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Concept and design aspects of High Temperature Heat Pumps in the EU-PROJECT SOLINDARITY

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ABSTRACT

The EU-Project SOLINDARITY will develop, demonstrate and validate the feasibility of an integrated Solar Energy-based Heat Upgrade System (SEHUS) comprising solar energy resources (High Vacuum Flat Solar Panels and Photovoltaic), innovative High Temperature Heat Pumps (HTHP), Thermal Energy Storage and Waste Heat Recovery for the deep decarbonization of industrial processes with temperatures up to 280°C. 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). This publication presents initial results from the development of a reversed Brayton HTHP regarding the SEHUS, while considering different industrial applications. The integration concept and a preliminary dimensioning, based on steady-state simulations, cover the configuration of the HTHP and serve as the starting point for the design phase, particularly regarding the turbo machinery and the drive system. Results from the system's initial design iterations are also presented, allowing conclusions to be drawn about the process integration of HTHP and its components into different industrial applications.