Distributed energy systems chile

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Distributed energy resources in Chile can be classified into two categories. The first includes power plants with an installed capacity of up to 9 MW, connected to the electricity grid via distribution lines within the area served by the distribution company (PMGD, in Spanish) or via transmission lines (PMG, in Spanish). The second category comprises net billing facilities up to 300 kW, which are exclusively connected to the grid through distribution lines within the distribution company"s (DisCos) service area.

Part of the success of PMGDs can be attributed to the special economic regime provided by regulation. From the outset, PMGDs have had access to an alternative economic framework when selling energy to the system, allowing them to choose between a "stabilised price" or selling their generation at the marginal price.

It is important to note that Chile"s electricity system operates in a two-tier market: (1) the market among generators, or "spot market", where energy is valued and sold at the marginal price at the specific node where transactions occur; and (2) the contract market, where generators can sell energy to end customers through PPAs.

Although PMGDs can sell energy to end customers via the PPA market, they benefit from this special economic regime when selling energy in the spot market. Under the "stabilised price" regime, PMGDs gain access to a predictable and certain cash flow, reducing the requirement of PPAs for securing financing. It is, therefore, unsurprising that two-thirds of PMGDs operate under the stabilised price regime.

Regulatory changes are not the only challenge for PMGDs. Infrastructure limitations are also affecting their ability to inject and sell energy into the system. Transmission congestion, constraints within distribution lines or networks, security concerns by the operation of a myriad of PMGDs in a concentrated zone (mostly in the central part of Chile), and intense competition for available positions in the relevant infrastructure are making the path for new PMGD projects increasingly arduous and challenging.

Despite their initial success, PMGDs are currently experiencing a degree of deceleration. According to data from Chile"s ISO, there were 493 PMGDs in operation in 2022, but by 2023, this number had fallen to 322 connected PMGDs.[7] Other figures indicate a reduction in growth rate of approximately 11 per cent between 2022 and 2023.[8]

As mentioned, one of the primary drivers of this slowdown is congestion in transmission lines, which limits PMGDs" ability to feed energy into the electrical grid and sell it to other generators or end users. Data from Chile"s ISO of May 2024 highlights a significant rise in substation-level congestion, from none in 2020 to 56 substations in 2024. This congestion also affects other infrastructure, including transformers, many of which are experiencing an inversion of electrical flow due to the integration of PMGDs. This, in turn, increases the likelihood of transmission congestion.[9]

As expected, transmission congestions means that PMGDs face restrictions when attempting to inject energy into the grid. According to current regulations, if transmission congestion is detected during the connection process with the distribution company, the connection can only be authorised to the extent that the transmission lines can physically support it. Therefore, even if a PMGD has additional capacity, its energy output will be limited by the capacity of the relevant transmission lines.

At the system level, transmission constraints result in energy curtailment, which disproportionately affects renewable energy sources. According to Chile"s ISO, by June 2024, curtailment had reached 2,046.77 GWh of wind and solar generation, representing a 243 per cent increase compared to the same period in 2023.[10]

In this context, PMGDs, which are predominantly solar, can be seen as indicative of broader challenges within Chile"s generation system, particularly the significant limitations on feeding and selling energy into the market due to infrastructure constraints.

One solution is to move power - mainly solar - from periods of the day when it cannot be consumed due to these limitations to times when it is more needed, and alternative sources of generation - primarily renewable energy - are unavailable. In essence, this involves using storage to move the daylight into the night time.

Storage capacities are rapidly advancing in Chile. As of July 2024, there are 26 standalone energy storage system projects nationwide under environmental evaluation in the SEIA (Environmental System), equivalent to 2,103 MW of installed storage capacity, 10,639 MWh of stored energy, and an investment of US$2.8bn.[13]