

(HERMES)-HIGHLY EFFICIENT SUPER CRITICAL ZERO EMISSION ENERGY SYSTEM

Contact: Artur Pozarlik | a.k.pozarlik@utwente.nl

Main goal

The main objectives of the HERMES project are to advance gas turbine technology to create a reliable, flexible, and zero-emission solution for energy supply with long-term impact at the EU level. The project aims to develop and assess the first highly efficient closed-loop supercritical zero emission energy system. This system will be based on a directly fired supercritical gas turbine engine operating on locally synthesized renewable liquid and gaseous fuels, such as methanol or hydrogen, coupled with decentralized carbon capture utilization and storage (CCUS).

But the project is not just about technological innovation; it's about smart integration of energy systems across sectors as well. By improving the integration of renewable energy and renewable fuel-based solutions across various energy-consuming sectors, our goal is to optimize their effectiveness and impact, for a sustainable future. As part of this project, we're developing a methodological approach using "digital twins" to manage energy flows within integrated systems, along with localized combustion and chemical kinetics. Through machine learning, we'll monitor energy demands and production, ensuring a smart input/output match. Optimization algorithms will then maximize fuel, power and heat output, leveraging surplus electricity and available storage in smart cities.

Our ambitions extend beyond technological prowess to cover socio-economic and environmental considerations, aligning with the priorities outlined in the European Green Deal. Through detailed techno-economic evaluations, regulatory frameworks analysis, and stakeholder engagement, we strive to ensure that our solutions are not only sustainable but also socially and economically viable.

FUNDING/PROGRAMME: HORIZON EUROPE



Project PI: Artur Pozarlik

project contributor(s): Yashar Hajimolana, Monika Sharevska, Johann Hurink, Gerwin Hoogsteen, Jim Kok, Abhishek Singh

Project leader: University of Twente

Collaborators: ETHNICON METSOVION POLYTECHNION, EXERGIA ENERGY AND ENVIRONMENT CONSULTANTS AE, TEC4FUELS, OWI SCIENCE FOR FUELS GMBH, IMPERIAL COLLEGE OF SCIENCE TECHNOLOGY AND MEDICINE, CENTRE EUROPEEN DE RECHERCHE ET DEFORMATION AVANCEE EN CALCUL SCIENTIFIQUE, PAUL SCHERRER INSTITUT, OPRA ENGINEERING SOLUTIONS B.V., ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE, POLITECHNIKA WROCLAWSKA

The Thermal Engineering research group within the Faculty of Engineering Technology and the Energy Group at the Faculty of Electrical Engineering, Mathematics, and Computer Science (EEMCS) are collaborating closely on the HERMES project.



