Using heat from underground parking lots to warm apartments

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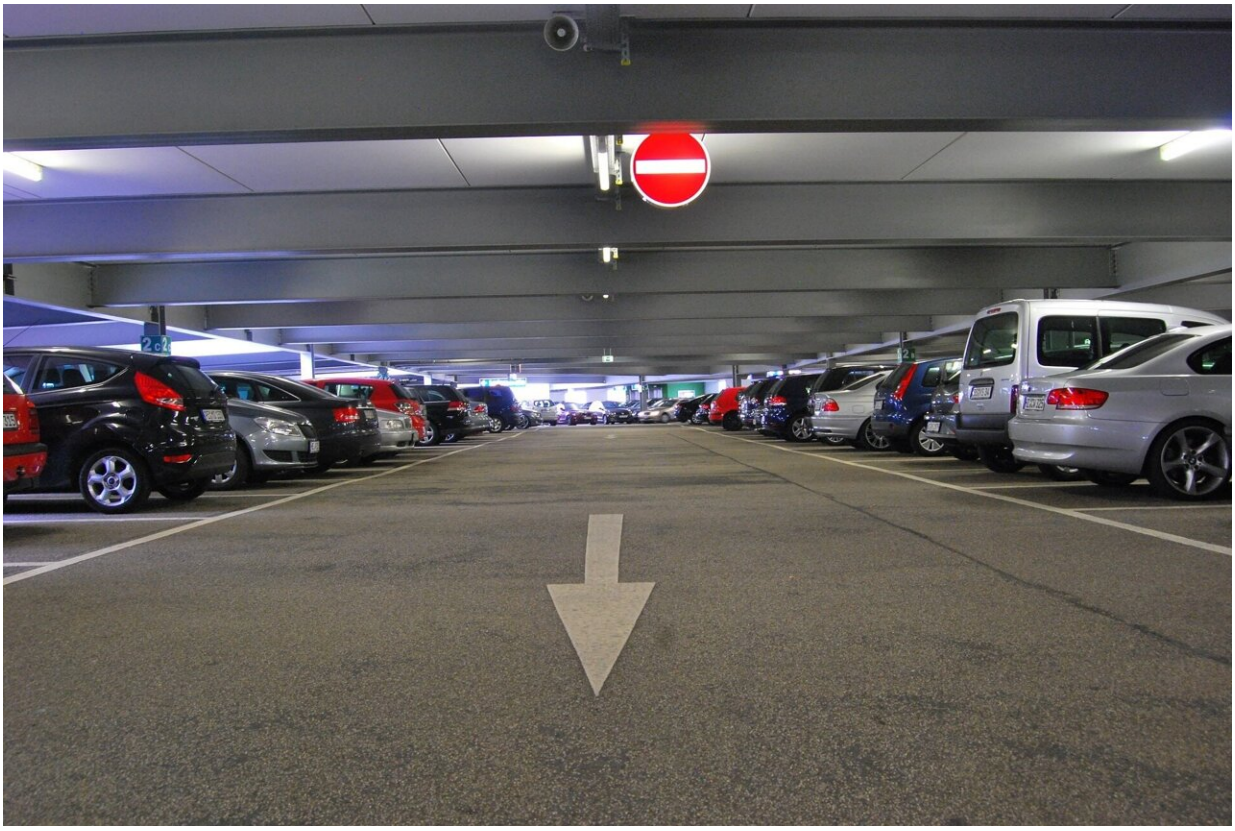

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Over a third of the energy used in Switzerland each year goes to heating. And nearly 60% of the heating used in Swiss residential buildings originates from fossil fuels—making Switzerland the biggest such

consumer in Europe. The good news is that the country's fossil-fuel reliance should decrease in the coming years, thanks to incentives by the federal and cantonal governments, advances in insulation materials and new technology. A growing number of building owners are installing hybrid systems that draw on different types of energy in order to limit the use of fossil fuels—and Enerdrape's technology is for precisely these kinds of systems. Its geothermal wall panels can be installed in underground structures and recover the heat located in the soil. The panels are currently being pilot-tested at a parking lot in Lausanne's Sébeillon district, where they should be able to supply up to a third of the energy needed to heat the 60-odd apartments in the building above.

Constant heat all year long

Enerdrape's system is designed to make maximum use of underground walls and exploit a natural, sustainable resource in places where it would otherwise go untapped. It consists of ten blue-and-white panels measuring 1.3m x 0.7m and made of a metal no thicker than a painter's canvas. Each panel functions as a heat exchanger that captures both geothermal and ambient energy. A heat pump then circulates this energy throughout the building above, providing a constant supply all year long. "The soil temperature doesn't vary once you get a few meters below ground," says Margaux Peltier, the CEO of Enerdrape. "That means the energy generated by our panels isn't dependent on weather conditions or the time of year."

With their stylish design, the panels give the dreary parking lot walls a facelift. But that's obviously not the reason why Alberto Simonato, director at Realstone—the company that owns the Lausanne parking lot—agreed to test out Enerdrape's technology. Realstone also supported Enerdrape in its application for a BRIDGE Proof of Concept grant from the Swiss National Science Foundation and Innosuisse. "We often encourage startups that are developing innovative technology for

reducing CO_2 emissions—an issue on which we take a proactive stance and are one step ahead of Switzerland's federal and cantonal building standards," says Simonato. "We're also working with another EPFL startup to install remote meters on some of our buildings' heating and water systems." Realstone owns five buildings in the Sébeillon district with a total of 356 apartments. "If Enerdrape's panels prove to be as effective as we expect, we could install them on the soil-abutting walls of a 275-place parking lot, or in some of our other buildings," says Simonato.

Enerdrape's cofounders spent two years conducting a range of underground tests at EPFL in order to verify the market potential of their technology. Peltier in particular evaluated different heat-exchange fluids and tube sizes as part of her engineering research at EPFL's Laboratory of Soil Mechanics. In the end, the yield delivered by the panels turned out to be better than expected. It's also true that today's cities generally have more space available in underground parking lots than they do for installing other types of renewable energy systems. And the walls of underground structures often constitute space that otherwise wouldn't generate income, in parts of cities where real estate can be pricey. Enerdrape's panels could feasibly be installed in new and existing buildings over the next few years at a cost that's comparable to other systems and with a yield that's at least as good, if not better. The only catch is that the concrete walls on which the panels are installed must be in direct contact with the soil so that the panels can capture the geothermal energy.

Also useful for train and subway stations and tunnels

Enerdrape was set up in 2019 and has already won several startup grants and awards. Along with the Sébeillon pilot test that will run to the end of this year, Peltier and her staff are putting together a fundraising round and hope to bring in around CHF 2 million by next summer. They intend

to use the proceeds to launch a first production run of their panels in order to be fully prepared for market entry.

The company's technology is an example of an "energy geostructure," in which the Laboratory of Soil Mechanics is a pioneer. These systems use underground structures like building foundations as sources of energy. According to the International Energy Agency (IEA), the share of clean heating technology—which includes heat pumps and district heating—needs to more than double to 50% of sales by 2030 to be able to meet the IEA's sustainable development scenario. Enerdrape hopes to play a role in achieving that goal. Its technology can be used not just in underground parking lots, but also in tunnels, train and subway stations. "Our research has shown that our panels can also work effectively when they have a more rounded shape, such as that required for the inside of a tunnel, for example," says Peltier.

Provided by Ecole Polytechnique Federale de Lausanne

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