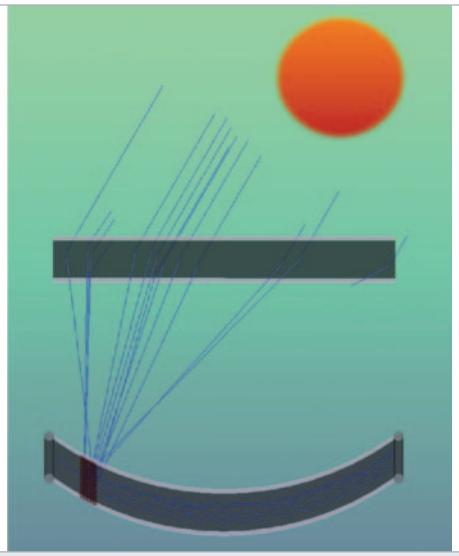
Scattering Solar Thermal Concentrators

PENNSYLVANIA STATE UNIVERSITY	
PROGRAM:	SunShot CSP R&D 2012
TOPIC:	Advanced Collectors
LOCATION:	University Park, Pennsylvania
AWARD AMOUNT:	Up to $0.3 million
PROJECT TERM:	2012–2015



This is a rendering of a scattering solar concentrator. Light collected by a cylindrical Fresnel lens is focused within a curved glass "guide" sheet, where it is redirected into confined modes by a small mobile scattering element and transported toward heat transfer elements at the edges. *Illustration from Pennsylvania State University*

MOTIVATION

All thermal concentrating solar power (CSP) systems use solar tracking, which involves moving large mirror surfaces to follow the daily movement of the sun. This approach is both simple and effective, but it suffers from two principal drawbacks: tracking error caused by wind loading and the high capital cost of the mirrors and support structure. Together, these factors account for nearly half of the installed system cost. Additionally, mirror movement leads to poor land-use efficiency because of shading concerns.

PROJECT DESCRIPTION

This project's objective is to explore a new, scattering-based approach to concentrating sunlight that aims to improve the overall performance and reliability of the collector field. The research team is working to demonstrate a small-scale, fully functioning prototype that minimizes tracking requirements; subsequently, the team will test the prototype's performance outdoors.

IMPACT

This project aims to demonstrate that scattering solar thermal collectors are capable of achieving optical performance equal to state-of-the-art parabolic trough systems, but with the added benefits of immunity to wind-load tracking error, more efficient land use, and utilization of stationary receivers.

CONTACTS

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For more information, visit the project page at: www.solar.energy.gov/sunshot/csp_sunshotrnd_pennstate.html.

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