Press information

20.10.2023
255/2023

Clean and safe power for data centres
Kiel University and Trinity College Dublin receive €2.5 million EU funding to develop particularly reliable and sustainable transformers

When power fails in data centres, the damage is often great: not only is the operation of companies or institutions interrupted, but important data can also be lost. In addition, the facilities are known for their high energy consumption. The goal of the research project "Super-HEART" is a power supply that can reliably use several sustainable energy sources such as hydrogen and solar energy at the same time. The focus is on developing a cost-efficient transformer that enables a continuous, clean flow of electricity. In the project working groups from the fields of power electronics and materials sciences at Kiel University and Trinity College Dublin are cooperating. It is funded by the European Union with a total of 2.5 million euros from an innovation programme until 2025. 1.3 million euros of this will go to Kiel University. The project is also supported by the Fraunhofer Institute for Silicon Technology (ISIT) in Itzehoe.

Integrating hydrogen into the energy grid as a reliable power source

"The energy transition poses completely new challenges for our power grid. This EU funding is an important support to advance a reliable and sustainable energy supply, for example with hydrogen, together with partners and thus also fulfil our social responsibility as a university," emphasises Prof. Dr. Simone Fulda, President of Kiel University.

In contrast to conventional transformers, using power electronic components hydrogen can be integrated into power grids as an energy source. Up to now, however, power electronic components have been considered susceptible to failure and require expensive and complex redundancies: several components take over in the event of a failure and thus reliably maintain the power supply.

The transformer that will be developed in the Super-HEART project is intended to be much more compact and cost-effective. To achieve this, the project team is developing extremely fast and powerful supercapacitors. It is also using innovative semiconductor materials such as silicon carbide and gallium nitride. Due to their high efficiency they are considered to be the materials of the future for power electronics.

Developing game changers for critical infrastructures

With this project, Marco Liserre, Professor of Power Electronics at Kiel University and Deputy Head of ISIT, is building on previous EU projects in which he developed a modular transformer. "The modular transformer and the supercapacitors for short-term energy storage are technological breakthroughs themselves. By combining them and developing them further, we expect a 20 per cent increase in performance in terms of stored energy, reliability of power supply and reduction in operating costs," says project leader Liserre. "This can make them a 'game changer' for complex and critical infrastructures that otherwise incur high downtime costs." The first prototypes will be tested in data centres and zero-energy houses, which produce their own energy needs using hydrogen-powered fuel cells, photovoltaic systems and other storage and energy sources.

Supercapacitors for emergency energy storage

Supercapacitors are energy storage devices that can be charged and discharged much faster than conventional batteries. If the power supply fluctuates or fails for a short time, they can immediately release or absorb energy. This also makes it possible to temporarily shut down faulty components in the power grid. "However, the supercapacitors currently available on the market can only store a small amount of energy. We want to use special nano and micro-structuring to improve their performance and fit them optimally into the new transformers," says Rainer Adelung, Professor of Functional Nanomaterials at Kiel University.

The Kiel researchers are working closely with Valeria Nicolosi, Professor of Nanomaterials and Advanced Microscopy at the Institute of Chemistry at Trinity College Dublin. She has built special supercapacitors from two-dimensional nanomaterials based on titanium carbide, which will be further developed in this project.

Looking for industrial partners to enter the market

Now that Liserre has twice been awarded funding from the European Research Council (ERC), including the prestigious ERC Consolidator Grant, he is looking for industrial partners to commercialise the results of his research, with a view to setting up his own company.

More information:
www.super-heart.eu/

EU innovation funding programme "EIC Transition"
With this funding line, the European Commission aims to support universities, research institutions and companies in translating basic research results from previous EU projects into applications. In addition to financial resources, the funding also includes advisory services for spin-offs. The European Innovation Council (EIC) and the European Research Council (ERC) work closely together to support European talent and enable breakthrough innovation.
https://eic.ec.europa.eu/eic-funding-opportunities/eic-transition_en

Project overview:
Project title: “Super-HEART”: a fault-tolerant and highly efficient energy hub with embedded short-term energy storage for high availability electric power delivery
Duration: 2022-2025
Funding programme: EIC Transition
Funding amount: 2,5 Mio. Euro (in total), 1,3 Mio. Euro for Kiel University
www.super-heart.eu

Project title: „U-HEART“: Unbreakable HEART: a reconfigurable and self-healing isolated dc/dc converter
Duration: 2018-2020
Funding programme: ERC Proof-of-Concept-Grant
Funding amount: 150.000 Euro
https://u-heart.de/

Project title: „HEART“: Highly Efficient and Reliable smart Transformer
Duration: 2014-2019
Funding programme: ERC-Consolidator-Grant
Funding amount: 2 Mio. Euro
https://www.heart.tf.uni-kiel.de/en/home

Photos are available for download:
https://www.uni-kiel.de/fileadmin/user_upload/pressemitteilungen/2023/255-SUPERHEART-1.jpg

Now the project team met the first time all together in Kiel – Professor Marco Liserre (Power Electronics, Kiel University, first row, from right), Prof. Valeria Nicolosi (Nanomaterials, Trinity College Dublin) and Prof. Rainer Adelung (Materials Science, Kiel University) and their teams (second row, from left) Jan-Ole Stern, Arkadeb Sengupta, Fabian Schütt, Dahnan Spurling, Yoann Pascal, Thiago Pereira.

www.uni-kiel.de/fileadmin/user_upload/pressemitteilungen/2023/255-SUPERHEART-2.jpg
The members of the EU project Super-HEART want to develop power electronic components that aim to integrate sustainable energy sources such as hydrogen into the power grid.
© Julia Siekmann, CAU

www.uni-kiel.de/fileadmin/user_upload/pressemitteilungen/2023/255-Superheart-3.png
The “Super-HEART” transformer is intended to combine several sustainable energy sources and storage devices for a continuous, clean flow of electricity, e.g. for the operation of data centers.
© Dahnan Spurling

www.uni-kiel.de/fileadmin/user_upload/pressemitteilungen/portraitbilder/marco-liserre.jpg
With the EU's innovation funding, project leader Marco Liserre, professor of power electronics at Kiel University and Deputy Head of ISIT, wants to bring new transformers from basic research to market maturity.
© Claudia Eulitz, CAU

www.uni-kiel.de/fileadmin/user_upload/pressemitteilungen/portraitbilder/Rainer_Adelung_2021.jpg
Rainer Adelung, Professor of Functional Nanomaterials at Kiel University, is working on high-performance supercapacitors that are to be integrated into the transformers as emergency energy storage.
© Julia Siekmann, CAU

Contact:
Prof. Marco Liserre
Power Electronics, CAU
Deputy Head of ISIT
Phone: +49 431 880-6100
E-Mail: ml@tf.uni-kiel.de

Dr. Yoann Pascal
Power Electronics, Fraunhofer ISIT
E-Mail: yoann.pascal@isit.fraunhofer.de

Prof. Rainer Adelung
Functional Nanomaterials, CAU
Phone: +49 431 880-6116
E-Mail: ra@tf.uni-kiel.de

Dr. Fabian Schütt
Functional Nanomaterials, CAU
Phone: +49 431 880-6024
E-Mail: fas@tf.uni-kiel.de

Christian-Albrechts-Universität zu Kiel
Presse, Kommunikation und Marketing, Eva Sittig, Text/Redaktion: Julia Siekmann
Postanschrift: D-24098 Kiel, Telefon: (0431) 880-2104, Telefax: (0431) 880-1355
E-Mail: presse@uv.uni-kiel.de Internet: www.uni-kiel.de Twitter: www.twitter.com/kieluni
Facebook: www.facebook.com/kieluni Instagram: www.instagram.com/kieluni

Link zur Meldung: https://www.uni-kiel.de/en/details/news/255-superheart