Economical performance of solar molten salt power generation

This study focuses on the techno-economic optimization of direct molten salt parabolic trough solar thermal power plants (STPPs) equipped with thermocline filler (TCF) thermal energy storage (TES). On one hand, this technology allows for cost reductions compared with state of the art two-tank (2T) TES. On the other hand, however, it leads to a performance ...

This research introduces an innovative transient modelling tailored for the comprehensive annual performance analysis of a solar tower power plant coupled to a two-tank TES system, incorporating molten salts as the storage medium.

- Techno-economic analysis and simulation of various renewable energy systems - Dynamic modelling, ... - Annual evaluation and financial appraisal of innovative solar power facility designs for power generation, solar fuels, ... Performance of molten salt solar power towers in Chile. J. Renew. Sustain. Energy, 5 (2013)

The present study explores the integration of supercritical CO 2 (sCO 2) power cycles into Concentrating Solar Power (CSP) plants using molten salt, and the hybridization of these plants with solar photovoltaic (PV) systems through electric heaters. Techno-economic evaluations determined the optimal power cycle configuration and subsystem ...

Three key energy performance indicators were defined in order to evaluate the performance of the different molten salts, using Solar Salt as a reference for low and high temperatures.

System-level simulation of a molten-salt thermocline tank is undertaken in response to year-long historical weather data and corresponding plant control. Such a simulation is enabled by combining a finite-volume model of the tank that includes a sufficiently faithful representation at low computation cost with a system-level power tower plant model. Annual ...

The molten salt medium related costs make up typical-ly a significant proportion of the overall TES system costs. For large-scale systems, molten salt costs are currently in a range from 4-20EURkWh th -1 depending on exact market pri-ces and temperature difference. The material research on molten salt related aspects is diverse.

Annual plant performance of a 100 MWe molten-salt power tower plant is optimized as a function of the thermocline tank size and the plant solar multiple (SM). The effectiveness of the thermocline tank in storing and supplying hot molten salt to the power plant is found to exceed 99% over a year of operation, independent of tank size.

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The main characteristic of a molten salt solar tower plant (MSSTP) is the use of a molten salt mixture as heat transfer and storage medium. The salt is a mixture of roughly 60 % NaNO3 and 40 % KNO3 and is commonly referred to as solar salt. Most MSSTP operate within a temperature range of 290°C to 565°C and use an external

Moreover, solar parabolic trough collectors and molten salt thermal energy storage are used to preheat water entering a bottoming steam-driven power generation cycle. An electrolizer is installed to separate water into hydrogen and oxygen for charging a hydrogen storage tank, procuring hydrogen for fuel cell vehicles, and producing methane by combining hydrogen and ...

Increased control abilities increase stability of the power system and, as a consequence, strongly influences economic aspects. It regards both system management and energy market stability. It should be also mentioned that molten salt reservoirs are conjugate to concentrated solar power harvesting due to the lack of additional energy conversion.

State-of-the-art concentrating solar power (CSP) plants based on central tower receivers use molten nitrate salts as the high-temperature heat transfer and thermal energy storage (TES) media to drive Rankine power cycles for dispatchable renewable electricity [1] signs may achieve solar-to-electric conversion efficiencies above 20% [2].Plants with ...

Yu Zhao proposed three Brayton cycle power generation systems based on solar salt heat storage, and the findings indicate that the combination of a molten salt heat storage system with a compressed carbon dioxide energy storage system exhibits superior economic performance compared to the original photovoltaic and molten salt heat storage scheme [12].

The design and techno-economic performance of a compact additively manufactured (AM) molten salt (MS)-to-supercritical carbon di-oxide (sCO 2) primary heat exchanger (PHE) for solar thermal application is described.The PHE design consists of sCO 2 flow through an array of microscale pin fins while the MS flows through mm-scale rectangular ...

Advancements and Challenges in Molten Salt Energy Storage for Solar Thermal Power Generation Yuxin Shi1* 1 School of Mechanical and Energy Engineering, Zhejiang University of Science and Technology, Hangzhou, Zhejiang Province, 310023, China Abstract. Solar power, which is one of the most abundant and sustainable

This paper investigates the techno-economic performance of a molten salt power tower integrated with an air-cooled supercritical carbon dioxide recompression cycle. Prior research into the cycle design point showed trade-offs between efficiency, cost, and temperature difference across the heat input, resulting in trade-offs between the design ...

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