Home energy storage iceland

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Beneath the road on a snow-dusted mountain in the Hellishei?i region of southwest Iceland, a river of boiling water flows through porous, volcanic rock. Above, thick steel pipes connect to geodesic domes, each of which houses a geothermal well.

Stein??r N?elsson, a senior geologist with ISOR (Iceland Geosurvey), parks his car near one of the rounded huts. He and his team analyze rock samples taken from boreholes to figure out the best way to drill, and then track how the supply of hot water is affected by tapping its steam, which is used to create electricity for this area, as well as the capital of Reykjavik.

The repercussions are epic: volcanic eruptions, earthquakes and a massive geothermal resource that, over the past century, has transformed Iceland from impoverished nation to the 15th richest country in the world. While the rest of Europe worries about turning down the heat or turning back to coal, Icelanders enjoy risibly low energy bills and an enviable quality of life, thanks to an abundance of water, most of which is scalding hot.

Today, every home in Iceland is heated with renewable energy: 90% from district heating systems that tap hot water directly underground and 10% from electricity generated either using steam from that water or hydropower. One-hundred percent of the country"s electricity is also renewable.Getting there was neither easy nor cheap. Voters needed to be persuaded to abandon coal, funds raised for new infrastructure, technologies created and then embraced. A big part of Iceland"s success comes down to leverage, N?elsson reflects, as we crunch our way through mounds of volcanic scree between the wells.

It"s taken almost a century, but the country has managed to maximize the social benefits of renewable energy, as well as the economic and environmental ones. Once thick with smog, the air over Reykjavik is now crystal clear. Homes are toasty, heated by naturally boiling water that"s also used to warm the multitude of outdoor swimming pools Icelanders consider an essential resource during the cold, dark winters.

"In England, you go to the pub after work," N?elsson says. "Here, you sit in a hot tub, 38 or 40 degrees, and discuss the news and politics and football. This is where a lot of community is taking place."

There are lessons here for other countries about the benefits that can be leveraged from bold investments in renewable energy. And even countries not sitting on active volcanoes may be able to utilize lower-temperature geothermal energy, says Gabriel Melek, chief of staff at Fervo Energy, a geothermal technology company based in Houston, Texas. The key is how deep you need to drill, and whether the rock is permeable. "You don"t need to be in the goldilocks situation to have geothermal deployed at scale."

A short drive from the mountain, the overlapping benefits that can be leveraged from abundant geothermal energy are on full display at the Hellishei?i Power Station. Surrounded by hills, its glassy, triangular visitor"s

center rises, volcano-like, from a hardened lake of moss-covered lava; bumpy-black basalt softened by luminous, velvety green. The area doubles as a recreational site; hiking trails weave through the geothermal field and Icelandic horses carry riders on valley treks beside the network of zig-zagging green-painted pipes carrying hot water to Reykjavik.

The plant itself is a tourist attraction, complete with a gift shop. It"s also the cornerstone of a high-tech incubator, powering a cluster of businesses on site that, in turn, are doing their own work to decarbonize the planet. The world"s first direct carbon capture facility, called Orca, is here, built by Swiss startup Climeworks AG. Its fat cigar-shaped filters quiver in the wind like something out of Dr. Seuss as they suck in what looks like crystal clear sub-arctic air. Because of the way invisible greenhouse gases swiftly disperse, it"s as likely to contain the C02 from a fleet of New York taxis or a Mumbai factory.

The problem of what to do with all that hoovered-up carbon is solved by another expanding business onsite, Carbfix. It takes most of Orca"s captured carbon and injects it deep into Iceland"s porous underground rock, using the same pipes and injection wells used by the power plant to return spent brine into the ground after it"s used to generate electricity.

There"s an algae farm here as well, Vaxa Technologies, that borrows the power plant"s water, and repurposes some of its carbon emissions, to produce sustainable human and fish food. And, just a short drive from Hellishei?i, the same geothermal energy is used to heat a cluster of eight greenhouses in the small town of Reykir. Renewable power has proven key to bolstering Iceland"s food security: Despite cold winters with as little as five hours of daylight, the country manages to grow all of the cucumbers and 60% of tomatoes used domestically.

"This is the only time in the history of Iceland that foreign investment is knocking at our door. We have usually been knocking at their door," says Gu?laugur ??r ??r?arson, Minister of the Environment, Energy and Climate. "Most of them are looking for the same thing: green energy. And it"s obvious that we cannot fulfill everyone"s needs. We need to pick and choose."