Chile grid stabilization

Chile grid stabilization

High-voltage transmission towers in the Atacama Desert in northern Chile. A new 1,342-kilometre power line is being planned to help connect solar and wind energy projects to the country"s grid. (Image: Jon G. Fuller / Alamy)

According to Chile"s National Energy Policy of 2021, energy generation is responsible for 77% of the country"s greenhouse gas emissions. Transitioning to a cleaner energy system to lower these emissions is therefore a huge national challenge, but one Chile has made strides towards in recent years: its installed solar and wind energy capacity generated 37% of the energy in the system last year, the same percentage contributed by thermal energy.

However, according to a 2023 report by technology consultancy Fraunhofer Chile, the country"s rapid renewable energy capacity growth has also created a number of challenges, with its underdeveloped transmission infrastructure having been unable to keep up with the pace of change. This has resulted in what is known as curtailment.

The concept of curtailment evolved from terminology used for dams, explains Jorge Leal, an expert in renewable energies: "When dams have excess water, they have to spill some. So, when there is excess supply, power plants are also forced to get rid of energy - to curtail - and they start with those with variable production costs that are equal to zero, such as solar and wind power plants located in northern Chile."

Leal says this energy curtailment arises because there is an oversupply of energy during sunlight hours, especially in the north and centre of the country, where many solar plants are located. This is because of the availability of land and the high levels of radiation, Leal adds. Furthermore, the demand for energy in the north of Chile "is not so great", as its urban centres such as Arica and Iqique are not very large and have no significant industrial sectors.

Following a call for tenders in 2020 from the National Electricity Coordinator (CEN), Chile"s grid operator, the Kimal-Lo Aguirre project was awarded to China Southern Power Grid (CSG) in 2021, in collaboration with the domestic companies Transelec and ISA Inversiones Chile.

State-owned CSG is one of China"s two major state-owned power distributors, and bought 27.7% of Transelec, Chile’s leading power transmission company, in 2018. The resulting consortium that will oversee Kimal-Lo Aguirre was named Conexi?n Energ?a. Works are yet to begin, but a goal of completing the project by 2029 has been set.

Di?logo Chino spoke to Conexi?n Energ?a"s general manager, Sebasti?n Fern?ndez. He points out that Kimal-Lo Aguirre will be the first high-voltage direct current (HVDC) project built in the country. This type of technology, he says, is widely used in other countries that share Chile"s characteristics of "a large geographical extension and with focal points for renewable energy generation sources". He highlights that Brazil, the United States, Canada, Norway, Sweden and China have had such long-distance lines for many years.

Power stations must be able to transmit electricity across long distances to reach electrical substations for distribution, which requires very high voltages. This high-voltage transmission can be achieved using either an alternating current (HVAC) or a direct current (HVDC).

In comparison with HVAC, HVDC can carry more power across longer distances while shedding less energy along the way. Furthermore, HVDC can transmit a higher voltage than HVAC through a cable of the same thickness, all while using smaller, cheaper power towers. These efficiency and financial considerations make HVDC preferable for transmission lines like the 1,342-kilometre Kimal-Lo Aguirre.

Among the advantages of HVDC technology, Fern?ndez highlights the reduced need for circuits and cables. It also eliminates intermediate substations, "which generates a lower impact on the land and a considerably lower cost".