

“Regulation on Framework for Resource Adequacy” [Draft]

The OERC notified “**Framework for Resource Adequacy**”. The key highlights of this draft is mentioned below:

Objective: The sole objective of Resource Adequacy framework is the reliable fulfilment of the peak demand with the help of adequate supply of generation and demand response.

The Resource Adequacy framework will cover the following important aspects:

- a) Availability of adequate generation capacities to reliably serve demand under multiple scenarios.
- b) Optimal capacity mix based on minimization of overall system cost.
- c) Time horizon for the implementation of the framework should be 5 – 10 years.
- d) Energy storage, other flexible resources, and short-term sale/purchase under bilateral contracts will be incorporated into the resource adequacy framework.

The document can be accessed [here](#)

- 1. Need of Resource Adequacy Framework:** Utilities in India are currently grappling with the challenge of reliably meeting peak demand. To address this, a combination of sufficient power supply, a demand response framework, and the sharing of inter-state and inter-region power is essential. The primary aim of the Resource Adequacy (RA) framework is to prevent a mismatch between demand and supply, and to ensure system security and reliability on a national scale.

Power procurement cost plays a significant role in the RA study. Given that power procurement plans and contracts generally have a long-term perspective, they must be developed well in advance based on reliable and accurate forecasts. The Centre for Energy Regulation (CER) at IIT Kanpur has conducted research on these aspects, culminating in the publication of a book titled "Regulatory Framework for Long-term Demand Forecasting and Power Procurement Planning"¹. Additionally, IITK has provided insights on "Power Purchase and Procurement Process Regulations"² and the "Terms and Conditions for Short-term Procurement/Sale of Power Regulation, 2021"³.

With the experience of CER and the Energy Analytics Lab (EAL) in conducting long-term demand forecasting and power procurement planning for the states of Uttar Pradesh and Chhattisgarh, we emphasize the necessity for a robust regulatory framework. Studies have shown that significant economic benefits, in terms of reduced private and social costs, can be achieved through RA⁴.

¹ Singh et al. (2019), Regulatory Framework for Long-term Demand Forecasting and Power Procurement Planning, Centre for Energy Regulation (CER), Monograph, Book ISBN:978-93-5321-969-7, https://cer.iitk.ac.in/assets/downloads/CER_Monograph.pdf

² Draft Detailed Procedure for Madhya Pradesh Electricity Regulatory Commission (Power Purchase and Procurement Process) Regulations, Revision-II, 2022 (RG-19(2) of 2022), https://cer.iitk.ac.in/odf_assets/upload_files/blog/Revision_2_2022_Power_Procurement_Draft_Regulation.pdf

³ APERC (Terms and Conditions for Short-term Procurement/sale of power) Regulation, 2021, https://cer.iitk.ac.in/odf_assets/upload_files/Draft_APERC_Terms_and_Conditions_for_short_term_procurement_sale_of_power_Regulation_2021.pdf

⁴ Anoop Singh, “Comments on CEA (Resource Adequacy Framework for India), 2022[draft]” Power Chronicle, Volume 5,

- 2. Necessity of 15-minute time block-wise demand forecast:** Draft clause no. 6.1 states “*It shall entail hourly assessment and forecasting of demand within the distribution area of the Distribution Licensee for multiple horizons.....*”

The scheduling in the Indian electricity market framework is based on 15-minute time block basis. Forecasts for RA carried out on block-wise basis, rather than hourly demand forecasts, would be more desirable especially as demand as well as supply variations have variability recorded on time-block basis. Higher RE penetration would make this even more desirable. Furthermore, once the institutional setup is tuned to hourly forecasts, there would be little attention paid to block-wise data leading to loss of data and reduced reliability of the forecast itself.

- 3. Suggested changes in techno-economic parameters:** Draft clause no. 6.8 states that “*The Distribution Licensee may modify the load obtained separate trajectory should be developed for each customer category.*” (emphasis added)

Demand Side Management (DSM), including load management, initiatives undertaken by the discoms would have influenced their historical load profile. Draft clause no. 6.8 (a) mentions consideration of past *Demand Side Management* practices. Unless such historical data is available, it would not be feasible to incorporate the same. To enable the discoms to incorporate these in future load forecasting exercises, such data should now be archived in usable form.

Additionally, visibility of RE generation connected through net/gross metering is important to ensure that these are appropriately accounted for in future. The integration of data from smart metering systems would also provide valuable insights into customer behavior and energy usage patterns, thereby enhancing the accuracy of load forecasts.

- 4. Role of Deviation Settlement Mechanism in load forecast?:**

Draft clause no. 6.8 (d) *Deviation Settlement Mechanism* is mentioned as part of the forecasting process. Deviation Settlement Mechanism is a real-time mechanism designed to address deviations between scheduled and actual generation/drawal. It cannot be predicted or forecasted in advance. Furthermore, tightening of frequency band and introduction of ancillary services market is expected to reduce its impact in future. Therefore, in the context of resource adequacy, Deviation Settlement Mechanism should not be used for long-term demand forecasting.

- 5. Changes in specific energy consumption:**

As per draft clause no. 6.8 (g), the *Changes in specific energy consumption* is to be considered as a factor for demand forecasting. Demand forecasting is an exercise to predict the same. It seems that this is in the context of partial end of use approach to load forecast that uses expected change in specific energy consumption.

In the context of econometric forecast, this is related to the output variable. How should and output variable be used as an input variable while using such an approach? Differentiation for the same should be incorporated. Additionally, there is no

clarification on how the necessary data for these changes will be collected from a bottom up approach.

6. Separate trajectory for each customer category:

In the Draft clause no. 6.8, it is mentioned that a separate demand trajectory should be developed for each customer category. In the absence of category-wise load profile data, this would not be feasible. A resource adequacy exercise is based on forecasted load profile rather than energy forecasts⁵. Translation of category-wise energy forecasts to a peak demand or load profile forecast would require that peak demand forecast for each category and also the coincidental factor for the same. Necessary clarification may be incorporated so that the regulation is agnostic to the methodological approach, else the regulation would indirectly end up nudging choice of forecasting methodology.

7. Load Forecast given in MWh: Draft clause no. 6.11 states that “*The summation of energy forecast (MWh) for various consumer categories upon adjusting for captive, prosumer, and open access load forecast, as obtained as per clauses 6.4 to clause 6.10, as the case may be, shall be the load forecast for the Distribution Licensee.*” (emphasis added)

Load forecasts and energy forecasts should be differentiated in units as they are different concepts. should be expressed in megawatts (MW). The draft clause no. 6.11 mentions load forecast in megawatt-hours (MWh). The same be corrected with appropriate context differentiating the two.

8. Explicit role of Demand Response and TOD tariff: The draft regulation proposes RA largely through increased generation capacity and power procurement planning, but does not take into account the role of demand response and demand shift caused by the implementation of TOD tariffs. The discom should be allowed flexibility to consider impact of such programs.

9. Separate Sections for Timelines/Methodology of Medium-term and Long-term Demand Forecasting: Draft clause no. 7.4 “*The Distribution Licensee shall produce hourly, 1-year Short-Term (ST), 5-year Medium-Term (MT) and 10-years Long-Term (LT) forecasts on a rolling basis and submit to SLDC by 30th April of each year for the ensuing year(s).*”

The draft clause 7 is titled to address short-term demand forecast. However, its sub-clause 7.4 discusses medium-term and long-term demand forecasts. It is recommended either to include medium-term and long-term demand forecasting in the title of clause 7 or create separate sections for medium-term and long-term demand forecasting.

10. Storage Capacity: Draft clause no. 14.6 states, “*GRIDCO shall contract storage capacity corresponding to the results of MT- DRAP capacity addition requirement*

⁵ Previous studies by Energy Analytics Lab (EAL), IIT Kanpur for Uttar Pradesh and Chhattisgarh had developed forecasts for the load profile and used the same for power procurement planning (in the context of resource adequacy).

for future years from Battery Energy Storage System (BESS) and Pump Storage Projects (PSP) as per the guidelines for Tariff Based Competitive Bidding process notified by the Ministry of Power”.

An optimal power procurement strategy should be based on the forecasted demand over long/medium/short-term basis, while considering a basket of long-term/medium-term/short-term power procurement options and be purely based on the economic/commercial considerations. The sizing requirement for storage capacity should be determined on the basis of such techno-economic modelling. The draft clause 14.6 does not clarify how ‘optimal’ storage capacity requirement would be determined. Clarity with respect to the same needs to be included.

- 11. Banking arrangement to be included in a separate Clause:** Draft clause no. 14.7 states that *“GRIDCO may contract power through Central Agencies/ Intermediaries/ Traders/Aggregators/ Power Exchanges or through agreements/ Banking arrangements with other Distribution Licensees in compliance with competitive bidding guidelines.”* (Emphasis added).

It is suggested that provision for banking arrangement may be included in a separate clause, because banking arrangement does not involve any competitive bidding process. Such arrangements are usually agreed upon mutually between two parties/Discoms.

- 12. Long-term Distribution Licensee RA Plan (LT-DRAP):** Draft clause no. 15.3 *“In its overall power procurement planning approach, GRIDCO shall lay greater emphasis on adequate contracting through Long and Medium-Term arrangements.”*

The above clause should incorporate ‘including impact of other measures such as Demand Response Program and ToD tariffs. Previous studies conducted by CER-EAL at IIT Kanpur for long-term demand forecasting and power procurement planning (spanning a ten-year horizon) have shown that such analysis enables discoms to make timely decisions about contracting capacity, considering the long-term demand trajectory and associated economic factors. The power procurement planning approach should thus consider optimal capacity contracting so as to achieve resource adequacy at an optimal cost without burdening final consumers with capacity charges.

- 13. Rolling Plan for Incremental Capacity:** Draft clause no.15.4, *“Assessment through Annual Rolling Plan shall ascertain incremental capacity addition requirement through Long-Term/ Medium-Term/ Short-Term upon factoring in existing and planned procurement initiatives of GRIDCO”.*

Year-on-year ‘addition’ of the incremental capacity as determined by the RA plan, say 200 MW, may not be a practical and cost efficient. However, addition of 500 MW capacity (say, thermal capacity or large RE with storage) may offer economics of capacity addition on the incremental requirement may present a feasible option. Thus, it is suggested that the assessment may be done for five-year period on a rolling basis (instead of an annual rolling plan) and be submitted annually to the Commission. This would help the discom to make optimal investment / contracting choice as feasible.

- 14. Flexibility regarding Contract Capacity Timeline:** Draft clause no. 15.5
“GRIDCO shall contract capacities by 30th November of each year and submit the Annual Rolling Plan to the Commission and SLDC & STU by 31st December of each year for ensuring year(s).”

By November 30th of each year, it may not be feasible to contract all short-term requirements, which have better visibility in the near term. Furthermore, procurement for some of the months of the next FY would not qualify as short-term power procurement. For example, any procurement for the month of March, 2026, which falls in the next FY, and would be 16 months away (from November 2024) and thus would not be qualified as short term power procurement.

The RA framework aims for such contracts to be in place by the cut-off date. However, short-term contracts, which can be arranged from a few hours to several months in advance, are not available through competitive platforms like power exchanges (PXs). The dynamic nature of the power market significantly impacts the pricing of these short-term contracts. Distribution licensees should have some flexibility to arrange short-term procurement over a period. This would avoid a rush to enter into short-term power procurement around the month of November as most of the DISCOMs have similar provisions. This flexibility also allows discoms to fine-tune their projections and adjust power procurement needs as necessary. **Quarterly updates should be provided for fine-tuning short-term needs and reported to the Commission within two weeks of the end of each quarter.**

- 15. Procurement Planning:** Draft clause no. 15.6 states *“GRIDCO shall also demonstrate to the Commission 100% tie-up for the first year and a minimum 90% tie-up for the second year (on rolling basis) to meet the requirement of their contribution towards meeting national peak. Only resources with Long / Medium /Short-Term contracts shall be considered to contribute to the RA”*.

Given that gestation period for setting up new capacity is long, 100% tie-up of long-term capacity may not be feasible for the first few years of its implementation. A graduated approach may be adopted for the first three years with the capacity adequacy requirement to the extent of 95%, 98 % and 100 % be applied for the first year (to be applicable for the first three years post notification of the regulation). Rush for 100% capacity requirement may force the discom to enter into sub-optimal short-/medium-term contracts. **It is proposed that the rollout of the RA plan should have sufficient time for the utilities to ensure compliance for the first year of implementation, to the least. This further highlights the importance of demand response, which would have relatively much shorter gestation period.**

- 16. Techno-economic flexibility assessment for state generating resources:** The commission may initiate the study for assessment of flexibility of the state generating stations so as to identify technological solutions to improve system flexibility. Any approval of investment clause for flexibility enhancement of existing power stations should solely be based on economic benefits of such investment over the investment horizon.

Investment to reduce technical minimum or to enhance ramping of thermal generating stations would be economically fruitful if this exercise is undertaken only for the

marginal plants (high variable cost plants) which often face the challenge of technical minimum and ramping.

EAL Power Chronicle Vol. 5 issue 2 highlighted the importance of ‘Selection of TPPs for Investment to Enhance Flexible Operation’⁶,

“Note that low cost power plants are generally not required to demonstrate and deliver significant ramping capability but be limited to those which fall at the margin of the merit order. The later kind of plants are expected to demonstrate greater flexibility amidst growing share of variable renewable energy. The need for investment should thus focus on such plants. Otherwise the proposal would have high cost implications for the final consumers.”

https://eal.iitk.ac.in/assets/docs/power_chronicle_vol_5_issue_2.pdf

It is recommended that the RA regulations should consider economics of flexibility and their impact on overall power procurement costs, including additional operation and maintenance (O&M) expenses for providing flexibility services.

⁶ Singh (2022), ‘Comments on CEA (Flexible Operation of Thermal Power Plants)’, EAL Power Chronicle Vol. 5 issue 2, Energy Analytics Lab (EAL), IIT Kanpur, ISSN: 2583-2409 (O)