



US-APWR Seismic Closure Plan (SCP) Update

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4DS-UAP-20120018-A1

Agenda



- Overview (Public)
 - ✓ Purpose
 - ✓ Background: Seismic Closure Plan (March 2012) – [UAP-HF-12082, March 31, 2012 (ML12094A342)]
 - ✓ Summary of Changes since March 2012 submittal
- Update to Seismic Closure Plan (Public)
 - ✓ Impact on DCD, Technical Reports and Calculations
 - ✓ Revised Licensing Information Submittal Plan
 - ✓ Seismic Closure Plan Update Submittal Letter – [UAP-HF-12238, August 29, 2012 (No ML# yet)]



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Agenda



- Design changes (Non-Public)
 - ✓ Design enhancements for Essential Service Water Pipe Tunnel (ESWPT) south segment and relocation of Turbine Building (T/B)

 - ✓ Design enhancements for the Reactor Building (R/B) Complex
 - Aircraft Impact Assessment Re-evaluation
 - Revised Time Histories



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Overview



- Purpose of Meeting
 - ✓ Present a summary of the updated Seismic Closure Plan including the licensing information submittal plan for:
 - Technical Reports
 - RAI Response Revisions
 - DCD Markups

 - ✓ Present design changes for the ESWPT, Turbine Building, and R/B Complex



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Overview



➤ Background

- ✓ A series of interactions with the NRC including RAI responses, calls, and meetings led to development of a comprehensive resolution plan to resolve seismic issues (Seismic Closure Plan)
- ✓ March 29, 2012 Public Meeting to discuss Seismic Closure Plan
- ✓ The presentation of that plan included:
 - 1) Proposed design changes (common basemat approach)
 - 2) Analysis methodology changes (time histories, sliding evaluations)
 - 3) Assessment of documents and analyses affected
 - 4) Schedule of submittals



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Overview



- Since the March submittal, additional changes and enhancements have resulted in the need to revise the SCP
- Summary of changes
 - ✓ **ESWPT**
 - Site-Specific South Segment integrated into R/B complex
 - T/B relocation to the south finalized (moves further south)
 - ✓ **AIA**
 - Thicker R/B south wall
 - Few other exterior / interior walls added or thickened
 - Layout of equipment near R/B south wall modified due to shock considerations
 - ✓ **Time Histories**
 - R/B concrete strength increased
 - Thicker PCCV wall around MS/FW penetrations



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Update to Seismic Closure Plan



Impact of Design Enhancements and Changes

1. Seismic analysis changes
 - Technical inputs, assumption, results and description will change
2. Drawing changes
 - Base drawings will change
3. Detailed equipment layout changes

Note: Red text indicates a change from the original March 2012 Seismic Closure Plan submittal and presentation



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Update to Seismic Closure Plan



Seismic Analysis Changes

1. Based on design enhancements and changes, the following DCD description and figures will change:
 - Tier 1 will be revised to incorporate the ESWPT south segment into the US-APWR standard plant (aka Essential Service Water Pipe Chase [ESWPC])
 - Chapter 2: Table 2.0-1 will be revised for soil profiles description and data, bearing capacity demands, allowable settlements
 - Chapter 3: Section 3.7, 3.8, Appendix 3H (LMSM for R/B-PCCV-CIS) and Appendix 3I (ISRS) have updates regarding time history, generic soil profiles, and seismic analysis (SSI, SSSI, stability evaluations)
 - Seismic Margin Analysis will be performed after seismic analysis to meet the RAI response commitment in RAI 761-5804
 - Section 19A will be revised to update AIA assumptions and evaluation summary
2. Related Technical Reports will be revised
(See Attachment 1 of revised Seismic Closure Plan Letter)



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Update to Seismic Closure Plan



Drawing Changes Due to Layout Change

1. Most plot plan, **building arrangement**, and **equipment** layout figures in several chapters will change
2. Changes are caused by layout changes of the PS/B, structural rearrangement of the A/B, thickness change of the **R/B Complex basemat, R/B south wall, PCCV wall in the vicinity of the MS/FW penetrations; ESWPT south segment (ESW Pipe Chase [ESWPC]) relocation, T/B relocation, and AIA reevaluation;**
 - CIS has not been changed
 - **Concrete strength has been increased for R/B complex, including foundation**
3. The above changes above are **also** implemented in **related** drawings, such as fire area, radiation zone, etc.



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Update to Seismic Closure Plan



Equipment Layout Changes

1. HVAC System Design in Chapter 9
 - Enlargement of the PS/B and structural rearrangement of the A/B changes the cubicle size, and could affect the capacity of HVAC system
 - The required capacity may be within the rated capacity
2. Fire Hazard Analysis in Chapter 9 / Flooding Analysis in Chapter 3 / PRA in Chapter 19
 - Layout change of the PS/B made the floor area change, re-analyses are necessary
 - The impact of the changes are expected to be negligible
3. Aircraft Impact Analysis in Chapter 19
 - Change of **R/B Complex** building shape due to PS/B change **and A/B integration; and T/B relocation affect** the AIA
 - The impact of the changes are **incorporated in the AIA and the R/B Complex structural analysis, including shock evaluations and relocation of some equipment**



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Update to Seismic Closure Plan



DCD Impact Summary

Impacted Category		Cause	Impacted Chapter
Seismic Analysis Changes	Seismic Analysis Structural Analysis Seismic Classification Seismic Margin Analysis	<ul style="list-style-type: none"> Seismic input change (soil profiles, bearing capacity, settlements) ISRS change (time history, generic profiles) ESWPC incorporation into R/B complex AIA related R/B complex changes PCCV wall thickness increase at MS/FW penetration area 	2, 3, 19
Drawing Changes	Layout drawings and others such as fire area, radiation zone	<ul style="list-style-type: none"> Layout change on PS/B, structural rearrangement on A/B, thickness change of basemat, ESWPC incorporation, AIA related R/B complex changes 	Tier 1, 1, 2, 3, 6, 8, 9, 11, 12
Equipment Layout Changes	HVAC system design Electrical load	<ul style="list-style-type: none"> Cubicle size change in PS/B HVAC capacity change AIA related equipment layout changes 	8, 9, 12
	Flooding / Fire Hazard Analysis PRA	<ul style="list-style-type: none"> Change of layout in the buildings (PS/B, T/B) 	Tier 1, 3, 9, 19
	Aircraft Impact Analysis	<ul style="list-style-type: none"> Change of building shape due to PS/B and A/B change, and T/B relocation 	Tier 1, 19, 19A
Other Analyses	Accident Radiological Analysis for MCR and TSC	<ul style="list-style-type: none"> Change of R/B Complex layout / source-receptor distances 	2



Note: Details for impacted DCD sections listed in Table 3 of SCP

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Update to Seismic Closure Plan



DCD Mark-ups

- Table 3 of revised Seismic Closure Plan letter shows the DCD changes
- The DCD mark-ups will be provided by end of February 2013



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Update to Seismic Closure Plan



Technical Reports Revision

- Table 1 of the revised Seismic Closure Plan letter identifies the Technical Reports and submittal dates related to DCD Sections 3.7 and 3.8, including those reports which are being revised for the seismic-related changes
- Table 1 also lists a submittal plan for the five Technical Reports (MUAP-11005, 11013, 11018, 11019, and 11020) related to the SC module, which will be revised based mainly on RAIs
- The calculation reports which support the Technical Reports, including planned completion dates, are shown in Table 2 of the revised Seismic Closure Plan letter
- The revised final design reports related to changes in seismic loading, such as stress analysis of sump strainer, fuel racks, and GTG will be provided in Phase 4



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Road Map for Seismic Design



		2012					2013									
		May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July
MUAP-12002 Rev.1	Sliding Evaluation and Results				▼ Rev.0 Methodology					● Rev.1 Results						
UAP-HF-12207 (7/20/2012)	Response to RAI 939-6334 and 940-6532 (Seismic Design Parameters)				▼					●						
MUAP-10006 Rev.3	R/B SSI Analyses and Results									●						
MUAP-11002 Rev.2	T/B SSI Analyses and Results									●						
MUAP-11007 Rev.2	Embedment and Ground Water Effects									●						
MUAP-11005 Rev.1	Research Achievements of SC									●						
MUAP-11013 Rev.2	Design Criteria for SC Modules															
MUAP-11018 Rev.1	CIS: Stiffness and Damping for Analysis									●						
MUAP-11019 Rev.1	CIS: SC Wall Design Criteria															
MUAP-11020 Rev.1	CIS: Anchorage Connection, and Section Design and Detailing															
-	Calculations (Technical Report or RAI Response)									◆	◆	◆				
-	Calculations (Basic Structural Design)															◆
-	Calculations (SC Module)									◆	◆					
	DCD Markups and RAI Response Revisions															● ●

Table applies to Sections 3.7, 3.8

▼ - Submitted

● - Planned Submittal

◆ - For Audit



SC Module-related activities

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Update to Seismic Closure Plan



Historical RAI Responses

- Issue Statement
 - A subset of previously submitted RAI responses may no longer be applicable due to changes in methodologies, standard plant configuration, or new results
- Current Status / Resolution Proposal
 - Previous Section 3.7 and 3.8 RAIs have been reviewed
 - Revised responses are being prepared as appropriate
- Deliverables
 - ✓ List of affected RAI responses **provided in Table 4 of revised Closure Plan**
 - ✓ Revised RAIs **to be submitted concurrently with related DCD markups** as defined in **the revised Closure Plan**



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Update to Seismic Closure Plan



Historical RAI Responses (Categorization)

- A. No Material Effect
 - A1. The RAI question is no longer applicable because its subject is no longer used by the DCD or its design documents (e.g., lumped-mass-stick-model usage for PCCV static analysis)
 - A2. DCD changes do not alter the response or associated mark-ups, or they alter a response that was superseded by a subsequent response, or they alter mark-ups in a manner unrelated to the response
- B. Editorial Changes Only **(not used since outdated references will be corrected in RAI revision per category C)**
- C. Material Effect – Response Revision Required.
 - **Technical material will be incorporated into MUAPs and DCD to minimize NRC RAI revision review time and resources**



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Update to Seismic Closure Plan



Results of RAI Questions Historical Response Review

Subsection	No Change Required			Change Required	Total
	A1	A2	B	C	
2.5	0	1	0	2	3
3.4.2	0	0	0	2	2
3.7.1	6	15	0	26	47
3.7.2	20	24	0	124	168
3.7.3	0	24	0	1	25
3.7.4	0	2	0	2	4
3.8.1	5	14	0	8	27
3.8.3	0	83	0	6	89
3.8.4	5	34	0	13	52
3.8.5	14	11	0	16	41
TOTAL	50	208	0	200	458

On Hold (not yet answered): 3.7.1 (1), 3.7.2 (70), 3.8.5 (4) Total On Hold=75
 In Process: 3.7.3 (1) 4DS-UAP-20120018-A17



Update to Seismic Closure Plan



Conclusions

- **March 2012 SCP Addressed:**
 - ✓ New common R/B / A/B / PS/B basemat layout
 - ✓ Use of Northridge TH (Option 1, Approach 2)
 - ✓ 16" gap between R/B Complex and T/B
 - ✓ Use of non-linear sliding analysis
- **Update March 2012 SCP to account for NEW enhancements and changes:**
 - ✓ Incorporation of ESWPC into common basemat layout
 - ✓ Increase in distance between R/B Complex and T/B
 - Sliding evaluation soil pressures
 - ✓ Increase in R/B wall thickness due to AIA reevaluation
 - ✓ Revised Time History approach
 - Option 1, Approach 1
 - For SSI, SSSI
 - For non-linear sliding analysis



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Update to Seismic Closure Plan



Conclusions (cont'd)

- **Additional enhancements and changes have caused additional changes to the plant layout and revisions to analyses:**
 - ✓ Seismic Analysis
 - ✓ Supporting Calculations
 - ✓ TRs
 - ✓ DCD (analyses descriptions, figures, and historical RAI evaluations)
- **Therefore SCP was updated to provide new descriptions and**
 - ✓ New submittal dates for TeRs
 - ✓ New submittal dates for DCD markups
 - ✓ New available for audit dates for calculations
 - ✓ Updated historical RAI question evaluation categorization
 - ✓ New submittal dates for historical RAI revisions