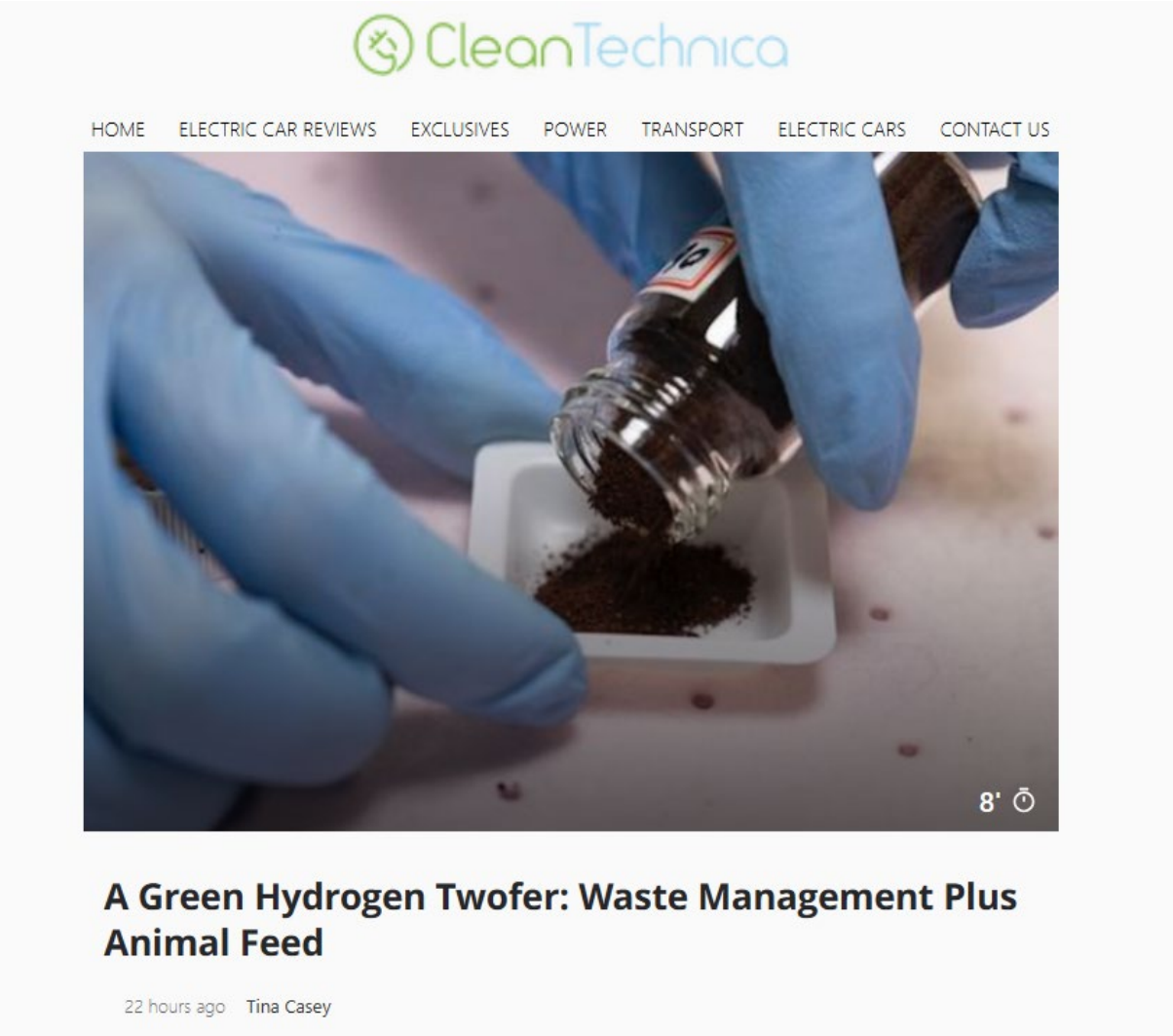
https://cleantechnica.com/2025/03/12/a-green-hydrogen-twofer-waste-management-plus-animal-feed/amp/



As a new global industry, green hydrogen has been treading water in a seesaw state. Some ventures have already crashed while others are gaining momentum. In the meantime, new green hydrogen production systems are also beginning to materialize, one example being a new solar-powered system for producing both hydrogen and animal feed from municipal wastewater.

From Wastewater To Green Hydrogen

Most of the green hydrogen investor dollars have been going into water electrolysis, in which electricity is deployed to jolt hydrogen gas from plain water. Still, the wastewater-to-hydrogen angle has occasionally surfaced on the *CleanTechnica* radar as well.

In 2013, for example, the Energy Department's Lawrence Livermore National Laboratory teamed up with the startup Chemergy to trial the company's green hydrogen system at a municipal wastewater treatment plant in California. The US Department of Defense also contributed hydrogen fuel cells to the effort, which aimed to determine if the plant could produce enough hydrogen-generated electricity to run some of its own operations.

Activity in the wastewater area has picked up since then, including industrial wastewater from Superfund cleanup sites. In one recent example, the leading New Mexico utility Kit Carson Electric Cooperative earned a $231 million grant from the US Department of Agriculture, aimed at constructing a 104-megawatt green hydrogen system that leverages wastewater from a former mining site, along with a long-duration energy storage system of up to 16 hours.

Lots Of Wastewater Available For Hydrogen Production

No word yet on whether or not the dictator-adjacent Commander-in-Chief who occupies the Oval Office will try to claw back at $231 million grant, which was authorized in the final days of the Biden administration. If Kit Carson loses the funding, hundreds of local jobs and a more resilient regional grid go down along with it. *Pro tip: Next time, don't vote for the convicted felon*.

The timing for loss of the grant is particularly bad because Kit Carson is a rural electric cooperative with a public benefit mission. As such, it has been scrambling to assist federal workers summarily fired by Trump advisor and Tesla CEO Elon Musk and his team at "DOGE." On February 28, the utility issued a no-disconnect pledge to fired federal workers, along with a one-time credit on their bills.

Meanwhile, researchers around the world continue to pursue the idea of prying green hydrogen and other valuable resources out of wastewater. The latest example comes from Nanyang Technological University in Singapore, where a research team has come up with a new method for deploying solar power on municipal sewage sludge.

Sludge is what happens after a municipal wastewater treatment plant separates most of the water out from the incoming stream of sewage. The remaining solids can be subjected to an anaerobic digestion step, which breaks down the organic material into an inert material that can be used as a soil amendment. The digestion process also yields biogas.

There is a lot of sludge to be had. NTU cites UN-Habitat, which estimates that wastewater treatment plants generate more than 100 million tonnes (metric) of sludge each year. Efforts to repurpose digested sludge as an organic soil amendment have materialized as a sustainable solution, though in recent years concerns have been raised over the potential risk of contaminants in municipal wastewater.

The Three-Step Green Hydrogen Solution

The NTU team has figured out a way around the contamination issue, but don't get too excited just yet. The project is still in the proof-of-concept stage. Still, the team is confident that its process is more efficient than the conventional anaerobic digestion process. "It recovers significantly more resources, completely removes heavy metal contaminants, has a smaller environmental footprint, and offers better economic feasibility," the researchers state.

The NTU process starts by separating heavy metal contaminants from the proteins, carbohydrates, and other organic materials in the sludge.

Solar energy lends an assist for the following step. "Next, a solar-powered electrochemical process uses specialised electrodes to transform the organic materials into valuable products, such as acetic acid — a key ingredient for food and pharmaceutical industries — and hydrogen gas, a clean energy source," NTU explains.

The final step involves introducing light-loving bacteria to the mix, which produce single-cell proteins while digesting nutrients in the liquid.

In addition to producing green hydrogen instead of biogas, the NTU team calculates that their process can recover more than 91% of the organic carbon in sewage sludge, and convert 63% of per cent of that into animal feed protein. “In comparison, traditional anaerobic digestion typically recovers and converts around 50 per cent of organic materials in sewage sludge,” they assert.

A Green Revolution For Wastewater Treatment Plants

Wastewater treatment plants are enormous, energy-sucking pieces of civic infrastructure, so introducing renewable energy to the treatment process can make a significant impact on carbon emissions.

“Notably, [the process] results in a 99.5% reduction in CO_2 emissions and a 99.3% decrease in energy depletion compared with conventional anaerobic digestion,” the NTU researchers state. The details are available in the team’s paper, “Solar-driven sewage sludge electroreforming coupled with biological funnelling to cogenerate green food and hydrogen,” published in the journal *Nature* last fall.

The wastewater-to-hydrogen solution could also help resolve water resources issues that can limit the reach of conventional water electrolysis systems. In Texas, for example, analysts have already begun exploring how the state’s booming interest in green hydrogen will impact its water resources.

Researchers at the University of Texas at Austin note that the demand of the water electrolysis industry is small compared to irrigation and municipal water supply systems. Still, in a newly published study they estimate that green hydrogen could account for 2–6.8% of water demand in the state by 2050.

Some municipalities are already beginning to explore wastewater as an alternative source. The Norwegian firm Nel, for example, is sending its containerized electrolyser system to the city of St. Cloud, Minnesota, where it will be deployed at the municipal wastewater facility to produce green hydrogen.

The new system will complement other sustainability measures at the plant, including onsite biofuel generators and a biogas storage facility. Along with solar panels, these provide enough energy to run the plant and then some. During periods of peak production the plant delivers excess electricity to the grid.

“The hydrogen can be used onsite for heating and power, stored when excess renewable energy is generated, and used when solar and biogas are unavailable,” Nel explained in a press statement last September, adding that there is also a potential for recovering oxygen from the system as well.