

Project Yields Data That Will Help Securely Manage a Renewable-Based Electric Grid



Electrical Distribution Design, an NISC company located in Blacksburg, Virginia, partnered with the U.S. Department of Energy on a three-year project that uses modeling and simulation with real-time data to create a cyberattack-resistant, more efficient and more stable electrical grid powered by renewable energy.

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Because of the increasing desire to move toward renewable energy sources, the electric grid is continually becoming more complex. As a result, modeling is growing increasingly important, especially due to the growing magnitude of generators and storage devices. The work done in this project is a step toward managing the grid.

The project had several significant findings, including:

- Abnormality Detection is a last-ditch effort in defending against cyber-attacks, physical attacks, failed infrastructure and unknown system operations that significantly affect operations. Abnormality Detection features had an overall success rate of over 90%.
- A multi-mode control strategy is needed to mitigate equipment failures and attacks, coordinate transmission and distribution system control, optimize energy usage and provide for the highest-possible levels of renewable penetration. When using Coordinated Control strategies, voltages are controlled to agree with the results of an optimum power flow solution and result in seasonal energy savings, storm energy savings, high photo voltaic (solar) variability energy savings and distribution system support of transmission system voltage.
- Test results predict that the Integrated System Model's real-time software can improve grid situational awareness, help discover and mitigate abnormal operations, reduce costs and improve voltage stability margins. One area of improvement includes using cloud technology to run grid simulations at scale, in an efficient and cost-effective manner. Another area of further improvement includes using data to automate the build and near-real-time tuning of grid models to enhance model accuracy.
- In certain instances, systems can see 1.76-2.94 GWh of energy savings, amounting to \$91-\$152 of savings per customer per year, as well as a 746-1,246-ton-per-year reduction in carbon releases.

The project concluded at the end of April 2024 and the Department of Energy has decided not to fund the subsequent demonstration phase.

Visit www.edd-us.com/m2iegs for more information. Detailed results of the study will be published in a Department of Energy report at www.osti.gov at a later date.

About EDD

Electrical Distribution Design (EDD), an NISC company located in Blacksburg, Virginia, is a leader in electrical distribution system modeling and analysis. EDD's commercial software product, DEW, stands apart in its ability to deliver near real-time operational analytics for electric utilities. EDD provides advanced engineering modeling software and services to electric utilities and related industries.

