

New free analysis platform shines light on how solar energy projects will affect utilities' power systems

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ORNL researchers have teamed up with other national labs to develop a free platform called Open Energy Data Initiative Solar Systems Integration Data and Modeling to better analyze the behavior of electric grids incorporating many solar projects. Credit: Andy Sproles/ORNL, U.S. Dept. of Energy

Researchers at the Department of Energy's Oak Ridge National

Laboratory, in collaboration with three other national labs, have developed a free online platform to help utilities understand how solar energy projects will affect the operation of their power systems. This capability can increase utilities' confidence in expanding their solar portfolios, protecting reliable delivery of electricity while supporting U.S. efforts to slow climate change.

"This [web portal](#) and the unique set of functions it offers to the power systems analysis research and development community will improve electricity grid's reliability and resiliency while we move to rapidly incorporate as much renewable energy as we can," said ORNL's Jin Dong, lead researcher on the project.

The new [software platform](#), called [Open Energy Data Initiative Solar Systems Integration Data and Modeling](#), is unlike data repositories developed previously because it is designed for free use, with any power system datasets, by any user. The online web portal was created in equal partnership with Argonne National Laboratory, Pacific Northwest National Laboratory and the National Renewable Energy Laboratory.

It allows utilities and other users to develop and insert their own algorithms and data to analyze [electric grids](#) that incorporate extensive solar projects. Modeling these networks is more challenging because solar resources are often spread out geographically through a variety of owners. This situation reduces utilities' access to the information that would enable a more accurate understanding of how the whole system will behave.

"Although renewable technology is available, many utilities are not confident they can manage a system with high renewable penetration," Dong said. "Using this software platform, they can speed up the adoption process."

It provides a single public repository for information to support development, testing and validation of power system models for integrating solar energy. Each lab developed a menu of sample algorithms to use with the platform.

The platform includes four major applications:

- Pre-processing data to protect privacy by hiding [personal details](#) and combining information from different network technologies into one dataset.
- Developing algorithms to accurately deduce the electrical voltage across the whole network using just a few pieces of information.
- Designing a smart control system for managing solar energy devices to make the power grid more dependable while using as much renewable energy as possible.
- Developing algorithms that recognize changes in electric current, voltage or frequency, identifying signs of abnormal grid behavior that can cause cascading failures.

In addition to the framework and algorithms, ORNL has developed a [case study](#) showing how to use the toolkit for detecting and identifying fleeting grid faults, with the help of University of Tennessee-ORNL Governor's Chair Yilu Liu and her team.

Looking ahead, researchers are exploring the addition of new software capabilities, such as measuring the impact of electric vehicle charging scenarios or new "smart building" technologies.

"For example, if my utility district has 80,000 EVs charging overnight, what's the impact on my system?" Dong said. "We need to establish ways for utilities to adapt their own tools by using these resources, so they can handle this kind of planning themselves."

Additional ORNL researchers involved in the project include Srikanth Yoginath, Ajay Yadav, Boming Liu and Teja Kuruganti.

Provided by Oak Ridge National Laboratory

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