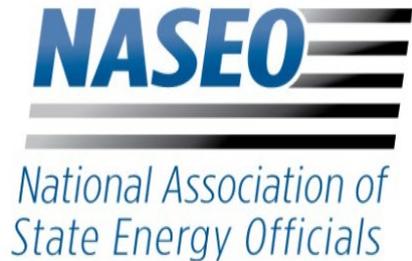
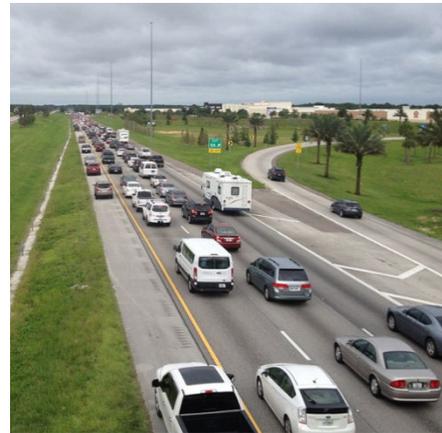




2018 Governor's Energy Summit: Energy Innovation, Powering a Nation
October 10, 2018 - Roanoke, WV



Role of Energy Resiliency in Emergency Response

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



Critical Infrastructure Security & Resilience

■ Presidential Policy Directive (PPD) -21 February 12, 2013

Select Excerpts

- “It is the policy of the United States to strengthen the security and resilience of its critical infrastructure against both physical and cyber threats.”
- “These efforts shall seek to reduce vulnerabilities, minimize consequences, identify and disrupt threats, and hasten response and recovery efforts related to critical infrastructure.”
- “The term "resilience" means the ability to prepare for and adapt to changing conditions and withstand and recover rapidly from disruptions. Resilience includes the ability to withstand and recover from deliberate attacks, accidents, or naturally occurring threats or incidents.”



Categories of Resilience-Enhancing Measures



Source: State Energy Resilience Framework J. Phillips, M. Finster, J. Pillon, F. Petit, and J. Trail
Global Security Sciences Division, Argonne National Laboratory December 2016

Framework for Defining Resilience

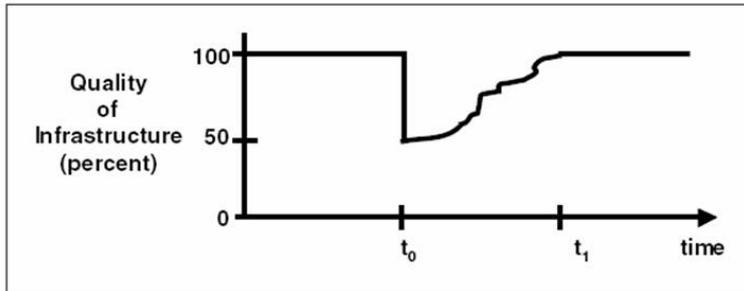


FIGURE 3 Measure of seismic resilience—conceptual definition. Source: Bruneau et al., 2003.

$$R = \int_{t_0}^{t_1} [100 - Q(t)] dt$$

For a community, loss of resilience, R , can be measured as the expected loss in quality (probability of failure) over the time to recovery, $t_1 - t_0$.

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

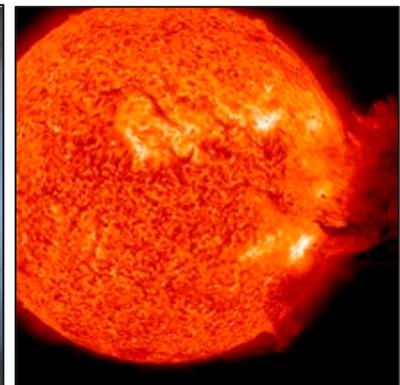
- **Robustness** -- The ability to operate or stay standing in the face of disaster
- **Resourcefulness** -- Skillfully managing a disaster once it unfolds
- **Rapid Recovery** -- The capacity to get things back to normal as quickly as possible after a disaster
- **Learning Lessons** -- Having the means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

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

+ Preparedness and Resiliency

Two sides of a coin

- **Plan and Respond** to events that disrupt energy supply and assure 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.*



+ **State Energy Assurance Planning**

Responding to energy emergencies & reducing risk to critical energy infrastructure

- **Nearly all states, some territories, and 43 local governments have prepared energy assurance plans to:**

- Respond to energy supply disruptions, assure the continued operations of essential public services, and mitigate or reduce risks
- Create and sustain expertise on preparedness, response, cybersecurity, interdependencies, and communications, etc.
- Develop processes for tracking energy supply disruptions
- Prepare workforce development plans and training
- Conduct energy emergency exercises
- Revise or new state policies, procedures, and practices

- **Benefits for States and Local Governments:**

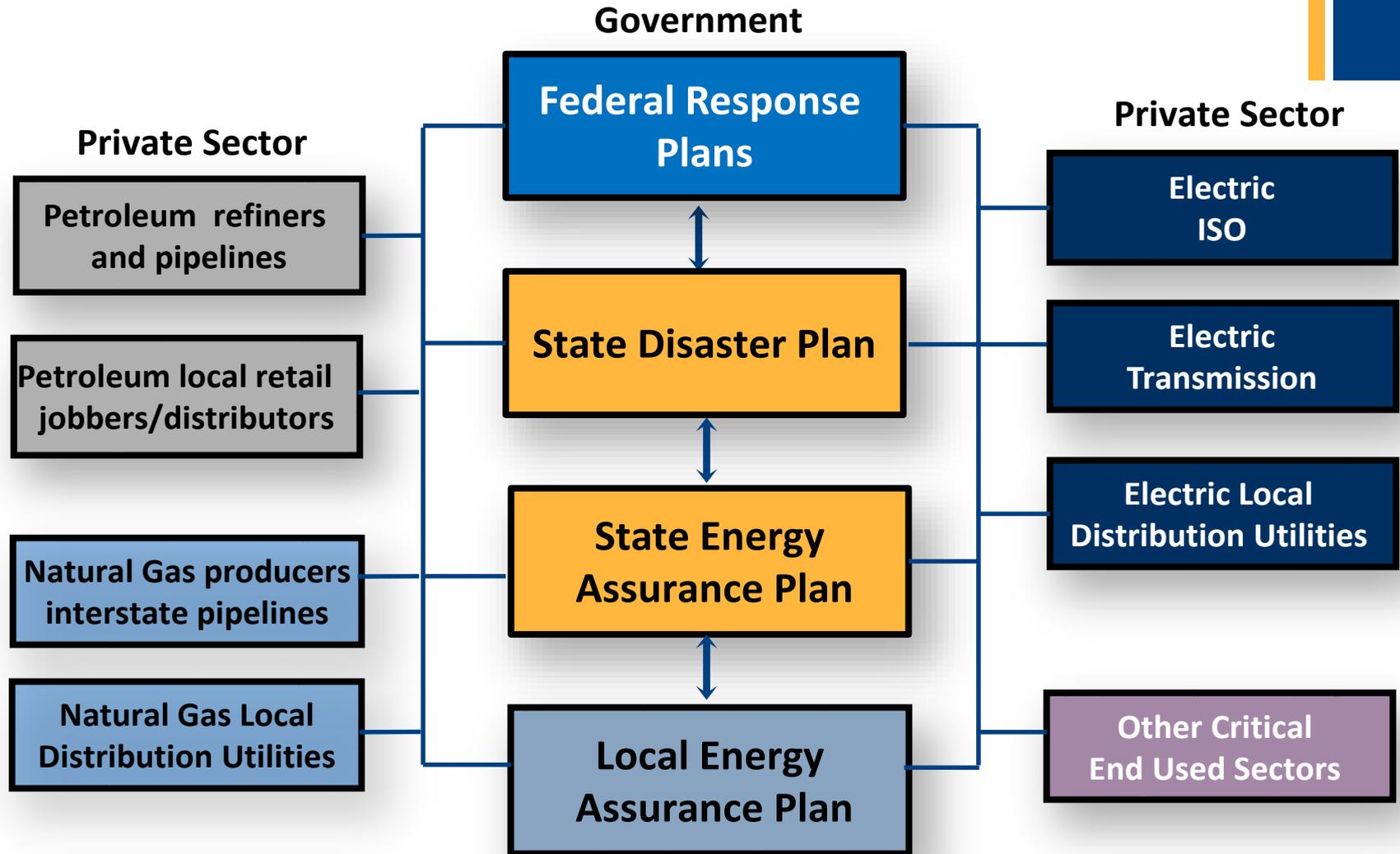
- Enhance the speed and effectiveness of the energy emergency response
- Improve coordination across state agencies multi-state regions
- Expand situational awareness and consequence assessment
- Improve recovery and restoration capabilities and reduce risks

For more information visit: naseo.org/energyassurance



Coordination of Plans

Planning interfaces



State Energy Resilience Framework

RESILIENCE – Ability of an entity — e.g., asset, organization, community, region — to *anticipate, resist, absorb, respond to, adapt to, and recover* from a disturbance

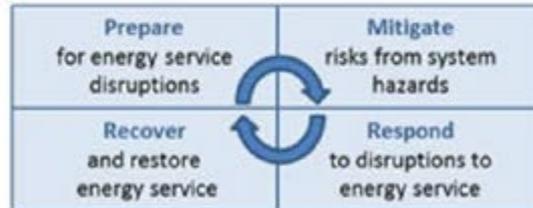
1 Understand Stakeholders Needs and Requirements

- Consider subsystems of concern
 - Determine energy production and usage

2 Determine Threat and Hazard Susceptibilities and Vulnerabilities



4 Implement Resilience Enhancement Options



3 Develop a Resilience Plan

- Use state energy resilience planning
 - Define generic options
 - Determine barriers to resilience

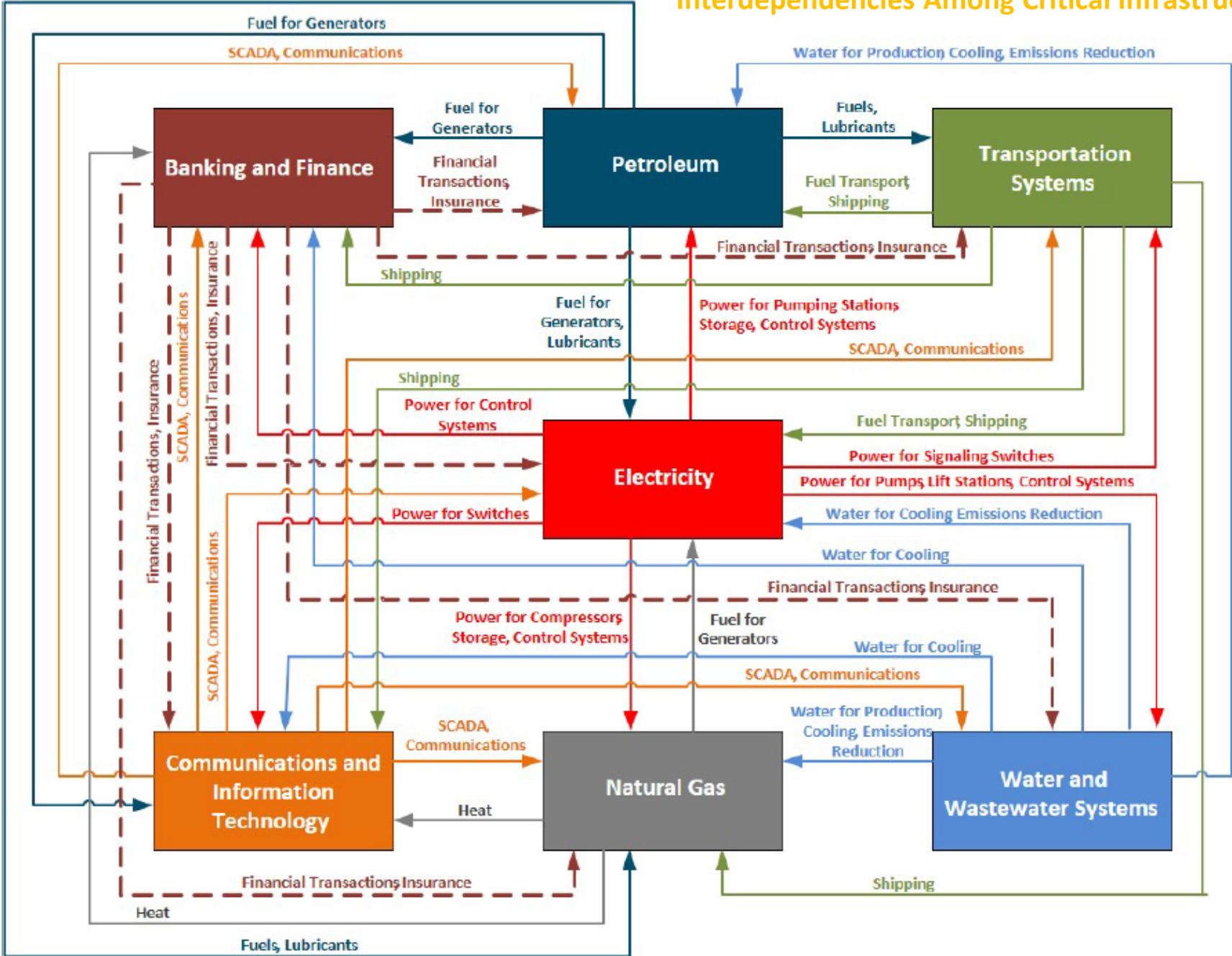
5 Review and Maintenance

- Develop after action reports and lessons learned
 - Evaluate and update resilience options
 - Revise resilience planning

System Goal

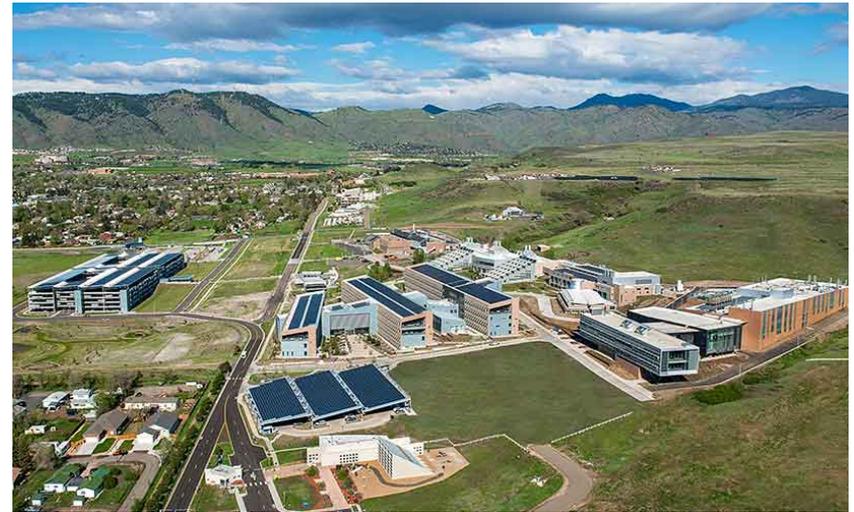
Maintain energy availability to customers and consumers

Interdependencies Among Critical Infrastructure



+ *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



Additional Ways of Improving Resiliency

- Infrastructure hardening
- Improving efficiency
- Replacement of aging/failing infrastructure
- Physical and cyber security
- Understanding critical interdependencies
- Sustain and improving emergency response capabilities
- Increase multi-state coordination
- Utilizing new technologies
- Removing supply chain choke points
- Shortening supply chains
- Diversification of supply resources
- Continuity of business/government operations
- Public-private partnerships
- Supporting investments in infrastructure
- Initiatives to increase local government resiliency
- Back-up generators and fuel for critical public/private facilities

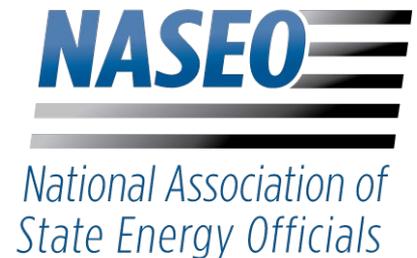


Thank you!

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References and further reading

- [Guidance on Updating State Energy Emergency Plans](#) -- NASEO
- [Guidance For States on Petroleum Shortage Response Planning](#) – NASEO February 2018
- A series of publications on Initiative for Resiliency in Energy through Vehicles (iREV) effort are available at <https://naseo.org/publications>
- [Energy Efficiency is Not Enough](#): Rethinking Building Energy Performance for Good Times and Bad -- 2018 ACEEE Summer Study on Energy Efficiency in Buildings
- [National Petroleum Council \(NPC\) “Enhancing Emergency Preparedness for Natural Disasters”](#) (December 2014) See: <http://www.npc.org/>
- [National Infrastructure Protection Plan 2013](#), Partnering for Critical Infrastructure Security and Resilience and Supplements – U.S. Department of Homeland Security <http://www.dhs.gov/national-infrastructure-protection-plan>
- Energy Sector Specific Plan 2015: <https://www.dhs.gov/sites/default/files/publications/nipp-ssp-energy-2015-508.pdf>





References and further reading (Cont.)

- [Liberty Eclipse Exercise](#) -- U.S. Department of Energy and NASEO December 2016 examined the response to a large scale power outage cause by a cyber-attack which cause major petroleum shortages.
- [State and Regional Energy Risk Profiles](#) The profiles provide a state by state summary of both natural and man-made hazards with the potential to cause disruption of the electric, petroleum, and natural gas infrastructures.
<http://www.energy.gov/oe/state-energy-risk-assessment-initiative-state-energy-risk-profiles>
- [Cybersecurity A Primer for State , Utility Regulators Version 3.0. January 2017, National Association of Regulatory Utility Commissioners, see](#)
<https://pubs.naruc.org/pub/66D17AE4-A46F-B543-58EF-68B04E8B180F>

