

Midwest Interconnection Seams Study

CHALLENGE

At the western edge of the American prairie, just east of the Rocky Mountains, lies a collection of electrical resources that string together the United States power system. Seven, back-to-back, high-voltage direct-

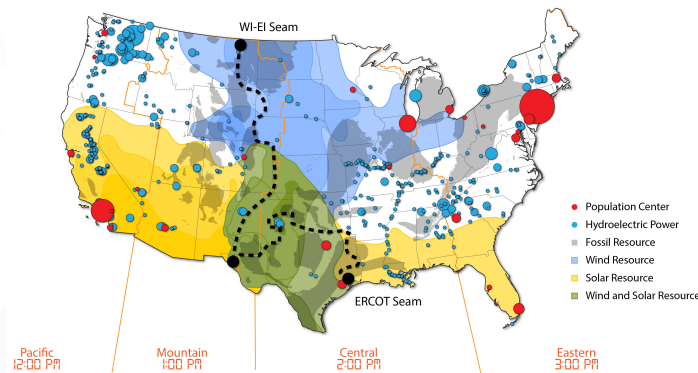
current (HVDC) facilities enable about 1,400 megawatts (MW) of electricity to flow between the Eastern and Western Interconnections. This transfer capability is not much compared to the size of the networks they connect—the larger Eastern Interconnection has 700,000 MW of generating capacity. But these strategically located interconnection facilities (“seams”) will soon be ready for replacement. They present a timely and impactful opportunity to modernize the U.S. electric grid.

System planners in the central United States are faced with a dilemma. On one hand, power system planners in this part of the country could act locally, focusing on their individual footprints and demand. On the other hand, system planners could investigate the potential for new infrastructure investments to drive down electricity costs and fuel national economic growth. How big are the differences between these futures? What are the best options for getting the most out of the region’s natural resources?

APPROACH

The Interconnection Seams Study brings together two national labs and Iowa State University to analyze a range of transmission scenarios that aim to decrease the cost of serving U.S. electricity demand by facilitating more efficient transfers of electricity across the country. This project will quantify the value of enhancing interconnection by conducting multi-scale economic and reliability analyses of four transmission scenarios: baseline; transmission upgrades at the seams; transmission upgrades at the seams and limited, region-to-region HVDC transmission; and a national network of HVDC.

In its analyses, the project will consider a 15-year timespan from 2024 to 2038. Three classes of power system modeling and analysis will be used in



Conceptual representation of the three major seams in the United States.

At-A-Glance

PROJECT LEADS

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PARTNERS

- Iowa State University
- Southwest Power Pool
- Midcontinent Independent System Operator
- Western Area Power Administration

BUDGET

\$1.2 million

DURATION

March 2016 – October 2017

TECHNICAL AREA

Design and Planning Tools

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a coordinated fashion to identify the economic, environmental, reliability, and resiliency benefits of each transmission scenario. The three classes of modeling and analysis—long-term system expansion, year-to-day production cost, and minute-to-minute power flow—each examine phenomena on a different time scale.

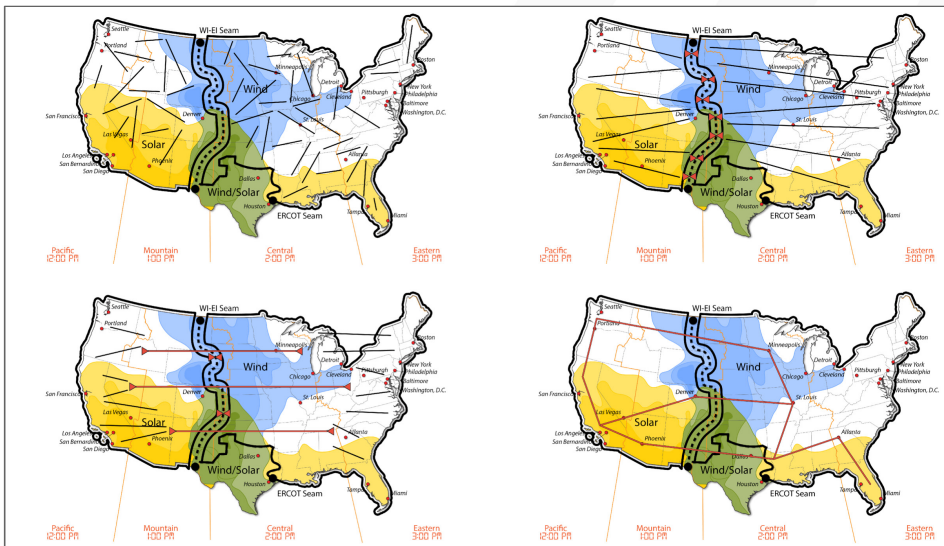
Tools developed at Iowa State University and the laboratories will be used to model and analyze long-term generation and transmission capacity expansion for the study. Then, the National Renewable Energy Laboratory

will use these results as input to a modeling study to analyze the operations of the enhanced system. A production cost model will be used to simulate the economic commitment and dispatch of resources throughout the nation and consider important elements of modern power system operations. Finally, because the Eastern Interconnection’s power flow models are developed in Power System Simulation for Engineering (PSSE) format, these operations results will be imported into the Siemens PSSE model to perform an AC power flow analysis at the Pacific Northwest National Laboratory.

EXPECTED OUTCOMES

The objective of the project is to study and quantify the value of enhancing the country’s electrical interconnection. It will do so by assembling and, in many cases, creating state-of-the-art models to simulate the many factors affecting transmission costs and effectiveness. By doing so, the project will highlight least-cost options for increasing the

robustness of the U.S. electricity system and decreasing the cost of serving load. With over 40 active industry partners, the project’s results will help guide key stakeholders as they decide how the country’s interconnections will evolve over the coming decades.



The four transmission scenarios considered by the project, clockwise from top left, are: baseline, reconfigured seams, national HVDC network, and reconfigured seams plus limited HVDC transmission.

LAB TEAM



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