



The North American ENERGY RESILIENCE Model NAERM

SUPPORTING SECURE & RESILIENT ENERGY INFRASTRUCTURE WITH INTEGRATED MODELING TOOLS

As energy delivery becomes more complex, automated, networked, and inter-dependent, a new generation of modeling tools is necessary to ensure that energy delivery is resilient to manmade / natural disasters with climate-driven impacts, while maximizing the deployment of clean energy solutions.

The North American Energy Resilience Model (NAERM), developed by a Department of Energy (DOE) multi-laboratory, interdisciplinary team, enables unprecedented advanced modeling and analysis of the nation's energy infrastructure and interdependent systems. NAERM offers energy system planners, operators, and federal agency partners premier modeling and situational awareness capabilities to predict the consequences and evaluate mitigations and responses to natural hazards and malicious attacks.

NAERM, which was developed using a secure, cloud-based architecture, provides analysts with state-of-the-art modeling tools. These tools quantitatively assess impacts from current and future risks by integrating

numerous government and commercial computer models, databases and sensor streams to present a comprehensive picture of the nation's energy delivery systems.

NAERM leverages the capabilities and know-how of subject matter experts across eight national laboratories and partners at Federal agencies, Power Marketing Administrations, and the private sector in support of this ground-breaking endeavor.

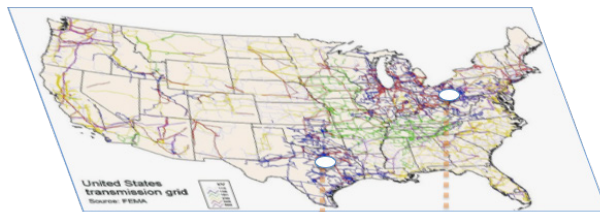
With NAERM's innovative tools and insights, policymakers and stakeholders have the ability to quantitatively inform decisions, strategically allocate investments, and effectively respond to major disruptions in pursuit of a more resilient, secure, and renewable-rich energy infrastructure.

NAERM enables detailed engineering analysis of energy infrastructure vulnerabilities.

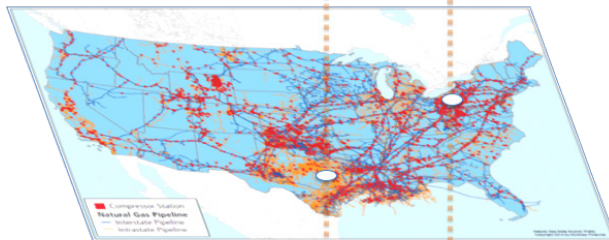


The **NAERM System** combines multiple energy and interdependent infrastructure models with system data and realistic natural hazard and human threat scenarios to provide actionable information to energy system planners, operators, and government stakeholders.

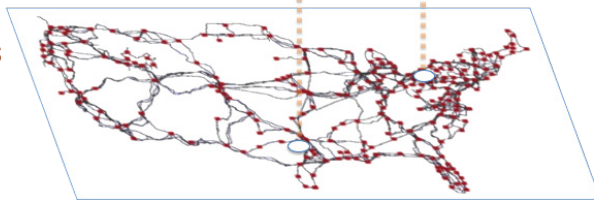
Electric Power



Natural Gas



Communications



Key Capabilities as of January 2021

- **Electric & Gas Models:** Simulate interdependencies between national energy systems, enabling better-informed decisions on resilience.
- **Communications Systems:** Identify communications system linkages with critical energy infrastructures to evaluate interdependencies.
- **Threat & Hazard Analysis:** Assess impacts of potential terrorist attacks, cyber threats, and natural disasters such as wildfires and earthquakes.
- **Situational Awareness:** Aggregate data feeds and analytic capabilities to assess the health of the grid and inform emergency planning and response.
- **Carbon-free Energy Resilience:** Support national efforts to integrate renewable energy, distributed energy resources, and other elements of grid modernization.

ANSWERING KEY QUESTIONS

NAERM provides accurate, timely, actionable information to help answer questions and make informed, national-level decisions to improve the resilience of our energy delivery systems and other interdependent infrastructure.



ENERGY SYSTEM PLANNERS

- How will our decisions affect the resilience of our energy delivery systems?
- How can we maintain support for critical functions during and after events?
- How do we engineer more robust solutions to enable rapid restoration and recovery?



ENERGY SYSTEM OPERATORS

- How can we maintain situational awareness to rapidly identify and respond to emerging threats?
- How do we make risk-informed decisions during and after events?
- How can we minimize large-scale impacts once an attack is underway?



FEDERAL AND STATE AGENCIES

- How can we provide national-scale insights to inform federal and state emergency response?
- How can we determine what help is needed before, during, and after a disruption?
- What information do we need to coordinate efforts across agencies and rapidly recover from disasters?

Team of Eight DOE Laboratories will Deliver National-Scale Energy Modeling Capabilities



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energy.gov