Calculation of energy storage time for CSP plants

Overview

This work incorporates a simulation and optimization study on a 100 MW central tower CSP plant with 15 h of thermal energy storage in Dubai, UAE. The main performance indicators studied are the capacity factor (CF) and the levelized cost of electricity (LCOE). Current commercial concentrating solar power (CSP) plants distinguish themselves from ordinary photovoltaic (PV) power plants by storing enough collected thermal energy to enable electricity generation for several hours after the sun goes down. CSP plants store this thermal energy in the sensible. What is the addition of TES to a CSP plant actually worth?

How would a plant actually be used to minimize system production cost?

How does TES change the value of CSP?

Examining dispatch can explain the origin and differences of these costs. This paper presents a completely new concept of PCM energy storage. Recent research aimed at quantifying the added values of CSP dispatchability, the key findings being: (i) the dispatchability of CSP adds quantifiable economic benefits, (ii) the flexibility of CSP can aid the integration in the grid of other renewable energy technologies, such as solar. Since CSP plants cycle daily with the solar resource, it is also important that plants efficiently start up each day and manage transients through cloudy periods.

Article Content

Quantifying the Value of CSP with Thermal Energy Storage

“Estimating the Capacity Value of Concentrating Solar Power Plants with Thermal Energy Storage: A Case Study of the Southwestern United States” IEEE Transactions on Power Systems.

Life cycle assessment of concentrated solar power plants ...

This study evaluates the environmental and techno-economic performance of a 110 MW central tower Concentrating Solar Power (CSP) plant with molten salt Thermal Energy Storage (TES) under three ...

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Abstract—Central tower concentrated solar power (CSP) systems are considered the most mature clean tech-nology to substitute conventional power plants. This work incorporates a simulation and ...

Thermal energy storage (TES) with phase change materials ...

Together with component models for all other components in a full scale CSP plant, the PCM model is able to estimate storage performance during a representative operation based on typical ambient ...

Life cycle assessment (LCA) of a concentrating solar power (CSP) ...

The results obtained in this comparative study on the impacts generated by tower CSP plants with different storage capacities allow us to establish that, as the storage capacity of the plant ...

Optimal Thermal Energy Storage Configuration Model for CSP Units

The proper configuration of TES capacity can promote the efficient utilization of CSP resource as well as lower the general cost. This paper proposes a TES capacity configuration model which can work out ...

Design of CSP plants with optimally operated thermal storage

When a new CSP plant is being considered for con-struction at a specific location, models and tools are needed to assess the potential of eneregy production, and thus eventually compute the PPA price ...

Improved CSP Efficiency: Innovations and Challenges in Thermal ...

Abstract: This review article examines the current state and future prospects of systems for storing thermal energy in concentrated solar power (CSP) plants.

Modeling the Guaranteed Performance of CSP Plants

Because the performance of the plant will vary seasonally due to changing sun positions, day length, solar intensity, and different weather conditions, it is necessary to use a performance model to ...

Re-Designing the CSP Thermal Energy Storage System to ...

Current commercial concentrating solar power (CSP) plants distinguish themselves from ordinary photovoltaic (PV) power plants by storing enough collected thermal energy to enable ...

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