



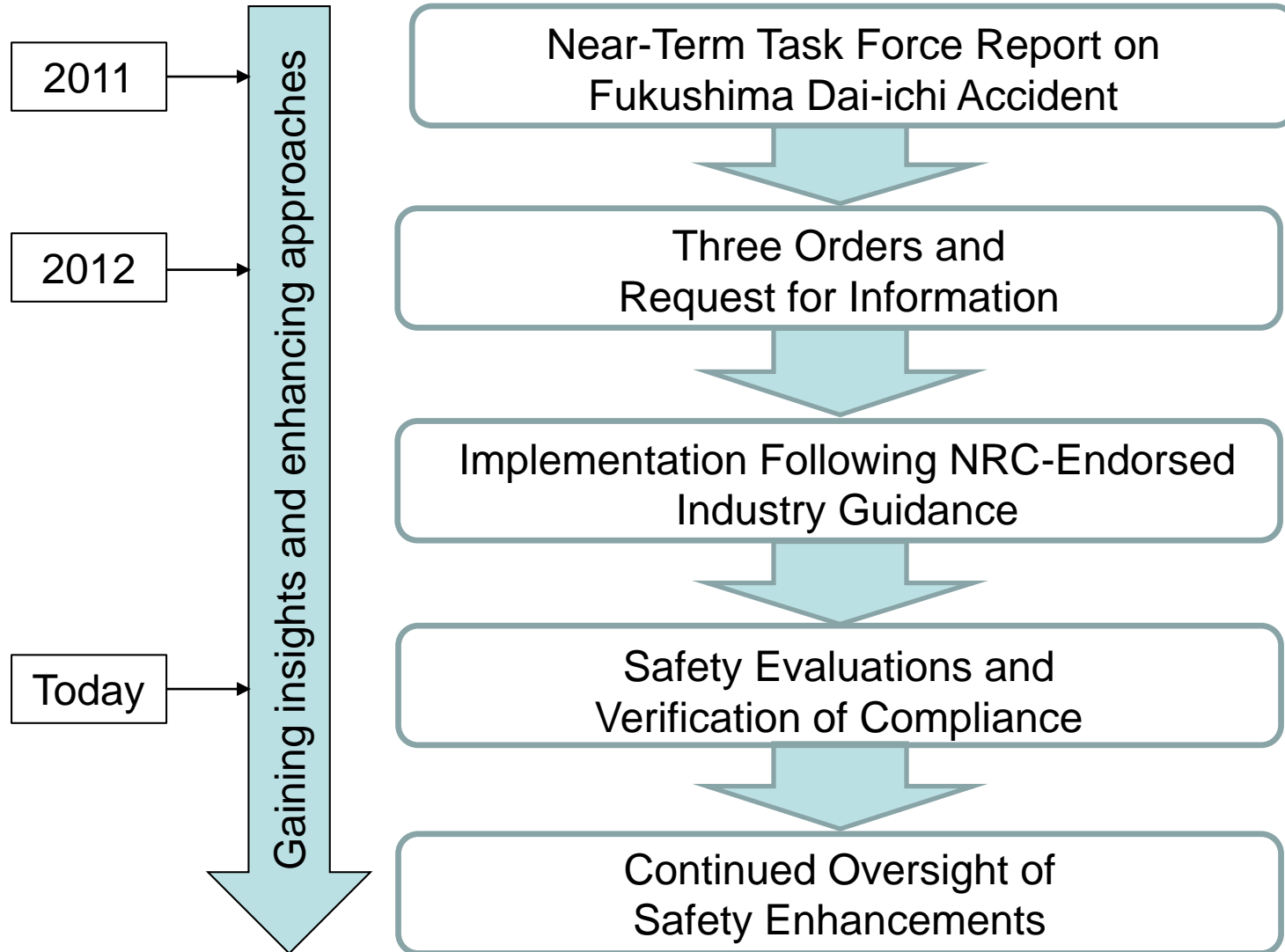
Briefing on the Status of Lessons Learned from the Fukushima Dai-ichi Accident

Michael Johnson

**Deputy Executive Director for Reactor and
Preparedness Programs**

May 17, 2016

Evolution of Fukushima Activities



A Comprehensive Approach

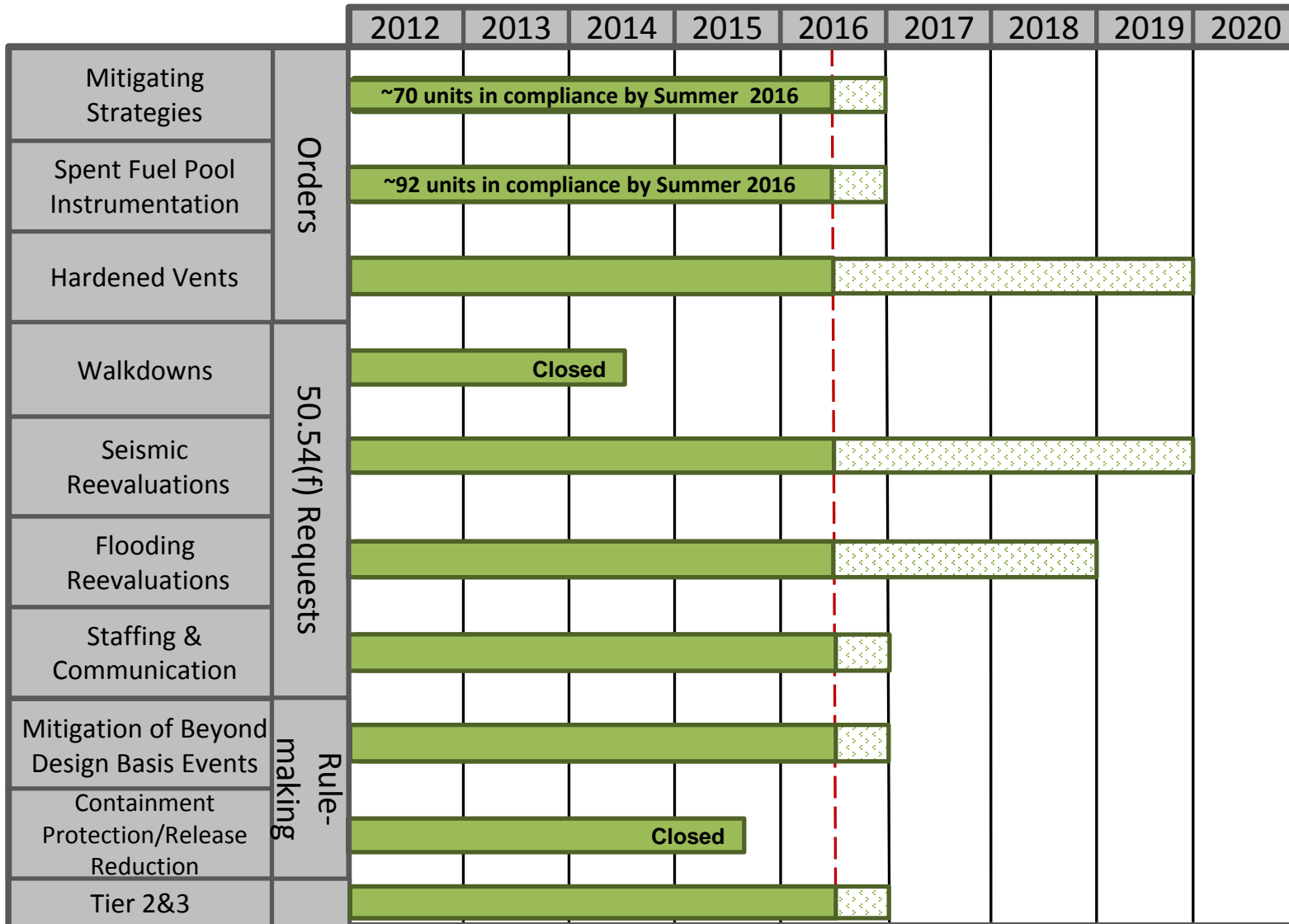
	Recommendation	Status
✓ Ensuring Protection from External Events	2.1 – Reevaluation of seismic & flooding hazards	Ongoing
	2.2 – Periodic reconfirmation of hazards	Ongoing
	2.3 – Seismic & flooding hazard walkdowns	Closed
	Other – Reevaluate other external hazards	Ongoing
✓ Enhancing Mitigation of Beyond-Design-Basis Events	4.1 – Mitigation of beyond design basis events rulemaking*	Ongoing
	4.2 – Mitigation of beyond design basis events order	Ongoing
	5.1 – Severe accident capable hardened vents order	Ongoing
	5.2 – Vents for other containment designs	Closed
	6 – Hydrogen control and mitigation	Closed
	7.1 – Reliable spent fuel pool instrumentation	Ongoing
	7.2- 7.5 – Spent fuel pool water makeup capability*	Ongoing
✓ Strengthening Emergency Preparedness for Multi-Unit Events	8.1-8.4 – Onsite emergency response capabilities*	Ongoing
	9.1-9.4 – Rulemaking to enhance emergency plans*	Ongoing
	10.1-10.2 – Analyze and evaluate other EP considerations*	Ongoing
	10.3 – Evaluate ERDS capabilities	Closed
	11.2&11.4 – Decision-making and public education	Closed
✓ Regulatory Philosophy	1 – Reassess regulatory framework	Closed
	12.1 – Include defense in depth requirements within ROP	Closed
	12.2 – Enhance staff training on severe accidents & SAMGs	Closed
✓ Radiological Consequences	11.3 – Real time radiation monitoring within EPZ	Ongoing
	Other – Containment vent filters/filtering strategies	Closed
	Other – Expand EPZ size beyond 10 miles	Closed
	Other – Pre-stage KI to residents beyond 10 miles	Closed
	Other – Expedited transfer of spent fuel to dry storage	Closed

*Integrated into MBDBE rulemaking due by end of 2016

Speakers

- **Jack Davis, Director, Japan Lessons-Learned Division (JLD)**
 - **Overall Progress and Update on Tier 1 Activities**
- **Mohamed Shams, Chief, Hazards Management Branch, JLD**
 - **Seismic and Flooding Hazard Reevaluations**
- **Gregory Bowman, Deputy Director, JLD**
 - **Resolution of Tier 2 and 3 Recommendations**
- **Troy Pruett, Director, Division of Reactor Projects, Region IV**
 - **Long-term Oversight**

Implementation On/Ahead of Schedule



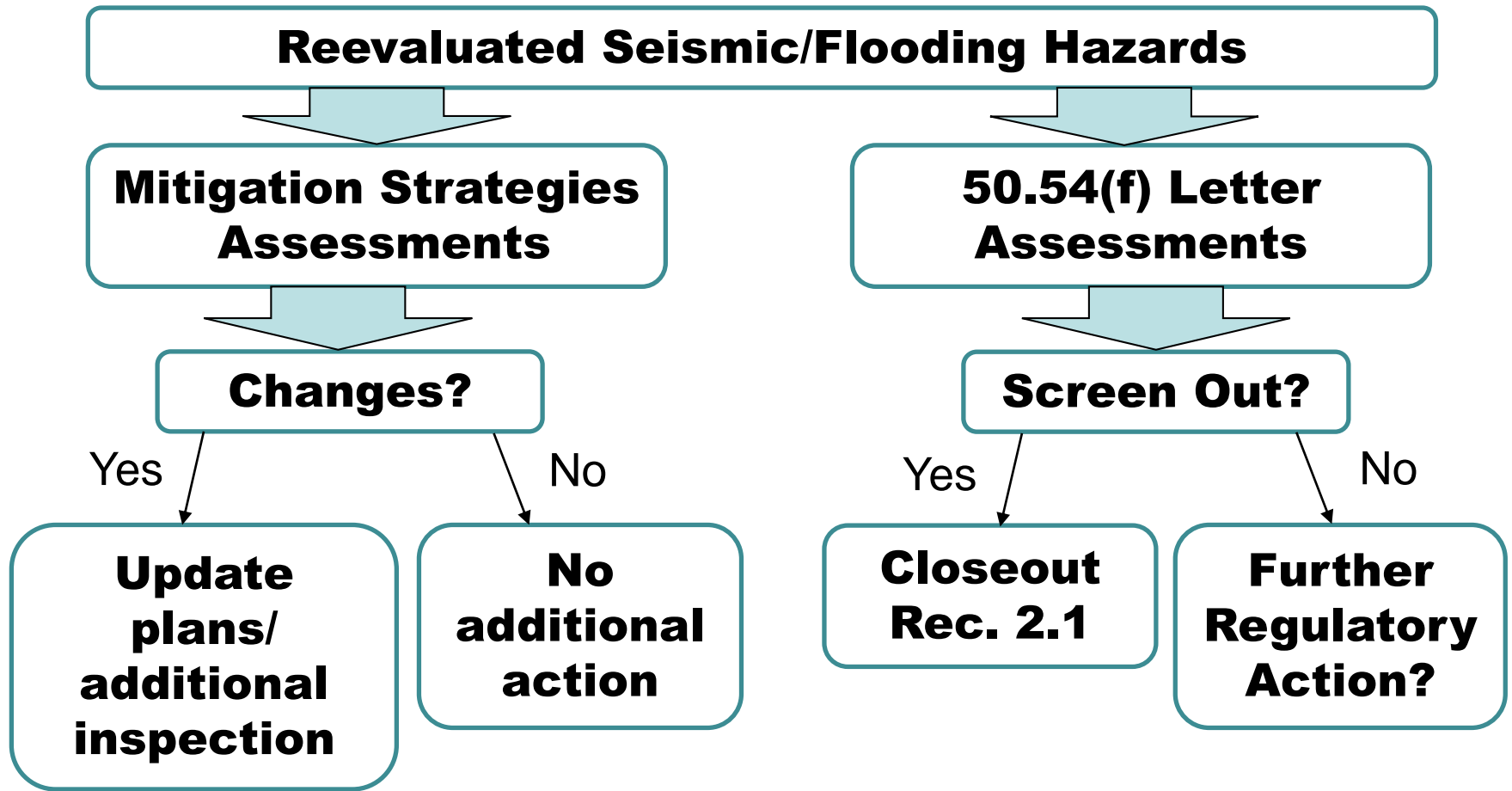
Today ▲

**For illustrative purposes only*



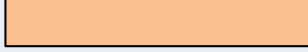







Comments Received on Mitigation of Beyond-Design-Basis Events Proposed Rule

- **Improve clarity in the use of the term “loss of all ac”**
- **Remove requirement for multiple source term dose assessment**
- **Clarify use of risk insights for addressing reevaluated hazards**
- **Establish process to define when changes require prior NRC approval**
- **Allow flexibility with implementation timeframes**

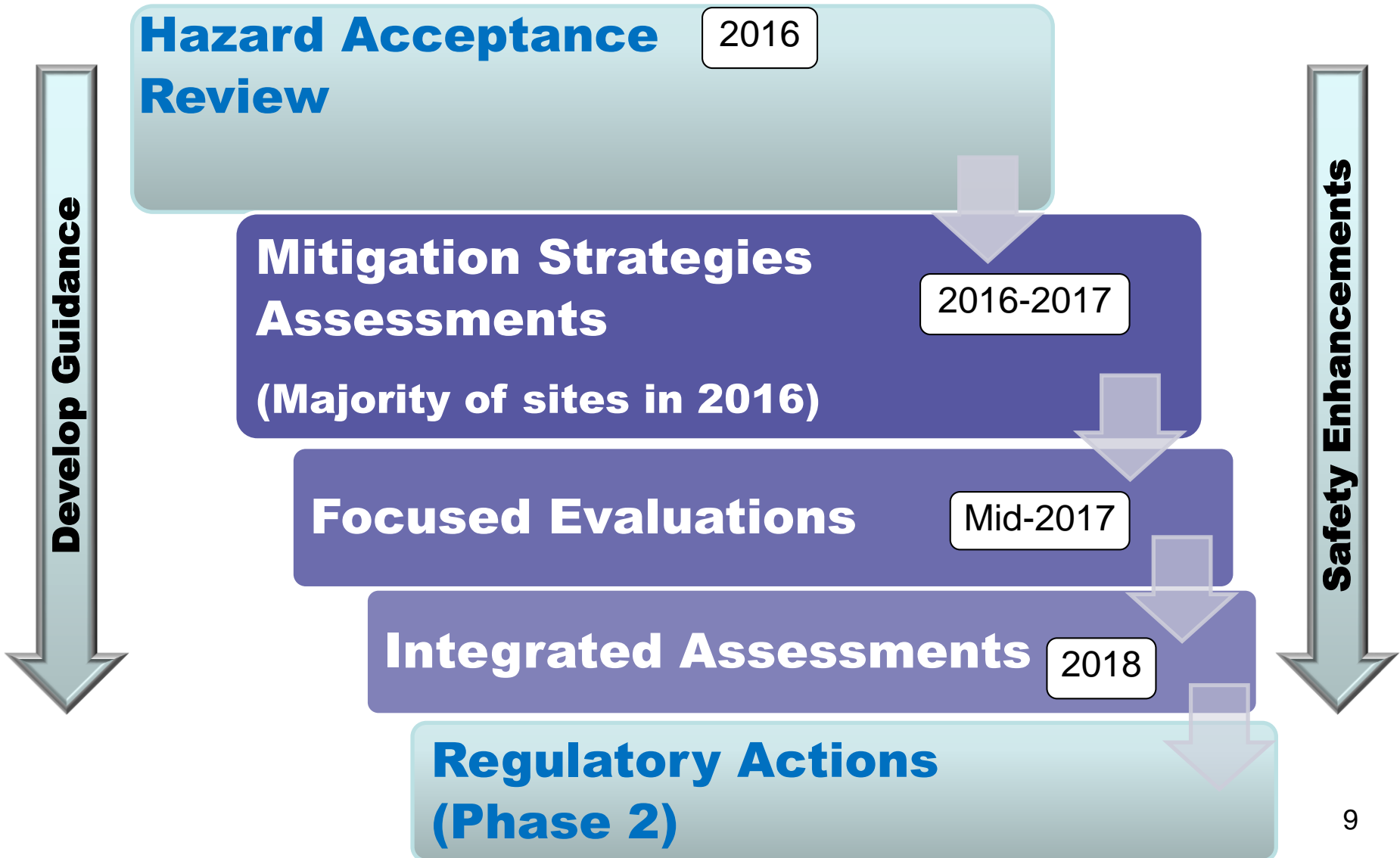
Closure of Seismic and Flooding Hazard Reviews



Significant Progress in Hazard Reevaluation

Seismic		Flooding	
Hazard Reevaluation Reports Received	(100%) 	Hazard Reevaluation Reports Received	(93%) 
Acknowledgement Letters Issued	(100%) 	Hazard Acceptability Letters Issued	(84%) 
Expedited Approach Received	(100%) 	Interim Actions Received	(93%) 
Expedited Approach Response	(97%) 	Interim Actions Inspected	(85%) 
Staff Assessments Issued	(95%) 	Staff Assessments Issued	(25%) 

Flooding Action Plan Implementation is on Track



Seismic Hazard Reevaluation is on Schedule



Status Summary of Tier 2 and 3 Recommendations

Resolved

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

Closed

Subsumed in Tier 1

Further Assessment

Closed – Evaluation of Instrumentation Enhancements

ACRS: Assess need to enhance instrumentation to survive beyond-design-basis events

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

Summary of Final Evaluation

- Tier 1 enhancements and existing requirements.
- Insights from MBDBE rulemaking analyses.
- Ongoing work to develop consensus standard.
- *Addressed comments from ACRS and stakeholders.*
- *Added information on SAMG principles/approaches.*
- ***Conclusion – No additional regulatory action necessary.***

Closed – Evaluation of Vents for Other Containment Designs

5.2: Reevaluate the need for hardened vents for other containment designs

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

Summary of Final Evaluation

- Significant information from previous/ongoing studies.
- EA-13-109 in progress for Mark I and II containments.
- Mitigating strategies for all containment designs.
- *Addressed comments from ACRS and stakeholders.*
- *Added insights from ongoing SOARCA study.*
- ***Conclusion – No additional regulatory action necessary.***

Closed – Evaluation of Hydrogen Control and Mitigation

6: Identify insights about hydrogen control and mitigation inside containment or in other buildings

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

Summary of Final Evaluation

- Existing requirements in 10 CFR 50.44.
- Significant information from previous studies.
- EA-12-049 and EA-13-109 enhance safety.
- *Addressed comments from ACRS and stakeholders.*
- *Added insights from ongoing SOARCA study.*
- ***Conclusion – No additional regulatory action necessary.***

Group 3 Recommendations Are On Schedule

- **Ongoing analysis to address the following recommendations:**
 - **Evaluation of other external hazards**
 - **Periodic confirmation of external hazards**
 - **Real-time radiation monitoring in EPZs and on-site**
- **Results of external hazard screening to Commission by end of May 2016**
- **Goal to resolve all remaining Tier 2&3 recommendations by the end of 2016**

Post-Compliance Inspections

- **NRC conducted on-site audits during evaluation of licensees' plans**
- **NRC safety evaluations capture staff's assessment**
- **Temporary Instruction 191 is being used to verify compliance**



Results of Initial Inspections



- **Temporary Instruction 191 results**
- **No findings of significance identified**
- **Issues addressed in corrective action programs**
- **All issues discussed with cross-regional panel**
- **Inspection activity increases in 2017**

Future Oversight Plans

- **Transition plan has been crafted**
- **Continue to develop and use normal agency processes**
- **Address lessons learned from Temporary Instruction 191 inspections**
- **Collaboration on training and information sharing**
- **Finalize oversight program for National SAFER Response Centers and Severe Accident Management Guidelines**

Path Forward for Completing Lesson-Learned Initiatives

- **Significant progress has been achieved**
 - **Majority of safety benefit will be in place by end of 2016**
- **Additional work is needed to closeout Fukushima lessons learned**
- **Continued engagement with stakeholders**
- **Consistent with international community**

Acronyms

AC	Alternating Current	KI	Potassium-Iodide
ACRS	Advisory Committee on Reactor Safeguards	MBDBE	Mitigation of Beyond Design Basis Events
CEUS	Central and Eastern United States	NRC	Nuclear Regulatory Commission
CFR	Code of Federal Regulations	ROP	Reactor Oversight Process
EA	Enforcement Action	SAMG	Severe Accident Management Guidelines
EP	Emergency Preparedness	SAFER	Strategic Alliance for FLEX Emergency Response
EPZ	Emergency Planning Zone	SBO	Station Blackout
ERDS	Emergency Response Data System	SOARCA	State-of-the-Art Reactor Consequence Analyses
JLD	Japan Lessons-Learned Division	WUS	Western United States