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Prof. Dr. Luisa F. Cabeza, PhD,

Advisory Board Editor of

Energy Convers. Manag.

Dear Prof. Cabeza,

On behalf of my co-authors, attached please find the manuscript entitled “Decarbonizing an industrial process through a combined, high-temperature CSP and sensible heat storage” to be considered for publication in the journal *Energy Conversion and Management*.

Based on the Spanish patent request of application number P20233097 (by A. Sanchez Sanchez de Puerta, J.L. Aranda-Hidalgo and myself), we present and characterize the unsteady operation of a proof of concept combining CSP (solar dish technology) and carbon-blocks thermal energy storage, aimed at decarbonizing an industrial activity demanding a flat high-temperature (800 °C) heat profile (27 kW and 650 kWh/day). By means of a mathematical model coupling a solar dish (modifying the recent work of García Ferrero et al., 2023) and a TES unit (inspired by Schumann’s model), we have conducted unsteady numerical simulations from the DNI measurements of three days (two solstices and one equinox) of 2022 in two locations of interest of southern Spain: Córdoba and Málaga.

The performance of our solution is as follows. One or several solar dishes first increase the temperature of the HTF (compressed air). Then, according to a simple decision-making algorithm, the mass flow enters or bypasses a TES unit. If additional backup energy is required to reach a final temperature, it is supplied externally from the Spanish electric grid. A sensitivity analysis has shown that four solar dishes in parallel configuration, combined with a TES unit of aspect ratio $L/D = 1.5$ (if in Córdoba) or $L/D = 1.0$ (if in Málaga), is a suitable solution to effectively reduce the external energy consumed by the system as well as the operation cost and the environmental impact.

From our knowledge, the originality of the numerical model characterizing the performance of the CSP-TES combined solution, with the corresponding energy management is a valuable product that could attract the interest of many researchers interested in solar and TES technologies. We are firmly convinced that the rigorous mathematical formulation, involving validation and verification steps for each of the elements of the system, and the application of our model to a global energy and environmental problem concerning the high-temperature industry (e.g. chemical, cement, steel, electrolysis processes, etc.), makes our manuscript a high-quality contribution to the *Energy Conversion and Management* journal.

We look forward to hearing from you in due course.

Sincerely Yours,



PhD Antonio Martín-Alcántara,
on behalf of all co-authors.