

## ArevaEPRDCPEm Resource

---

**From:** Eudy, Michael  
**Sent:** Friday, April 11, 2014 5:37 PM  
**To:** david.white@areva.com; HOTTLE Nathan (AREVA) (Nathan.Hottle@areva.com)  
**Cc:** Segala, John; Wunder, George; Li, Chang; McKenna, Eileen; Kellum, Jim; Law, Yiu; Peng, Shie-Jeng; Pohida, Marie; Phan, Hanh; ArevaEPRDCPEm Resource; Stubbs, Angelo; Hernandez, Raul; Park, Sunwoo; Zimmerman, Jacob; Som, Swagata; Clark, Theresa; McKirgan, John; Zhao, Jack; Mazaika, Michael; Budzynski, John; Thomas, George; Scarbrough, Thomas; Strnisha, James; Grady, Anne-Marie; Swain, Patricia; Mrowca, Lynn; Le, Hien; Frankl, Istvan  
**Subject:** NRC List of AREVA Fukushima 3/19/14 Public Meeting Outcomes  
**Attachments:** NRC List of AREVA Fukushima 3-19-14 Public Meeting Outcomes.docx; NRC meeting - March 19 2014 Fukushima update.pdf

David,

The attached is the NRC list of the action items and outcomes from the AREVA/NRC 3/19/14 Public Meeting related to Fukushima issues. Please let me know if you have any questions.

Michael A. Eudy - Project Manager  
U.S. Nuclear Regulatory Commission  
NRO/DNRL/LB3  
301-415-3104

**Hearing Identifier:** AREVA\_EPR\_DC\_RAIs  
**Email Number:** 4857

**Mail Envelope Properties** (9E28710E0B702149AEC663972863644002076BB1D454)

**Subject:** NRC List of AREVA Fukushima 3/19/14 Public Meeting Outcomes  
**Sent Date:** 4/11/2014 5:36:55 PM  
**Received Date:** 4/11/2014 5:37:00 PM  
**From:** Eudy, Michael

**Created By:** Michael.Eudy@nrc.gov

**Recipients:**

"Segala, John" <John.Segala@nrc.gov>  
Tracking Status: None  
"Wunder, George" <George.Wunder@nrc.gov>  
Tracking Status: None  
"Li, Chang" <Chang.Li@nrc.gov>  
Tracking Status: None  
"McKenna, Eileen" <Eileen.McKenna@nrc.gov>  
Tracking Status: None  
"Kellum, Jim" <Jim.Kellum@nrc.gov>  
Tracking Status: None  
"Law, Yiu" <Yiu.Law@nrc.gov>  
Tracking Status: None  
"Peng, Shie-Jeng" <Shie-Jeng.Peng@nrc.gov>  
Tracking Status: None  
"Pohida, Marie" <Marie.Pohida@nrc.gov>  
Tracking Status: None  
"Phan, Hanh" <Hanh.Phan@nrc.gov>  
Tracking Status: None  
"ArevaEPRDCPEm Resource" <ArevaEPRDCPEm.Resource@nrc.gov>  
Tracking Status: None  
"Stubbs, Angelo" <Angelo.Stubbs@nrc.gov>  
Tracking Status: None  
"Hernandez, Raul" <Raul.Hernandez@nrc.gov>  
Tracking Status: None  
"Park, Sunwoo" <Sunwoo.Park@nrc.gov>  
Tracking Status: None  
"Zimmerman, Jacob" <Jacob.Zimmerman@nrc.gov>  
Tracking Status: None  
"Som, Swagata" <Swagata.Som@nrc.gov>  
Tracking Status: None  
"Clark, Theresa" <Theresa.Clark@nrc.gov>  
Tracking Status: None  
"McKirgan, John" <John.McKirgan@nrc.gov>  
Tracking Status: None  
"Zhao, Jack" <Jack.Zhao@nrc.gov>  
Tracking Status: None  
"Mazaika, Michael" <Michael.Mazaika@nrc.gov>  
Tracking Status: None  
"Budzynski, John" <John.Budzynski@nrc.gov>  
Tracking Status: None  
"Thomas, George" <George.Thomas@nrc.gov>

Tracking Status: None  
"Scarbrough, Thomas" <Thomas.Scarbrough@nrc.gov>  
Tracking Status: None  
"Strnisha, James" <James.Strnisha@nrc.gov>  
Tracking Status: None  
"Grady, Anne-Marie" <Anne-Marie.Grady@nrc.gov>  
Tracking Status: None  
"Swain, Patricia" <Patricia.Swain@nrc.gov>  
Tracking Status: None  
"Mrowca, Lynn" <Lynn.Mrowca@nrc.gov>  
Tracking Status: None  
"Le, Hien" <Hien.Le@nrc.gov>  
Tracking Status: None  
"Frankl, Istvan" <Istvan.Frankl@nrc.gov>  
Tracking Status: None  
"david.white@areva.com" <david.white@areva.com>  
Tracking Status: None  
"HOTTLE Nathan (AREVA) (Nathan.Hottle@areva.com)" <Nathan.Hottle@areva.com>  
Tracking Status: None

**Post Office:** HQCLSTR01.nrc.gov

<b>Files</b>	<b>Size</b>	<b>Date &amp; Time</b>	
MESSAGE	313	4/11/2014 5:37:00 PM	
NRC List of AREVA Fukushima 3-19-14 Public Meeting Outcomes.docx			22456
NRC meeting - March 19 2014 Fukushima update.pdf	681530		

**Options**

<b>Priority:</b>	Standard
<b>Return Notification:</b>	No
<b>Reply Requested:</b>	No
<b>Sensitivity:</b>	Normal
<b>Expiration Date:</b>	
<b>Recipients Received:</b>	

April 11, 2014  
NRC list of AREVA Fukushima 3/19/14 Public Meeting Outcomes

AREVA Action Items:

- AREVA planned to submit all outstanding Fukushima related RAIs by Sept 30, 2014. This includes RAI 563, 598, 623, 624, and 626.
- AREVA planned to submit Revision 1 of TR ANP-10329 by Sept 30, 2014.
- AREVA needs to move forward on scheduling pending audit for GOTHIC – HVAC analysis for MCR and Safeguards buildings.
- AREVA to suggest dates for S-RELAP5 audit tentatively scheduled for June/July.
- AREVA to clarify discrepancy found in RAI 526 Q9.1.3-15 related to 55.5 foot SPF water level specified in FSAR but 62.3 ft level indicated in Fukushima response. SFP time to boil audit may or may not be necessary after AREVA clarifies this issue.

NRC Action Items:

- NRC would need to perform a new GOTHIC containment analysis audit after seeing modifications presented during the meeting. NRC to provide a revised GOTHIC containment analysis audit plan based on changes discussed. **(completed 4/1/14)**
- NRC to provide a revised S-RELAP5 audit plan. **(pending)**
- NRC to continue review of 3/19/14 TR ANP-10329 Disposition Matrix and provide any additional feedback and schedule public meeting if necessary. **(completed 4/11/14)**

Points to consider:

- Pending NRC audits may result in new RAIs.
- AREVA has reviewed conforming changes and has not found any impacts on Group A Chapters.
- NRC stated that Fukushima related COL items should dictate imposed design criteria and be clearly spelled out.
- NRC stated that structural methods for Phase 2 and 3 structures should be described to show protection of portable equipment.
- AREVA needs to consider surge line flooding related to RAI 624. In addition, the status of the accumulator and gravity injection should be clarified.
- AREVA would remove containment venting from Fukushima mitigation strategies as it relates to RAI 598.
- AREVA needs to give more specifics about the design criteria with respect to Fukushima mitigation for SSCs as they relate to AWWA D100-2005 and ASCE 43-05.



# **U.S. EPR – Fukushima Path to Closure**

March 19, 2014

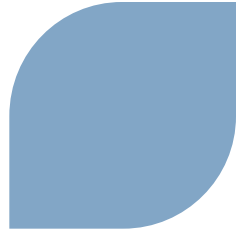
Tim Stack, Len Gucwa, David White,

Robert Weiss, Joe Delrue

U.S. EPR Design Certification

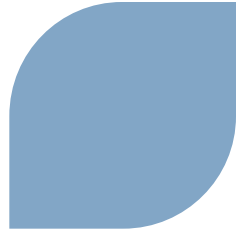


# Agenda



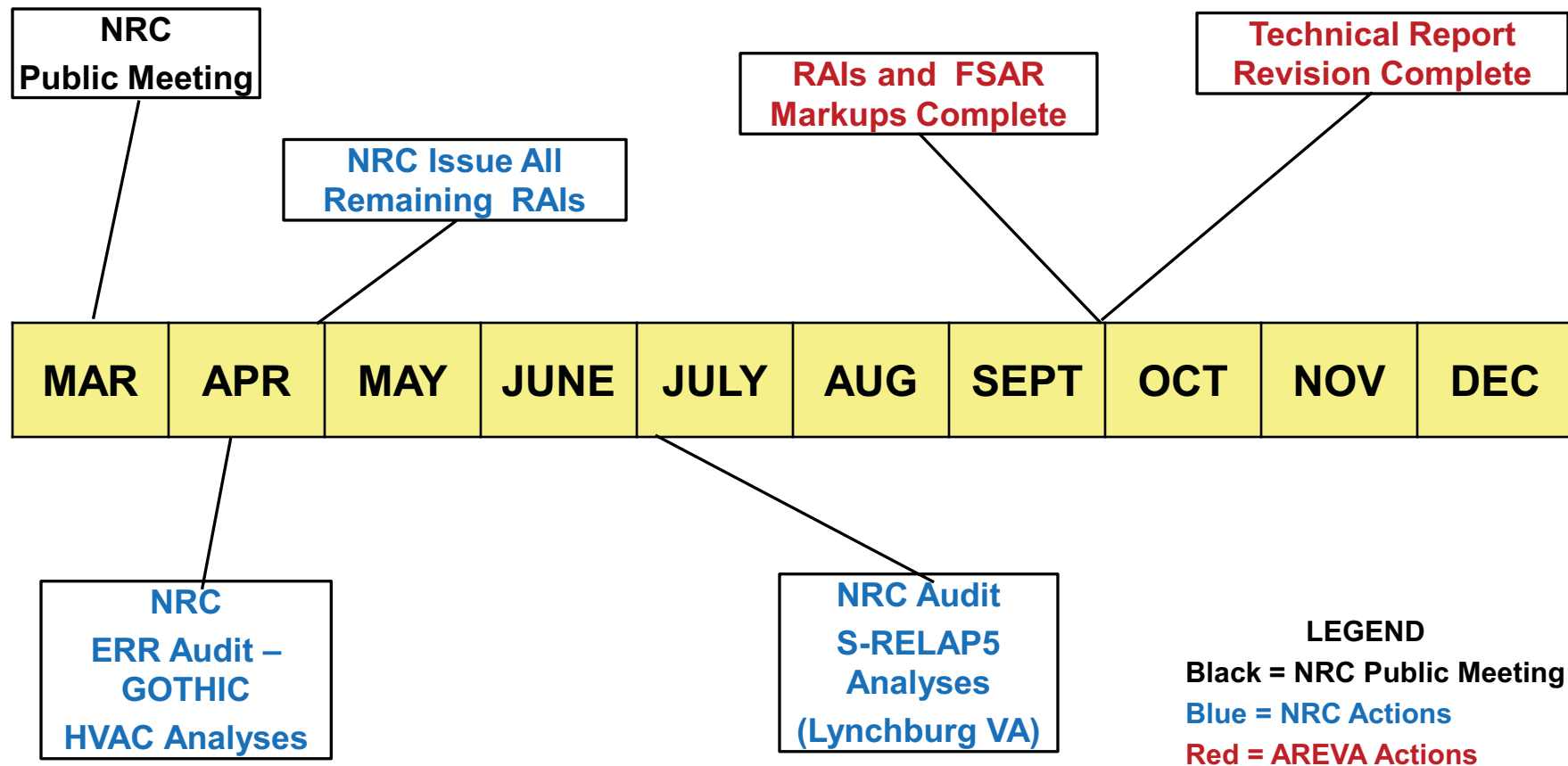
- ▶ Introductions (**10 minutes**)
- ▶ Purpose and Background (**30 minutes**)
- ▶ NRC feedback on RAI 563 and June 25, 2013 meeting (**2 hours**)
- ▶ Design modifications and analyses (**1 hour**)
- ▶ DCD incorporation plan (**30 minutes**)
- ▶ RAI and audit status (**30 minutes**)
- ▶ Summary and next steps (**25 minutes**)

## Meeting Purpose



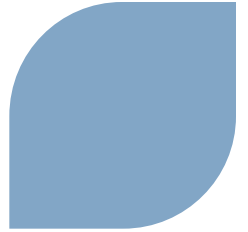
- ▶ **Present the closure plan and associated schedule for the U.S. EPR Fukushima Mitigation Strategy**
- ▶ **Confirm agreement with NRC on the path to closure for the U.S. EPR Fukushima Mitigation Strategy**

# 2014 Schedule





# Background



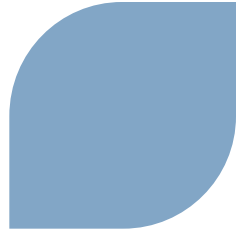
- ▶ Earthquake and tsunami in Japan resulted in core damage at three of the reactors at the Fukushima Dai-ichi plant site, March 11, 2011
- ▶ NRC issued initial findings for the event, *“The Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident,”* July 12, 2011
- ▶ NRC issued Order EA-12-049, *“Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events,”* March 12, 2012
- ▶ NRC issued Order EA-12-051, *“Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation,”* March 12, 2012

# Design Certification RAI Status

RAI	Question No.	Topic/Subject	Status
549	13.03-8	Emergency preparedness as it relates to staffing and communications associated - Implementation of Fukushima Task Force Recommendation 9.3	14 Sept. 2012 CLOSED
550	09.01.03-16	Reliable Spent Fuel Instrumentation - Implementation of Fukushima Task Force Recommendation 7.1 → <b>This RAI addresses Order EA-12-051</b>	25 Oct. 2012 CLOSED
563	19-356	Mitigation Strategies for Beyond-Design-Basis External Events – Recommendation 4.2 → <b>This RAI addresses Order EA-12-049</b>	Advance response submitted 4 May 2013 Final Response: 3Q CY2014
598	06.02.01-106	Containment venting and containment heat removal	Issued on 14 Aug 2013 Final Response: 3Q CY2014
623	19.02-1 – 19.02-4	NRC questions on performance requirements for SR, NSR, and portable components used in the mitigation strategy	Issued 6 Feb. 2014 Final Response: 3Q CY2014
624	19-372	Mode 5 & 6 vulnerability	Issued 6 Feb. 2014 Final Response: 3Q CY2014
626	06.03-19	Single failure and design condition of check valve on discharge of Primary Coolant Injection Pump	Issue March 2014 Final Response: 3Q CY2014

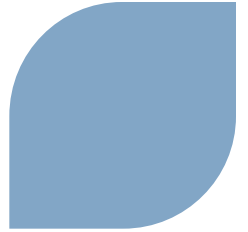
**Open RAIs relate to Order EA-12-049**

# Background



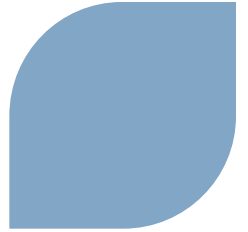
- ▶ For mitigation of beyond-design-basis external events, Order EA-12-049 requires a three phase approach:
  - ◆ **Phase 1:** The **initial phase** requires the use of **installed equipment** and resources to maintain or restore **core cooling, containment and spent fuel pool (SFP) cooling capabilities**.
  - ◆ **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.

# Background



- ▶ To address Order EA-12-049, AREVA issued Technical Report ANP-10329 Rev. 0, “*U.S. EPR Mitigation Strategies for Extended Loss of AC Power Event*” and associated FSAR markups
- ▶ Division of responsibilities in Technical Report ANP-10329:
  - ◆ DC Applicant (AREVA) – Phase 1 baseline coping capability with installed equipment, describes permanent plant connections, and identifies performance requirements for portable equipment to support long-term event mitigation (interface provisions for Phase 2 and 3 actions).
  - ◆ COL Applicant – Phase 2 and 3 ELAP event implementation strategies. COLA interface requirements specified by AREVA in Technical Report ANP-10329 via COL Items.

# NRC feedback on RAI 563 and June 25, 2013 meeting



- ▶ On June 25, 2013, public meeting held to discuss NRC feedback on RAI 563 and Technical Report ANP-10329 → **final disposition of NRC feedback was not reached**

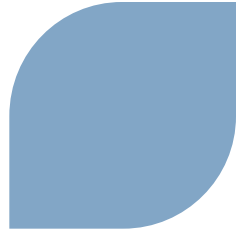
- ◆ **Key Topics**

1. Treatment of Shutdown States
2. Containment Venting
3. Seismic Design and Reasonable Protection Requirements

- ◆ **NRC Feedback Disposition Matrix**

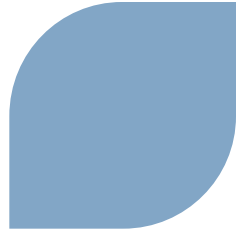
**Closure on NRC feedback is needed to  
finalize Fukushima Mitigation Strategy**

# Treatment of Shutdown States



- ▶ **Issue:** NEI FLEX Guide (NEI 12-06) and Order EA 12-049 require that licensees be capable of mitigating events initiated in all modes. NEI FLEX Guide (NEI 12-06) is largely focused on events initiated in operating states.
- ▶ On September 18, 2013, NEI submitted position paper on Shutdown / Refueling Modes (ML13273A514) to clarify original FLEX Guide.
  - ◆ NEI position paper describes how licensees will, by procedure, maintain equipment available for deployment in shutdown and refueling modes.
- ▶ NRC endorsed the NEI position paper in letter dated September 30, 2013 (ML13267A382).
  - ◆ NRC staff concluded that position paper provides an acceptable approach for demonstrating that licensees are capable of implementing mitigation strategies in all modes of operation, including shutdown and refueling modes
  - ◆ NRC staff will evaluate licensee's resulting program through the audit and inspection process.

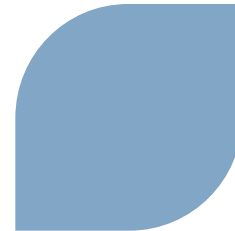
# Treatment of Shutdown States (continued)



## ► AREVA position:

- ◆ Treatment of shutdown states is tied to resolution of RAI 624 (Mode 5 and 6 vulnerability).
- ◆ Additional S-RELAP5 analyses in Modes 5 and 6 are being performed that will resize the Primary Coolant Injection Pump (higher total developed head) to accommodate these scenarios.
- ◆ For RAI 624, U.S. EPR strategy:
  - Will take credit for additional capabilities of Primary Coolant Injection Pump in combination with venting using Primary Depressurization System valves to provide feed and bleed cooling.
  - Will align with NRC endorsed, industry prepared shutdown risk guidance.
  - Will credit COL applicant procedures and processes to manage risk during shutdown states, consistent with NRC endorsed, industry prepared shutdown risk guidance.

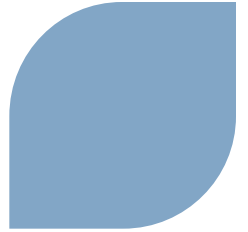
# Containment Venting



- ▶ **Issue:** In NRC feedback on RAI 563 and RAI 598, NRC questioned the viability of the U.S. EPR containment venting strategy.
- ▶ **Technical Report ANP-10329 describes two options for controlling containment pressure:**
  - ◆ Containment venting via the low flow purge line
  - ◆ Containment spray via a portable pump injecting into the SAHRS spray header
- ▶ **AREVA position:**
  - ◆ Containment venting will be removed from the U.S. EPR strategy.
  - ◆ Containment heat removal will be discussed further in RAI 598 response.

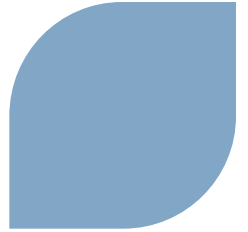


# Seismic Category and Reasonable Protection Clarifications



- ▶ **Issue:** NEI 12-06 (FLEX Guide) does not provide an approved code or standard for seismic qualification of non-Category I SSCs.
- ▶ **Issue:** In NRC feedback on RAI 563 feedback, several classification questions were raised regarding the Fire Protection Building and Fire Protection Water Storage Tanks (e.g., Seismic Category II classification). AREVA also issued condition report ([CR 2013-7542](#)) to resolve NRC classification questions and other AREVA internal classification questions related to Fukushima event mitigation.

# Seismic Category and Reasonable Protection Clarifications



## ► AREVA position:

### ◆ Adequate functionality following a safe shutdown earthquake (SSE) can be demonstrated:

- For valves and piping – using ANSI/ASME B31.1
- For other SSCs (e.g., tanks, diesel driven fire water pumps, etc.) - using ASCE 43-05, *Seismic Design Criteria for Structures, Systems and Components in Nuclear Facilities*
- Fukushima Mitigation Strategy is consistent with strategy used for U.S. EPR Fire Protection System (RAI 169 Question 09.05.01-66 - 2009)

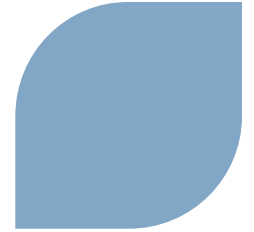
### ◆ Reasonable protection strategy (Table 4-2 in Technical Report ANP-10329) will be revised to reconcile NRC feedback on RAI 563 and CR 2013-7542.

# Revised Technical Report Table 4-2



Hazard	Applicability	General Approach
Seismic	Structure	Seismic Category I <u>or</u> <del>ASCE 7-10 for Seismic Category II and</del> Conventional Seismic structures designed for the SSE using <u>ASCE 43-05 or AWWA D100-2005</u> .
	Systems and Components	<p>Seismic Category I <u>or</u> reasonable protection of non-safety-related installed equipment in Seismic Category I, <del>Seismic Category II</del> and Conventional Seismic structures.</p> <p>Reasonable protection of non-safety-related equipment installed in Seismic Category I, <del>Seismic Category II and</del> <u>or</u> Conventional Seismic structures <u>and</u> includes <u>use of</u>:</p> <ul style="list-style-type: none"> <li>• ASME B31.1 – piping, valves and supports.</li> <li>• ASCE 43-05 – other equipment (e.g., pumps, diesels, electrical).</li> </ul>

# Revised Technical Report Table 4-2



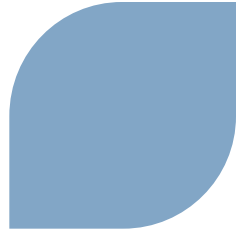
Hazard	Applicability	General Approach
Flooding	Structure	Seismic Category I or <del>Seismic Category II and</del> Conventional Seismic structures located at <u>1 foot above the maximum flood elevation</u> <del>same elevation as Seismic Category I structures.</del> Note: U.S. EPR uses a “dry site” concept for Seismic Category I structures.
High Wind	Structure	Seismic Category I or ASCE 7-10 for <del>Seismic Category II and</del> Conventional Seismic structures with wind speeds <u>and missiles</u> based on Regulatory Guides <u>1.76 and 1.221.</u>

# Revised Technical Report Table 4-2



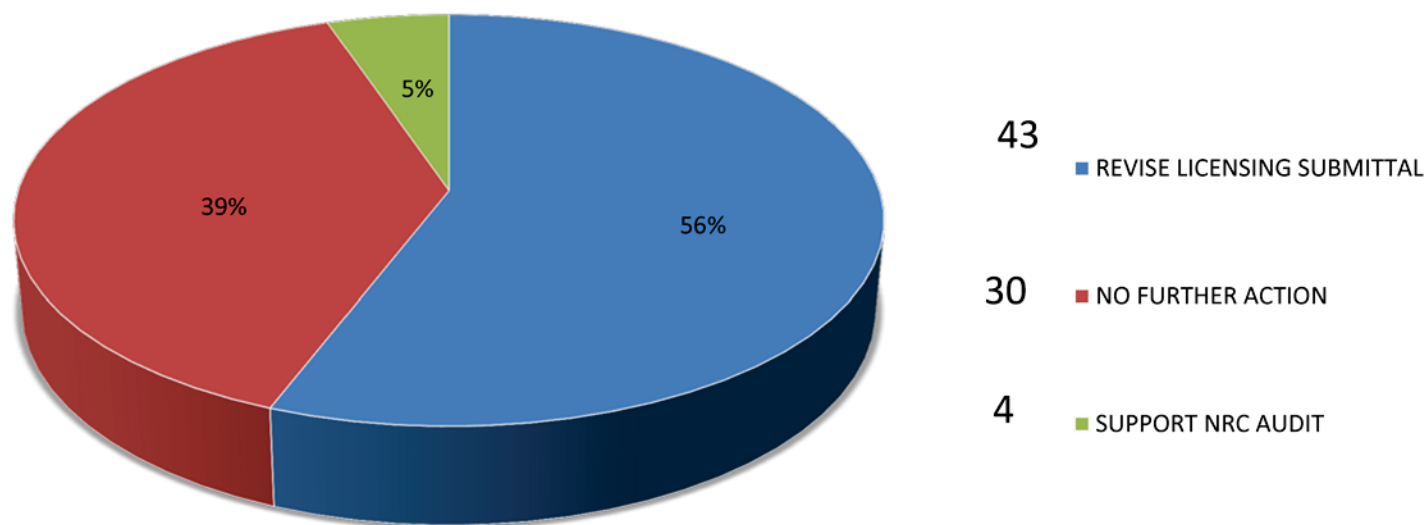
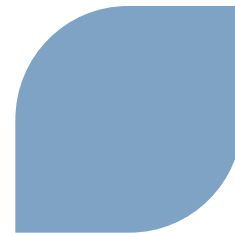
Hazard	Applicability	General Approach
Snow, Ice and Cold Temperatures	Structure	Seismic Category I <u>or</u> ASCE 7-10 for <del>Seismic Category II and</del> Conventional Seismic structures.
	Systems and Components	Equipment (safety-related or non-safety-related) evaluated for 1% exceedance temperatures (-10 °F).
High Temperatures	Structure	Seismic Category I <u>or</u> ASCE 7-10 for <del>Seismic Category II and</del> Conventional Seismic structures.
	Systems and Components	Equipment (safety-related or non-safety-related) evaluated for 1% exceedance temperatures (100 °F dry bulb/77 °F wet bulb coincident).

# NRC Feedback Disposition Matrix

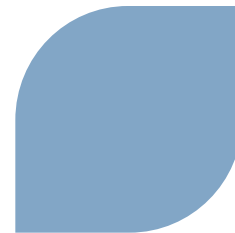


- ▶ **Proposed resolutions for all NRC feedback at June 25, 2013 public meeting are provided in Disposition Matrix (meeting handout)**
  - ◆ 77 comments/questions provided by NRC
  - ◆ Breakdown on proposed follow-up actions (**Next Slide**)
  
- ▶ **Path forward**
  - ◆ Discuss proposed resolutions on an “exception basis” at this meeting
  - ◆ NRC issue additional RAI(s), as needed, for issues requiring further AREVA action

# NRC Feedback – Follow-up Actions



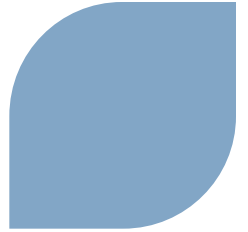
# Design Modifications



- 1) Re-size Primary Coolant Injection Pump (PCIP) for higher developed head (RAI 563, RAI 624)**
- 2) Remove containment venting via Low Flow Purge (RAI 563, RAI 598)**
- 3) Revise seismic design requirements and reasonable protection requirements (RAI 563, CR 2013-7542)**
- 4) Revise design conditions of check valve on discharge of PCIP (CR 2013-8207, RAI 626)**
- 5) Revise SAHRS flange connections (CR 2013-5118)**
- 6) Revise Hot Leg pressure sensor elevation requirements (RAI 563, RAI 598)**



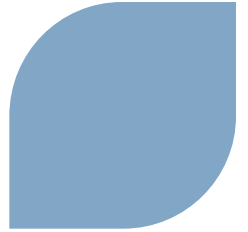
# Re-size Primary Coolant Injection Pump (PCIP)



**Change:** Re-size the Primary Coolant Injection Pump (PCIP) such that it has sufficient developed head to overcome line losses, static head and peak RCS pressure in Modes 5 and 6. In addition, re-size ELAP diesel generator and portable diesel to support increased PCIP developed head.

**Rationale:** Remove Modes 5 and 6 vulnerability (RAI 624)

# Remove Containment Venting via Low Flow Purge

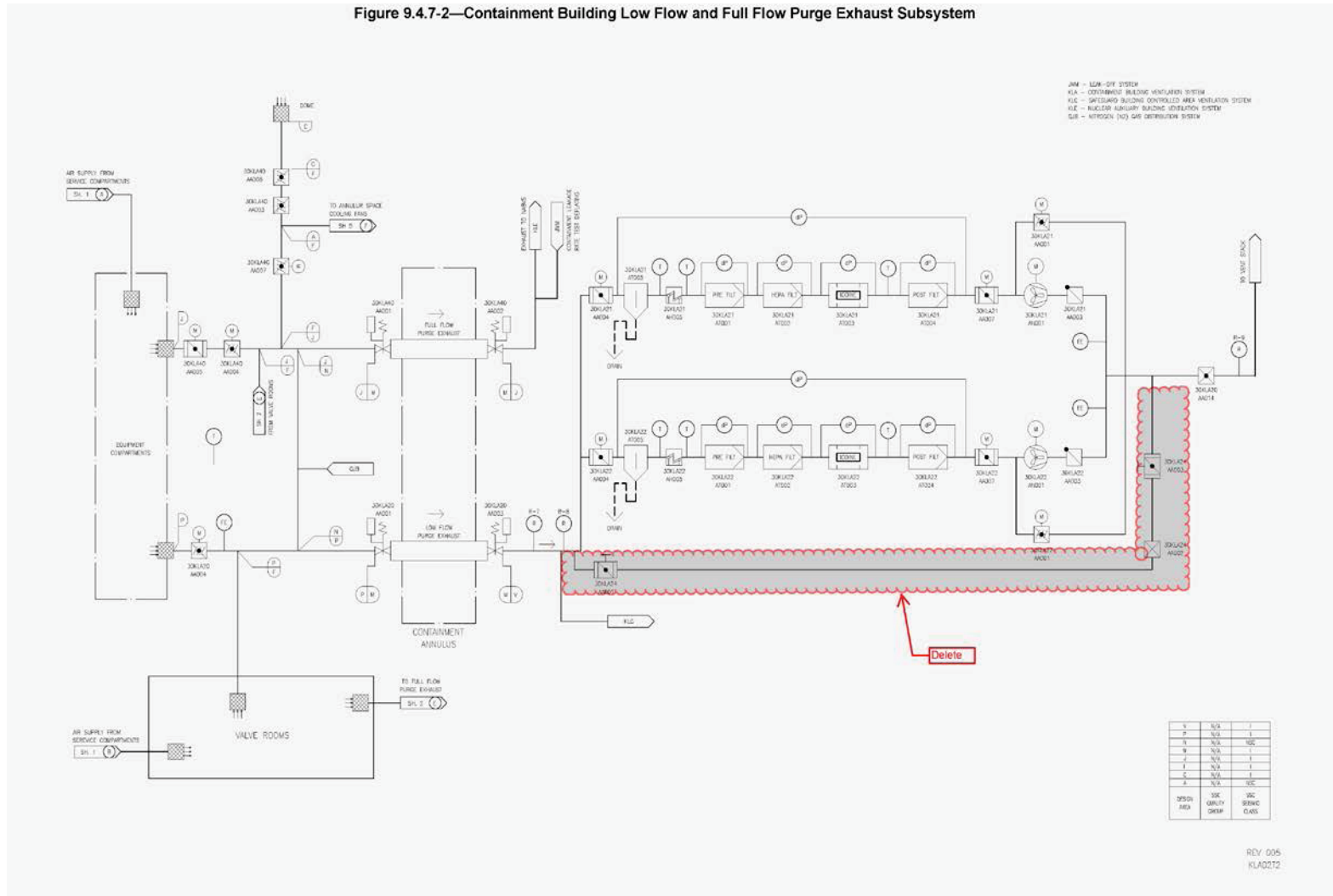


**Change:** Remove Seismic Category I bypass ducting and associated isolation dampers from low flow purge system.

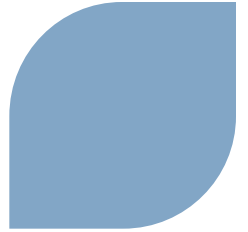
**Rationale:** Resolve NRC questions on viability of containment venting strategy (RAI 598)

# Remove Containment Venting via Low Flow Purge

Figure 9.4.7-2—Containment Building Low Flow and Full Flow Purge Exhaust Subsystem



# Revise Seismic Design and Reasonable Protection Requirements

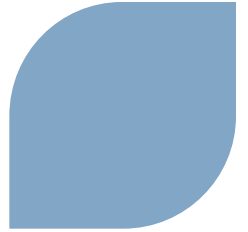


**Change:** Revise equipment classifications and codes and standards to align requirements with applicable regulatory requirements (e.g., RG 1.189 for fires, Order EA-12-049 for Fukushima Event Mitigation).

- ▶ Fire Protection Building and Fire Protection Water Storage Tanks are classified as Conventional Seismic (CS).
- ▶ Fire protection water sources will be qualified for SSE, consistent with R.G. 1.189.
- ▶ Fire Protection Building and Storage Tanks will be designed against the effects of high wind missile spectra based on R.G. 1.76 and 1.221.

**Rationale:** Address NRC classification feedback on RAI 563 and resolve CR 2013-7542

# Revise design conditions of check valve on discharge of PCIP

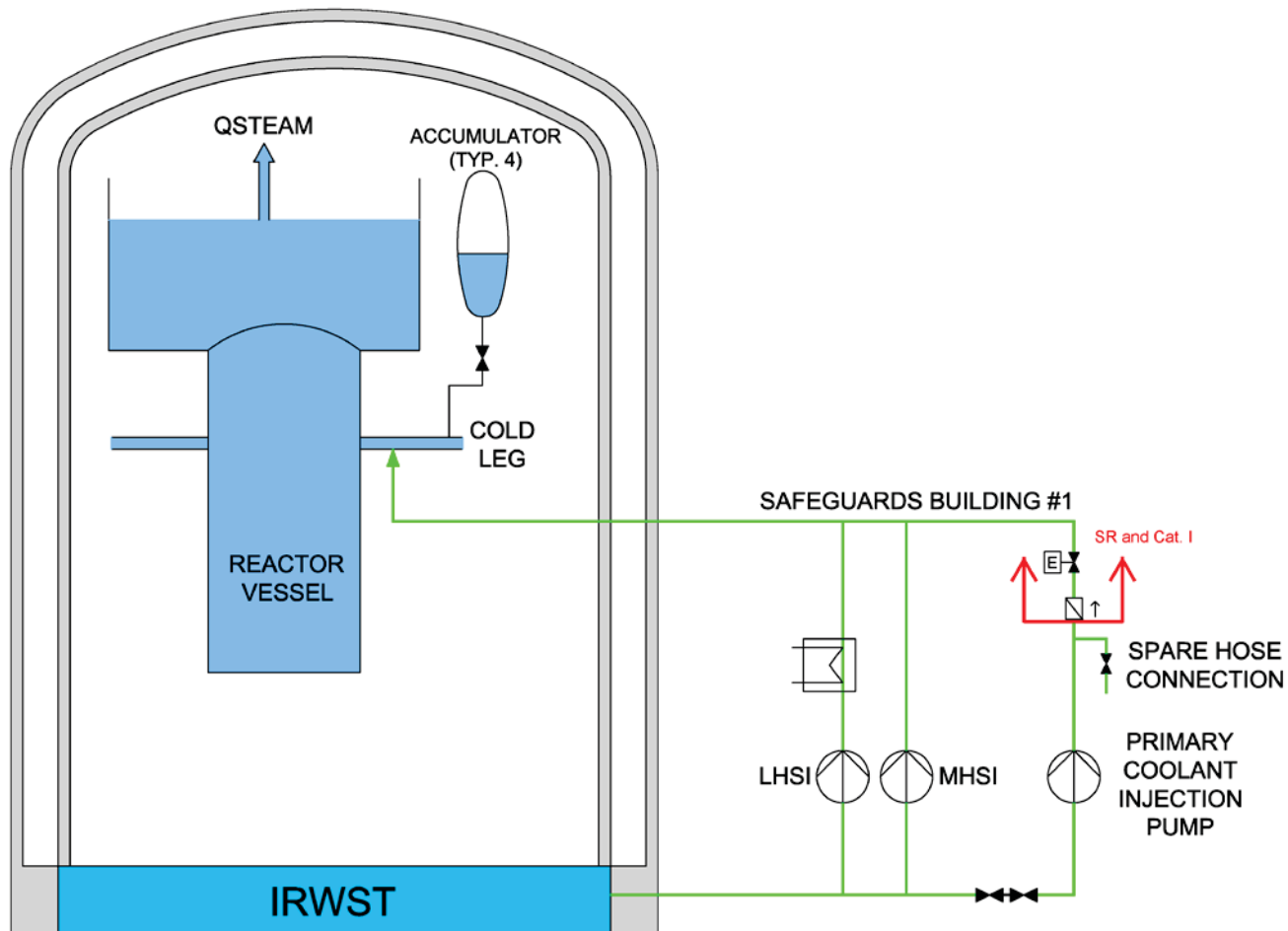


**Change:** Improve single failure protection at discharge of Primary Coolant Injection Pump (PCIP):

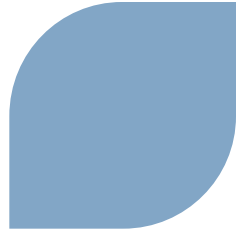
- ▶ Move the safety-related, Category I design boundary condition to include check valve 30JND11AA011.
- ▶ Require that 4" motor operated throttling valve (30JND11AA012) be closed and depowered in Modes 1-4

**Rationale:** Resolve Condition Report CR 2013-8207 and RAI 626 to improve single failure protection

# Design condition of check valve on discharge of PCIP



# Revise Flange Connections to SAHRS



**Change:** Add new connection point to SAHRS and increase size of existing connection point

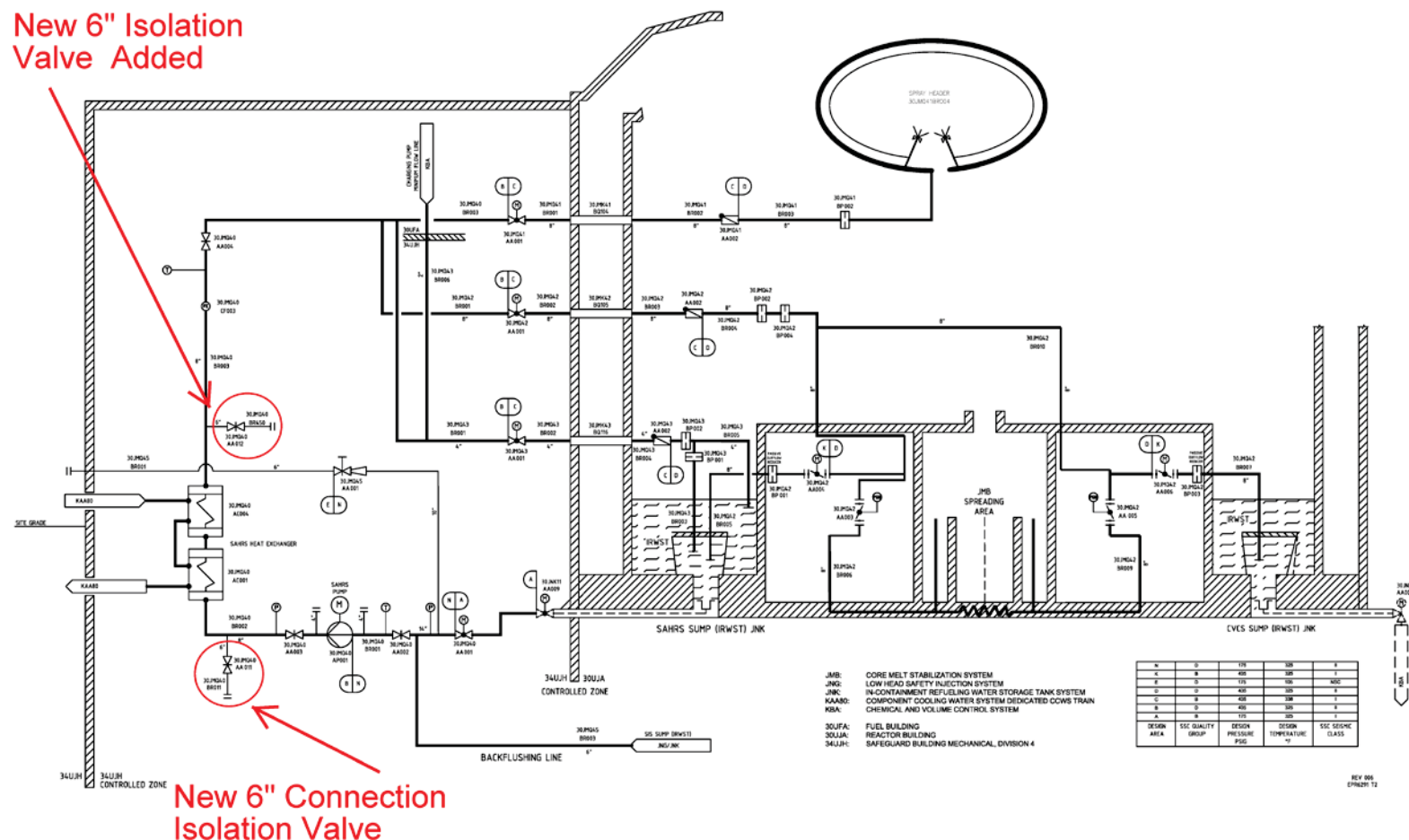
- ▶ New 6" branch line (30JMQ40BR011) and 6" manual isolation valve 30JMQ40AA011 will be installed downstream of manual isolation valve 30JMQ40AA003.
- ▶ Branch line 30JMQ40BR450 will be increased to 6" and new 6" manual isolation valve 30JMQ40AA012 will be installed at existing flange connection.

**Rationale:** Resolve Condition Report CR 2013-5118 which identified inadequate design conditions of the flange connections on the suction side of the SAHRS Pump for use as a potential connection point for the portable spray pump discharge.

# SAHRS Flange Connection Changes

Figure 19.2-22—Severe Accident Heat Removal System

New 6" Isolation Valve Added



SAHRS	SAHRS	SAHRS	SAHRS	SAHRS
SAHRS	SAHRS	SAHRS	SAHRS	SAHRS
SAHRS	SAHRS	SAHRS	SAHRS	SAHRS
SAHRS	SAHRS	SAHRS	SAHRS	SAHRS
SAHRS	SAHRS	SAHRS	SAHRS	SAHRS

REV 005  
EPM2011 T2

Next File

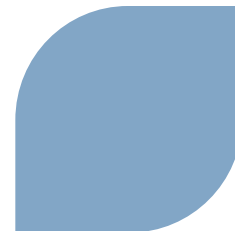
Tier 2

Revision 6—Interim

Page 19.2-113



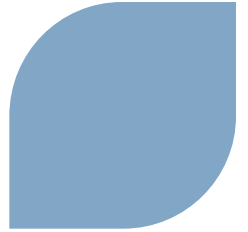
# Revise Hot Leg Pressure Sensor Elevation Requirement



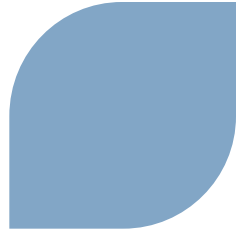
**Change:** Add requirement that Hot Leg pressure sensors be located at an elevation higher than -1.64 feet (bottom of Heavy Floor) or be protected from the effects of submergence.

**Rationale:** Ensure that all equipment inside containment that may be relied upon in Fukushima Mitigation Strategy are located above the – 1.64 foot elevation. The -1.64 foot elevation becomes the limit for use of portable water sources to fulfill the containment heat removal function.

# Analyses



- 1) S-RELAP5 analyses to address vulnerabilities in Modes 5 and 6 (RAI 563, RAI 624)**
- 2) Re-sizing analyses for Primary Coolant Injection Pump (PCIP) for higher developed head. Conforming analyses to implement results of S-RELAP5 analyses (RAI 563, RAI 624)**
- 3) Analyses to define containment heat removal requirements (RAI 598, RAI 623)**

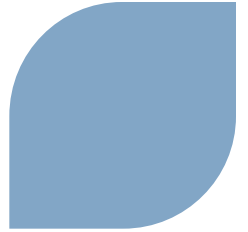


## ► ELAP in Mode 6 S-RELAP5 Analysis

- ◆ Steam Generators are unavailable
- ◆ RV head off - adequate vent path
- ◆ RCS level 1 ft below the flange
- ◆ Determine:
  - Time to Boil
  - Time to Uncover
- ◆ Demonstrate that 300 gpm of makeup at 30 minutes prevents core uncover

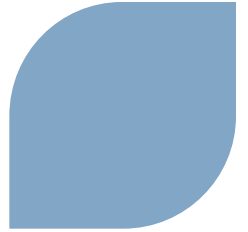
## ► ELAP in Modes 5 and 6 S-RELAP5 Analysis

- ◆ Steam Generators are unavailable
- ◆ RCS is vented - one set of Primary Depressurization System (PDS) valves open
- ◆ Two cases with initial RCS conditions-  $\frac{3}{4}$  midloop and 6" below the flange.
- ◆ Determine:
  - Time to Boil
  - Time to Uncover
  - Peak RCS pressure → resize PCIP (for higher developed head)
- ◆ Demonstrate that 300 gpm of makeup at TBD minutes prevents core uncover



## ► Re-size Primary Coolant Injection Pump (PCIP)

- ◆ Re-size the Primary Coolant Injection Pump (PCIP) such that it has sufficient developed head to overcome line losses, static head and peak RCS pressure in Modes 5 and 6 (S-RELAP 5 analyses).
- ◆ Re-size ELAP diesel generator and portable diesel to support increased PCIP developed head.



## ► Define containment heat removal requirements

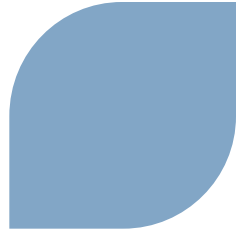
### ◆ Revise containment GOTHIC analysis:

- Use existing GOTHIC model for Fukushima Mitigation Strategies
- Use IRWST as suction source of borated water (vs. alternate water source) to simplify Phase 2 and 3 event mitigation
- Goal - limit containment temperature and pressure to design values vs. severe accident values
- Determine required spray initiation time

### ◆ Re-evaluate NPSH requirement and discharge head of portable containment spray pump with IRWST as suction source and revised containment conditions

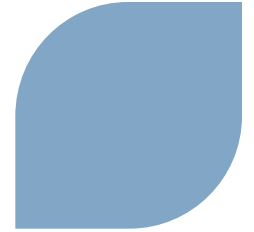
### ◆ Determine heat removal requirements for portable heat exchanger (located on discharge of portable containment spray pump) with IRWST as suction source

# DCD Incorporation Plan



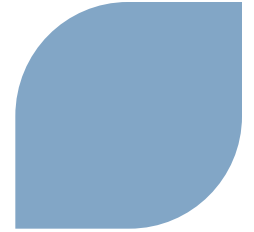
- ▶ **One comprehensive revision to Technical Report ANP-10329 will be issued and referenced in DC FSAR Chapter 19.2 that describes the U.S. EPR Fukushima Mitigation Strategies.**
- ▶ **As needed, conforming changes will be issued for other FSAR sections that support Technical Report ANP-10329.**
  - ◆ **Conforming changes to the FSAR will be made to support the required plant modifications**
  - ◆ **An initial FSAR impact assessment (Tier 1 and Tier 2) is provided (**see next set of slides**):**
    - Anticipated FSAR changes are restricted to Tier 2 Group B and C FSAR chapters only
    - No Tier 2 Group A FSAR chapters are expected to be affected

# Anticipated FSAR Changes (Tier 1) Due to Fukushima Modifications



FSAR TIER	Chapter	Section	Section Title	Reason for Change
1	2	Table 2.2.1	Reactor Coolant System ITAAC	Long term RCP Seal Testing
1	2	2.2.3	Safety Injection System and Residual Heat Removal System	Design condition of Primary Coolant Injection Pump discharge
1	2	Table 2.2.3-1	SIS/RHRS Equipment Mechanical Design	Design condition of Primary Coolant Injection Pump discharge
1	2	Figure 2.2.3-1	Safety Injection System and Residual Heat Removal System Functional Arrangement	Design condition of Primary Coolant Injection Pump discharge
1	2	Figure 2.6.8-1	Containment Building Ventilation System Functional Arrangement	Remove Containment Venting via Low Flow Purge

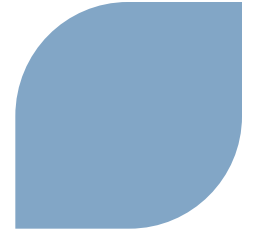
# Anticipated FSAR Changes (Tier 2) Due to Fukushima Modifications



FSAR TIER	Chapter	Section	Section Title	Reason for Change
2	3	3.2.1.4	Conventional Seismic	Seismic Design Category and Reasonable Protection Clarifications
2	3	3.2.1.5	Non-Seismic	Seismic Design Category and Reasonable Protection Clarifications
2	3	Table 3.2.2-1	Classification Summary	Design condition of Primary Coolant Injection Pump discharge, remove containment venting via low flow purge, Seismic Design Category and Reasonable Protection Clarifications
2	3	3.3	Wind, Hurricane and Tornado Loadings	Seismic Design Category and Reasonable Protection Clarifications



# Anticipated FSAR Changes (Tier 2) Due to Fukushima Modifications



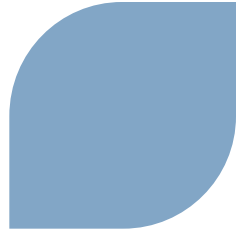
FSAR TIER	Chapter	Section	Section Title	Reason for Change
2	3	3.4	Water Level (Flood) Design	Seismic Design Category and Reasonable Protection Clarifications
2	3	Table 3.9.6-2	Inservice Valve Testing Program Requirements	Design condition of Primary Coolant Injection Pump discharge
2	3	Table 3.10-1	List of Seismically and Dynamically Qualified Mechanical and Electrical Equipment	Design condition of Primary Coolant Injection Pump discharge, remove containment venting via low flow purge

# Anticipated FSAR Changes (Tier 2) Due to Fukushima Modifications



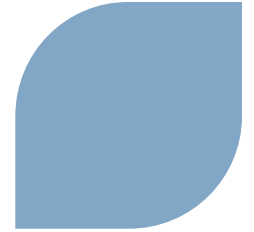
FSAR TIER	Chapter	Section	Section Title	Reason for Change
2	3	3.5	Missile Protection	Seismic Design Category and Reasonable Protection Clarifications
2	3	3.7.2.8	Interaction of Non-Seismic Category I Structures with Seismic Category I Structures	Seismic Design Category and Reasonable Protection Clarifications
2	6	6.3.2.2.2	System Components	Resize Primary Coolant Injection Pump
2	6	Figure 6.3-2	Safety Injection / Residual Heat Removal System Train (Typical)	Design condition of Primary Coolant Injection Pump discharge
2	6	Table 6.3-6	Safety Injection System Failure Modes and Effects Analysis	Design condition of Primary Coolant Injection Pump discharge

# Anticipated FSAR Changes (Tier 2) Due to Fukushima Modifications



FSAR TIER	Chapter	Section	Section Title	Reason for Change
2	9	9.4.7.1	Containment Building Ventilation System – Design Bases	Remove Containment Venting via Low Flow Purge
2	9	9.4.7.2	Containment Building Ventilation System – System Description	Remove Containment Venting via Low Flow Purge
2	9	Figure 9.4.7-2	Containment Building Low Flow and Full Flow Purge Exhaust Subsystem	Remove Containment Venting via Low Flow Purge
2	9	9.5.1.2	Fire Protection - Program Description	Seismic Design Category and Reasonable Protection Clarifications

# Anticipated FSAR Changes (Tier 2) Due to Fukushima Modifications



FSAR TIER	Chapter	Section	Section Title	Reason for Change
2	4	14.2.8.1	First-of-a-Kind Testing	Long Term RCP Seal Testing
2	14	14.2.12.3.6	Containment Integrated Leak Rate and Structural Integrity Tests (Test #029)	Remove Containment Venting via Low Flow Purge
2	14	14.2.12.6.8	Primary Coolant Injection Subsystem (ELAP) (Test #058)	Resize Primary Coolant Injection Pump
2	14	14.2.12.8.4	Containment Purge (Test #076)	Remove Containment Venting via Low Flow Purge
2	19	Table 19.2-6	COL Applicant Responsibilities for ELAP Event Mitigation	Remove Containment Venting via Low Flow Purge, Resize Primary Coolant Injection Pump

# Design Certification RAI Status

RAI	Question No.	Topic/Subject	Status
549	13.03-8	Emergency preparedness as it relates to staffing and communications associated - Implementation of Fukushima Task Force Recommendation 9.3	14 Sept. 2012 CLOSED
550	09.01.03-16	Reliable Spent Fuel Instrumentation - Implementation of Fukushima Task Force Recommendation 7.1 → <b>This RAI addresses Order EA-12-051</b>	25 Oct. 2012 CLOSED
563	19-356	Mitigation Strategies for Beyond-Design-Basis External Events – Recommendation 4.2 → <b>This RAI addresses Order EA-12-049</b>	Advance response submitted 4 May 2013 Final Response: 3Q CY2014
598	06.02.01-106	Containment venting and containment heat removal	Issued on 14 Aug 2013 Final Response: 3Q CY2014
623	19.02-1 – 19.02-4	NRC questions on performance requirements for SR, NSR, and portable components used in the mitigation strategy	Issued 6 Feb. 2014 Final Response: 3Q CY2014
624	19-372	Mode 5 & 6 vulnerability	Issued 6 Feb. 2014 Final Response: 3Q CY2014
626	06.03-19	Single failure and design condition of check valve on discharge of Primary Coolant Injection Pump	Issue March 2014 Final Response: 3Q CY2014

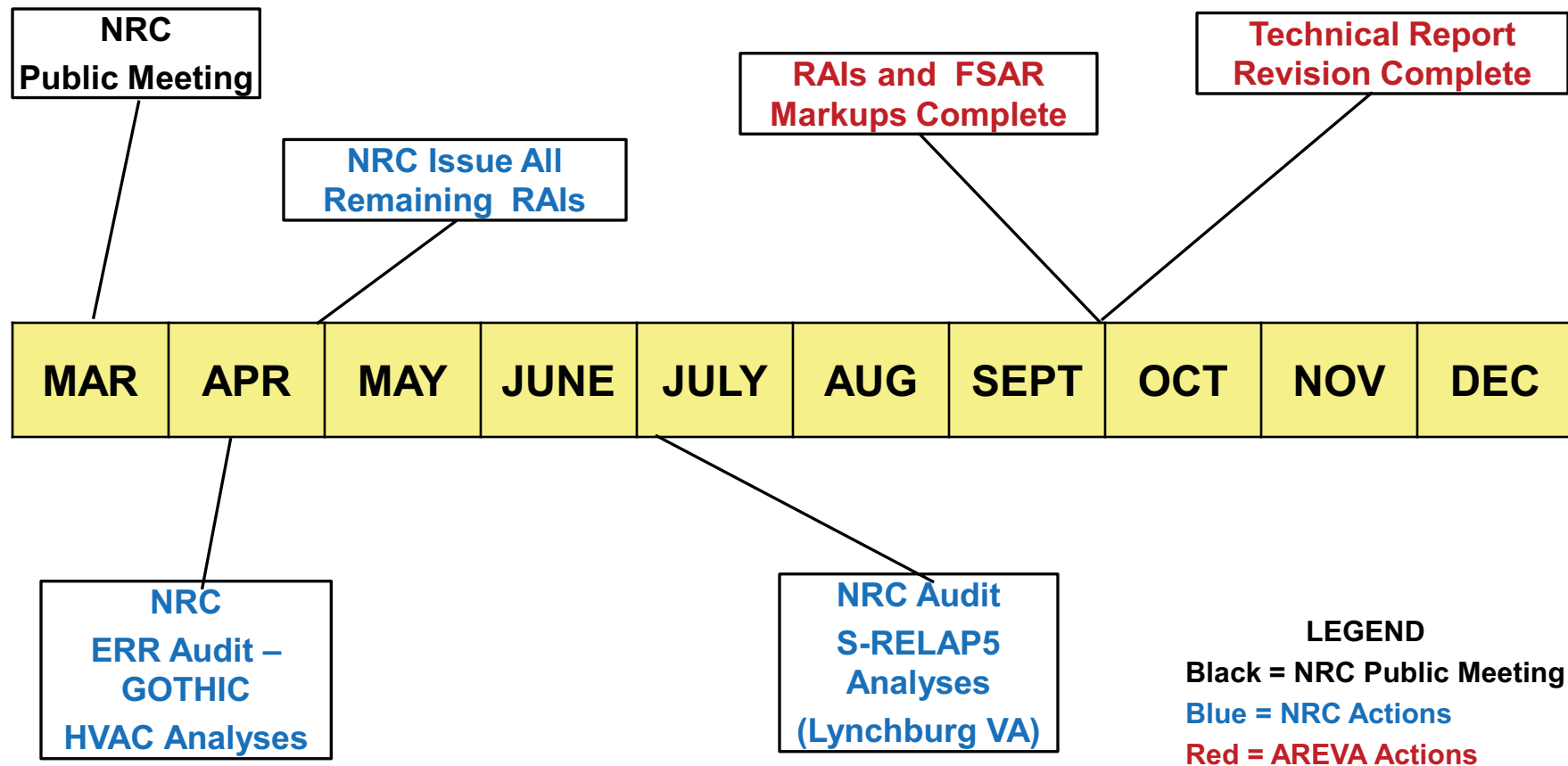
**Are any other RAIs expected?**

# Audit Status

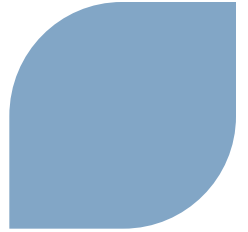
Item	Audit Topic	Audit Type	Status
1	GOTHIC Containment Analysis	ERR	Audit Performed in June 2013. NRC to provide Audit Summary Report.
2	DC Load Shedding Analysis	ERR	Audit Performed in July 2013. NRC Peer Review in Progress.
3	S-RELAP5 ELAP analysis (Modes 1-4)	Face-to-Face Lynchburg	Draft audit plan submitted. If desired, AREVA recommends Modes 5 & 6 S-RELAP5 analyses audit at the same time
4	GOTHIC - HVAC analysis (MCR and Safeguards Building)	ERR	Draft audit plan submitted.
5	Spent Fuel Pool Heatup analysis	ERR	Draft audit plan submitted. Audit may not be required.

**Are any other audits expected?**

# 2014 Schedule



# Summary and Next Steps



## ► Actions to achieve closure

### ◆ AREVA

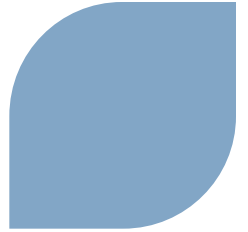
- Submit responses to RAIs
- Submit revised Technical Report ANP-10329 and updated FSAR sections
- Support NRC audits

### ◆ NRC

- Transmit any outstanding RAIs
- Perform audits and submit audit reports
- Approve RAI responses, FSAR revisions, and revised Technical Report ANP-10329
- Document safety evaluation with no open items



# Summary and Next Steps



## ► Meeting Action Items

### ◆ AREVA

- ....

### ◆ NRC

- ....