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Simulating errors in annual energy production from a shaded photovoltaic system DAVID STARLING, ROBERT VITAGLIANO, MAURO NOTARO, JOSEPH RANALLI, Penn State University — When calculating the available solar resource for a photovoltaic installation, one must consider the site latitude, the annual weather patterns as well as the local horizon. In particular, the local horizon reduces the annual irradiance via shading; however, to estimate this reduction one must first measure the horizon and then simulate its effects on photovoltaic power production throughout a typical meteorological year. Simulations are performed using Java and the software development kit for System Advisor Model (SAM) developed by NREL. In order to determine the local horizon as an input to SAM, a solar site survey must be conducted. Since these horizon measurements are imperfect, simulated annual energy production possesses a degree of uncertainty. Over the course of a one-year undergraduate research project, we simulated the effect of horizon measurement errors. Results show that modest errors in the horizon measurement ($\pm 5^\circ$ in azimuth) result in minimal errors in annual energy production (3.3%). Therefore, the use of SAM and open source smart-phone technology should be sufficient for students to conduct a solar site survey and simulate annual energy production (as well as financial variables) in a classroom setting.

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