



THE WSU-PNNL ADVANCED GRID INSTITUTE

Vision

The Advanced Grid Institute (AGI), which combines smart-grid talent and resources from Washington State University (WSU) and the Pacific Northwest National Laboratory (PNNL), is creating and implementing a national-scale grid simulation platform and data framework to enable advanced controls and operations for the complex power systems of the future.

The AGI employs innovative research and collaboration to create new power system modeling and simulation capabilities that meet emerging industry requirements while delivering greater scientific and engineering impact than would be possible by either institution acting alone.

The Need

Growing risks to the nation's bulk power infrastructure—from extreme weather events to cyberattacks to resource volatility—require a more resilient power grid. But to build a more resilient power grid, planners and operators need to better understand how the holistic system will behave in response to unprecedented structural and operational challenges.

Modeling and simulation have long been the cornerstone for understanding the behavior of complex power systems. However, as grid systems become more complex and data-intensive, the operation and control of the future power grid will require more nuanced insights



than current engineering tools can deliver. The AGI addresses this critical challenge by creating and bringing to practice a common, industry-accepted platform for national-scale grid simulation that is greatly enhanced by large-scale data integration.

Implementation

The AGI provides distinctive leadership in developing the underpinning science and technology to support next-generation simulation, modeling, and data integration solutions for grid operations and power system control.

Specifically, the AGI is focused on fast-acting, end-to-end, adaptive control paradigms that are rigorously validated using high-resolution, multi-scale simulation software and hardware. Through these leadership efforts, the AGI is solving national-scale problems and meeting new industry requirements, including preventing cascading failures; understanding alternative grid



architectures; developing technology transition paths; creating analytic methods for designing future system states; and enabling the technical and market impact of increasing penetration of distributed resources. All of these challenges require advanced knowledge and capabilities in grid modeling, hierarchical control, co-simulation frameworks, and high-performance computing infrastructures: a combination of expertise, capabilities and experience uniquely available through WSU and PNNL.

Solutions for All

The AGI is creating a national simulation and data framework to consolidate and coordinate divergent efforts across the industry, including removing roadblocks associated with model, data, simulation, and tool incompatibility. The AGI's implementation of this vision is focused on inclusion and interoperability, enabling stakeholders to bring their own solutions and focus on the problems the industry needs to solve rather than becoming mired by lack of data, incompatibility of models, or inaccuracy of solutions. By taking this approach, the AGI is removing barriers to widespread adoption while making it easier and less costly for industry stakeholders to adopt a common approach, technology platform, and data framework for advanced grid simulation, modeling, and analysis.

To achieve this vision, the AGI has committed to the following outcomes over a 5-year timeframe:

- Deliver federated control experiments integrating WSU and PNNL facilities and linked to academic and industrial testbeds throughout the nation;
- Leverage computing and modeling expertise to create high-resolution, multi-domain, national-scale simulation capabilities that fully represent the complexity of the U.S. power grid;
- Attract and educate leading talent to relevant research positions in the electric utility industry;
- Create an ecosystem of vendors, utilities, and universities actively using the integrated simulation and data repository capabilities; and
- Create agreements and mechanisms allowing seamless collaboration among PNNL staff, WSU faculty, and WSU students.

The AGI is providing a highly-visible and impactful portfolio of research activities that complement and advance the overall electric power grid research and development activities at WSU and PNNL, and beyond.

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