Fukushima Daiichi - Where are we now?

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Agenda

- Status of Fukushima Daiichi Today
- Status of U.S. Lessons Learned Activities
  - Overview
  - Seismic and Flooding Reevaluations
  - Tier 2/3 Items
    - Emergency Planning Zone
    - Other EP Items

Fukushima Today

Video created by the Japanese Government
Ministry of Trade, Economics, and Industry
Presented September 15, 2015
At the International Atomic Energy Agency

https://www.youtube.com/watch?v=S3DC6q66KVE&feature=youtu.be

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Radioactivity in the Ocean

- November 2014 News Release from Wood Hole Oceanographic Institute
  - 100 Miles due west of Eureka, CA
  - < 2 Bq per cubic meter of Cesium 134 (more than 1,000 times below EPA drinking water limits)
  - This Fukushima-derived cesium is far below where one might expect any measurable risk to human health or marine life, according to international health agencies.
- April 2015 News Release from Wood Hole Oceanographic Institute
  - Ucluelet, British Columbia
  - 1.4 Bq per cubic meter of Cesium 134
- "If someone were to swim for 6 hours a day every day of the year in water that contained levels of cesium twice as high as the Ucluelet sample, the radiation dose they would receive would still be more than one thousand times less than that of a single dental x-ray." Dr. Ken Buesseler, WHOI

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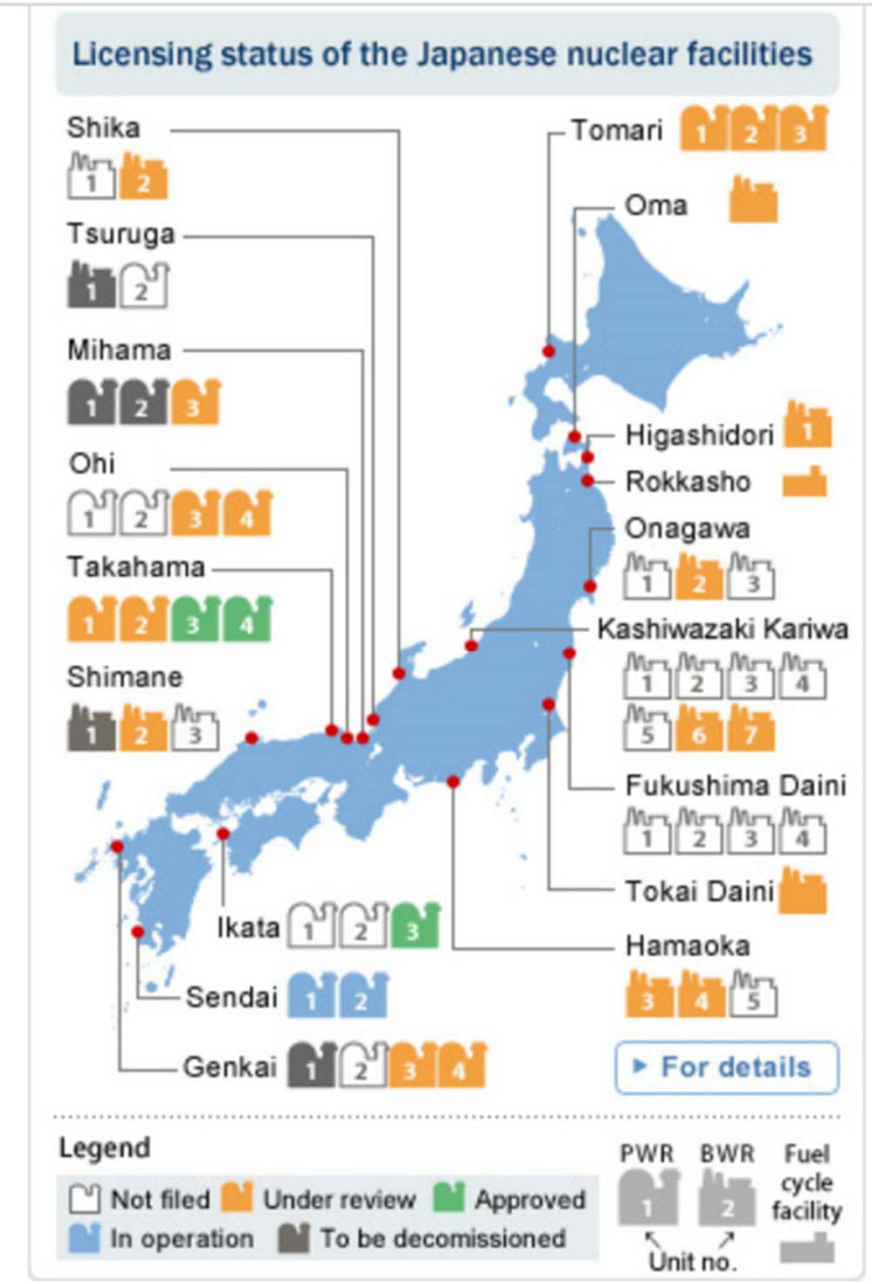
Status of other Japanese Nuclear Power Plants



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Summary – Spent Fuel Removal

- Units 1-3 are being monitored and cooled
- Unit 4 - all spent fuel removed from spent fuel pool
- Unit 3 – large rubble removal in progress
  - spent fuel removal FY2017 (566 assemblies)
- Unit 2 – planning for spent fuel removal
  - spent fuel removal FY2020 (615 assemblies)
- Unit 1 – temporary building removal to support rubble removal
  - spent fuel removal FY2020 (392 assemblies)

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Summary – Water Management

- Remove the source of contamination
  - water treatment
  - remove water from trench
- Keep water away from contamination sources
  - groundwater bypass and pumping
  - frozen soil walls
- Prevent leaks of contaminated water
  - welded tanks, seaside impermeable wall

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Summary – Site Conditions

- All stored water on site has been treated
  - Over 70% fully treated with ALPS
  - Remainder treated for Sr and Cs removal – to be further treated with ALPS
- Site conditions have improved
  - Full face respirator not needed for >90%
  - Dose at boundary <2 mSv/yr (<1 mSv/yr by end of FY2015)
  - Non-detectable airborne at site boundary

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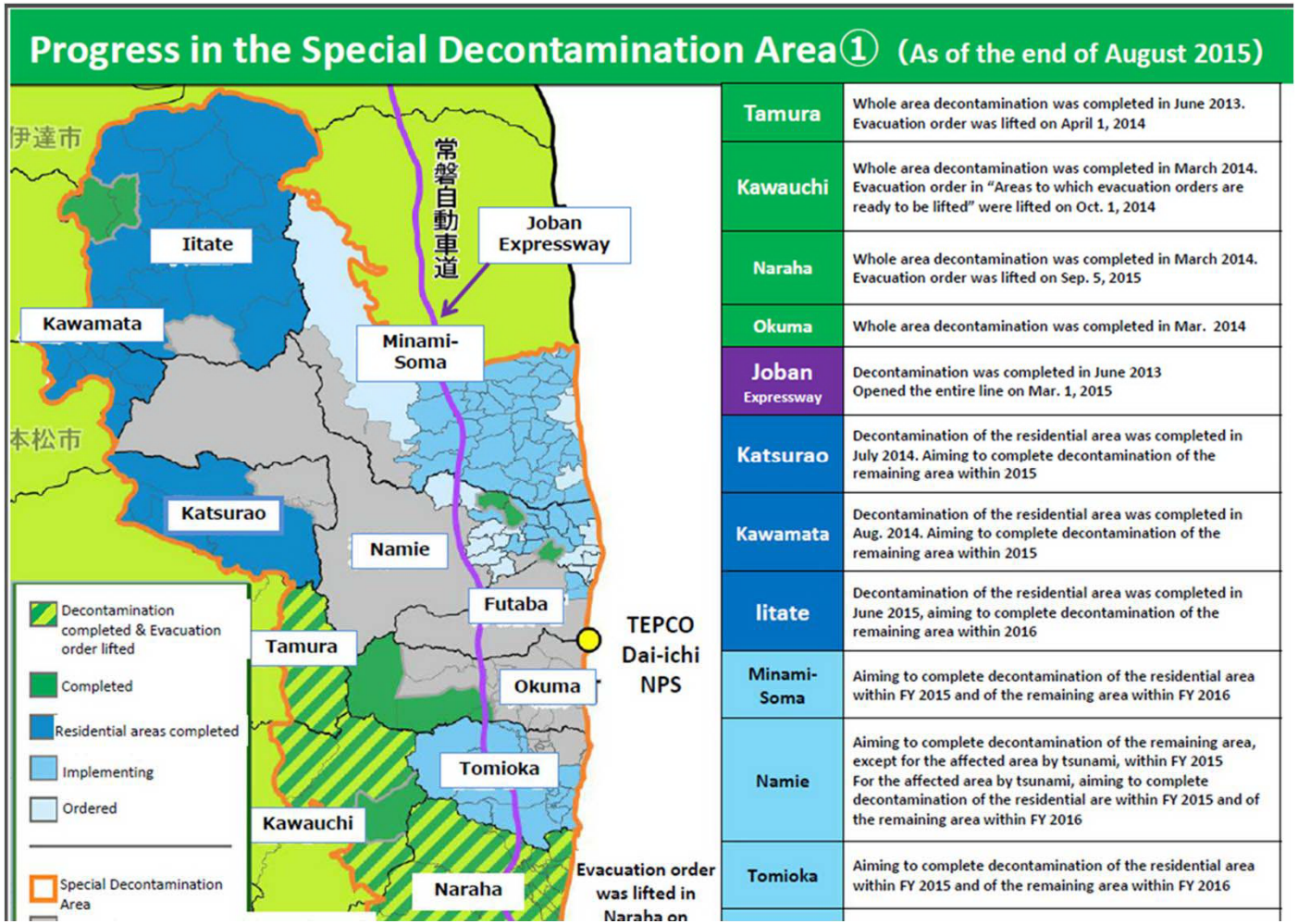
Land Decontamination



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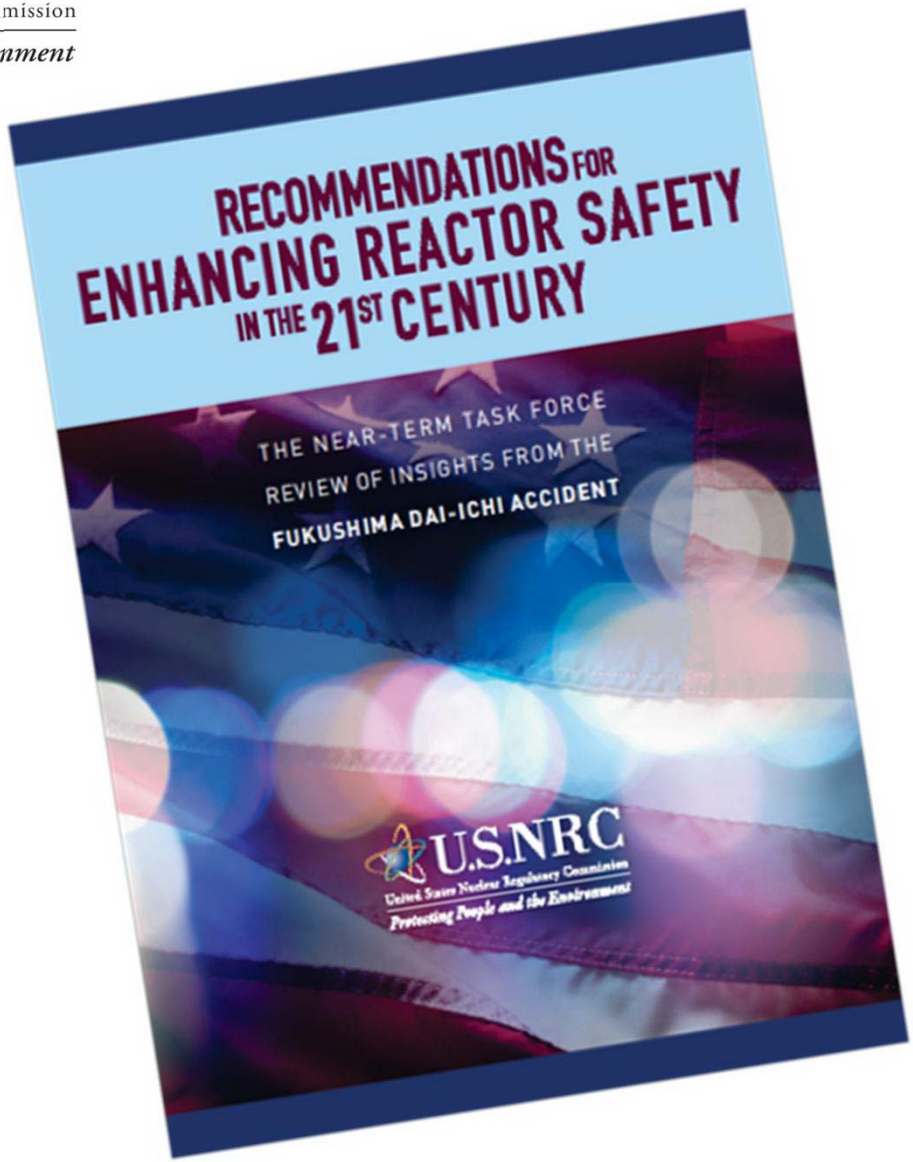

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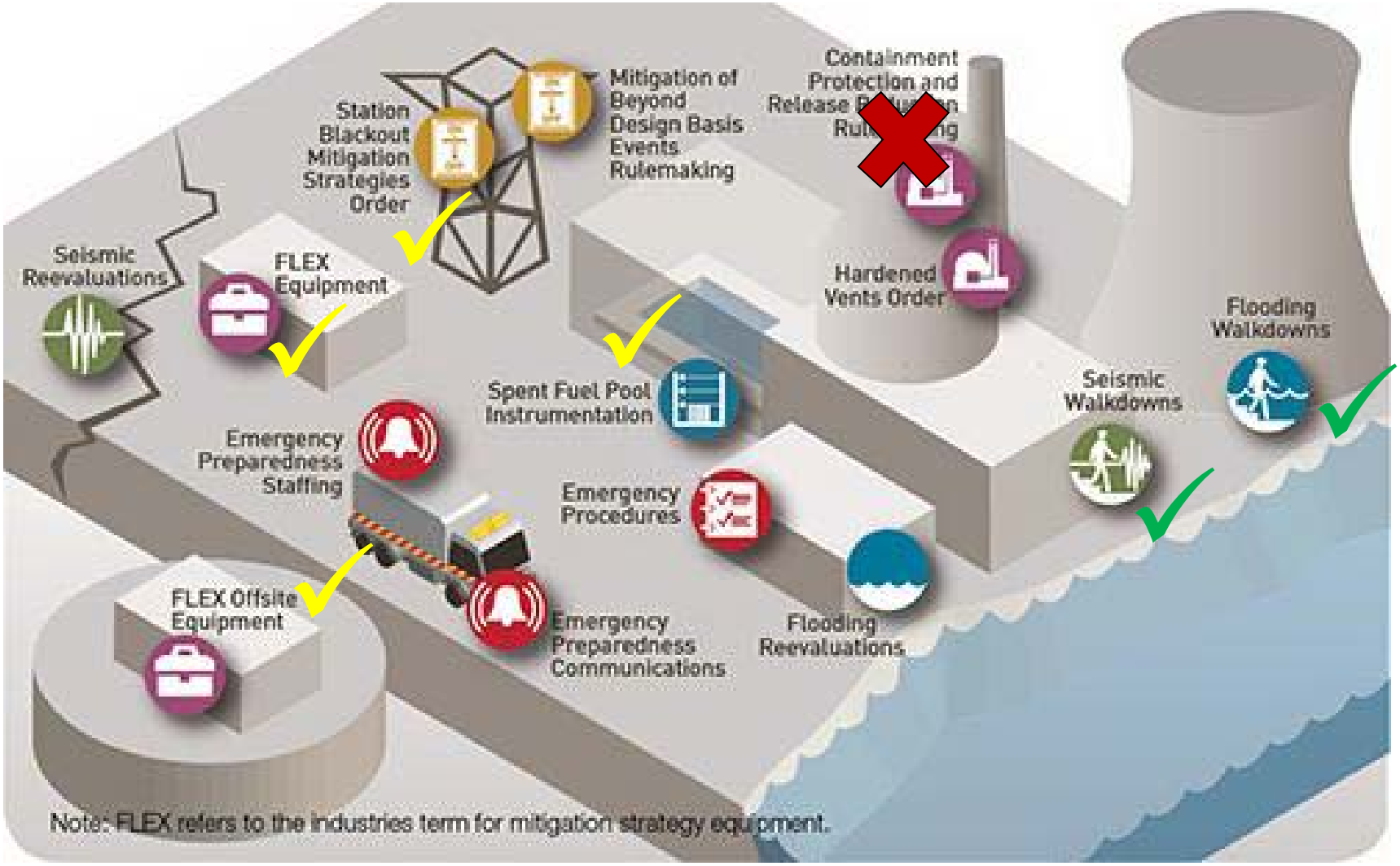

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Mitigating Strategies

Requires a three-phase approach for maintaining or restoring core cooling, containment, and spent fuel cooling

Phase	L
Initial	
Transition	
Final	

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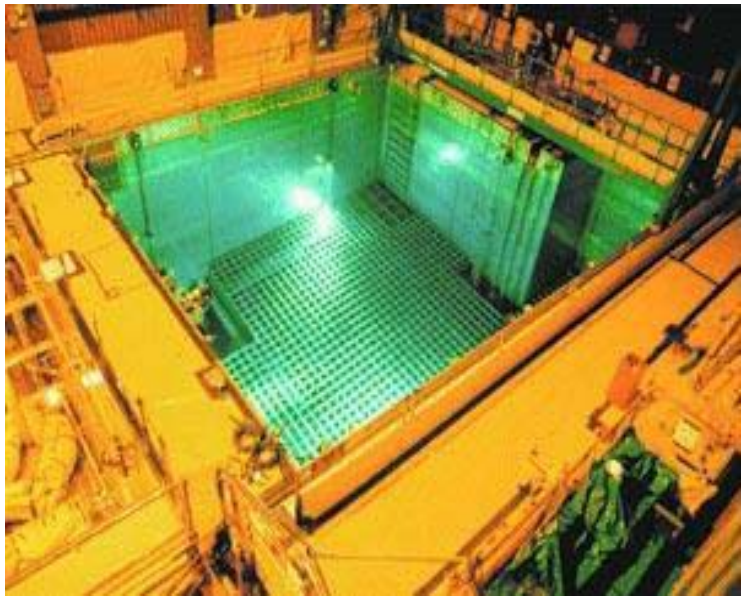
Spent Fuel Pool Instrumentation

- Requires installation of water level instrumentation to indicate the following levels:
  - Normal fuel pool level
  - Below-normal level that still provides radiation shielding
  - Very low level, near top of fuel, where immediate action to add make-up water should be taken



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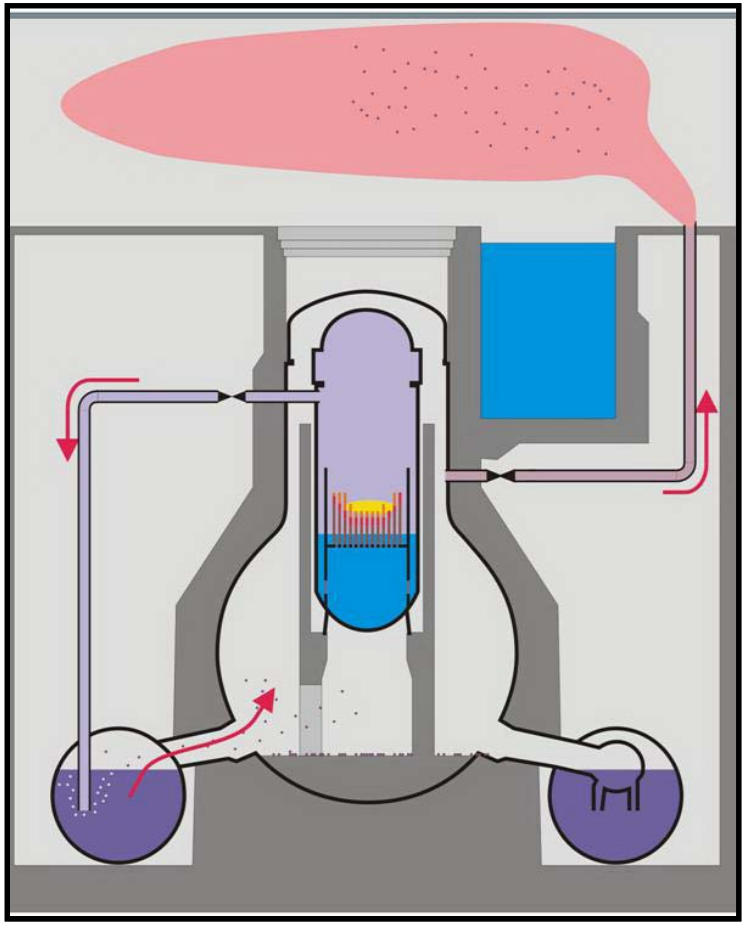
Containment Vents



- Applies to boiling water reactors with certain designs (Mark I/II)
- Vents help control pressure by removing heat
- May help prevent core damage
- Must continue to function if core damage/melting occurs
- Required to work when normal power is lost
- Modified order has two phases

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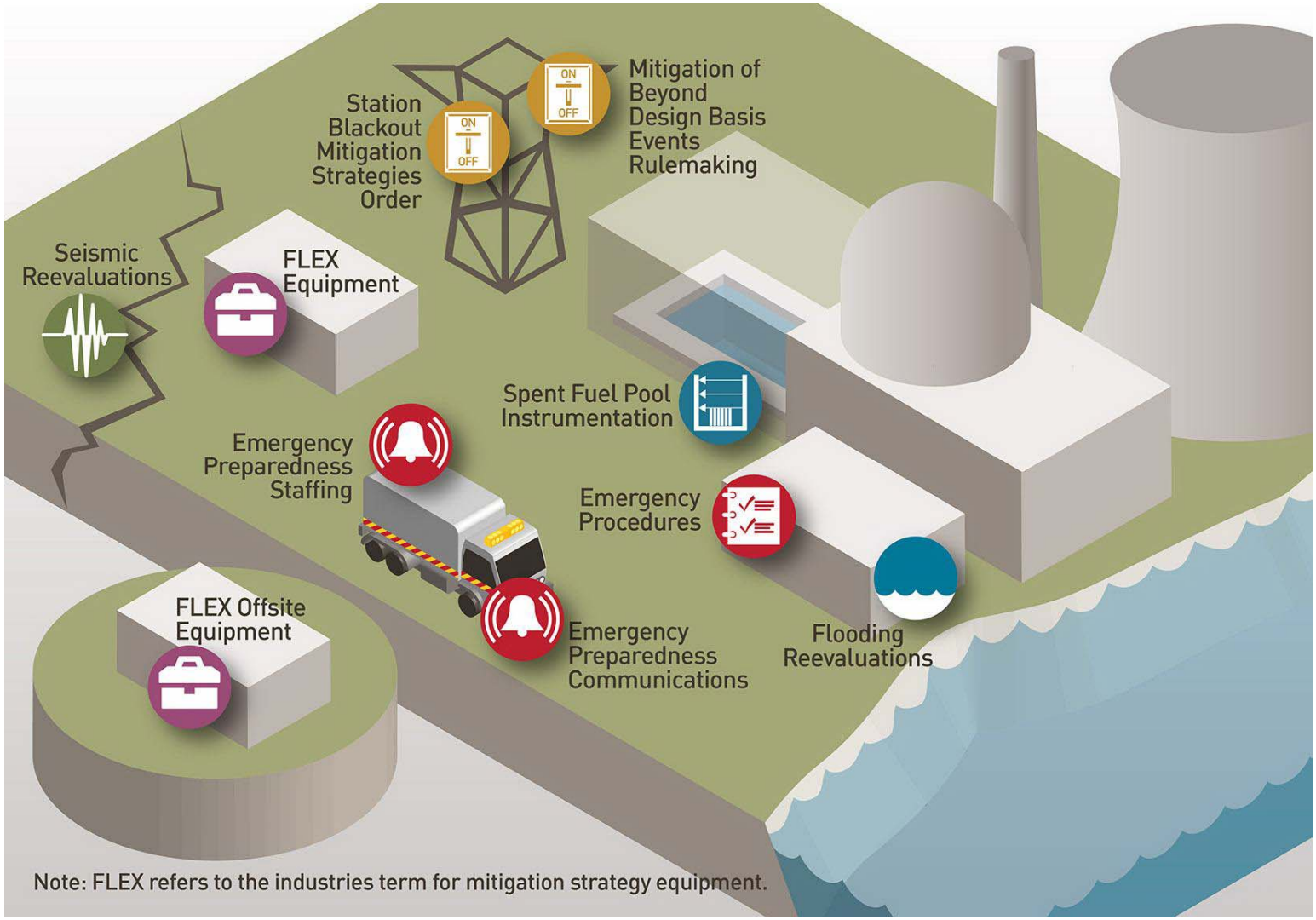
Mitigation of Beyond-Design-Basis Events Rulemaking



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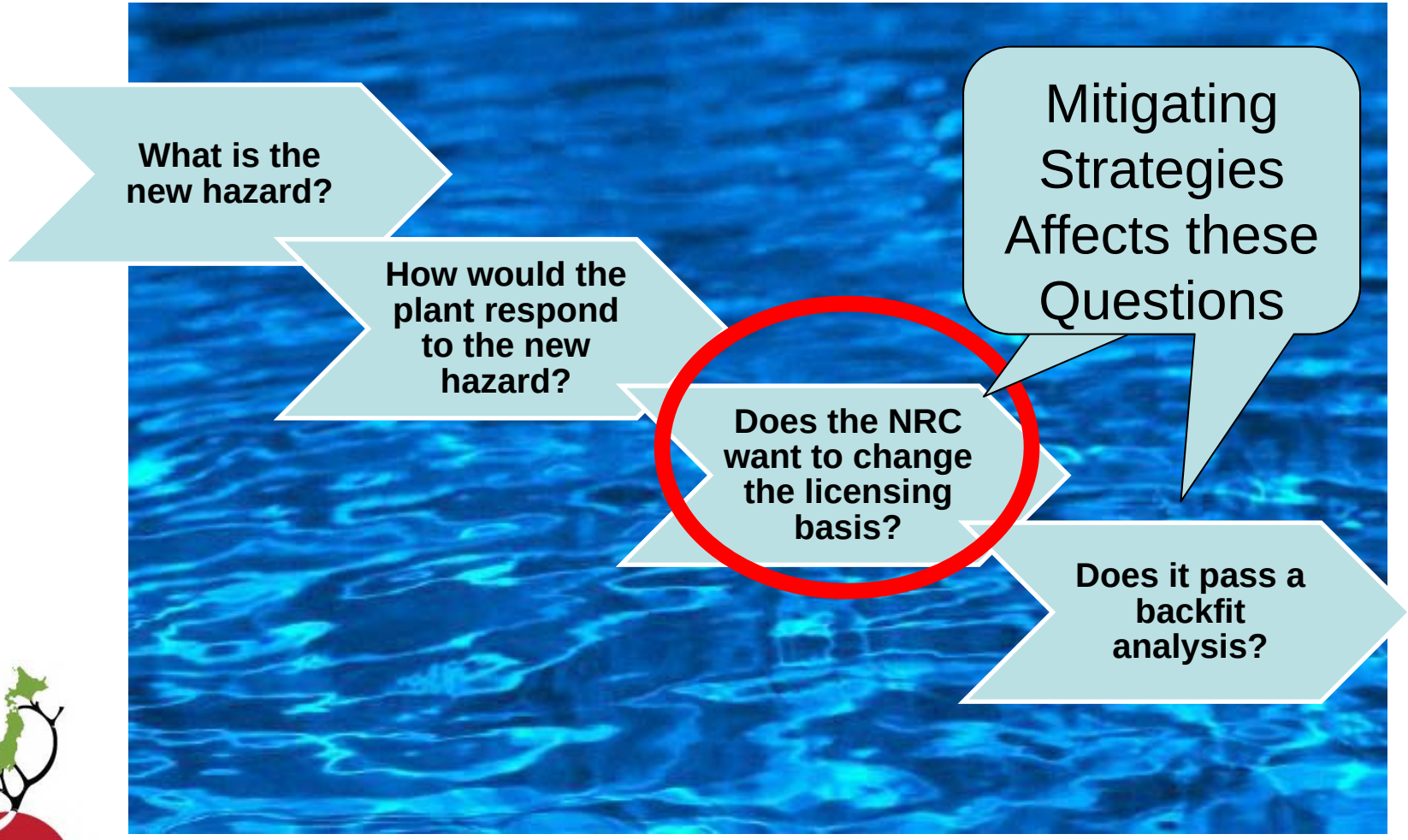
Seismic and Flooding Reevaluations



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What does this mean?

Licensees will already be required to plan how to preserve*:

Core Cooling
Spent Fuel Pool Cooling
and **Containment**

under the conditions of the reevaluated flooding and seismic hazards

Mitigating Strategies Assessment

*There may be limited exceptions which would have to be approved by the NRC.

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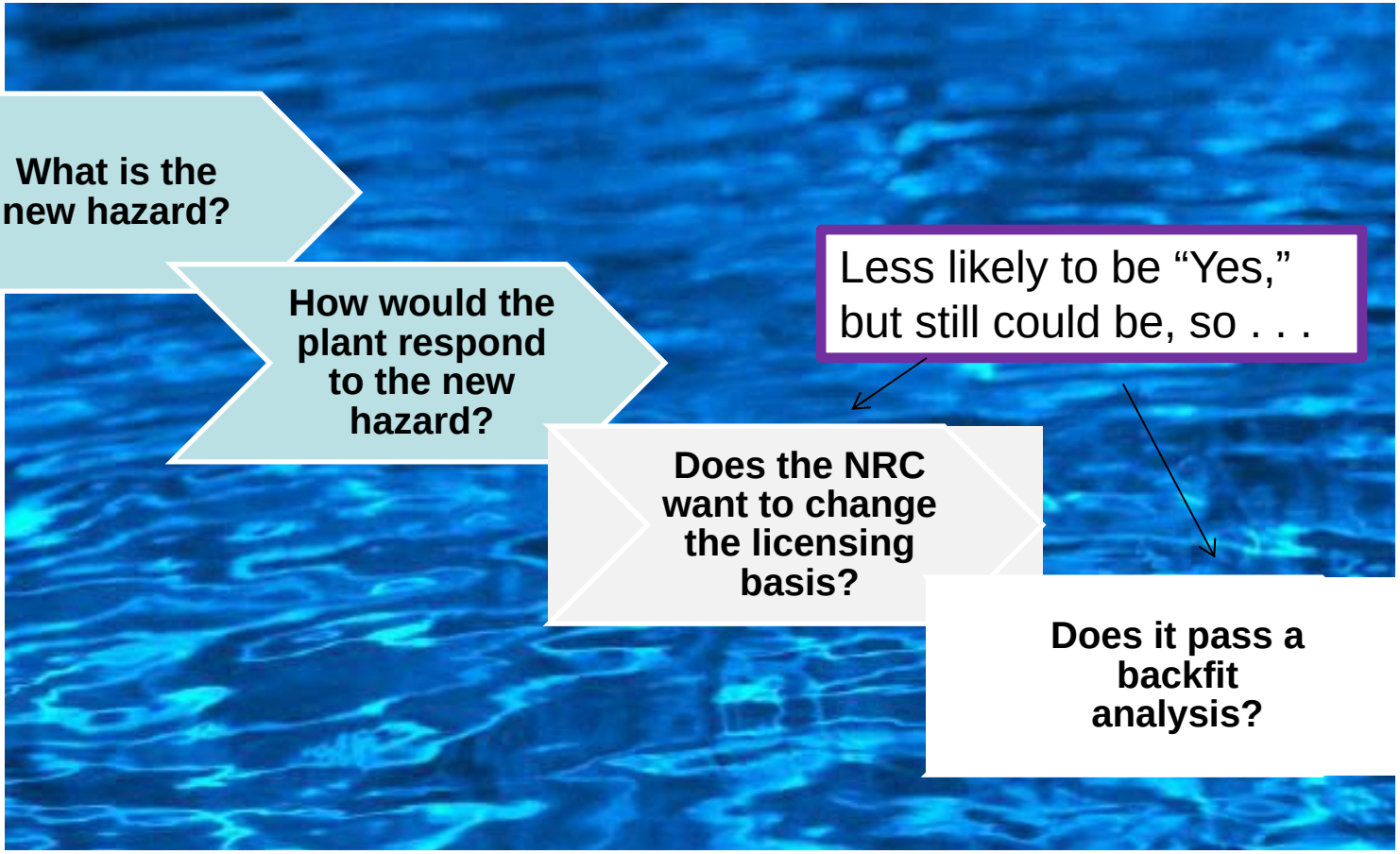
Seismic and Flooding Reevaluations



. . . THE PROCESS CONTINUES.

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Flooding Hazard Reevaluation Closure Plan

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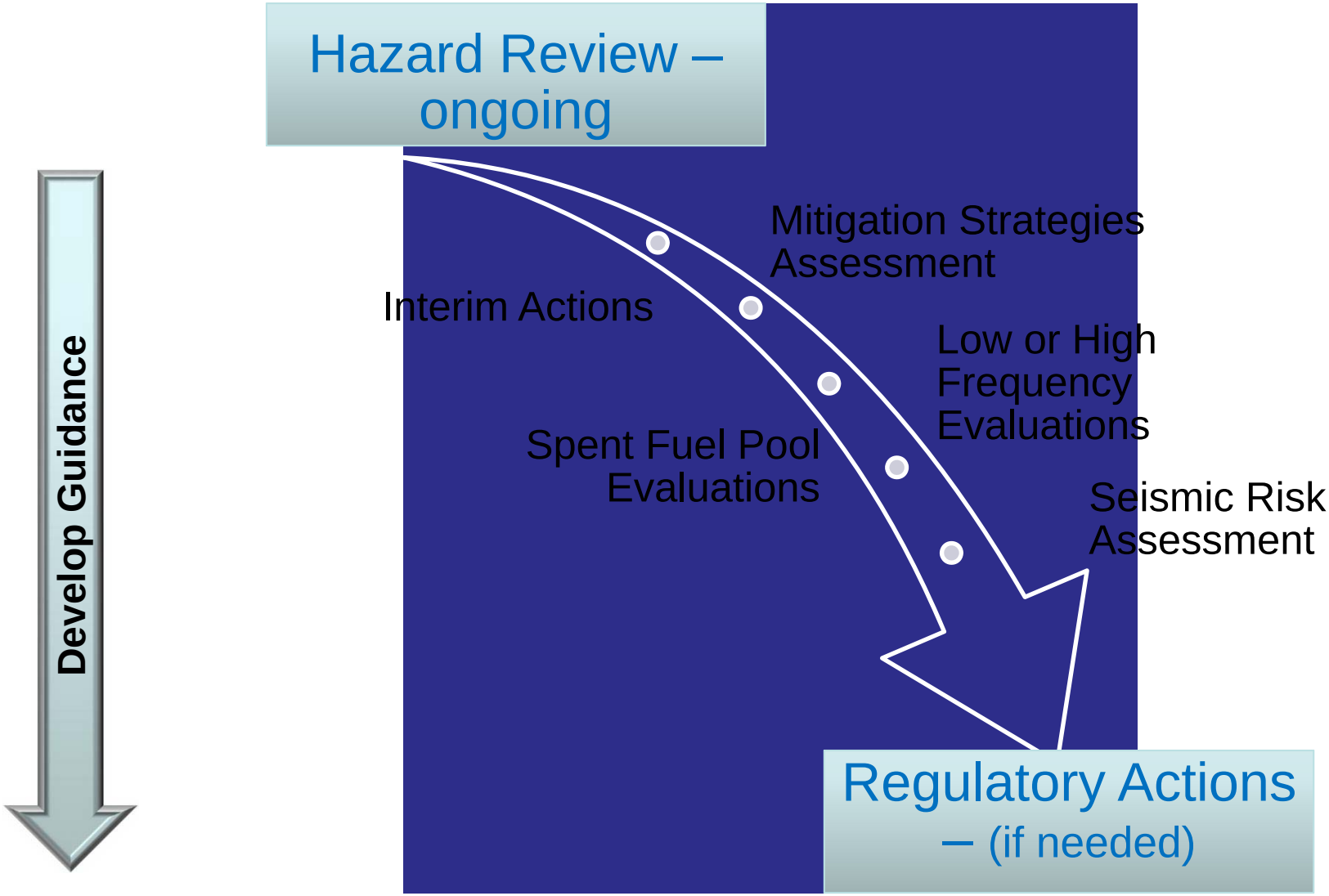
Seismic Hazard Reevaluation Closure Plan



Tier 2 and 3 Recommendations

-	Expedited transfer of spent fuel to dry cask storage
7.2 – 7.5	Spent Fuel Pool Makeup Capability
9.1/9.2	Emergency preparedness (EP) enhancements for prolonged SBO and multiunit events
9.3*	Emergency Preparedness
9.4	Improve ERDS capability
10*	Additional EP topics for prolonged SBO and multiunit events
11*	EP topics for decision-making, radiation monitoring, and public education
3	Enhanced Capability to prevent/mitigate seismically-induced fires & floods
9.3*	ERDS Capability throughout Accident
10*	Additional EP topics for prolonged SBO and multiunit events
11*	EP topics for decision-making, radiation monitoring, and public education
12.1	Reactor Oversight Process modifications to reflect DID framework
12.2	Staff training on severe accidents and resident inspector training on SAMGs
-	Revisit Emergency Planning Zone Size & Pre-stage Potassium Iodide Beyond 10 Miles
5.2	Reliable hardened vents for other containment designs
6	Hydrogen control and mitigation inside containment or in other buildings
-	Reactor and Containment Instrumentation
-	Reevaluation of “Other” External Hazards
2.2	Periodic confirmation of seismic and flooding hazards
10*	Additional EP topics for prolonged SBO and multiunit events
11*	EP topics for decision-making, radiation monitoring, and public education

Completed | Subsumed in Tier 1 | Ready to Close | Further Interaction | Further Assessment

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Tier 3 EP Recommendations

Ready to Close Now

- Basis of EPZ Size and Pre-staging KI
- 9.3, ERDS Capability throughout an Accident
- 10.2, Protective Equipment Requirements
- 10.3c, ERDS Continuous Transmission
- 11.2, Recovery & Reentry Insights
- 11.4, Training in the Local Community

Additional Assessment or Documentation

- 10.3a, Alternative Method for Transmitting ERDS
- 10.3, ERDS Data Set
- 11.3, Efficacy of Real Time Radiation Monitoring

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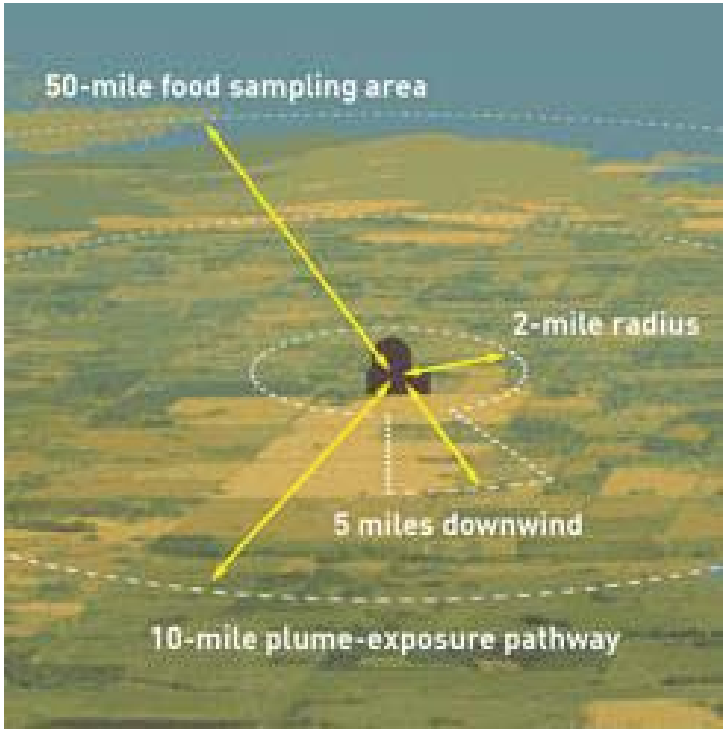
Basis of EPZ Size and Pre-staging KI



10 mi Emergency Planning Zone

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50 mi Ingestion Pathway

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Basis of EPZ Size and Pre-staging KI

- Denied 2012 petition to expand EPZ, etc.
  - Response can be expanded as needed
  - The National Response Framework facilitates prompt and effective measures
- Information from Fukushima studies does not call those conclusions into question
  - UNSCEAR found that radiation doses were low, therefore health effects would be low
  - Average affected dose for adults ~ 5x background

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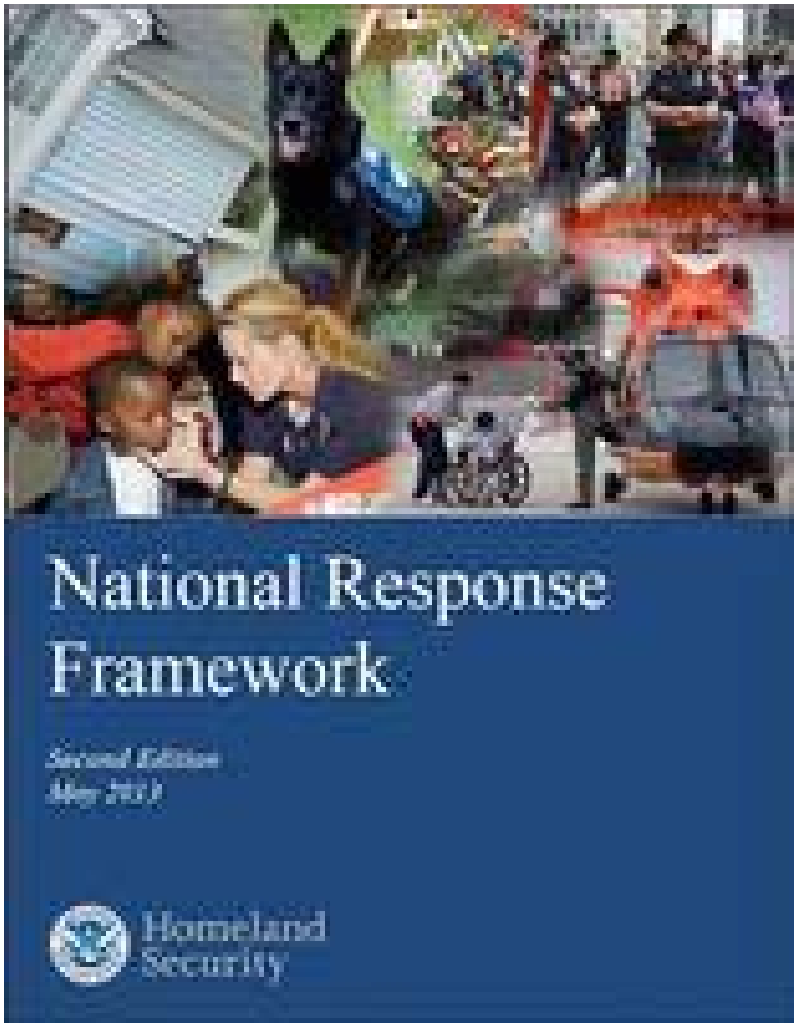
Recovery & Reentry Insights



- FEMA is leading an interagency effort to update the Nuclear/Radiological Incident Annex
- Southern Exposure Exercise, 2015

Recommendation: Close

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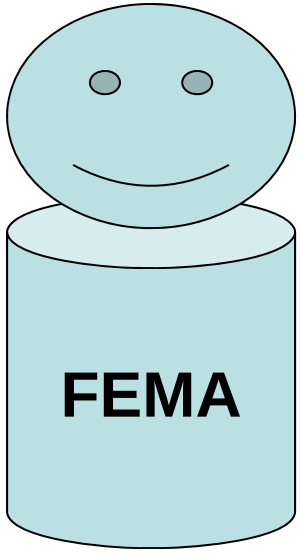
Training in the Local Community

Several states and local authorities have or are revising their public outreach materials subsequent to Fukushima.

Recommendation: Close



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FEMA's Radiological Emergency Preparedness Program outreach Integrated Process Team

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Summary

- Considerable progress has been made.
- Activities have already resulted in safety improvements.
- Expect further substantial safety enhancements in place by 2016.