Abstract Submitted
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High-Temperature, High-Concentration Solar Thermoelectric Generators EMILY WARREN, LAURYN BARANOWSKI, Colorado School of Mines, MICHELE OLSEN, PAUL NDIONE, JUDY NETTER, ALAN GOODRICH, MATTHEW GRAY, PHILIP PARILLA, DAVID GINLEY, National Renewable Energy Laboratory, ERIC TOBERER, Colorado School of Mines, National Renewable Energy Laboratory — Solar thermoelectric generators (STEGs) powered with concentrated solar energy have potential for use as primary energy converters or as topping-cycles for more conventional concentrated solar power (CSP) technologies. Modeling based on current record modules from JPL suggests thermoelectric efficiencies of 18% could be experimentally expected with a temperature gradient of $1000 - 100°C$. Integrating these state-of-the-art TEGs with a concentrating solar receiver requires simultaneous optimization of optical, thermal, and thermoelectric systems. This talk will discuss the modeling, design, and experimental testing of STEG devices under concentrated sunlight. We have developed a model that combines thermal circuit modeling with optical ray tracing to design selective absorber coatings and cavities to minimize radiation losses from the system. We have fabricated selective absorber coatings and demonstrated that these selective absorber films can minimize blackbody radiation losses at high temperature and are stable after thermal cycling to 1000°C. On-sun testing of STEG devices and thermal simulators is ongoing and preliminary results will be discussed.

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