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For the kind attention of:

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Comments on the Staff Paper on "Capacity market for Electricity in India"

Background

The Regulatory Assistance Project (RAP) thanks the Commission for this opportunity to comment on the Staff Paper on "Capacity market for Electricity in India".

The options suggested in the Staff paper would be, in our opinion, a step in the right direction, since they would enable a transition from a mechanism where load-serving entities are the anchors of investment through PPAs, considering only their individual needs, toward one where the focus is on the resources needed at the system level.

We commend the CERC for developing this staff paper and appreciate the chance to contribute RAP's insights to advance this effort.

Our interest is to contribute to CERC's efforts to reform the country's electricity system, make it more efficient, achieve important public policy goals, and serve the public good in India. We trust that you will find our observations below to be objective, independent, and tailored to support CERC's guidance.

RAP wishes to offer some general comments and some specific comments on the draft regulations, plus some suggestions on the reforms articulated, as follows:

High-Level Comments and Recommendations

Benefits of a capacity market in India

We commend the effort made by the staff in reviewing international experience. Capacity markets have a long history of challenges and lessons learned that India can consider as it designs a market suited to its own needs.

In our opinion, a well-designed capacity market in India has the potential to:

a) Increase electricity security by aligning the incentives of load-serving entities and generators with system needs.

b) Reduce "cross-subsidies" between entities currently bearing the fixed costs of assets that are available during times of system stress and those whose assets underperform during the same periods.

c) Reduce the cost of capacity procurement by allowing discoms to share resources through the market.

d) Provide a significant incentive for load-serving entities to harness the large amount of demand-side flexibility that currently remains untapped.

The Staff Paper contains many elements that support these objectives. We suggest some areas that could be strengthened to better achieve them.

RAP sees a rationale for implementing a capacity market to transparently allocate the costs incurred by the system to satisfy electricity demand and maintain the operating reserves required for secure system operation. This is particularly important given the existing price caps; such a mechanism is needed to compensate for the cost of the marginal capacity required to meet demand.

Beyond the discussion of the appropriate design of a capacity market in India, we would like to highlight that the effectiveness of even a well-designed capacity market can be severely hampered by stringent price caps in the energy market. Such caps reduce incentives for market participants to respond during periods of system stress, either by making additional resources available or by voluntarily reducing load.

Positive Points of the Proposal

Focus on periods of distress

The three options presented for capacity procurement propose the delivery of capacity during periods of system stress, as identified by the NLDC, as the criterion for determining whether a capacity product has been delivered. Although further detail is needed, this is the correct approach, as it aligns remuneration with the system's adequacy needs. It also reflects the evolution of Capacity Remuneration Mechanisms in various jurisdictions, which increasingly focus on performance during periods when capacity is actually needed.

It would be advisable to provide more detail on when and how stress periods would be defined. Different jurisdictions have adopted different approaches depending on whether stress periods are forecast in advance, based on day-ahead or real-time system conditions, or identified ex post. For example:

- In Argentina[1], stress periods are defined annually in advance.

[1] https://www.services-rte.com/files/live/sites/services-rte/files/pdf/MECAPA/2018.12.21-Regles-du-Mecapa.pdf

- In France[2], they are defined on a day-ahead basis, based on the system operator's assessment.
- In Great Britain[3], they are defined by the system operator four hours in advance.
- In PJM[4], non-performing resources are penalized during emergency events through performance penalties currently in the order of USD 3,000–5,000/MW, which is akin to a real-time definition of stress periods.
- In Mexico[5], stress periods are identified ex post at the end of the year by selecting the 100 hours with the lowest observed available operating reserves, effectively providing a random check of resource availability and performance.

Strengthening the energy market

The proposal allows load-serving entities to fulfil their adequacy obligations by procuring capacity from generators, without requiring those plants to be scheduled directly by the entities. This enables generators to participate in the market while continuing to be scheduled and dispatched efficiently.

This is an excellent development, as it allows load-serving entities to rely on the energy market to achieve efficient dispatch while still fulfilling their adequacy obligations.

National scope of the market

The Staff Paper mentions the following approach to define capacity product delivery:

"To prevent gaming, the capacity providers could be mandated to ensure they participate and are cleared in the market during the peak/stress hours, to be notified by the NLDC."

We commend the national character of such a market. Reliability is a function of the total available capacity in the country during periods of system stress. This approach would allow load-serving entities located in different areas of the country to fulfil their adequacy obligations by contracting capacity located in other regions.

Nonetheless, we suggest softening the language regarding the requirement that capacity providers be mandated to be cleared in the market during stress periods, as this could introduce inefficiencies. Generators with a capacity obligation may not always be the most efficient resources available to supply energy, and lower-cost resources may be available to serve demand. Alternative requirements, such as obligating capacity providers to offer their available

[2]https://www.argentina.gob.ar/normativa/nacional/resoluci%C3%B3n-400-2025-419016/actualizacion

[3]https://assets.publishing.service.gov.uk/media/6911ba14cf24e9250d893e79/informal-consolidation-cm-rules-2025.pdf

[4] https://www.pjm.com/-/media/DotCom/documents/manuals/m18.pdf

[5]https://www.cenace.gob.mx/Docs/MercadoBalance/Manual%20del%20Mercado%20para%20el%20Balance%20de%20Potencia%20%28DOF%20SENER%2022-Sep-16%29.pdf

capacity into the day-ahead market at their marginal cost, would ensure that the resources remain available while preserving dispatch efficiency.

Additionally, it would be advisable to include a deliverability assessment, similar to the CAISO example[6] highlighted in the paper, to ensure that capacity can effectively be shared among regions. Without such an assessment, resources may be credited with capacity that cannot, in practice, be delivered or activated during critical periods because of transmission constraints or other operational limitations.

Technologically neutral approach

The Staff Paper acknowledges that many technologies may contribute to adequacy, which is a step forward compared with many existing markets. A capacity product is not binary, and different technologies may contribute to different degrees. For instance, although a four-hour battery may contribute more than a two-hour battery, their contribution will depend on the duration of stress periods. Hence, a more precise definition of the capacity product will nevertheless be required in order to assess the contribution of renewable energy resources, both with and without storage.

In particular, it will be necessary to define:

- how scarcity periods are identified;
- how these scarcity periods are measured (e.g., based on operating reserve shortages, loss-of-load risk, or peak demand conditions);
- whether they are identified ex post or in advance, and, if in advance, how far ahead.

Areas of Improvement

Lack of differentiation between capacity contracts and a capacity product

The Staff Paper, in some sections, appears to equate a plant's contracted capacity (installed or nameplate capacity) with the adequacy service it provides.

However, a resource's contribution to adequacy is realized only during periods of system stress, when it reduces the likelihood that an unexpected outage will result in load shedding.

The term "capacity" in a contract, such as a PPA, is therefore not equivalent to the service that a capacity market should procure, namely, reliability during scarcity conditions.

[6] https://www.caiso.com/documents/business-practice-manual-for-reliability-requirements-version-dame.pdf

For example, the NYISO[7] capacity market differentiates between Installed Capacity (ICAP) and Unforced Capacity (UCAP). The latter represents the amount of capacity for which a resource is credited, taking into account its expected contribution to system adequacy and reliability.

Interaction of PPAs with the capacity market

The Staff Paper does not address how the adequacy contribution of PPAs will be treated in the context of a capacity market. This is particularly relevant because, as acknowledged in the paper, although PPAs provide a mechanism for generators to recover their fixed costs, there is no direct link between the delivery of energy and the adequacy needs of either the load-serving entity or the system as a whole.

Under the current proposal, periods of system stress will depend not only on the availability of plants contracted through the new capacity mechanisms but also on the availability of the entire generation fleet, including plants contracted through PPAs and captive plants.

The absence of a framework addressing this issue may create significant distributional impacts. For example, although a discom may appear to be fully covered through PPAs, in practice, it may still be short of effective capacity during periods of system stress if those plants are unavailable.

As currently drafted, the proposal appears to assume that capacity contracted through PPAs would automatically count toward adequacy obligations, even in cases where the unavailability of those PPAs creates a shortfall that the system must ultimately resolve.

CERC has the opportunity to create a comprehensive framework that integrates both PPAs and new capacity contracts. For example, a discom that is effectively short during periods of scarcity could become a net buyer in the capacity market.

This would require several additional steps:

1. Explicitly separating the “procurement” of the capacity product from the “delivery” of the capacity product.
2. Tracking each load-serving entity’s demand (including captive and open-access consumers) during periods of system stress.
3. Tracking the generation or capacity actually made available during periods of system stress.
4. Creating an imbalance settlement mechanism under which net buyers compensate those resources that effectively fill the adequacy gap in real time. Such an imbalance settlement would provide an implicit penalty or reward depending on whether a load-serving entity under-procures or over-procures capacity relative to its contribution to the system’s adequacy requirements.

[7] https://www.nyiso.com/documents/20142/2923301/icap_mnl.pdf

Consumers with captive plants, open-access consumers, and discom adequacy resources should all be subject to a true-up against actual delivery during periods of system stress in order to prevent cross-subsidization among participants

Lack of clarity on the role of demand-side response

One of the main flaws of capacity markets in many jurisdictions is the lack of clear rules allowing demand-side resources to participate actively in the capacity market.

Although the Staff Paper mentions that the cost of the mechanism will be borne by load-serving entities, additional detail on how Demand Side Resources (DSRs) could participate would be welcome. We suggest considering two approaches.

The first approach, implemented in France[8] and Mexico[9], allocates the cost of the capacity mechanism among load-serving entities (including consumers with captive generation and open-access consumers) in proportion to their demand during periods of system stress. This creates a strong incentive for these entities to reduce consumption and to activate demand-flexibility resources when they are most needed by the system. Ideally, the NLDC should notify participants in advance of the possibility of a critical period, allowing load-serving entities sufficient time to respond and reduce demand where feasible.

The second approach, which is used in markets such as NYISO[10] and PJM[11], allows Demand Side Resources to participate directly as capacity resources. Under this model, DSRs are contracted to provide capacity and are obligated to reduce demand when called upon by the system operator during periods of system stress.

Assess the impact that price caps may have on resource adequacy

Price caps largely reduce the incentives for load-serving entities to contract in advance for the resources needed to cover their expected demand. As India enforces the adequacy regulations and considers the creation of a capacity market, it should consider increasing the level of the price caps in the wholesale market, since this would provide incentives to load-serving entities to enter into contracts with resources. In addition, high price caps in wholesale energy markets allow many markets, such as the Italian 12, to use financially settled contracts, such as call options, to incentivize capacity resources to be available during periods of stress.

[8] https://www.services-rte.com/files/live/sites/services-rte/files/pdf/MECAPA/2018.12.21-Regles-du-Mecapa.pdf

[9]https://www.cenace.gob.mx/Docs/MercadoBalance/Manual%20del%20Mercado%20para%20el%20Balance%20de%20Potencia%20%28DOF%20SENER%2022-Sep-16%29.pdf

[10]https://www.nyiso.com/documents/20142/2923301/icap_mnl.pdf

[11] https://www.pjm.com/-/media/DotCom/documents/manuals/m18.pdf

Specific Comments on the Capacity Procurement Options

Comments on Option 1

Option 1 describes the procurement only of the capacity product, while allowing generators to earn their revenues through the spot energy market.

This design is feasible, provided that energy price caps are sufficiently increased so that all capacity providers — including gas plants — can recover revenues through the spot market. Otherwise, plants with low CAPEX and high OPEX may not have an opportunity to recover their costs in the energy market, artificially increasing bids in the capacity market.

Comments on Option 2

This option explicitly presents a financially settled contract, which is a natural development and could contribute significant flexibility to the wholesale market.

Although we consider this option very promising, it is not clear why a generator should be penalized if it fails to clear in the energy market. We understand the concern that generators should not be paid without providing a service, but the service being procured in this case is not energy itself.

Plants should be available during times of distress, and this should be sufficient for them to receive capacity credit. If more efficient plants are available and dispatched instead, there is no benefit in forcing less efficient plants to generate.

The staff paper discusses penalties for resources not performing. For both options 1 and 2, it would also be important to clarify what would be the penalties/rewards for Load Serving Entities to be short/long of resources during times of distress. Step 4, which we mentioned in the section “Interaction of PPAs with the capacity market", provides a natural mechanism to provide this penalty.

Comments on Option 3

Option 3 resembles a centralized auction, although the procurement is only for the imbalance. Several important elements need to be defined for this design to succeed.

Although a central agency would procure the capacity, it is not clear who would define the amount of “peak capacity” to be procured. This is a critical issue, since centralized procurement mechanisms tend to over-procure capacity. It would be advisable to discuss the mechanisms to ensure that central procurement does not lead to over-procurement. For instance, in Great Britain[12], a panel of technical experts play a role in defining the amount to be procured.

[12] https://assets.publishing.service.gov.uk/media/68762902a8d0255f9fe28e94/2025-panel-of-technical-experts-report-on-neso-ecr.pdf

A second issue concerns contract duration. Existing plants may be able to participate under one- to three-year contracts, but not necessarily under 10- or 15-year arrangements.

Many capacity markets, such as PJM[13], only require one-year capacity commitments. The existence of the capacity payment itself, complementing energy revenues, is often sufficient to drive investment.

Alternatively, the Great Britain Capacity Market[14] provides differentiated contract durations — for example, 15 years for new plants, 3 years for refurbished plants and one year for existing plants.

Comments on the Section on Procurement of Reserves

According to the staff paper, the NLDC currently procures reserves only in cases where states have not procured sufficient reserves themselves.

This approach seems to be a step forward in the right direction. Nonetheless, it is short of what it seems to be the most efficient schemes.

The main issue is that the reserve requirement of the All-India system depends on the load, availability, and reserve position of the system as a whole. If one state fails to procure sufficient reserves, resources in another state may still compensate for the shortfall, while reserve deficiencies may ultimately lead to load shedding elsewhere.

The reserves that prevent load shedding and react to outages are those available across the entire interconnected system.

An approach where secondary and tertiary reserves are procured separately by each state is less likely to achieve efficient outcomes and could create significant enforcement challenges.

For example, such an arrangement would require monitoring and enforcing reserve obligations not only for discoms, but also for captive plants and open-access consumers maintaining their own adequacy positions.

Centralized procurement of reserves, therefore, appears to be the most efficient approach.

Comments on the Section on Secondary/Short-Term Capacity Market

This section describes options for a short-term, or secondary, market in which different obligated entities could balance their positions as they obtain more accurate information regarding their

[13] https://www.pjm.com/-/media/DotCom/documents/manuals/m18.pdf

[14] https://assets.publishing.service.gov.uk/media/6911ba14cf24e9250d893e79/informal-consolidation-cm-rules-2025.pdf

actual demand and available resources. From our perspective, the development of such a market would be beneficial, as it provides a mechanism to minimize the costs associated with the over- or under-procurement of capacity by load-serving entities.

Nonetheless, for this market to be effective, it would still be necessary to separate the concepts of "procurement" (i.e., contracted capacity) and "delivery" (i.e., capacity actually available during periods of system stress). Such a distinction would provide a clear definition of product delivery and make it possible to identify entities that are short or long on capacity resources. (Please see the discussion in the section on the interaction of PPAs with the capacity market.)

In particular, this would require:

1. Explicitly separating the "procurement" of the capacity product from the "delivery" of the capacity product.
2. Tracking each load-serving entity's demand (including captive and open-access consumers) during periods of system stress.
3. Tracking the generation or capacity actually made available during periods of system stress

Recommendations

Recommendation 1 – Implement a capacity market

Although the current mechanisms for attracting investment have succeeded in bringing substantial capacity online, they also create significant risks of cross-subsidization among participants.

Load-serving entities with surplus capacity today may be supplying energy during stress hours while bearing the cost of those contracts without necessarily being remunerated for the reliability service they are effectively providing.

A well-designed capacity market would make this value transparent and compensate net suppliers of reliability accordingly.

Recommendation 2 – Define a capacity delivery product based on system scarcity

CERC should define a capacity product — and potentially use a different term — to clarify that the product being traded is distinct from "nameplate capacity" and is linked specifically to the ability to meet demand during periods of system stress.

Markets such as Argentina[15], France[16], PJM[17], Great Britain[18], and Mexico[19] already use forms of "delivered capacity" measured in this way, in which a generator's contribution depends not on its installed capacity but on its availability during critical periods.

We also recommend that periods of system stress be linked to episodes or hours in which there is a shortage of operating reserves, rather than simply to hours of peak demand, as reserve shortages are more directly related to the risk of load shedding and blackouts. This distinction is particularly relevant for a system such as India's, where peak demand may occur during solar generation hours, when operating reserves may remain plentiful due to high renewable output.

Recommendation 3 – Proceed with a technologically neutral design

Adequacy in times of distress is provided by all available resources during critical periods. An efficient capacity market should recognize the contribution of renewable energy resources, storage and demand response resources adequately.

Recommendation 4 – Allow the demand side to participate in the market

Load-serving entities will ultimately bear the cost of this mechanism. It is therefore fair and efficient to allocate costs according to each participant's contribution to system stress.

For that reason, we suggest allocating to load-serving entities a proportional share of the total "delivered capacity" requirement associated with their demand during times of distress.

This would provide incentives to deploy demand-side management measures and reduce demand during critical periods. Similar approaches have enabled demand response participation in many jurisdictions.

Recommendation 5 – Separate the "procurement procedure" from "capacity delivery" measurement

India is a diverse country, and different entities may prefer to procure resources through different contractual schemes, including PPAs, bilateral financial settlements, or the mechanisms proposed in the staff paper.

These are simply different procurement arrangements, and this contractual flexibility can be preserved if procurement mechanisms are separated from the methodology used to measure capacity delivery.

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[15] https://www.argentina.gob.ar/normativa/nacional/resoluci%C3%B3n-400-2025-419016/actualizacion

[16] https://www.services-rte.com/files/live/sites/services-rte/files/pdf/MECAPA/2018.12.21-Regles-du-Mecapa.pdf

[17] https://www.pjm.com/-/media/DotCom/documents/manuals/m18.pdf

[18] https://assets.publishing.service.gov.uk/media/6911ba14cf24e9250d893e79/informal-consolidation-cm-rules-2025.pdf

[19] https://assets.publishing.service.gov.uk/media/6911ba14cf24e9250d893e79/informal-consolidation-cm-rules-2025.pdf

The staff paper already moves significantly in this direction by emphasizing that contracted resources should be available during times of distress.

This "capacity delivery" measurement framework should apply not only to resources procured through the options highlighted in the staff paper, but to all load-serving entities and the resources forming part of their adequacy portfolios.

Market Oversight and Monitoring

Regardless of the capacity market design ultimately adopted, we recommend establishing a robust market monitoring and oversight framework from the outset. Depending on their design, some capacity markets may create significant opportunities for the exercise of market power, strategic withholding, and other forms of gaming, particularly in circumstances where the supply-demand balance is tight and a relatively small number of resources can materially affect market outcomes. This risk is more likely in centralized markets[20], where load-serving entities do not procure capacity directly, and less pronounced in markets where load-serving entities contract capacity on their own and organized markets[21] are used primarily to manage imbalances.

For this reason, CERC should ensure that the capacity market is accompanied by a dedicated market monitoring function with the authority, data access, and analytical capabilities necessary to identify and address potential market design flaws, market manipulation, and anti-competitive behavior.

We hope the comments above assist with finalization of the Staff Paper on "Capacity market for Electricity in India".

Once more, we applaud CERC for developing this critical content and lend our support to the reforms and advances articulated therein.

Thank you for this opportunity to comment. If we can be of further assistance, please do not hesitate to contact us. We would be keen to collaborate with CERC on these and related matters.

Sincerely,

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[20] https://www.pjm.com/pjmfiles/directory/merged-tariffs/oatt.pdf

[21] https://www.caiso.com/market-operations/market-monitoring