United arab emirates energy storage applications

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*The Gulf Arab states’ utility-scale energy storage market is expected to reach 1.5-2.5GW by 2027, compared to 0.1GW of capacity installed by 2021. This will constitute a growth of at least 15-fold by 2027 despite limited policy support, and persistent market and financial challenges.

*In the region, batteries are currently the largest source of energy storage system (ESS) and are dominated by the United Arab Emirates. These technologies will contribute significantly to planned capacity expansion, mostly through a large single-site application in Saudi Arabia. Additionally, pumped hydro storage is expected to provide half of storage expansion through announced projects in Saudi Arabia and the UAE.

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Increasing deployment of large-scale grid-integrated Energy Storage Systems (EES) in Gulf Arab states is being driven by the implementation of renewable energy systems. More and more, variable renewable energies are being integrated into the grid as upgrades to transmission and distribution networks are being deferred. As a result, demand for ESS is likely to grow.

Planned to expand at least 15-fold within the next four years, the announced large-scale storage systems in Gulf Arab states are together expected to exceed 1.5GW of capacity by 2027, with 7.5GWh of cumulative stored energy deployed through several notable projects in Saudi Arabia and the United Arab Emirates (UAE). Separately, a 1GW dam in Wadi Baysh, Saudi Arabia faces an uncertain fate. If the project proceeds, then the region"s combined storage capacity will reach 2.5GW by 2027, with a stored energy capacity of 13.5GWh.

This represents additions of 1.4-2.4GW of capacity, which is expected to be online by 2027, up from 0.1GW

in 2021. This will increase stored energy from 1.8GWh to 11.7GWh. For comparison, the European energy storage market reached 3GW/4GWh by the end of 2021 according to Bloomberg NEF, whilst on a global scale, a record 10GW/22GWh was installed in 2021.

The ESS market has had a slow start in the Gulf, but renewable energy and, by extension, storage indicators - such as electricity demand, committed renewables targets, and grid status - highlight potential for fast growth. Historically, Gulf Arab states" rapid increase in power consumption prompted a race to boost power generation capacity. Consequently, the annual growth rate of installed generation capacity in Gulf Arab states averages 7%-10%, compared to a global rate of 6%. Oil producers are now adding renewable energy to their sources of power generation, thereby freeing up oil for exports - and increasing revenues as a result.

To achieve the goal of freeing up oil for export and mitigate the impact of climate change, Gulf Arab states have pledged ambitious 2030 renewable energy targets ranging from 15% of power generation in Kuwait to 50% in Saudi Arabia. Although renewable energy has yet to make a dent in the Gulf Arab power mix, these states have the opportunity to leapfrog renewable energy project development. Fast-tracking renewables in the Gulf is enabled by a strong renewable energy resource base, favorable financing terms and lower project development risks compared to many developed and developing countries.

Storing large quantities of electricity in various ESS can address the variability of renewable energy technologies and manage the need to curtail or quickly ramp up power generation. This is also an attractive option considering the chronic investment deferrals for network upgrades which target transmission and distribution operations. In addition, different ESS applications provide a variety of benefits such as grid services, including frequency regulation and energy arbitrage, among other ancillary services.

Energy storage systems vary in technologies, applications, and characteristics. Indeed, energy storage technologies fall within one of the following categories: mechanical - such as pumped hydro storage; electrochemical - as in batteries; thermal - such as molten salt; chemical - like hydrogen; and electrical supercapacitors. Despite this variety, technology market trends in the Gulf are largely in line with global trends, focusing on pumped hydro storage and battery applications.