

# System Advisor Model Includes Analysis of Hybrid CSP Option

Highlights in  
Research & Development

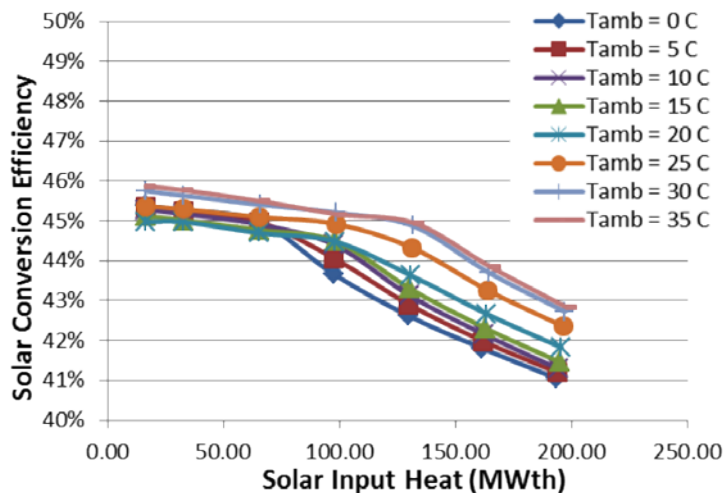
NREL has created an analytical model to study a hybrid power option—concentrating solar power coupled with natural-gas-powered generation.

Several novel concepts related to power generation have been missing in the System Advisor Model (SAM). One such concept, until now, is a hybrid integrated solar combined-cycle (ISCC) system, which has been identified as a potentially cost-effective and lower-risk option for deploying concentrating solar power (CSP).

To enable the detailed assessment of this hybridization strategy, National Renewable Energy Laboratory (NREL) scientists have developed a new CSP component to SAM that models a retrofit ISCC system. In this model, power-cycle performance data are connected with SAM's molten-salt power-tower model.

By adding this hybridization model to SAM, NREL scientists have advanced published models by making it possible to analyze the effect of power-cycle off-design behavior on the solar technology performance.

This expanded capability within SAM will allow a broad community of users to assess the performance and economic viability of new CSP concepts—such as solar-field and receiver designs integrated with a brownfield power plant.



Plot that investigates the solar conversion efficiency for various ambient temperatures and shows the benefits of hybridization at high ambient temperatures.

**Technical Contact:** Ty Neises, [ty.neises@nrel.gov](mailto:ty.neises@nrel.gov)

**References:** Neises, T. (2013). *SAM Enhancements for CSP*. DOE Continuation Report (unpublished).

System Advisor Model website. (2013). National Renewable Energy Laboratory. <https://sam.nrel.gov>.

Zhu, G.; Neises, T.; Turchi, C. (2013). "Thermodynamic Evaluation of Solar Integration into a Natural Gas Combined Cycle Power Plant." Submitted to *Applied Energy*.

## Key Research Results

### Achievement

NREL developed a retrofit integrated solar combined-cycle model that connects power-cycle performance data with SAM's molten-salt power-tower model.

### Key Result

This new model determines the effect of power-cycle off-design behavior on the performance of the solar technology.

### Potential Impact

This development allows SAM users to assess the performance and economic viability of a new CSP deployment option.

**NREL is a national laboratory of the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, operated by the Alliance for Sustainable Energy, LLC.**

15013 Denver West Parkway  
Golden, CO 80401  
303-275-3000 | [www.nrel.gov](http://www.nrel.gov)

NREL/FS-5500-60997 | January 2014

Printed with a renewable-source ink on paper containing at least 50% wastepaper, including 10% post consumer waste.