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HYFLEXPOWER : The world's first integrated power-to-X-to-power hydrogen gas turbine demonstrator

With the HYFLEXPOWER project, a consortium made up of ENGIE Solutions, Siemens Gas and Power, Centrax, Arttic, German Aerospace Center (DLR) and four European universities are implementing a project funded by the European Commission under the Horizon 2020 Framework Programme for Research and Innovation (Grant Agreement 884229). The implementation of this project, the world's very first industrial-scale power-to-X-to-power¹ demonstrator with an advanced hydrogen turbine, will be launched at Smurfit Kappa PRF's site - a company specialized in manufacturing recycled paper - in Saillat-sur-Vienne, France. The purpose of this project is to prove that hydrogen can be produced and stored from renewable electricity and then added with up to 100 percent to the natural gas currently used with combined heat and power plants. For this an existing Siemens SGT-400 industrial gas turbine will be upgraded to convert stored hydrogen into electricity and thermal energy.

A world first: Industrial-scale power-to-X-to-power demonstrator

Through its Horizon 2020 Framework Programme the European Commission supports highly innovative research and demonstration projects aiming at developing and creating innovative products and services and thus stimulating growth in Europe. For this, the European Commission is awarding grants in a competitive procedure in which HYFLEXPOWER was able to assert itself against a large number of competitors.

With this particular project, HYFLEXPOWER will demonstrate that renewable hydrogen can serve as a flexible means of storing energy which can then be used to power a high-power industrial turbine.

Storing fluctuating renewable energy is one of the major challenges of the energy transition. In this context, the stakeholders involved in the HYFLEXPOWER project are developing new technologies which can be used across the whole power-to-X-to-power¹ cycle. The installed demonstrator will be used to store excess renewable electricity in the form of green hydrogen. During periods of high demand this stored green hydrogen will then be used to generate electrical energy to be fed into the grid.

¹ According to the ADEME (France's agency for environment and energy management), "Power to X" (or "P2X") is the act of converting electricity into another energy vector. For the HYFLEXPOWER project, the "X" vector is hydrogen.

ENGIE Solutions has been entrusted with producing energy at the Smurfit Kappa site in Saillat-sur-Vienne, France. At the site, ENGIE Solutions operates a 12 MWe combined heat and power facility which produces steam for the manufacturing company's requirements. The project will develop and demonstrate an advanced plant concept which will contribute to modernizing and improving the factory's existing power plant. During two demonstration campaigns, the facility will be powered by a mix of natural gas and hydrogen, ultimately aiming up to 100 percent hydrogen operation. In this regard, the overall goal of the HYFLEXPOWER project is to test an entirely green hydrogen-based power supply for a completely carbon-free energy mix, meeting or even operating significantly below EU emission limits.

An exclusively European technology

The consortium selected following the call for proposals is made up exclusively of European companies and bodies. Each stakeholder's role is defined as follows :

- ENGIE Solutions will build the hydrogen production and storage chain facility, up to the natural gas/hydrogen mix prior to injection into the turbine
- Siemens Energy will supply the electrolyser for hydrogen production and develop the hydrogen gas turbine
- Centrax will upgrade the package for H2 operation and install the new turbine
- German Aerospace Centre (DLR) together with University College London, University of Duisburg-Essen, Lund University will support hydrogen turbine technology development
- National Technical University of Athens will perform economic, environmental and social assessments of the concept
- Arttic will support in the operational project management and with project's communication activities.

The project's total budget is close to €15.2 million, €10.5 million of which will be contributed entirely by the European Union under the Horizon 2020 program.

Officially launched on 1 May 2020, the project will last 4 years and will be split into several phases:

- May 2020: Contract finalization and start of engineering development
- 2021: Installation of the hydrogen production, storage and supply facility at pilot demonstration site
- 2022: Installation of the gas turbine for natural gas/hydrogen mixtures and initial demonstration of advanced pilot plant concept
- 2023: Pilot demonstration with up to 100 percent hydrogen for carbon-free energy production from stored excess renewable energy

This extremely promising technology is fully in line with Siemens, ENGIE Solutions and Centrax strategy of providing its clients with zero-carbon solutions.

Siemens Gas and Power helping to increase level of decarbonization

Siemens Gas and Power is helping its customers to achieve their decarbonization goals by building infrastructures for power-to-X-to-power and making a global contribution to cross-sector decarbonization. Siemens offer all core technologies for a long-term CO2-free energy supply, from power and heat generation, to power transmission and distribution, and efficient electrolysis for hydrogen production.

“Siemens Gas and Power wants to be the driving force behind the decarbonization of energy systems worldwide”, said Karim Amin, CEO of the Generation Division of Siemens Gas and Power. “Our goal is to make our gas turbines usable for 100 percent hydrogen. With that, gas

turbines can be the “technology of choice” for our customers to ensure a secure energy supply in a completely decarbonized world in the future”, Amin added.

ENGIE Solutions, a stakeholder committed to hydrogen

As an energy for the future, green hydrogen has a major role to play in the energy transition. For ENGIE Solutions, the most abundant element in the universe is vital to decarbonizing industrial processes.

ENGIE Solutions is certain that this energy will help speed up the transition of regions and manufacturing companies, and is supporting the development of renewable hydrogen – it already has a number of projects, either in operation or forthcoming.

“With the HYFLEXPOWER project, ENGIE Solutions is once again demonstrating its intent to support manufacturers and regions as they seek to optimize and green their energy use. Developing renewable hydrogen for industrial purposes is a perfect example. This demonstrator is the future”, says Pierre Hardouin, CEO of ENGIE Solutions for Industries.

Centrax Ltd, developing Hydrogen ready solutions

Centrax sees green hydrogen as an important part of the path to a decarbonized energy system and welcomes the considerable investment being made by the Horizon 2020 programme to assist the development of Hydrogen compatible combustion systems.

“Our goal is for our gas turbine combined heat and power systems to be ‘Hydrogen Ready’ to provide future proof power generation solutions for our Customers” says Harry Trump, Director of Business Development for Centrax Ltd.

The project's partners:



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ENGIE
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LUNDS UNIVERSITET



National
Technical
University
Athens



About CENTRAX

CENTRAX Limited is a privately-owned company based in Newton Abbot in the South West of England. The company was established in 1946 to develop automotive and industrial gas turbines. Since 1979 CENTRAX has been a distributor for Allison, Rolls-Royce and Siemens Industrial Gas Turbines for the European Combined Heat and Power (CHP) and Industrial Power Generation markets. CENTRAX Gas Turbines specialises in the manufacture and service of gas turbine powered generator sets ranging from 3.9 to 15 MW using core engines from Siemens. The generator sets are used mainly for high efficiency combined heat and power and also in base load, simple-cycle and standby applications. CENTRAX Gas Turbines is a global company, with a broad customer base throughout the world and employs over 250 people. CENTRAX designed, built, installed, and commissioned the gas turbine generator set and provides a long-term maintenance contract for ENGIE at the demonstration site in Saillat-sur-Vienne.

Visit : www.centraxgt.com  

About Siemens Gas and Power

Siemens Gas and Power GmbH & Co. KG is the global energy business of the Siemens group, which has been working with its customers on solutions for the evolving demands of industry and society for more than 150 years. With planned stock listing, Siemens' energy business will operate independently as Siemens Energy in the future. It will offer broad expertise across the entire energy value chain, along with a comprehensive portfolio for utilities, independent power producers, transmission system operators, the oil and gas industry, and other energy-intensive industries. With its products, solutions, systems, and services, Siemens Energy will address the extraction, processing, and transport of oil and gas as well as power and heat generation in central and distributed thermal power plants, and power transmission and technologies for the energy transformation, including storage and sector-coupling solutions. The majority stake in Siemens Gamesa Renewable Energy will round out its future-oriented portfolio. With its commitment to leading the way in decarbonization of the global energy system, Siemens Energy will be a partner of choice for companies, governments, and customers on their path to a more sustainable future. With around 90,000 employees worldwide, Siemens Energy will help shape the energy systems of today and tomorrow. www.siemens.com.

About ENGIE Solutions

ENGIE Solutions supports towns, industries and companies in the tertiary sector, providing them with solutions to the challenges posed by the energy transition in the form of turnkey and bespoke packages.

ENGIE Solutions' experts apply all their expertise in pursuit of three aims: optimising the use of energy and resources, greening energies and reinventing living and working environments.

ENGIE Solutions guarantees its clients a single point of contact and a combination of complementary offerings that go beyond energy. The company is committed to achieving results and its 50,000 employees which operate throughout France (900 sites) have expertise in an extremely diverse number of areas, ranging from the design and operation of infrastructure & services, to funding, installation and maintenance.

ENGIE Solutions is part of the ENGIE Group, one of the world's leading low-carbon energy and services groups whose aim is to become the leader in the zero-carbon transition. Sales: €10 billion.

To find out more, visit www.engie-solutions.com   

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