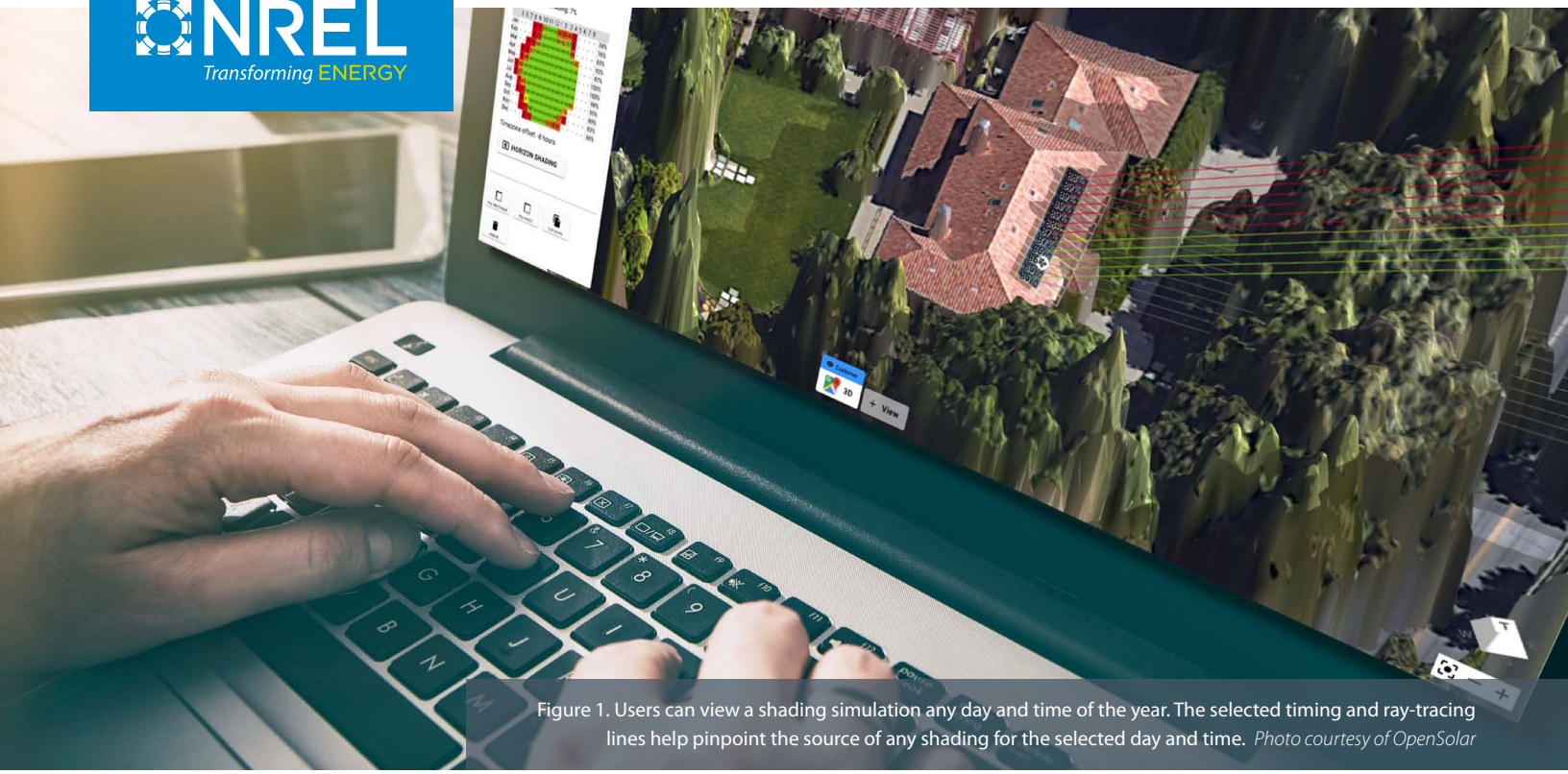

Figure 1. Users can view a shading simulation any day and time of the year. The selected timing and ray-tracing lines help pinpoint the source of any shading for the selected day and time. *Photo courtesy of OpenSolar*

Comparing the OpenSolar Remote Shading Analysis Tool to On-Site Shading Measurements

According to the 2021 U.S. Solar Market Insight report by Wood Mackenzie, it is estimated that non-hardware costs—or "soft costs"—account for 63% of the total cost of residential solar installations.[1]

The National Renewable Energy Laboratory (NREL) estimates customer acquisition to be the highest contributor to total soft costs in residential solar installations, accounting for up to $0.67/W (including permitting, inspection, and interconnection costs).[2] Various strategies—including remote shading analysis software, among others—may offer some potential soft-cost savings that could reduce the total cost of residential solar installations.

OpenSolar is a software that helps users produce photovoltaic designs and proposals. Using the address of the property, the OpenSolar software creates an articulated 3D model of a site and performs remote shading analysis, calculating solar access values (SAVs) based on the 3D environment and the path of the sun across the year. Solar access is a measurement of the available clear sky over a site and is used to characterize the impacts of local shading objects.[3] On-site shading measurements have historically been used to characterize the solar access of the proposed site and inform the design of the photovoltaic system based on potential energy production; however, remote shading analysis technology is becoming more common.

FAST FACTS

- The U.S. Department of Energy National Renewable Energy Laboratory (NREL) Commercialization Assistance Program provides early-stage assistance to help startup companies cross technological barriers to commercialization while encouraging private-sector investment.
- OpenSolar is a solar installation design, sales, and management software platform.
- NREL compared solar access values (SAVs) calculated by OpenSolar to those measured on-site by NREL using two Solmetric SunEye 210 shade measurement tools. A total of 81 rooftop locations were considered for eight sites, including four houses in Los Angeles, California, and four houses in Denver, Colorado.
- The 81 estimated SAVs provided by OpenSolar were found to be statistically equivalent to the measurements taken on-site by NREL with a tolerance of less than ±3 SAVs.

[1] SEIA/Wood Mackenzie Power & Renewables U.S. Solar Market Insight Report 2021 Q3, www.woodmac.com/industry/power-and-renewables/us-solar-market-insight/.

[2] U.S. Solar Photovoltaic System and Energy Storage Cost Benchmark: Q1 2020, www.nrel.gov/docs/fy21osti/77324.pdf.

[3] Analysis of Solar Census Remote Solar Access Value Calculation Methodology, www.nrel.gov/docs/fy15osti/63098.pdf.

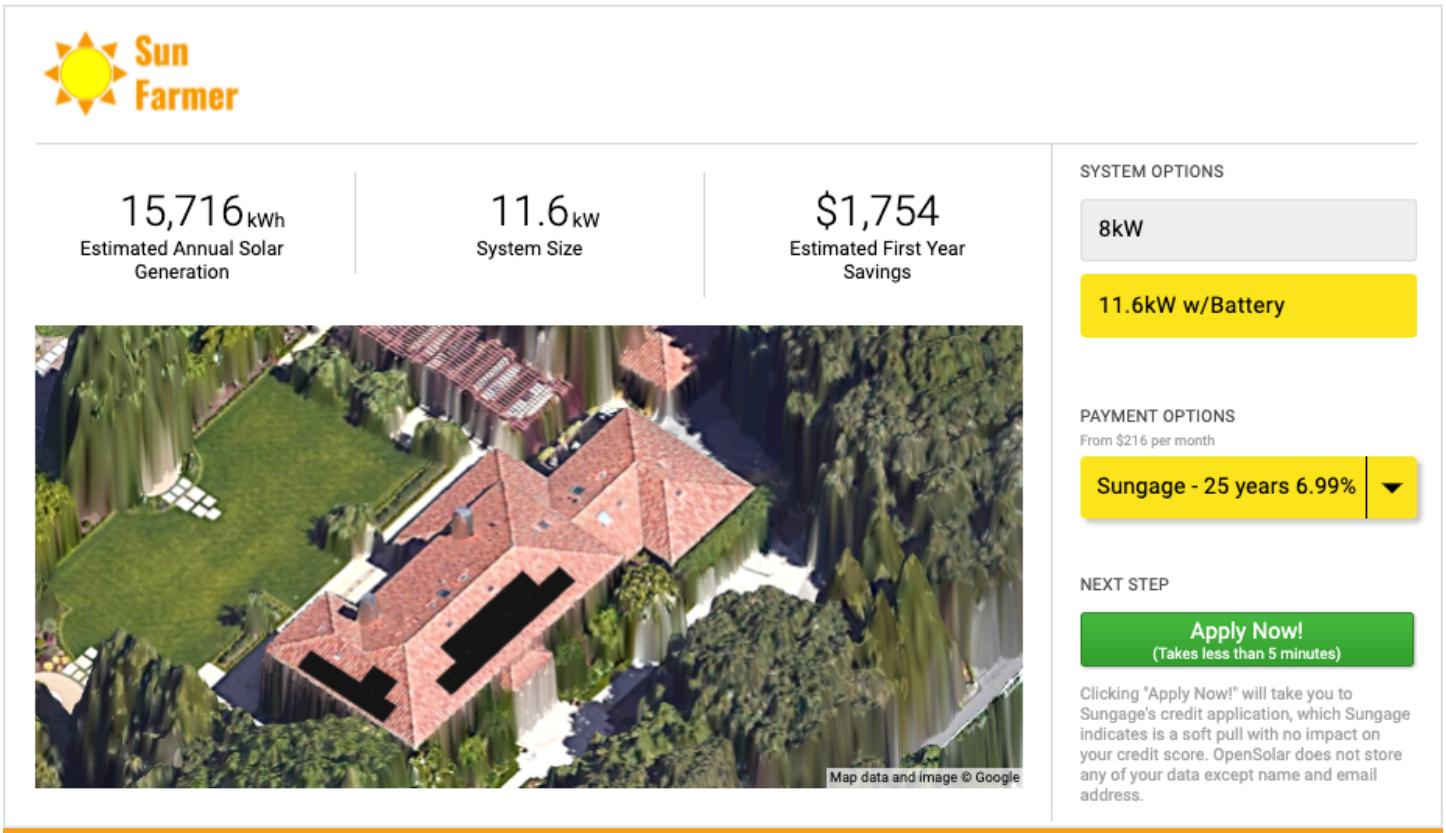

Figure 2. OpenSolar's online proposals are customizable and interactive.
Photo courtesy of OpenSolar

Under the NREL Commercialization Assistance Program, NREL evaluated the statistical equivalence between SAVs calculated by the company OpenSolar using their remote OpenSolar analysis software and SAVs measured by NREL on-site using a Solmetric SunEye 210 shade measurement tool.

Comparing Solar Access Percentage Values

NREL provided OpenSolar with descriptions of 81 total points across eight rooftop locations with varying slopes, rooftop obstructions, surrounding trees, and other factors that affect rooftop SAVs. These included 43 specific rooftop locations across four houses in the Los Angeles, California, metro area and 38 specific rooftop locations across four houses in the Denver, Colorado, metro area. For each point, NREL conducted on-site measurements of annual SAVs in 2015 by averaging the measurements taken with two Solmetric SunEye 210 devices for each physical rooftop location. OpenSolar provided NREL with annual SAVs estimated using their software for each of the 81 points described.

Table 1 shows the results of the two one-sided statistical test used to evaluate the differences in the SAVs estimated by OpenSolar and the SunEye on-site measurements.[3] Values calculated by the OpenSolar 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 OpenSolar were statistically equivalent within ±2.63 SAVs for the Los Angeles locations and within ±2.69 SAVs for the Denver locations compared to those of the on-site measurements made by NREL using the SunEye devices.

Table 1. Analysis of Annual SAV Estimates from OpenSolar

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

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