The business case for energy storage systems in the APAC region

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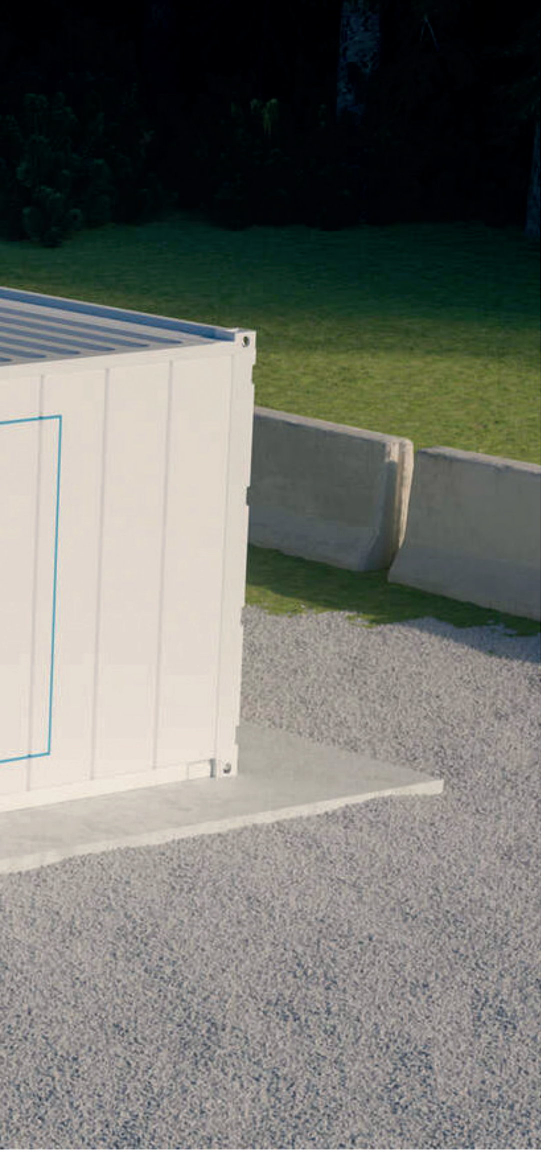
The Asia Pacific (APAC) region is in the early stages of a transformational energy transition that requires progressive, widespread switching from fossil fuels to variable renewable energy sources (VRES) such as wind and solar power. This presents both opportunities and challenges.



The growth in installed and planned VRES generation capacity has provided investors with increasingly attractive opportunities and projects. With renewable energy generation expected to increase by 47% between 2021 and 2030, the APAC region is witnessing a large increase in renewable energy project development. This is as a result of the various technologies' cost competitiveness, as well as government actions to increase renewable energy penetration in the power generation mix.

Energy storage: business cases

ESS are on the path towards becoming increasingly commercially viable, and our three business cases from the APAC market have shown that storage can deliver value by enabling fast-start capabilities and peak shaving for VRES. The co-location of storage and renewable energy sources also means investors and developers can deploy storage to offset any potential balancing costs they would incur due to intermittent generation. In addition, we describe potential revenue generation streams by providing ancillary services such as frequency containment reserves.

Once the economics of a technology solution with compelling benefits make sense, it can quickly gain traction and scale-up commercially. The three business cases described below centre on BESS becoming increasingly commercially viable through technological advances, cost-learning effects, and by offering services.

Business Case 1: network upgrade referral

Studies[1] have shown that capacity avoidance or deferral is the biggest source of value for energy storage in the long run. Energy storage complements other fixed assets in the network and allows for better planning and operation of the network. The addition of storage can defer transmission upgrades as it can address the issue of congestion in the network by delivering power during periods of low use and more available capacity. Without such a solution, utilities would typically need to address the issue of congestion through network upgrades and new transmission lines. Therefore, this is a valuable service that can be provided by ESS, but the key issue globally and in the Asia Pacific region, is the need for market rules to be adapted to appropriately value such services and incentivize ESS projects adequately.

Business Case 2: boosting grid stability as more VRE capacity is connected

Utilities can deploy ESS while meeting their growing obligation to increase the number and capacity of distributed energy resources (DERs) connected to grids and maintaining stability. Among the benefits that ESS can offer here are fast-start, frequency containment reserve, FCR, and peak shaving. The latter in particular is a key factor in avoiding further carbon emissions. In many markets in the Asia Pacific region, high loads during peak periods are covered by thermal or fossil fuel plants which are typically natural gas fired. Therefore, ESS can provide a low-carbon alternative provided the system is charged using renewable or low-carbon power. Utilities and regulators in the Asia Pacific region are in the process of determining adequate compensation measures for grid stability services, but the main impediment is the current low penetration of renewable energy. Once renewable energy penetration increases to the point where grid stability is a real rather than a theoretical cause for concern, there is likely to be an increasingly attractive commercial scenario for ESS.

1 Long-run system value of battery energy storage in future grids with increasing wind and solar generation - ScienceDirect

Business Case 3: benefits of co-location with RE

Investors and developers of RE can deploy ESS to offset any potential balancing costs they would otherwise incur due to intermittent generation. There is also a potential revenue generation stream in offering ancillary services such as FCR, provided such a framework exists in the market to allow participants to bid their offerings. This is not the case in many parts of Asia Pacific where markets can be cost-based and purely PPA oriented causing such services to not be cost-efficient while precluding new entrants in the market. Other than ancillary services, there are also arbitrage opportunities from storing energy when it is being produced cheaply and bidding to supply it when market prices will result in profit.

Reducing costs

Lithium-ion battery costs continue to fall while performance rises as the technology moves rapidly down the cost-learning curve and technical advances improve its characteristics and efficiency for applications including utility-scale ESS. This points to lower capital costs, and hence reduced financial risk, for tomorrow's Lithium-ion BESS compared with facilities of the same scale today. Or, looked at another way, more storage capacity for the same cost as today.

Then there are the operational cost savings than can pass through to stakeholders in the electricity value chain and on to consumers. It has been estimated that the Hornsdale

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Power Reserve led to more than AUD 100 million savings in South Australia's energy costs in 2019, when the ESS also helped restore the grid to normality within minutes of an interconnector equipment failure islanding the power system in that part of the country.

Increasing bankability

The three business cases illustrated the potential for ESS to supply multiple services simultaneously. This creates the possibility of 'layering', selling multiple services to a customer to maximize the potential revenue stream, and thereby increasing the bankability of a storage project.

Not only will layering, also known as 'value stacking', counterbalance technology challenges and regulatory risks, it also helps strengthen the business case of a storage project while also offering a risk-management tool based on diversifying sources of revenue.

Technology Bankability

Assessment of critical technologies is required in an energy storage project, such as a BESS, if the project is financially leveraged. DNV's well-established framework for technology bankability assessment is well accepted by the investment and insurance industry. A bankability report reduces the risk exposure in an investment and helps to even up information imbalances between manufacturers and buyers across international boundaries.

Warranties are also critical to the bankability review for an energy storage product or project. For storage projects, they are the foundation on which all other supply, commissioning, operational, service, and financial documents are built. Even with significant improvements in cell and system technology alongside cost reductions, warranty terms have become more complex.

There is no industry standard yet, and the battery degradation curves can vary widely across various Lithium-ion battery cell types. When DNV reviews capacity warranties we look closely at the annual degradation curve provided, how it is measured, how performance is calculated, and any other operational restrictions imposed on the project for the warranty to remain valid.

Optimising energy storage projects

Operating storage is significantly different from operating fossil or RE power plants and requires different strategies for each application. Drawing on our experience of the regulatory and technology challenges and opportunities worldwide, DNV conducts analysis to assess the potential role and value of energy storage for the electricity supply systems, including identifying optimal configurations, sizing, and locations of potential ESS.

More than five million hours of energy storage testing has been logged in our US-based laboratory, which directly translates to experience that we deploy in our role in supporting the successful development of projects globally and in the APAC region. This helps to compensate for the power and utilities industry's general lack worldwide of operational storage site data, a knowledge gap that represents a 'growing pain' for a sector considering whether and how to use ESS technologies.

Regulatory and governmental policy risks

Navigating the regulatory and governmental policy risks involved requires in-depth local experience, insight, and human networks to avoid making potentially costly decisions to invest in ESS in what could turn out to be the wrong project in the wrong place at the wrong time.

Conclusion

The markets in the Asia Pacific region represent a complex mix of differing ambitions and levels of development when it comes to variable renewable energy source such as wind and solar. This is reflected in their varying needs and propensity to encourage the addition of energy storage to their energy systems, whether or not the storage has a grid-scale capacity and is connected to national grids, or whether it forms an integral part of microgrids bringing a reliable and cleaner energy to rural and remoter communities.

As the energy transition in the region accelerates, there will undoubtedly be more, and greater, opportunities for energy storage to play a key role in overcoming the intermittency and curtailment barriers to renewables.

www.dnv.com/power-renewables/generation/wind-energy.html

ESS business cases	Layering potential
Network upgrade deferral	Low
Increased grid stability in light of higher volume of VRES in the system	Higher
Benefits of ESS co-location with RE	Highest

Layering potential of 3 ESS business cases