



# **Briefing on the Status of Lessons Learned from the Fukushima Dai-ichi Accident**

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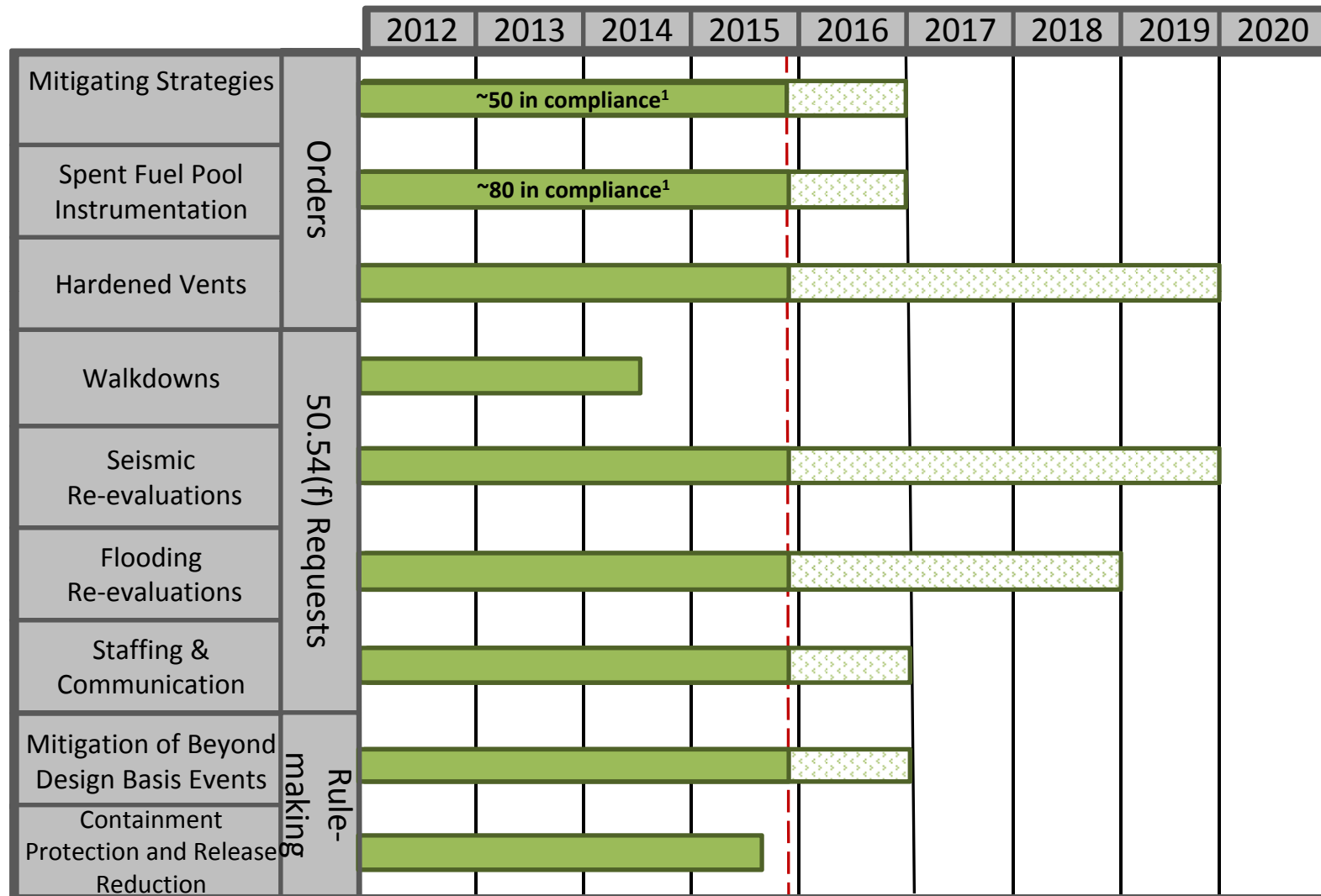
**Executive Director for Operations**

**November 17, 2015**

# Speakers

- **William Dean, Director, Office of Nuclear Reactor Regulation**
  - Overall Progress
  - Seismic and Flooding Reevaluations
- **Jack Davis, Director, Japan Lessons-Learned Division**
  - Resolution of Tier 2 and 3 Recommendations
- **Michael Johnson, Deputy Executive Director for Reactor and Preparedness Programs**
  - International Activities

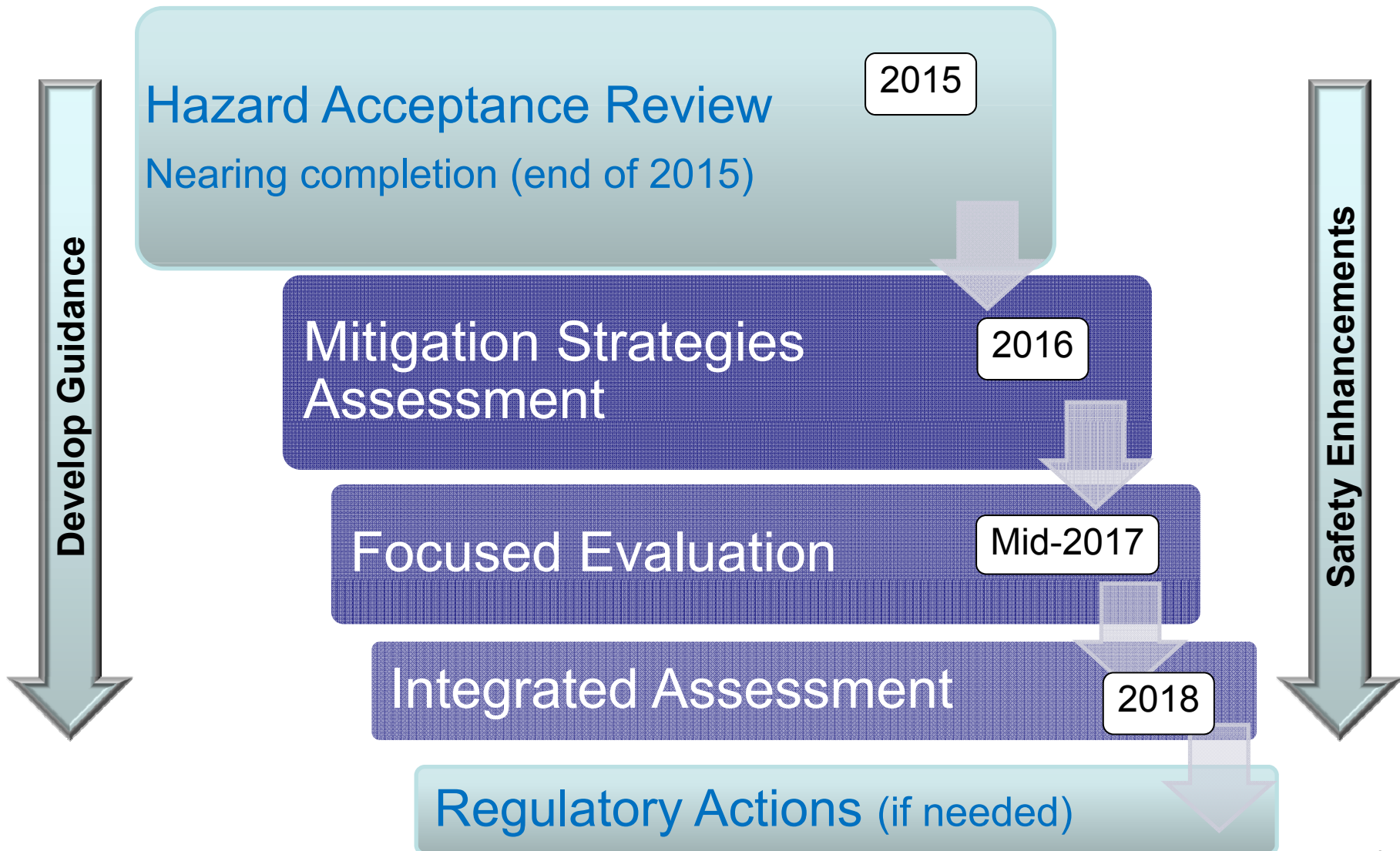
# Tier 1 Implementation On or Ahead of Schedule



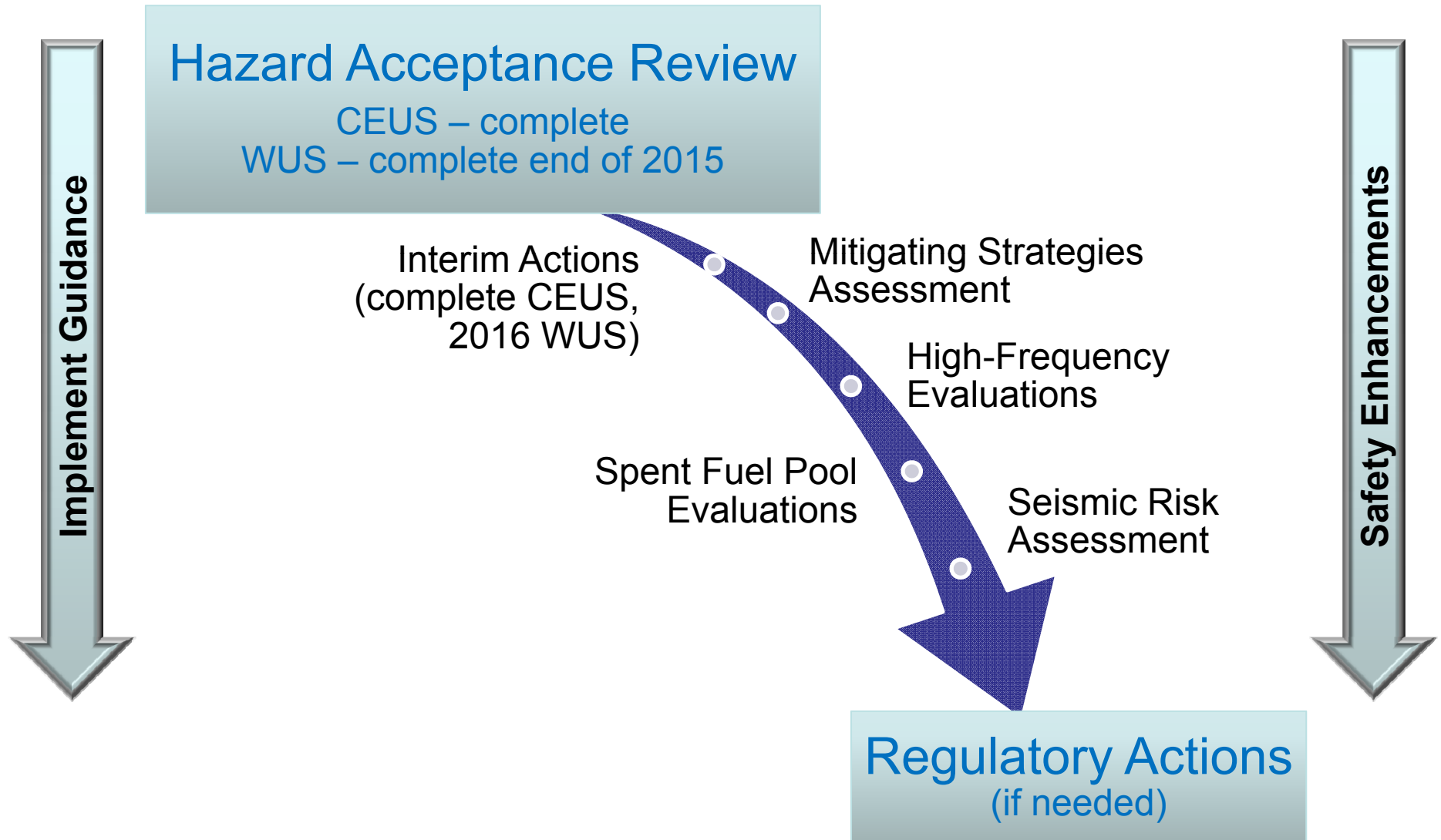
Today

*\*For illustrative purposes only 3  
1 expected after Fall 2015 outages*

# Flooding Hazard Reevaluation Closure Plan



# Seismic Hazard Reevaluation Closure Plan



# **Tier 2 and 3 Resolution Paths Determined**

- **Assessments with a focus on identifying and assessing regulatory gaps**
- **Evaluations consider:**
  - **Existing requirements**
  - **Tier 1 safety enhancements**
  - **Insights from completed Tier 2&3 work**
  - **Insights from previously completed analyses**
- **Engagement with stakeholders**
- **Importance of maintaining an appropriate level of technical rigor**

# Summary of Proposed Resolution Approach for Tier 2 and 3 Recommendations

Resolved

-	Expedited transfer of spent fuel to dry cask storage	Completed
3	Enhanced capability to prevent/mitigate seismically-induced fires & floods	Subsumed in Tier 1
-	Revisit emergency planning zone size & pre-stage potassium iodide beyond 10 miles	Ready to Close
9.3	ERDS capability throughout accident (partial)	Ready to Close
10	Additional EP topics for prolonged SBO and multiunit events (partial)	Ready to Close
11	EP topics for decision-making, radiation monitoring, and public education (partial)	Ready to Close
12.1	Reactor Oversight Process modifications to reflect DID framework	Ready to Close
12.2	Staff training on severe accidents and resident inspector training on SAMGs	Ready to Close
7.2 – 7.5	Spent fuel pool makeup capability	Ready to Close
9.1/9.2	EP enhancements for prolonged SBO and multiunit events	Ready to Close
9.3	Emergency preparedness (partial)	Ready to Close
9.4	Improve ERDS capability	Ready to Close
10	Additional EP topics for prolonged SBO and multiunit events (partial)	Ready to Close
11	EP topics for decision-making, radiation monitoring, and public education (partial)	Ready to Close
5.2	Reliable hardened vents for other containment designs	Further Interaction
6	Hydrogen control and mitigation inside containment or in other buildings	Further Interaction
-	Reactor and containment instrumentation	Further Interaction
-	Reevaluation of “other” external hazards	Further Interaction
2.2	Periodic confirmation of seismic and flooding hazards	Further Assessment
11	EP topics for decision-making, radiation monitoring, and public education (partial)	Further Assessment

# Ready to Close – Seismically-Induced Fires and Floods

3: Evaluate potential enhancements to prevent or mitigate seismically-induced fires and floods

Tier 1 → Initiate development of a PRA methodology  
Tier 3 → Determine if regulatory action is needed

## Evaluation

- Existing robust NRC requirements.
- Safety enhancements associated with Tier 1 activities mitigate risk.
- Draft feasibility study for the PRA methodology is currently under review.

## Recommendation

Close

. . . Additional safety enhancements not necessary



# Ready to Close – Basis of EPZ Size and Pre-Staging KI Beyond 10 Miles

Additional Recommendation: Reevaluate the basis of EPZ size and pre-staging KI beyond 10 miles

Tier 3 → Dependent on long-term studies

## Evaluation

- 2014 denial of rulemaking petition to expand EPZ size.
- Insights from international studies at Fukushima.
- New data from the site supports existing regulations and policies.

## Recommendation

Close

. . . Information continues to support existing regulations and policies

# Ready to Close – Various Emergency Preparedness Activities

Rec. 9.3 (Partial): Maintain ERDS throughout accident

Rec. 10.3: ERDS enhancements

Rec. 11.2: Evaluate recovery and reentry insights from Fukushima

Rec. 11.4: Training in the local community on radiation, radiation safety, and the use of KI

## Evaluation

- NRC's oversight role in emergencies
- ERDS design considerations
- Some licensees voluntarily transmit ERDS continuously
- FEMA is leading the ongoing efforts for 11.2 and 11.4

## Recommendation

Close

. . . Cost/benefit considerations; progress to date

# Ready to Close – ROP Modifications to Reflect Defense-in-Depth Framework

12.1: Expand ROP self-assessment and biennial ROP realignment to include defense-in-depth considerations

Tier 3 → Dependent on Recommendation 1

## Evaluation

- Rec. 1 now closed to RMRF initiative.
- ROP self-assessment and realignment processes being enhanced.
- General ROP enhancements underway.
- Existing agency processes in place.

## Recommendation

Close

. . . Follow normal agency processes for future ROP enhancements

# Ready to Close – Staff Training on Severe Accidents and SAMGs

12.2: Enhance training to include lessons learned and training on SAMGs for resident inspectors

Tier 3 → Dependent on Recommendation 8 (now subsumed in MBDBE proposed rulemaking)

## Evaluation

- Severe accident training enhanced to include the accident and lessons learned.
- SAMG training is being developed.
- Qualification programs being updated.

## Recommendation

Close

. . . Enhancements to training and qualification programs are underway

# **Tier 3 Emergency Preparedness Activities Addressed by the Mitigation of Beyond-Design-Basis Events Rulemaking**

**Rec. 9.1: Initiate rulemaking to require EP enhancements for multiunit events**

**Rec. 9.2: Initiate rulemaking to require EP enhancements for prolonged station blackout**

**Rec. 9.3 (Partial): Order licensees to perform various EP enhancements until rulemaking is complete**

**Rec. 10.1: Analysis of protective equipment Requirements**

**Rec. 10.2: Command and control structures**

**Rec. 11.1: Enhanced resources to get equipment onsite**

# **Additional Stakeholder Interaction – Instrumentation Enhancements**

ACRS: Assess need to enhance reactor and containment instrumentation to survive beyond design basis events

Tier 3 → Further staff study; dependent on higher priority recommendations

## **Evaluation**

- Tier 1 enhancements and existing requirements.
- Insights from MBDBE rulemaking analyses.
- Ongoing work to develop consensus standard.

## **Recommendation**

No need for regulatory action identified, but staff plans additional interaction before finalizing assessment

# Additional Stakeholder Interaction – Vents for Other Containment Designs

5.2: Reevaluate the need for hardened vents for other containment designs. . . [take] appropriate regulatory action . . .

Tier 3 → Dependent on insights from Tier 1 activities (Order EA-13-109 and related rulemaking)

## Evaluation

- Significant information from previous studies.
- EA-13-109 in progress.
- Mitigating strategies enhance safety.
- Commission disapproved CPRR rulemaking.

## Recommendation

No need for regulatory action identified, but staff plans additional interaction before finalizing assessment

# Additional Stakeholder Interaction – Hydrogen Control and Mitigation

6: Identify insights about hydrogen control and mitigation inside containment or in other buildings as additional information is revealed through further study. . .

Tier 3 → Dependent on insights from Tier 1 activities and further evaluation

## Evaluation

- 10 CFR 50.44.
- Significant information from previous studies.
- EA-13-109 in progress.
- Mitigating strategies enhance safety.
- NRC participated in international studies.

## Recommendation

No need for regulatory action identified, but staff plans additional interaction before finalizing assessment



# Further Assessment Needed – Evaluation of Other Natural Hazards

ACRS and Consolidated Appropriations Act for 2012:  
The [NRC] shall require reactor licensees to reevaluate  
the seismic, tsunami, flooding, and other external  
hazards at their sites . . .

Tier 2 → Lack of critical skill set for both NRC and  
industry

## Evaluation

- External natural hazards addressed by mitigation strategies.
- Enhanced efficiency through screening process.
- Process focuses on hazards of primary concern.

## Recommendation

Further assessment/  
interaction needed  
... Including previous  
assessments, protection under  
current regulations, and  
stakeholder input

# Further Assessment Needed – Periodic Reconfirmation of Natural Hazards

2.2: . . . rulemaking to require licensees to reevaluate the seismic hazards and flooding hazards every 10 years and address any new and significant information. If necessary, update the design basis. . .

Tier 3 → To be based on insights from Tier 1 reevaluations (also Tier 2 other external hazards)

## Evaluation

- Existing processes ensure safety maintained.
- Rulemaking not necessary.
- Internal processes could be enhanced to make them more proactive and systematic.

## Recommendation

Further assessment/  
interaction needed  
. . . To obtain input from stakeholders and complete process enhancements

# Further Assessment Needed – Radiation Monitoring During an Accident

Rec. 11.3: Efficacy of real-time radiation monitoring in EPZ and onsite

Tier 3 → Required further staff study

## Evaluation

- Consider history with real-time radiation monitoring.
- Benefit from interaction with Federal, State, local stakeholders.

## Recommendation

Further assessment/  
interaction needed

- . . . To gather stakeholder input, evaluate, and document assessment results

# **International Collaboration**

- **Continued engagement and cooperation with international counterparts**
  - **Participate in meetings and missions**
  - **Review and assess reports**
- **NRC regulatory actions are similar to those taken by international partners**
- **Focus areas include:**
  - **Protection from external hazards**
  - **Mitigation of beyond-design-basis events**
  - **Strengthening emergency preparedness**

# Consistency with IAEA Lessons Learned

	IAEA Themes*	NTTF
✓ Ensuring Protection from External Events	Vulnerability of plants to external events	2, additional issues
✓ Enhancing Mitigation of Beyond-Design-Basis Events	Application of the defense-in-depth concept Assessment of the failure to fulfil fundamental safety functions Assessment of beyond-design-basis accidents and accident management	1, 4.2, 5, 6, 7, 8, 12
✓ Strengthening Emergency Preparedness for Multi-Unit Events	Assessment of human and organizational factors Emergency preparedness – Response in Japan Protecting emergency workers Protecting the public Transition from the emergency phase to the recovery phase and analysis of the response Onsite stabilization and preparations for decommissioning	4, 9, 10, 11
✓ Regulatory Philosophy	Assessment of regulatory effectiveness Response within the international framework for emergency preparedness and response	Pre-existing NRC/U.S. processes
✓ Radiological Consequences	Off-site remediation of areas affected by the accident Radioactivity in the environment Radiological consequences for non-human biota Management of contaminated material and radioactive waste	Pre-existing NRC/U.S. processes

\*IAEA, "The Fukushima Daiichi Accident," August 2015

# **Conclusions**

- **Continued focus on the safety and security of operating plants**
- **Steady progress towards completion of Fukushima initiatives**
- **Sound recommendations for resolving Tier 2 and 3 items**
- **Demonstrable improvement in safety as the lessons are implemented**

# Acronyms

<b>ACRS</b>	<b>Advisory Committee on Reactor Safeguards</b>	<b>IAEA</b>	<b>International Atomic Energy Agency</b>
<b>CEUS</b>	<b>Central and Eastern United States</b>	<b>KI</b>	<b>Potassium Iodide</b>
<b>CPRR</b>	<b>Containment Protection and Release Reduction</b>	<b>MBDBE</b>	<b>Mitigation of Beyond-Design-Basis Events</b>
<b>DID</b>	<b>Defense in Depth</b>	<b>PRA</b>	<b>Probabilistic Risk Assessment</b>
<b>EA</b>	<b>Enforcement Action</b>	<b>ROP</b>	<b>Reactor Oversight Process</b>
<b>EP</b>	<b>Emergency Preparedness</b>	<b>SAMGs</b>	<b>Severe Accident Management Guidelines</b>
<b>EPZ</b>	<b>Emergency Planning Zone</b>	<b>SBO</b>	<b>Station Blackout</b>
<b>ERDS</b>	<b>Emergency Response Data System</b>	<b>WUS</b>	<b>Western United States</b>
<b>FEMA</b>	<b>Federal Emergency Management Agency</b>		