PhD Antonio Martín-Alcántara
Magtel I+D+i
P.E. Las Quemadas, C/ Gabriel Ramos Bejarano, 114
Córdoba, 14014, Spain
antonio.alcantara@magtel.es

Prof. Dr. Luisa F. Cabeza, PhD,
Editor-in-Chief of
Journal of Energy Storage

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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 of Energy Storage*.

Based on the Spanish patent request with 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-block 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 time-dependent numerical model combining the CSP-TES performance, with the corresponding real-time energy management is a valuable product that could attract the interest of many researchers interested in CSP-TES combined 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 (fed with real data) to address 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 *Journal of Energy Storage*.

We look forward to hearing from you in due course.

Sincerely Yours,

PhD Antonio Martín-Alcántara,

on behalf of all co-authors.