Development and Deployment of Multi-Scale Production Cost Models

CHALLENGE

U.S. power systems are evolving rapidly because of technological advancements in computing, communications, energy storage and conversion, and asset controllability. As power systems become more distributed and the behavior of individual generators becomes more variable and uncertain, system operators need better tools for planning. Efficiency planning and operating of future power systems will require high-resolution, coordinated simulations that better include scheduling and dynamic systems.

Traditionally, power system planners have been forced to choose between conflicting goals when using production cost models for analyses. A model with high resolution and the ability to address uncertainties suffers from prolonged execution times. Reducing the execution time enables planners to analyze a larger number of scenarios, but limits the model's resolution and ability to address uncertainty.

APPROACH

The Multi-Scale Production Cost Modeling (PCM) project aims to improve the tools that simulate power system operations. By developing and leveraging advanced computational tools and delivering the tools and expertise through industry outreach, the project team will significantly accelerate existing PCM simulations. The team will also test and deploy the tools to address the uncertainty associated with the high penetration of renewables on electric grids.

EXPECTED OUTCOMES

This project is improving the state-of-the-art in production cost modeling to enable industry to conduct more accurate analyses, faster, and in greater detail. For example, geographic decomposition is one of several new algorithms that can reduce execution time and increase model accuracy. Using this approach, researchers are able to more accurately reflect the economic friction between market areas.

At-A-Glance

PROJECT LEADS

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BUDGET

$2.34 million

DURATION

March 2016 – October 2018

TECHNICAL AREA

Design and Planning

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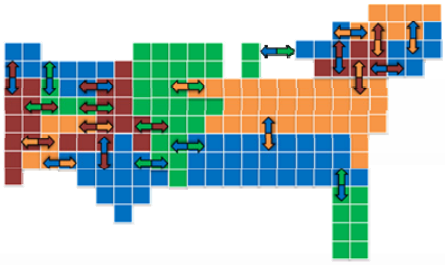
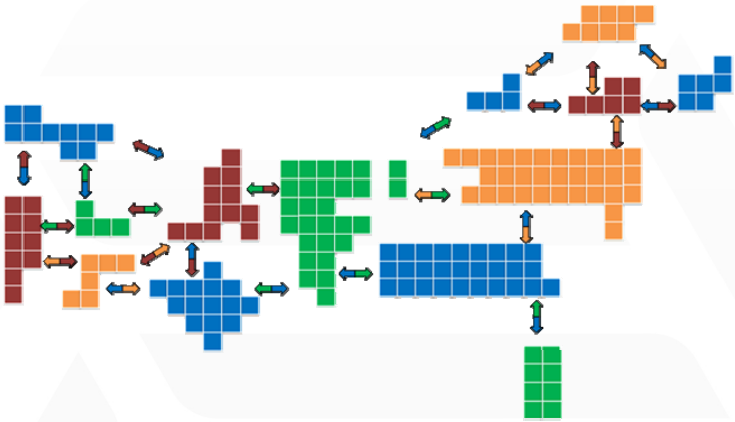
Geographic decomposition breaks up the optimization problem necessary to study all three U.S. Interconnections in a Production Cost Model. This enables a more realistic representation of how the markets are actually operated and significantly reduces solve time.

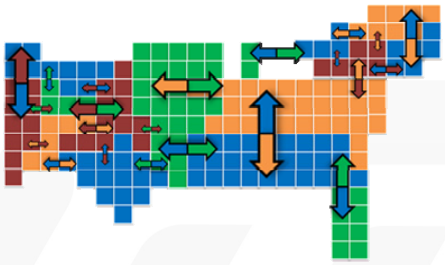
1. Transmission Flow Forecast



2. Decomposed Unit Commitment



3. Real Time



LAB TEAM

Argonne NATIONAL LABORATORY | Lawrence Livermore National Laboratory | NREL NATIONAL RENEWABLE ENERGY LABORATORY | Pacific Northwest NATIONAL LABORATORY | Sandia National Laboratories

Launched in November 2014 under the U.S. Department of Energy's Grid Modernization Initiative, the GMLC is a strategic partnership between DOE Headquarters and the national laboratories, bringing together leading experts and resources to collaborate on national grid modernization goals. The GMLC's work is focused in **six technical areas** viewed as essential to modernization efforts:

Devices and Testing | Sensing and Measurements | Systems Operations and Control
Design and Planning | Security and Resilience | Institutional Support