NREL
NATIONAL RENEWABLE ENERGY LABORATORY

Figure 1. HelioScope shade reports give system designers simple visualizations of shading effects.

VALIDATING the Accuracy of HelioScope's Automated Shade Reports

HelioScope is an advanced sales and design platform built from the ground up to support the solar photovoltaic (PV) installation process with design automation and bankable performance modeling tools.

Solar installers and developers can quickly assess a location's solar potential and deliver shade-adjusted proposals without time-intensive site visits.

Using the software, shade reports are generated with globally-available satellite imagery and a 3D modeling interface. Obstructions like trees, chimneys, and HVAC units are rendered with user-defined geometry. User input is assisted by LiDAR (where available) and shade-based height estimating—a method that determines the height of objects based on the apparent shade patterns as captured in satellite or aerial imagery.

Once geometry is captured, the shading scene is evaluated for both direct and diffuse irradiance for every module across every hour of the year. The results of the 3D simulation engine are

FAST FACTS

- **HelioScope and NREL conducted a blind study to determine the accuracy of HelioScope's remote shading tool. HelioScope was compared to Solmetric's SunEye, and solar access value results were equivalent within ±1.3 SAV's over the entire data set.**
- **HelioScope performs module-level energy simulations that have been validated by DNV-GL to be within 1% of PVsyst, an industry-standard performance modeling software.**
- **HelioScope layout and performance modeling tools are cloud-based and available globally.**

automatically formatted for submittal to rebate authorities and financial institutions. Third-parties can easily interpret and validate HelioScope shade reports using industry-standard methodologies.

Verifying the Accuracy of Remote Shading

In all, 85 roof locations were assessed on houses with varying slopes, rooftop obstructions, surrounding trees, and other factors that affect rooftop SAVs. HelioScope's estimated SAVs were compared with the average readings taken from two Solmetric SunEye devices at the physical roof locations. Table 1 shows the results of the two, one-sided statistical tests used to evaluate the differences in the HelioScope and SunEye readings.[1] Readings between HelioScope and SunEye devices are statistically equivalent if the confidence intervals of their mean differences fall within a given SAV equivalence interval.

The National Renewable Energy Laboratory (NREL), in partnership with HelioScope, independently verified the accuracy of HelioScope's 3-D modeling capabilities to create remote-shading solar access values (SAVs) on an annual basis for locations in Los Angeles, California, Denver, Colorado and Camden, New Jersey. Estimates of annual SAVs were calculated using the HelioScope PV system design tool at 43 roof locations across four houses in the Los Angeles metro area, at 38 roof locations across four houses in the Denver metro area, and at four locations across two buildings in Camden, NJ. Table 1 provides an analysis of annual SAV equivalence intervals of ±3%, ±5%, and ±10% for the Denver and LA locations. The table uses a Yes/No designation for each equivalence interval and location to indicate whether the product was able to meet the equivalence intervals.

The results of the analysis show that annual SAV measurements calculated by HelioScope were statistically equivalent within ±3.12 SAVs to those of on-site measurements made with SunEye devices in Los Angeles and within ±2.35 SAVs in Denver. Over the entire data set for the 85 roof locations in the three cities, including the Camden, New Jersey sites, the SAV measurements calculated by HelioScope were statistically equivalent within ±1.3 SAVs.

SAV Equivalence Interval	Denver	Los Angeles
± 3%	Yes	No
± 5%	Yes	Yes
± 10%	Yes	Yes

Table 1. Estimated annual solar access value equivalence interval ranges from HelioScope system design

Potential for Soft-Cost Savings

HelioScope's remote shade modeling accurately estimates the energy potential of a site without requiring costly visits to the location. Solar professionals can quickly qualify prospective customers from the comfort of their desk and avoid investing resources into low-probability projects in the early stages of the sales process. Time that would otherwise be spent driving to sites can now be used for other aspects of the business.

The cost of analyzing site data and conducting an on-site assessment—before a proposal—is estimated to constitute 55% of the customer acquisition and engineering design costs for residential solar PV installations.[2] Accordingly, NREL estimates that bid preparation software tied with integrated shading analysis can save $0.17 per watt on a 5-kilowatt system.[2]

Although NREL has not independently certified HelioScope's soft-cost savings, the estimated savings of this type of software application deployed at market scale is generally understood to reduce soft costs to a similar degree.

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

[2] Ardani et al. 2013. Non-Hardware ("Soft") Cost-Reduction Roadmap for Residential and Small Commercial Solar Photovoltaics, 20132020. NREL/TP-7A40-59155. National Renewable Energy Laboratory, Golden, CO. *www.nrel.gov/docs/fy13osti/59155.pdf*

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