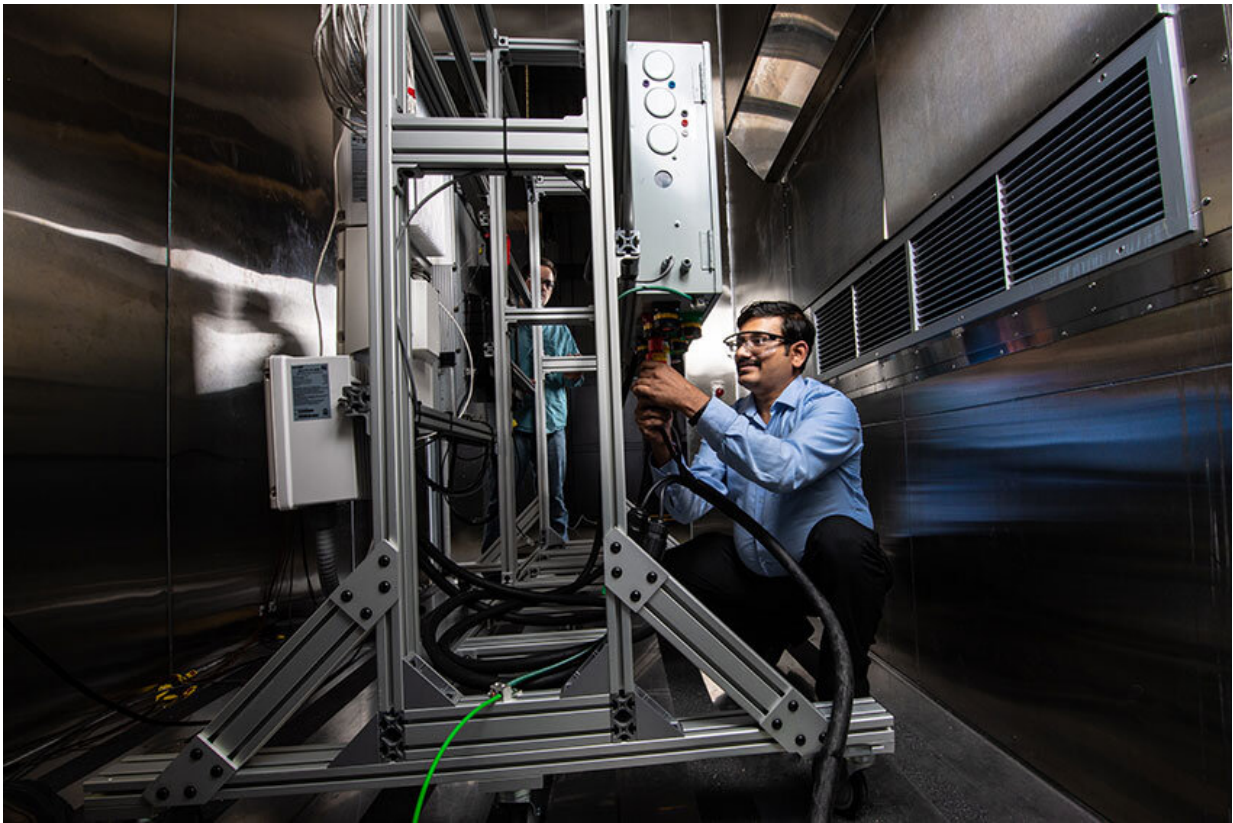


Automated test bed helps battery stakeholders with residential systems

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NREL researchers Colin Tombari and Ramanathan Thiagarajan work with a residential battery test bed in an environmental chamber at the Energy Systems Integration Facility. Credit: Dennis Schroeder, NREL

When National Renewable Energy Laboratory (NREL) researchers

began one of the [largest-to-date studies of residential battery systems](#), their first finding was made before any data arrived at the lab: Residential battery stakeholders could find major benefits in working closer together.

That insight led to the creation of NREL's residential battery [test](#) bed, a research environment that allows any stakeholder to understand the inner workings of batteries—for any use (backup, self-consumption, arbitrage), from any vendor, and in any climate. The new test bed is also rigged for [remote access](#), and it is automated, so users can control experiments online and off-site.

"We're trying to connect dots for stakeholders," said Adarsh Nagarajan, manager of the Power System Design and Planning Group at NREL. "We want to bridge customers, [battery manufacturers](#), installers, and utilities to enable communication. We want to maximize the value of [energy](#) storage."

Inspiration for the test bed came from something Nagarajan and his team noticed firsthand in new home battery installations: Nobody is talking, and they are missing value because of it.

In the most common scenario, a customer purchases a battery energy storage system without understanding much about utility rate structures. That customer hires an installer who programs the device to the best of their knowledge but who also has incomplete knowledge about how to maximize the system's settings. And beyond the battery, the utility's rate structure might not be friendly to battery energy storage systems.

"Each of these stakeholders is independent; they're not making informed decisions," Nagarajan said. "The residential battery test bed is a space for partners to explore how battery systems can be optimized for each stakeholder."

The test bed is based on the unique conditions that utilities face across the country. The same battery behaves differently in Arizona than it does in Minnesota. Customers also have different schedules, and they could be connected to a variety of other energy resources. The residential battery test bed allows users to experiment across circumstances and find the best settings for their systems.

Users have access to a PV simulator, a load simulator, an environmental chamber, and high-performance computing. A user inputs only a temperature profile, a load profile, and a battery program, and the test bed runs automated simulations that users can control via [NREL's high-performance computer portal](#).

From central Arizona—where NREL and utility Salt River Project first explored optimal battery settings—to the rest of the nation, the residential battery test bed is making system-specific knowledge accessible for utilities and communities.

"Thanks to the U.S. Department of Energy, this test bed allows us to expand residential battery research from Arizona to the United States," Nagarajan said. "Imagine a map describing the unique operational conditions and programs for energy storage systems across the nation. Our test bed spreads insight among stakeholders and scales up the lessons from local systems."

With better information for stakeholders comes better management of batteries. Rather than a mismatch of priorities, Nagarajan hopes that the [test bed](#) will lead to high value from [battery](#) energy storage systems for customers, utilities, and communities.

More information: To use the residential battery test bed, contact Adarsh Nagarajan at Adarsh.Nagarajan@nrel.gov.

Provided by National Renewable Energy Laboratory

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