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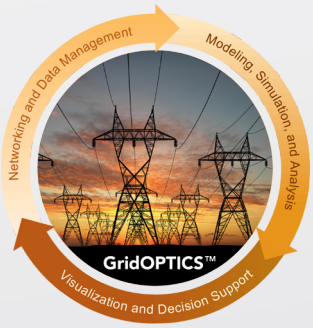


FUTURE POWER GRID INITIATIVE

Market Design Analysis Tool

OBJECTIVE

Power market design plays a critical role in the outcomes related to power system reliability and market efficiency. However, translation of market rules/designs into the complex mathematical market clearing mechanism is not a trivial process.

The project will:

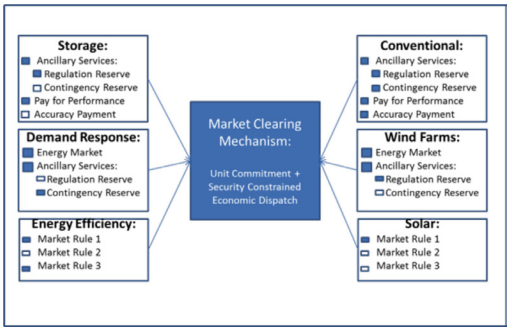
- develop a mechanism to let users create, customize and evaluate market processes in a power market simulator
- develop a methodology to find an optimal market design to efficiently attain a desired future state of the power grid

APPROACH

The project will develop two mechanisms to fulfill its objectives:

Market Design Interpreter (MDI) will:

- allow users to modify market clearing mechanism based on user-specified set of market rules
- a graphical user interface for users to input market design specifications



Market Design Instrument Schema

Market Design Optimizer (MDO) will:

- select the optimal combination market rules to attain a desired future state of power grid.
- use MDI to modify the market clearing mechanism to obtain the optimal set of market rules.

IMPACT

The Market Design Analysis Tool (MDAT) will be used to study the implications of market rules on market outcomes. With MDAT's tools of market design interpreter (MDI) and market design optimizer (MDO), users can

- translate market design specifications into the market clearing mechanism
- develop the optimal market design to achieve a desired future state of the power grid
- make optimal market rules and policy recommendations

The proposed methodology will enable users from diverse backgrounds – academia, industry, regulatory bodies, and policy makers – to evaluate and compare the impacts of existing and proposed market design on market outcomes

U.S. DEPARTMENT OF ENERGY

FOCUS AREA 2 - MODELING AND SIMULATION

FOCUS AREA

Focus Area Two targets research in the areas of advanced mathematical models, next-generation simulation and analytics capabilities for the power grid. Projects in Focus Area Two will use high-throughput data streams produced by projects in Focus Area One and integrate them with sophisticated mathematical models to conduct large-scale power grid simulation and analysis. Focus Area Two strives to advance the state-of-the-art in modeling and simulation in order to achieve much higher fidelity situational awareness and global comprehension for power grid stability, efficiency and flexibility. **Focus Area Leads:** Ian Gorton (ian.gorton@ pnnl.gov), and Ning Zhou (ning.zhou@ pnnl.gov)

ABOUT FPGI

The Future Power Grid Initiative (FPGI) will deliver next-generation concepts and tools for grid operation and planning and ensure a more secure, efficient and reliable future grid. Building on the Electricity Infrastructure Operations Center (EIOC), the Pacific Northwest National Laboratory's (PNNL) national electric grid research facility, the FPGI will advance the science and develop the technologies necessary for meeting the nation's expectations for a highly reliable and efficient electric grid, reducing carbon emissions and our dependence on foreign oil.

ABOUT PNNL

Pacific Northwest National Laboratory is a Department of Energy Office of Science national laboratory where interdisciplinary teams advance science and technology and deliver solutions to America's most intractable problems in energy, the environment and national security. PNNL employs 4,900 staff, has an annual budget of nearly $1.1 billion, and has been managed by Ohio-based Battelle since the lab's inception in 1965.

For more information, please visit the FPGI website or contact:

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PNNL-SA-90015