

Melting glaciers key to greater reliance on hydroelectric power?

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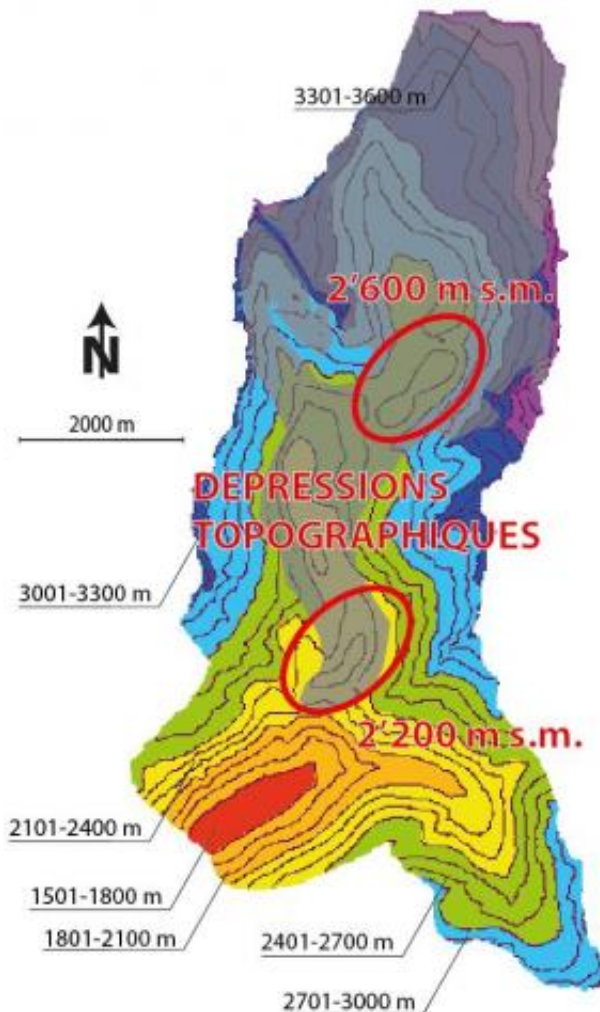
Credit: 2012 EPFL

(Phys.org)—The great glaciers of the Alps are melting. Several climate change scenarios, some of which are based on an average temperature increase of $+4^{\circ}\text{C}$, predict their complete disappearance by the end of this century. As they retreat, the glaciers uncover cavities; these fill with meltwater, becoming lakes.

The Swiss National Science Foundation (SNSF) is funding a research project on the risks and possibilities of these new mountain lakes. Anton Schleiss, director of EPFL's Hydraulic Constructions Laboratory, is participating in the project. "[Glaciers](#) store water and transfer winter precipitation into summer runoff. Once they have disappeared, we will need to manage these new reservoirs, which will take over this [water](#)

[storage](#) role."

For his Master's thesis project, EPFL Civil Engineering student David Zumofen studied several different options for how we can take advantage of these new natural reservoirs to produce electricity.



In the first scenario, the lake water would go through turbines on site, as

part of the construction of a future Gletsch-Oberwald [hydroelectric power plant](#). This would yield less energy, but would not require altering any existing structures between the Rhone and [Lake Geneva](#).

The second scenario would use the existing hydroelectric structures in place in Oberhasli, on the other side of the Grimsel Pass, at the drainage divide between the Rhine and Rhone watersheds. Because the water can pass through existing turbines several times on its journey downstream, this solution is much cheaper and could generate more electricity. The only problem is that the water will end up in the Rhine, depriving the Rhone of an important source of water.

The Rhone glacier is visibly melting

Over the past ten years, the Rhone glacier has lost 6% of its mass. Just 150 years ago, it covered the entire Gletsch valley. Today, its tongue has retreated far up the watershed. From previous studies we know that two large cavities, each more than 50 meters deep, are hidden beneath the glacier. One of them may be completely uncovered by 2065, creating a lake that could be used for generating hydroelectric power.

"We must be careful about making climate predictions, because what was true a century ago may well no longer hold 100 years from now," says Zumofen. "If current predictions are correct, however, one of the two lakes could hold up to 50 million cubic meters of [water](#)." Zumofen analyzed the outflow of the glacier both during melting and once the glacier is completely gone, confirming the advantage of exploiting the lake, which will remain large even when the glacier no longer exists.

These studies are timely, because Switzerland has declared its commitment to abandoning nuclear power by 2050. It's the wealth of actual and potential hydropower stored in the Alps that make this a realistic possibility.

Provided by Ecole Polytechnique Federale de Lausanne

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