USING eCOGNITION TO DETECT SOLAR POTENTIAL

EARTH IMAGERY AND IMAGE ANALYSIS SOFTWARE HELP LEAD MORE CUSTOMERS TO THE SOLAR GRID.

Over the past decade solar's "hard costs"—modules and inverters—have decreased by as much as 60 percent. Coupled with federal and state tax incentives and rebates, and more affordable financing options, the lower equipment prices have helped grow the U.S. photovoltaic market by 69 percent on average over the past decade.

These growth opportunities have brought challenges to service providers. With hard costs at a negligible rate, solar companies and financiers face fierce competition to attract and acquire customers–the so-called "soft costs" of turning the solar curious into solar consumers.

Because lead generation and customer acquisition costs can run as high as 50 percent of the total cost of completing an installation, companies have been in need of innovative and efficient ways to enable potential clients to easily assess their solar potential and then purchase a system.

Geostellar, an online solar marketplace, saw this challenge as an opportunity to use geospatial technological advancements to help the whole solar-curious chain become smarter about solar. Geostellar has created a customized, real-time system that allows users to assess their property's solar potential, analyze financing options and local service providers, and then chose the most favorable solar option in a few mouse clicks.

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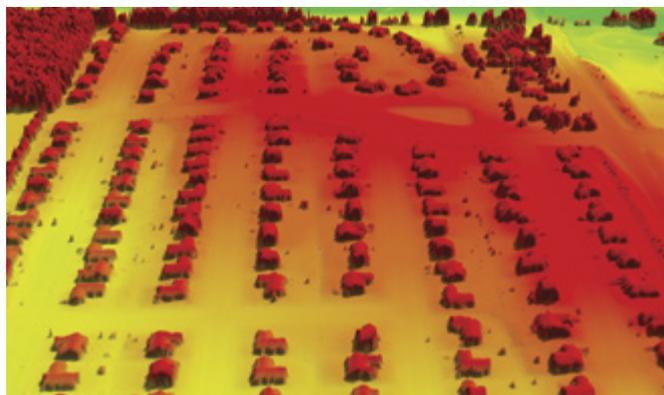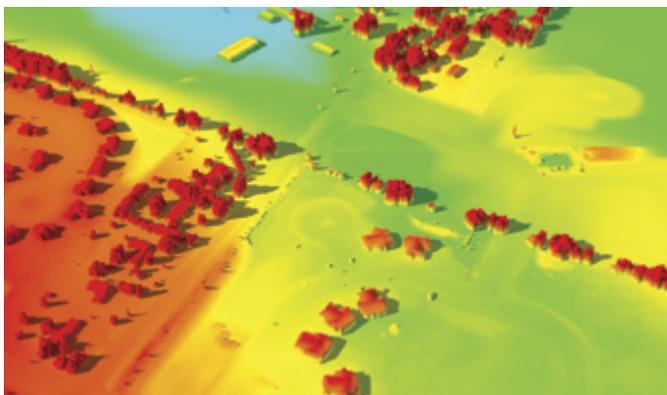
LiDAR surface models. Geostellar models a neighborhood structure with trees, utility poles and other objects and creates a virtual world of shadows, slopes and solar hot spots.

THE CHALLENGE

To achieve its mission to provide an on-demand, e-commerce system that could provide customized solar analytics, Geostellar first needed to have building vectors, the crucial data layer that would enable it to create precise maps and 3D models of all 3,143 counties in the US. Those foundational layers would then allow its system to map any rooftop's solar potential in real-time.

With millions of building footprints to map nationwide, a manual process of identifying and delineating buildings would not be feasible. Geostellar required an image analysis system that would almost completely automate the land classification process. And since each environment would present unique classification challenges, the solution needed the intelligence to quickly and accurately distinguish different structures from vegetative types and map out only buildings.

In addition, although Geostellar would predominantly use LiDAR imagery for extracting buildings, not every county in the US has LiDAR data available. So the company also required a flexible system that could easily ingest and accurately classify imagery of variable quality.
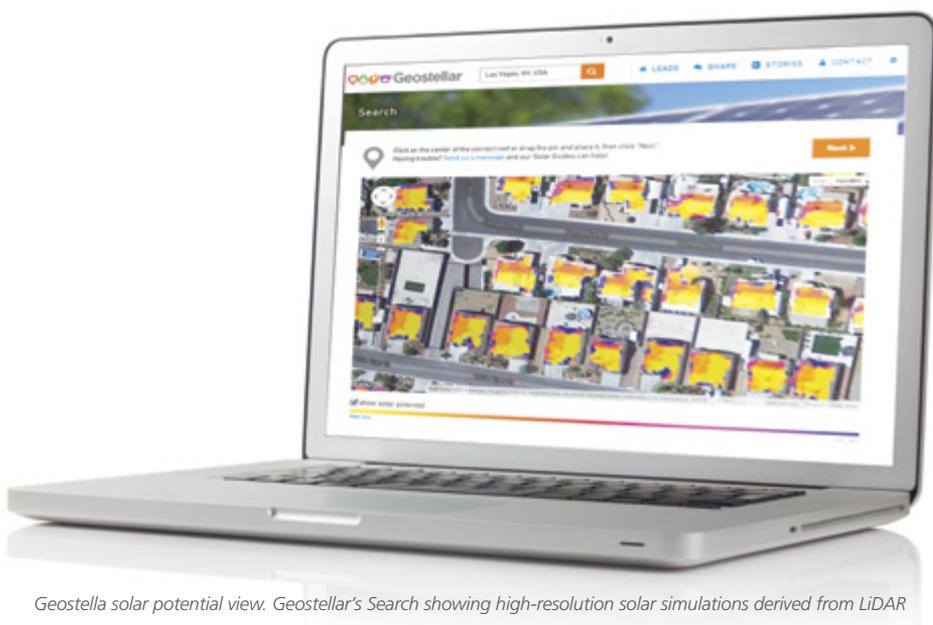
Geostella solar potential view. Geostellar's Search showing high-resolution solar simulations derived from LiDAR surface models and building footprints generated by eCognition.

"WITHOUT THE ABILITY TO FIND AND EXTRACT BUILDINGS, IT WOULD BE IMPOSSIBLE TO MAP A ROOFTOP'S SOLAR POTENTIAL."

David Levine, Geostellar CEO

THE SOLUTION

With geographic targets in mind, Geostellar began scouring available data repositories for high-resolution spatial imagery such as satellite data and LiDAR point clouds, together with ancillary information such as local tax rates, utility rates, precipitation and temperature and zoning regulations.

To address the issue of automatically creating building vectors, Geostellar chose Trimble® eCognition® object-based image analysis software.

"With eCognition, I can quickly asses the quality of the datasets that I'm working with, tweak the rule sets accordingly, and the software does the rest," said Dan Koopman, a spatial analyst with Geostellar. "And it's fast– depending on county size, it can take one minute to three hours on average to produce a building layer. That's about

90 minutes of manual time for every one minute of eCognition time, which is significant time savings."

Although the process changes with the geography, once the available data is integrated, eCognition typically analyzes the information to first separate vegetation from impermeable surfaces. Then, based on height, it determines which vegetation is grass and which are trees, and identifies rooftops and roads. It also delineates building footprints and maps them. Those vector maps are then used by Geostellar's proprietary solar simulation engine to create and provide on-demand rooftop assessments.

Needing only a user's address and average cost of their monthly electricity bill, Geostellar's geomatics platform runs a 3D simulation to compute how much sun hits their roof annually. It then

automatically layers in other data such as local utility rates, property values and incentives programs and calculates the property owner's financial prospects for transitioning to solar. In addition to the real-time assessment, it also provides a list of financing options, and vetted manufacturers and installers for consideration. Users then simply click on the most favorable offering.

eCognition is driven by rule sets, which are customized workflows of if-then scenarios the software uses to automatically classify specific objects and map land covers.

With these rule sets, Geostella has the flexibility to input spatial data and any other relevant data and instruct the software to classify any given county and thematically map any 2,500-meter-square area by feature type. For the solar maps, that feature type is buildings.

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> *Dan Koopman, a spatial analyst with Geostellar*

A closeup of building footprints (shown in red) in a residential neighborhood after analysis in eCognition

A mix of large commercial buildings and smaller residential buildings (shown in red) after analysis in eCognition

®Trimble.

THE OUTCOME

By resolving the key, automated-classification component of its solar e-commerce system, Geostellar was able to expand its reach into solar hotbeds across the US as well as offer its customers an efficient way to soften the hard costs of solarizing the country.

"We've been able to map about 80 percent of the most valuable solar markets at one-meter resolution," said David Levine, Geostellar CEO. "That's connected us to valuable markets such as California, Massachusetts and Connecticut, states that we wouldn't have been able to do business in had we not been able to extract features automatically."
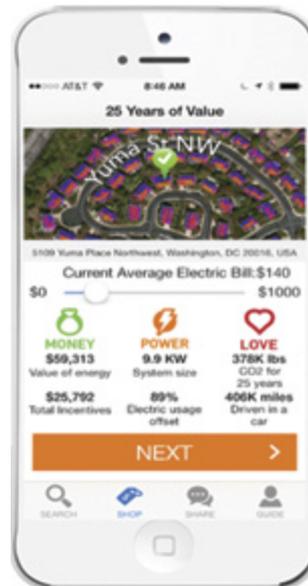
Connecticut's Clean Energy Finance & Investment Authority (CEFIA) is using Geostellar's platform to efficiently connect the solar curious with solar contractors in Connecticut. Through CEFIA's GoSolarCT web portal, more than one million Connecticut homeowners can obtain specific data regarding their home's suitability for solar and compare energy and cash savings for solar leases and loans.

Geostellar extended its solar reach to individual consumers. In December 2013 it launched a consumer-centric extension of its online solar marketplace called SolarMojo™, a free mobile app that allows homeowners to compare solar installation and financing plans from industry leaders and purchase a system with the push of a button.

By nearly automating the A-Z of "going solar," technological solutions like Geostellar's are not only reducing manual labor to the physical installation of a system, they are helping to ultimately drive down the total cost of developing the solar energy market.

HIGHLIGHTS AT A GLANCE

- Geostellar needed Building Footprints in order to customize solar modeling to the residential property scale. Creating a database of Building Footprints is traditionally extremely expensive, because it has largely been done by hand.

- eCognition empowers Geostellar to create high resolution, high accuracy building footprint geometries in an efficient manner, with an margin of error small enough that manual intervention (manual QC) is not required.

- The ability to extract these geometries in an automated fashion is the only way that such a large undertaking as mapping the entire US at the individual property level is possible.

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