Patagonia has been pivotal to Chile's transition to renewable energy.

CHILE'S BET ON GREEN HYDROGEN

The country aims to be the world's cheapest producer of the alternative fuel

John Bartlett

Tucked between fjords and islets on the blustery shoreline of the Magellan Strait, the tiny city of Punta Arenas sits at the tip of South America, just above the Antarctic Circle.

Wind tears at the flags on the façade of the regional governor's offices as locals traverse the main plaza, seeking refuge in the saloons and restaurants around the center of town.

Magallanes, Chile's southernmost region, whose capital is Punta Arenas, is sparsely populated and largely unspoiled. But this pristine swath of Patagonia could soon be the beating heart of a global transition toward renewable energy.

Chile, a country of 19.5 million people, is positioning itself at the forefront of this shift, and Patagonia's strong winds offer one of several tantalizing possibilities.

"Our country's conditions are favorable to continue leading the way in the development of renewable energies," says Diego Pardow, Chile's energy minister. "Our technical renewable potential is among the best in the world."

From fierce solar radiation in the Atacama Desert to the blustery plains and valleys of Patagonia, Chile's renewable potential is indeed vast. Strong ocean currents, geothermal energy, and hydroelectric power from the rivers rushing through the central and southern valleys are also being harnessed.

And added to that, almost half of the world's known lithium reserves—crucial for battery technology—sit under the salt flats in Chile's arid north. A series of shallow turquoise and blue pools sit on the surface, evaporating lithium-rich brine to be refined and exported.

As such, Chile has made some ambitious promises. It has committed to carbon neutrality by 2050 and pledged to close or repurpose all of its 21 coal-fired power plants by 2040, and its energy matrix is steadily becoming cleaner.

According to the energy ministry's latest figures, in August this year, 58 percent of the nearly 30,000 megawatt capacity of the national grid came from renewable sources. That proportion will reach 62 percent next month with several projects coming online imminently.

However, the centerpiece of the country's ambitious bet on renewables is "green" hydrogen, a clean fuel source with the potential to revolutionize global energy supply.

The International Renewable Energy Agency estimates that hydrogen will account for as much as 12 percent of global energy use by 2050 and has identified Chile, Morocco, and Namibia as countries that could emerge as green hydrogen exporters.

"Chile holds a comparative advantage for the production of green hydrogen because it has great

potential for generating renewable energies with extraordinary levels of efficiency," explains Pardow.

To split the molecules into hydrogen and oxygen, a current is passed through water in an electrolyzer. The energy released is fed into the national grid; the hydrogen is captured, stored, and transported to be used in zero-emission fuel cells—or combined with carbon dioxide to make synthetic ammonia for fertilizers or methanol as a gasoline substitute.

The "green" element refers to the source of the energy—in this case, renewable.

Currently, 95 percent of the world's hydrogen is produced using energy derived from hydrocarbons—known as "gray" hydrogen. But Chile's plentiful renewable energy sources make it a potential hub for the sought-after green variety.

An ambitious national green hydrogen strategy, presented in November 2020, aims for Chile to be producing the world's cheapest green hydrogen by the end of the current decade—and to have broken into the top three exporters globally by 2040.

Yet at present, Chile doesn't produce any green hydrogen on an industrial scale. And while consensus on the need for the energy transition is broad, not everyone is as enthusiastic about what could happen to the regions where this potential is set to be realized.

"Tierra del Fuego could become a sacrificial zone," says Diego Luna, 49, a Uruguayan conservationist who arrived in Chile 26 years ago. "We need to be very careful how we go about this."

Luna is concerned about wind turbines placed in the flight paths of up to 60 species of migratory birds. Dolphin and whale populations could also be affected by an increase in maritime traffic if exports take off.

In 2021, Chile's government estimated that 13 percent of the world's green hydrogen could eventually be produced using wind energy from Magallanes and Chile's Antarctic claim—amounting to 126 gigawatts.

According to Luna's estimates, that would require the installation of at least 13,000 square kilometers of wind turbines.

But despite reservations, Patagonia's hydrogen rush could already be underway. Companies are beginning to use Chile as a proving ground for green hydrogen technology.

"This is a gigantic area to develop hydrogen as a viable and realistic option to decarbonize the planet," says Fernando Meza, the business development manager at Enel Green Power Chile, a subsidiary of Italian energy giant Enel.

The company is one of the leaders in the sector, with nine wind farms operating in Chile. By the end of the year, it will open its Haru Oni pilot project, with the aim of producing an annual yield of 350 tons of synthetic methanol and 130,000 liters of gasoline—it will be an important step in assessing the feasibility of Patagonian green hydrogen.

The next phase, says Meza, is to push ahead with the 38-square-kilometer Faro del Sur wind farm at Cabo Negro, just north of Punta Arenas. The $500 million, 65-turbine facility would generate 325 megawatts of green hydrogen energy, although it was withdrawn from Chile's environmental evaluation system recently because of "exceptional demands."

However, Meza expects it to go ahead following negotiations with authorities.

"Defining limits and ways of developing the industry sustainably is a job for both the public and private sectors," he says, adding that he hopes for further support from the government.

In December, the Chilean government pledged $50 million in grants to six green hydrogen projects the length of the country, including $17 million granted to the Faro del Sur project.

The energy ministry projects that, through a mixture of public and private funds, investment in green hydrogen and other derivatives could reach $45 billion by 2030—and $330 billion by 2050.

But the infrastructure required will have a significant effect on Punta Arenas, which, barring a detour through Argentina, cannot be accessed by land. Most supplies arrive by boat, and schools, hospitals, and other services will be stretched by even a modest wave of workforce arrivals.

For now, Magallanes remains wild. But change could be just around the corner.

Meza says that within two to four years, Enel will have a good handle on the feasibility of green hydrogen in Patagonia.

"If all of this investment comes to pass, we are looking at a radical change to the Magallanes we know today," says Luna, the conservationist.

"Socially, culturally, physically, and economically this place will be unrecognizable. And I'm not sure we've thought about that enough." FD

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