

Gas turbine runs with 100 % green hydrogen, a world first

Imagine a fully decarbonised, flexible and reliable energy industry. The successful demonstration of an industrial turbine powered by fully renewable hydrogen is pointing the way.



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When it launched in 2020, the EU-funded [HYFLEXPOWER](#) project set out to prove that renewable hydrogen can be a flexible energy storage medium and that it can be used to power an industrial turbine. Just three and a half years later, it has successfully demonstrated an integrated industrial power-to-hydrogen-to-power solution with 100 % green hydrogen for carbon-free electricity generation. For the first time ever, the demonstration took place on the site of the Smurfit-Kappa paper mill in Saillat-sur-Vienne,

France.

The hydrogen is produced by a 1 MW electrolyser on site, and then stored in an almost 1 tonne tank and used to power a Siemens Energy SGT-400 industrial gas turbine. According to Karim Amin, Executive Board Member of HYFLEXPOWER project coordinator Siemens Energy, Germany, the knowledge and experience gained from the project will help the company to continue developing its green gas turbine fleet. “The interaction between electrolysis, storage, and hydrogen conversion at one site has been impressively demonstrated, and now it’s a matter of scaling the results,” he comments in a [press release](#), posted on Siemens Energy’s website. Siemens Energy supplied the electrolyser for hydrogen production and developed the hydrogen gas turbine.


The initial tests conducted in 2022 made it possible to operate the gas turbine with 30 % hydrogen content mixed with natural gas. Now, the most recent demonstration has shown that state-of-the-art turbines with dry low emissions technology can be fuelled with up to 100 % hydrogen, as well as with natural gas and any blends in between.

Promising prospects

The hydrogen production, storage and supply for the demonstrator was developed by global energy group ENGIE, France. “At ENGIE, we are very proud of this world first,” remarks Frank Lacroix, the group’s Executive Vice President in charge of Energy Solutions, referring to the successful demonstration. “The HYFLEXPOWER project is remarkable for many reasons: for the exceptional collaboration it has enabled between several European partners, for the forward-looking technologies it has tested, and for the promising prospects it opens up for the use of renewable hydrogen in the industrial sectors most difficult to decarbonize. We look forward to continuing this decisive work for the future of decarbonized industry with our partners.”

The successful power-to-hydrogen-to-power demonstration has motivated the research team to extend the scope of operation beyond electricity production to industrial heat production and additional operational modes. Plans are also underway to find ways to scale up and commercialise decarbonised electricity generation.

Siemens Energy’s Hydrogen & Green Fuels Portfolio Manager Ertan Yilmaz comments on the HYFLEXPOWER (HYdrogen as a FLEXible energy storage for a fully renewable European POWER system) project’s accomplishment in a [news item](#)  published on the project website: “Together, we have made history by successfully demonstrating an industrial gas turbine powered by 100% green hydrogen. This achievement proves that a fully decarbonized, flexible, and reliable energy industry is not only possible but achievable. It also opens a world of possibilities for the energy industry of the future. Our SGT-400 turbine, when fully operating on 100% green hydrogen, will save the planet from up to 65,000 tons of CO2 emissions.”

For more information, please see:
[HYFLEXPOWER project website](#) 

Keywords

HYFLEXPOWER, hydrogen, energy, green, turbine, gas turbine, power-to-hydrogen-to-power

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