Water for Hydrogen Production

We Need to Talk!

Something is bothering Dr. Florencia Saravia: "Green hydrogen is important for the energy transition. But we are not talking about where the water for its production should come from. We need to change this immediately." In order to draw attention to this previously neglected topic, the German Technical and Scientific Association for Gas and Water (DVGW) recently published a fact sheet summarizing the most important correlations between water demand and hydrogen production. Saravia is Head of the "Water Chemistry and Water Technology" division of the DVGW Research Center at the Engler-Bunte Institute of KIT. She was significantly involved in the publication.

Energy production and water scarcity – this combination inevitably prompts thoughts of North Africa, an ideal location for generating solar energy, but one that is also very dry for the most part. "The import of hydrogen is essentially an import of water. Locations with increased water stress are therefore unsuitable for producing the gas," Saravia says, but then recommends taking a differentiated view of the problem: "North Africa is not just the Sahara and Sahel. There is enough water in the coastal regions, namely seawater."

When processed appropriately, water from the oceans is perfectly suitable for electrolysis, i.e. the separation of water into hydrogen and oxygen. If, for example, power-to-gas (PtG) plants are built in North African coastal regions in which solar or wind energy is used to produce hydrogen, this can even have a positive impact on the local water supply. "In addition to water for electrolysis, desalination plants can also produce drinking water," Saravia explains.

While drinking water may be a welcome by-product of PtG technology, the chemical engineer and water chemist categorically rules out the possibility of turning drinking water into hydrogen: "Drinking water is a human right. We must not use it as a source of renewable energy." This is not even necessary, as biologically purified wastewater can now be treated in such a way that it can then be used as ultrapure water in electrolysis, says Saravia.

In addition, the scientist, who also teaches at KIT alongside her research for the DVGW, would like to draw attention to the supply situation and the consequences of water use for PtG in Europe and Germany: "There are also ‚dry' areas here," she says, naming Brandenburg, Saxony-Anhalt, Mecklenburg-Western Pomerania, and Franconia. The situation is more relaxed in other federal states. And Germany also has coasts on the North and Baltic Seas: "If we talk about the right location, the water supply for hydrogen production is not a problem here," says the researcher.

One of the reasons for this is that the PtG industry's demand will be relatively low. According to the DVGW fact sheet, production of 40 gigawatts of hydrogen by the middle of the century will annually require 40 million cubic meters of freshwater, not including the cooling water requirement. For comparison: Berlin alone requires around 230 million cubic meters of water every year; the energy sector even uses nine billion cubic meters of water as cooling water, of which at least 300 million cubic meters evaporate.

"Nevertheless, we urgently need a water strategy and good water management for the energy sector," Saravia emphasizes. She considers legislators, regulatory authorities and also operators of future plants responsible for this. The right locations need to be selected for the electrolysis plants and there needs to be public acceptance – from the water supply to the handling of by-products. "After the production of ultrapure water, a concentrate containing salt has to be disposed of. We need to develop clever solutions for this. Otherwise resistance will be inevitable." ■

Drinking water: Too precious for the production of hydrogen. (Photo: Margo Alexa, Adobe Stock)