Nebraska Local Energy Assurance Planning Workshops
Ogallala, NE – June 11, 2019
Columbus, NE – June 13, 2019




National Association of State Energy Officials

Energy Assurance Fundamentals for State and Local Governments

Jeffrey R. Pillon, Director of Energy Assurance
National Association of State Energy Officials

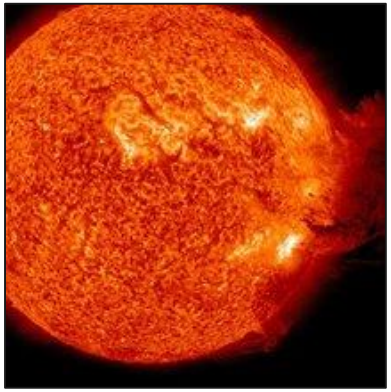
© The Associated Press In this photo released by state-run IRIB News Agency, an oil tanker is on fire in the sea of Oman, Thursday, June 13, 2019. Two oil tankers near the strategic Strait of Hormuz have been reportedly attacked. The alleged assault on Thursday left one ablaze and adrift as sailors were evacuated from both vessels. The U.S. Navy rushed to assist amid heightened tensions between Washington and Tehran. (IRIB News Agency via AP)

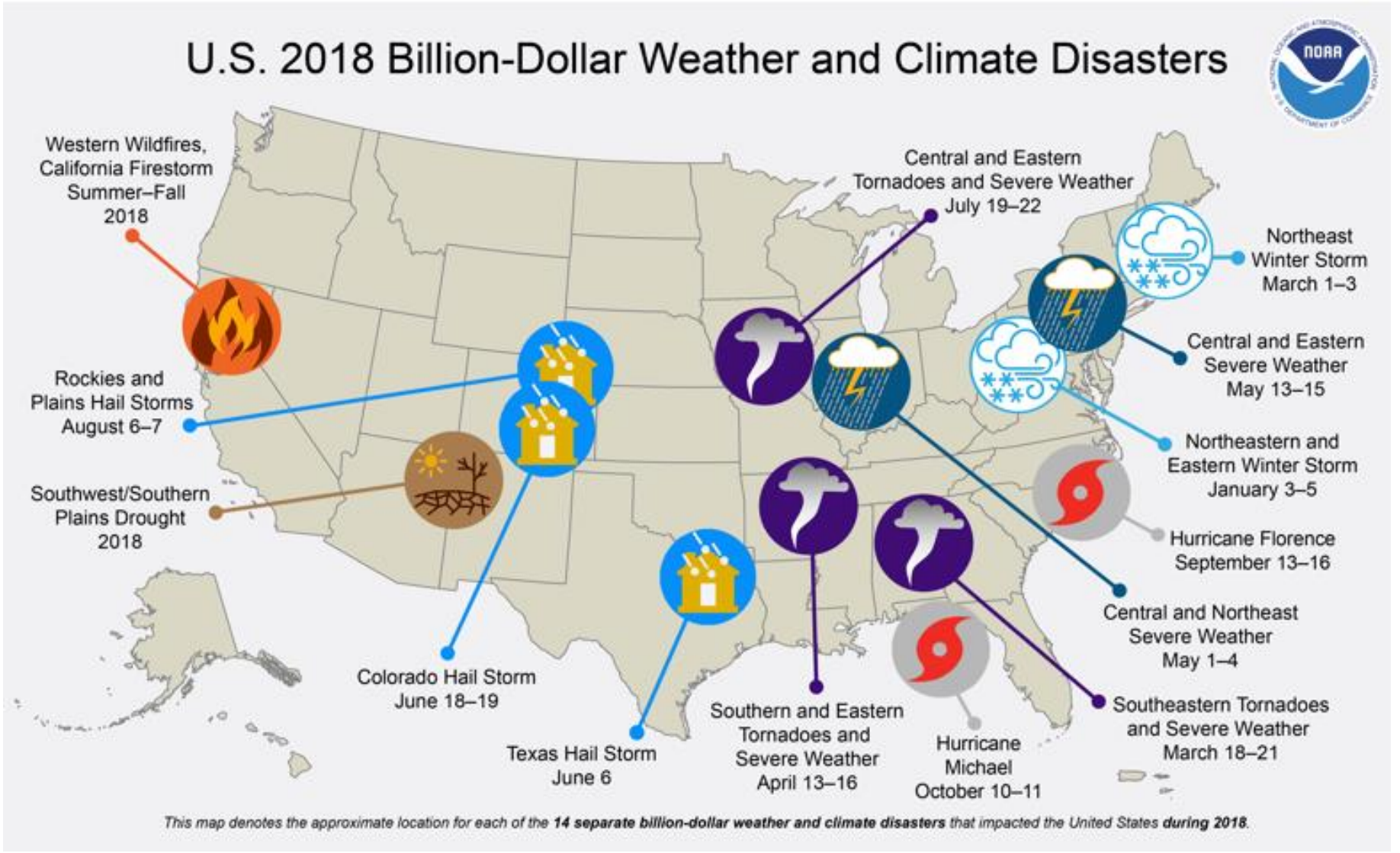
Energy Assurance is the Capability to:

- **Plan and Respond** to events that disrupt energy supply and assuring a rapid return to normal conditions. This is a coordinated effort involving the private energy sector's response, augmented by local, state and federal governments as needed

- **Mitigate Risks** through policies, programs and investments that provide for a more secure and resilient energy infrastructure that also reduces interdependencies impacts
  - *Where risk is a function of consequences, vulnerabilities and threats.*

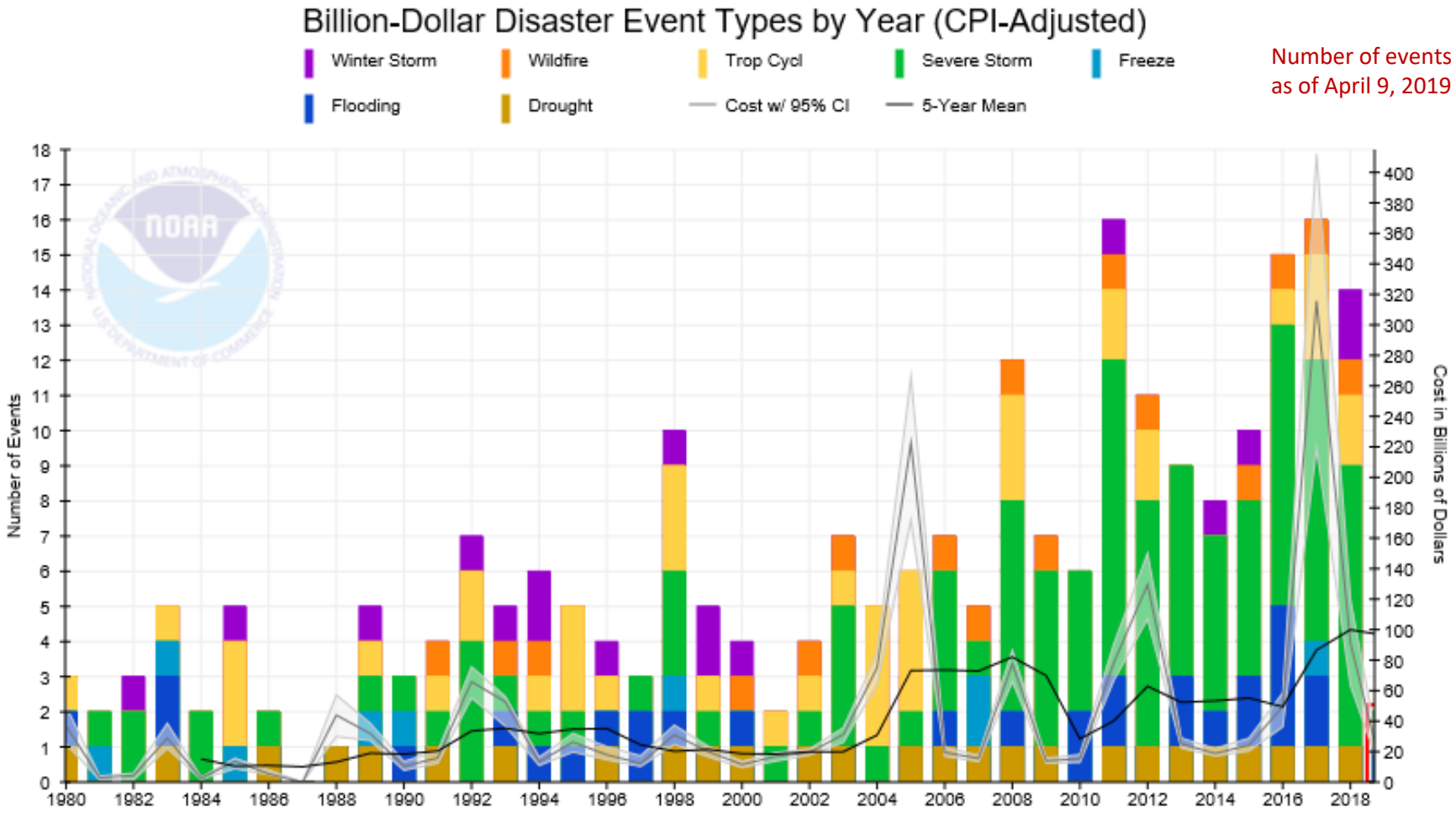




Source: National Oceanic and Atmospheric Administration's National Centers for Environmental Information. U.S. Billion-Dollar Weather and Climate Disasters: Overview. https://www.ncdc.noaa.gov/billions/. Accessed on June 7, 2019.

In the last five years there have been 63 weather and climate disasters costing a total of $500 billion



Number of events as of April 9, 2019

Source: National Oceanic and Atmospheric Administration's National Centers for Environmental Information. Billion-Dollar Weather and Climate Disasters: Time Series (2014-2018). https://www.ncdc.noaa.gov/billions/time-series. Accessed on June 7, 2019.

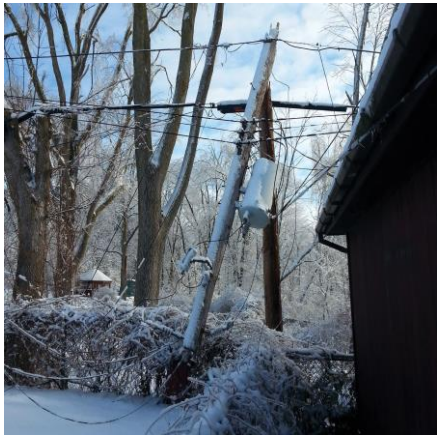
Topics for Today

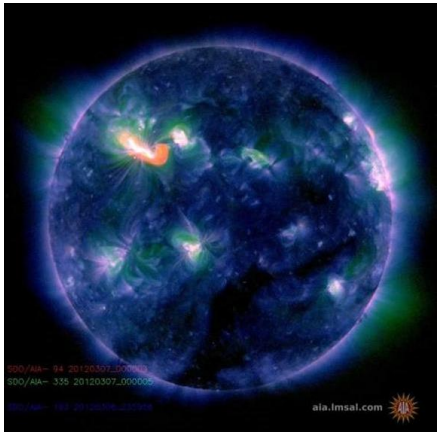
Part 1: Energy Emergency Planning

A. Understanding Interdependencies
B. Energy Emergency Preparedness and Response
C. Federal Roles and Energy Assurance
D. State Agency Roles in Energy Emergencies

Part 2: Infrastructure Security and Resilience

A. National Infrastructure Protection Plan
B. Risk Assessments, Mitigation and Resiliency
C. Cybersecurity

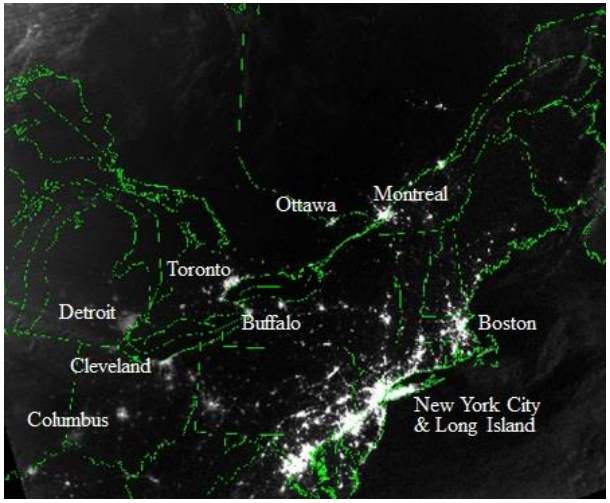




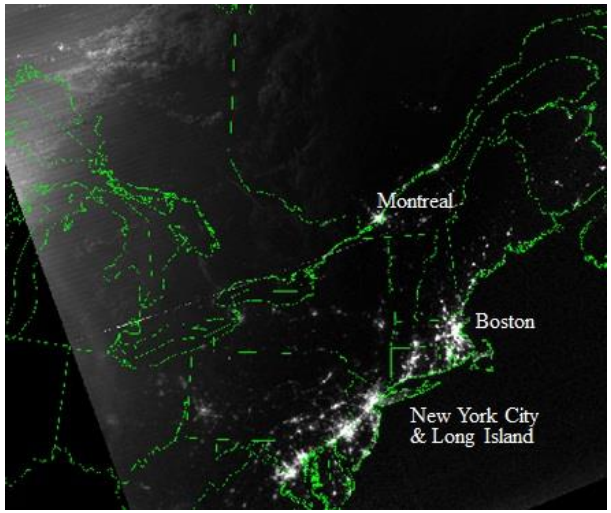
A. Understanding Interdependencies

For emergency response and long term risk and vulnerability mitigation

BLACKOUT 2003 – August 14 ~ 4:10 PM EDT



August 13 – 8:29 PM ~ 20 hours BEFORE



August 14 – 8:14 PM ~ 4 hours AFTER

Defense Meteorological Satellite Program Images, courtesy of the United States Air Force Weather Agency

Why Infrastructure Interdependencies are Important

- Interdependencies operate at multiple levels
  - Facilities and assets
  - Networks (physical, cyber)
  - End-to-end systems
  - Communities, regions and states
  - Intra-state and multi-state
  - Cross-national border and global

- Can cause cascading failures with significant public health and safety, economic, environmental and national security impacts
- Can impede emergency response and recovery

Lessons Learned from the August 14, 2003 Blackout

- Water System
- Fuel Supplies
- Communications
- Gasoline Shortage
- Food Safety
- And Many Others

Michigan State Emergency Operations Center

MPSC Report on August 14, 2003 Blackout
https://www.michigan.gov/mpsc/0,4639,7-159-16377_17104-80766--,00.html

Interdependencies Among Critical Infrastructure

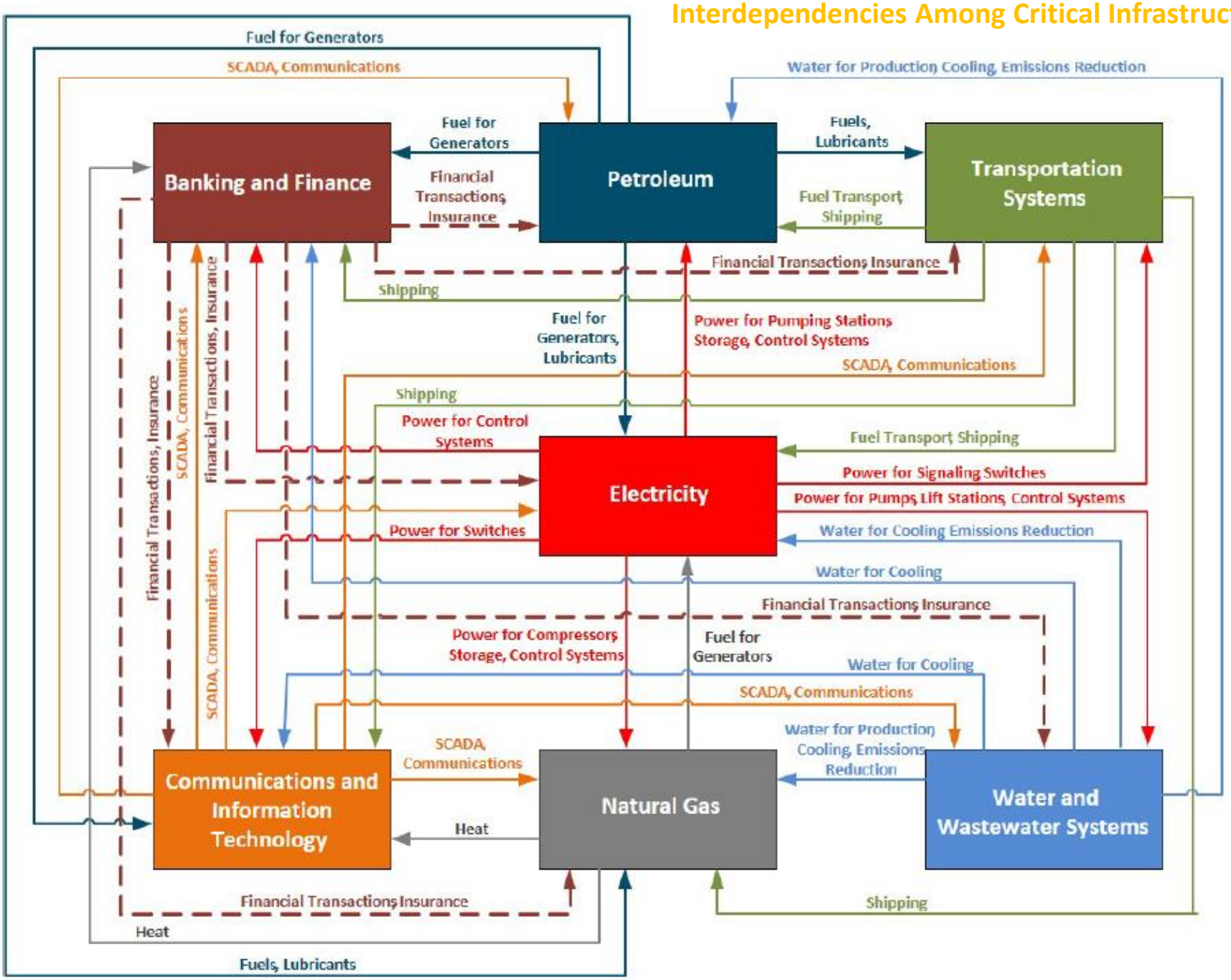


Figure 3.20 Infrastructure Interdependencies

	Element	Electrical Power	Natural Gas	Oil Industry	Water Purification	Sewage Treatment	Hospital & Health Care Services	Food Industry	Postal and Courier Services	Meteorological Services	Financial Services	Rail Services	Trucking	Municipal Transit Systems	Roads Infrastructure	Hazardous Materials	Public Works	Police Services	Fire Services	Ambulance Services	911 Services	Warning Sirens	Flood Control	Search and Rescue	Office Building Systems	Shelters	Telecommunications	Television Industry	Radio Industry	Other Critical Facilities
Energy & Utilities	Electrical Power			M	L				L	L	M	L	L		M	M		L	L	L	L				L		H			
	Natural Gas	L		L					L	L	M		L		L	L		L	L	L	L				L		M			
	Oil Industry	H			L				L	L	M	L	H		M	L		L	L	L	L				L		M			
	Water Purification	H		M					L				M		L	L		L	L	L	L				L		M			
	Sewage Treatment	M		H	H					L			L		L	L		L	L	L	L				L		M			
Services	Hospital & Health Care Services	H	H	H	H	L		H	M				M		M	M		L	M	M	L	L			H		H	L	L	
	Food Industry	H	L	M	H	H	L		L	L	L	H	H		H	L		L	L						H		H			
	Postal and Courier Services	H	L	H	L					L	M	L	H	L	H			L	L						H		H			
	Meteorological Services	L	M	L	L				L						L				L		L		L		M		H	L	M	
	Financial Services	H	M	M	M	L	L		M									M	L		L				H		H			
Transportation	Rail Services	M	L	H	M	M	M	M	L	L	L		H	L	L	M		L	L	L	L		L		M		M			
	Trucking	M	L	H	L	L	M	M	M	L		M			H	M		L	L	L					M		H			
	Municipal Transit System	M	L	H	L	L				L			L		H			L	L	L					M		M			
	Roads Infrastructure	M	L	H	L	L				M			M			M		M	L	L			L		L		M	L	L	
	Traffic Control	H																												
Safety	Hazardous Materials	M	M	M	M		L		L	M		M	M		M			L	M		L		L		L		M		M	
	Public Works	H	M	M	L	L						L	M		H	M							M				M			
	Police Services	H	M	H	L	L	L		L	M					H				H	M	M			M	H		H	L	L	
	Fire Services	M	M	H	H	L	L			L					H	M		M		M	M				M		H			
	Ambulance Services	M	M	H		L	H		L	L					H			M	M		M			L	L		H			
	911 Services	H	M	M		L																			M		H			
	Warning Sirens	H																L	L								H	M	M	
	Flood Control	M	L							M						L									L		H			
	Search and Rescue	L	L	H	L	L	M			M					L			L		L			L		L		M	L	L	
	Office Building Systems	H	M	M	H	M			L						L												M			

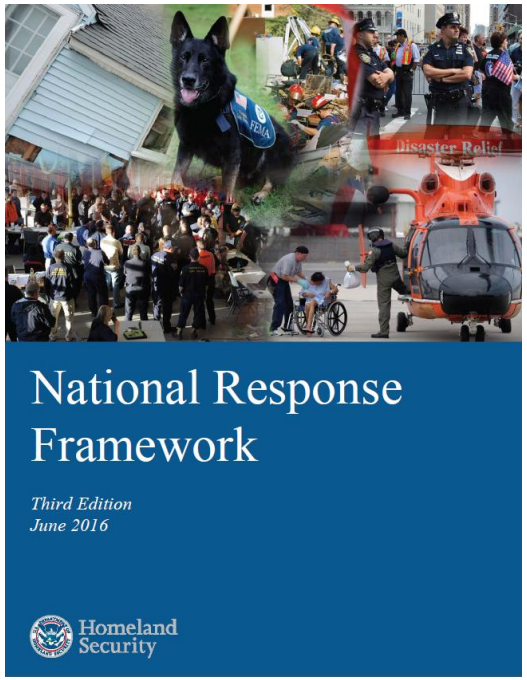
B. Energy Emergency Preparedness and Response

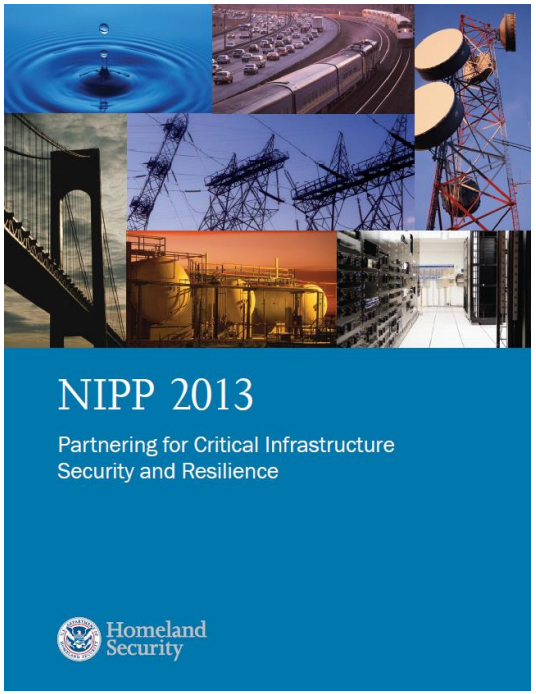
Ten Actions States Should Take

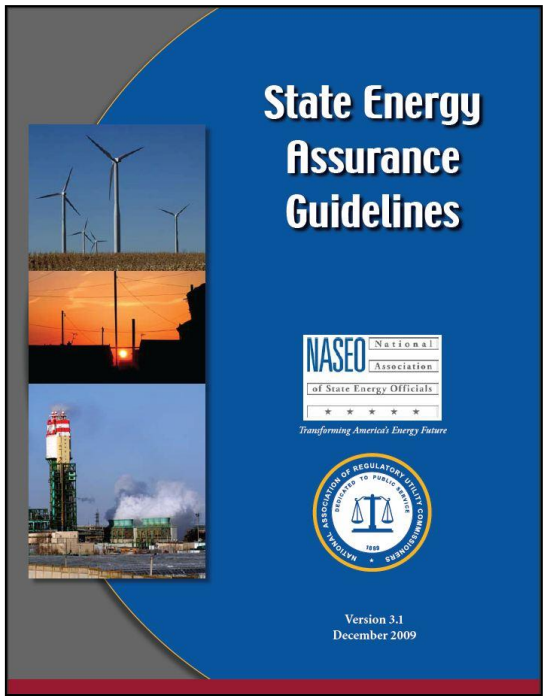
1. Make sure you and your staff are prepared and trained to meet the needs of policymakers.
2. Know your state's energy profile and interdependencies.
3. Know the geography and demographics of your state's energy infrastructure.
4. Know and maintain key government and industry contacts.
5. Maintain a good working relationship with private and public sector contacts.
6. Be prepared to work with the media.
7. Know the legal authorities which support your response.
8. Understand how you can effectively respond (e.g., increasing supply, reducing demand, other actions).
9. Maintain an alternative budget for emergencies.
10. Keep your energy assurance plan up to date.

National and State Guidance

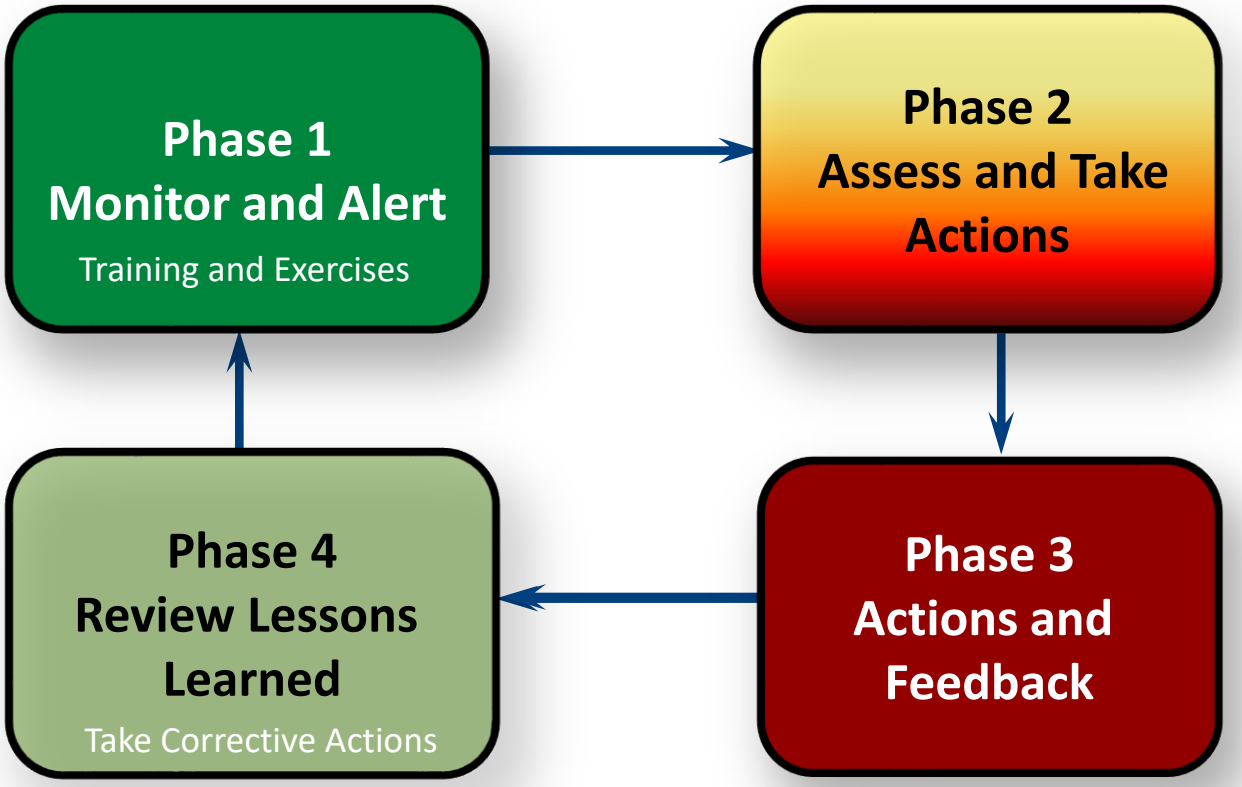
- National Response Framework
  - https://www.fema.gov/media-library/assets/documents/117791Emergency
- Support Function #12 – Energy Annex
  - https://www.fema.gov/media-library-data/1470149363676-f4f9246fc46b10727523aee39e076a2a/ESF_12_Energy_Annex_20160705_508.pdf
- National Infrastructure Protection Plan
  - http://www.dhs.gov/nipp
- State and Local Energy Assurance Guidelines
  - http://www.naseo.org/eaguidelines







Four Phases of an Emergency



Gathering Data and Information for Consequence Assessment

- Understanding the state energy profile
  - Capacities and utilization
  - Energy flows, consumption and prices
- What data do you have?
- What more do you need?
- What does it mean?
- Vulnerability Assessment
- Nebraska Energy Office tracks energy trends, statistics and critical energy infrastructure

See the U.S. Energy Information Administration's Energy Explained (https://www.eia.gov/energyexplained/) and State Data Portal (https://www.eia.gov/beta/states/overview)

Nebraska Energy Assurance Plan

- Executive Summary
- Introduction and Purpose
  - Purpose, Objectives, Plan Organization, Planning Process, and Plan Maintenance Schedule
- Operational Elements
  - Nebraska Energy Profile – Overview, Energy Consumption, Expenditures, Use by End-Use Sector
  - Energy Producers/Suppliers
  - Federal, Regional, and State Energy Agencies, Organizations, and Associations
  - Energy Emergency Authorities – Energy Emergency Legal Authorities, Driver Hours-of Service Waiver, Federal Energy Emergency Authorities, and Legal Authorities Pertaining to Public Power in Nebraska
  - Disruption Events – Natural Events, Accidental Impacts, Systematic Events, and Deliberate Attacks (Including Cyber)
  - Event Assessment/Recover-Tracking Methods – Data Analysis Capabilities, Methods for Ongoing Monitoring of Energy Markets and Use of Forecasts, Sources for Situation Awareness and Analysis, Sector Specific Shortage Indicators and Information Sources
  - Energy Emergency Response – Declaration Procedures, Energy Emergency Response Organization, Roles, and Responsibilities
  - Communication Procedures
  - Public Information Program – Coordination of Program, Operational and Equipment Considerations, and Program Activities in Response Phases

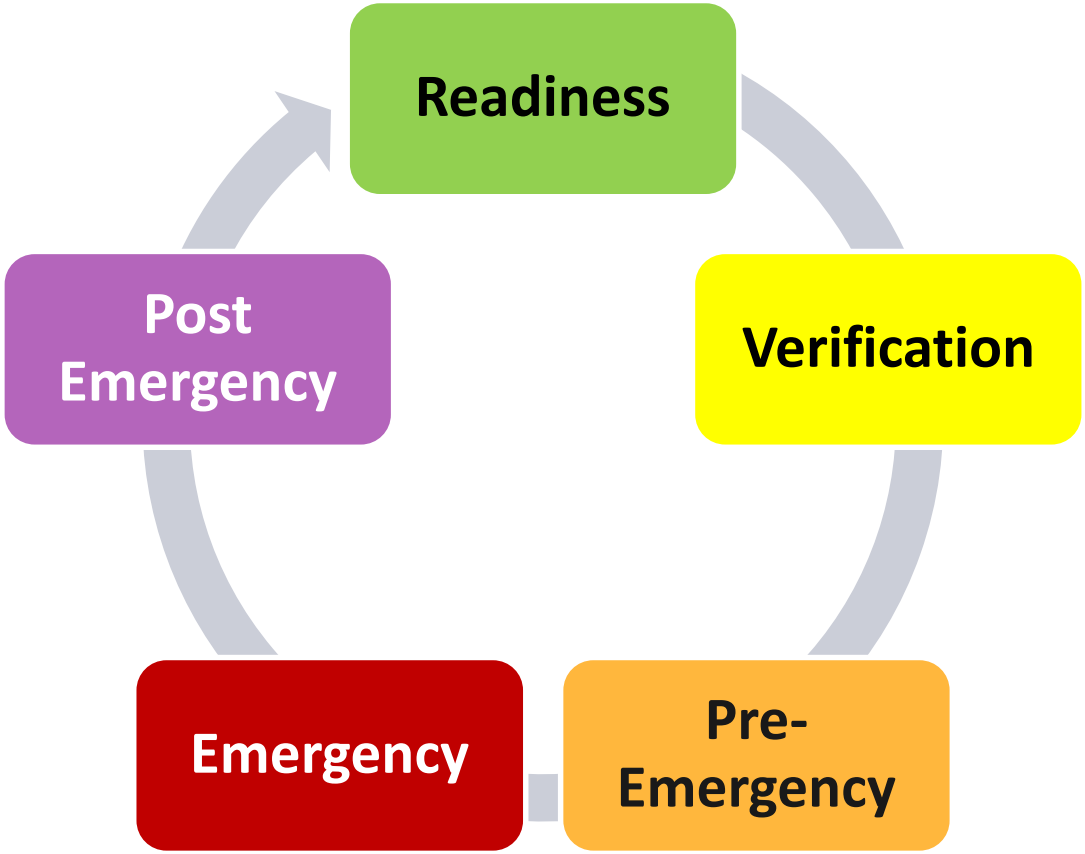
Nebraska Energy Assurance Plan (cont'd)

- Contingency Plans
  - Motor Fuel, Electricity, Natural Gas, Propane, Aviation Fuel, and Linkages to Other State Plans and National Guidelines
- Critical Energy Infrastructure Plans
  - Critical Infrastructure Protection – Roles and Responsibilities of State Agencies, Critical Infrastructure Protection Planning and the Energy Sector, Description and Prioritization of Energy Infrastructure and Key Assets, Coordination of Public and Private Sector Plans
  - Energy Sector Risk/Vulnerability Assessment – Natural Hazards, Electric Power Grid, Energy Infrastructure Interdependencies, and Cybersecurity
  - Identifying Protective Strategies – Developing Investments that Build Resiliency, Diversification of Energy Sources and Integration of Renewables, Enhance Reliability Efficiency of Systems, Smart Grid Technology Strategies, and Cybersecurity Strategies
  - Agriculture Commodities with Energy Needs – Energy Uses for Crop Production Cycles, Cattle and Calves Production Cycles, and Hog Production Cycles
- Appendices

The risk of a disruption due to a cyber attack should be addressed as part of the plans for each energy resource and sector or may be part of a separate planning document

Nebraska Energy Assurance Plan (Cont'd)

- For each energy resource the plan describes actions to be taken in each of the following phases:



Emergency Natural Gas Response Plans

- **Managing Supply and Assuring Essential Public Needs**
  - Utility measures to maximize alternative supplies
  - Curtailment provisions in local distribution utilities tariffs or public utility commission rules or orders for:
    - End-use customers
    - Transportation customers
    - Gas-fired electric generation
- **Reducing Demand**
  - Expanded energy efficiency and conservation
  - Voluntary public appeals
  - Mandatory Actions
    - Closing or curtail operating hours for non-essential facilities and major users
    - Assuring essential service operations
    - Fuel switching

Emergency Electricity Response Plans

- Public utility commissions involved in outage monitoring and recovery
- Renewable energy resources (e.g., wind, solar, hydroelectric, geothermal)
- Managing supply and assuring essential public needs
- Expanded energy efficiency and conservation voluntary and then mandatory (curtail operating hours)
- Reducing demand and sales
  - Load shedding options
  - Public appeals from utilities
  - Appeals from state government
  - Rotating blackouts

Petroleum Shortage Response Plans

Gasoline, Diesel Fuel, #2 Heating Oil, Propane, Ethanol, Biodiesel, Other

- **Managing Supply and Assuring Essential Public Needs**
  - Waivers of Federal Motor Carrier Safety Regulations (Driver Hours)
  - Fuel Specification (Environmental) Waivers
  - Restrict state agency fuel use
- **Mandatory Measures**
  - Flag system on fuel availability at retail gas station
  - Minimum purchase requirements or purchase limits
  - Restriction of public events
    - Odd/even day gasoline purchase to reduce the length of lines at gas station should this become a problem
  - State Petroleum Product Set-Aside Program ***(longer term fuel shortages)***

Petroleum Shortage Response Plans (Cont'd)

Gasoline, Diesel Fuel, Heating Oil, Propane, Ethanol, Biodiesel, Other.

- **Reducing Demand**
  - Flexible work schedules and telecommuting
  - Ridesharing/vanpooling programs
  - Increase use of alternative fuel vehicles
  - Programs to increase the use of mass transit
  - Improve vehicle maintenance
  - Public information emergency conservations actions
  - Home energy saving recommendations (e.g., propane, fuel oil)

Energy Emergency Assurance Coordinators

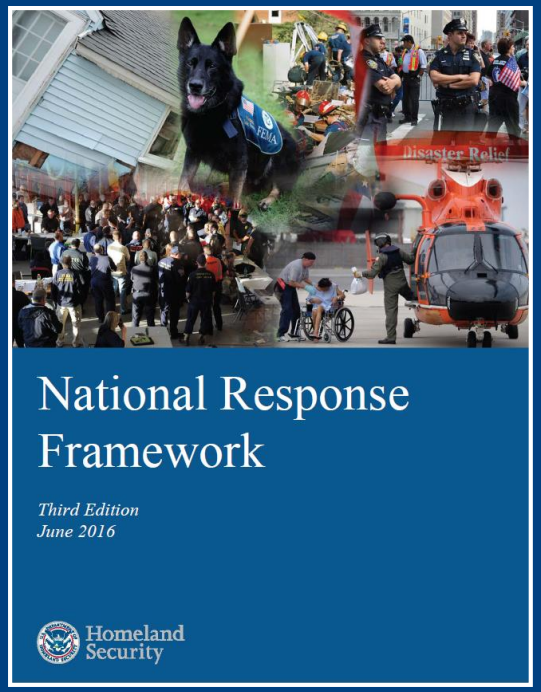
- Points of contact for states, U.S. Department of Energy, and industry in event of an energy emergency
- Provide assessment, notification, news and updates on actions taken and can have access the U.S. Department of Homeland Security's Homeland Security Information Network
- Primary and secondary contact for each sector (e.g., petroleum, electricity, natural gas) from each state
- Established in 1996
  - New memorandum of understanding was signed by the Secretary of Energy in February 2016
  - Expanded to include NASEO, National Association of Regulatory Utility Commissioners, National Governors Association, and National Emergency Management Association

Media and Public Information

- Be prepared and know who will speak directly to the press
  - If established, work through joint information center
- Assure clear and consistent messages
- Do not speculate, rely on known facts
- Provide authoritative, accurate and timely information
- Provide background information explaining the nature of the problem

Friday, September 12, 2008. The day before Hurricane Ike made landfall in response to long lines at gas stations based on rumors of $5 & $6 per gallon prices to come. On June 26, 2009, eleven Michigan gas stations entered into compliance agreements due to allegations of price gouging.

C. Federal Roles and Energy Assurance



- State plans need to be maintained and coordinated with the federal government
- Federal response typically follows when state and local governments exceed their capacity to respond and request assistance. The Infrastructure Security and Energy Restoration Division within the U.S. Department of Energy's Office of Cybersecurity, Energy Security, and Emergency Response is the focal point for energy assurance planning, security and preparedness and nationally supports ESF-12 Energy
- States can support ongoing efforts in coordination with the Department by using U.S. State Energy Program funding and other federal and state resources

Energy Assurance Functions

Monitor	Prepare	Respond
Weather Forecasts OE-417 Disruptions Industry/State/Regional Calls Analytic Studies and Lessons Learned	Orientation for Staff and Constituents Energy Assurance Plan Guidance Table Top Exercises Energy Emergency Assurance Coordinators	Emergency Situation Reports Due Diligence for Waiver Requests Support to ESF-12 Deployments Damage and Restoration Validation

Communicate and Coordinate within the Department and with partners throughout federal, state, local government and industry
All information is shared via public or secure web sites

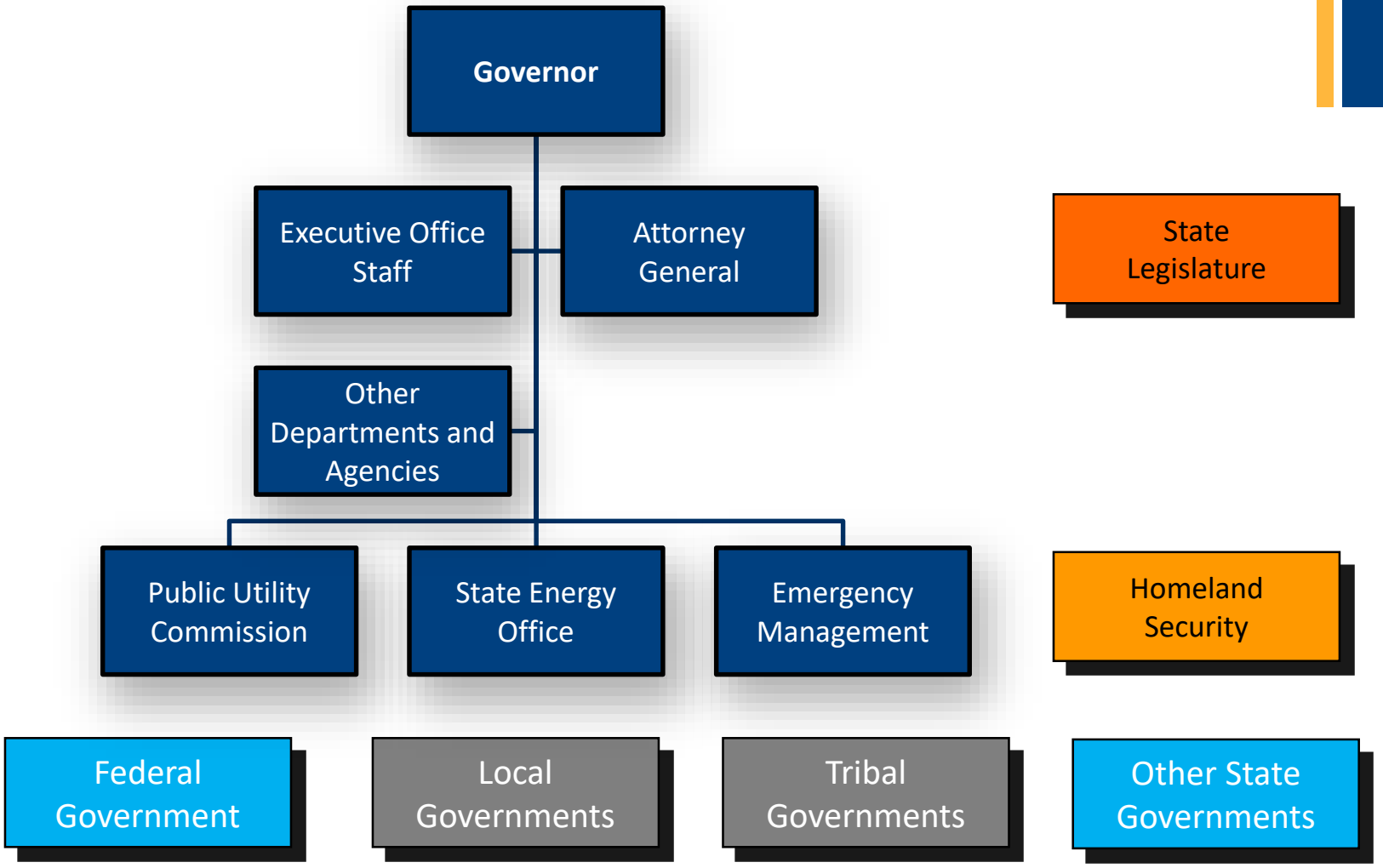
DOE's Monitoring, Situational Awareness and Analytical Capability

- Situation/Spot Reports
- Eagle-I – Interactive geographic information system maps the nation's energy infrastructure and obtains near real-time information on power outages and updates on the petroleum and natural gas sectors
- OE-417 power outage incident reporting
- Visualization Products
  - Near Real-Time Monitoring
  - Pre-Event Products (Predictive)
  - Post-Event Products (Restoration)
- After Action Reports

C. States Agency Roles in Energy Emergencies

- Roles and responsibilities vary considerably across the states
- In 2010, states received federal energy assurance planning grants to develop and exercise plans over a 2-3 year period
  - No new federal funding has been authorized by Congress
  - States can support this effort through U.S. State Energy Program funding and other resources
- Key state agencies include:
  - State Energy Offices
  - Public Utility Commissions
  - Emergency Management
  - Homeland Security Agencies

State Energy Emergency Organizations



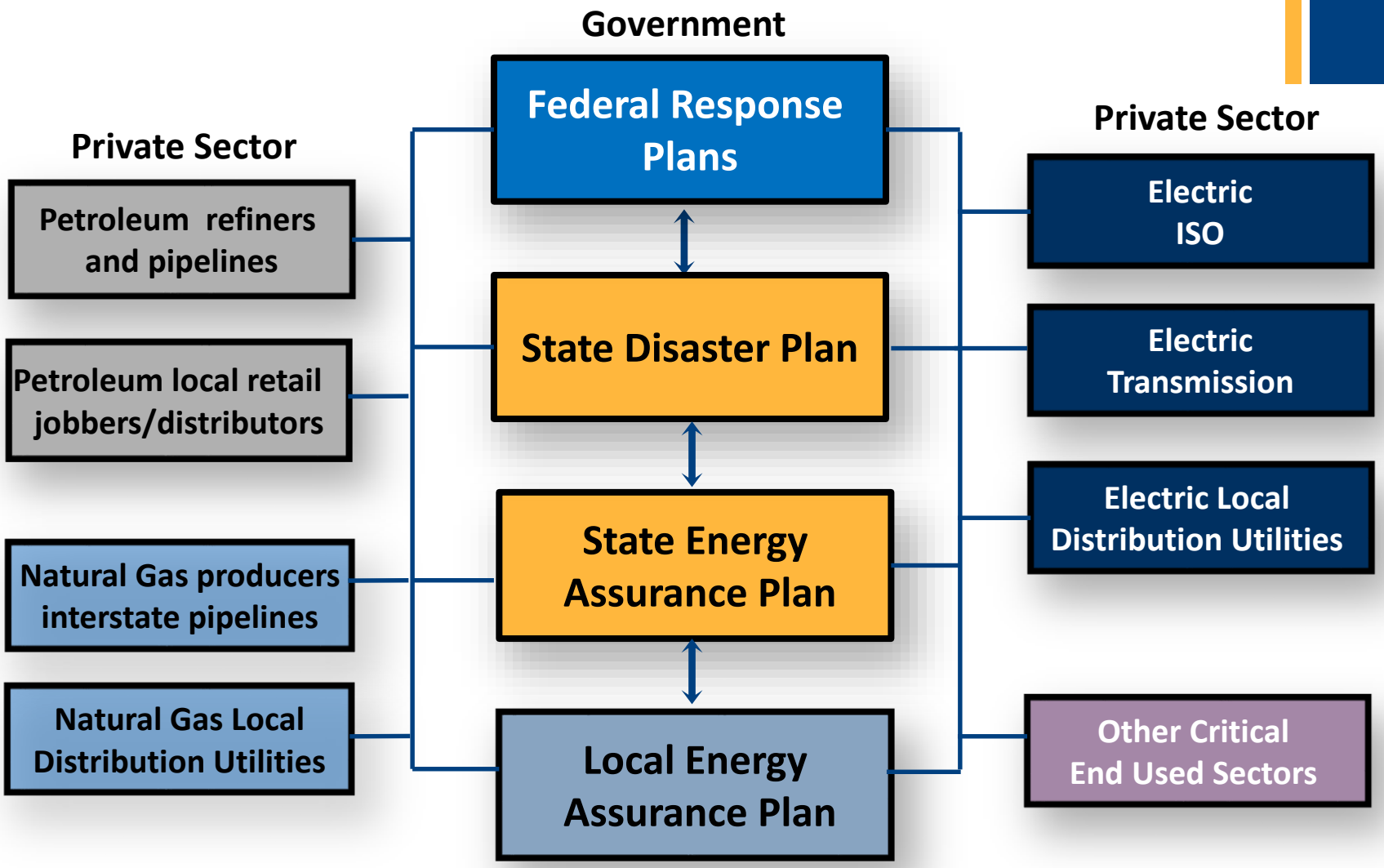
State Role in Energy Security Planning

"All response is local. Energy Assurance Planning supports successful state and local response, as well electricity and oil and natural gas counterparts."

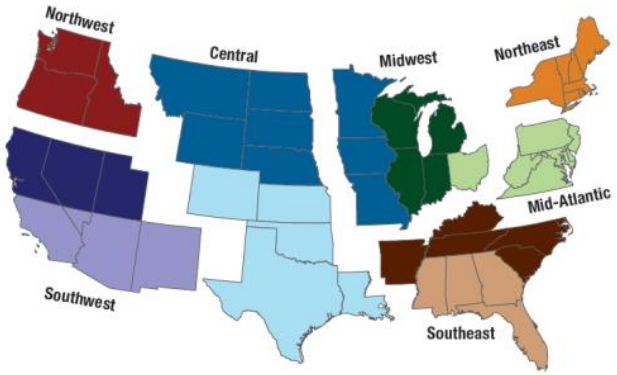
Data Tracking and Monitoring	Authorities and Responsibilities	Procedures and Processes	Contacts	Federal Framework
• Capacity and Flows • Critical Infrastructure • Threats and Hazards	• Emergency Declarations • Waivers • Connection to other state plans	• How to Declare Emergency • Emergency Electrical Procedures • Petroleum Shortage Plans • Public Outreach	• Local Gov't • Other State Agencies • Neighboring States • Decision-makers • Petroleum suppliers • Gas and electric utilities • Distribution companies • Industry associations	• National Response Plans • National Infrastructure Protection Plan • Energy Sector Specific Plan

Coordination of Plans

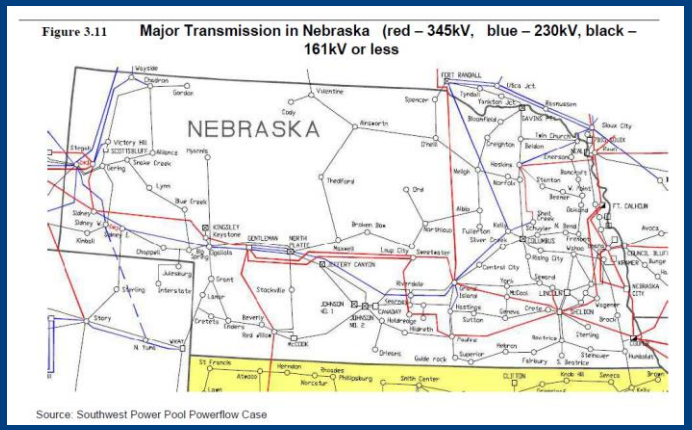
Planning interfaces

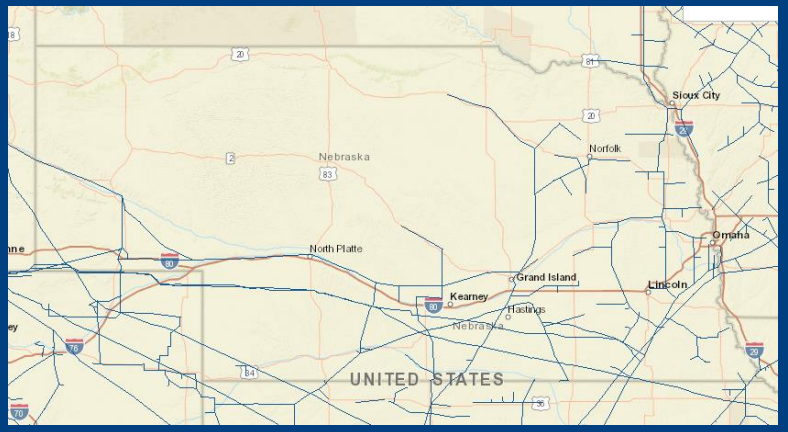


Multi-State Regional Coordination



- Infrastructure that may be critical to a state may be in another state (or country)
- States need to maintain contacts in the energy sector and with other states in the region
- State response plans need to be coordinated regionally
- The **Energy Emergency Assurance Coordinators** provides for crisis communication
- Regional energy emergency exercises improve coordination and preparedness

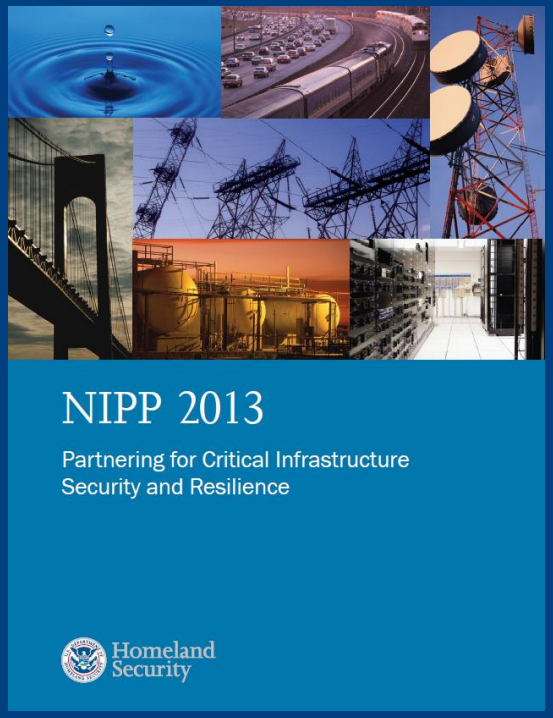




- Part 2: Infrastructure Security and Resilience
  - A. National Infrastructure Protection Plan
  - B. Risk Assessments, Mitigation and Resiliency
  - C. Cybersecurity

A. National Infrastructure Protection Plan

Original Plan – June 2006, updated in 2009, and December 2013



- Presidential Policy Directive 21 (PPD-21), titled *"Critical Infrastructure Security and Resilience",* directed the U.S. Department of Homeland Security to update to the National Infrastructure Protection Plan (NIPP)
  - Emphasizes the complementary goals of security and resilience for critical infrastructure
  - Integrates cyber and physical security into an enterprise approach to risk management
    - Consistent with Executive Order 13636, Improving Critical Infrastructure Cybersecurity
  - Aligns with the National Preparedness System in Presidential Policy Directive 8 (PPD-8)
  - States should work with state sector-specific agencies to support the vision, mission, and goals and engage subject matter expert assistance at the sector level

NIPP Sector Partnership Model Cross Sector Coordination

- Energy has two Subsectors
  - Oil and Gas
  - Electric
- Each subsector has a Sector Coordinating Council

		Critical Infrastructure Partnership Advisory Council		
Critical Infrastructure Sector	**Sector-Specific Agency**	**Sector Coordinating Councils (SCCs)**	**Government Coordinating Councils (GCCs)**	**Regional Consortia**
Chemical	Department of Homeland Security	✓	✓	
Commercial Facilities ⓘ		✓	✓	
Communications ⓘ		✓	✓	
Critical Manufacturing		✓	✓	
Dams		✓	✓	
Emergency Services ⓘ		✓	✓	
Information Technology ⓘ		✓	✓	
Nuclear Reactors, Materials & Waste		✓	✓	
Food & Agriculture	Department of Agriculture, Department of Health and Human Services	✓	✓	
Defense Industrial Base ⓘ	Department of Defense	✓	✓	
Energy ⓘ	Department of Energy	✓	✓	
Healthcare & Public Health ⓘ	Department of Health and Human Services	✓	✓	
Financial Services ⓘ	Department of the Treasury	Uses separate coordinating entity	✓	
Water & Wastewater Systems ⓘ	Environmental Protection Agency	✓	✓	
Government Facilities	Department of Homeland Security, General Services Administration	Sector does not have an SCC	✓	
Transportation Systems ⓘ	Department of Homeland Security, Department of Transportation	Various SCCs are broken down by transportation mode or subsector.	✓	

Critical Infrastructure Cross-Sector Council

Federal Senior Leadership Council

State, Local, Tribal, and Territorial Government Coordinating Council

Regional Consortium Coordinating Council

ⓘ Indicates that a sector (or a subsector within the sector) has a designated information-sharing organization.

DOE's Sector Specific Agency (SSA) Authorities

FAST Act (2015)

Codified DOE's SSA Role

PPD-21 –Establishes **a s**hared responsibility among the Federal government, SLTT entities, and public and private owners and operators for CI security and resilience

PPD-41 –Federal Government's response to any cyber incident involving government or private sector entities

U.S. Department of Energy (DOE) Office of CESER
Infrastructure Security and Energy Restoration (ISER) Division

State, Local, Tribal, and Territorial Governments (SLTT)	Oil and Natural Gas Subsector Coordinating Council (ONG SCC)	Electricity Subsector Coordinating Council (ESCC)	Energy Government Coordinating Council (EGCC)	Emergency Support Function #12 – Energy

CESER Collaboration Across the Energy Sector

State, Local, Tribal and Territorial (SLTT) Program

NASEO National Association of State Energy Officials

NCSL

AMERICAN PUBLIC POWER ASSOCIATION

NGA NATIONAL GOVERNORS ASSOCIATION

NEMA™

ESCC Electricity Subsector Coordinating Council

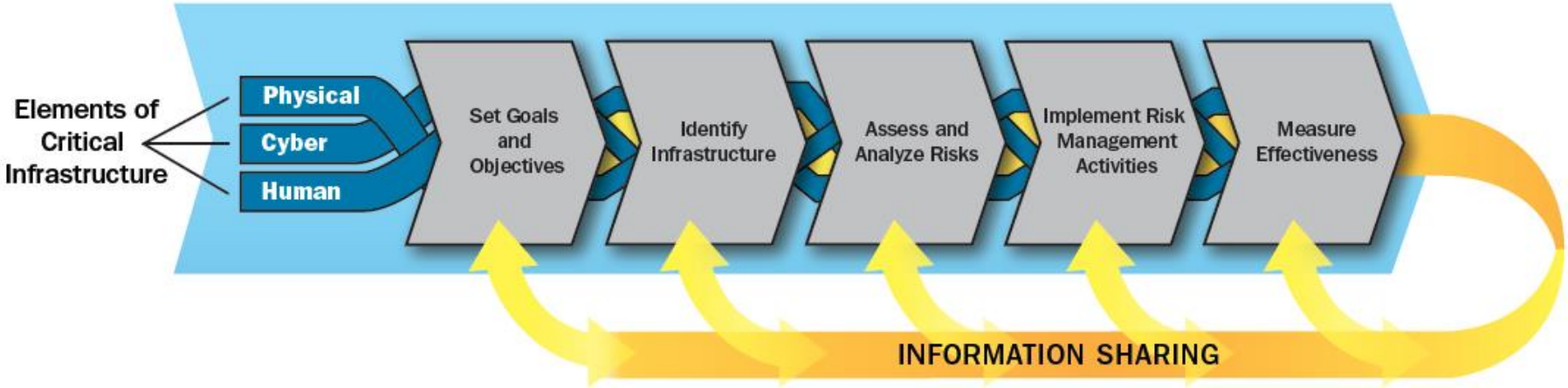
2019 Leadership	• Tom Fanning, Southern Company • Kevin Wailes, Lincoln Electric • Duane Highley, Tri-State
Steering Committee	• APPA, Canadian Electricity Association, EEI, EPRI, EPSA, NIAC, NRECA, NERC, ISO/RTO Council
Working Groups	• Vision and Planning • Threat Information Sharing • Industry-Government • Research and Development • Cross-Sector Liaisons

OIL AND NATURAL GAS SECTOR COORDINATING COUNCIL

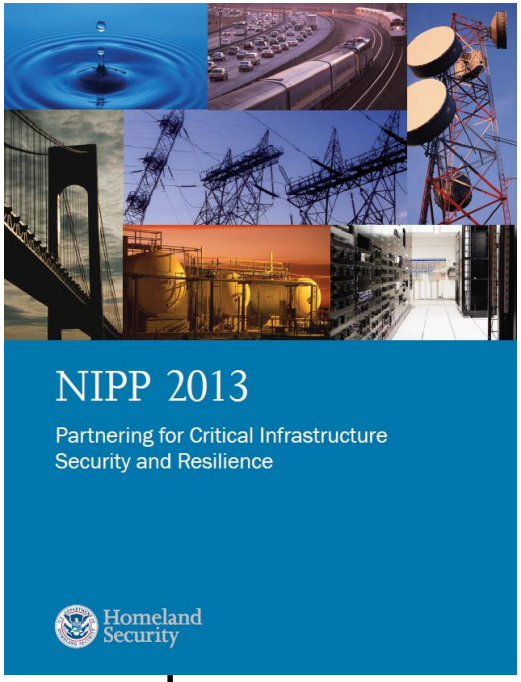
2019 Leadership	• Tamara Lance, Atmos Energy • Jillian Sulley, Devon Energy
Owner and Operator Trade Associations	•AXPC, AFPM, AGA, API, APGA, AOPL, ESC, GPA, IPAA, IADC, ILTA, INGAA, NACS, NOIA, NPGA, OMSA, OOC, PMAA, SIGMA, TXOGA, and USOGA
Associate Member Trade Associations	•Canadian Association of Petroleum Producers •Canadian Energy Pipeline Association

The NIPP Framework

- Set Goals and Objectives
- Identify Assets, Systems, Networks, and Functions
- Assess Risk (Consequences, Vulnerabilities, and Threats)
- Implement Rick Management Activities
- Measure Effectiveness



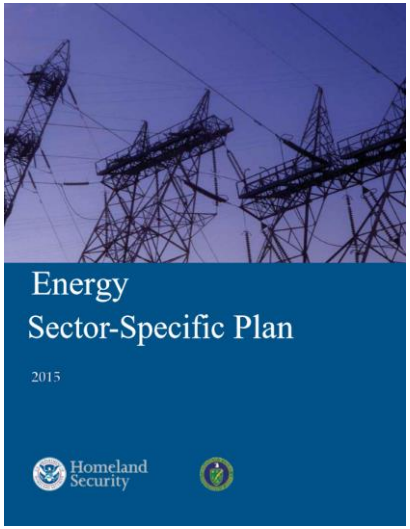
Sector-Specific Plans



- Detail the application of the NIPP risk management framework in each of the 16 critical infrastructure/key resources sectors
- Sector-Specific Agencies partner with their sector to develop individual sector-specific plans
- Plans are annexes to the NIPP
  - Updated in 2015 to reflect 2013 changes to the NIPP

Goals of the Energy Sector Specific Plan

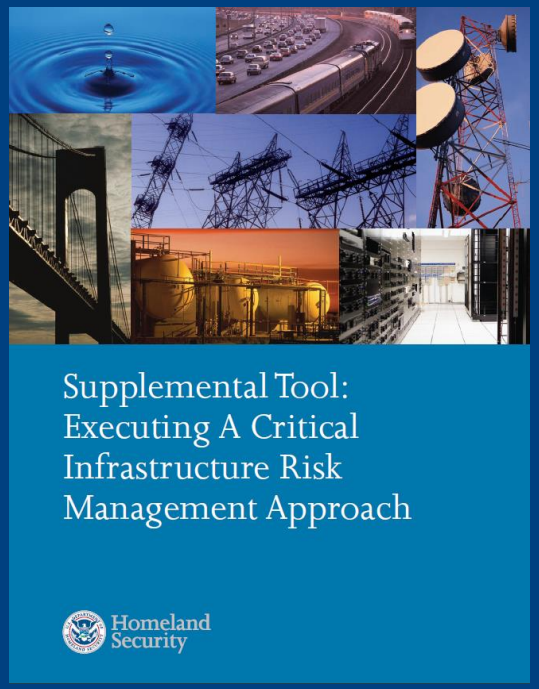
- Assess and analyze threats to, vulnerabilities of, and consequences to critical infrastructure
- Secure critical infrastructure against human, physical, and cyber threats through sustainable efforts to reduce risk, while considering the costs and benefits of investments
- Enhance critical infrastructure resilience by minimizing adverse consequences through planning and mitigation efforts, saving lives, and ensure rapid recovery
- Share actionable and relevant information across the critical infrastructure community to enable risk-informed decision-making
- Promote learning and adaptation during and after exercises and incidents



January 25, 2016

https://www.dhs.gov/sites/default/files/publications/nipp-ssp-energy-2015-508.pdf

B. Risk Assessment, Mitigation and Resiliency



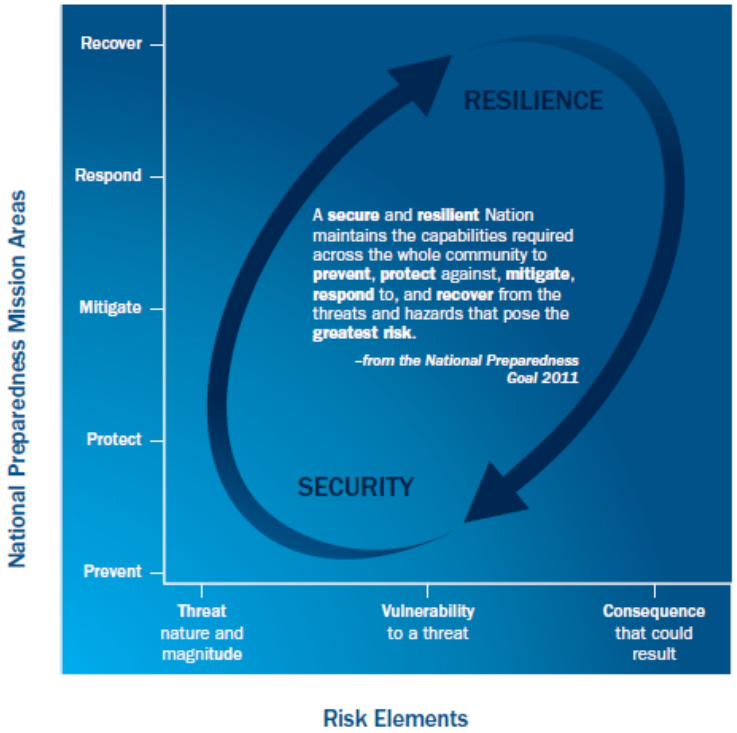
http://www.dhs.gov/NIPP

- You need to understand what the risks are before you can work to mitigate the impacts and build resiliency
- When you quantify the size of economic and human consequences the cost benefits of the investments to mitigate energy sector risks are often relatively small compared to the consequences
- The term "mitigation" refers to the capabilities necessary to reduce loss of life and improved resiliency because fewer resources are needed for response and recovery
- Results from a Federal Emergency Management Agency study showed that, on average, future losses were reduced by about $6 for every $1 spent

Risk – The potential for an unwanted outcome resulting from an incident, event, or occurrence, as determined by its likelihood and the associated consequences

- **Consequences:** If something happens, what are the human and economic impacts to society?
  - Must also consider how impacts will affect interdependent infrastructures and behavior of impacted populations
- **Threats/Hazards:** What can happen? What is the frequency/probability?
- **Vulnerabilities:** Are there weak links in the energy supply chain and infrastructure? Are components antiquated/old and failure prone? Are there infrastructure co-locations or bottlenecks? Why is it critical?
  - Includes consideration of energy infrastructure attributes and interdependencies

Figure 4 – Critical Infrastructure Risk in the Context of National Preparedness



Source: NIPP 2013: Partnering for Critical Infrastructure Security and Resilience

Risk Assessment

Risk is a function of

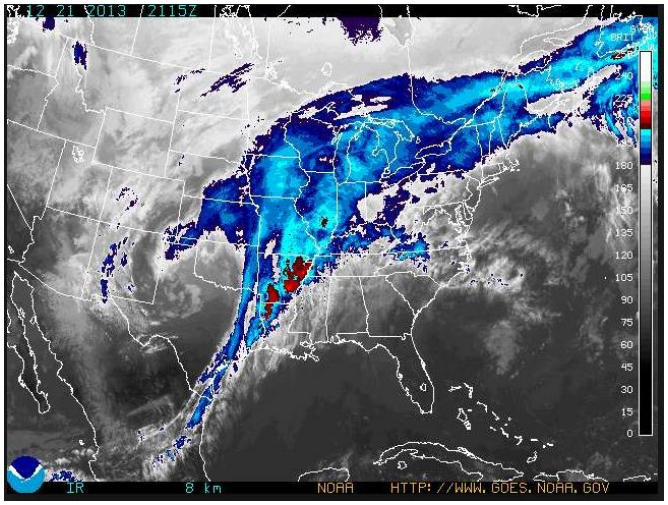
[Consequence x Threat x Vulnerability]

$15 million Rifle Attack Visible Line of Site

The April 16, 2013, assault on the Pacific Gas and Electric Company's Metcalf substation near San Jose, California damaged 17 transformers, caused $15 million in damage, and put the facility out of service for nearly a month

Consequence

- Consequence analysis should address both direct and indirect effects of any hazards including: natural disaster, infrastructure failure, pandemic, cyber or terrorist attack, or other disruptive events
- Under the NIPP, the U.S. Department of Homeland Security works with sector-specific agencies and security partners to examine the inherent characteristics of assets, systems, or networks to identify "worst-case" consequences
- Consequences for the national-level comparative risk assessment can be divided into four main categories:
  - Human impact, fatalities, and injuries
  - Economic impacts, primary/secondary
  - Impact on public confidence
  - Impact on government capability



December 2013 Ice Storm

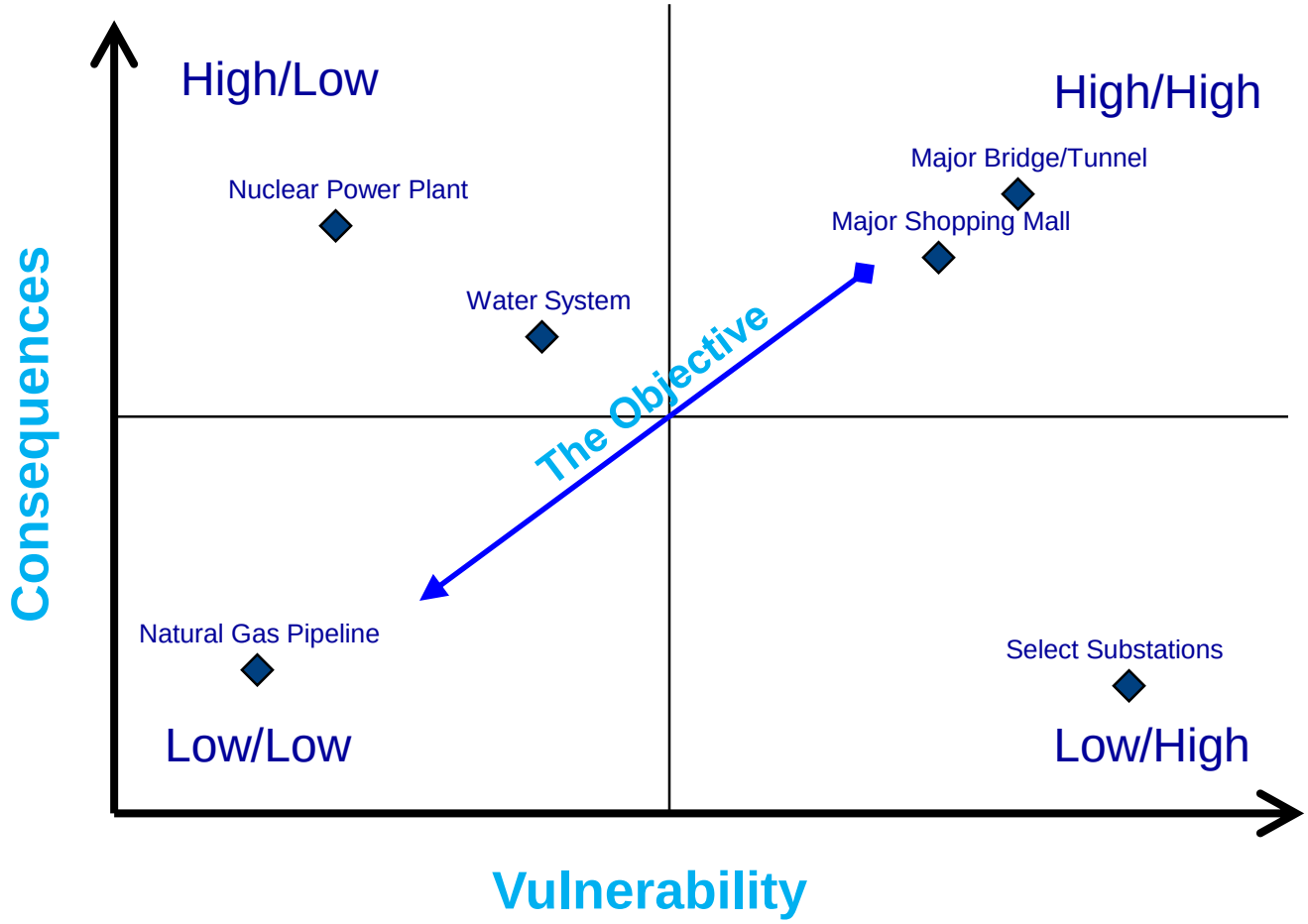
Vulnerabilities and Criticality

- **Vulnerabilities**
  - Visible vs. not visible
  - Widely known vs. unknown
  - Easy vs. difficult to protect perimeter
  - Inherent redundancy and resiliency
  - Security measures/standards adopted
  - Public vs. restricted access
  - Speed of response
  - Insider vulnerability
  - Cybersecurity
- **Criticality**
  - What is really important
  - Levels of interdependencies
  - Relative importance
  - High consequences and impacts
  - Potential threat to public safety

Fermi Nuclear Power Plant
Monroe, Michigan

Determining Criticality

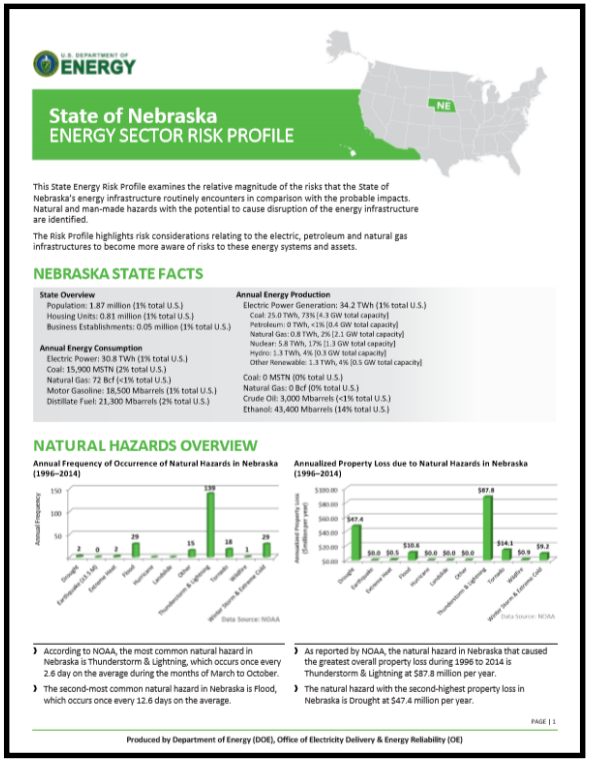
Illustrative Examples Only



How should "threat" be factored in using an "all hazards approach?"

State Energy Risk Profiles

- The profiles examine the relative magnitude of the risks that each state's energy infrastructure routinely encounters in comparison with the probable impacts
  - Address natural and man-made hazards with the potential to cause disruption of the electric, petroleum, and natural gas infrastructures



U.S. DEPARTMENT OF ENERGY

State of Nebraska
ENERGY SECTOR RISK PROFILE

This State Energy Risk Profile examines the relative magnitude of the risks that the State of Nebraska's energy infrastructure routinely encounters in comparison with the probable impacts. Natural and man-made hazards with the potential to cause disruption of the energy infrastructure are identified.

The Risk Profile highlights risk considerations relating to the electric, petroleum and natural gas infrastructures to become more aware of risks to these energy systems and assets.

NEBRASKA STATE FACTS

State Overview
Population: 1.87 million (1% total U.S.)
Housing Units: 0.81 million (1% total U.S.)
Business Establishments: 0.05 million (1% total U.S.)

Annual Energy Consumption
Electric Power: 30.8 TWh (1% total U.S.)
Coal: 15,900 MSTN (2% total U.S.)
Natural Gas: 72 Bcf (<1% total U.S.)
Motor Gasoline: 18,500 Mbarrels (1% total U.S.)
Distillate Fuel: 21,300 Mbarrels (2% total U.S.)

Annual Energy Production
Electric Power Generation: 34.2 TWh (1% total U.S.)
Coal: 25.0 TWh, 73% [4.3 GW total capacity]
Petroleum: 0 TWh, <1% [0.4 GW total capacity]
Natural Gas: 0.8 TWh, 2% [2.1 GW total capacity]
Nuclear: 5.8 TWh, 17% [1.3 GW total capacity]
Hydro: 1.3 TWh, 4% [0.3 GW total capacity]
Other Renewable: 1.3 TWh, 4% [0.5 GW total capacity]
Coal: 0 MSTN (0% total U.S.)
Natural Gas: 0 Bcf (0% total U.S.)
Crude Oil: 3,000 Mbarrels (<1% total U.S.)
Ethanol: 43,400 Mbarrels (14% total U.S.)

NATURAL HAZARDS OVERVIEW

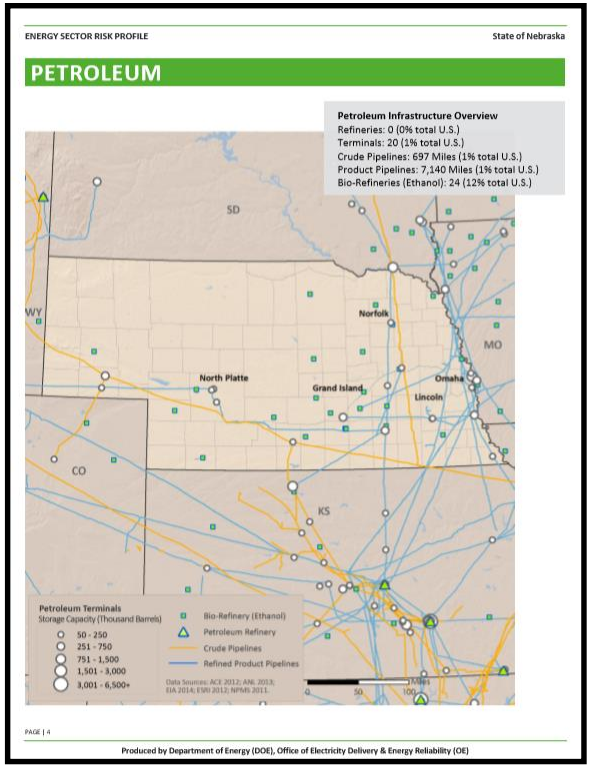
Annual Frequency of Occurrence of Natural Hazards in Nebraska (1996–2014)

Annualized Property Loss due to Natural Hazards in Nebraska (1996–2014)

- According to NOAA, the most common natural hazard in Nebraska is Thunderstorm & Lightning, which occurs once every 2.6 day on the average during the months of March to October.
- The second-most common natural hazard in Nebraska is Flood, which occurs once every 12.6 days on the average.
- As reported by NOAA, the natural hazard in Nebraska that caused the greatest overall property loss during 1996 to 2014 is Thunderstorm & Lightning at $87.8 million per year.
- The natural hazard with the second-highest property loss in Nebraska is Drought at $47.4 million per year.

PAGE | 1

Produced by Department of Energy (DOE), Office of Electricity Delivery & Energy Reliability (OE)



ENERGY SECTOR RISK PROFILE — State of Nebraska

PETROLEUM

Petroleum Infrastructure Overview
Refineries: 0 (0% total U.S.)
Terminals: 20 (1% total U.S.)
Crude Pipelines: 697 Miles (1% total U.S.)
Product Pipelines: 7,140 Miles (1% total U.S.)
Bio-Refineries (Ethanol): 24 (12% total U.S.)

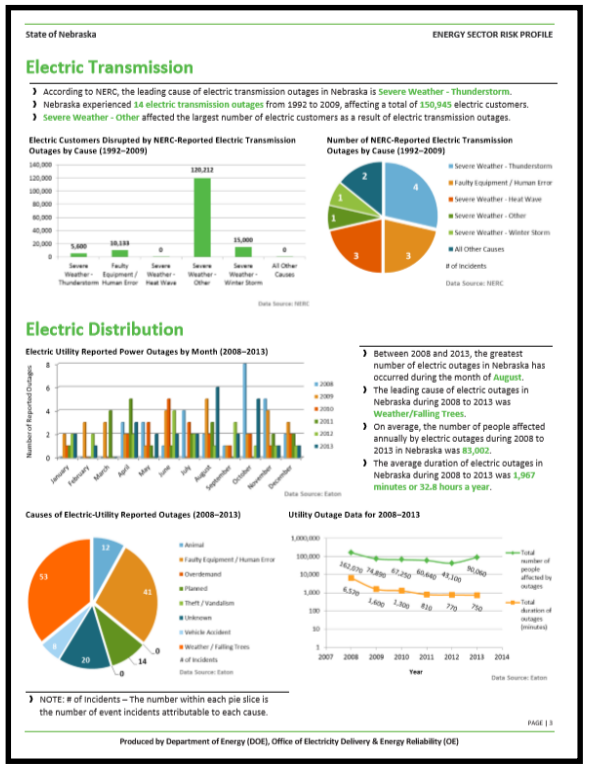
Petroleum Terminals
Storage Capacity (Thousand Barrels)
50 - 250
251 - 750
751 - 1,500
1,501 - 3,000
3,001 - 6,500+

Bio-Refinery (Ethanol)
Petroleum Refinery
Crude Pipelines
Refined Product Pipelines

Data Sources: ACE 2012; ANL 2013; EIA 2014; ESRI 2012; NPMS 2011.

PAGE | 4

Produced by Department of Energy (DOE), Office of Electricity Delivery & Energy Reliability (OE)



State of Nebraska — ENERGY SECTOR RISK PROFILE

Electric Transmission

- According to NERC, the leading cause of electric transmission outages in Nebraska is Severe Weather - Thunderstorm.
- Nebraska experienced 14 electric transmission outages from 1992 to 2009, affecting a total of 150,945 electric customers.
- Severe Weather - Other affected the largest number of electric customers as a result of electric transmission outages.

Electric Customers Disrupted by NERC-Reported Electric Transmission Outages by Cause (1992–2009)

Number of NERC-Reported Electric Transmission Outages by Cause (1992–2009)

Electric Distribution

Electric Utility Reported Power Outages by Month (2008–2013)

- Between 2008 and 2013, the greatest number of electric outages in Nebraska has occurred during the month of August.
- The leading cause of electric outages in Nebraska during 2008 to 2013 was Weather/Falling Trees.
- On average, the number of people affected annually by electric outages during 2008 to 2013 in Nebraska was 83,002.
- The average duration of electric outages in Nebraska during 2008 to 2013 was 1,967 minutes or 32.8 hours a year.

Causes of Electric-Utility Reported Outages (2008–2013)

Utility Outage Data for 2008–2013

NOTE: # of incidents – The number within each pie slice is the number of event incidents attributable to each cause.

PAGE | 3

Produced by Department of Energy (DOE), Office of Electricity Delivery & Energy Reliability (OE)

Developed by the U.S. Department of Energy. Available at: http://www.energy.gov/oe/state-energy-risk-assessment-initiative-state-energy-risk-profiles

Framework for Defining Resilience

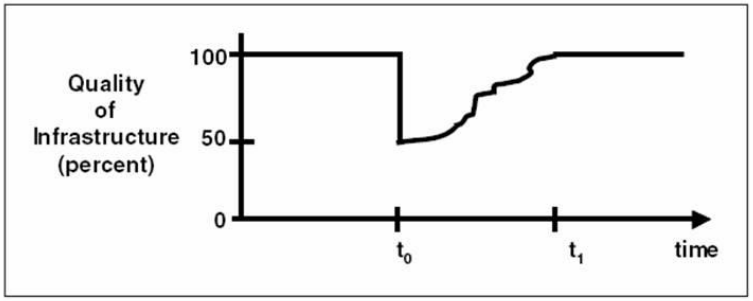


FIGURE 3 Measure of seismic resilience—conceptual definition. Source: Bruneau et al., 2003.

$$R = \int_{t_o}^{t_1} [100 - Q(t)]dt$$

For a community, loss of resilience, *R*, can be measured as the expected loss in quality (probability of failure) over the time to recovery, *t1 – t0*.

Source: Multidisciplinary Center for Earthquake Engineering Research framework for defining resilience (Bruneau and Reinhorn, 2007; Bruneau et al., 2003)

Resilience results from a sustained commitment to four factors

- ***Robustness*** – The ability to operate or stay standing in the face of disaster
- ***Resourcefulness*** – Skillfully managing a disaster once it unfolds
- ***Rapid Recovery*** – The capacity to get things back to normal as quickly as possible after a disaster
- ***Learning Lessons*** – Having the means to absorb the new lessons that can be drawn from a catastrophe

Source: Flynn, S. (2008) America the Resilient: Defying Terrorism and Mitigating Natural Disasters. *Foreign Affairs,* 87 (2), 2-8.

Investments that Reduce Risks, Enhance Resiliency, Economic Efficiency, and the Environment

- Net zero energy buildings have greater self sufficiency
- Combined heat and power can reduce fuel use, improve conversion efficiency, and operate independently of the power grid
- Microgrids can supply highly-reliable power during times of natural disaster
- Alternative fuel and electric vehicles diversify energy resource usage
- Well-insulated homes and buildings that hold heat longer in a winter power outage
- Smart grids rapidly detect the size of power outages reducing response time
- Grid modernization can reduce line losses and transmission congestion
- Energy storage (e.g., batteries, fuel cells, and emergency fuel reserves)

Net Zero Buildings at the National Renewable Energy Laboratory in Golden Colorado

C. Cybersecurity

A cross sector interdependency and organizational issue

- Defend, detect, and react to cyber attacks
- Examine the physical security of telecommunications and computer operations within state control, and encourage private entities to follow suit
- Promote awareness of cyber threats and mitigation techniques

The *Business Blackout* report Lloyd's of London and the University of Cambridge's Centre for Risk Studies.

Cybersecurity Threats

- Idaho National Laboratory Aurora Experiment (March 2007)
  - http://www.youtube.com/watch?v=fJyWngDco3g
- Stuxnet is a computer worm designed to attack industrial system using a "zero-day" exploit which are software vulnerabilities yet unknown to the software maker or antivirus vendors
  - Believed to be responsible for destroying many of Iran's uranium centrifuges
- In December 2016, hackers struck an electric transmission station in Kiev Ukraine which blacked out a fifth of its total power capacity for an hour
  - "Crash Override" as only the second-ever known case of malicious code purpose-built to disrupt physical systems
  - May have been a test dry run
- Social engineering
- Attacks launched through third party suppliers
- Ransomware attacks
- Embedded control systems
- Internal employee threat

Motivation for Cyber Intrusions

- *Overt attacks* – Objective is to disrupt, destroy, frighten
  - Terrorists, nation states, disgruntled current or former employees
- *Gain System Control* – Remotely modify and operate the system as a vehicle for attack
- *Extortion* – Criminal motivation to make money, ransom ware
- *Theft* – Objective is to make money and not be discovered (stealth) – social security numbers, credit card numbers, intellectual property
  - Organized crime (domestic and international) and individuals
- *Intrusion* – Unauthorized access to information and the potential to use information to do harm

A Tornado Near a State Data Center

Hackers are not the only thing you need to be concerned about

Example of Risk Management for Cybersecurity

Risk is a function of:

[Consequence x Vulnerability x Threat]

- Loss of revenue
- Economic losses
- Public safety
- Physical damage
- Loss of confidence
- Decline in stock value
- Operational interdependencies
- Interdependencies cascading, etc. (customers/suppliers)
- Modification of data in transit
- Zero day vulnerability exploits
- Denial of service attacks
- Theft of information
- Spoofing
- Sniffing
- Human engineering
- User errors
- Equipment failure
- Malicious actors
- Viruses/worms
- Natural hazards
  - Hurricanes
  - Floods
  - Severe storms
  - Earthquakes
  - Solar flairs
  - Pandemics

Roles for State Energy Agencies

1. Convene a Cyber Team to work with electric and gas utilities and the petroleum sectors to promote cybersecurity

2. Identify and provide cybersecurity training for staff

3. Understand the cybersecurity requirements and data back-up for your agency's systems and disaster recovery plans

4. Ensure that cybersecurity requirements placed on utilities are being met and public utility commission oversight is exercised – Ask Questions
   - Public utility commission staff need to be up-to-date on cybersecurity requirements and potential threats

3. Understand the national strategy and evolving standards for critical infrastructure and cybersecurity risk mitigation and response to cyber-attacks

For more information see: Smart Grid & Cyber Security for Energy Assurance (Nov 2011) and Cybersecurity A Primer for State Utility Regulators Version 3.0. January 2017

In Conclusion:

Key Points to Remember

1. Know the state's and local critical energy infrastructure supply chains and its capacity and throughput.
2. Know about energy infrastructure in other regions and states that are important to your energy supply.
3. Understand state and local agency roles and responsibilities for critical energy infrastructure and how they coordinate.
4. Update your state, local and industry contacts annually.
5. Regularly update energy assurance plan or when major organizational changes occur that alter responsibilities.
6. Conduct regular training and exercises.
7. Work with the private sector on state and local energy plans that promote energy efficiency, renewable energy, etc. which can contribute to a more diverse, reliable and resilient energy infrastructure.

Thank you!

Jeff Pillon, Director, Energy Assurance, NASEO
Telephone: 517.580.7626
Email: jpillon@naseo.org

NASEO
National Association of State Energy Officials