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Comparing Solargraf® Shading Predictions to On-Site Shading Measurements

Solargraf® (www.solargraf.com) is an all-in-one 3D design and proposal tool that lets users design solar and storage systems and manage the contracting, financing, and permitting of a project. Combining the capabilities of AI-based image processing and LIDAR assisted technology, Solargraf helps generate 3D models for any address across the globe. Elements such as roof pitch, azimuth, height, walls, obstructions, and trees are automatically detected. The power of Solargraf lies in its proprietary shading engine, which simulates the sun's path at each hour of the day throughout the year and leverages site-level weather data to calculate irradiance and Solar Access Values (SAVs) for each point on the 3D model (as seen on the right in Figure 1). These values, combined with system losses, are then used to obtain production estimates for solar modules placed on the roof, eliminating the need for time-consuming site visits. Further, it simulates the system over its lifetime and shows the estimated savings that a homeowner may achieve by installing the system. Using integrations with financing providers and DocuSign, installers can also complete the loan applications and contracting from within the Solargraf tool. The design can then be converted to a permit plan set using Solargraf's integrated service.

As part of a larger Cooperative Research and Development Agreement with Enphase Energy that covered several projects, NREL evaluated the statistical equivalence between SAVs calculated by Enphase Energy using their Solargraf software to perform remote shading analysis, and SAVs measured by NREL on-site using a Solmetric SunEye 210 shade measurement tool.

Figure 1. Overview of shading imagery in the Solargraf tool. *Image from Enphase Energy*

Comparing Solar Access Percentage Values

NREL provided Enphase Energy with specifications of 81 total points across eight residential rooftops, featuring a variety of slopes, rooftop obstructions, surrounding trees, and other factors that affect rooftop SAVs. 43 points are located across four houses in the Los Angeles, California, metro area, and 38 specific points are located across four houses in the Denver, Colorado, metro area. In 2014, NREL conducted on-site measurements of annual SAVs for each of the 81 points by averaging the measurements taken with two Solmetric SunEye 210 devices. Enphase Energy provided NREL with annual SAVs estimated using their Solargraf® software for each of the 81 points described. Note that since the measurements were taken in 2014, Enphase needed to locate older satellite data to use with the tool to calculate SAVs; by default the tool uses much newer satellite imagery.

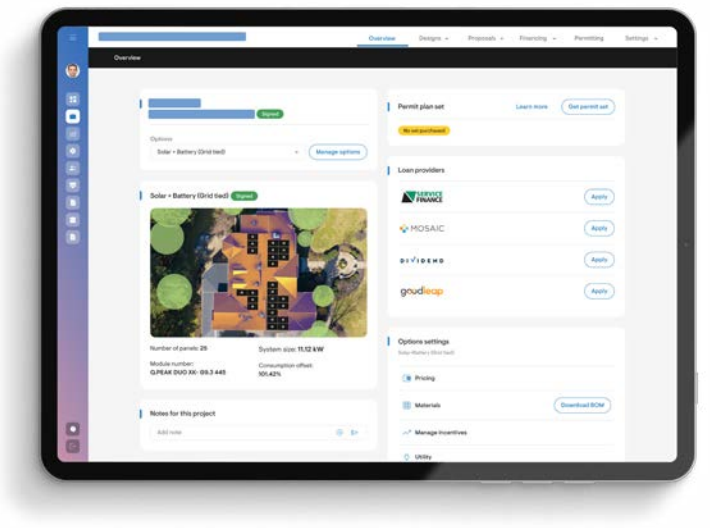

Figure 2. Projects built with Solargraf can have multiple proposal options and can be customized in a variety of ways. *Image from Enphase Energy*

Table 1 shows the results of the two one-sided statistical test (TOST) used to evaluate the differences in the SAVs estimated by Solargraf and the SunEye on-site measurements. Values calculated by the Solargraf software and those measured on-site by NREL using the SunEye tool are considered statistically equivalent if the confidence intervals of their mean differences fall within a given interval. In aggregate, the results of the analysis show that the annual SAVs provided by Solargraf were statistically equivalent within ±2.39 SAVs for both the Los Angeles locations and the Denver locations, compared to those of the on-site measurements made by NREL using the SunEye devices.

Table 1. Comparison of Annual SAV Estimates from Solargraf and On-Site Measurements for 81 Points on Rooftop Locations across Eight Houses

Equivalence Interval	Los Angeles	Denver
±3 SAV	Yes	Yes
±5 SAV	Yes	Yes
±10 SAV	Yes	Yes

Fast Facts

- Solargraf is a solar design software and proposal tool owned by Enphase Energy. NREL has a larger cooperative research and development agreement (CRADA) with Enphase, and this is the first product of that collaboration.
- NREL compared 81 solar access values (SAVs) calculated by Solargraf to those measured on-site by NREL using two Solmetric SunEye 210 shade measurement tools.
- A two one-sided test was used to compare data collected for 81 rooftop locations for four houses in Los Angeles, California, and four houses in Denver, Colorado. The 81 estimated SAVs provided by Solargraf were found to be statistically equivalent to the measurements taken on-site by NREL with a tolerance of less than ±3 SAVs.

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