Energy storage for grid stability brazil

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The rapid growth of renewable energy in Brazil has not been matched by transmission and distribution infrastructure. Connection restrictions for both “distributed-” and centralized-generation sites are leading companies to adopt new strategies to maintain expansion, reports pv magazine Brasil"s Livia Neves.

Grid connection queues in Brazil are offering new opportunities for energy storage and hybrid systems and opening new energy business models. Renewables companies including Auren, Statkraft, and Casa dos Ventos are adding solar and batteries to their utility-scale wind power sites to use existing power transmission capacity.

Batteries are also making inroads into small-scale, distributed generation in response to connection shortages to the utility-run, low-voltage distribution network and to power failures in states including S?o Paulo. In addition, businesses such as France"s GreenYellow are adopting a "zero-grid" approach focusing on generation at the point of consumption without injection into the grid. GreenYellow has previously added more than 200 MW of remote-generation solar capacity to the grid.

Casa dos Ventos has told pv magazine Brasil it will begin construction in 2024 on 300 MW of solar in Bahia, with 200 MW to be added to its under-construction 553 MW Babil?nia Centro wind site and 100 MW at its operational, 360 MW Babil?nia Sul wind farm. In May 2024, solar development engineering manager Guilherme Castro said the solar plants will share transmission system connection with the turbines, with access granted in April 2024.

Those plants will provide energy under the "autoprodu??o," or self-production model, in which the end user becomes a partner in the project and receives discounts on some taxes and on transmission system charges. While self-production electricity is more costly than current low wholesale prices, it is less volatile and the arrangement makes new renewables sites more viable in the low-electricity price environment.

Casa dos Ventos" newly hybridized sites will have to stick to the energy transmission deals signed for the original wind plants, raising the risk of curtailment of any excess power generated. "Naturally, if there is a limit, curtailment can happen so solar sizing is a sensitive point," according to engineering manager Castro.

Properly dimensioned solar can help wind power generation, by controlling reactive energy with solar inverters, for example. "In the case of associated plants, if the system operator orders a restriction, it"s easier to cut solar and keep wind because wind turbines have a mechanical inertia," said Castro. That opens up a market for solar companies, he added. "One of the [solar] sector"s main pains is the difficulty of accessing the grid. For solar companies that don"t have wind expertise, searching for a wind partner that isn"t already looking at this could be an opportunity."

Shading from wind turbines is less of a problem than in other countries because of land availability in Brazil, and Castro said Casa dos Ventos" sites will achieve a lower overload between panels" direct-current generation capacity and the alternating-current rating of their inverters. He cited an "overload ratio" of "between 1:1 and 1:15, depending on the value of the dollar and the panel. We"ve seen 20%, or 1:2. In the case of a curtailment, that"s cheaper."

Curtailing excess power is cheaper than batteries, said Castro. "The battery could help deliver flat energy but in our analysis, at today"s battery price, it"s still not worth optimizing. But there is an acceleration in the fall in costs which could make the alternative viable."

Norwegian developer Statkraft will include batteries in its BRL 926 million ($181 million) solar hybridization of the Ventos de Santa Eug?nia and Morro do Cruzeiro wind sites in Bahia. With a total generation capacity of 275 MW, construction at the latter should begin in June 2024 and end in August 2025. Building will begin at Ventos de Santa Eug?nia in July 2024 and finish in November 2025.

In November 2023, Auren Energia inaugurated its 48.1 MW Sol do Piau? solar plant next to the 206 MW Ventos do Piau? wind farm, which has operated since 2021. The BRL 255 million hybridization project, in Curral Novo, Piau?, was the first approved by state body the Ag?ncia Nacional de Energia El?trica (Aneel). In 2021, Aneel introduced hybrid plant permissions - featuring shared licenses - and associated plant permits, with separate licenses but enabling new installations to be paired with operating assets.

A flurry of applications for small solar arrays was prompted by a deadline for a program under which generators would receive like-for-like credit for excess energy injected into the grid. That regulation applied to systems up to 5 MW in scale, although the vast majority of such projects have up to 75 kW of generation capacity. Many of the requests were turned down by electricity distribution companies, however, who claimed that reversing the flow of power in areas with many distributed-generation systems could cause overvoltage in the grid.