OAK RIDGE NATIONAL LABORATORY

Critical Infrastructure Resilience

Scientists at Oak Ridge National Laboratory deploy data science and analytics, modeling and simulation, and high-performance computing to support US critical infrastructure resilience. Our unique expertise lies in creating novel datasets, incorporating datasets into integrated situational awareness platforms, and building state-of-the-art models and analytics to determine cascading impacts on interdependent critical infrastructure sectors.

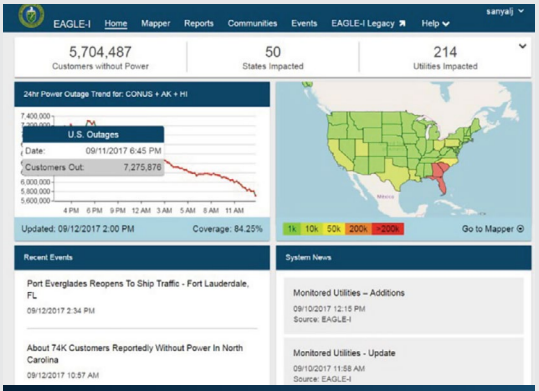
Extreme weather events and adversarial cyberattacks pose ongoing threats to our nation's critical infrastructure, potentially putting human lives at risk. Working with industry and government partners, we leverage ORNL's resources to create tools that empower infrastructure managers, emergency managers, and resource planners to better understand interdependent critical systems and make them more resilient in case of extreme events or attacks.

HOMELAND INFRASTRUCTURE FOUNDATION LEVEL DATA

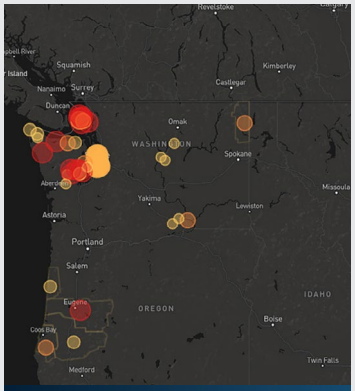
ORNL provides the nation's authoritative geospatial datasets for critical infrastructure analysis and protection, preparedness planning, and crisis management. Funded by the National Geospatial-Intelligence Agency, our Homeland Infrastructure Foundation Level Data sets deliver operational, situational, and strategic awareness of critical US infrastructures, including energy infrastructures (e.g., substations and distribution/transmission lines), schools, childcare facilities, rail networks, prisons, shelters, nursing homes, hospitals, law enforcement, mobile home parks, major sports venues, and convention centers.

ORNL'S STATE-OF-THE-ART MODELING CAN:

- Provide situational awareness of how critical infrastructure systems function in real time
- Determine cascading impacts on interdependent critical infrastructure sectors
- Assist with resource planning and emergency response
- Prepare for energy infrastructure impacts during extreme events



EAGLE-I



ODIN

STATIONS

ENERGY INFRASTRUCTURE

ORNL delivers the following key datasets and interactive platforms to support US energy infrastructure resilience:

- **EAGLE-I**—Authoritative federal platform that provides real-time situational awareness about the nation's electricity, oil, and natural gas infrastructures. This interactive platform uses geospatial datasets and techniques to determine all hazards that put energy infrastructures at risk.
- **The Outage Data Initiative Nationwide (ODIN)**—A comprehensive digital reporting standard for power outage data to enable utilities to easily and automatically share outage data with designated stakeholders.
- **Urban-NET**—A fully operational decision-support tool representing interdependent critical infrastructure systems as a networked graph, enabling decision-makers to detect and model dependencies, vulnerabilities, and cascading impacts.
- **Imagery for INFrastructure Restoration and Assessment (IINFRA)**—Time-series situational awareness data about the spatial and temporal distribution of populations experiencing power outages, helping with response and restoration.
- **Restoration of Power Outage from Wide-area Severe Weather Disruptions (RePOWERD)**—Probabilistic and simulation models providing estimated power restoration times to the emergency management community, aiding in the planning, monitoring, and support of vulnerable populations.
- **Real-time situational awareness for oil and natural gas**—A holistic platform providing a common operating picture for the oil and natural gas sector. Using dynamic map layers, this tool reports near real-time flows through natural gas pipelines to delivery points, as well as oil sector information such as the status of tanker arrivals, ports, refineries, and terminals.
- **Situational Temporal Awareness Tool for Integrated Oil and Natural Gas Systems (STATIONS)**: A tool for situational awareness in near real-time about liquid fuel availability across the supply chain to help emergency management personnel coordinate response and prioritize deliveries in the wake of extreme events.

CONTACT | Supriya Chinthavali | Group Lead | Critical Infrastructure Resilience | chinthavalis@ornl.gov

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NATIONAL SECURITY SCIENCES