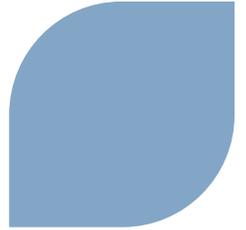


# Public Meeting to Discuss Closure of U.S. EPR™ Fukushima Response

Rockville, Maryland  
September 19, 2012

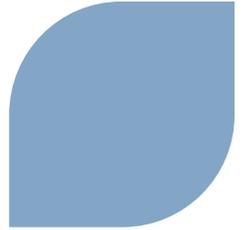


# Agenda



- ▶ **Purpose and Background**
- ▶ **U.S. EPR™ Response to Fukushima Tier 1 and Tier 2 Recommendations**
- ▶ **NRC/DCWG Interaction Opportunities / Next Steps**

# Purpose and Background



## ► Purpose

- ◆ Provide the status of the U.S. EPR™ Fukushima response to NRC Orders, ANPRs and RAIs (DC and COL)
- ◆ Discuss the U.S. EPR™ Fukushima mitigation strategy and associated schedule for U.S. EPR™ Fukushima response
- ◆ Confirm agreement with the NRC on the path to closure for U.S. EPR™ Fukushima response and identify open NRC questions or desired inputs
- ◆ Identify future interaction opportunities to support closure of U.S. EPR™ Fukushima response

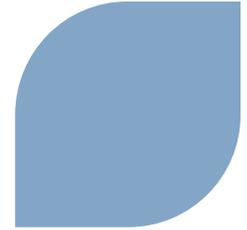
# U.S. Regulatory Timeline

Date	Event
March 11, 2011	Earthquake and tsunami in Japan, accident begins
July 13, 2011	NRC releases Near-Term Task Force (NTTF) final report
December 7, 2011	DC and COL applicants present U.S. EPR™ lessons learned from Fukushima to U.S. NRC
February 17, 2012	NRC issues SECY-12-0025, <i>Proposed Orders and Requests for Information in response to Lessons Learned from Japan's March 11, 2011, Great Tohoku Earthquake and Tsunami</i> . Enclosure 3 lists New Tier 2 Activity–NTTF Recommendation 2.1 <i>Other Natural External Hazards Reevaluations</i>
March 12, 2012	NRC issues two orders to PWR operating plant licensees and COL holders, and request for additional information: <ul style="list-style-type: none"> <li>•EA-12-049- <i>Mitigation Strategies for Beyond Design Basis External Hazards</i></li> <li>•EA-12-051- <i>Reliable Spent Fuel Pool Instrumentation</i></li> <li>•10 CFR 50.54(f) letter requesting additional information, Recommendations 2.1, 2.3 and 9.3</li> </ul>
April 25, 2012	NRC issues letters to DC and COL applicants defining Tier 1 NTTF recommendations requiring action prior to DC: <ul style="list-style-type: none"> <li>•Rec. 2.1 - <i>Seismic Hazards Analysis</i></li> <li>•Rec. 7.1 - <i>Spent Fuel Pool Instrumentation</i></li> <li>•Rec. 9.3 - <i>Enhanced Emergency Preparedness</i></li> <li>•Rec. 4.2 - <i>Protection of Equipment from External Hazards</i></li> </ul>

# U.S. Regulatory Timeline

Date	Event
May 9, 2012	NRC issues RAIs for NTTF recommendation 2.1, <i>Seismic Hazards Analysis</i> , to COL applicants
May 13, 2012	NEI issues Revision B1 of NEI 12-06, <i>Diverse and Flexible Coping Strategies (FLEX) Implementation Guide</i> , to NRC
May 18, 2012	NRC issues RAIs for NTTF recommendation 7.1, <i>Spent Fuel Pool Instrumentation</i> , and NTTF recommendation 9.3, <i>Enhanced Emergency Preparedness</i> , to DC and COL applicants
May 31, 2012	NRC issues "draft" JLD-ISG-2012-01, <i>Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design- Basis External Events</i>
July 13, 2012	NRC issues SECY-12-0095, <i>Tier 3 Program Plans and 6-Month Status Update in Response to Lessons Learned from Japan's March 11, 2011, Great Tohoku Earthquake and Tsunami</i> . Enclosure 2 lists the Tier 1, Tier 2, and Tier 3 Recommendations.
August 21, 2012	NEI issues final Revision 0 of NEI 12-06, <i>Diverse and Flexible Coping Strategies (FLEX) Implementation Guide</i> , to NRC
August 29, 2012	NRC issues "final" JLD-ISG-2012-01, <i>Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design- Basis External Events</i>

# SECY 12-0095, Overview of Scope Tier 1 and Tier 2 Recommendations



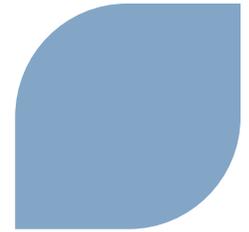
IDENTIFIER / SOURCE	TIER	REGULATORY ACTION	DESCRIPTION
NTTF 2.1	1	Request for information (RFI)	Reevaluate seismic and flooding hazards against current requirements and guidance and update the design basis. Take appropriate regulatory action to resolve issues associated with updated site-specific hazards.
NTTF 2.3 (Note 1)	1	RFI	Perform seismic and flood protection walkdowns and address plant-specific vulnerabilities. Take appropriate regulatory action to resolve issues associated with updated site-specific hazards.
SECY-12-0025, Enclosure 3	2	RFI	Reevaluate other natural external hazards against current requirements and guidance and update the design basis. Take appropriate regulatory action to resolve issues associated with updated site-specific hazards.
NTTF 3 (partial) (Note 2)	1	Plan	Develop a plan to prepare a probabilistic risk assessment methodology for seismic- induced fires and floods.
NTTF 7.1	1	Order	Issue a generic order to nuclear power plants requiring a reliable indication of water level in spent fuel storage pools.
NTTF 7.2-7.5 (Note 3)	2	Rulemaking	Require licensees to provide reliable spent fuel pool makeup capabilities.
NTTF 8	1	Rulemaking	Issue ANPR in support of a rulemaking to require integration of onsite emergency response processes, procedures, training, and exercises.

Note 1: Recommendation 2.3 is for operating plants and is addressed via NTTF Item 2.1 for new plants. Therefore, no DC or COLA action is planned.

Note 2: NTTF Recommendation # 3 is a Tier 1 activity for the Staff and will be implemented as a Tier 3 activity. Therefore, there is no DC or COL action at this time.

Note 3: NTTF Recommendation 7.5 is Tier 2 and requests the NRC to initiate rulemaking or licensing activities or both to require spent fuel pool improvements (Recommendations 7.1 – 7.4). Therefore, there is no DC or COL action at this time.

# SECY 12-0095, Overview of Scope Tier 1 and Tier 2 Recommendations (continued)



IDENTIFIER / SOURCE	TIER	REGULATORY ACTION	DESCRIPTION
NTTF 9.3 (partial)	1	RFI	Request that licensees perform a staffing study for responding to a multiunit event, evaluate enhancements that would be needed to power communications equipment throughout a prolonged SBO, and inform the NRC of the results.
NTTF 9.3 (partial)	2	Order	Issue a generic order to nuclear power plants requiring a revision to the emergency plan to address multiunit dose assessments, periodic training and exercises for multiunit and prolonged SBO scenarios, and drills on identification and acquisition of offsite resources, and ensuring sufficient emergency preparedness (EP) resources for multiunit and prolonged SBO scenarios.
NTTF 9.4 (Note 4)	1	Voluntary initiative	Order licensees to complete the ERDS modernization initiative by June 2012 to ensure multiunit site monitoring capability.
NTTF 4.1	1	Rulemaking	Issue advance notice of proposed rulemaking (ANPR) in support of a rulemaking to enhance the capability to maintain plant safety through a prolonged station blackout (SBO).
NTTF 4.2	1	Order	Issue a generic order to nuclear power plants requiring a three-phase approach for mitigating beyond-design-basis external hazards.
SECY-12-0025, Enclosure 2	1	Orders and RFI	Related to NTTF 2.1, 2.3, 4.1, and 4.2. Include ultimate heat sink (UHS) systems in reevaluation and walkdowns, include loss of UHS as a design assumption in conjunction with strategies for dealing with prolonged SBO, and address loss of access to normal UHS in conjunction with measures taken to deal with beyond-design-basis external hazards.

Note 4: NTTF Recommendation # 9.4 is a Tier 1 voluntary activity for operating plants. Therefore, there is no DC or COL action at this time.

# Closure Plan for Recommendation 2.1

- ▶ **Recommendation 2.1 is Tier 1 and requests licensees to reevaluate the seismic and flooding hazards at their sites against current NRC requirements and guidance, and if necessary, update the design basis and SSCs important to safety to protect against the updated hazards.**

## ◆ DC Approach

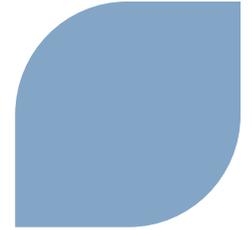
### Seismic

- Horizontal and vertical ground motion based on European Utility Requirements spectral shapes anchored to a peak ground acceleration (PGA) of 0.3g. In addition, a high frequency control motion is added anchored at a 0.21g horizontal PGA and a 0.18g vertical PGA
- Range of soft, medium and hard rock sites
- A COL Item [3.7-1] confirms that the site-specific seismic response is bounded by the U.S. EPR™ design basis parameters

### Flooding

- U.S. EPR™ uses a “Dry Site” concept → Site platform level (grade level) is arranged above the maximum level of the design basis flood
- COL Items [3.4-1, 3.4-2, 3.4-3, 3.4-6 and 3.4-7] confirm that site-specific flooding considerations are bounded by the U.S. EPR™ design basis flood values or are otherwise demonstrated to be acceptable
- No Applicable DC RAIs → No further action planned for DC for Item 2.1

# Closure Plan for Recommendation 2.1 (continued)

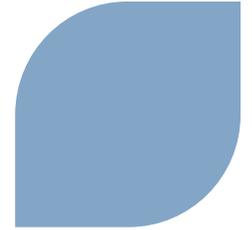


## ◆ COLA Approach

### Seismic:

- Reevaluate the seismic hazard at the Calvert Cliffs Nuclear Power Project Unit 3 (CCNPP Unit 3) and at Bell Bend (BB) with the use of the 2012 Central and Eastern United States (CEUS) Seismic Source Model (SSM)
  - The CEUS SSM stems from a Senior Seismic Hazard Analysis Committee (SSHAC) Level 3 Process and adequately accounts for the effects of events such as the August 23, 2011 Mineral Virginia earthquake
- Define a Safe Shutdown Earthquake (SSE) that accounts for seismic hazard obtained from the 2012 CEUS SSM and the current regulatory guidance
- Perform the U.S. EPR™ seismic reconciliation process using the site specific SSE and the site specific soil columns
- Perform site specific Soil Structure Interaction (SSI) analysis and compare structural response with the ranges of demands considered by the U.S. EPR™ Design Certification

# Closure Plan for Recommendation 2.1 (continued)



## ◆ COLA Approach (continued)

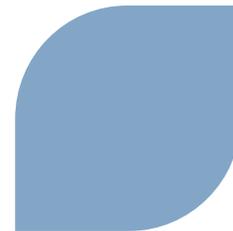
### Seismic (continued)

- Applicable COLA Seismic RAIs:
  - UNE received RAI 345 for this item → UNE has submitted a response to RAI 345 on September 12, 2012.
  - PPL received RAI 118 for this item → PPL will submit a response to RAI 118 by November 16, 2012.

### Flooding:

- CCNPP Unit 3 and BB are “dry” sites → above the design basis flood level
- Design basis flood level meets current regulatory guidance
- FLEX Guidance specifies use of flood analysis applicable to COL applications for adjacent sites
- No Applicable COLA RAIs for flooding → No further action planned for COLA for Item 2.1(flooding)

# Closure Plan for SECY-12-0025, Enclosure 3 Recommendation



- ▶ **Recommendation from SECY-12-0025, Enclosure 3 is Tier 2 and requests the re-evaluation of other natural external hazards against current regulatory requirements and guidance and update the design basis.**

## ◆ DC Approach

- U.S. EPR™ design satisfies current regulatory requirements and guidance.
- COL Item [2.0-1] confirms that the site characteristics are bounded by the U.S. EPR™ design basis parameters or are shown to not adversely affect the ability of safety related structures to perform their safety functions.
- No Applicable DC RAIs → No further action planned for DC for SECY-12-0025, Enclosure 3 recommendation

## ◆ COLA Approach

- Natural external hazards at CCNPP Unit 3 and BB have been evaluated against current regulatory guidance.
- No Applicable COLA RAIs → No further action planned for COLA for SECY-12-0025, Enclosure 3 recommendation

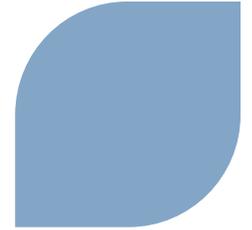
# Closure Plan for Recommendation 7.1

- ▶ **Recommendation 7.1 is Tier 1 and resulted in Order EA-12-051. Licensees must provide sufficiently reliable instrumentation to monitor spent fuel pool water level and be capable of withstanding design-basis natural phenomena.**

## ◆ DC Approach

- Conform to Order EA12-051 consistent with Interim Staff Guide JLD-ISG-2012-03 and NEI 12-02 Rev 1.
- The existing U.S. EPR™ spent fuel pool cooling system instrumentation includes 4 seismically qualified, safety related wide range level sensors.
- Each level sensor has a range that spans from the top of the normal operating level to below the top of the fuel racks.
- Each of the two divisions of wide range level sensors will be modified to include the capability to connect a sensor directly to a battery operated portable indication device.
- Applicable DC RAIs
  - AREVA received RAI 550 for this item → AREVA submitted RAI 550 response on September 11, 2012.

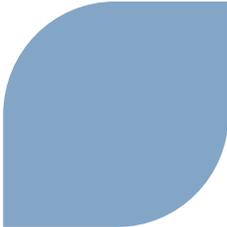
# Closure Plan for Recommendation 7.1 (continued)



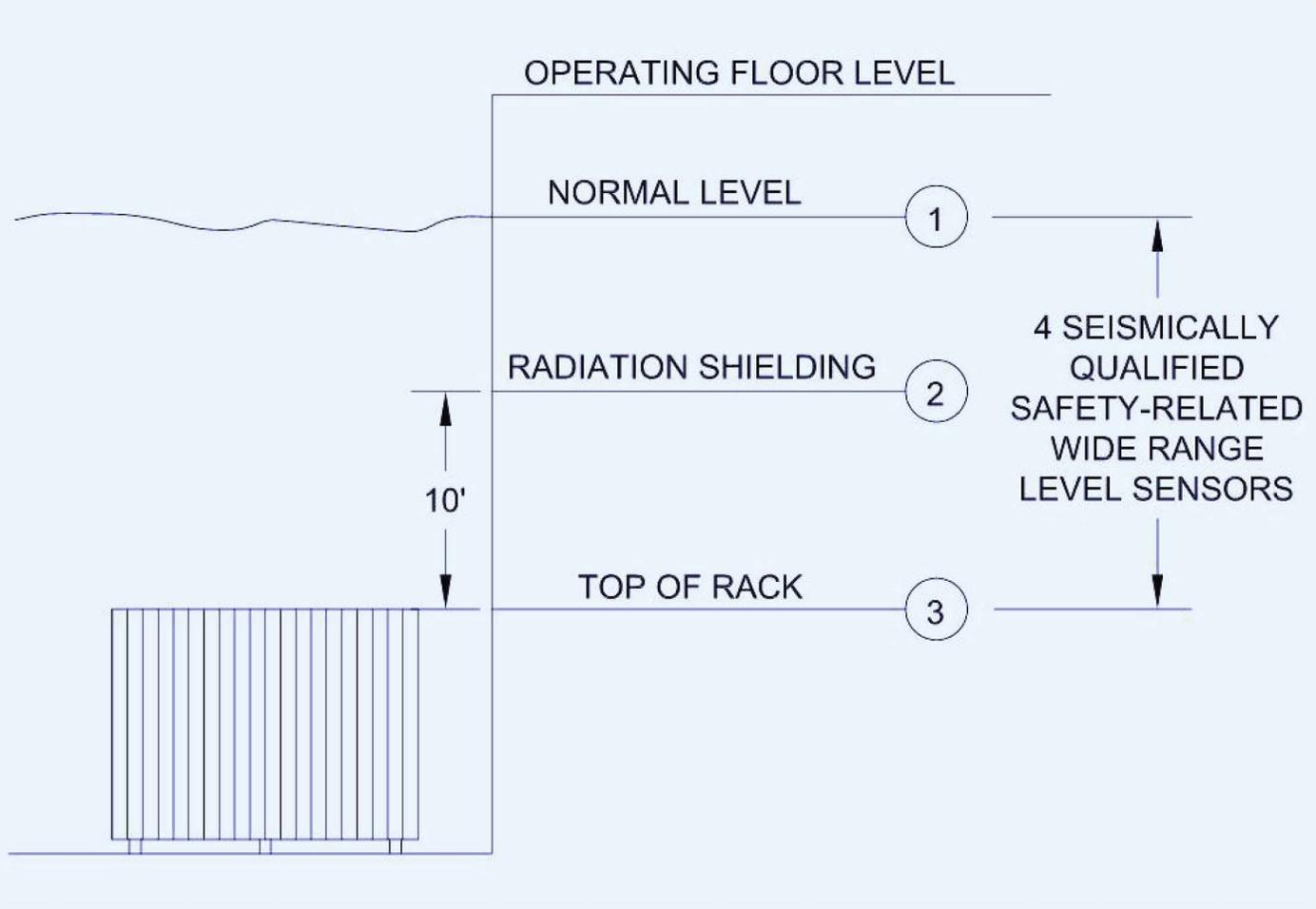
## ◆ COLA Approach

- The design described in DC is incorporated by reference into the COLAs.
  - The COL applicant that references the U.S. EPR™ design will assess their training program to demonstrate that the spent fuel pool instrumentation will be maintained available and reliable in an extended loss of all AC power. Personnel shall be trained in the use and the provision of alternate power to the safety-related level instrument channels.
- Applicable COLA RAIs:
  - UNE received RAI 347 for this item → UNE will submit a response to RAI 347 by November 29, 2012.
  - PPL received RAI 118 for this item → PPL will submit a response to RAI 118 by December 14, 2012.

# Closure Plan for Recommendation 7.1 (continued)



## Spent Fuel Pool Level Instrumentation



## Closure Plan for Recommendation 7.2 – 7.4

- ▶ **Recommendation 7.2 is Tier 2 and requests that licensees provide safety-related AC electrical power for spent fuel pool makeup.**

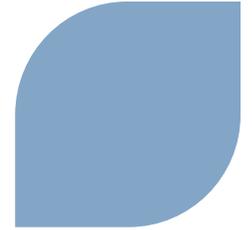
### ◆ DC Approach

- The existing U.S. EPR™ design includes the capability to provide safety-related AC electrical power for spent fuel pool makeup.
- Applicable DC RAIs
  - AREVA has not received an RAI for this item → AREVA awaiting NRC issuance of RAI.

### ◆ COLA Approach

- The design described in DC is incorporated by reference into the COLAs.
- Applicable COLA RAIs
  - UNE and PPL have not received an RAI for this item → UNE and PPL awaiting NRC issuance of RAI.

# Closure Plan for Recommendation 7.2 – 7.4 (continued)



- ▶ **Recommendation 7.3 is Tier 2 and requests that Plant Technical Specifications require one train of emergency onsite electrical power be operable for spent fuel pool makeup/instrumentation when there is irradiated fuel in the spent fuel pool, regardless of plant operating mode.**

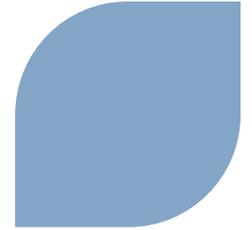
## ◆ DC Approach

- The Plant Technical Specifications will be revised to conform to NTF recommendation 7.3.
- Applicable DC RAIs
  - AREVA has not received an RAI for this item to date → AREVA awaiting NRC issuance of RAI.

## ◆ COLA Approach

- The Plant Technical Specifications described in DC are incorporated by reference into the COLAs.
- Applicable COLA RAIs
  - UNE and PPL have not received an RAI for this item → UNE and PPL awaiting NRC issuance of RAI.

# Closure Plan for Recommendation 7.2 – 7.4 (continued)



- ▶ **Recommendation 7.4 is Tier 2 and requests that a seismically qualified means to spray water into spent fuel pools be provided, including an easily accessible connection to supply water (e.g., using a portable pump or pumper truck) at grade outside of the building.**

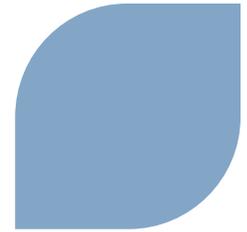
## ◆ DC Approach

- The existing U.S. EPR™ design includes a Spent Fuel Pool Spray System with easily accessible connections to supply water.
- The Spent Fuel Pool Spray System will be seismically qualified.
- Applicable DC RAIs
  - AREVA has not received an RAI for this item → AREVA awaiting NRC issuance of RAI.

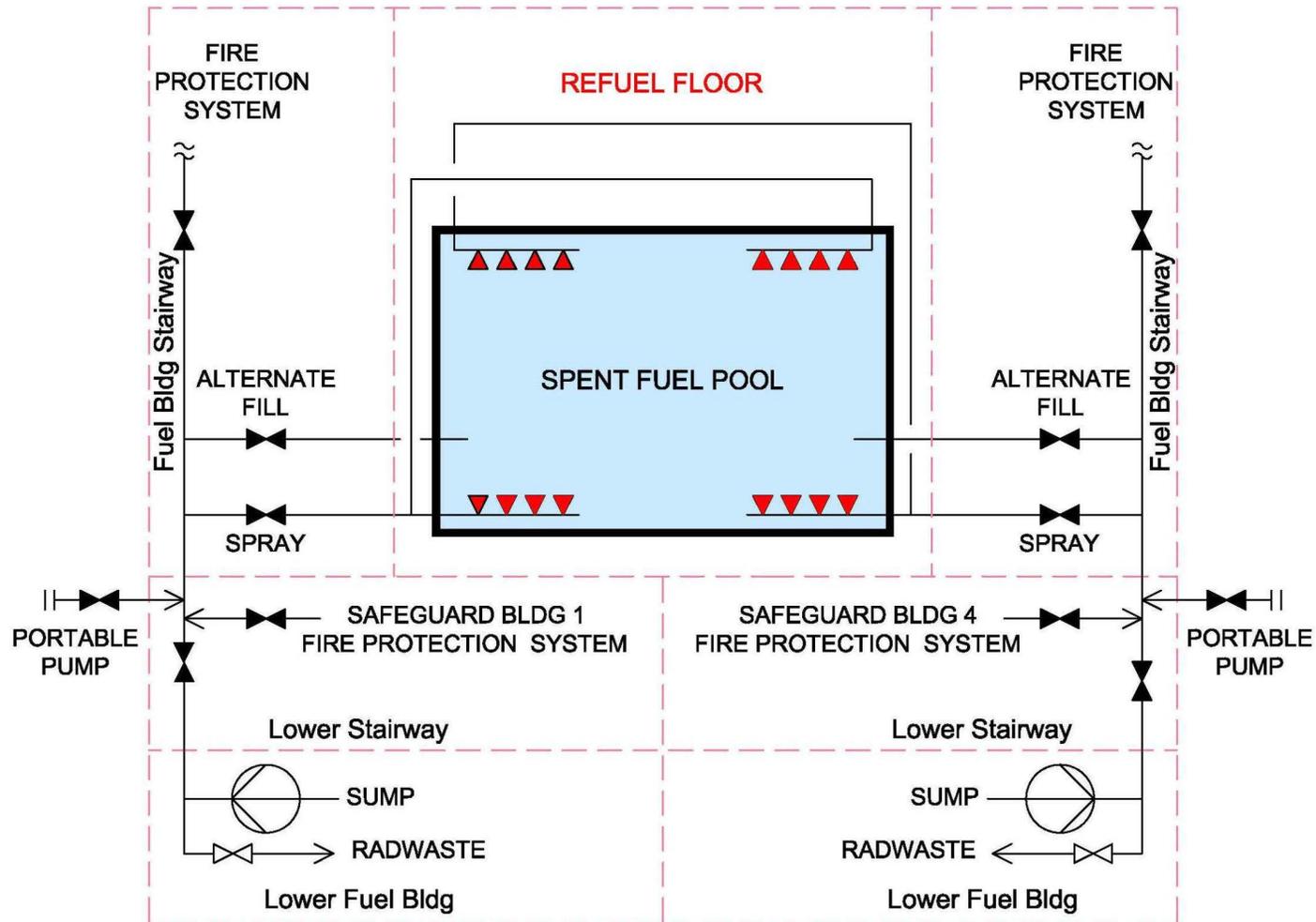
## ◆ COLA Approach

- The design described in DC is incorporated by reference into the COLAs.
- Applicable COLA RAIs
  - UNE and PPL have not received an RAI for this item → UNE and PPL awaiting NRC issuance of RAI.

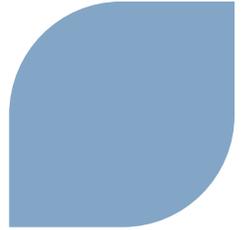
# Closure Plan for Recommendation 7.2 – 7.4 (continued)



## Spent Fuel Pool Spray System



# Closure Plan for Recommendation 8

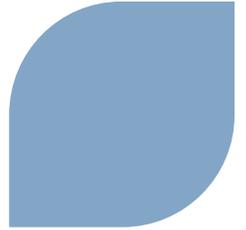


- ▶ **Recommendation 8 is Tier 1 and resulted in an ANPR to support rulemaking. Recommendation 8 requests licensees to strengthen and better integrate EOPs, SAMGs and EDMG's.**

## ◆ DC Approach

- The existing U.S. EPR™ DC includes high-level guidance for Emergency Operating Procedures (EOPs), Severe Accident Management Guidelines (SAMGs) and Extensive Damage Mitigation Guidelines (EDMGs).
- COL Items [13.4-1 and 13.5-1] require the COL applicant to provide site-specific information for administrative, operating, emergency, maintenance and other operating procedures and programs.
- No Applicable DC RAIs → No further action planned for DC for Item 8

# Closure Plan for Recommendation 8 (continued)



## ◆ COLA Approach

- Operating Strategies for Severe Accidents (OSSA) establishes the Mitigating Strategies for Severe Accidents for input to the EOPs.
- The OSSA defines the interface between the EOPs and the SAMGs
- Written procedures shall be established, implemented, and maintained covering the Emergency Operating Procedures required to implement the requirements of NUREG-0737 as stated in Generic Letter 82-33.
- COLA EP Programs are both for single units.
- COLA FSAR Chapter 13 Table 13.4-1 Item 14 and FSAR ITAAC Table 2.3-1 will ensure COLA complies with NTTF 8
- Applicable COLA RAIs
  - UNE and PPL have not received an RAI for this item → UNE and PPL awaiting NRC issuance of RAI.

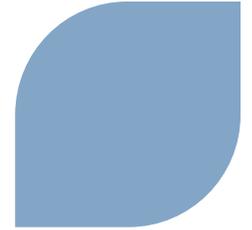
## Closure Plan for Recommendation 9.3 (Tier 1)

► **Recommendation 9.3 is Tier 1 and requires applicants to provide for enhanced EP staffing and communications.**

### ◆ DC Approach

- The existing U.S. EPR™ design includes on-site communications systems that are independent and diverse.
- A COL Item [13.3-1] requires the COL applicant to provide a site-specific Emergency Plan (EP) in accordance with 10 CFR 50.47 and 10 CFR 50, Appendix E.
- A COL Item will be added that requires the COL applicant to assess the capability of their on-site and augmented staff to respond to a large scale natural event resulting in an extended loss of all AC power.
- Applicable DC RAIs
  - AREVA received RAI 549 for this item → AREVA has submitted a draft RAI 549 response. Final response is due September 22, 2012.

# Closure Plan for Recommendation 9.3 (continued)



## ◆ COLA Approach

- COLA development of procedures and guidelines will follow Industry (PWROG, NEI) guidance, as endorsed by applicable NRC regulatory guides, consistent with the Task Force recommendation (SECY-11-0124).
- NEI FAQ 12-12 was issued to address the staffing analysis requirements. The Staffing analysis will be addressed once procedures and equipment are identified. The commitment will incorporate NEI 12-01 and NRC recommendations.
- Enhanced communications will incorporate the recommendations of NEI 12-01 and the NRC for off-site communications.
- ITAAC Table 2.3-1 will be updated as required.
- Applicable COLA RAIs:
  - UNE received RAI 346 for this item → UNE will submit a response to RAI 346 by October 23, 2012.
  - PPL received RAI 118 for this item → PPL will submit a response to RAI 118 by December 21, 2012.

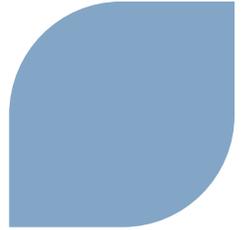
## Closure Plan for Recommendation 9.3 (Tier 2)

- ▶ **Recommendation 9.3 is Tier 2 and requires licensees to enhance their Emergency Plan (e.g., multi-unit dose assessments, periodic training, etc.).**

### ◆ DC Approach

- A COL Item [13.3-1] requires the COL applicant to provide a site-specific Emergency Plan (EP) in accordance with 10 CFR 50.47 and 10 CFR 50, Appendix E.
- Applicable DC RAIs
  - AREVA has not received an RAI for this item → AREVA awaiting NRC issuance of RAI.

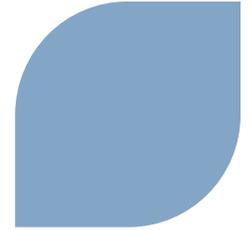
# Closure Plan for Recommendation 9.3 (Tier 2) (continued)



## ◆ COLA Approach

- A site-specific COLA Emergency Plan will be developed that addresses the seven planning standards given an SBO and multi unit sites as applicable once new rule is implemented.
- COLA EP Programs are both for single units.
- Applicable COLA RAIs
  - UNE and PPL have not received an RAI for this item → UNE and PPL awaiting NRC issuance of RAI.

# Closure Plan for Recommendation 4.1

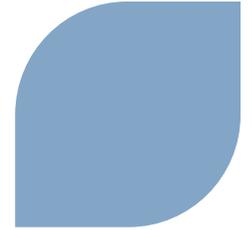


- ▶ **Recommendation 4.1 is Tier 1 and resulted in an ANPR to support rulemaking. Recommendation 4.1 requests licensees to strengthen their Station Blackout (SBO) mitigation capability (10 CFR50.63) under conditions involving significant natural disasters.**

## ◆ DC and COLA Approach

- The DCWG provided comments on the SBO ANPR on May 4, 2012, and recommended the following:
  - The requirements of the current SBO rule (10 CFR 50.63) should remain unchanged.
  - Enhanced mitigation of loss of AC power events involving significant natural disasters should be pursued under the auspices of Order EA-12-049 (Near-Term Task Force Recommendation 4.2).
- No Applicable DC and COLA RAIs → No further action planned for DC or COLA for Item 4.1

# Closure Plan for Recommendation 4.2

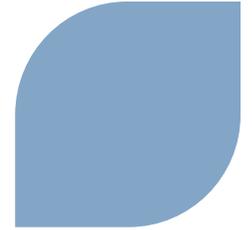


► **Recommendation 4.2 is Tier 1 and resulted in Order EA-12-049. Licensees must enhance mitigation capabilities for beyond design basis external hazards.**

◆ **Order requires a three phase approach:**

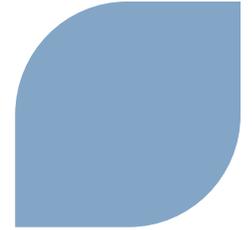
- Phase 1: The initial phase requires the use of installed equipment and resources to maintain or restore core cooling, containment and spent fuel pool (SFP) cooling capabilities.
- Phase 2: The transition phase requires providing sufficient, portable, onsite equipment and consumables to maintain or restore these functions until they can be accomplished with resources brought from off site.
- Phase 3: The final phase requires obtaining sufficient offsite resources to sustain those functions indefinitely.

# Closure Plan for Recommendation 4.2 (continued)



- ◆ **Implement strategies to maintain or restore core cooling, spent fuel cooling and containment for an indefinite coping period.**
- ◆ **Implement strategies in all modes**
- ◆ **Implement strategies assuming simultaneous loss of all AC power [LOOP + loss of EDGs + loss of alternate AC source] + loss of ultimate heat sink**
- ◆ **Provide reasonable protection of mitigating equipment from external events assuming all units on a site are affected**

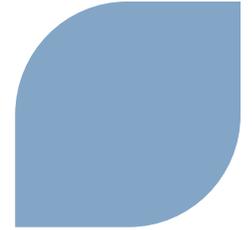
# Closure Plan for Recommendation 4.2 (continued)



## ◆ DC Approach

- The U.S. EPR™ mitigation strategy for Recommendation 4.2 will conform with Order EA-12-049, JLD-ISG-2012-01 and NEI 12-06 with the following clarifications:
  - Acceptance criteria for containment pressure control
  - Reliance on secondary side feed and bleed cooling for Phase 1 event mitigation
  - Reliance on ASCE 07-05 vs. ASCE 07-10 for reasonable protection
- The DC applicant will address Phase 1 event mitigation and will add permanent plant connections (as needed) and identify performance requirements for portable equipment to support long-term event mitigation (interface provisions for Phase 2 and 3 actions).
- **Applicable DC RAIs**
  - AREVA has not received an RAI for this item → AREVA awaiting NRC issuance of RAI.

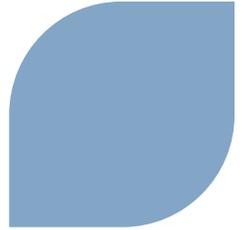
# Closure Plan for Recommendation 4.2 (continued)



## ◆ COLA Approach

- The COLA mitigation strategy for Recommendation 4.2 will conform with the DC mitigation strategy for the U.S. EPR™, and will address Phase 2 and Phase 3 long-term event mitigation.
- Both COLAs endorse the approach of requesting a License Condition proposed by other applicants. The License Condition (summarized here) would require us to implement the following actions prior to initial fuel load:
  - Develop, implement and maintain strategies to maintain or restore core, containment and SFP cooling following beyond design basis external events
  - Provide reasonable protection for associated equipment from external events
  - Submit an integrated plan within one year of COL issuance, including a description of how compliance will be achieved
  - Submit an initial status report within 60 days of COL issuance and provide updates every 6 months after submittal of the integrated plan
- Applicable COLA RAIs
  - COLAs have not received RAIs for this item → COLAs awaiting NRC issuance of RAIs

# Closure Plan for Recommendation 4.2 (continued)



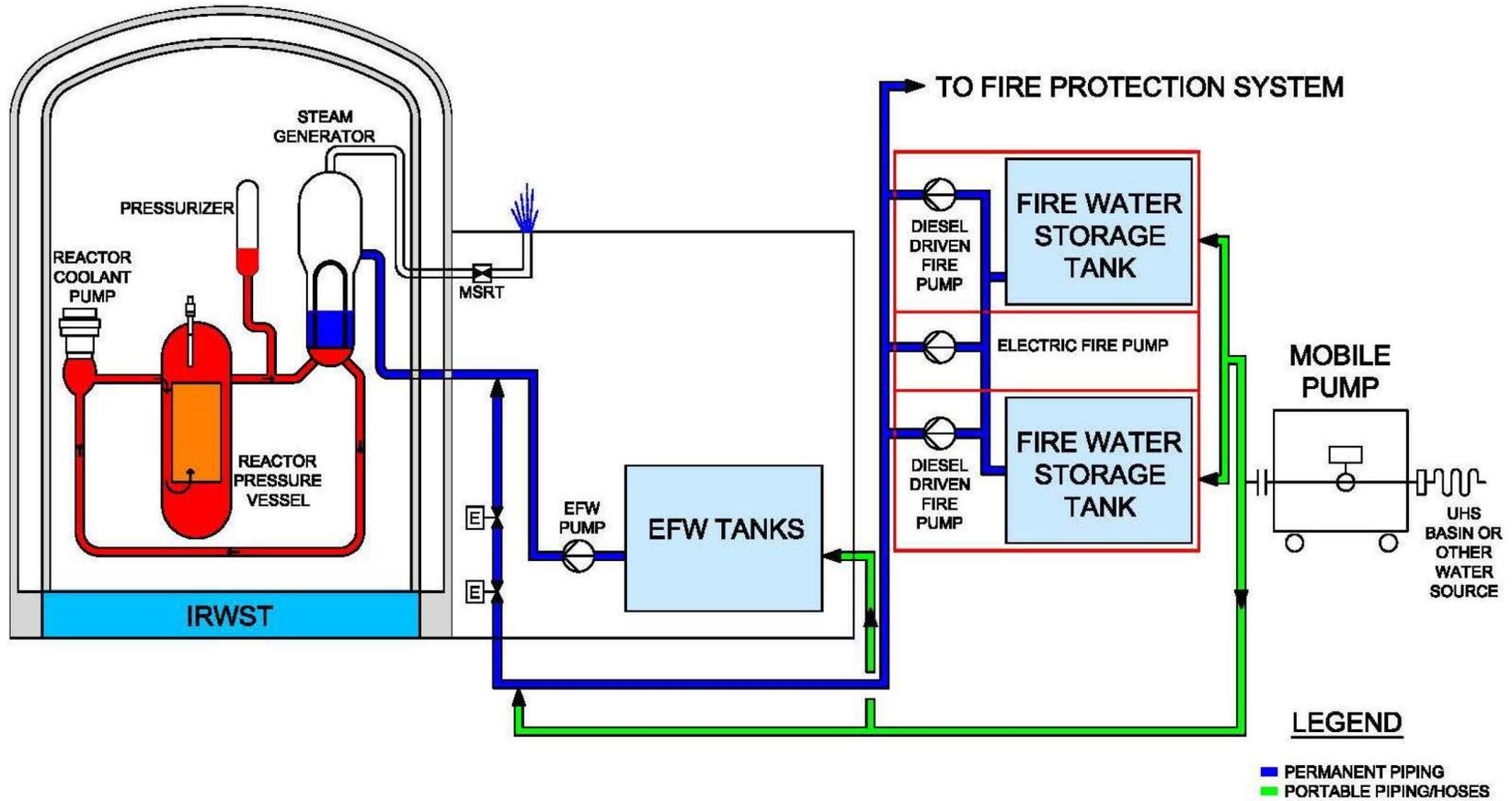
## Acceptance Criteria

FUNCTION	ACCEPTANCE CRITERIA
Core Cooling	Fuel in core remains covered – no fuel damage
Spent Fuel Cooling	Fuel in spent fuel pool remains covered – no fuel damage
Containment Integrity	Containment pressure remains below containment ultimate pressure capacity limits

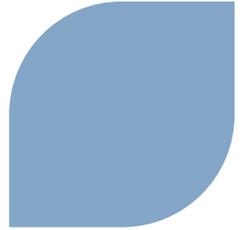
# FLEX Capability – Core Cooling Summary

Safety Function	Method	Phase 1	Phase 2 and 3	
<b>CORE COOLING</b>	<b>Reactor Core Cooling &amp; Heat Removal (steam generators available)</b>	<ul style="list-style-type: none"> <li>Secondary side feed and bleed with Diesel Driven Fire Pump via EFW header</li> <li>Sustained Source of Water</li> <li>Depressurize SG for Makeup with Portable Injection Source</li> </ul>	<ul style="list-style-type: none"> <li>Use of installed equipment for initial coping – permanent seismic piping from Diesel Driven Fire Pump to EFW header</li> <li>SGs will be depressurized using Main Steam Relief Trains.</li> <li>Permanent connection for portable pump</li> <li>Upgrade Fire Water Storage Tanks for reasonable protection.</li> </ul>	<ul style="list-style-type: none"> <li>Portable, self-powered, low pressure (TBD) pump</li> <li>Mobile means to refill fire water storage tank</li> <li>Mobile means to refill fire pump diesel tanks and lube oil</li> </ul>
	<b>Core Cooling and Heat Removal (Modes 5 and 6 with SGs not available)</b>	<ul style="list-style-type: none"> <li>Provide Borated RCS Makeup</li> </ul>	<ul style="list-style-type: none"> <li>Diverse makeup connections to RCS for long-term RCS makeup and residual heat removal to vented RCS</li> <li>Permanent connection for portable pump</li> <li>Borated water source is In-containment Refueling Water Storage Tank (IRWST)</li> <li>Depending on which operating condition, an RCS vent path may need to be established (pressurizer relief valves).</li> </ul>	<ul style="list-style-type: none"> <li>Portable, self-powered, RCS makeup pump (low pressure)</li> </ul>
	<b>RCS Inventory Control/Long-Term Subcriticality</b>	<ul style="list-style-type: none"> <li>Low Leak RCP Seals and/or borated high pressure RCS makeup required</li> </ul>	<ul style="list-style-type: none"> <li>Credit RCP standstill seals to limit RCP seal leakage during initial event mitigation.</li> <li>Permanent connection for portable pump</li> <li>Borated water source is In-containment Refueling Water Storage Tank (IRWST) or Extra Borating System (EBS) tanks .</li> </ul>	<ul style="list-style-type: none"> <li>Portable, self-powered, RCS makeup pump</li> <li>Mobile means to refill Extra Borating System (EBS) tanks</li> <li>Repowering an installed pump (e.g., EBS) may be the preferred approach</li> </ul>
	<b>Key Reactor Parameters</b>	<ul style="list-style-type: none"> <li>SG Level</li> <li>SG Pressure</li> <li>RCS Pressure</li> <li>RCS Temperature</li> </ul>	<ul style="list-style-type: none"> <li>Instruments powered by class 1E dc bus</li> <li>External connections (primary) to low voltage switchgear for mobile power source or mobile charger</li> </ul>	<ul style="list-style-type: none"> <li>Re-power batteries using portable, AC source</li> </ul>

# Secondary Side Feed and Bleed

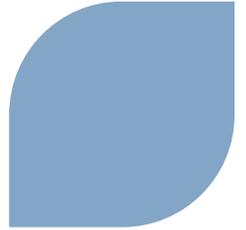


# Diesel Driven Fire Pumps and Storage Tanks



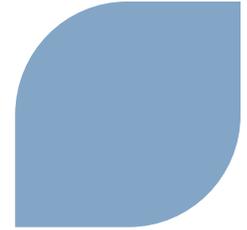
- ▶ **Each Diesel Driven Fire Pump has a rated flow rate of 2,500 gpm at a pressure of 185 psi.**
  - ◆ **Each diesel driven Fire Water Pump has a flow capacity that exceeds 4 EFW pumps.**
  - ◆ **The discharge pressure of the Diesel Driven Fire Pump will be confirmed by the RELAP5 analysis.**
- ▶ **Two (2) 300,000 gallon Fire Water Storage Tanks are provided.**
  - ◆ **An existing non-LOCA cooldown analysis shows 390,000 gallons of EFW consumed in about 18 hours.**
- ▶ **The Fire Protection Storage Tanks and Buildings are classified as Conventional Seismic Structures and meet the requirements of RG 1.189, “Fire Protection for Nuclear Power Plants”.**
- ▶ **Reasonable protection of the Fire Protection Storage Tanks will address missile protection from high winds.**

# Estimated Event Timeline – SGs Available



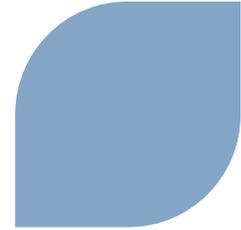
<u>TIME</u>	<u>STEP</u>
00:00	Extended loss of ac power. Decay heat to be removed by natural circulation.
1 – 1.5 hrs	Operator initiates SG depressurization with MSRTs and SG fill from diesel driven Fire Water pump prior to SG dryout. Initial feed flow rate is between 400 - 800 gpm.
1 – 1.5 hrs	Begin dc power load shed.
TBD	Borated RCS makeup via Accumulators. Isolate Accumulators or vent nitrogen prior to nitrogen injection. Borated RCS makeup then provided via portable pump or EBS pump powered by small portable diesel generator.
> 8 hrs	Recharge batteries with portable power supply.
18 - 20 hrs	Refill Fire Water Storage Tanks from other water sources ( e.g. UHS basin).
~ 24 hrs	Monitor Spent Fuel Pool level. Commence makeup to Spent Fuel Pool if necessary.
24 hrs	Utilize off site resources.

# FLEX Capability – Containment Summary



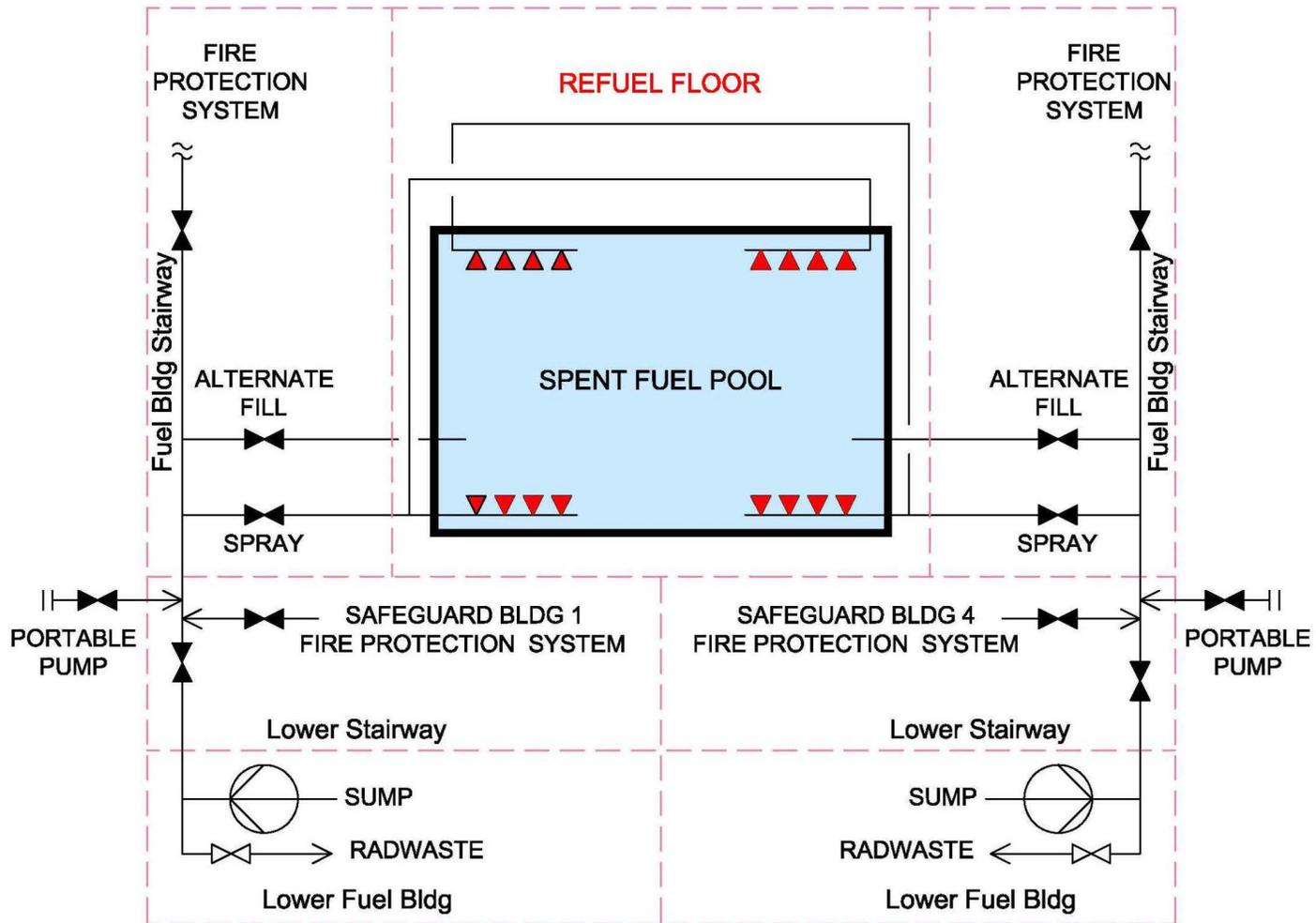
	Safety Function	Method	Phase 1	Phase 2 and 3
<b>CONTAINMENT</b>	Containment Function, Containment Pressure Control/Heat Removal	<ul style="list-style-type: none"> <li>Containment Spray, or alternate capability, or Analysis</li> </ul>	<ul style="list-style-type: none"> <li>In the short-term, isolate containment by closing DC powered Containment Isolation Valves.</li> <li>Primary Connections (primary and alternate) to containment spray header or alternate capability or Analysis</li> <li>No containment venting</li> </ul>	<ul style="list-style-type: none"> <li>Portable means to cool containment or IRWST (if required).</li> </ul>
	Key Containment Parameters	<ul style="list-style-type: none"> <li>Containment Pressure</li> </ul>	<ul style="list-style-type: none"> <li>Instruments powered by class 1E dc bus</li> <li>External connections (primary) to low voltage switchgear for mobile power source or mobile charger</li> </ul>	<ul style="list-style-type: none"> <li>Re-power batteries using portable, AC source</li> </ul>

# FLEX Capability – Spent Fuel Cooling Summary

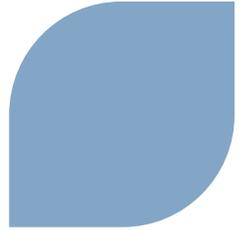


Safety Function		Method	Phase 1	Phase 2 and 3
SPENT FUEL COOLING	Spent Fuel Cooling	<ul style="list-style-type: none"> <li>• Makeup via hoses directly to pool</li> <li>• Makeup via connection to SFP makeup piping or other suitable means (e.g., sprays).</li> <li>• Makeup with Portable Injection Source</li> </ul>	<ul style="list-style-type: none"> <li>• In the short-term, the spent fuel will be cooled by maintaining water inventory above the top of the spent fuel.</li> <li>• Connections (primary and alternate) to Spent Fuel Pool spray header</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Portable, self-powered, low pressure (TBD) pump</b></li> </ul>
	SFP Parameters	<ul style="list-style-type: none"> <li>• SFP Level</li> </ul>	<ul style="list-style-type: none"> <li>• Instruments powered by class 1E dc bus</li> <li>• EPR design includes 4 Safety-Related wide range level sensors in the Spent Fuel Pool that meet the intent of EA 12-051.</li> <li>• Capability to disconnect a WR level sensor in the I&amp;C Room and attach to a portable battery powered indication device.</li> <li>• External connections (primary) to low voltage switchgear for mobile power source or mobile charger</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Re-power batteries using portable, AC source</b></li> <li>• <b>Portable battery powered indication device.</b></li> </ul>

# Spent Fuel Pool Spray System

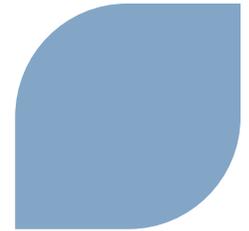


# Spent Fuel Pool Heatup Times



- ▶ **With no credit taken for makeup water being added to the Spent Fuel Pool, the time to uncover the fuel (from a temperature of 140°F) is greater than 24 hours.**
- ▶ **Per Section 3.2.1.1 of NEI 12-06, Rev. 0, the requirement is to keep fuel in the spent fuel pool covered.**
- ▶ **Since there is SFP level indication (including portable indication), there will be ample time to makeup to the Spent Fuel Pool .**

# FLEX Capability – Support Functions Summary

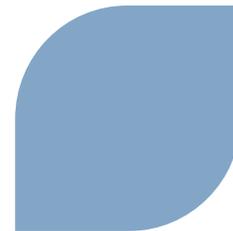


Safety Function	Method	Phase 1	Phase 2 and 3	
<b>SUPPORT FUNCTIONS</b>	ac power	<ul style="list-style-type: none"> <li>ac distribution system</li> </ul>	<ul style="list-style-type: none"> <li>ac distribution system</li> </ul>	<ul style="list-style-type: none"> <li>Portable, AC source (on-site)</li> <li>ac distribution system</li> </ul>
	dc power	<ul style="list-style-type: none"> <li>Batteries</li> <li>dc distribution system</li> </ul>	<ul style="list-style-type: none"> <li>Batteries</li> <li>dc distribution system</li> </ul>	<ul style="list-style-type: none"> <li>Re-power batteries using portable, AC source (on-site)</li> <li>dc distribution system</li> </ul>
	Communications	<ul style="list-style-type: none"> <li>Plant communication systems</li> </ul>	<ul style="list-style-type: none"> <li>Plant communication systems</li> </ul>	<ul style="list-style-type: none"> <li>Portable communication systems</li> </ul>
	Lighting	<ul style="list-style-type: none"> <li>Emergency lighting</li> </ul>	<ul style="list-style-type: none"> <li>Emergency lighting powered by dc power system</li> </ul>	<ul style="list-style-type: none"> <li>Portable lighting systems</li> <li>Portable, AC source</li> </ul>
	HVAC	<ul style="list-style-type: none"> <li>Portable Ventilation Fans &amp; Hoses / trunks</li> </ul>		<ul style="list-style-type: none"> <li>Portable Ventilation Fans &amp; Hoses / trunks</li> <li>Portable, AC source</li> </ul>

# Reasonable Protection

- ▶ **Storage locations for mitigation equipment must provide reasonable protection from external events as necessary to allow the equipment to perform its function without loss of capability. External conditions address:**
  - ◆ **Seismic**
  - ◆ **External Flooding**
  - ◆ **Storms with High Winds (Hurricanes, tornadoes, etc.)**
  - ◆ **Snow, Ice, Low Temperatures**
  - ◆ **Extreme High Temperatures**
- ▶ **Reasonable protection of installed and portable equipment for the U.S. EPR™ is provided as follows:**
  - ◆ **Reasonable protection of installed and portable equipment conforms with JLD-ISG-2012-01 and NEI 12-06, *Diverse and Flexible Coping Strategies (FLEX) Implementation Guide*, with one exception:**
    - For non-CAT I structures, the U.S. EPR™ is committed to ASCE 07-05, “*Minimum Design Loads for Buildings and Other Structures*” instead of ASCE 7-10.

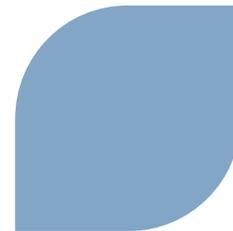
# Closure Plan for SECY-12-0025, Enclosure 2 Recommendation



- ▶ **Recommendation from SECY-12-0025, Enclosure 2 is Tier 1 is related to NTTF 2.1, 2.3, 4.1, and 4.2. and requests the inclusion of loss of UHS as a design assumption in conjunction with strategies for dealing with prolonged SBO, and address loss of access to normal UHS in conjunction with measures taken to deal with beyond-design-basis external hazards.**

## ◆ **DC and COLA Approach**

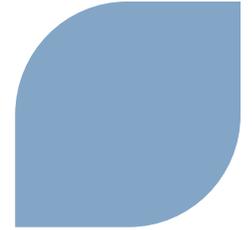
- See Closure Plans for NTTF 2.1 and 4.2 above. Loss of UHS is considered in the mitigation strategy for beyond-design-basis external hazards.
- No Applicable DC or COLA RAIs → No further action planned for DC or COLA for SECY-12-0025, Enclosure 3 recommendation



# Path to Closure for U.S. EPR™ Fukushima Response

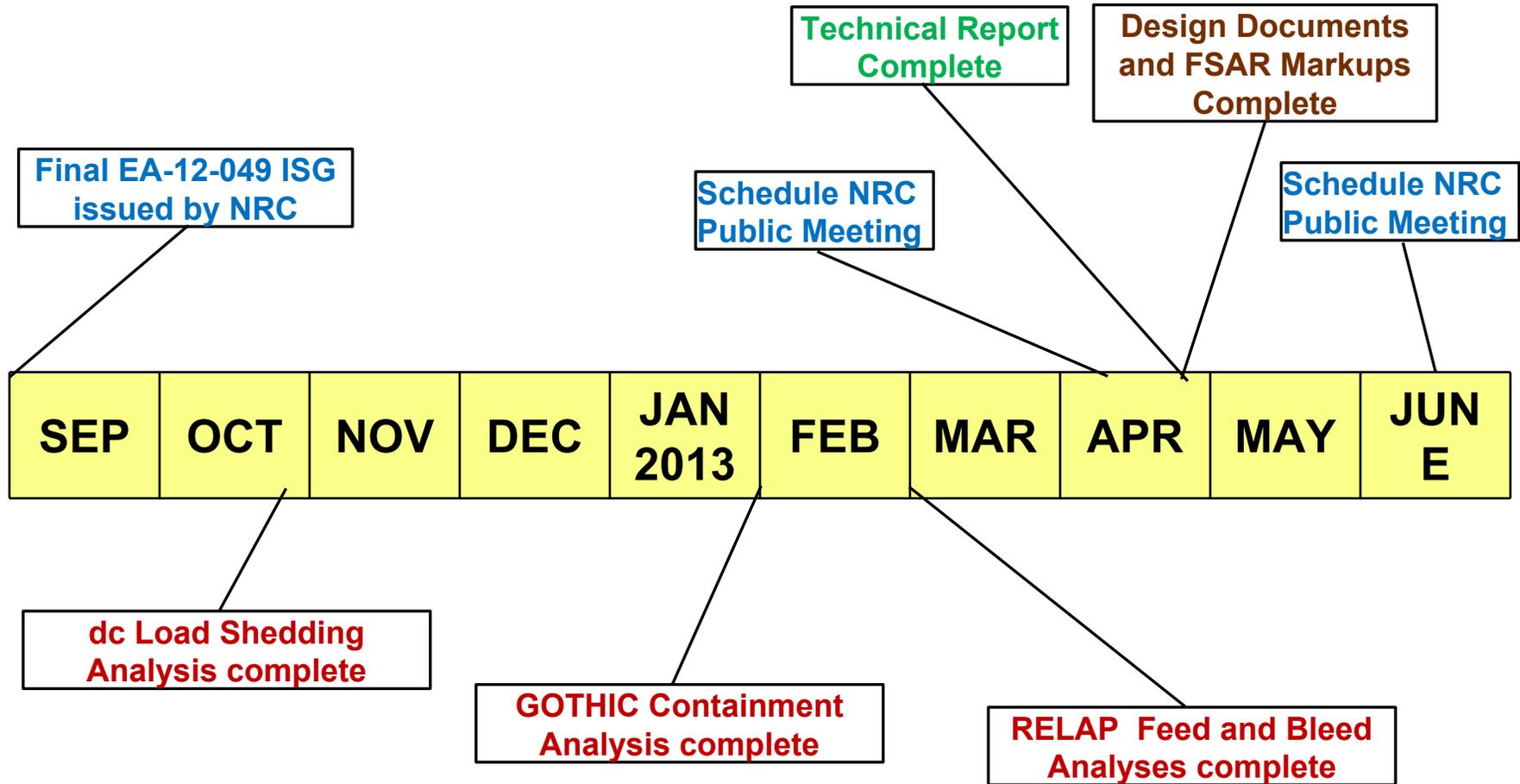
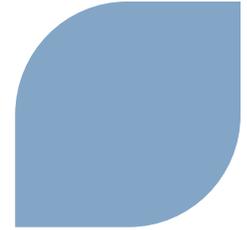


# Summary of Open RAIs

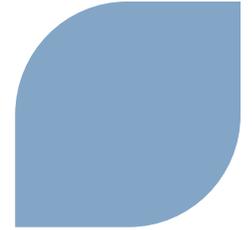


RAI	Question No.	Topic/Subject	Draft to NRC	Final to NRC
549	13.03-8	Emergency preparedness as it relates to staffing and communications associated - Implementation of Fukushima Task Force Recommendation 9.3	24 May 2012	22 Sept. 2012
550	09.01.03-16	Reliable Spent Fuel Instrumentation - Implementation of Fukushima Task Force Recommendation 7.1	11 Sept. 2012	31 Oct. 2012
CCNPP Unit 3 RAI 345	02.05.02-24	Vibratory Ground Motion - Implementation of Fukushima Task Force Recommendation 2.1	N/A	09/12/2012 (actual)
CCNPP Unit 3 RAI 346	13.03-51	Emergency Planning (Implementation of Fukushima Task Force Recommendation 9.3)	N/A	10/23/2012
CCNPP Unit 3 RAI 347	09.01.03-1	Spent Fuel Pool Cooling and Cleanup System (Attachment 3 to Order EA-12-051)	N/A	11/29/2012
BBNPP RAI 118	02.05.02-1	Vibratory Ground Motion - Implementation of Fukushima Task Force Recommendation 2.1	N/A	11/16/2012
BBNPP RAI 118	13.03-52	Emergency Planning (Implementation of Fukushima Task Force Recommendation 9.3)	N/A	12/21/2012
BBNPP RAI 118	09.01.03-1	Spent Fuel Pool Cooling and Cleanup System (Attachment 3 to Order EA-12-051)	N/A	12/14/2012

# Timeline for Closure of U.S. EPR™ Fukushima Response



## Next Steps



- 1. NRC issue RAIs as soon as possible.**
- 2. Periodic updates during bi-monthly DCWG / NRC meetings.**
- 3. Establish approach for updating COLA FSARs.**
- 4. Public meetings or NRC audits as required.**
- 5. Public meeting prior to issuing Technical Report on U.S. EPR™ Fukushima Response.**
- 6. Submit Technical Report on U.S. EPR™ Fukushima Response.**