



Investment Opportunities & Business Models of BESS at Distribution

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Concept note

India is transitioning towards a clean energy future through low carbon-based pathways. A sustainable energy framework is one of the key pillars to enable this paradigm shift. Renewable energy (RE), accompanied with power-grid upgradation, assumes prime importance in this endeavour. India has shown greater commitment to reduce its emission intensity from the electricity sector, which is reflected in its ambitious target of achieving the installed capacity of 175 GW of grid-connected renewable energy sources by 2022; the installed capacity from RE is to be ramped up to 275 GW by 2027 as per the National Electricity Plan, 2016. Recently, the union government issued operational guidelines for the implementation of Phase-II of 'Grid-Connected Rooftop and Small Solar Power Plants Programme' for achieving a cumulative capacity of 40 GW rooftop solar (RTS) plants by 2022. The Ministry of New and Renewable Energy (MNRE) has also issued guidelines to roll out the PM-KUSUM scheme, which would encourage farmers to generate solar power in their farms and use the clean energy to replace their diesel water pumps. Part of the plan is also to develop decentralized solar energy and other renewable energy generation plants of capacity up to 2 MW, which could be connected directly to existing 33/11 kV or 66/11 kV or 110/11 kV sub-stations of the distribution company. In aforementioned schemes, it has been decided to implement the programme by making the DISCOMs and their local offices as the nodal points for implementation of distributed solar PV systems. DISCOMs to play a key role in the expansion of RTS as DISCOMs have service engagement with consumers and authority to approve RTS installation lies with them, manage the distribution network, and also administer billing and metering facilities.

The benefits of switching to RTS accrue in the form of reduction in the capacity requirement of Transmission & Distribution (T&D) infrastructure and reduction in technical losses and power purchase cost as the demand through Distributed Energy Resources (DERs) installed at a point near the demand.

However, the increasing penetration of solar rooftop poses various technical impacts such as voltage instability and power quality; it also contributes to increasing



skewness in demand pattern. Increasing demand with higher peak demand calls for periodic upgradation of distribution equipment/network augmentation due to increased operational stress.

Clean mobility is also one of the priorities for the country and there are plans to convert 25% of the total vehicle fleet into electric by 2030. The government of India has announced an outlay of INR 10,000 crore under FAME 2 scheme in order to boost electric mobility with special focus on electrification of public fleets. Integration of a large number of distributed EV charging stations with the power distribution network will lead to increased operational stress in LT power distribution network.

At the same time, the introduction of 4th and 5th amendments of Deviation Settlement Mechanism (DSM), solar RPO targets, and penalty for power cuts other than force majeure conditions or technical faults as proposed amendments in Tariff Policy, 2016, adds to the pressure on DISCOMs for meeting the objective of providing reliable power to consumers at an affordable cost.

Therefore, it becomes imperative to explore the possibility of integrating localized-controllable balancing fleets such as energy storage (stationary batteries or, mobile ones as in EVs or, aggregation of distributed storage options) at the distribution network level to improve the operational efficiency of power utilities, manage the load of distribution transformers, and provide 24x7 quality power supply. The operational problems that exist in the power distribution sector in India can offer multiple applications that can be explored for BESS. The modularity of such systems is one of the most favourable attributes that can make financial sense for DISCOMs to adopt a phase-wise implementation instead of significant upfront investments through conventional system upgradation measures. A grid-scale BESS is defined by various applications that it can serve to mitigate some of the broad challenges, as previously discussed. The technology, size, operational strategies, and various benefits that it can offer, are all dictated by the application(s) that a BESS can serve. The significance and potential of BESS at the distribution level is also recognized under the study 'Energy Storage System Road Map for India: 2019–2032'. The report briefly discusses application-wise potential of BESS.



Understanding the market for battery energy storage and anticipating the returns pose significant challenges for investors to assess the applications of BESS at the downstream level of a distribution network. As of now, no standard cost of service or levelised life cycle cost can be attributed to a BESS. A BESS project with high upfront investment could offer services at low rates and a BESS project with an average upfront investment could offer services at expensive rates. Hence, learning from pilot projects in various regional locations is essential to have a good understanding of different applications of BESS and to prepare DISCOMs for anticipated operational challenges, including demand profile changes accompanying the paradigm shift towards cleaner and greener technologies. More pilot projects could be dedicated to different applications under different cost recovery mechanisms to gain sufficient understanding of the technology ecosystem to arrive at closer assumptions. Such pilot projects could also help in developing an understanding of operational challenges of BESS.

The existing BESS facilities are generally distribution utility-owned, and derive their value streams by providing services. However, considering the limited opportunities available with utility-owned BESS, there is a specific need to identify business models for creating economic viability of BESS. These business models would evolve from different ownership structures. The business models must make use of falling prices and the modular nature of batteries. Battery prices, which were above \$1,100/kWh in 2010, have fallen by 87% to \$156/kWh in 2019. According to the latest forecast from BloombergNEF, average prices will be close to \$100/kWh by 2023.

The policies, which are to be designed in order to support the increasing uptake of battery energy storage, are incidentally, much more challenging in terms of multiple dimensions and complexities associated with them than those to promote wind or, solar capacity addition. The challenges stem from undefined ownership and multiplicity of battery storage applications – renewable energy integration, micro grids, peak load management, load shifting – all of which call for different types of battery storage technologies and sizing of BESS for different applications, thereby impacting the financial viability.

It is therefore necessary to bring together all the perspectives, those of prospective end users primarily DISCOMs, system designers, BESS and related equipment manufacturers, project developers, financing institutions, regulators, and policymakers,



and collectively discuss the associated key issues and potential solutions. To deliberate on various applications, business models and ownership, possible use cases, current challenges of various stakeholders and the way forward for adoption of BESS at the distribution-level, TERI, with support from MacArthur Foundation, is organizing a thematic session titled ‘Battery Energy Storage at Distribution Downstream – Investment Opportunities and the Way Forward’ on the sidelines of the World Sustainable Development Summit (WSDS) 2020 in New Delhi. The session is divided into two panel discussions – ‘Investment Opportunities and Business Models of BESS at Distribution Downstream’ and ‘Use Cases of BESS at the Distribution Level’. Experts from various domains of the grid-scale BESS ecosystem including key investors/funders will share their views on the theme. An interactive Q&A session will follow.