Hybrid power project

Hybrid power project

Solar + wind, solar + storage, wind + storage—even fossil fuels combined with renewable energy—are supporting the growth of hybrid power plants that are breaking the norms of traditional power generation.

Much of the discussion about the ongoing energy transition focuses on hybrid power plants, those generation facilities combining a variety of technologies to produce power beyond traditional electricity resources. Hybrids can include microgrids, along with utility-scale solar and wind projects co-located with energy storage. Advocates for renewable energy see hybrids as a way to integrate more of their energy along the power grid. Hybrid installations also can include the use of fuels such as natural gas and diesel.

The recently passed Inflation Reduction Act (IRA) is expected to support development of hybrid projects, and already has spawned some U.S. installations. A project in Oregon that recently came online is one example; it’s a utility-scale plant that combines wind and solar generation with energy storage, according to joint developers Portland General Electric (PGE) and NextEra Energy Resources. Companies also are looking at designing hybrids using hydrogen, geothermal, and pumped hydro storage.

Research groups that track these plants and compile deployment data, such as the Lawrence Berkeley National Laboratory, note that hybrids involve two or more generation sources, but there is no “one size fits all,” as the size and scope of hybrids can vary widely.

Hybrid power plants can provide many important ancillary services, including “frequency regulation, reactive power and voltage control, and operating and spinning reserves, among others,” said Kohlstedt.

The Berkeley lab earlier this year released its annual update of operating hybrid plants. Its data showed that at the end of 2021, there were nearly 300 hybrids—those with greater than 1 MW of capacity—operating across the U.S, totaling nearly 36 GW of generating capacity and 3.2 GW/8.1 GWh of energy storage. Solar-plus-storage facilities (Figure 1) are the most common; the largest such plants are in California, Texas, and Florida.

The report said much of the new energy storage capacity in the past year was adding batteries to an existing solar array. The Berkeley researchers identified nearly 20 other hybrid plant configurations, including several incorporating fossil fuels, with those installations “dominated by the fossil component,” according to the report.

Ron Hopgood, division manager for Rosendin’s Renewable Energy Group, told POWER: “Outside of the completely new installations where both PV [photovoltaic solar] and BESS are built

together, we are seeing a lot of applications where we are being asked to go back and integrate a battery storage system to an existing PV facility.”

David Lincoln, senior vice president of the Rosendin group, said the company has “a number of AC- and DC-connected PV + storage projects in various stages of development and construction.” A few examples are the Scarlet I PV + BESS AC-connected project in Fresno County, California, that combines 284 MWdc of PV with 160 MWh of BESS, and the Sonrisa PV + BESS DC-connected project also in Fresno County.

Lincoln said, “First and foremost, hybridization of renewable energy [RE] projects addresses the biggest issue for wind and solar projects, which is power production variability. Integrating BESS solutions on existing PV/wind plants provides for time-shifting of power availability to periods where demand is higher and RE power production is low or non-existent. While providing power outside of typical RE production periods is critical, it also provides developers with significant commercial benefits by allowing developers to better forecast power availability and more flexibly engage in electricity markets.”

Said Coon: “In the case of Townsite, the inclusion of an energy storage system enables Arevon to shift the energy generated by up to four hours to supply electricity to the grid during hours of peak demand in the afternoon and early evening, helping to improve grid reliability.”

“One of the challenges with renewable energy is the intermittency of the resource,” said Daniel Casement, director of Power Markets for Arevon. “By combining the wind or solar with BESS in a hybrid configuration the battery can firm up the renewable energy so it can produce flat, predictable blocks of energy for each hour. Depending on the size of the BESS it can also shift the renewable energy to times of the day when loads are highest and provide dependable, clean energy when the grid needs it the most.”