

Interview: An In-Depth Overview of the Indian Energy Storage Market | Dr. Rahul Walawalkar, Executive Director, India Energy Storage Alliance (IESA)



As climate agreements and renewable energy are debated all around the world, India is trying to solve a number of its own energy challenges. These begin with renewable energy grid integration and pervade all sectors starting with battery manufacturing and going all the way to the National Energy Storage Mission. The ees International Magazine spoke with Dr. Rahul Walawalkar, Executive Director of the India Energy Storage Alliance (IESA), to learn about perspectives of the Indian energy storage market and how the mentioned challenges are going to be tackled.



Dr. Rahul Walawalkar, Executive Director, India Energy Storage Alliance (IESA)

ees International: At nearly 65GW of installed generation capacity, Renewable Energy constitutes 20% of India's total generation capacity. At the current level of RE integration to the grid, what problems are being faced currently and how are they being mitigated?

By many measures, despite rapid improvements, India's electric grid is a weaker grid than in many nations or even compared to its own measures. The grid frequency, a measure of supply-demand mismatch, still varies much more than targeted, and there are limited grid reserves. From 7% in FY2017, RE's share of gross generation in India would grow to about 19% by 2022 assuming the targets of 160 GW solar + wind are met.

In a number of states, the RE developers have faced problems due to curtailments due to transmission limitations during the peak generation season for both wind and solar. Apart from that, the number of wind and solar farms has also suffered unplanned outages due to power quality issues in the grid.

To address issues due to the imbalance between forecast and real injection of power the deviation settlement mechanism is being implemented which is starting to create an awareness about forecasting errors and are encouraging RE developers and IPPs to explore solutions to mitigate the intermittency and forecasting errors.

Despite the tremendous potential for integration of RE and energy storage, we have lost significant time in just discussing these issues. Since 2014, MOP and MNRE have created number of committees such as at least 3 committees to consider 'Large scale renewable integration challenges' and 'Standing Committee for Energy Storage and Hybrid Systems'. There is a separate committee for Greening the Islands project and also different groups that have worked with donor agencies such as USAID and GIZ.

Fortunately current Minister for Power and New & Renewable Energy, Shri. R. K. Singh has taken a very proactive view on the opportunity of energy storage in India. Under the leadership of MNRE Secretary, Shri. Anand Kumar, the expert committee has drafted the National Energy Storage Mission, which is expected to get launched in next 2 months. IESA and industry is supporting this initiative with anticipation that it will address the issues that have slowed the growth of this sector for past 2-3 years.

ees International: MNRE announced the setting up of a committee to draft the National Energy Storage Mission. What are the main objectives with which the draft is being prepared and how would this mission be dovetailed with the National Solar Mission?

Over the past 5 years various state agencies, as well as central government departments including MNRE, MOP, NITI Aayog have been working on aspects related to energy storage policy. Since energy storage can act both as a generation as well as load, it takes careful consideration to adapt existing policy frameworks or develop new frameworks. MNRE constituted the expert committee in February 2018 to draft the National Energy Storage Mission to provide the policy framework necessary for industry. NESM is modeled utilizing learnings from the National Solar Mission and provides a policy framework considering 4 key areas:

- Energy storage for large scale RE at the transmission level
- On-site energy storage integration at the distribution level
- Rural micro-grids and energy access
- Storage component in EV plans

NESM also brings focus on innovation and domestic manufacturing for advanced energy storage technologies.

ees International: What steps are being taken by the Government to promote indigenous manufacturing of batteries as part of Make in India programme?

IESA has set up a vision to make India a Global Hub for R&D and Manufacturing of Advanced Energy Storage by 2022. In 2017, IESA submitted recommendations to DIPP and Niti Aayog for encouraging domestic manufacturing of advanced energy storage and EV technologies.

In March 2018, Minister for Power and New & Renewable Energy, Shri. R. K. Singh chaired a meeting with battery-based energy storage manufacturers to set up manufacturing units in India.

IESA was a part of this discussion. The meeting not only focused on the government's push on electric vehicles (EVs) and its expected surge in the coming years, but also on future tenders that cover hybrid solar and wind projects to be coupled with energy storage.

Under the proposed National Energy Storage mission, the government would soon release a policy with a focus on 'Make in India' and the government is planning to take all possible measures to incentivize advanced energy storage manufacturing in India.

NESM also addresses the issues related to the raw materials available for manufacturing and the government had already started discussions with resource rich countries such as Bolivia and Australia.

ees International: At what stage of implementation are the large energy storage integrated solar power plants tendered recently?

Nearly 50 MWh of energy storage projects are under auction in India. MNRE has issued twice Expression of Interest to develop demonstration projects in energy storage and Solar Energy Corporation has issued at least 3 bids for 8-10 projects for RE + storage projects. Over past 3-4 years, IESA and the industry have enthusiastically supported all these efforts and have submitted detailed proposals to the government.

Under the NESM, MNRE is considering encouraging minimum 30 minutes of storage for large solar and wind parks. The recent solar power project tenders have created a strong interest among solar developers towards energy storage. The interest is likely to sustain in the near future.

ees International: Batteries are the backbone of the evolving EV industry and are also a key enabling factor to the transition to the Renewable Energy driven economy. What are the important performance features that distinguish batteries deployed in these two applications?

Batteries can be used for both RE integration as wells EVs. There are certain types of batteries that could be used for both applications, while there are certain batteries that are more suitable either for stationary or EV markets. This is possible as there are different priorities and performance features that are required for these two markets.

For EV applications, energy density (both by weights and by volume) and safety is the most critical parameter. Given the typical size of the battery packs considered for passenger vehicles, one needs batteries that can provide at least 1000 cycles.

For stationary applications, there are two separate applications which can be considered as Power Applications (requiring less than 1 hour of storage) and Energy Applications that require multiple hours of storage. For power applications, one needs batteries that can be charged ? discharged quickly and can cycle for more than 10,000 cycles, while for longer duration applications one could use batteries that provide < 5000 cycles that can still provide 10 + years of operating life. For outdoor applications, energy density may not the be most important factor, while for rooftop solar integration, space constraint is a major factor, and thus higher energy density batteries would be preferred.

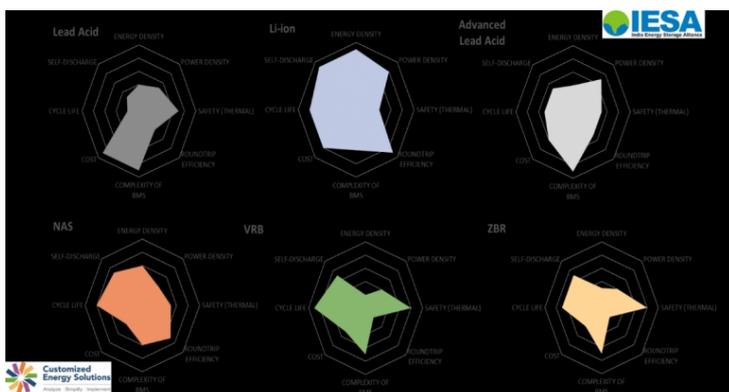
ees International: What value and revenue stacks are possible with grid connected energy storage systems and how well we are placed to realize them?

Energy storage technologies can allow multiple value streams for grid connected energy storage systems. These include

- Energy arbitrage by shifting generation from off peak to on peak hours
- Grid ancillary services such as providing frequency regulation and / synchronous reserves
- Providing reactive power support
- Provide ramp rate control by smoothing variability of renewables
- Avoiding or deferring T&D upgrades

ees International: What are the leading Electrical Energy Storage technologies and how does their performance compare?

Batteries, pumped storage systems, ice storage, and heat-based thermal storage make up some of the more common types of energy storage. Pumped Hydro Storage is often referred to as ?conventional energy storage?. More recent emerging forms of energy storage, such as batteries, flywheels, and new compressed air energy technologies, are often referred to as ?advanced energy storage?. Energy storage technologies can be broadly classified as: mechanical, electrochemical, thermal, electrical and chemical storage. Each type of available energy storage technology has specific attributes as shown below. These factors must be evaluated in order to choose the suitable technology density for a specific purpose.



The leading energy storage technologies | Source: IESA

ees International: How are the industry and academic institutions collaborating in developing leading edge electrical energy storage technologies?

Various Indian research institutes and universities have shown interest in energy storage technologies. This includes IESA members such as GERMI, TERI, VJIT and others. Indian national labs like CECRI, VSSC, CMET, ARCI are actively working in this area and in comparison to global standards, there is a great scope to enhance India's R&D space.

In the past 3 years, India has witnessed the creation of 100s of Accelerators / Incubators that are focusing on information technology/healthcare area. There is a need for a special incubator to nurture energy storage technology startups and provide them with suitable facilities for accelerating their progress from lab to commercialization. IESA has been working on the creation of such Incubator for energy storage sector in line with Atal Innovation Mission (AIM). We're also working with the Skill India initiative and various academic partners to identify skill and training gaps in this area.

ees International: Though the battery price has been falling steadily, it looks like we have not as yet reached the inflection point. How will the growing EV and Grid storage markets in tandem with the technology development play out, in bringing about the EES revolution?

India has the potential to deploy over 300 GWh of energy storage by 2022. We anticipate this to focus on 3 areas, EVs, behind the meter energy storage and grid scale energy storage. We are already seeing the inflection point for deployment of energy storage in commercial EVs such as eRickshaws and distributed applications to displace diesel usage. Other key applications include supporting meeting the targets set by national wind and solar mission as well as meeting the energy access goals set up by the Prime Minister. EV market would be driven by 3 wheelers and commercial transport vehicles during next 5 years.

ees International: What is the current Energy Storage market in India and how big the market would grow in the next five years? How is IESA engaged in promoting the interests of the EES industry in India?

According to IESA estimates the current annual market is ~15GWh including the conventional storage technologies such as lead acid batteries. There's been a fast adoption of li-ion batteries for applications such as diesel usage reduction for DG sets. We expect that within the next 5 years the annual market would grow to 30-50 GWh including EVs and newer stationary storage applications. IESA estimates the market for energy storage would grow to over 300 GWh during 2018-25.

IESA was launched in 2012 to promote energy storage, micro grid technologies and EVs in India. Since then, the IESA network has grown rapidly and currently has 80+ members who are exploring opportunities for energy storage, microgrids and EVs. Our members include a good mix of energy storage technology providers, power conversion system providers, system integrations, project developers, large users, potential investors as well as research institutions. The aim of IESA network is to help members understand the various energy storage technologies, business applications and intertwined policy/regulatory issues. IESA team works with these members to help them make an informed decision on technology adoption and target markets.

We are also working with policy makers and regulators and have been part of Renewable Integration Taskforce for Ministry of Power and CEA during 2013-14, part of Energy Storage and Hybrids standing committee for Ministry of New and Renewable Energy during 2014-16. Also working with CEA, CERC and Forum of Regulators to enable adoption of these emerging technologies in India. IESA has taken leadership in drafting the national Energy Storage Mission and has also contributed to developing energy storage safety roadmap for India, which includes the creation of stationary energy storage safety standards under BIS.

To promote domestic manufacturing, we have partnered with IEEMA to host the masterclass for providing insights to CXOs of Indian companies who are looking to diversifying in the energy storage industry.

ees International: Which Indian states are the leading energy storage pioneers with their latest policies and tenders?

State Governments like Karnataka, Telangana and Maharashtra have made a promising move by announcing their own policies to promote the development of Electric Mobility Infrastructure and providing incentives for manufacturing of EVs and energy storage. In recent months various tenders by SECI, BESCOM, NTPC, NLC were floated in states like Andhra Pradesh, Himachal Pradesh and Andaman & Nicobar islands.

ees International: What kind of workshop are you planning to provide at Intersolar India, taking place on December 11-13, 2018 in Bangalore, Karnataka?

IESA is the associate partner for Intersolar India and is looking forward to witness a collaborative engagement. IESA will be having a booth where it will showcase how energy storage is becoming an emerging business option for most of the new companies and also for large business houses. IESA workshop will address the underlying techno-commercial trends in energy storage as well as provide insights into changing regulatory and business models that are creating a unique opportunity. IESA team and experts will share their experiences from around the globe and discuss its relevance for India.

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