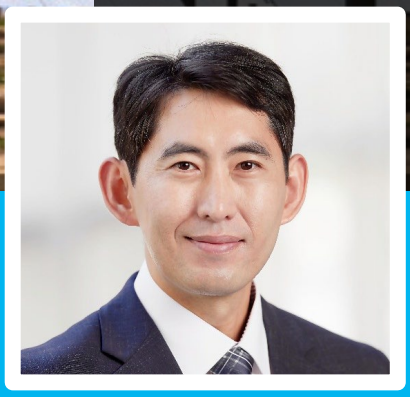
Advancing Heliostat Performance Through Precision Angle Measurement Seminar

January 21, 2026
1 PM MT / 3 PM ET



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

HelioStat Consortium Seminar series host:
Dr. Brooke Stanislawski

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ABSTRACT

Accurate prediction and characterization of heliostat tracking performance remain a critical role to achieving DOE's cost and reliability targets for next generation concentrating solar power (CSP) systems. As part of the HelioCon "Heliostat Technology Advancement" initiative, UNLV is developing and deploying the Operating Surface Angle Measurement System (OSAMS) – a highly precise, low-cost sensor designed to measure reflective surface angle and structural deviations under real operating conditions. Following successful hardware development, calibration, and tracker-mounted validation, the current phase of work focuses on full-scale heliostat field testing. In this phase, OSAMS sensors are installed directly on a heliostat to measure surface normal variations, quantify tracking error behavior, and evaluate environmental loading effects, including wind, gravity, and thermal deformation. This seminar will present the testing methodology and initial findings from the UNLV field deployment, including sensor mounting strategies, synchronized data acquisition techniques, and analysis of surface angle error patterns observed over extended operational periods. The presentation will also highlight how these high-resolution data streams support ongoing analytical model development for tracking error decomposition and wind-induced deflection characterization. Ultimately, this work advances HelioCon's mission to lower heliostat cost and enhance field reliability by enabling validated performance measurements and improved physics-based modeling capabilities.

BIO

Dr. Heejin Cho is a Professor of Energy Technology in the Department of Mechanical Engineering and Co-Director of the Center for Energy Research (CER) at the University of Nevada, Las Vegas (UNLV). Prior to joining UNLV in 2023, he served for over a decade as Assistant and Associate Professor of Mechanical Engineering at Mississippi State University (MSU) and previously worked as a Research Engineer at the Pacific Northwest National Laboratory (PNNL). His research focuses on solar energy, energy storage, and advanced energy systems, with an emphasis on designing and optimizing sustainable, high-performance energy solutions for buildings, communities, and industrial applications. His work spans concentrating solar power (CSP) technologies, distributed renewable energy systems, thermal energy storage, and AI-driven energy management frameworks that support net-zero carbon goals. Throughout his career, Dr. Cho has led or contributed to more than $30 million in funded research as Principal Investigator or Co-Principal Investigator across UNLV, MSU, and PNNL. His sponsors include the U.S. DOE, DoD, USDA, NASA, national laboratories, and industry partners. He is an ASME Fellow and has authored more than 120 scholarly publications in energy and environmental systems. He serves as Section Chief Editor for Energy Reports (Elsevier) and as Associate Editor for the ASME Journal of Energy Resources Technology and the ASME Journal of Thermal Science and Engineering Applications. He also served as General Conference Chair of the 2021 ASME International Conference on Energy Sustainability.

Aaron Sahm has been working at the Center for Energy Research on the campus of the University of Nevada, Las Vegas (UNLV) for over 20 years as an Undergraduate Assistant, a Graduate Assistant, and as a Research Engineer as manager of the UNLV Center for Energy Research test site and the Nevada Regional Test Center (NVRTC). During this time, he has been involved with many different solar energy projects. This has included flat plate photovoltaic installation and testing, single axis photovoltaic trackers, Stirling Dishes, zero energy homes, phase change material, solar hydrogen generation, hydrogen/natural gas blending, steam generation, supercritical CO2 Brayton cycle systems, and high concentrating photovoltaics (HCPV). From 2012 to present Mr. Sahm's primary tasks have involved the operation and planning of the NVRTC. Other tasks during this time period involved assisting with manufacturing and testing of supercritical CO2 power cycle components, testing of anti-soiling coatings on PV panels, automated chiller cleaners, hydrogen electrolyzers, appliance testing with blended natural gas and hydrogen, CPV/PV system diagnosis and repair, etc. Over the years Aaron has gained experience dealing with the challenges associated with the installation of CPV systems; weather issues, equipment scheduling, operation of heavy equipment, diagnosing and repairing components such as inverters, hydraulic controls, tracking controls, and software.