HYDROGEN
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Aarau is hosting the world's first PEM*-electrolyser facility generating hydrogen directly at IBAarau's hydro-electric power station

H_2 Energy and IBAarau have joined forces to build a production plant for hydrogen to be delivered to the first Coop hydrogen filling station.

The PEM-electrolyser facility combined with a compressor station is the first of his kind in Switzerland directly connected to a hydroelectric power station. The hydrogen plant uses only renewable energy and is intended to supply hydrogen filling stations.

The PEM-electrolyser facility is located at IBAarau AG's hydroelectric power station in Aarau. Thanks to its topography and its high average rainfall, Switzerland – dubbed «Europe's reservoir» – offers the ideal conditions for making use of water. Hydropower remains our key native source of renewable energy.

Using the energy supplied by hydroelectric power, water can be separated into hydrogen and oxygen by electrolysis. As well as enabling larger quantities of (fluctuating, renewable) energy to be stored, a facility which is vital to the new energy policy, hydrogen can also store energy and make it available for other applications and markets. Thus, at times of low electricity prices or surplus energy, the energy can be converted into hydrogen and siphoned off to other areas.

The planned hydrogen production plant will enable around 2 % of electricity produced at the hydroelectric power station to be converted to hydrogen.

Implementation at Aarau hydroelectric power station

The hydrogen production plant is being built at IBAarau Kraftwerk AG's hydroelectric power station. It is located at the building which used to house the 50 kV substation.

The planned annual production time is around 7,500 hours. For the 200kW plant, this gives an expected annual output of around 20,000 kg H_2, sufficient to run approx. 170 cars or three to four large trucks.

After the electrolysis the hydrogen is compressed by a compressor to 200 bar and stored in a trailer.

Hydrogen production using electrolysis

Electrolysis is a process whereby water (H_2O) is split into hydrogen (H_2) and oxygen (O_2), in this case using renewable electricity from the power plant.
The electrolyser can be adjusted to changing loads within a short period of time and has quick start-up and shutdown features. High pressure difference between H_2 and O_2 gas prevents disruptive contamination of O_2 in the H_2. The degree of purity of the hydrogen produced meets standard «SAE J2719» and satisfies the requirements for fuel cell cars.

Hydrogen logistics for mobility

H_2 Energy AG has signed a supply contract with Coop Mineraloel AG for renewably produced hydrogen and will deliver the hydrogen in its own trailer to the first Coop hydrogen filling station in Hunzenschwil.

As hydrogen is currently tax-exempt (no mineral oil tax, heavy goods vehicle charge etc.), even at today's very low petrol and diesel prices, fuel costs per journey with sustainable hydrogen are comparable to conventional fossil fuels. From an environmental and an economic perspective it makes sense to convert electrical power to hydrogen.

For quality assurance reasons the trailer will only be used to transport renewable H_2 («point-to-point»).

*PEM = Proton Exchange Membrane

Front view of the IBAarau hydroelectric power station in Aarau

PEM electrolyser

Hydrogen trailer

Technical data

PEM electrolysis	
Supplier	Diamond Lite S.A.
Manufacturer	Proton OnSite (USA)
Type	C Series, C 30, Proton Exchange Membrane (PEM)
Electrical power	5.8 kWh/Nm^3
Yield	30 Nm^3/h H_2 or 2.7 kg H_2/h
Outlet pressure	30 bar
Purity	99,9998%
Max. water consumption	30 litres/h

Trailer	
Supplier	Messer Schweiz AG
Pressure vessels	10 steel tanks
Operating pressure	200 bar
Geometric volume	23 m^3
Hydrogen transportation capacity	338 kg
Trailer dimensions (excluding towing vehicle)	Length: 12.7 m Breadth: 2.5 m Height: 3.6 m
Trailer weight	32 tonnes

Compressor	
Supplier	sera ComPress GmbH
Type	Metal membrane compressor
Intake pressure	27– 31 bar
Outlet pressure	max. 211 bar
Power	30 Nm^3/h
Drive	Crank drive with flywheel

IBAarau power station	
Year of construction	1895/1912, upgraded 1957
Turbines	11 Kaplan turbines
Average annual output	109 GWh
Summer production	60 GWh
Winter production	approx. 49 GWh
Maximum output	16 MW
Average output	12.5 MW
Average annual flow rate	300 m^3/s