Sandia National Laboratories

Energy, Climate & Infrastructure Security

The Infrastructure Security program area works to develop and apply technologies/analytical approaches to secure the nation's critical infrastructure against natural or malicious disruption.

Goal: Increase resilience of U.S. critical infrastructure system by providing government, regulatory, and industry stakeholders with increased understanding of interdependencies and risks

America depends on its infrastructure—not only for its continuing economic prosperity but, in this day and age where just-in-time delivery applies not only to manufacturing and industry but to energy and food supplies as well, for the survival of its urban population. Disruptions can come from many causes—some natural, some accidental, and some that are maliciously intentional. Hurricane Katrina showed us how the disruption of the gulf-states petroleum infrastructure has national repercussions. The September 11th attacks were essentially localized, but have had acute and long-term effects on a national and international scale. When the Interstate 35W bridge collapsed in Minneapolis, it took three months to clear the debris from the Mississippi. If that collapse had happened on the lower Mississippi, the disruption of barge traffic up and down the river could have had similar national consequences. America has endured these disruptions before and will again.

Critical infrastructure, infrastructure whose disruption will put many lives at risk, suffers not only under the threat of direct interruption but also from disruption via the interruption of another element of the

Vision

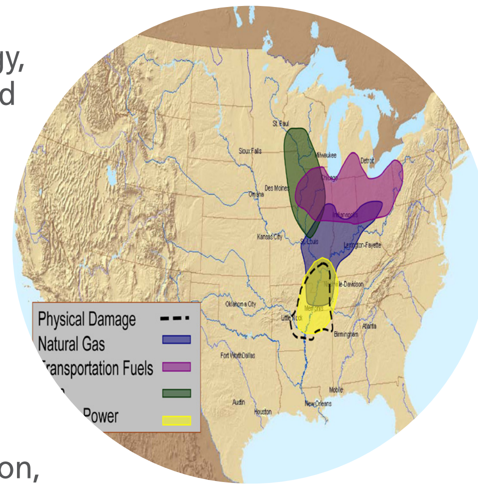
To enhance the nation's security and prosperity through sustainable, transformative approaches to our most challenging energy, climate, and infrastructure problems.

Infrastructure disruptions can result from natural disasters, attacks, or poor preparedness/response to a disruptive event.

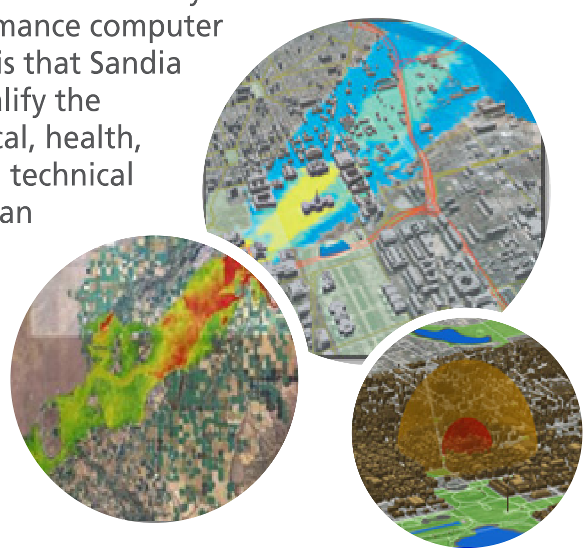
U.S. DEPARTMENT OF ENERGY

infrastructure on which it depends. The nation must be prepared for disruption to its critical infrastructure—and in order to do this, we must understand the interdependencies between the infrastructure's disparate systems. We must understand if some systems are more at risk than others and why. We need to know if evolving interdependencies increase or change the risks to critical systems. Are the trends toward more vulnerable conditions/configurations? Or less? How will critical infrastructure disruptions impact national security?

Understanding the linked, interdependent nature of the nation's critical infrastructure in order to enhance preparedness, protection, response, recovery, and mitigation is a hard problem—one that requires the capabilities of a national laboratory. It is through high-performance computer modeling and analysis that Sandia can quantify and qualify the interactions of political, health, social, economic, and technical systems. Simulation can couple the effects of socio-economic systems (power networks, distribution systems, transportation links) to physical systems (climate, weather, geology, geography) to understand large, complex data sets and capture non-local, non-intuitive interdependency effects at multiple simultaneous scales and resolutions. By studying these infrastructure systems and their effects on each other in simulation, we can advise policy makers and industry stakeholders on how to mitigate disruption effects and build resiliency into the national system.



NISAC projections of the disruption to natural gas, transportation fuel, electric power, and corn infrastructure after an earthquake in the New Madrid Seismic Zone.



NISAC models different disaster scenarios as a chemical/biological/radiological dispersion (top), damage downstream from a dam break (bottom left), and fallout from a small improvised nuclear device (bottom right) in order to understand the effects and prepare responders to mitigate them.

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Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000. SAND2011-1820P