NREL report finds similar value in two concentrating solar power technologies

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Parabolic troughs and dry-cooled towers deliver similar value for concentrating solar power (CSP) plants, despite different solar profiles, a new report by the Energy Department's National Renewable Energy Laboratory has found.

The report, "Estimating the Performance and Economic Value of Multiple Concentrating Solar Power Technologies in a Production Cost Model," found that the value of delivered energy of dry-cooled tower and parabolic trough CSP plants, integrated with thermal energy storage, are quite similar.

CSP with thermal energy storage is a unique source of renewable energy in that the solar thermal energy can be dispatched in a similar manner as conventional thermal generation to respond to changes in supply or demand.

CSP uses the thermal energy of sunlight to generate electricity. Parabolic troughs and power towers both concentrate sunlight onto a heat-transfer liquid, which is used to drive a steam turbine. Unlike photovoltaic energy, CSP can generate electricity not just when the sun is shining, but also after sundown, because a CSP plant can be built with thermal energy storage, such as molten salt.

"In our study, we analyzed various plant configurations and identified specific ones that provide significantly more value than has been found in previous analyses," said NREL Analyst Jennie Jorgenson, the lead

author of the report. "For example, we explored the potential benefits of extending thermal storage at CSP plants beyond six hours, a typically modelled amount. In this analysis we found additional benefits for six to nine hours of storage, but rapidly diminishing benefits for greater than nine hours of storage."

The NREL report, funded through the Energy Department's Office of Energy Efficiency and Renewable Energy in support of its SunShot Initiative, provides valuable quantitative results in a Colorado test system, comparing the two CSP technologies with thermal energy storage and evaluating how the operational and capacity value varies with plant configuration. The report also demonstrates that multiple CSP technologies and plant configurations can be analyzed using traditional planning tools such as production cost models.

NREL is currently undertaking a similar analysis looking at the value of multiple CSP configurations in California under an assumed 40% penetration of renewables within that state.

"For both conventional and renewable energy systems, low levelized cost of energy does not necessarily reflect these systems' total value to the grid," Jorgenson added. "So, providing tools that utilities and grid operators are familiar with can lead to more informed decision-making as greater levels of renewable energy penetrate the market."

More information: Report: www.nrel.gov/docs/fy14osti/58645.pdf

Provided by National Renewable Energy Laboratory

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