

EU-PROJECT SOLINDARITY - SOLAR-DRIVEN INDUSTRIAL POWER AND HEAT UPGRADED WITH HIGH-TEMPERATURE HEAT PUMPS FOR ENHANCED INTEGRATED PROCESS EFFICIENCY

Enrico Jende^{1*}, Panagiotis Stathopoulos¹

¹ German Aerospace Center, Institute of Institute of Low-Carbon Industrial Processes,
Cottbus-Zittau, Germany, *enrico.jende@dlr.de

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Abstract

SOLINDARITY will develop, demonstrate and validate the feasibility of an integrated Solar Energy-based Heat Upgrade System (SEHUS) comprising solar energy resources, innovative High Temperature Heat Pumps (HTHP), Thermal Energy Storage (TES) and Waste Heat Recovery (WHR) for the deep decarbonization of industrial processes with temperatures up to 280°C. The solar energy resources include High Vacuum Flat solar Panels (HVFPS) for pressurized hot water generation at a temperature of up to 150°C with high performance Photovoltaic (PV) panels with trackers and special nanocoatings, that (apart from producing directly power for the process power needs) drive a novel, reverse Brayton HTHP to elevate its working medium (air) temperatures up to 440°C. The project will address all major technical challenges related to the integration of the aforementioned modules to the main process plant, while holistic orchestration at system level will be achieved thanks to Artificial Intelligence (AI)-enabled process control, Digital Twinning (DT) architecture and easy-to-use visualization dashboard, that will optimally manage all plant assets at any given time, efficiently matchmaking the available resources with the industrial power and heat needs. The pilot system to be developed will demonstrate its effectiveness, robustness, sustainability and cost-efficiency in three industrial sites, belonging to different industrial sectors (Food, Paper, Rubber industries) and climatic regions (Germany, Greece, Italy), utilising medium-grade heat at different temperatures (195-270°C) and media (diathermic oil, air), and having different plant capacities, operational and physical configurations, land constraints, fuels in use, etc. Moreover, 5 replication studies (3 in Jordan; 2 in Morocco) have been foreseen in solar resources abundant non-EU Mediterranean region countries. To this end, the SOLINDARITY consortium brings together 18 partners from 6 EU countries and Switzerland, Morocco and Jordan.