



U.S. NRC

UNITED STATES NUCLEAR REGULATORY COMMISSION

Protecting People and the Environment

The Nuclear Regulatory Impacts of Fukushima Daiichi in the United States

ANS Latin American Section

*William D. Magwood, IV
Commissioner
June 24, 2013*

Nuclear Regulatory Commission

Who We Are

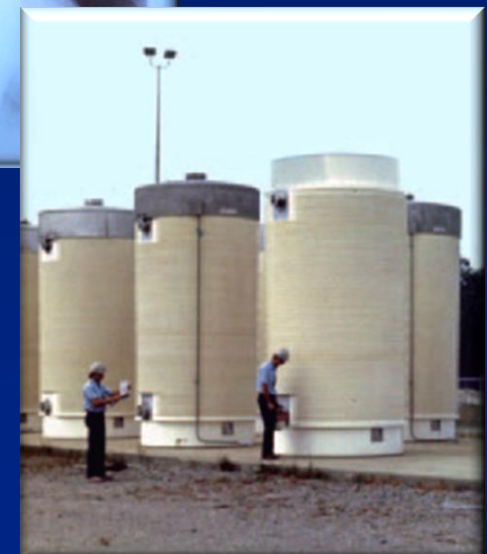
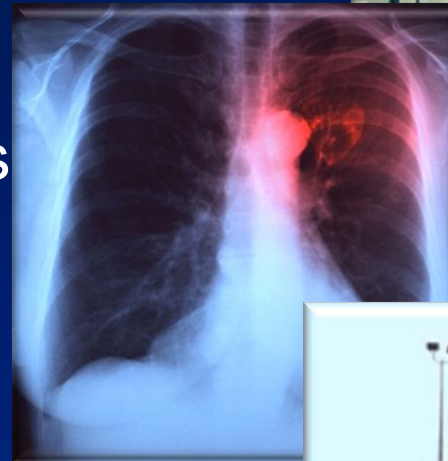
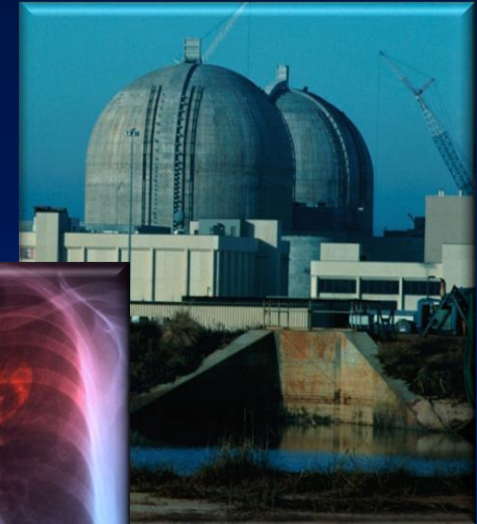
- The Energy Reorganization Act of 1974 divided the Atomic Energy Commission into a “promotional” technology development agency – the Department of Energy – and a regulatory agency – the NRC.
- NRC is 4000 people dedicated to assuring the safe and secure use of nuclear materials in the United States in order to protect the health and safety of the American people.



Nuclear Regulatory Commission

What We Regulate

- **Nuclear Reactors** - commercial power reactors, research and test reactors, new reactor designs.
- **Nuclear Materials** - nuclear reactor fuel, radioactive materials for medical, industrial and academic use.
- **Nuclear Waste** – transportation, storage and disposal of nuclear material and waste, decommissioning of nuclear facilities.



The Commission *Independence and Transparency*

- The Commission is a collegial, quasi-judicial body
- Five members with staggered five-year terms:
 - Each is nominated by the President, approved by the Senate
 - President designates one commissioner to serve as Chairman
- Decisions on all regulatory issues are determined by majority voting:
 - Each member has an equal vote
 - Commissioners may speak one-on-one to discuss voting matters, but “Sunshine Act” requirements forbid regulatory discussion with more than two commissioners unless such meetings are noticed and held in public
 - Once voting matters are completed, votes are made public

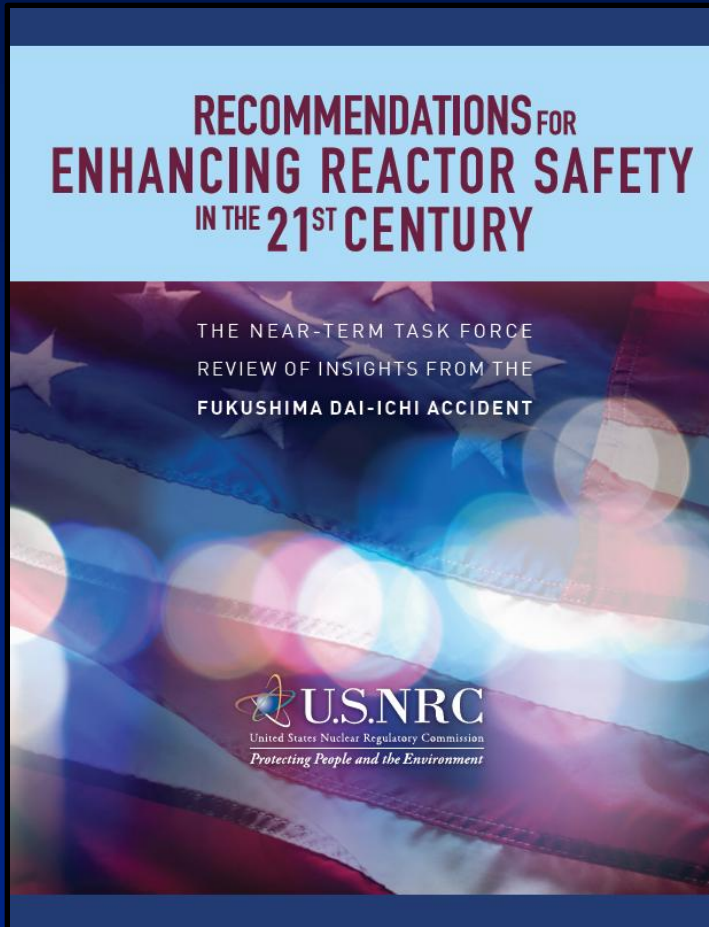
Fukushima Daiichi

Leading to Changes in Regulation



NRC Near-Term Task Force

U.S. Plants Are Safe – But More Can Be Done



- Continued operation and licensing of nuclear power plants do not pose an imminent risk to safety.
- Mitigation measures already in place (*i.e.*, “B.5.b”) could reduce likelihood of core damage and radiological releases.
- 12 technical recommendations to further enhance nuclear safety.

After Fukushima *Learn the Big Lessons*

- **Must Understand the Natural Hazard Risks Facing Each Plant**
- **We Can't Predict Every Event**
- **Recovering from Disaster is At Least as Important as Preparing for Disaster**
- **New, Challenging Scenarios:**
 - *Multi-Unit Events*
 - *Potential for Common Cause Failure of On-Site and Off-Site AC Power (Station Black Out)*



NRC Actions Taken in 2012 *Focus on High-Priority Items*

Order

Mitigating Strategies for Beyond Design Basis Events

Order

Reliable Hardened Vents for Mark I and II Containments

Order

Enhanced Spent Fuel Pool Instrumentation

Analyses

Seismic and Flooding Walk-Downs

Analyses

Seismic and Flooding Reevaluations

Analyses

Emergency Preparedness Staffing and Communications for Multi-Unit Events

NRC Actions Taken in 2012

Rulemakings



- **New Station Blackout Rule**
Modify SBO requirements to establish enhanced capability to mitigate a prolonged SBO
- **Integration of Plant Emergency Procedures**
New rule requiring the integration of EOPs, SAMGs, and EDMGs (i.e., post-9/11 measures)

Enhancements to Nuclear Safety *Mitigating Strategies for Beyond Design Basis Events*

- **Expands upon the existing “B.5.b” requirements (established after the 9/11 terrorist attacks):**
 - Assure reactor core and spent fuel pool cooling in the event plant systems are disabled by a site-wide disaster
 - Equipment must be protected and/or dispersed to prevent loss from a single cause
 - Requires preparation for multi-unit emergencies - one more of each set of emergency equipment than is needed based on the number of reactors at a site (N+1)

FLEX: Industry-developed strategy to meet new NRC requirements. Diverse, flexible means to prevent core damage after beyond design basis external events



FLEX Features

- Applies installed equipment, onsite portable equipment, and pre-staged offsite resources (at all US plants and two regional centers)
- Provides essentially indefinite cooling capability
- Provides capabilities beyond NRC requirements

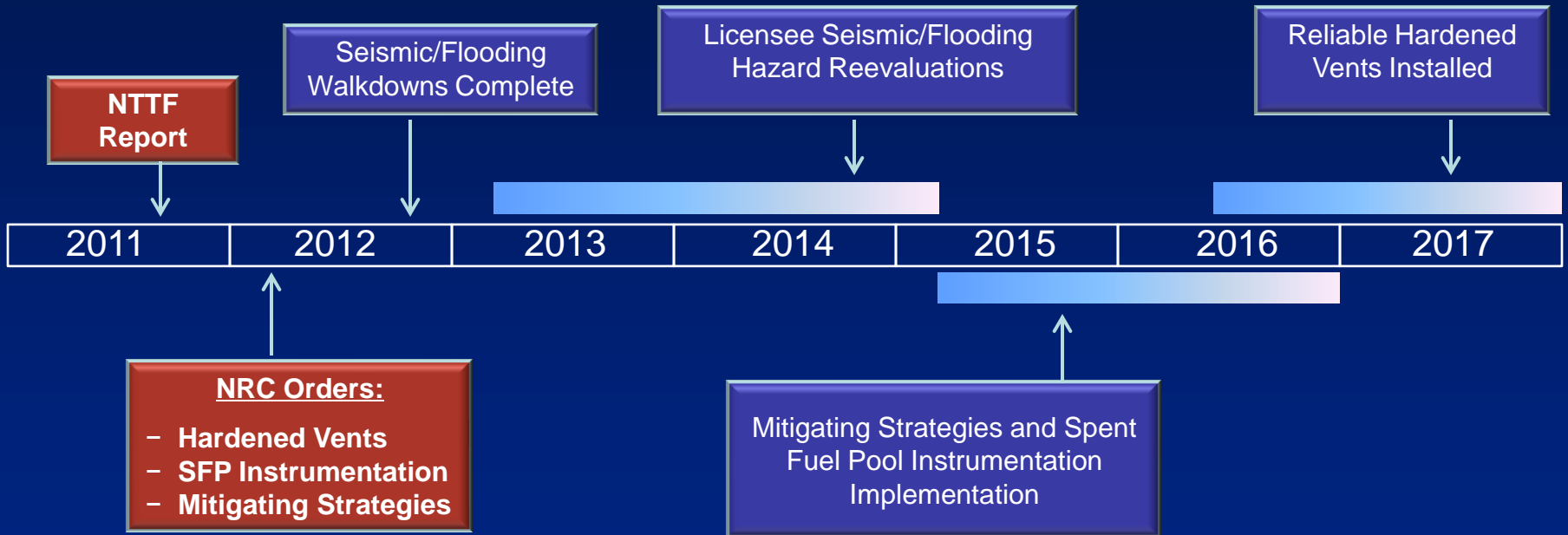
Enhancements to Nuclear Safety

Industry's FLEX Initiative

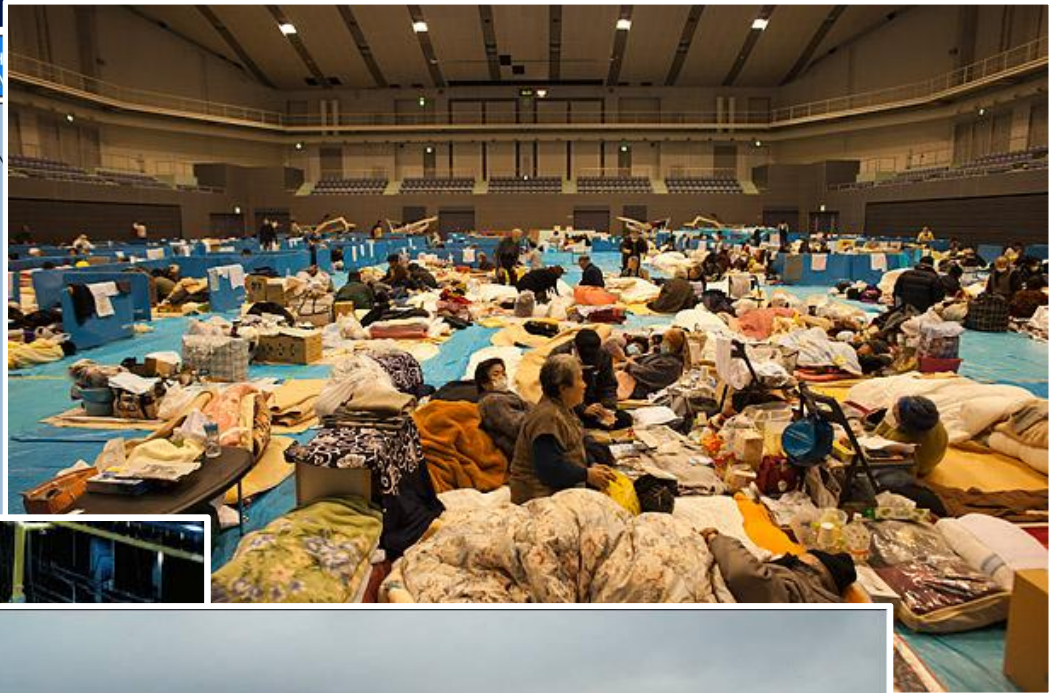
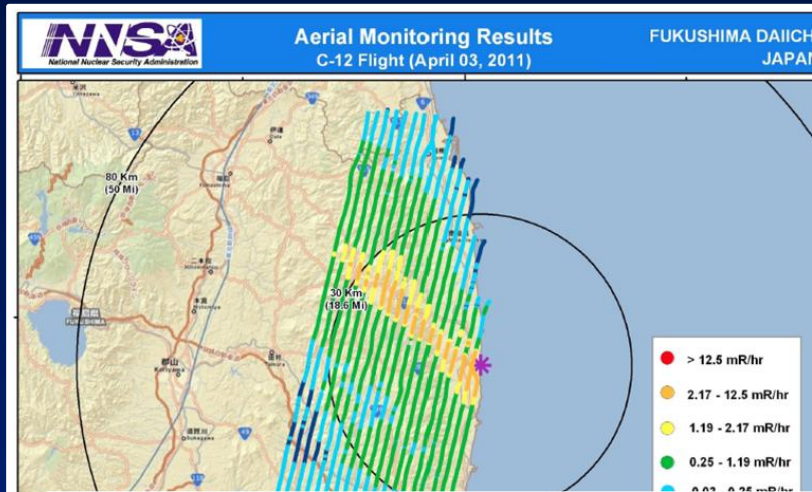
- More than 300 pieces of safety equipment (generators and high-capacity pumps, etc.) installed or ordered
- Standardized fittings and redundant access points for water and electric power
- Layered defense strategy:
 - installed plant equipment
 - on-site portable equipment
 - offsite equipment (deployable by the 24th hour)



Schedule of Key of Regulatory Actions Based on Fukushima Lessons Learned

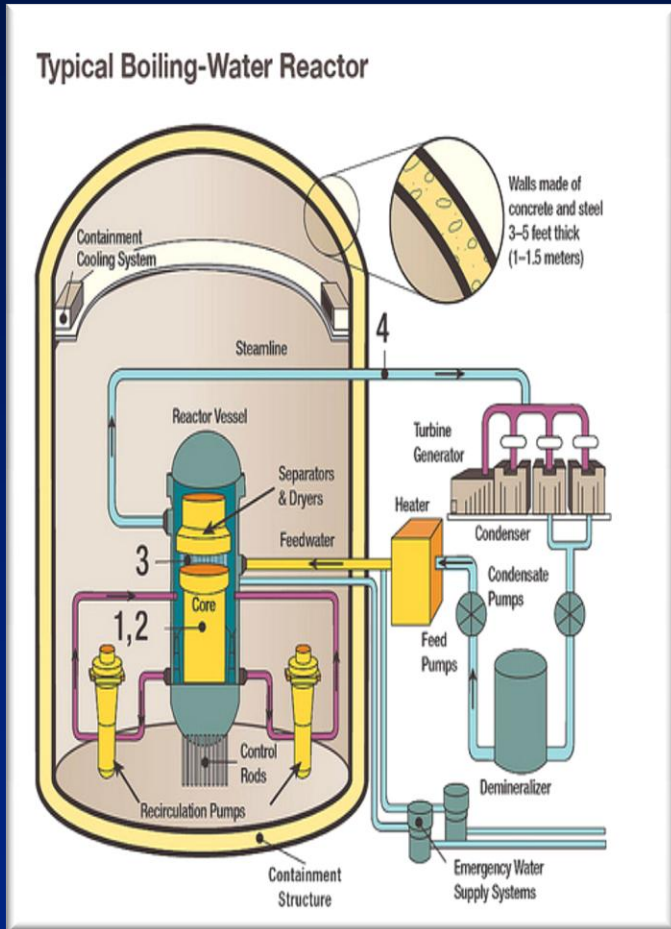


Fukushima Teaches *The Public Listens*



Enhancements to Nuclear Safety

Next Steps: Severe Accident Venting



- Severe Accident Vents

Modifies 2012 order requiring vents on Mark I and II containments to be “severe accident capable”

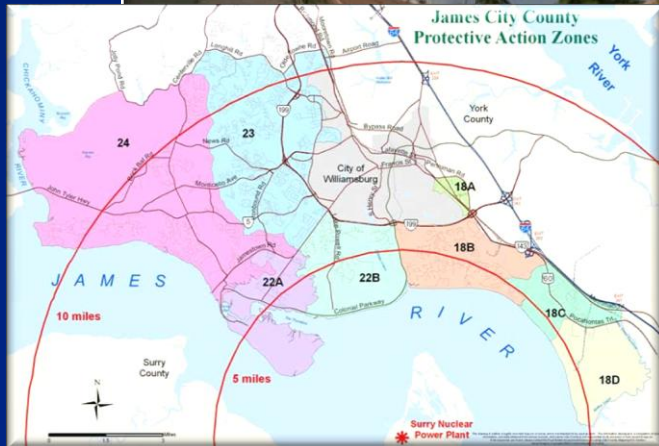
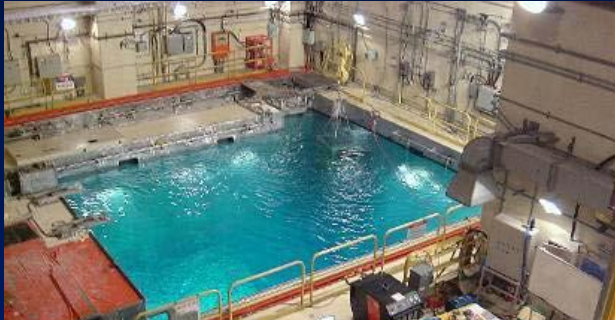
- Vent Filtering and Containment Integrity for Mark I and II BWRs

New rule requiring development of strategies to prevent release of significant amounts of radioactive material during severe accidents

- *features site-specific analyses*
- *allows for wet scrubbers, dry filters, and in-containment strategies*

Enhancements to Nuclear Safety

Next Steps: Lower Tier Actions

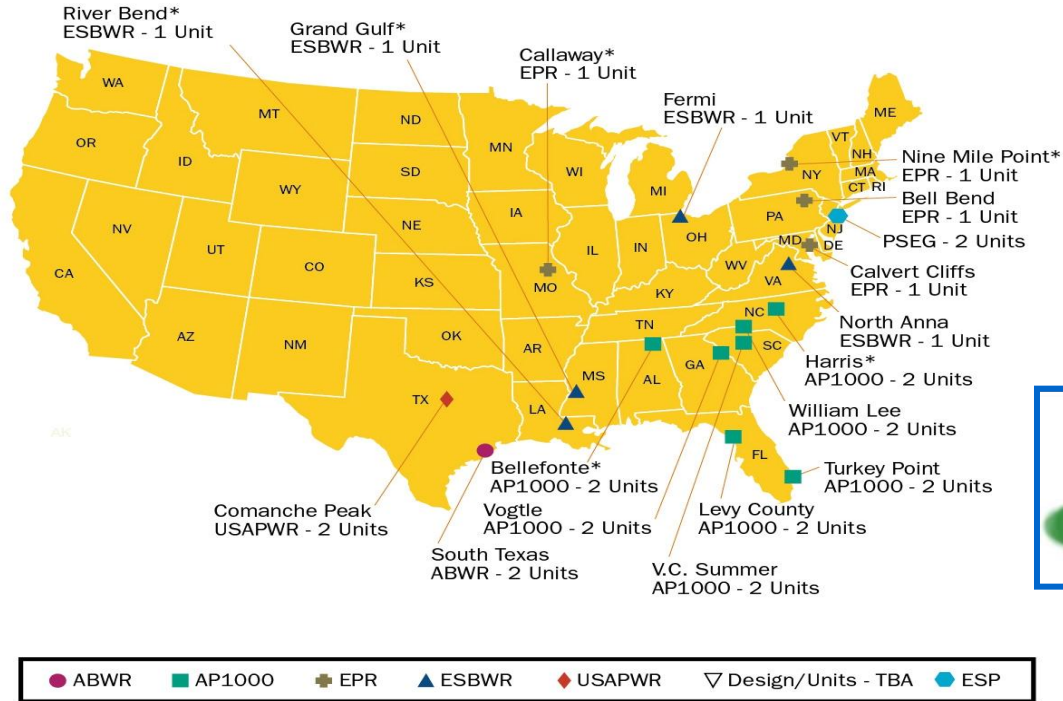


- Evaluation of Spent Fuel Pools
Review safety of pools during extreme events and consider need for calculated dry storage
- Consideration of Other Natural Hazards
Review natural hazards beyond seismic and flooding, e.g., storms, extreme temperatures, etc.
- Review Emergency Preparedness Requirements
Review adequacy of 10-mile EPZ and current potassium iodide distribution practices

After Fukushima

Licensing New Nuclear Power Plants

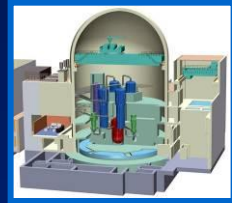
New Reactor Applications Under Review—Large LWRs+



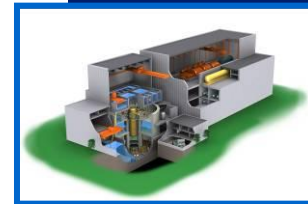
ABWR



AP1000



US APWR



ESBWR



US EPR

*Review Suspended by Applicant
 +Large LWRs—Large Light-Water Reactors, generally on the order of 1000 MW(e) or more

The NRC continues to review Generation III+ designs and 8 license applications to build new advanced LWR power plants in the U.S.

Siting and Licensing of New Plants

Natural Hazard Considerations

- **U.S. siting regulations and guidelines revised in 1990s**
 - Reflect insights gained from previous licensing activities
 - Reflect new knowledge related to natural phenomena
- **Design basis must reflect most severe historical natural phenomena**
 - Must consider normal operation and accident conditions
 - Explicit consideration of uncertainties



Siting and Licensing of New Plants

The Commission's Direction



- 1) Based on review of Fukushima events, there is no technical or regulatory cause to alter new plant licensing activities
- 2) Post-Fukushima requirements placed on current plants will be applied—as applicable—to new plants
- 3) Current approach to assessing natural hazards for new plants is appropriate—should apply new plant methodologies to assess hazards facing existing nuclear plants

Siting and Licensing of New Plants

The Work Continues



Georgia Power has initiated full scale construction of Vogtle units 3 and 4 after receipt of a combined Construction and Operating License from the NRC

Siting and Licensing of New Plants

The Work Continues

SCANA was the most recent power company to receive a license to build and operate a Generation III+ nuclear plant. Work is now underway at the V.C. Summer site in South Carolina to construct two AP1000 reactors



Siting and Licensing of New Plants

New Questions: SMRs

- **Potential for Siting in Place of Obsolete Coal Plants**—Many small, older coal plants are located near populated areas and in rural communities. **Can small modular reactors be placed at these sites?**
- **Emergency Planning Zones**—Current U.S. nuclear plants operate within a standard 10-mile EPZ. **Can small reactors be permitted to operate with EPZs set at the site boundary?**

mPower



NuScale

Fukushima's Impact on U.S. Nuclear Regulation

- **Some Things Have Not Changed:**
 - Public consciousness increased, but views of existing plants and new projects remain generally positive
 - Very limited impact on U.S. nuclear power; sites acceptable before Fukushima are acceptable today
- **Some Things Have Changed Forever:**
 - The distinction between “design basis” and “beyond design basis” events has been blurred
 - Operator and regulator mindsets have been dramatically altered – particularly with regard to extreme scenarios



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