NREL
NATIONAL RENEWABLE ENERGY LABORATORY

Fast Facts

- The U.S. Department of Energy (DOE) SunShot Initiative Incubator program provides early-stage assistance to help startup companies cross technological barriers to commercialization while encouraging private sector investment.

- As part of the Incubator 8 program, Geostellar is producing an interactive solar profile that models the financial benefits of solar energy unique to each individual home. Geostellar and the National Renewable Energy Laboratory (NREL) conducted a blind study to determine the validity of the system size and energy production estimates within the solar profile.

- When compared with actual measurements from completed installations, NREL determined that Geostellar successfully predicted the viability of the site and the performance of the system based on system size, tilt, orientation, and solar access.

Geostellar: Remote Solar Energy Assessments Personalized

Geostellar has produced an online tool that generates a unique solar profile for homeowners to learn about the financial benefits to installing rooftop solar panels on their homes. The *Geostellar website* incorporates the physical building characteristics of the home, including shading, slope, and orientation of the roof, and applies electricity costs and incentives to determine the best solar energy production options at the best price. Homeowners can type in their address to see a personalized report of the total energy production available through solar technology and identify the best financing option for their specific needs.
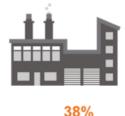

Figure 1. Geostellar power report for a residential home

In 2013, DOE selected Geostellar as a SunShot Incubator award from the U.S. Department of Energy (DOE). This award provides technical assistance to startup companies working in the solar energy sector. In addition, DOE provided the National Renewable Energy Laboratory (NREL) with funding to assist Geostellar with an independent validation of its online estimated energy production values against actual installed rooftop photovoltaic systems.

Platform Validation

The validation conducted by NREL concluded that more than three-quarters of Geostellar's potential size estimates were at least as large as the actual installed systems, indicating a correct assessment of roof availability. Geostellar can be set to estimate the largest possible system for a given roof, and consequently, finding that actual systems are equal-to or smaller-than that maximum validates the sizing methodology. In addition, those estimates are within 10% of actual PV Watts results.

Accuracy of Estimated System Size and Performance

The Geostellar energy production results were directly compared against existing residential homes in New Jersey. Of the 83 buildings in the original validation dataset, 15 were excluded either because they are commercial buildings or because the installer noted that trees would need to be cut so that the installation could be completed. NREL compared the remaining 68 homes to Geostellar outputs based on system size and 25-year energy production.

The system size component of the validation model compared the size of an actual installed system in kilowatts (kW) to the estimated size reported by Geostellar. Of the 68 homes used in the validation, Geostellar estimated a potential system of at least the installed system size in 76% of the homes (Table 1). This level of agreement indicates a reasonable assessment of the available roof area for successful solar installation.

Table 1. Distribution of Geostellar Size Estimates

Percent of Geostellar estimates compared to actual installed systems	Number of homes
>100	52 (76%)
75–100	7 (10%)
50–75	4 (6%)
25–50	4 (6%)
0–25	1 (1%)

The Geostellar results were also validated by comparing their calculated 25-year energy production values against calculated 25-year energy production values using known installation data. For this comparison, 45 homes in the New Jersey sample were used according to solar availability measurement data. Using the same performance derate losses, first-year soiling loss, and annual degradation values as Geostellar's default model assumptions, NREL compared the PV Watts 25-year energy production values for the actual installed systems to the Geostellar predictions. To estimate the 25-year energy production, NREL used the same assumptions for system losses as Geostellar but substituted in known-values for system size, tilt, orientation, and solar access. These variables were calculated using on-site Solar Pathnder measurements. The results are provided in Table 2.

Table 2. Distribution of Geostellar 25-Year Production Value Estimates

Percent of Geostellar estimates compared to PVWatts values	Number of homes
>110	7 (15%)
101–110	7 (15%)
90–100	24 (53%)
80–89	7 (15%)
N/A	31

Figure 2. Comparison of Geostellar remote assessment (left), installed system (middle), and NREL Lidar (right)