

Pilot hydrogen storage and production facility offers glimpse into the fueling stations of the future

November 13 2014, by Emmanuel Barraud



Credit: Murielle Gerber / EPFL

The pilot hydrogen storage and production facility that EPFL has built in Martigny (VS) had a public open house yesterday. It was an opportunity to get a glimpse into the fueling stations of the future.

"Fill it up with hydrogen, please!"

In just a few years, this request won't be a fictional one. The clean vehicles we occasionally see on the roads will increasingly become the norm.

Whether they're electric with lithium batteries or a fuel cell, or burn

hydrogen instead of petroleum, these vehicles will still need, like today's cars, to be regularly refueled. "Electric cars still need lengthy periods of time to recharge – several hours on the 230 V grid", says Hubert Girault, director of EPFL's Laboratory of Physical and Analytical Electrochemistry.

One of the avenues being explored in his laboratory is found at the pilot facility in Martigny (VS). It is a device that stores electricity in a mega-flow battery and then releases it as direct current (DC). The mega-flow battery serves as a buffer between how the electricity is produced (by renewables like wind, for example) and its rapid transfer to a vehicle, which could be charged up in just a few tens of minutes. "These megabatteries are capable of delivering 500 volts at 300 amps, like Tesla's Supercharger stations," explains the professor.

The pilot facility in Martigny is based on a vanadium redox flow battery. Unlike traditional lead or [lithium batteries](#), in which the charge accumulates in electrodes, in this battery the charge accumulates in liquid electrolytes. The power is proportional to the electrodes' surface area and the accumulated energy is proportional to the reservoir volume. The technology is intrinsically extremely safe, with no risk of explosion.

These mega-flow batteries, some of which can attain hundreds of megawatts, do have one drawback, however: what do you do when the battery is full, but the windmill providing the electricity still continues to turn?

EPFL has an answer: you store it as hydrogen. This energy-rich gas can be either burned in a combustion engine or used in a [fuel cell](#) to produce electricity. In this pilot facility their device combines the two stages of the process, foreshadowing the fuel stations of the future that will be able to provide both direct current (DC) and hydrogen.

EPFL's choice to build the mega-flow battery in Martigny's water treatment station, in partnership with the District of Martigny, CREM (Centre de recherches énergétiques et municipales) and the public works (Sinergy), was a deliberate one. In addition to pulling energy from a wind mill project in the region, the facility will also use the hydrogen it produces to completely methanize the biogas generated during the water treatment process. Biogas is a mixture of methane and CO₂ produced by the anaerobic digestion of organic matter; once it's methanized it can be used to fuel vehicles that run on natural gas.

"On the longer term we believe that this site will be very advantageous as a demonstration platform for testing a variety of technologies that will be necessary in the transition to renewable sources of energy," says Girault.

Provided by Ecole Polytechnique Federale de Lausanne

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