Heliostat Consortium Intern Seminar
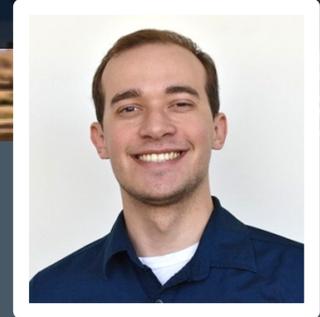
August 27, 2025
1 PM MT / 3 PM ET

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Jack Goggin
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A Performance Forecasting Framework for the Solar Fields of Concentrating Solar Thermal Tower Systems

Learn about the development of a novel workflow for simulating solar field performance to ensure software packages for modeling the optical and technoeconomic performance of various CSP components account for uncertainties present throughout the power or heat generation process.

Mobile Metrology and Mini VSHOT

Learn about the development of various metrology methods to assess mirror optical qualities for users of heliostat fields to identify and understand the optical imperfections in their mirrors and their effects on system performance.

The Measurement Report Tool: Open-Source Software to Automate Reflectivity Measurements of Solar Materials

Learn about the development of the Measurement Report Tool (MRT), a user-friendly software for automating the collection and standardization of data from common instruments which characterize solar materials (Perkin Elmer L1050, Devices and Services 15R USB, Surface Optics Corporation 410 Solar).

U.S. Department of Energy
HelioCon
Heliostat Consortium for Concentrating Solar-Thermal Power

HelioStat Consortium Seminar series brought to you by the Heliostat Consortium Resource, Training, and Education (RTE) topic area

Host: Dr. Brooke Stanislawski
Register on Zoom: http://bit.ly/3IUzUxt

Gino Kler
Performance Forecasting
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A Performance Forecasting Framework for the Solar Fields of Concentrating Solar Thermal Tower Systems

Abstract: Several software packages for modeling the optical and technoeconomic performance of various components of CSP systems exist, but the meaningfulness of their results is limited by their failure to account for uncertainties present throughout the power or heat generation process. Furthermore, the quality of point estimates for annual outputs and efficiencies is inconsistent across the different tools. In this project, we are addressing these shortcomings by developing a novel workflow for simulating solar field performance with higher fidelity than previously possible. We develop this workflow via Python APIs for SolarPILOT, SolTrace, and SAM. Our primary contribution is a Python script that takes in a SolarPILOT project file and produces point, percentile (e.g., P10/P50/P90), and interval annual energy output estimates from SAM. We achieve this by introducing distributional information instead of point estimates for key parameters known to be uncertain and impactful on plant output, and by using SolTrace's Monte Carlo ray tracing to achieve higher-fidelity efficiency estimates of optical performance. The resulting data are sent to SAM to produce a distribution of point estimates to inform decisions about prospective CSP projects.

Bio: Gino is a recent graduate from Washington University in St. Louis with a bachelor's in mathematics + computer science and master's in statistics. At NREL, as part of HelioCon, Gino works under Alex Zolan's mentorship to improve the methodology for simulation and technoeconomic analysis of solar fields in concentrating solar power systems. Gino's broader research interests are applied geometry and analysis.

Zoe Wilf
Research and Development
Graduate Intern, Sandia
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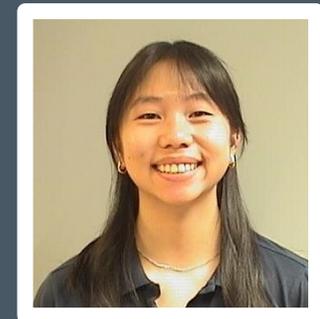
Mobile Metrology and Mini VSHOT

Abstract: In order to determine how well a concentrating solar power system is performing, the optical accuracy of the mirrors used in the system must be understood. An ideal mirror used as a concentrated solar power heliostat facet would be perfectly smooth and accurate, with no imperfections or slope errors. Because such a geometrically perfect mirror cannot exist, users of heliostat fields must be able to identity and understand the nature and effects of their mirrors not having ideal optical characteristics. In order to address this problem, a variety of metrology methods have been developed in the Concentrating Solar Optics Laboratory at the Sandia National Solar Thermal Test Facility, capturing data that can inform calculations and determine the optical qualities of a mirror, often utilizing cameras, simple optical principles, and complex software. The Mobile Metrology platform presents a method of transporting, organizing, and standardizing the mobile implementation of these latest concentrated solar power optic metrology capabilities. The newest of these capabilities is mini VSHOT, a simple and manual metrology method that utilizes laser reflectometry principles to measure a mirror, and is one of various heliostat accuracy measurement methods that will be implemented in the first Sandia Mobile Metrology test campaign.

Bio: Zoe Wilf is pursuing a Master's degree in Mechanical and Aerospace Engineering at the University of California, Davis. Utilizing her background in mechanical design, test planning, and project management, she contributes to the efforts of the Concentrating Solar Optics Laboratory at the National Solar Thermal Test Facility at Sandia National Laboratories as a summer graduate intern. Her work at Sandia is an ideal intersection between her interests in renewable energy systems and complex engineering problems.

Jack Goggin
Optical Metrology and
Standards Intern, NREL

The Measurement Report Tool: Open-Source Software to Automate Reflectivity Measurements of Solar Materials
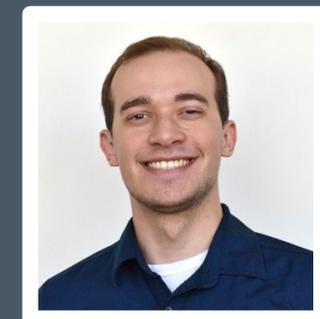
Abstract: Common instruments which characterize solar materials (Perkin Elmer L1050, Devices and Services 15R USB, Surface Optics Corporation 410 Solar) produce different data types which are difficult to manually collect into a standardized report. To address this problem, we have developed easy-to-use software called the Measurement Report Tool (MRT), which we intend to make available through OpenCSP. The MRT collects data from the three mentioned instruments, then visualizes the data into graphs and tables within a written report. In this presentation, we describe the MRT software and demonstrate its use.

Bio: Jack Goggin is a post-master's intern at NREL. While at NREL, he has developed the Measurement Report Tool (MRT) to help automate the characterization of solar mirrors and absorbers. In addition, he has also modelled heliostat dwell times with different drive systems to constrain heliostat building requirements. Lastly, he has contributed to NREL's effort to optimize the procedure of measuring solar reflectors through an uncertainty study. Before NREL, Jack studied physics at Penn State for his master's, where he wrote a thesis about the effects of human intervention on forest fire statistics. Before this he was fascinated by quantum materials in his undergraduate degree in physics at George Mason University.