July 15th, 2021

To
Shri. Sanoj Kumar Jha,
Secretary
Central Electricity Regulatory Commission

Sub: IESA comments/suggestions on draft (Ancillary Services) Regulations, 2021

Respected Sir,

Greetings from India Energy Storage Alliance (IESA)!

This is in reference to your invitation for comments/suggestions on draft Central Electricity Regulatory Commission (Ancillary Services) Regulations, 2021 vide notification no. No. RA-14026(11)/3/2019-CERC dated 29th May, 2021. On behalf of the Energy Storage industry, we take this opportunity to extend our gratitude to Hon'ble Commission bringing out necessary amendments to the Ancillary Service regulations and allowing Energy storage to participate in the Ancillary Services Market.

IESA has been working from 2013 with CERC in order to open the participation of energy storage in Ancillary Services Markets. IESA submitted a detailed report on role of energy storage technologies for ancillary services for improving power quality and reliability in India in 2014. CERC Draft Ancillary Services Operations Regulations, 2015 were floated for stakeholder consultations on 01st May, 2015. A public hearing on the draft regulations was held on 12th June, 2015. The Regulations were notified on 19th August 2015 and were expected to be operationalized in 2016. In November 2016 CERC also issued the final detailed procedure for ancillary service operations. Although 2018 CERC discussion paper on ancillary services, laid out a very clear road map for implementation of ancillary services. Unfortunately for past 5 years, industry is waiting for CERC to provide clear direction, but we have lost significant time with technology specific pilots for ancillary services being rolled out for coal and hydro plants to provide ancillary services. Both coal and Hydro generation provides ancillary services around the globe, but recent experience indicates that advanced storage technologies are able to cost effectively compete with them for particularly high value ancillary services such as frequency regulation. We request CERC to issue comprehensive regulations and ensure timely steps to pick up the pace with global practices and lost opportunity in last 5 years.

Based on the discussions and inputs received from our Industry members, we are enclosing our comments/recommendations on the Draft Regulations document for your kind consideration.

Key recommendations from India Energy Storage Alliance

1. In order to maintain India prestigious status of "One Nation, One Grid, One Frequency", it is extremely important to ensure real time management of frequency band fluctuations rather than depending on 5 min, 15 min monitoring window and steps has to be taken to ensure for restoring the frequency band limits close to 50 Hz with in few seconds

2. It is evident that current response times are specifically designed considering limitations of existing thermal resources, instead of considering the best response times required for managing the grid frequency and reliability. This would be seen as a half measure and can send a wrong signal to the industry. We urge CERC to reconsider these response times and make them aligned so that Indian grid is made resilient to respond to the deviations in optimum fashion. We have included specific recommendations on experience form international markets to elaborate on the internationally accepted best practices of fast frequency response and pay for performance mechanisms.
3. In order to ensure stable Indian electricity grid and capture the advantages of FRAS, IESA recommends to procure at least 25% of SRAS capacity (eg 1000 MW of FRAS out of 4000MW of Secondary Response Ancillary Services) through POSOCO in a competitive bidding with a term of at least 3-5 years. Simultaneously efforts can continue for developing market-based price discovery and bidding guidelines for procuring ancillary services. On the other note, we request CERC to share the studies done to arrive at the SRAS incentive structure and results to stakeholders so that they develop more concrete understanding. In the Indian conditions, IESA has done calculations for potential costs for procuring ancillary services, which could be less than 3 paise / kWh for 2% frequency regulation requirement (~4000 MW) if passed to all the loads or less than 9 paise / kWh if only passed to C&I customers.
4. Energy storage technologies have been proven as the most cost effective way of providing ancillary services in past 8+ years around the globe. In India, we have an opportunity to leapfrog adoption of ancillary services by adopting regulatory mechanisms such as pay for performance, that creates incentives for better performing technologies to be deployed for improving grid reliability. This could offer a significant market opportunity for energy storage in the immediate future if a technology neutral market design allows it to compete with traditional assets.
5. To define Energy Storage as part of the regulation as eligible entity to provide all capacity, energy, and ancillary services that the resource is technically capable. Notify a consolidated regulations as per IEGC code which defines all the services like Primary, Secondary and Tertiary Responses, Black Start and voltage support etc which are offered for supporting the grid to define under Ancillary Services Regulations.
6. Based on the results of MOP USAID pilot results and global experiences, it is very well clarified about the significant savings by deployment of energy storage in addition to conventional sources. We recommend defining primary reserves as part of Ancillary services regulation and urge Hon'ble Commission to allow energy storage to participate as a Primary Service Provider
7. Draft AS regulations propose SRAS to be capable of responding to signal within 30 seconds and providing the entire SRAS capacity obligation within fifteen (15) minutes and sustaining at least for the next thirty (30) minutes; TRAS is capable of providing services within 15 minutes and sustaining the service for at least next 60 minutes. However globally, resources are equipped with frequency or other controls that can rapidly increase output or decrease consumption in response to a major disturbance or other contingency even with in micro seconds to 10 minutes. Hence it is requested to relook into the response time defined vide draft regulation.

8. As more demand grows and RE penetrates the market, Clarity on future requirements and capacity of more ancillary markets be added (example 2 second signals, faster response time etc). There is also requirement of working a roadmap of addition of new market structures,

study and planning based on the analysis and periodic review of the progress to be shared so that developers can plan accordingly because assets like BESS can be adopted to serve new structures as well.

9. Successful A/S procurement should result in lower deviations, more positive operations/less penalty for DISCOMS, more grid stability and less outages. If this understanding is correct, to achieve this goal, faster response and more coordination around market clearing is required to ensure the right systems are bid into the market to support the grid and achieve this goal.

Detailed explanation for the key recommendations are attached as Annexure -1 of the document. We hope our submissions are considered positively in the best interest of the industry. IESA, on behalf of our Industry members, assure full support and cooperation to Hon'ble Commission towards development of the sector.

Yours Sincerely,

Dr. Rahul Walawalkar
President,
India Energy Storage Alliance

India Energy Storage Alliance's Recommendations on

Draft Ancillary Services Regulation'2021

On behalf of Energy Storage and E-mobility Industry, IESA appreciates the efforts of Hon'ble Commission in bringing out necessary amendments to the Ancillary Service regulations and allowing Energy storage to participate in the Ancillary Services Market.

IESA has been working from 2013 with CERC in order to open the participation of energy storage in Ancillary Services Markets. IESA submitted a detailed report on role of energy storage technologies for ancillary services for improving power quality and reliability in India in 2014.[1] CERC Draft Ancillary Services Operations Regulations, 2015 were floated for stakeholder consultations on 01st May, 2015. A public hearing on the draft regulations was held on 12th June, 2015. The Regulations were notified on 19th August 2015 and were expected to be operationalized in 2016.[2] In November 2016 CERC also issued the final detailed procedure for ancillary service operations.[3] Unfortunately for past 5 years, industry is waiting for CERC to provide clear direction, and we have lost significant time with technology specific pilots for ancillary services being rolled out for coal and hydro plants to provide ancillary services. Both coal and Hydro generation provides ancillary services around the globe, but recent experience indicates that advanced energy storage and demand response technologies are able to cost effectively compete with them for particularly high value ancillary services such as frequency regulation. We request CERC to issue comprehensive regulations and ensure timely steps to pick up the pace with global practices and lost opportunity in last 5 years.

Hence, we urge Hon'ble Commission to ensure implementation of the Ancillary Regulations at the earliest. We believe that clear cut regulations and road map during any initial phases of technology adoption, can make larger impact on the growth of technology and opportunities for technology providers. With the recent Cabinet Approval of the Advanced Chemistry Cell Battery Manufacturing Production Linked Incentive, not just the industry but many investors are looking for a clear signal from CERC on removing barriers for energy storage technologies, and opening up ancillary services is a 1st important step in this direction. With the above note, we humbly submit following suggestions on the Draft Ancillary Service Regulations for your kind consideration.

1. Real Time Grid Frequency Band Management:

The Commission has through periodic amendments in the Indian Electricity Grid Code (IEGC) tightened the allowable frequency band for 15 minute average frequency from a range of 49.0- 50.5 Hz in Feb 2000 to the range 49.90-50.05 Hz since February 2014. However, the real time frequency often goes outside the Normal Operating Frequency Band, and we have witnessed the instantaneous frequency fluctuating between 49.65 to 50.3 Hz. With the MNRE plans for reaching to 450 GW of renewable energy deployment by 2030 from current

[1] https://shaktifoundation.in/wp-content/uploads/2017/06/IESA-Shakti-Energy-Storage-for-Ancillary-Services-India-2014-published.pdf

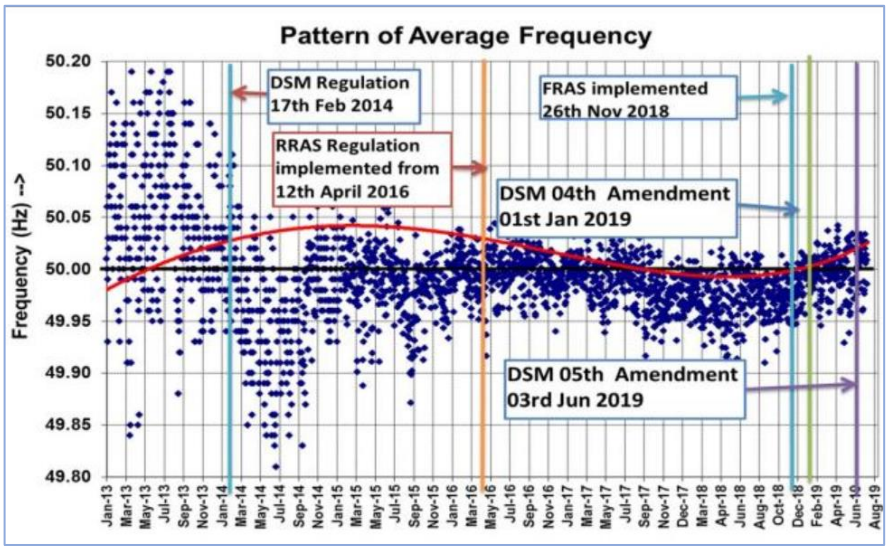
[2] https://powermin.gov.in/sites/default/files/uploads/Final_Consolidated_Report_RE_Technical_Committee.pdf

[3] https://cercind.gov.in/2016/regulation/revisedSOR.pdf

~ 100 GW renewables in 2020. Effectively integrating large amounts of variable generation will require more flexible grid resources (such as energy storage) and advanced, real-time sensing and control capabilities.

For an example North American Electric Reliability Corporation follows real power balancing control performance standards, frequency Response and Frequency Bias Setting standards[4] to control Interconnection frequency within defined limits of 59.98 Hz to 60.02 Hz (i.e. a band of 0.04 Hz vs 0.15 Hz band permitted in India). Australia's Frequency Control Ancillary Service (FCAS) regulation[5] requires to continually correct the generation/demand balance in response to minor deviations in load or generation. When FCAS signal is enabled, the battery follows every 4 seconds a dispatch signal from AEMO. Compared to conventional generators, the battery's response is both quicker and more precise. `

Coming back to Indian context if we closely observe the following figures published by POSOCO, Although, we see an improvement in the system frequency over the years, but still for some days frequency band is falling only for 40% time (right graph) therefore, there is lots of scope of more improvement to decrease the band to 49.95 to 50.05 Hz and AS can play a key role in bring it close.



Source: Forum of Regulators

IESA Recommendation: In order to maintain India prestigious status of "One Nation, One Grid, One Frequency", it is extremely important to ensure real time management of frequency band fluctuations rather than depending on 5 min, 15 min monitoring window and steps has to be taken to ensure for restoring the frequency band limits close to 50 Hz with in few seconds. This is also crucial as India is aspiring to become a preferred destination for manufacturing and grid frequency cannot be managed by individual customers, but needs to be managed at system level through appropriate regulations.

[4] https://www.nerc.com/pa/Stand/Reliability%20Standards%20Complete%20Set/RSCompleteSet.pdf

[5] https://www.aurecongroup.com/markets/energy/hornsdale-power-reserve-impact-study

2. Ancillary Service response time for various Services:

Draft AS regulations propose SRAS to be capable of responding to signal within 30 seconds and providing the entire SRAS capacity obligation within fifteen (15) minutes and sustaining at least for the next thirty (30) minutes; TRAS is capable of providing services within 15 minutes and sustaining the service for at least next 60 minutes. However globally, resources are equipped with frequency or other controls that can rapidly increase output or decrease consumption in response to a major disturbance or other contingency even with in micro seconds to 10 minutes[6]. Hence it is requested to relook into the response time defined vide draft regulation.

IESA Recommendation: It is evident that current response times are specifically designed considering limitations of existing thermal resources, instead of considering the best response times required for managing the grid frequency and reliability. This would be seen as a half measure and can send a wrong signal to the industry. We urge CERC to reconsider these response times and make them aligned so that Indian grid is made resilient to respond to the deviations in optimum fashion. We have included specific recommendations on experience form international markets in subsequent points to elaborate on the internationally accepted best practices of fast frequency response and pay for performance mechanisms.

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3. Introduction of Secondary Fast Reserves/ Fast Frequency Response in the Regulations:

Draft Regulations acknowledges the need for a fast response ancillary service and short comings in existing framework of Ancillary Services. However fast regulations are made invisible part of fast ramping resources in the SRAS segment. The main advantage of deploying Energy Storage is its capability of providing fast frequency support. Also, when pilot for FRAS hydro was implemented, main challenges encountered in the FRAS is that the need for maintaining min threshold quantum to despatch under FRAS. During the FRAS pilot, difficulties were faced in the squaring off of the despatched FRAS energy due to various reasons. Seasonal availability of water throughout the year to ensure smooth operation of the resources. Many of these issues can be mitigated using BESS for FRAS application, as it is not affected by seasonality issues.

Over past decade, number of regions including US and UK have made changes in the regulatory framework to allow newer technologies such as energy storage and demand response to participate in providing ancillary services including frequency regulation. Hence, to fully utilize the benefits of fast regulation service, we should procure at least 25% of SRAS capacity (eg 1000 MW of FRAS out of 4000MW of Secondary reserves) through POSOCO in a competitive bidding with a term of at least 3-5 years. Recent international experience suggests that such tendering and procurement can be completed in 3-6 months, and these projects could be deployed in subsequent 6 months. This will enable India to achieve significant ancillary service deployment by 2022 and provide a clear signal to market. Simultaneously efforts can continue for developing market-based price

[6] https://publications.anl.gov/anlpubs/2016/09/130102.pdf

discovery and bidding guidelines for procuring ancillary services that can be used for additional ancillary service procurement over next couple of years.

2016 procurement of Enhanced Frequency Regulation by UK National Grid can be a model that can be followed by CERC for the same.[7]

UK Experience with enhanced frequency regulation service:

National Grid Electricity Transmission (NGET) is the System Operator for the National Electricity Transmission System in Great Britain. As part of their responsibilities as System Operator, they are required to ensure that the National Electricity Transmission System is balanced on a moment-by-moment basis. In order to achieve this, NGET procures balancing services. NGET procures a service known as dynamic frequency response, whereby providers automatically vary their power consumption or production (technology dependent) to compensate for deviations in system frequency away from the nominal Great Britain frequency of 50Hz.

One of the most critical considerations for any service is how fast it can be delivered, with shorter control cycles requiring faster services. Frequency management control cycles consume reserve provided by actions taken in longer-scale cycles. As an alternative to procuring increasing volumes of frequency response NGET has designed an enhanced frequency response (EFR) service[8] which, by responding faster than existing frequency response services, will help reduce the increasing response required in times of low system inertia. Based on the international experience of procuring 1% secondary regulation services, we believe that India The EFR design included the option of two service types which differ in the size of the frequency insensitive zone designed to enable storage technologies to manage state of charge.

The competitive bidding was allowed for all existing as well as new resources that could meet the following technical requirements

1. Should be capable of delivering a minimum of 1 MW[9] of response This may be from a single unit or aggregated from several smaller units.[10]

2. Should be capable of responding within one or two second to frequency deviations and operate in frequency sensitive mode within the operational envelope and associated restrictions set out in the invitation to tender.

The service providers are required to deliver dispatch automatically according to their tendered windows. Units providing dynamic response must be in frequency sensitive mode at the start of each EFR window so they can be automatically dispatched. It is also important to define a criteria to

[7] https://www.nationalgrid.com/sites/default/files/documents/Enhanced%20Frequency%20Response%20FAQs%20v5.0_.pdf

[8] https://www.nationalgrideso.com/document/142161/download

[9] https://www.nationalgrid.com/sites/default/files/documents/Enhanced%20Frequency%20Response%20FAQs%20v5.0_.pdf

[10] https://www.energy-storage.news/news/tesla-powerwalls-hooked-up-to-provide-grid-frequency-balancing-in-vermont-u

evaluate performance score for the resources selected for providing such frequency response mechanism, which can be based on speed and accuracy of the response. Resources that do not meet the pre defined criteria can be penalized or removed out of the dispatch curve. This can provide incentives by providing better performing resources to get dispatched more often and get higher revenues, while reducing the overall system costs.

This methodology ensures security of supply based on the availability of source and this will be measured second by second from providers metering and the availability factor. A Service Performance Measure will be calculated per Settlement Period as the sum of the second by second ratio of Normalised Response against the envelope at a given frequency value. Normalised Response is the ratio of Actual Response delivered in that second against the Operational Capacity (which will be the tendered MW value unless a relief event has permitted a temporary reduction). If the Normalised Response is within the envelope, the SPM is set at 100%.

Assessment Procedure: The Contract was for 4-5 years. Contracts were awarded based on the two-stage assessment process, subject to the Applicant Cap and the NGET Requirement Cap. 1) Tender response was evaluated and compared against the forecast cost of alternative action for the time periods specified by the Applicant as being available for the provision of enhanced frequency response. 2) The assessment was based on the cost rather than the price. i.e. "the total cost to NGET rather than the unit price offered through the tender". The forecast cost of alternative action was calculated from 3 variables: cost of creating reserve, cost of holding, and cost of positioning.

Additional International Experience in FFR[11]

- USA National Grid introduced an enhanced frequency response (EFR) in 2016 to provide sub-second rapid response frequency reserves. The tender to procure EFR contracted eight battery storage facilities for four years at prices between USD 9.21/MW/h and USD 15.74/MW/h.MISO, CAISO, NYISO of USA implemented flexible ramping product would be procured in both day-ahead and real-time markets. The resources providing the ramping service are compensated at the lost opportunity cost of a resource participating in the energy market.
- National Grid, the TSO in the United Kingdom, has the obligation to maintain system frequency within ±1 % of the target value of 50 hertz.
- EU Markets has lays down detailed guidelines on operational planning for ancillary services, as well as load-frequency control and reserve rules, including operational agreements, frequency quality, load-frequency control structure, operation of load-frequency control, FCRs, FRRs, replacement reserves, exchange and sharing of reserves, time control process, co-operation with DSOs, and transparency of information. The balancing capacity products can be defined as a) Frequency containment reserves b) Frequency restoration reserves and c) Replacement reserves.

[11] https://www.irena.org/-media/Files/IRENA/Agency/Publication/2019/Feb/IRENA_Innovative_ancillary_services_2019.pdf?la=en&hash=F3D83E86922DEED7AA3DE3091F3E49460C9EC1A0

- Netherlands' automatic and manual FRR markets, as well as Belgium and Denmark's manual FRR market, procure balancing capacity and energy as separate products

- In Japan, some utilities require that large solar PV projects control their feed-in of electricity by using battery storage to meet grid frequency requirements. For example, the 38 MW Tomakomai solar PV project includes a 20 MW lithium-ion battery, one of the world's biggest at the time of construction in 2017. The sole application of the battery is to meet the frequency requirements of the local energy utility, Hokkaido Electric Power Company

IESA Recommendation: In order to ensure stable Indian electricity grid and capture the advantages of FRAS, IESA recommends to procure at least 25% of SRAS capacity (eg 1000 MW of FRAS out of 4000MW of Secondary Response Ancillary Services) through POSOCO in a competitive bidding with a term of at least 3-5 years. Simultaneously efforts can continue for developing market-based price discovery and bidding guidelines for procuring ancillary services. On the other note, we request CERC to share the studies done to arrive at the SRAS incentive structure and results to stakeholders so that they develop more concrete understanding.

In the Indian conditions, IESA has done calculations for potential costs for procuring ancillary services, which could be less than 3 paise / kWh for 2% frequency regulation requirement (~4000 MW) if passed to all the loads or less than 9 paise / kWh if only passed to C&I customers.

			2013	2015	2018	2020
Storage	$/MWh		$ 7,50,000	$ 6,00,000	$ 4,00,000	$ 2,50,000
Inverter & BOS	$/MW		$ 2,00,000	$ 1,75,000	$ 1,50,000	$ 1,25,000
EPC	$/MW		$ 2,00,000	$ 1,75,000	$ 1,50,000	$ 1,25,000
	MW	MWh	Total Cost 2013	Total Cost 2015	Total Cost 2018	Total Cost 2020
Configuration	1	1	$ 11,50,000	$ 9,50,000	$ 7,00,000	$ 5,00,000
O&M (total life)		3%	$ 69,000	$ 85,500	$ 1,05,000	$ 1,05,000
Energy Loss (2-5 Yrs)	7%	$ 92.31	$ 1,13,206	$ 1,69,809	$ 2,83,015	$ 3,96,222
Project Life - Yrs			2	3	5	7
$/MWh			$ 84.49	$ 50.96	$ 27.60	$ 18.14
Rs/ Mwh			₹ 5,069.28	₹ 3,312.41	₹ 1,932.04	₹ 1,360.65
End user cost (1% Regulation) Rs / kWh			₹ 0.051	₹ 0.033	₹ 0.019	₹ 0.014
End user cost (2% Regulation) Rs/kWh			₹ 0.101	₹ 0.066	₹ 0.039	₹ 0.027
Peak Load (MW)			1,50,000	1,60,000	1,70,000	2,00,000
Total System Cost (1% regulation)			$ 1,11,01,71,795	$ 71,42,57,322	$ 41,10,28,034	$ 31,78,48,107
Total System Cost (2% regulation)			$ 2,22,03,43,590	$ 1,42,85,14,644	$ 82,20,56,068	$ 63,56,96,215

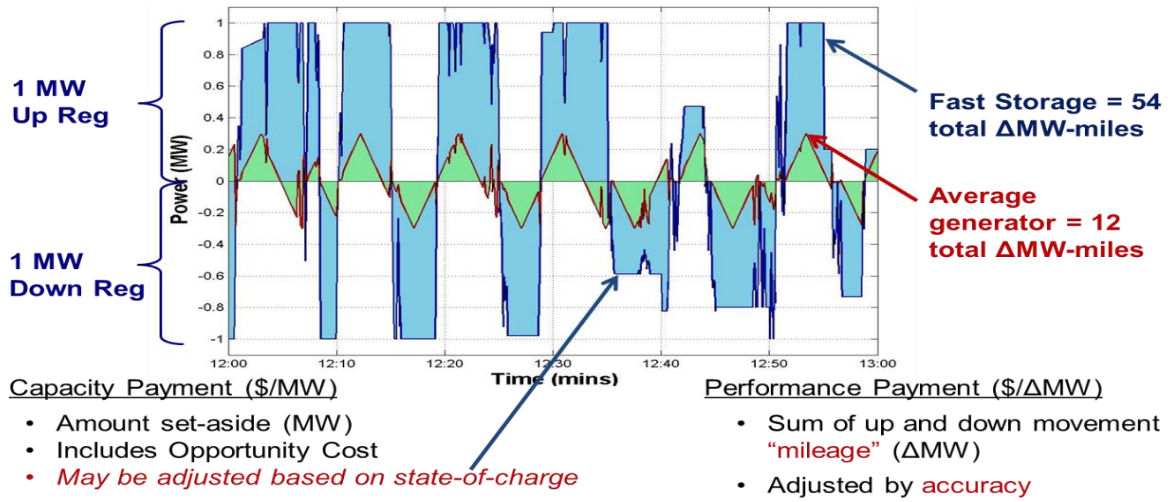
Fig: Frequency Regulation Cost Calculation[12]

[12] CES Analysis

4. Incentive Structure – Pay for Performance Structure:

Conventionally, different energy resources providing frequency regulation services have been compensated at the same remuneration, irrespective of their performance. However, new technology resources can provide much faster regulation service than conventional generators. Therefore, the compensation mechanism must appropriately value the performance characteristics of different resources. This will incentivise greater deployment of storage technologies in providing ancillary services

Incentive mechanism should not be just limited to response and availability of resources as required. It should be calculated based on remunerate resources based on how fast they are able to respond to the system operator signals. The compensation is proportional to the response time. Based on these early studies and subsequent technical workshops, US FERC Order 755[13] Created Two-Part Payment for frequency regulation that Recognizes value of speed and accuracy.



Present draft only offers incentives to only secondary services and nothing for the tertiary services. In order to make sure best use of evolving of markets and technologies available, it is suggested to extend these incentives to other ancillary services (voltage, tertiary etc.) based on "pay for performance" kind of structures.

IESA Recommendation: Energy storage technologies have been proven as the most cost effective way of providing ancillary services in past 8+ years around the globe. In India, we have an opportunity to leapfrog adoption of ancillary services by adopting regulatory mechanisms such as pay for performance, that creates incentives for better performing technologies to be deployed for improving grid reliability. This could offer a significant market opportunity for energy storage in the immediate future if a technology neutral market design allows it to compete with traditional assets.

[13] https://www.ferc.gov/sites/default/files/2020-06/OrderNo.755.pdf

5. Need for Consolidated Regulations for all the Ancillary Services

As per Indian Electricity Grid Code Regulations 2010, Ancillary Services means "in *relation to power system (or grid) operation, the services necessary to support the power system (or grid) operation in maintaining power quality, reliability and security of the grid, eg. active power support for load following, reactive power support, black start, etc*"

However, existing Regulatory Provisions for Ancillary Services in India clearly focus only on frequency response characteristics (mostly on frequency restoration and relieve the congestion in the transmission network) and all the other grid support mechanisms are ignored. Considering only secondary and tertiary reserves under IEGC and for other services if it is listed down under different regulations, it will eventually leading to lot of ambiguity and missing the main objective of Ancillary services. Hence it is recommended to bring all the reserves and services like Primary, Secondary and Tertiary Responses, Black Start and reactive power support which are offered for supporting the grid to define under Ancillary Services Regulations.

Draft regulation does not outline details about how PRAS would be met, what would be the required size of procurement and the compensation mechanism for such a service. Hence it is highly recommended to consider including primary reserves as part of the Ancillary Services Regulations since all the three reserves compliment each other in providing frequency response services. It would be advantageous to adopt a market mechanism for primary reserve as well:

a. By including Primary reserve into a similar market mechanism will lead to efficiencies in the market resulting in lower overall system procurement for such reserves. A market for primary reserve will ensure the best technology is procured for the task to be done. Markets such as PJM and Ireland have recognized the first responders on the system need to be compensated higher and this will enable the most efficient resources to be deployed. With limited speed requirements and only market mechanism around SRAS and TRAS, the efficiencies will not be achieved.

b. Creating a mechanism for different technologies to participate in this market will ensure higher performing assets are deployed on the grid that will further enhance the grid as more variable renewable energy (VRE) is added

As per IEGC, 2010 Black start service is an essential reliability service in power system operation. However very few hydro stations and gas stations have the capability to black start and build the grid post blackout. Similarly Draft IEGC 2020[14] recommends periodic demand assessment of active as well as reactive power on weekly/monthly/yearly basis for current year for load - generation balance planning as well as for operational analysis and shall be part of operational planning data. All these support services to be considered and should made part of Ancillary Services Regulation

Black Start Ancillary Services: The generators capable of providing start up power to mandatorily provide the Black Start Services as per the instructions of the load despatchers. BSAS to be paid as and when the same is required by the nodal agency.

[14] https://cercind.gov.in/2020/reports/Final%20Report%20dated%2014.1.2020.pdf

Voltage Control Ancillary Services (VCAS): There is already a commercial mechanism in the IEGC under Regulation 6.6 of the IEGC Regulations, w.r.t. voltage reference at the interchange point, which incentivizes maintaining a proper voltage profile at all interchange points between control areas in the grid. However, in case it is observed by the system operator that there is a critically low voltage in the grid at one or more such interconnection points persisting during a season, the system operator may requisition voltage support ancillary services from any service provider, who may bid the same through the power exchange.

Federal Energy Regulatory Commission (FERC) vide order 841 allows "***Storage is eligible to provide all capacity, energy, and ancillary services that the resource is technically capable of providing"***[15]**.** Similar kind of structure is required for active adoption of ESS and such definition to be included to be made part of Ancillary Services Regulation

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IESA Recommendation: To define Energy Storage as part of the regulation as eligible entity to provide all capacity, energy, and ancillary services that the resource is technically capable. Notify a consolidated regulations as per IEGC code which defines all the services like Primary, Secondary and Tertiary Responses, Black Start and voltage support etc which are offered for supporting the grid to define under Ancillary Services Regulations.

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4. Participation of Energy Storage as a Primary Reserve

Expert group committee of IEGC recommends that in future primary response is also contributed by renewable generators. Accordingly, it has been provided in the IEGC that Wind/ Solar/Hybrid plant commissioned after 31st March 2022 shall have the option to provide primary response individually through BESS or through a common BESS installed at its pooling station.

BESS can actively support and participate in Primary Reserves as well. Allowing related clauses and making suitable inclusions in the draft. A detailed modelling assessment to gauge the BESS requirement for ancillary market operation conducted under Greening The Grid - Renewable Integration and Sustainable Energy (Rise) Program, by USAID India and Ministry of Power has proven very positive output and strengthen this suggestion. The analysis combined the power generation resources of five states (Andhra Pradesh, Telangana, Karnataka, Maharashtra, and Chhattisgarh) for scheduling and dispatch to ascertain the savings scope

Findings from this Study[16]**:**

a. BESS will help arrest the nadir frequency with its fast-response characteristics, as is the case with inertial support from conventional units and will also help achieve the target value for quasi steady state frequency. Thus BESS reduces the burden on conventional units due to high RE additions to the grid.

b. BESS support in primary reserves can drastically reduce the primary reserves support required from conventional units for frequency reserves.

[15] https://www.ferc.gov/sites/default/files/2020-12/Order-No-841.pdf

[16] https://www.gtg-india.com/wp-content/uploads/2021/04/Evaluation-of-Battery-Energy-Storage-System-BESS-in-Southern-India.pdf

c. If BESS is deployed to provide primary reserves, the reserve capacity of conventional units can be released to meet consumer/system demand.

d. With 5% droop for conventional generation (as per IEGC guidelines) from the Southern region, about 3,000 MW of conventional capacity can be released for frequency reserves with BESS support

e. **The model shows that savings of approximately INR3,000 crore can be generated on an annual basis because of the additional capacity being made available. A 1,200 MW BESS system would cost approximately INR 1,100 crore a year (based on year 2020 costs, with financing assumptions aligned to market practices). The estimated savings would thus be almost three times the cost if BESS were to be deployed as a reserve for providing primary response, and the conventional capacities reserved for such response released to meet consumer demand.**

IESA Recommendation: Based on the results of MOP USAID pilot results and global experiences, it is very well clarified about the significant savings by deployment of energy storage in addition to conventional sources. We recommend defining primary reserves as part of Ancillary services regulation and urge Hon'ble Commission to allow energy storage to participate as a Primary Service Provider

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5. Requirement for Scenario planning

As the demand grows and more RE penetrates the market, Clarity on future requirements and capacity of more ancillary markets be added (example 2 second signals, faster response time etc). There is also requirement of working a roadmap of addition of new market structures, study and planning based on the analysis and periodic review of the progress to be shared so that developers can plan accordingly because assets like BESS can be adopted to serve new structures as well.

6. Impact on DSM

Successful A/S procurement should result in lower deviations, more positive operations/less penalty for DISCOMS, more grid stability and less outages. If this understanding is correct, to achieve this goal, faster response and more coordination around market clearing is required to ensure the right systems are bid into the market to support the grid and achieve this goal.

7. SRAS- Down, TRAS-Down and Deviation and Ancillary Service Pool account

The paper clearly highlights how payments to/from a pool will work for SRAS and TRAS up and down providers. What is unclear is how the overall market mechanism will work. It seems close to the causer-pay mechanism in Australia for Frequency Regulation, which ensures that systems causing deviation are paying into a Pool and from that pool, systems supporting deviation Up or Down are compensated. Along with our over-arching comment, more sharing of details would enable clarity, to stakeholders and alignment.