

Press release June 16, 2023

FlexKWK: Green heat with high temperature storage

Partners from the energy sector, storage technology and science start research project

Duisburg/Essen. The energy industry in Germany is facing major challenges: How can we succeed in making electricity and heat available in the future, on the one hand securely and reliably, but on the other hand also in a climate-friendly way and at the lowest possible cost? The project partners from the University of Duisburg-Essen, the storage specialist Kraftblock, plant manufacturer Steinmüller Engineering and the Essen-based energy company Iqony have launched a pilot project that aims to remedy this situation.

The issue to be examined is how, in particular, plants that produce electricity and heat at the same time in accordance with the principle of cogeneration can be used even more economically and in a more resource-efficient manner in the future.

In the coming decades, combined cycle power plants (CCGTs) in particular will play a decisive role in energy generation because they can be deployed flexibly and, by using hydrogen as an energy medium, they will also be able to provide base-load capable and climate-neutral power generation. The fact that combined cycle power plants are already considered particularly efficient today is due to their high electrical efficiency and their high fuel utilization efficiency in the simultaneous generation of heat and electricity.

However, the combined generation of electricity and heat can also lead to economic problems. This is because the plants are often operated on a heat-led basis to ensure the supply of heat to customers. That means that the power plants also have to run in situations when the electricity is not needed on the market and, in the worst case, has to be fed into the grid at negative prices. The aim must be to decouple the heat supply from electricity production in such periods.

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Feasibility study as a project

This is precisely where the joint project “FlexKWK”, which the partners have now launched, comes in. Specifically, it deals with the integration of an innovative storage system for the provision of green heat. Instead of molten salt storage systems, which have been installed to date, primarily in solar power plants, high-temperature solid-state storage facilities are to be used here. These are designed to solve the problems that salt storage involves: the temperature limitation of the salt mixture and the need for a new steam generator to incorporate the heat in a power plant. According to the project partners, the use of high-temperature solid-state storage, by contrast, opens up several opportunities, such as securing district heating capacity and converting existing power plants into thermal storage power plants – and at more favorable economic conditions, as the project now underway aims to demonstrate.

Project partners from a leading-edge cluster

The consortium, led by Richard Lindenau of the Energy Technologies division at Iqony Solutions GmbH, consists of partners from industry and research. The industrial partners are Iqony Solutions GmbH, Steinmüller Engineering GmbH and Kraftblock GmbH. The Chair of Energy Process Engineering and Energy Systems at the University of Duisburg-Essen represents the research aspect. Together, the partners are pursuing the goal of developing a plan for the use of a sensitive high-temperature storage system and testing it for technical and commercial feasibility. “The aim is to use an innovative storage solution to help ensure that plants operated on the cogeneration principle can be optimized in the future so that they not only have particularly low emissions, but are also as economically efficient as possible,” says Dr. Ralf Schiele, COO of Iqony GmbH.

Economical heat storage power plants

The concept envisages converting an existing power plant into a heating plant with thermal energy storage using a sensitive high-temperature storage unit with a temperature of up to 1,000 degrees Celsius. Modelling and simulation will be used to investigate typical operating scenarios and estimate the investment costs for a real solution suitable for everyday use. In other words, the project team intends to use these methods to draw up a feasibility study on the deployment of high-temperature heat storage systems in combination with, for example, a combined-cycle gas turbine or another power generation plant operating on the principle of cogeneration.

Furthermore, the project is aimed at developing cost-effective and optimized thermal storage power plants that rely on the use of high-temperature storage. There, surpluses of energy from renewables are to be converted into electricity on demand or fed into the heating network.

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About Kraftblock

Kraftblock builds systems for the decarbonization of thermal processes for industries, district heating and power plants. At its core is a sustainable and cost-effective high-temperature storage system that can store thermal energy at a maximum temperature of 1,300°C for up to two weeks. This makes Kraftblock systems an important building block in the energy transition and for the decarbonization of process heat. Kraftblock GmbH, based in Saarland, was founded in 2014 by chemist Dr. Martin Schichtel and economist Dr. Susanne König. Schichtel developed the patented storage granulate, which is characterized by recycled raw materials and high thermal conductivity.

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About SPIN

SPIN – Spitzencluster für industrielle Innovationen e. V. (Leading-Edge Cluster for Industrial Innovations) – creates alliances of relevant players in North Rhine-Westphalia such as business groups, medium-sized companies, start-ups, universities and research institutes in the fields of energy and digital technology. The aim is to drive forward future technologies in application-related research projects. The focus is on the development of climate-friendly technologies, processes and products for the successful transformation of industry and the energy system in the Rhine-Ruhr region. The Ministry of Economic Affairs, Innovation, Digitalization and Energy of the State of North Rhine-Westphalia (MWIDE) is funding the establishment of the SPIN office in the CoWorking Space of the Essen ruhrHUB for a three-year period starting in December 2021. The leading-edge cluster currently employs a staff of five and comprises 14 members who are working together with other partners on seven approved research projects with a volume of around 21.5 million euros. SPIN is also one of 73 projects established by the Ruhr Conference to shape structural change in the Ruhr metropolis.

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About Steinmüller Engineering

Steinmüller Engineering GmbH is a member of the IHI Corporation, a globally operating Japanese group with approx. 29,000 employees. At the Gummersbach site, the international team of more than 130 qualified specialists is successfully engaged in the fields of energy and environmental technology and engineering services. References range from studies and component supplies to complex and demanding new construction or modernization projects – for example, turnkey sewage sludge incineration plants.

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About LEE

The Chair of Energy Process Engineering and Energy Systems (LEE) at the University of Duisburg-Essen is concerned with the energy supply of the future. Its research is directed at the decarbonization of the energy sector. The focus is on centralized and decentralized energy conversion, and on energy efficiency. Selected research topics include CCS, sustainable fuels and energy sources, and energy efficiency. The institute's work is thus at the interface between pure research and application technology, linking various disciplines such as economics, the natural sciences, and information and control technology.

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About Iqony

Iqony makes green energy feasible. With 85 years of experience in the planning, construction and operation of energy facilities, the company provides holistic solutions for the decarbonization, decentralization and digitalization of the energy supply. Iqony focuses on renewable energies and bridging technologies that can be used in a climate-neutral way now and in the future. In addition to solar, wind and geothermal energy, the portfolio includes hydrogen solutions, storage technologies, engineering services and gas-fired power plants. Around 2,300 employees worldwide implement

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projects for major industrial companies, utilities, cities and municipalities in numerous countries across the globe. Specializing in tailor-made solutions for complex challenges, Iqony draws on its broad and in-depth knowledge of the energy industry across the full range of technologies and services.

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