



TotalEnergies, Sunfire and Fraunhofer give the go-ahead for green methanol in Leuna

Leuna, June 15, 2021– TotalEnergies announced the launch of the e-CO₂Met project at the Hydrogen Lab Leuna together with the electrolyser manufacturer Sunfire, the Fraunhofer Center for Chemical-Biotechnological Processes CBP and the Fraunhofer Institute for Microstructure of Materials and Systems IMWS. Methanol can be produced from low-carbon hydrogen and captured carbon dioxide, which is an important approach to reducing climate-damaging greenhouse gas emissions. With the ambition to produce climate-neutral methanol on site, this demonstration project will integrate the various components required to this end, such as the use of renewable energy.

TotalEnergies currently produces around 700,000 tons of methanol per year based on fossil raw materials at the TotalEnergies Raffinerie Mitteldeutschland in Leuna, making it the largest methanol producer in Europe. The e-CO₂Met project is therefore an important step towards climate neutrality. It aims to test the combination of three innovative processes - the use of CO₂ from the refinery, the use of green hydrogen produced by high-temperature electrolysis and the subsequent methanol synthesis on the Hy2Chem scaling platform.

"TotalEnergies R&D program on Carbon Capture and Utilization is developing approaches for the economically viable reuse of CO₂ which is in line with the climate ambition of the company. e-CO₂Met is the first pilot project for TotalEnergies to convert CO₂ with renewable electric energy to methanol. Whilst this methanol can be considered itself an e-fuel, it can importantly be used as a platform in a further upgrading to products including sustainable aviation fuels," **explains Marie-Noelle Semeria, Chief Technology Officer at TotalEnergies.**

"With the innovative production of synthetic methanol, crude oil and natural gas can be replaced in the chemical industry and the required raw materials can be produced in a climate-neutral way. In this way, we are making a contribution to the decarbonisation of basic chemicals," **says Thomas Behrends, Managing Director TotalEnergies Raffinerie Mitteldeutschland.**

High-efficiency electrolysis for hydrogen production from renewable energies

A core piece of e-CO₂Met is the 1 MW high-temperature electrolyser from the Dresden-based electrolysis company Sunfire. The system's efficiency of more than 80 percent for producing green hydrogen from renewable electricity and water vapour is far higher than that of conventional electrolysers. As a result, the system requires significantly less electricity to produce one kilogram of hydrogen.

"Our innovative electrolysis technology is the key to decarbonising all industrial sectors that are still dependent on fossil fuels today. Especially in the refining and chemical industries, clean and sustainable solutions are needed to achieve the EU's ambitious climate targets. We look forward to a strong partnership in the e-CO₂Met project," **says Sunfire CEO Nils Aldag.**

Green methanol from renewable hydrogen and exhaust gas CO₂

In the next step, the green hydrogen obtained from electrolysis and highly concentrated CO₂ from the refinery's production processes will be converted into green methanol. For this purpose, the Fraunhofer CBP and TotalEnergies are planning a pilot plant in the new Fraunhofer Hydrogen Lab at the Leuna Chemical Park. The pilot plant is the first project of the Hy2Chem scaling platform funded by the state of Saxony-Anhalt through EFRE funds. "With the Hy2Chem platform, we can test the use of regeneratively produced hydrogen for the production of feedstock chemicals and fuels in sustainable synthesis processes on a large scale for the first time - even under the conditions of a fluctuating hydrogen stream," **explains group leader Dr Ulrike Junghans, who is coordinating the project at the CBP.**

A crucial step for implementing these processes on an industrial scale is pushing the development of electrolyzers and synthetic processes. For this purpose, Fraunhofer IMWS operates the Hydrogen Lab Leuna, a unique test infrastructure on an industrial scale, and provides extensive scientific support. The Hydrogen Lab simulates different load profiles typical of renewable energy supply, maps their diurnal and inter-seasonal fluctuations and thus provides important findings for the design and cost estimation of the systems under realistic conditions.

"The Hydrogen Lab Leuna is the first large-scale test facility in Germany that is fully integrated with the infrastructure of the chemical industry, making it ideal for projects in the field of power-to-X processes. We can test industrial electrolyzers of any type at the systems level, further develop them together with our industry partners and at the same time gain valuable experience in supplying hydrogen to the pipeline system of our partner Linde - currently up to a 5 MW scale," **says Dr. Moritz Kühnel, who coordinates the electrolysis research activities at Fraunhofer IMWS.**

The development of a hydrogen economy is an important step towards climate neutrality in Germany and Europe. Especially in connection with the use of green hydrogen as a chemical raw material, there is also considerable potential for shaping structural change. Particularly at the industrial and chemical site of Leuna, a hub for green hydrogen and its derivatives can be created on the basis of many years of experience, existing infrastructure and the interaction between innovative companies and research institutes.



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About Sunfire

Founded in 2010, Sunfire GmbH is a leading global electrolysis company that develops and produces industrial electrolyzers based on alkaline and solid oxide technologies (SOEC). With its electrolysis solutions, Sunfire addresses the key challenge of today's energy system: providing green hydrogen and e-fuels from renewable electricity, water and CO₂ as climate-neutral substitutes for fossil energy. Sunfire's innovative and proven electrolysis technologies enable the decarbonisation of industrial sectors that are currently dependent on fossil-based oil, gas or coal. The company employs more than 250 people located in Germany, Norway and Switzerland. Further information at www.sunfire.de

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About Fraunhofer Institute for Microstructure of Materials and Systems IMWS

Fraunhofer Institute for Microstructure of Materials and Systems IMWS in Halle (Saale) offers microstructure-based diagnostics and technology development for innovative materials, components and systems. Building on its core competencies in high-performance microstructure analytics and microstructure-based material design, the institute researches questions of functionality and application behaviour as well as the reliability, safety and durability of materials that are used in various market and business fields with high importance for social and economic development. For its partners in industry and for public clients, Fraunhofer IMWS pursues the goal of contributing to the accelerated development of new materials, increasing material efficiency and cost-effectiveness and conserving resources. In this way, the institute contributes to securing the innovative capacity of important future fields as well as to sustainability as a central challenge of the 21st century. www.imws.fraunhofer.de

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About the Fraunhofer Center for Chemical-Biotechnological Processes CBP

Fraunhofer Center for Chemical-Biotechnological Processes CBP in Leuna develops and scales up processes for the conversion of regenerative raw materials into chemical building blocks and products to product-relevant dimensions. By providing infrastructure and pilot plant facilities for all the necessary process steps - from biomass fractionation, biotechnological and chemical conversion processes to downstream processing of the products - it closes the gap between laboratory and industrial production. Fraunhofer CBP in Leuna is a branch of the Fraunhofer Institute for Interfacial Engineering and Biotechnology IGB.

www.cbp.fraunhofer.de

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About TotalEnergies in Germany

TotalEnergies has been present in Germany since 1955 and currently secures over 4,000 jobs nationwide. Its German affiliate operates the third largest retail network in the country with around 1,200 service stations. In Germany, TotalEnergies offers a wide range of energy products: lubricants, LPG, heating oil, fuels for aviation and shipping, bitumen and special products dedicated to the industry. In Leuna, the Company operates one of Europe's most modern crude oil processing plants: TOTAL Raffinerie Mitteldeutschland. TotalEnergies is active in the petrochemicals sector, in the distribution of natural gas and of solar solutions from SunPower, and offers smart solutions for the automotive and aviation industries with Hutchinson. In the field of new energies for mobility, TotalEnergies operates a network of over 2,000 charging points for electric vehicles as well as hydrogen filling stations.

About TotalEnergies

TotalEnergies is a broad energy company that produces and markets energies on a global scale: oil and biofuels, natural gas and green gases, renewables and electricity. Our 105,000 employees are committed to energy that is ever more affordable, clean, reliable and accessible to as many people as possible. Active in more than 130 countries, TotalEnergies puts sustainable development in all its dimensions at the heart of its projects and operations to contribute to the well-being of people.

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