

Solar panels go through extreme tests at San Jose lab

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At a nondescript office park in San Jose, solar panels from manufacturers around the world are going through tests of extreme endurance to make sure they are safe to put on your roof.

High-powered lamps expose panels to the intensity of "One Sun" -- the universally accepted standard for simulating the most extreme amount of sun exposure a solar product might ever endure.

In the "wet room," solar panels are constantly soaked by spray nozzles, as if from a hard, pelting rain. In another part of the 20,000-square-foot facility, panels are subjected to several days of extreme shifts in temperature and humidity. Then there's the "hail impact" test: ice balls are shot at solar panels with a gun, to see how the panels would weather a serious hailstorm.

The tests are all carried out by employees of Underwriters Laboratories, the private company that is a global leader in product safety testing and certification. Based in Chicago, UL has labs across the world, and tests all sorts of consumer products, from coffee makers to hair dryers and toasters. The average American household has 125 products bearing the distinct UL mark of approval.

The explosion of solar manufacturing in Silicon Valley inspired UL to open the nation's largest solar testing and certification facility in San Jose in July 2008. UL opened a second solar testing facility in Suzhou, China, in 2009 and plans to open solar labs in Germany and Japan this year.

UL's Photovoltaic Technology Center of Excellence in San Jose includes 14 test chambers. The idea is to help solar manufacturers pinpoint any potential design or engineering flaws and accelerate their ability to move their solar panels to market.

The U.S. national electric code requires that all solar modules sold in the United States be certified to the UL standards, so companies are eager to get the UL stamp of approval. And most companies internally test their products as well, often going beyond the UL guidelines.

"UL is the gate to the marketplace," said Kent Whitfield, a former UL employee who is now director of reliability at Santa Clara-based solar manufacturer MiaSolé. "If you do not pass the test, you will not sell. Any solar company in the market today has passed the UL tests."

Most homeowners who have added solar to their roofs are unaware that their panels have gone through rigorous, state-of-the-art testing. It's an all-or-nothing process: there's no way to pass some tests and fail others.

"There are a lot of questions about the safety of renewables," said Evelyn Butler, energy director at UL's Photovoltaic Center in San Jose. "The closer we are to manufacturers, the more help we can be to the industry. It's great that an engineer can come down the street and see his solar panel under test."

Because most residential housing in the United States is constructed of wood, a lot of focus is put on the potential of electric shock or fire hazards if a solar panel should somehow fail. Panels must also be built to handle a variety of climates, from the blistering desert heat of the American southwest to the humidity of Florida.

"UL established a common floor for safety," said Julie Blunden, vice president of public policy for SunPower, Silicon Valley's largest solar manufacturer. "As the solar industry has matured, you now see companies differentiating themselves with warranties and performance."

Companies pay UL for the costs of conducting the tests. It typically takes about six months, and \$50,000, for a solar panel to go through the complete battery of tests.

"We often get calls from companies that say: 'We've got a new design, we need to launch it in 10 months, when can we get in the lab,'" said Butler, who says UL currently has about a four-to-six-week wait.

When this reporter visited the UL facility one recent morning, several solar panels were being tested, while dozens more were stacked in neat rows along the walls, waiting their turn. Enormous wooden crates bearing the names of the world's leading solar companies were being packed and unpacked.

While all solar panels might look the same to most people, engineers can easily spot subtle design differences. The valley's solar industry has become so competitive that some companies ask UL to cover up their panels with tarps to prevent competitors from peeking at their product.

UL also does testing for the international market, which has slightly different standards than the U.S. market, primarily to account for differences in housing construction.

Chris Paxton, who manages much of the solar testing at the lab, says the majority of "failures" occur with the "humidity freeze" test. The panels go through a 10-day testing cycle where they are exposed to 85 percent humidity _ much like the environment in the tropics. Wet modules are then brought down to frigid temperatures of negative 40 degrees Celsius, where the moisture freezes and expands. UL technicians then scour the panels for any defects or inconsistencies in construction.

Another test replicates the natural "shading" that occurs when trees or nearby buildings partially block sunlight on a solar roof. A hot, bright light is shined on some panels, basically overtaxing them, while others are kept shaded or totally dark.

"I saw a panel get charred, and then the glass totally shattered," said Paxton. "It had a double failure. We take pictures and do a failure analysis, but actually fixing the problem is up to the company."

MiaSolé manufactures thin film solar panels using a semiconductor compound known as CIGS, shorthand for copper indium gallium selenide. Whitfield, the company's director of reliability, re-created many of the UL tests internally. But certification by UL itself was still a critical step, and UL certified MiaSolé's panels in October.

"There was a celebration and a ceremony," said Whitfield, who like many others at MiaSolé was relieved and thrilled. "It's a major milestone."

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