

Institute demonstrates first-of-its-kind small-scale pumped heat energy storage system

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"One of the big problems that we face with [renewable energy](#) is balancing supply and demand," said SwRI Group Leader Dr. Natalie Smith, the project's lead investigator. "As the sun goes down in the evening, many people are returning home from work, turning on lights and using other electronics. This mismatch between high power demand and solar availability creates grid volatility. We want new technologies to store solar and [wind power](#) so that it can be used when the sun isn't shining, and the wind isn't blowing."

A PTES system stores energy thermally in hot and cold tanks for later use. When excess wind or [solar energy](#) is being produced, the PTES runs a [heat pump](#) to make the hot storage tank hotter and the cold storage tank colder. Then, when energy demands exceed production, the PTES runs as a [heat engine](#) converting the large temperature difference between the hot and cold stored energy into electricity.

"The full-scale PTES system offers high potential system performance up to 60% round-trip efficiency and can store energy for more than 10 hours," Smith said. "PTES is a promising, versatile technology that can be applied to many different energy sources without geological or geographical restrictions."

Malta, Inc. is developing a full-scale commercial PTES system capable of storing energy for more than 10 hours. Under DOE-funding, SwRI developed a small-scale PTES demonstration system that uses simple

recuperated cycles for both modes of operation with air as the main working fluid. The facility design is similar in basic architecture and operation to the full-scale technology and is intended to demonstrate system operability and controls strategies.

The U.S. Department of Energy supported the development of the system, which was successfully commissioned and has begun the detailed testing phase.

"We are hoping that this successful demonstration provides more confidence in this technology," Smith said. "PTES provides a viable means to bring balance and stability to our energy usage. If we want to reduce carbon emissions, we need to integrate more renewables. Our demonstration is the pathway to that full-scale system and demonstrates commercial readiness."

More information: Project homepage:
[www.swri.org/industry/advanced ... ation-energy-storage](http://www.swri.org/industry/advanced-energy-storage)

Provided by Southwest Research Institute

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