



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

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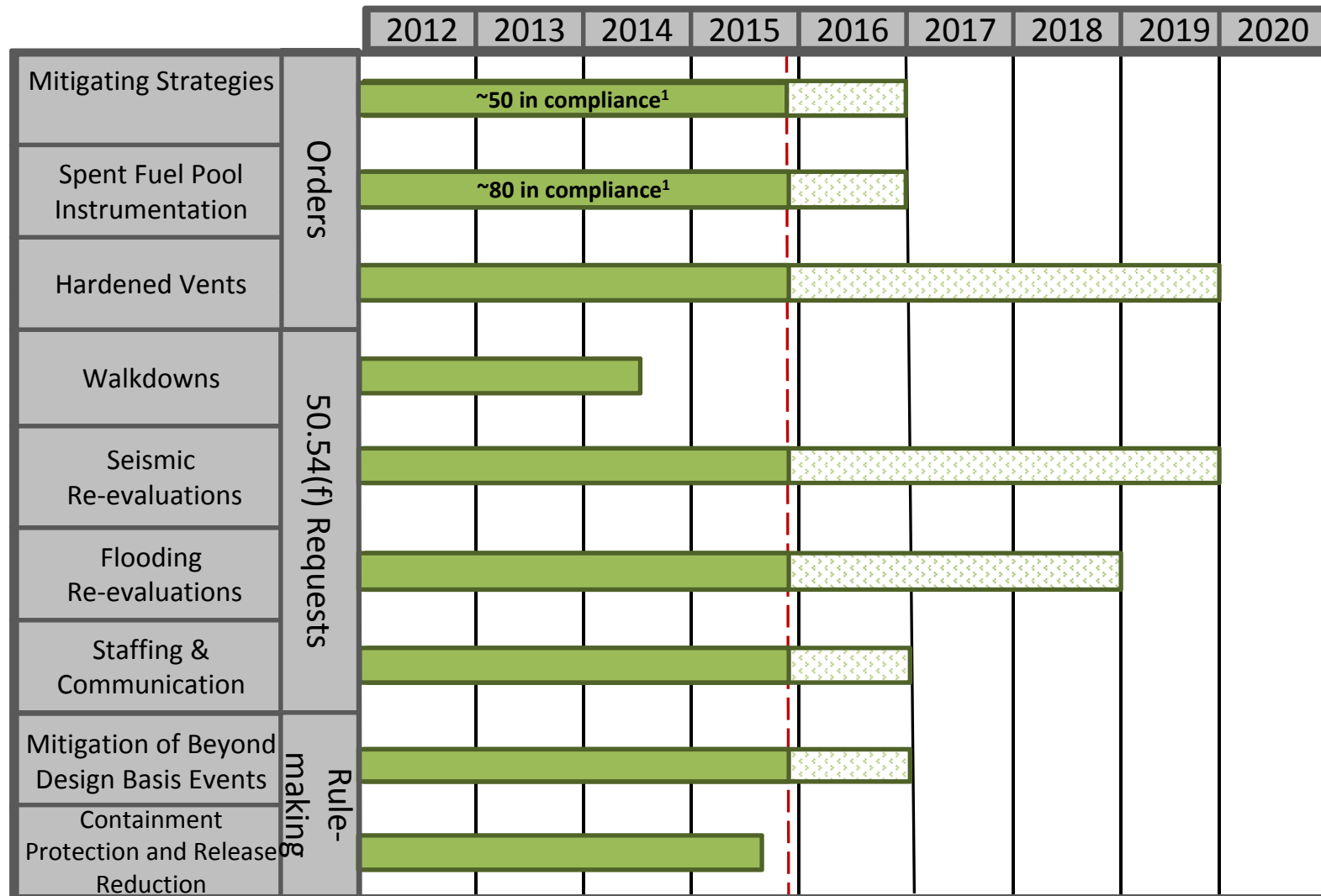
Executive Director for Operations

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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

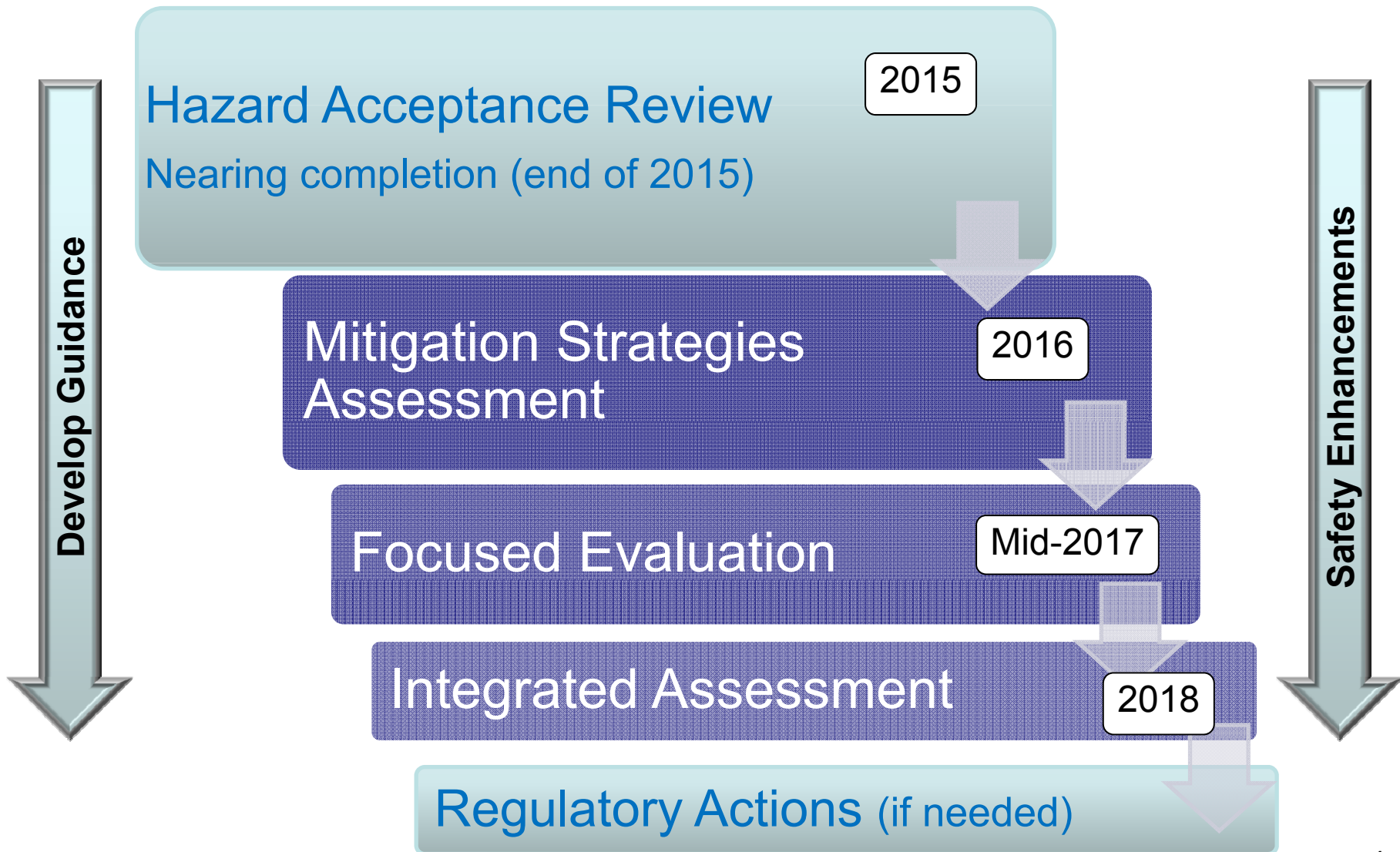
Tier 1 Implementation On or Ahead of Schedule



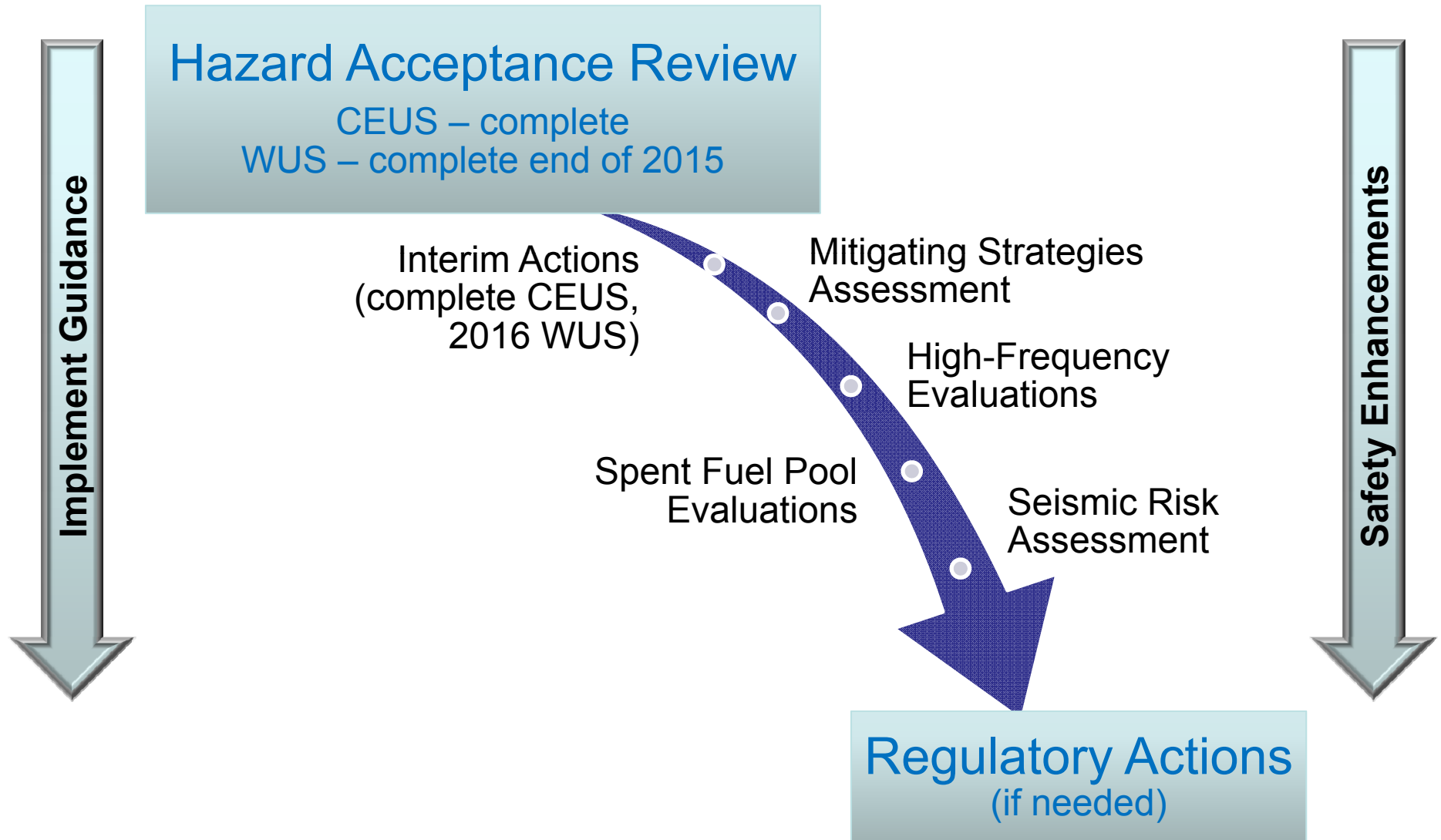
Today

**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

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