A Low-Cost Sky-Imaging Camera for Solar Forecasting on 5- to 15-minute Time Scales

Eric M. Wilcox (DRI-Reno), Marco Giordano (UNR-Atmospheric Science), and Rachel Tavares (TMCC)

We have developed a prototype sky-imaging camera instrument suitable for translating photographic images of the sky into forecasts of solar irradiance in the vicinity of solar photovoltaic (PV) arrays. The weather-proof camera includes on-board image processing that discriminates cloudy pixels from clear sky pixels and anticipates when clouds will shade the sun. The resulting forecast also relies on a cloud-free estimate of solar irradiance determined numerically on-board, or can optionally make use of a co-located pyranometer. Because the instrument is substantially cheaper than the current commercial alternative, it is suitable to deploy in a distributed fashion across a city at distributed solar PV sites. We anticipate integrating the first fully autonomous instrument in spring 2016 at the UNLV microgrid. We will develop a shared database of sky images for testing forecast algorithms of varying complexity. And we will investigate the utility and feasibility of deploying multiple sky imagers across the city of Las Vegas at publicly funded roof-top solar PV installations.