.Kale, Head – Stg. & Reg.	PXIL
16.	i) Shri Naveen Godiyal, Vice-President 1 ii) Shri Parvesh Kr. Sharma, Head – Stg. & Regulatory	HPX
17.	Shri Pankaj Prakash, Head, Regulatory	TATA Power
18.	i) Ms. Jyoti Mukul, Chief, Energy ii) Shri Naveen Munjal	CII
19.	Shri Karthik Ganeshan	CEEW
20.	i) Shri Ashok Sreenivas, Coordinator ii) Ms. Maria Chirayil iii) Ms. Ann Jossy	Prayas (Energy Group)
21.	Shri Milind Digrashkar	MSEDCL
22.	Shri Harpreet Singh Pruthi, Secretary	CERC
23.	Dr. Sushanta Kumar Chatterjee, Chief (RA)	CERC
24.	Shri Proteek Kumar Chakraborty, Chief (Fin.)	CERC
25.	Shri Awdhesh Kumar Yadav, Chief (Engg.)	CERC
26.	Shri Rajiv Pushkarna, Chief	CERC
27.	Shri A.V.Shukla, Joint Chief (Fin.)	CERC
28.	Shri Sunil Kumar Jain, Joint Chief (Engg.)	CERC
29.	Ms. Rashmi Nair, Deputy Chief (RA)	CERC
30.	Shri Sanjeev Tinjan, Asstt. Chief (RA)	CERC
31.	Shri Gagan Diwan, Asstt. Chief (Eco.)	CERC
32.	Shri Puneet Arora, Asstt. Chief (Fin.)	CERC

S. No.	Name & Designation	Organization
33.	Shri Ashutosh Sharma, Asstt. Chief (Eco.)	CERC
34.	Ms. Sukanya Mandal, Asstt. Chief (RA)	CERC
35.	Shri Akhilesh Awasthy	TLG (India)
36.	Shri Punit Chitkara	TLC
37.	i) Shri Sanjiv Kumar Singh, Consultant ii) Shri Naresh Mohan, Consultant iii) Shri Tapan Kumale, Consultant	ABPS Infra
38.	Shri Saurabh, PRO	CERC
39.	Ms Jijnasa Behera, RO	FOR
Virtual attendance		
1.	Shri R.K.Vishnoi, CMD	THDC
2.	Shri Rahul Walawalker, President & MD	Customized Energy Solutions India (P) Ltd.
3.	Shri R.P.Goyal, Director (Fin.)	NHPC
4.	Shri M.K.Gupta, General Manager	NHPC

Meeting of Central Advisory Committee (CAC)

Tariff Regulations Commencing from 01.04.2024

PRESENTATION BY CHIEF

CENTRAL ELECTRICITY REGULATORY COMMISSION

NEW DELHI, 110001

In this Presentation...

- ❖ **Introduction**
- ❖ **Key Aspects**
- ❖ **Simplification of Tariff Determination Process**
- ❖ **Financial Norms (*Capital Cost and Components of Annual Fixed Cost (AFC)*)**
- ❖ **Incentivising efficient plant operations**
- ❖ **Encouraging development of Hydro Generation Projects**
- ❖ **Issues for Discussion**

Background

- ❖ Central Commission determines the tariff for
 - Generating companies owned or controlled by Central Government
 - Other Generating companies having composite scheme for generation and sale in more than one state
 - Inter-State Transmission of electricity
- ❖ Tariff regulations have significant impact on tariff determination and the overall development of the power industry
- ❖ Central Commission issued a Terms and Conditions of Tariff Regulations for the period 2001-04, 2004-09 ,2009-14, 2014-19 and 2019-24
- ❖ Commission determined the tariff for about 90 GW capacity of generating stations and associated inter-state transmission system comprising of around 1350 Transmission Lines (1,60,000 in Ckm) and around 250 Sub-stations

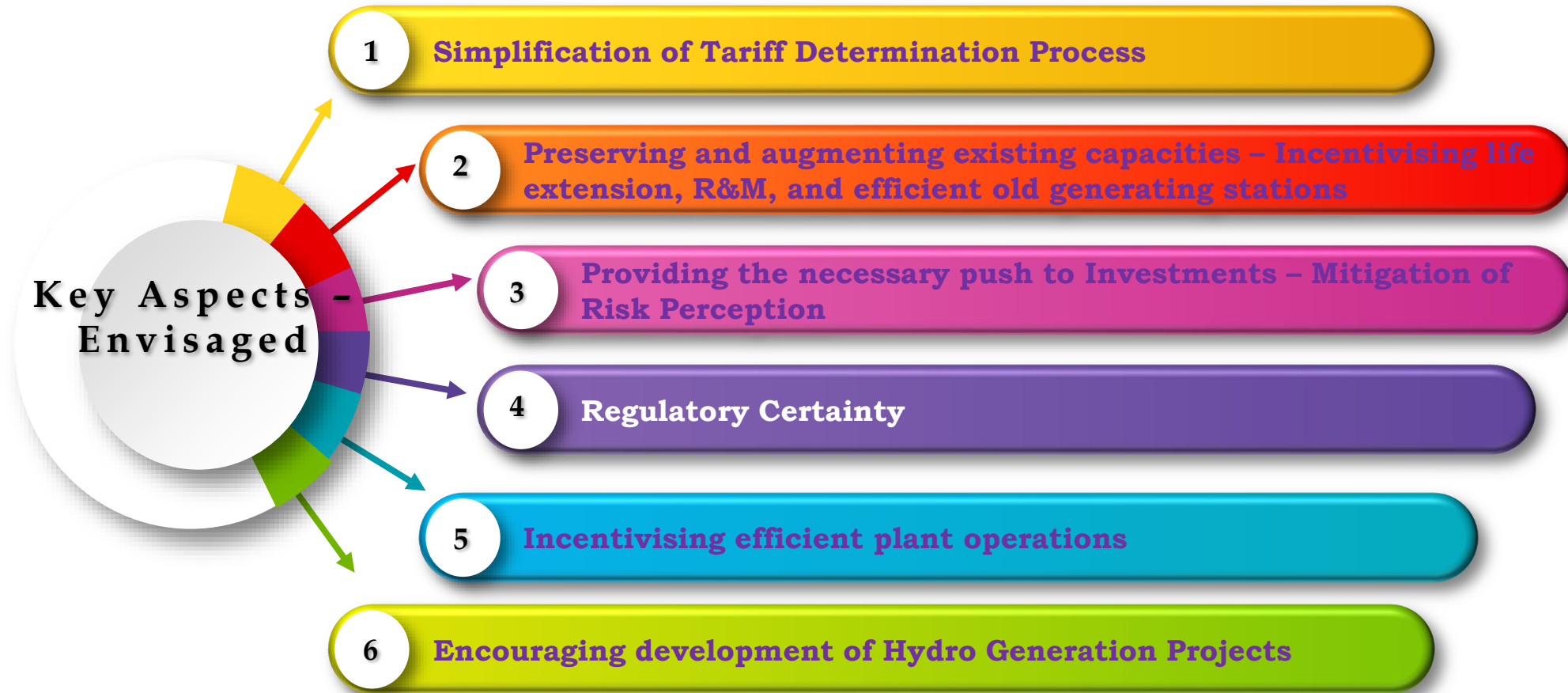
Key indicators

- ❖ All India Peak Deficit reduced from 9.84% in FY 2011-2 to 1.63% in FY 2016-17 which again increased to 4.01% in FY 2022-23 due to strong demand growth necessitating need for further capacity addition
- ❖ Average Cost of Supply (ACoS): Increased to 629 paisa/unit in FY 2021-22 from 538 paisa/unit in FY 2016-17
- ❖ Contribution to Power Purchase Cost in ACoS: 75.83% (72%-78%)
- ❖ AT&C losses: Reduced to 16.42% in FY 2021-22.
- ❖ Highest ever peak demand of 241 GW in the month of September-23
- ❖ As per projections of CEA, existing installed generation capacity of 423 GW will be increased to 777 GW by 2030. The existing transmission system needs to be augmented for this additional capacity

Broad Guiding factors for approach for Tariff determination

- ❖ Safeguarding Consumer interest as well as ensuring recovery of cost of electricity in reasonable manner
- ❖ Encourage competition, efficiency, economical use of the resources, good performance and optimum investments
- ❖ Attracting investment in the sector
- ❖ Inducing efficiency through incentive and disincentive mechanism

Key Aspects

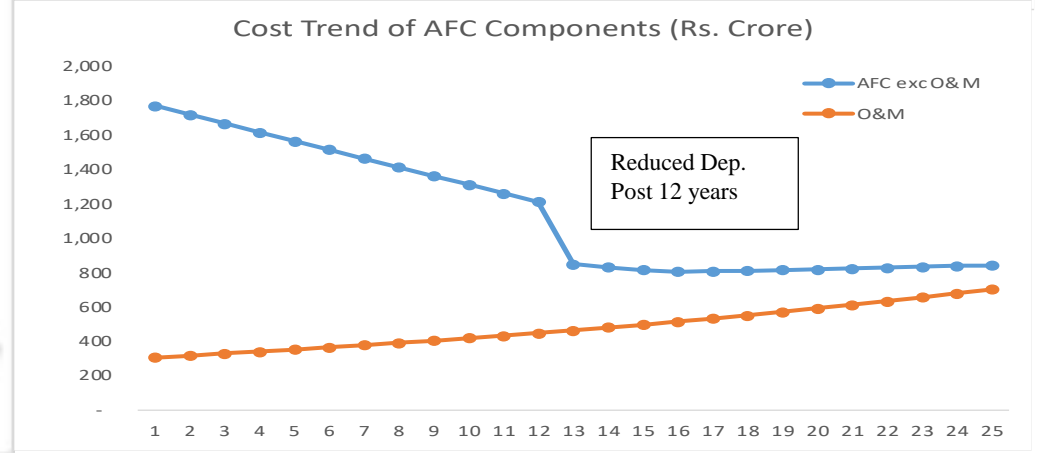
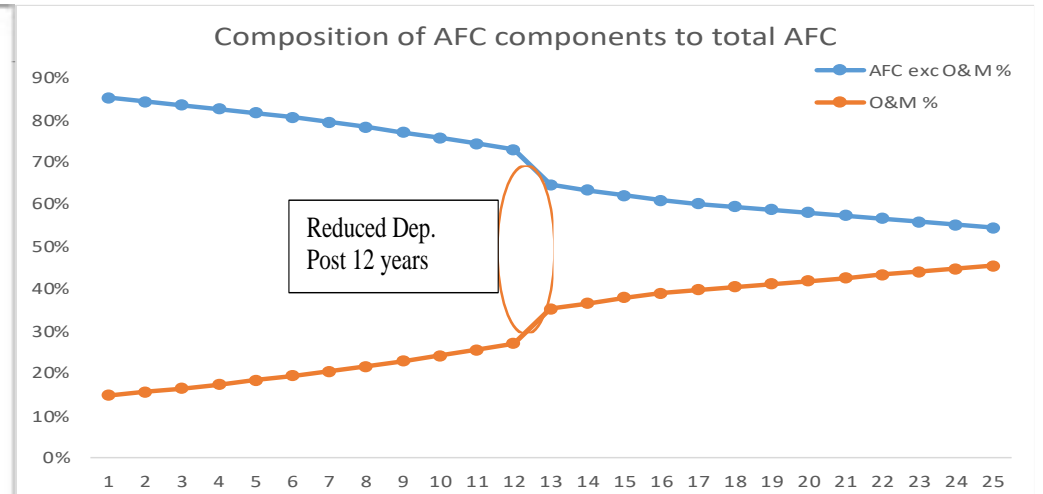
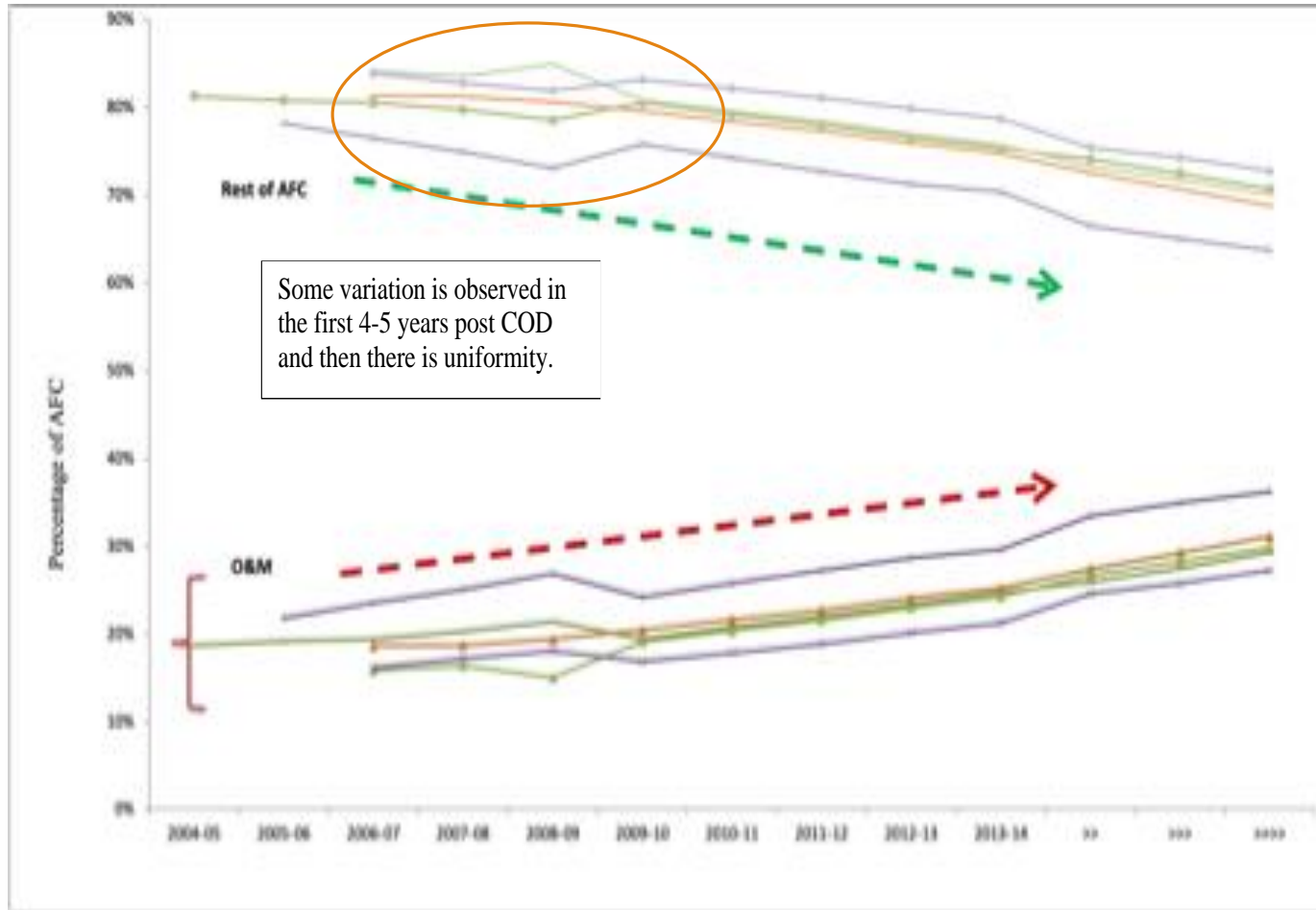


Simplification of Tariff Determination Process

Proposed Approach 1: Normative Tariff

- ❖ AFC may be clustered into following two groups:
 - a) AFC Components excluding O&M expense
 - b) O&M expense
- ❖ At the start of the control period
 - Indexing based on past data and forecasting these components [a) and b)] for the next control period
- ❖ At the end of the control period
 - Reviewing / truing up of Indexation factor to take care of change in IOL and IOWC
- ❖ Normative tariff will allow the tariff determined to be close to actuals and to eliminate the need for periodic tariff filings

Simplification of Tariff Determination Process



Fixed charges tend to follow a consistent path, with occasional variations due to additional capitalization

Simplification of Tariff Determination Process

Proposed Approach 2 - Further simplification of the existing Performance Based Hybrid Approach

- ❖ Most of the tariff components on normative basis, with some cost determinants on actual basis
- ❖ Approach to simplify the current framework, where regulatory burden increases due to large number of low value additional capitalization/spares claims
- ❖ Additional capitalisation may be allowed on normative basis:
 - **Generation:** Based on the actual additional capitalisation allowed in the past (15-20 years) with reference to different unit sizes and different vintages, **a special compensation allowance on yearly basis is proposed** which shall not be capitalised
 - Allowing additional capitalisation towards works presently covered under Regulation 26 to Regulation 29, wherever applicable
 - Minor items such as tools and tackles as well as capital spares that costs below Rs. 20 Lakh to be considered under O&M norms
 - **Transmission:** Unlike generating stations, additional capitalisation post cut-off date is rarely required. To continue with Additional capitalisation as presently allowed

Capital Cost

- ❖ **Reference Cost:** Benchmark Cost V/s Investment Approval Cost
- ❖ **Projects Acquired through NCLT Proceedings:** Historical Cost or Acquisition Value
- ❖ **Renovation and Modernisation (R&M):** Allowing a special allowance or provision of R&M after 25 years
- ❖ **Uncontrollable Factors:** To include delay on account of obtaining forest clearances as uncontrollable
- ❖ **Extending Cut-off Date:** From 3 years to 5 years to close contracts and discharge liabilities

Components of AFC- Depreciation & IoL

- ❖ **Lower Depreciation Rate in the initial years based on the mutual agreement between the Generator and the Beneficiaries** - To consider 15 years as loan repayment period instead of current practice of 12 years
- ❖ **Revision of Useful life** : From 25 to 35 years in respect of Coal based thermal generating stations and transmission sub-stations
- ❖ **Interest on Loan:** Consideration of the weighted average actual rate of interest of the generating company or transmission licensee instead of project specific interest on loan

Components of AFC- Return on Equity (ROE)

- ❖ **To continue with ROE Approach**

- ❖ **Rate of ROE:**

- Incentivise Timely completion of hydro generating stations to attract investments
- Differential Rate of RoE to thermal, hydro generation and transmission projects with further incentives for dam/reservoir-based projects including PSP
- Forum of Regulators (FOR) recommendation on differential RoE for Generation and Transmission Businesses with a reduction in RoE for Transmission Business
- Allowing additional incentive in form of paise/Kwh for Old Generating stations for Generation beyond target PLF
- Review of Rate of ROE for Additional capitalisation on account of Change in Law and Force Majeure

Components of AFC- Interest on Working Capital

- ❖ In view of low PLF of gas based generating stations, norms for the working capital requirement may be reviewed
- ❖ Alternative ways to determine quantum of working capital

Components of AFC- O&M Expenses

❖ **Demarcation of O&M Expenses:**

- Minor items such as tools and tackles as well as capital spares that costs below Rs. 20 Lakh to be considered under O&M norms
- Any major capital spares costing above Rs. 20 lakh may form part of the special compensation allowance

❖ **Passing on Impact of Wage Revision-** Normative approach

❖ **Additional O&M Expenses for North Eastern and Hilly Regions**

Operational Norms

- ❖ As the generating stations are being separately allowed degradation impact due to low load operations, **the norms may be fixed considering the ideal loading of generating units**
- ❖ Compensation for flexible operation of coal based generating units
- ❖ Continuation of relaxed norms in respect of some old generating stations
- ❖ High demand season and Low demand seasons; Peak and off Peak period- recovery of AFC charges
 - Recovery of AFC based on daily peak and off-peak periods
 - Suggestions on National versus Regional Peak as a reference point for High demand/low demand season

Operational Norms

- ❖ **GCV of Coal** – Ways to reduce the gap between GCV “as billed” and “as received” – Risk Sharing
- ❖ **Coal Blending** - Linking the consent of beneficiaries with the percentage blending (weight wise) of imported coal instead of an increase in ECR
 - May enable a swift response to an increase in demand by the generating company.
 - Procurement of such coal (other than linkage coal) has to be done through a transparent competitive bidding process
- ❖ Review of Incentives linked to generation in excess of target PLF/NAPAF especially during peak periods, in the case of hydro stations and old pit head generating stations in order to encourage higher generation from such plants

Encouraging development of Hydro Generation Projects

- ❖ **Local Area Development Expenses** – Expenses towards the advancement of the Local Area for the development of the project and for alleviating public resistance and delays, may be considered as part of the capital cost with certain limits
- ❖ **Gestation Period:** Measures to accelerate hydro construction period and enhance commercial acceptance
- ❖ **Incentives:** Incentivizing timely completion of projects
- ❖ Incentives for dam/reservoir-based projects including PSP

Other Proposals

- ❖ **Decommissioning Costs:** Possible approaches for allowing the decommissioning costs (*unrecovered depreciation, unutilized capital spares etc.*) in case the generating stations/transmission systems are decommissioned before the completion of their useful lives in compliance of a statutory order or due to technological obsolescence duly approved by RPC
- ❖ **Non-Tariff income:** Optimal utilisation of resources such as land banks and other enabling infrastructure and human resources to increase non-core revenues through land lease, data centres, ecotourism etc.
- ❖ **Input Price of coal – Integrated Mine:** Lack for sufficient data to review the current operational norms and other provisions

Other Proposals

- ❖ **Revision of Useful life:** From 25 to 35 years in r/o Coal thermal generating stations and transmission sub-stations
- ❖ **Delayed Projects:**
 - To encourage rigorous pursuit of approvals from statutory authorities, even if delay beyond SCOD is condoned, some part of the cost impact (Say 20%) corresponding to the delay condoned may be disallowed and / or
 - Rate of ROE: WAROI instead of fixed RoE on the quantum of cost corresponding to delay

Issues for Discussion

- ❖ **Simplification of Tariff : *Approach-I V/s Approach-II***
- ❖ **Normative Additional Capitalization**
- ❖ **Applicability of revised Operation norms for existing projects and new projects**
- ❖ **Interest on Loan:** Weighted average actual rate of interest of the generating company or transmission licensee
- ❖ **Rate of ROE:**
 - Different Rate for thermal, hydro generation and transmission projects
 - Additional incentive for Old Generating stations
 - RoE (WAROI) for additional capitalization on account of Change in law and Force Majeure
- ❖ **Encouraging development of Hydro Generation Projects**
- ❖ **Compensation for flexible operation of coal based generating units**
- ❖ **Peak & Off-Peak Tariff (High/Low demand season; National/Regional Peak)**
- ❖ **Any other suggestion**

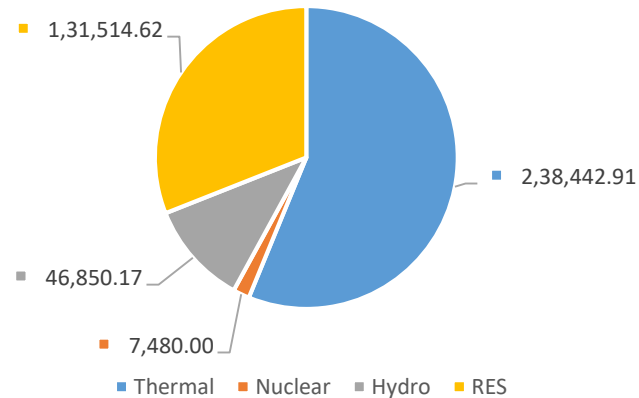
Thank you

Installed Capacity

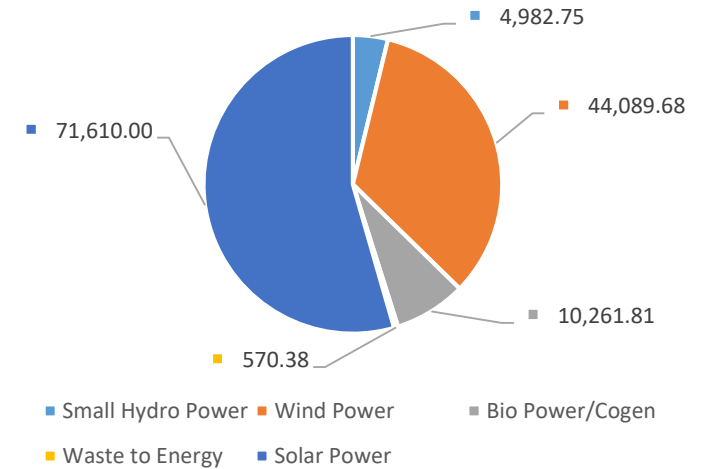
Installed Capacity as on Aug 31, 2023

Source	MW
Thermal	2,38,442.91
Nuclear	7,480.00
Hydro	46,850.17
RES	1,31,514.62
Total	4,24,287.70

Installed Capacity (MW)



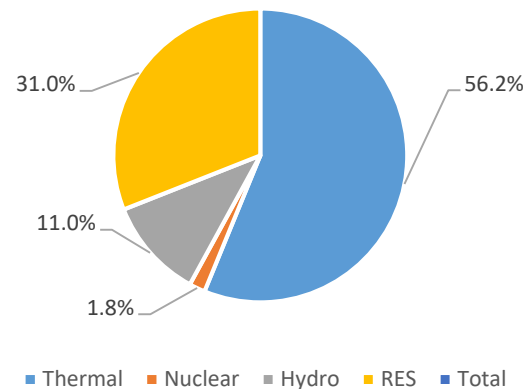
Breakup of RES



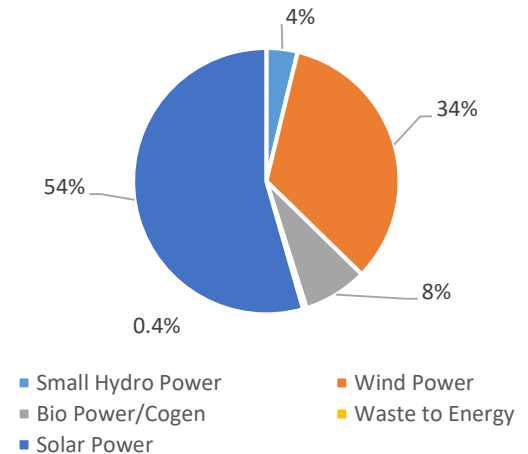
Break-up of RES

Small Hydro Power	4,982.75
Wind Power	44,089.68
Bio Power/Cogen	10,261.81
Waste to Energy	570.38
Solar Power	71,610.00
Total	1,31,514.62

Installed Capacity (% share) as on Aug 31, 2023 MW



RES Installed Capacity (% share) as on Aug 31, 2023 MW



Compensation methodology for operating a Thermal (Coal) Generating unit below 55% Minimum Power Level

- ❖ Penetration of large-scale renewable energy in the grid poses challenges for the power sector due to the inconsistent and intermittent nature of solar and wind power. To ensure grid security and reliability, substantial flexible power sources like pump storage, thermal plants, and batteries storage are necessary to balance the grid.
- ❖ Thermal power accounts for 54% of total installed capacity, meeting over 70% of total energy demand. It is crucial to reduce the minimum power load of existing coal-fired power plants and enhance their ramp rate capability, enabling more flexible operation.
- ❖ For achieving minimum power load (40%) and higher ramp rate, Coal based power plants may require few modifications by way of improved control systems etc. and also required to be compensated for the loss of life and increased variable cost.
- ❖ The primary focus of the utility shall have to be on the existing control system optimization and improvements in some of the areas like achieving automated control operation which includes proper tuning of operation so as to avoid temperature and pressure excursions.

Compensation methodology for operating a Thermal (Coal) Generating unit below 55% Minimum Power Level

- ❖ **Proposed Compensation** - Power plant needs to be compensated for both **fixed cost** due to infusion of capital investment, increased O & M cost and **variable charges** due to efficiency loss at part load operation and additional oil consumption due to increased Equivalent Forced Outage Rate (EFOR).

A. Compensation in Fixed Cost (FC) –

i. One Time Capital Expenditure :

- Unit commissioned before 01.01.2004) – Rs. 30 Crore (Increase in FC = Rs. 7.65 Crore per annum)
- Unit commissioned on or after 01.01.2004 – Rs. 10 Crore (Increase in FC = Rs. 2.55 Crore per annum)
- Subcritical Units with investment approval on or after 01.01.2011 – Rs. 6 Crore (Increase in FC = Rs. 1.53 Crore per annum)
- *Unit will be eligible for increased fixed tariff irrespective of actual operation once measures are implemented and exhibits desired low load operation.*
- *Power plant may be penalized proportionally (Fixed cost) for not exhibiting low load operation at least 85% of time when asked for.*

II. O&M cost due to increased Life Consumption (damage costs):

- Based on CEA Report "**Flexibilization of coal fired power plants**" the increase in annual O&M cost has been considered as 9%, 14% and 20% of O&M Cost at 50%, 45%, 40% loading respectively.
- *The increase in O&M cost will be allowed on the basis of plant actual low load operation. Unit will be eligible for full compensation if the unit participated in flexible operation minimum 310 days (85% days) in a year.*

Compensation methodology for operating a Thermal (Coal) Generating unit below 55% Minimum Power Level

B. Variable Cost:

- I. **Cost due to increase in Net Heat Rate:** Units running minimum power load below 55% shall be additionally compensated in Electricity Charge Rate (ECR) to the extent of Net Heat Rate (NHR) deterioration.

Compensation has been proposed in variable part of tariff considering **coal price Rs 2000.00 per ton** (estimated average cost of coal at pithead plants), **Rs. 3300.00 per ton** (estimated average cost of coal at non-pithead plants).

- II. **Cost due to additional oil consumption for additional EFOR (Equivalent Forced Outage Rate):** Based on Electric Power Research Institute study report the additional EFOR due to regular low load operation of thermal generating units may increase specific oil consumption from **0.5 ml/kWh to 0.7 ml/kWh**. Therefore, it is proposed to compensate **1.0 paisa/kWh on account of EFOR**.

Capacity (MW)	Loading (%)	Net Heat Rate increase (%)	Variable Tariff increase (%) at coal price Rs 2000/ton	Variable Tariff increase (%) at coal price Rs 3300/ton	Proposed variable Tariff increase (%)
200	<55-50	10.00	9.88	9.94	9.91
	<50-45	13.00	12.84	12.92	12.88
	<45-40	16.00	15.81	15.90	15.86
500	<55-50	10.90	10.76	10.83	10.80
	<50-45	13.60	13.44	13.51	13.48
	<45-40	16.00	15.81	15.90	15.86
660	<55-50	8.70	8.59	8.64	8.62
	<50-45	11.90	11.75	11.82	11.79
	<45-40	14.60	14.42	14.50	14.46
800	<55-50	8.60	8.49	8.54	8.52
	<50-45	12.00	11.84	11.92	11.88
	<45-40	15.00	14.81	14.90	14.86

** EFOR — Equivalent Forced Outage Rate is defined the percentage of scheduled operating time that a unit is out of service due to unexpected problems or failures and can no reach full load capacity due to component/equipment failures.*

Compensation methodology for operating a Thermal (Coal) Generating unit below 55% Minimum Power Level

Assumptions :

General-

- i. Auxiliary power consumption (APC): 6.5%,
- ii. Average PLF: 60%,
- iii. PAF: 100%,
- iv. Debt to equity ratio: 70:30
- v. Return on equity: 15.5%,
- vi. Interest on loan: 10%,
- vii. Depreciation rate: 5.28%
- viii. Specific oil consumption: 0.5 ml/kWh
- ix. Price of oil: Rs. 35/lt
- x. GCV of oil: 10000 kcal/lt,
- xi. GCV of Coal: 3800 kcal/kg.
- xii. Landing cost of coal
 - a) Rs.2000.00 per ton (estimated average cost of coal at pithead plants)
 - b) Rs. 3300.00 per ton (estimated average cost of coal at non-pithead plants)
- xiii. Weighted average cost of capital for annuity calculations : 10%

Unit size 200 MW - O&M Cost Rs. 36.56 lakh/MW, Heat rate 2430 kcal/kWh

Unit size 500 MW - O&M Cost Rs. 24.971akh/MW, Heat rate 2390 kcal/kWh

Unit size 660 MW - O&M Cost Rs. 22.471akh/MW, Heat rate 2280 kcal/kWh

Unit size 800 MW - O&M Cost Rs. 20.22 lakWMW, Heat rate 2200 kcal/kWh

Compensation methodology for operating a Thermal (Coal) Generating unit below 55% Minimum Power Level

Table-A. Likely Incremental Tariff (Rs 30 crores capital investment)

Unit Size (MW)	Loading (%)	Coal price Rs 2000.00 per ton	Coal price Rs 3300.00 per ton	Fixed Tariff increase (Paisa/kWh)		EFOR compensation (Paisa/kWh)	Total tariff (fixed & variable) increase (Paisa/kWh)	Total tariff (fixed & variable) increase (Paisa/kWh)	Proposed total tariff (fixed & variable) increase (Paisa/kWh)
		Variable Tariff increase (Paisa/kWh)	Variable Tariff increase (Paisa/kWh)	due to increased O&M cost	due to increased capital cost		Coal price Rs 2000.00 per ton	Coal price Rs 3300.00 per ton	
				Coal price Rs 2000.00 per ton	Coal price Rs 3300.00 per ton				
200	<55 to 50	13.68	22.57	6.70	7.68	1	29.06	37.95	33.51
	<50 to 45	17.78	29.34	10.42	7.68	1	36.88	48.44	42.66
	<45 to 40	21.89	36.11	14.88	7.68	1	45.45	59.67	52.56
500	<55 to 50	14.66	24.20	4.57	3.07	1	23.30	32.84	28.07
	<50 to 45	18.30	30.19	7.11	3.07	1	29.48	41.37	35.43
	<45 to 40	21.53	35.52	10.16	3.07	1	35.76	49.75	42.76
660	<55 to 50	11.17	18.42	4.12	2.56	1	18.85	26.10	22.48
	<50 to 45	15.27	25.20	6.40	2.56	1	25.23	35.16	30.20
	<45 to 40	18.74	30.92	9.14	2.56	1	31.44	43.62	37.53
800	<55 to 50	10.65	17.57	3.70	1.92	1	17.27	24.19	20.73
	<50 to 45	14.86	24.52	5.76	1.92	1	23.54	33.20	28.37
	<45 to 40	18.58	30.65	8.23	1.92	1	29.73	41.80	35.77

Table-B. Likely Incremental Tariff (Rs 10 crores capital investment)

Unit Size (MW)	Loading (%)	Coal price Rs 2000.00 per ton	Coal price Rs 3300.00 per ton	Fixed Tariff increase (Paisa/kWh)		EFOR compensation (Paisa/kWh)	Total tariff (fixed & variable) increase (Paisa/kWh)	Total tariff (fixed & variable) increase (Paisa/kWh)	Proposed total tariff (fixed & variable) increase (Paisa/kWh)
		Variable Tariff increase (Paisa/kWh)	Variable Tariff increase (Paisa/kWh)	Due to increased O&M cost	Due to increased Capital cost		Coal price Rs 2000.00 per ton	Coal price Rs 3300.00 per ton	
				Coal price Rs 2000.00 per ton	Coal price Rs 3300.00 per ton				
200	<55 to 50	13.68	22.57	6.70	2.56	1.00	23.94	32.83	28.39
	<50 to 45	17.78	29.34	10.42	2.56	1.00	31.76	43.32	37.54
	<45 to 40	21.89	36.11	14.88	2.56	1.00	40.33	54.55	47.44
500	<55 to 50	14.66	24.20	4.57	1.02	1.00	21.25	30.79	26.02
	<50 to 45	18.30	30.19	7.11	1.02	1.00	27.43	39.32	33.38
	<45 to 40	21.53	35.52	10.16	1.02	1.00	33.71	47.70	40.71
660	<55 to 50	11.17	18.42	4.12	0.85	1.00	17.14	24.39	20.77
	<50 to 45	15.27	25.20	6.40	0.85	1.00	23.52	33.45	28.49
	<45 to 40	18.74	30.92	9.14	0.85	1.00	29.73	41.91	35.82
800	<55 to 50	10.65	17.57	3.70	0.64	1.00	15.99	22.91	19.45
	<50 to 45	14.86	24.52	5.76	0.64	1.00	22.26	31.92	27.09
	<45 to 40	18.58	30.65	8.23	0.64	1.00	28.45	40.52	34.40

Table-C. Likely Incremental Tariff for units where investment approval received on or after 01.01.2011 (Rs 6 crores capital investment)

Unit Size (MW)	Loading (%)	Coal price Rs 2000.00 per ton	Coal price Rs 3300.00 per ton	Fixed Tariff increase (Paisa/kWh)		EFOR compensation (Paisa/kWh)	Total tariff (fixed & variable) increase (Paisa/kWh)	Total tariff (fixed & variable) increase (Paisa/kWh)	Proposed total tariff (fixed & variable) increase (Paisa/kWh)
		Variable Tariff increase (Paisa/kWh)	Variable Tariff increase (Paisa/kWh)	Due to increased O&M cost	Due to increased Capital cost		Coal price Rs 2000.00 per ton	Coal price Rs 3300.00 per ton	
				Coal price Rs 2000.00 per ton	Coal price Rs 3300.00 per ton				
200	<55 to 50	13.68	22.57	6.70	1.54	1	22.92	31.81	27.37
	<50 to 45	17.78	29.34	10.42	1.54	1	30.74	42.30	36.52
	<45 to 40	21.89	36.11	14.88	1.54	1	39.31	53.53	46.42
500	<55 to 50	14.66	24.20	4.57	0.61	1	20.84	30.38	25.61
	<50 to 45	18.30	30.19	7.11	0.61	1	27.02	38.91	32.97
	<45 to 40	21.53	35.52	10.16	0.61	1	33.30	47.29	40.30
660	<55 to 50	11.17	18.42	4.12	0	1	16.29	25.54	19.92
	<50 to 45	15.27	25.20	6.40	0	1	22.67	32.60	27.64
	<45 to 40	18.74	30.92	9.14	0	1	28.88	41.06	34.97
800	<55 to 50	10.65	17.57	3.70	0	1	15.35	22.77	18.81
	<50 to 45	14.86	24.52	5.76	0	1	21.62	31.28	26.45
	<45 to 40	18.58	30.65	8.23	0	1	27.81	39.88	33.85

- No additional capital investment is required in the unit size of 660MW and 800 MW units for operating them at 40% load.



Market coupling

26TH SEPTEMBER 2023

Market Coupling in PMR 2021



It is a process whereby bids collected from all the Power Exchanges are matched, after taking into account all bid types, to discover the uniform market clearing price for DAM/ RTM or market specified by Commission, subject to market splitting



- Discovery of uniform market clearing price
- Optimal use of transmission infrastructure
- Maximization of economic surplus, thereby creating simultaneous buyer - seller surplus

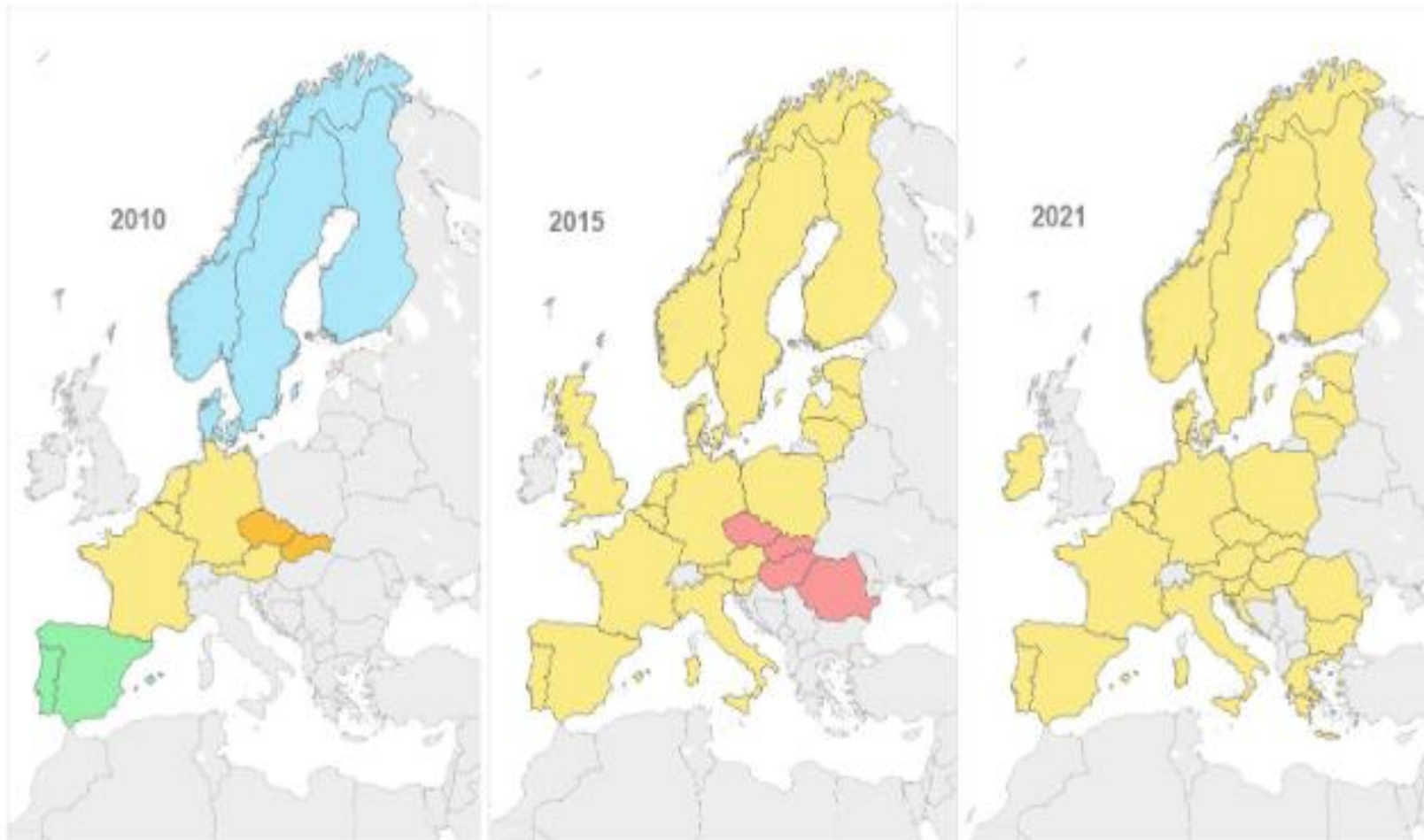


Market Coupling Operator
means an entity, as notified by the Commission, for operation and management of Market Coupling

** The provisions with regard to market coupling and Market Coupling Operator in these regulations shall come into effect as and when decided by the Commission in accordance with the regulations to be specified separately.*

International experience

Evolution of EU wholesale electricity day-ahead market coupling (2010 - 2021)



Outcome of Market Coupling in European market

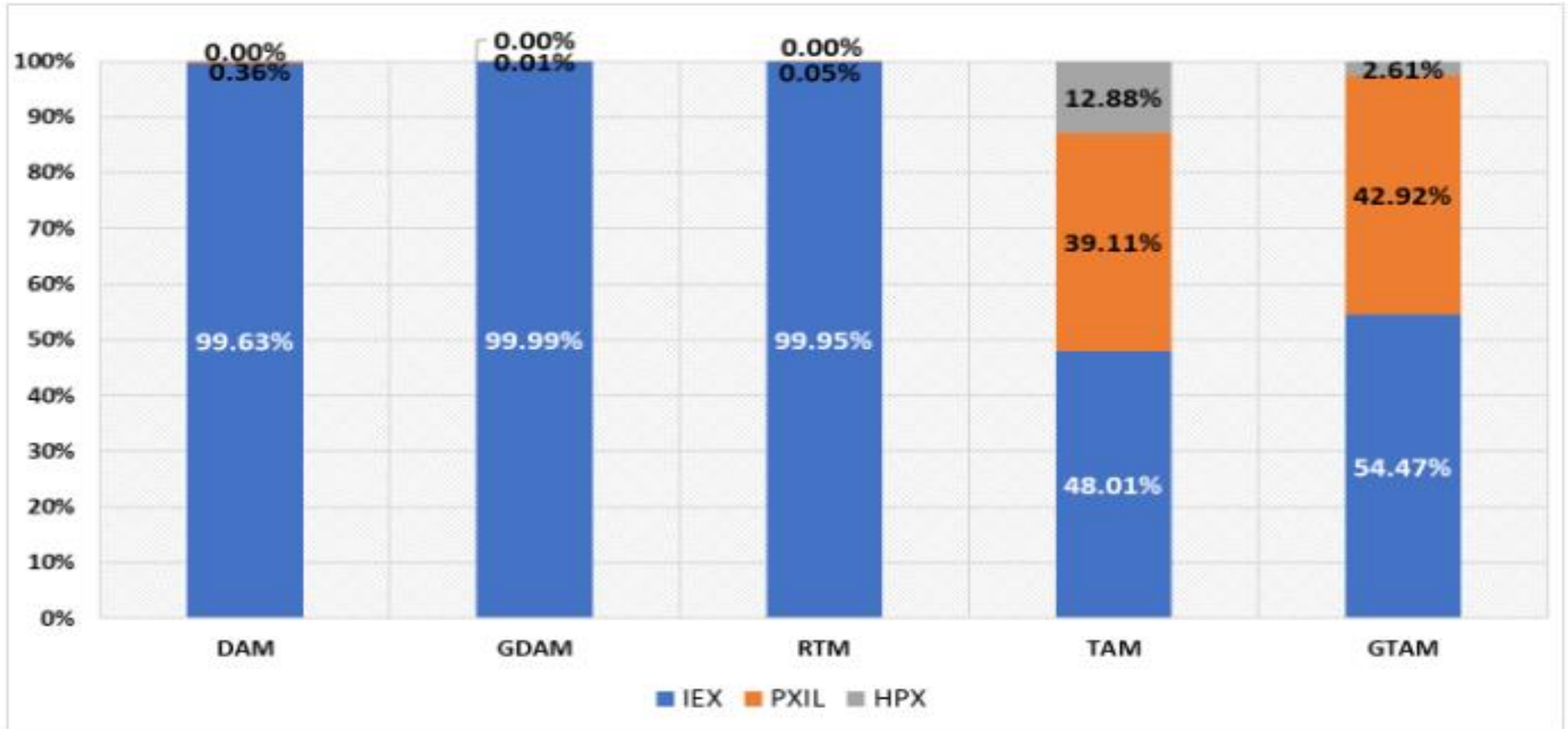
- At a regional and ultimately Union level, demand is met securely by the most economic resources
- A **more coordinated and economic approach to resource adequacy** – where some Member States are forecasting capacity deficits in the years ahead, others are forecasting surpluses
- Helps utilize cross-border generating resources implicitly
- Balancing energy over wider areas allows geographic and technical diversity to be exploited, reducing balancing volumes
- **The potential increase in social welfare of fully integrating Europe's electricity markets could lie in the range of €16 billion to €43 billion* annually by 2030.**
- The level of efficiency in the use of cross-zonal capacity (87 %) in day-ahead markets was the highest across all short-term timeframes in 2020**

** Realizing the benefits of European market integration, Regulatory Assistance Project, May 2018*

*** ACER/CEER Annual Report on the Results of Monitoring the Internal Electricity Markets in 2020*

Market coupling in Indian context

Background: Market Share of Exchanges



Background: Price Difference across exchanges

Price of electricity transacted in DAM at Power Exchanges (Rs/kWh)			
Month	IEX	PXIL	HPX
Jul-22	5.50	5.03	6.51
Aug-22	5.43	7.29	-
Sep-22	5.87	7.44	-
Oct-22	3.96	4.40	-
Nov-22	4.80	-	-
Dec-22	5.58	-	-
Jan-23	6.36	11.33	-
Feb-23	6.64	-	-
Mar-23	5.44	-	-

Market Coupling Probable Outcomes:

ADVANTAGES

- Discovery of uniform market clearing price
- Optimal use of transmission infrastructure
- Maximisation of economic surplus
- Improvement in Liquidity and Prices

DISADVANTAGES

- Diminished role of Power Exchanges
- Dampen innovation & technology investments
- Reduce Competition
- Discourage investments
- No improvement in Transmission utilization

Expert Committee Recommendations

- With regard to transmission corridor allocation, the Commission, vide order dated 30.4.2015, decided that the issue needs to be examined by an Expert Group to find out an acceptable solution that will also achieve social welfare maximisation
- Expert Group, comprising members from CEA, POSOCO, CERC, Power Exchanges, and other subject experts from academia, formed.
- The **report noted that merging the bids (integrated market clearing or market coupling) of the two power exchanges would give the most optimum solution with social welfare maximisation irrespective of congestion.**
- This would require changes in the market design and amendments in the Regulations.

POINTS FOR DISCUSSION

- Does the current market scenario form a compelling case for Market Coupling?
- Effect of coupling on technological innovation and competition
- Operational Aspects:
 - Who shall be the Market Coupling Operator?
 - Which Algorithm should be adopted for a coupled market?
 - How will the Clearing & Settlement be carried out?
 - In which market segments coupling should be introduced first?
 - Changes in Settlement process

THANK YOU

Does the current market scenario form a compelling case for Market Coupling?

- The participation in the power exchanges is voluntary at present.
- The electricity transacted through power exchange constitutes around 7% of the total generation in India.
- Although 87% is through LT PPA, the contracts available on the power exchanges (especially DAM & RTM) provide an opportunity to the DISCOM to “correct” its position
- DAM and RTM account for over 70% of the total PX transactions.
- IEX accounts for almost 99% share in the collective transactions segment.
- With market coupling, the bids would be divided among the exchanges, which are concentrated in one exchange.
- **Under such a scenario, what significant benefits can be derived in terms of uniform price discovery, and which model suits best for India?**

Effect of coupling on technological innovation and competition

Coupling would lead to:

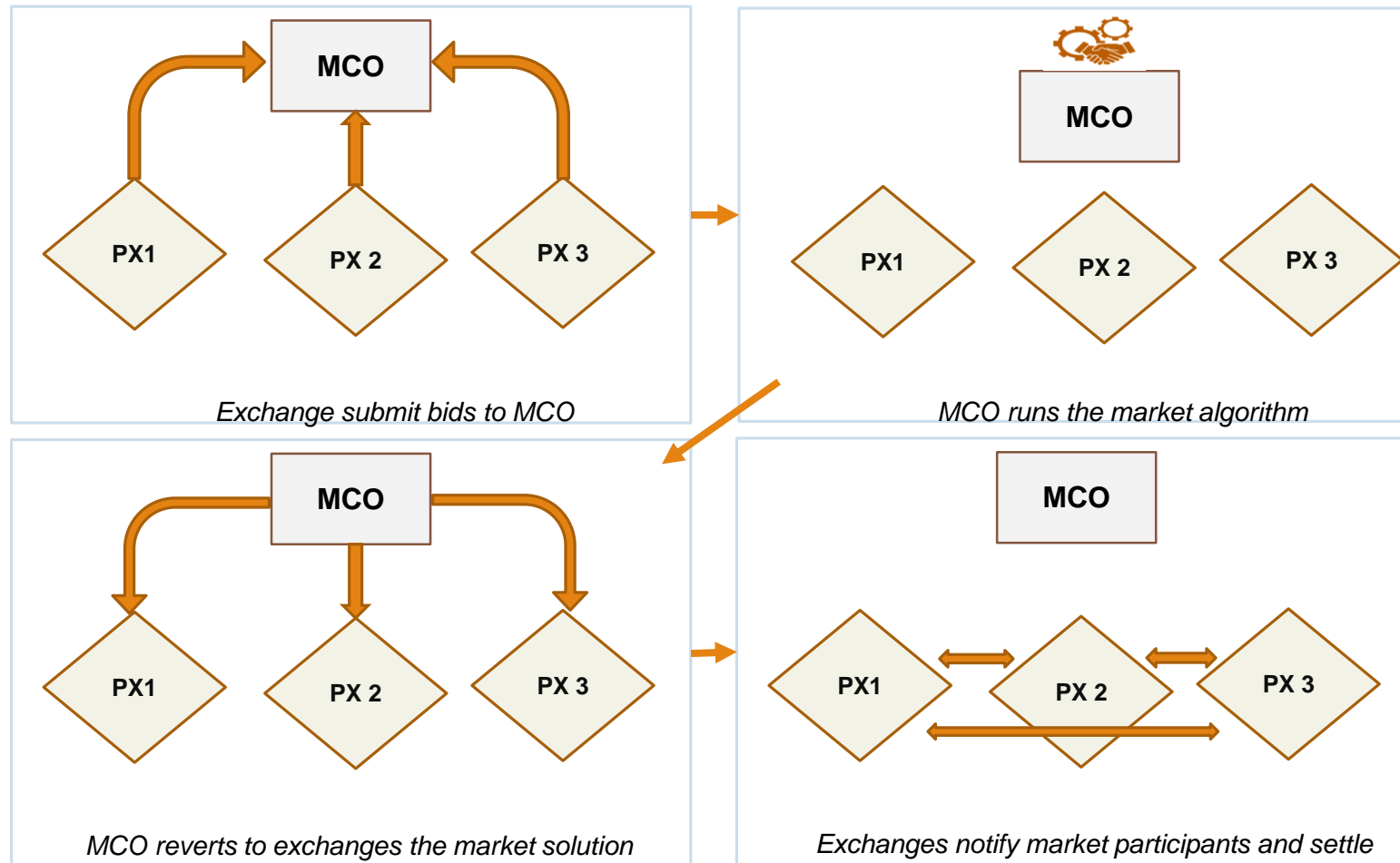
- Role of exchanges would be reduced to a bid collecting agency, this would result in less incentive for product innovation
- Centralized algorithm by design may not be able to accommodate complex bid structures keeping in view the compatibility & require uniformity
- As a result, market may have to forego certain innovative products

vs

Coupling would lead to :

- Increased competition among exchanges on the basis of services they offer
- Lowering of Transaction Fee, which may
 - reduce the overall cost to the participants
 - Increase volume transacted

Practical aspects involved in the implementation of Market Coupling



Who shall be the Market Coupling Operator?

Power Exchanges as MCO

- Power exchanges have the expertise of running the algorithms and handling different market scenarios
- Similar to EU market. IEX, PXIL & HPX could perform on rotational basis
- Aspects to be considered:
 - Procedure for carrying out MCO Functions
 - jointly design the plan to perform the MCO functions
 - *ensure that one single algorithm is utilized each time for price discovery*
 - Cooperation between Power Exchanges
 - *Contractual arrangement for sharing of bid information, security & avoid conflict*
 - *Technical infrastructure for information sharing*
 - Integrity of the Market Result
 - *Result should be repeatable & auditable*
 - *All exchanges to provide consent to result derived by designated exchange*
 - Commercial aspects like sharing of Transaction Fee

Who shall be the Market Coupling Operator?

Third Party MCO

- A third party MCO shall ensure more objective operation and will not have any conflict of interest.
- Could be the system operator (Grid-India) or an explicitly formed entity
- Aspects to be considered:
 - Technological competence and Data Security
 - Common format of data from all Power Exchanges
 - High level of data security and encryption
 - Algorithm – whether to be adopted from existing ones with the PXs or to design new
 - Integrity of the Market Result
 - *One Result which should be repeatable & auditable*
 - Regulated Entity
 - should be regulated by the Commission. The Commission, if desires, can direct for audit of such entity
 - Commercial aspects

Which Algorithm should be adopted for a coupled market?

- Current scenario:
 - The three power exchanges utilize distinct algorithm for matching of bids and price discovery
 - All the exchanges have heavily invested in their respective market engines
 - There are differences in the bid types and the bid interface offered by each exchange
- **Would it be advisable to select a suitable algorithm out of the three existing algorithm or should a new algorithm be designed jointly by the exchanges/ by the MCO?**
- **To be able to match the bids received on the three exchange, uniformity of bid types & relevant parameters is required? Would standardizing/ harmonizing the bid types in DAM & RTM, across the exchanges, address the issue? If so, which bid types would be suitable for the various buyers and sellers?**

How will the Clearing & Settlement be carried out?

- Current Scenario:
 - The power exchanges clear and settle with the nodal agencies on behalf of their clients
 - They also manage the pay-in and pay-outs of the clients/members
- PMR 2021 provides that the power exchanges shall carry out the Clearing and Settlement in accordance with the PSSA 2007. The Commission has granted extension for the same, owing to regulatory concerns with RBI.
- Scenario of Coupled Market:
 - Till such time a separate Clearing Corporation is introduced, situations requiring **cross settlements between the exchanges are highly likely** to occur.
 - While the power exchanges will be the counter party to the market participants, **would the Market Coupling Operator act as a counter party to the power exchanges** with regard to settlement rights and obligations?
 - Would it be advisable to **allow the Market Coupling Operator to charge transaction fee from the Power exchanges** who in turn charge a related transaction fee from the market participants?

In which market segments coupling should be introduced first?

Collective Transactions

- Only one exchange has witnessed significant volume
- Innovation in the bid types has been relatively limited by the power exchanges
- Behavioural aspect - a participant prefers to trade where the liquidity is more which ensures commensurate supply and a better price.
- Presence of multiple exchanges has not served the purpose of competition and innovation

Continuous Transactions

- All the three exchanges seem to enjoy a good market share
- Exchanges have time and again introduced innovative products/ contracts/ bid types in this segment on their respective platforms
- Participant behaviour here is different due to features like continuous matching

Changes in Settlement process

- Traders are already collecting bids from clients and submitting bids to exchanges
- Security maintained by traders is approximately double the cost of power purchased, i.e. maintaining weekly average margin equivalent to power purchased and sufficient margin for net cleared volume for tomorrow.
- **Should traders be allowed to submit their bids directly to the market coupler to reduce cost of power for clients, as the clients are presently paying margins to trader and also bearing fees and margins of exchange?**