Abstract Submitted
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Temperature reduction through system level flow enhancement via model solar PV farm wind tunnel experiments[1] ANDREW GLICK, JULIAAN BOSSUYT, NASEEM ALI, Portland State University, MARC CALAF, University of Utah, RAÚL BAYOÁN CAL, Portland State University — To further facilitate the reduction in cost of photovoltaic energy, new approaches to limit module temperature increase in natural ambient conditions should be explored. Thus far only approaches based at the individual panel level have been investigated, while the more complex, systems approach remains unexplored. Here, we perform the first wind tunnel scaled solar farm experiments to investigate the potential for temperature reduction through system level flow enhancement. Results indicate that significant changes in the convective heat transfer coefficient are possible, based on wind direction, wind speed, and module inclination. We show that 30-45% increases in convection are possible through an array-flow informed approach to layout design, leading to a potential overall power increase of $\sim 5\%$ and decrease of solar panel degradation by +0.3%/year. Previous models demonstrating the sensitivity to convection are validated through the wind tunnel results, and a new conceptual framework is provided that can lead to new means for solar PV array optimization.

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