Introduction to AES

I take this opportunity to introduce The AES Corporation (NYSE: AES), a Fortune 500 global power company. We provide affordable, sustainable energy in 14 countries through our diverse portfolio of distribution businesses as well as thermal and renewable generation facilities. Our workforce is committed to operational excellence and meeting the world's changing power needs. Our 2020 revenues were $10 billion, and we own and manage $34 billion in total assets.

AES is accelerating its build-up of Green energy portfolio worldwide by targeting to add 2 to 3 GW per year across the globe. AES is also actively engaged in using Artificial Intelligence (AI), Data Analytics, Machine Learning, Drones and Robotics in our conventional and the renewable energy businesses worldwide. As one of the world's leading innovator company, AES is ranked among the Top US Companies for Innovators. At AES we are continuously looking for robust, simpler, faster, and less expensive Solar solutions that can be adapted by the solar industry across the globe.

AES is a pioneer in the commercialization of battery based energy storage on the grid, placing the first lithium-ion grid battery in service in 2008 and has one of the largest fleet of lithium-ion based battery-based storage assets >500MW in commercial operation globally. It was the first company to receive Market Based Rate Authority from U.S. Federal Energy Regulatory Commission (FERC) for energy storage and was the first company to deploy advanced energy storage in the U.S.

AES is the only global power company with a continuous presence in India since 1992, demonstrating its long-term commitment to the Indian power market. In December 2020, AES has divested its coal fired plant of 1740 MW capacity to Government of Odisha, as a part of its decarbonization strategy and greening of AES' portfolio. In 2019, The AES Corporation and Mitsubishi Corporation inaugurated India's first grid-scale battery-based energy storage system a 10MW/10MWh system at a Tata Power Delhi Distribution Limited substation in Rohini, Delhi – the largest in South Asia.

AES response on draft Ancillary Services Regulations, 2021

India's energy mix is rapidly evolving, particularly to meet the country's ambitious renewable energy targets and address the COP21 framework. The transition away from fossil fuels and towards cleaner energy will put large amount of variable/intermittent renewable energy on the electrical grid in India. To support this transition the Indian power infrastructure will have to address a variety of integration challenges on the supply and demand sides, as well as the grid network itself. Numerous studies completed around the globe point to a similar conclusion that energy storage is critical to achieving a decarbonized power grid, as well as other significant changes involving electrification of transportation and building sectors. Energy storage is a "force multiplier" for carbon-free energy and is expected to be a critical component for grid stability.

Because of its numerous, relatively unique attributes, energy storage will be a key feature of a multi-pronged solution set required to address the challenges of the emerging Indian power system. To support India's renewable targets, a large number of energy storage systems, particularly battery-based, will have to be deployed across the power infrastructure. However, simply budling energy storage systems would not meet the objective of grid reliability, it would also require other elements of the grid to be addressed, like flexible demand management and pricing, diversity of renewable energy sources (both wind & solar) - including distributed resources, dynamic/intelligent network signals, accurate forecasting/scheduling norms, and improved electricity market mechanisms.

India's commitment and leadership with renewable energy has propelled it as one of the top countries in the world for solar energy and led to the launch of the first National Energy Storage Mission. The role that energy storage can provide for frequency control, voltage control, renewable integration and transmission investment deferral etc., has been widely discussed but there is currently no clear regulatory guidelines and pricing mechanisms laid out for these services. We believe that time is of essence for CERC to include energy storage in its planning and develop a clear and aggressive strategy for encouraging the utilization of battery-based energy storage in the power infrastructure. Without this (along with other system improvements mentioned above), the planned rapid growth of renewable energy development in India in the next few years may soon lead to grid instability, including potential blackouts, as is the case in Australia and UK where the regulators are now turning their attention to energy storage to address grid challenges.

A roadmap with sufficiently large procurement targets can be an effective means of driving market transformation and attract investments to push forward the deployment of energy storage systems. The roadmap can facilitate in breaking down the barriers and promoting market development by sending a clear policy signal. The roadmap would also address both the supply as well as demand side.

On the supply side, a long-term, stable market opportunity to supply energy storage products at significant volume will then be evident. This will encourage a wide range of industry players (manufacturers, software developers, project developers, construction firms, financial institutions, etc.) to begin committing investments in India which act as catalyst to the Make in India initiative.

On the demand side, key stakeholders such as system operators, generator owners, and grid operators will receive a clear, long term signal from policy makers to begin dedicating the necessary resources and to develop a planning and procurement framework to accommodate and leverage storage resources that address grid challenges.

Regulators must ensure fair competition amongst various technologies which would require the current valuation methodologies to be refined and market /procurement mechanism be updated to assign value to ("monetize") various storage attributes often unrecognized in conventional practice.

An example of such non-monetized attributes could be to develop appropriate performance-based compensation or incentives to reward flexibility, speed, and accuracy in how a resource responds to deviations or dispatch schedules. Another option to "monetize" storage attributes, while improving the efficiency of the power system, could be for India to transition to shorter scheduling period, leading to benefits such as:

- Reduced frequency deviations
- Reduced ramps
- Reduced incidence of sharp changes
- Better demand control
- Improved renewables integration

To summarize, it is important to ensure that in any forthcoming procurement should include storage solutions, where lithium-ion storage solution should be at the forefront among any set of options under consideration and evaluated fairly on all its merits, including actual long-term field operational experience, demonstrated performance data, proven environmental and safety record, and risk/maturity metrics.

Recommendations:

1. **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.

2. **Response capability for SRAS:** Draft Ancillary Services 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. A faster responding asset can be a more effective tool to the grid operators even in the secondary market to prepare for the level of VRE being added to grid. Hence, it is requested to relook into the response time defined vide draft regulation.

3. **For SRAS, how is pay for performance/performance incentive structured arrived at?** AES appreciates the forward thinking approach to establish a pay for performance structure. Can the final version provide more details on how the speed of response/ formula and structure of incentive were determined? Request also sharing of the studies done to arrive at this result to stakeholder so that they develop more concrete understanding. We think the structure and approach is correct, but its effectiveness will not be fully utilized unless applied to PRAS and also requiring faster response times in PRAS and SRAS. Faster responses are achievable, and only provide benefit to grid stability, why not utilize commercial solutions available.

4. **Requirement for Scenario planning:** As 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.

5. **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[1]. Hence it is requested to relook into the response time defined vide draft regulation.

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.

8. **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.
   The model shows that savings of approximately INR 3,000 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.
   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

9. **Market size uncertainty and merchant risk:**
   a. **No commitment compensation for SRAS:** We believe that as proposed for TRAS, a commitment compensation structure should also be put in place for SRAS to promote adoption of new technologies and to bring efficiency to the market. TRAS procurement can also be optimized if duration of service requirements are right sized and in set in tranches.
   b. **Mechanism/philosophy needed for market sizing**: To determine and plan potential of Ancillary service revenue streams, clarity around how the market sizing is done, and how it

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

will be conducted needs to be established. By establishing such a structure, investor/developers can assess the market better and reduce their merchant risk thereby promoting investments, creating efficient markets and lower overall cost to the system and population. Coordinated response between Primary Reserve, Secondary Reserve and Tertiary Reserve is also key to achieve an ideal system response.