

## Vogle PEmails

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**From:** Habib, Donald  
**Sent:** Wednesday, January 10, 2018 4:10 PM  
**To:** Vogle PEmails  
**Subject:** Vogle COLs - Technical Meeting on Shake-Space LAR January 11, 2018  
**Attachments:** Slides to Support LAR 205 Discussion.pdf

This presentation will be discussed at the NRC public meeting with Southern Nuclear Company at 9am on January 11, 2018.

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**From:** Ridgway, Paige [<mailto:PTAPSCOT@SOUTHERNCO.COM>]  
**Sent:** Thursday, January 04, 2018 4:28 PM  
**To:** Hoellman, Jordan <[Jordan.Hoellman2@nrc.gov](mailto:Jordan.Hoellman2@nrc.gov)>  
**Cc:** Patel, Chandu <[Chandu.Patel@nrc.gov](mailto:Chandu.Patel@nrc.gov)>; Haggerty, Neil <[X2NHAGGE@SOUTHERNCO.COM](mailto:X2NHAGGE@SOUTHERNCO.COM)>; Sparkman, Wesley A. <[WASPARKM@southernco.com](mailto:WASPARKM@southernco.com)>; Dixon-Herrity, Jennifer <[Jennifer.Dixon-Herrity@nrc.gov](mailto:Jennifer.Dixon-Herrity@nrc.gov)>  
**Subject:** [External\_Sender] RE: Technical Meeting on Shake-Space LAR

Hey Jordan!

See attached for the slides that will be used to support the discussion next Thursday on WEC LAR 205 "Seismic Gap Changes". Please let me know if you have any questions! Thanks!

*Paige Ridgway*

Licensing Engineer  
Nuclear Development Regulatory Affairs  
Work: (205)992-7516 | Cell: (205)542-9702  
[ptapscot@southernco.com](mailto:ptapscot@southernco.com)

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**From:** Sparkman, Wesley A.  
**Sent:** Thursday, January 4, 2018 8:48 AM  
**To:** Hoellman, Jordan <[Jordan.Hoellman2@nrc.gov](mailto:Jordan.Hoellman2@nrc.gov)>; Dixon-Herrity, Jennifer <[Jennifer.Dixon-Herrity@nrc.gov](mailto:Jennifer.Dixon-Herrity@nrc.gov)>  
**Cc:** Patel, Chandu <[Chandu.Patel@nrc.gov](mailto:Chandu.Patel@nrc.gov)>; Ridgway, Paige <[PTAPSCOT@SOUTHERNCO.COM](mailto:PTAPSCOT@SOUTHERNCO.COM)>  
**Subject:** RE: Technical Meeting on Shake-Space LAR

Should be today.

Thanks, Wes.

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**From:** Hoellman, Jordan [<mailto:Jordan.Hoellman2@nrc.gov>]  
**Sent:** Thursday, January 4, 2018 8:28 AM  
**To:** Dixon-Herrity, Jennifer <[Jennifer.Dixon-Herrity@nrc.gov](mailto:Jennifer.Dixon-Herrity@nrc.gov)>; Sparkman, Wesley A. <[WASPARKM@southernco.com](mailto:WASPARKM@southernco.com)>  
**Cc:** Patel, Chandu <[Chandu.Patel@nrc.gov](mailto:Chandu.Patel@nrc.gov)>  
**Subject:** RE: Technical Meeting on Shake-Space LAR

Hi Wes –

I confirm that the staff we think will be involved in the review are available on 1/11.

When do you think you'll be able to provide a pre-submittal document for our staff to review?

Thanks,  
Jordan

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**From:** Dixon-Herrity, Jennifer  
**Sent:** Wednesday, January 03, 2018 12:09 PM  
**To:** Sparkman, Wesley A. <[WASPARKM@southernco.com](mailto:WASPARKM@southernco.com)>; Hoellman, Jordan <[Jordan.Hoellman2@nrc.gov](mailto:Jordan.Hoellman2@nrc.gov)>  
**Cc:** Patel, Chandu <[Chandu.Patel@nrc.gov](mailto:Chandu.Patel@nrc.gov)>  
**Subject:** RE: Technical Meeting on Shake-Space LAR

Wes, that topic is the only listed topic on the meeting set up in our internal calendar for that day, so I think I can confirm it for you. Jordan will verify when he returns tomorrow. Thank you,

Jen

Jennifer L. Dixon-Herrity  
Chief, Licensing Branch 4  
Division of New Reactor Licensing  
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301-415-2967

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**From:** Sparkman, Wesley A. [<mailto:WASPARKM@southernco.com>]  
**Sent:** Wednesday, January 03, 2018 11:16 AM  
**To:** Dixon-Herrity, Jennifer <[Jennifer.Dixon-Herrity@nrc.gov](mailto:Jennifer.Dixon-Herrity@nrc.gov)>; Patel, Chandu <[Chandu.Patel@nrc.gov](mailto:Chandu.Patel@nrc.gov)>  
**Subject:** [External\_Sender] Technical Meeting on Shake-Space LAR

Jennifer,

I understand that Chandu is our of the office. Today is my first day back and I don't recall if we settled on 1/11/17 as a good day for the Staff to have a technical discussion related to a proposed LAR on the 4" Shake Space. Has that been confirmed?

Thanks, Wes.

**Hearing Identifier:** Vogtle\_COL\_Docs\_Public  
**Email Number:** 198

**Mail Envelope Properties** (SN4PR0901MB2173479B5A53AA2AD0204E8E97110)

**Subject:** Vogtle COLs - Technical Meeting on Shake-Space LAR January 11, 2018  
**Sent Date:** 1/10/2018 4:10:21 PM  
**Received Date:** 1/10/2018 4:10:37 PM  
**From:** Habib, Donald

**Created By:** Donald.Habib@nrc.gov

**Recipients:**  
"Vogtle PEmails" <Vogtle.PEmails@nrc.gov>  
Tracking Status: None

**Post Office:** SN4PR0901MB2173.namprd09.prod.outlook.com

| <b>Files</b>                             | <b>Size</b> | <b>Date &amp; Time</b> |
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| MESSAGE                                  | 3668        | 1/10/2018 4:10:37 PM   |
| Slides to Support LAR 205 Discussion.pdf |             | 533921                 |

**Options**  
**Priority:** Standard  
**Return Notification:** No  
**Reply Requested:** No  
**Sensitivity:** Normal  
**Expiration Date:**  
**Recipients Received:**

# Seismic Gap Changes SNC LAR-18-002 (WEC LAR-205)

Jan 11, 2018

Westinghouse Electric Company LLC



# Meeting Purpose and Agenda

## Meeting Purpose

- Technical exchange meeting to discuss seismic gaps between nuclear island and adjacent buildings
- Receive and Address Staff Feedback

## Agenda

- Overview of Issue
- Discussion of Seismic Gap Between the Nuclear Island and Seismic Category II Buildings
- Discussion of Seismic Gap Between the Nuclear Island and Non-Seismic Buildings
- Proposed Changes to the Licensing Basis
- Schedule



# Overview

## **Background:**

- The design nominal above-grade spacing between the Nuclear Island (NI) and the Turbine Building (TB), Annex Building (AB) and Radwaste Building (RB) is 4 inches.
- The minimum above-grade ITAAC gap between these same buildings is also 4 inches.

## **Problem Statement:**

- Constructing adjacent walls under these conditions and meeting other ACI requirements for tolerances and concrete cover has proven to be extremely challenging.
- Removal of surface material for localized ITAAC exceedances has proven to be time consuming.
- Construction methods cannot assure that localized exceedances or construction conflicts will not occur in future placements.

## **Proposed Resolution:**

- Reduce the minimum ITAAC gap from 4" to 3" for the NI to TB and AB
- Eliminate the ITAAC gap requirement for the NI to RB
- The nominal design gap between buildings will be maintained at 4" above grade.



# Change 1: Seismic Gaps between Nuclear Island and Seismic Category II Buildings

## **Background:**

- Current construction requirement: 4" minimum gap between the Nuclear Island (NI) and Turbine Building (TB)/Annex Building (AB) above grade. (Ref. Tier 1 Table 3.3-6, UFSAR Appendix 2.5E Section 5.2 and Subsections 3.7.2.8.1 and 3.8.5.1)
- Current design acceptance criteria: 1" minimum gap during a seismic event. (Ref. UFSAR Subsection 3.8.5.1)
- Current calculations demonstrate margin is greater than the licensing basis design acceptance criteria.

## **Problem Statement:**

- Challenges with maintaining the minimum 4" gap during construction.
  - NI and TB gap constructed <4" at one localized area.
  - Additional localized exceedances may be identified in future concrete pours.

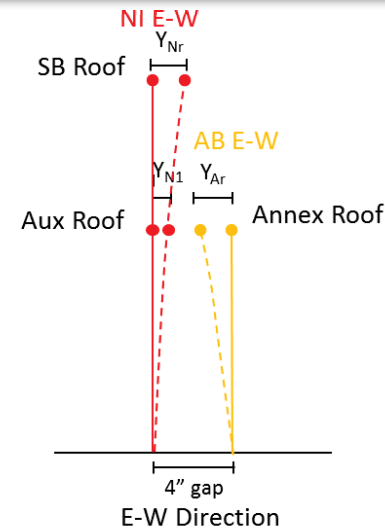
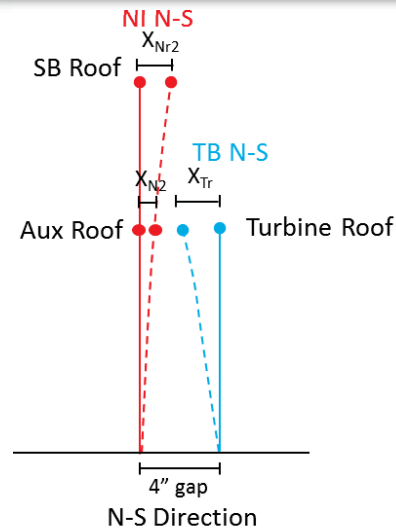
## **Proposed Resolution:**

- Reduce the minimum construction requirement from 4" to 3".
- Update calculations to continue to demonstrate the design acceptance criteria (1" minimum gap during seismic event) is met.



Note: This LAR does not propose any change to the gap below grade.

# Change 1: Seismic Gaps between Nuclear Island and Seismic Category II Buildings



| Licensing Basis |             | Current LB Requirements  | Proposed LB Requirements   | Calculations Supporting Proposed LB Requirements   |
|-----------------|-------------|--|--|--|
| T1              | Table 3.3-6 | TB&AB: 4" min gap  | TB&AB: 3" min gap  | N/A  |
| T2              | 3.7.2.8.1   | AB: $Y_{Ar} \leq 1.6"$   | AB: $Y_{Ar} \leq 1.6"$   | Updated calculation will demonstrate $Y_{N1} + Y_{Ar} = 0.951"$  |
| T2              | 3.8.5.1     | AB: $Y_{N1} + Y_{Ar} \leq 3"$<br>TB: $X_{N2} + X_{Tr} \leq 3"$               | AB: $Y_{N1} + Y_{Ar} \leq 2"$<br>TB: $X_{N2} + X_{Tr} \leq 2"$               | Updated calculation will demonstrate $Y_{N1} + Y_{Ar} = 0.951"$<br>Updated calculation will demonstrate $X_{N2} + X_{Tr} = 1.040"$ |
|                 |             | AB: $4" - (Y_{N1} + Y_{Ar}) \geq 1"$<br>TB: $4" - (X_{N2} + X_{Tr}) \geq 1"$ | AB: $3" - (Y_{N1} + Y_{Ar}) \geq 1"$<br>TB: $3" - (X_{N2} + X_{Tr}) \geq 1"$ | N/A  |



Note:

1. A settlement evaluation will be performed and it is not expected to impact the 1" minimum acceptance criteria. .



# Change 2: Seismic Gaps between Nuclear Island and Non-Seismic Buildings

## **Background:**

- Current construction requirement: 4" minimum gap between the Nuclear Island (NI) and the Radwaste Building (RB). (Ref. Tier 1 Table 3.3-6 and UFSAR Subsection 3.7.2.8.2)
- Current design acceptance criteria: The RB impact on the NI during a seismic event will not impair its structural integrity. (Ref. UFSAR Subsection 3.7.2.8.2)
- Current calculations demonstrate the design meets licensing basis design acceptance criteria

## **Problem Statement:**

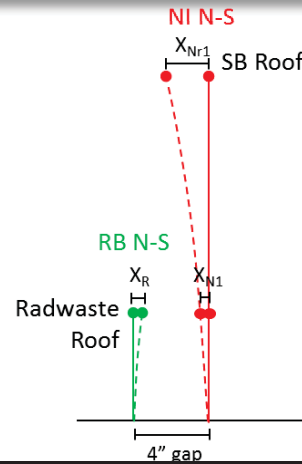
- The gap between the NI and the RB is not an input to the impact evaluation of RB on NI, therefore it does not affect the acceptance criteria of RB.
  - It is not meaningful to perform the ITAAC inspection on the RB gap when it does not contribute to the design/analysis.

## **Proposed Resolution:**

- Delete the requirement of gap between the RB and NI in Tier 1 Table 3.3-6, item 13.
- Modify UFSAR Subsection 3.7.2.8.2 from a minimum 4" clearance to a nominal 4" clearance.
- Update calculations to continue to demonstrate the design acceptance criteria (no impairment on NI integrity) is met.



# Change 2: Seismic Gaps between Nuclear Island and Non-Seismic Buildings



| Licensing Basis |             | Current LB Requirements                  | Proposed LB Requirements                     | Calculations Supporting Proposed LB Requirements   |
|-----------------|-------------|--|--|--|
| T1              | Table 3.3-6 | RB: 4" min gap                           | RB: Delete gap requirement from T1           | The evaluation of Radwaste Building (RB) was made to consider its impact on Nuclear Island (NI) or collapse in the safe shutdown earthquake. The gap between the NI and the RB is not an input to the impact evaluation of RB on NI, therefore it does not affect the acceptance criteria of RB (no impairment on NI integrity) in UFSAR Subsection 3.7.2.8.2.<br>Updated calculations will continue to demonstrate the design acceptance criteria is met. |
| T2              | 3.7.2.8.2   | RB: 4" min gap<br>RB: $X_{N1} \leq 0.2"$ | RB: 4" nominal gap<br>RB: $X_{N1} \leq 0.2"$ | Updated calculation will demonstrate $X_{N1} \leq 0.2"$  |

# Proposed Changes in Licensing Basis

- Propose to change the minimum gap between the NI and the TB/AB above 100'-0" from 4" to 3" in ITAAC No.3.3.00.13.
- Propose to delete the minimum gap requirement between the NI and the RB in ITAAC No.3.3.00.13.

| Table 3.3-6<br>Inspections, Tests, Analyses, and Acceptance Criteria |           |   |  |  |
|--|-----------|---|--|--|
| No.  | ITAAC No. | Design Commitment   | Inspections, Tests, Analyses   | Acceptance Criteria  |
| 819  | 3.3.00.13 | 13. Separation is provided between the structural elements of the turbine, annex, <del>and radwaste</del> buildings and the nuclear island structure. This separation permits horizontal motion of the buildings in the safe shutdown earthquake without impact between structural elements of the buildings. | An inspection of the separation of the nuclear island from the annex, <del>radwaste</del> and turbine building structures will be performed. The inspection will verify the specified horizontal clearance between structural elements of the adjacent buildings, consisting of the reinforced concrete walls and slabs, structural steel columns and floor beams. | The minimum horizontal clearance above floor elevation 100'-0" between the structural elements of the annex <del>and radwaste</del> buildings and the nuclear island is 4 inches. The minimum horizontal clearance above floor elevation 100'-0" between the structural elements of the turbine building and the nuclear island is 4 inches. |

**Justification:** The proposed change does not affect the 1" margin between the NI and TB/AB in seismic event. The maximum relative displacement between Auxiliary roof and Annex/Turbine roof under safe shutdown earthquake is less than 2".

The RB impact on NI is evaluated and confirmed it will not impair the integrity of the NI. As the gap between the NI and the RB is not an input to the impact evaluation, it does not affect the evaluation results.



# Proposed Changes in Licensing Basis

- Propose to change the minimum seismic gap between NI and AB above 100'-0" from 4" to 3" in UFSAR Appendix 2.5E Section 5.2.

SV0-1000-S2R-802

AP1000 Site Specific Seismic Evaluation Report

## 5.2 Adjacent Building Seismic Demand

The 2D SASSI east-west model, nuclear island and Annex building (Seismic Category II building), was used to obtain the relative displacement between nuclear island and at top of the annex building at NI elevation 179'-7" and annex building elevation 182'-8". The maximum relative displacement between nuclear island and at top of the Annex building for the ESP Best Estimate soil case is 2", which is less than the 4 inch gap between nuclear island and annex building. The response spectra at the location of the Seismic Category II Annex building are given in Figures 5.2-1 and 5.2-2 for the horizontal and vertical directions. The response spectra is compared to the AP1000 SSI Envelope (identified as ap2d) for the ESP best estimate soil case (identified as vg2d) at 5% damping.

3 inch  
minimum

**Justification:** The proposed change does not affect the 1" margin between the NI and the TB/AB in seismic event. The maximum relative displacement between auxiliary roof and annex roof under site specific earthquake is less than 2".



# Proposed Changes in Licensing Basis

- Propose to change the minimum seismic gap between NI and AB above 100'-0" from 4" to 3" in UFSAR Subsection 3.7.2.8.1.

## 3.7.2.8.1 Annex Building

The minimum space required between the annex building and the nuclear island to avoid contact is obtained by absolute summation of the deflections of each structure obtained from either a time history or a response spectrum analysis for each structure. The maximum displacement of the roof of the annex building is 1.6 inches in the east-west direction. The minimum clearance between the structural elements of the annex building above grade and the nuclear island is 4 inches.

3 inches

**Justification:** The proposed change does not affect the 1" minimum acceptance criteria between the NI and the TB/AB in seismic event. The maximum relative displacement between Auxiliary roof and Annex roof under safe shutdown earthquake is 0.951".



# Proposed Changes in Licensing Basis

- Propose to change the minimum 4" gap between NI and RB above 100'-0" to a nominal 4" gap in UFSAR Subsection 3.7.2.8.2.

## 3.7.2.8.2 Radwaste Building

The radwaste building is classified as nonseismic and is designed to the seismic requirements of the Uniform Building Code, Zone 2A with an Importance Factor of 1.25. As shown in the radwaste building general arrangement in **Figure 1.2-22**, it is a small steel framed building. If it were to impact the nuclear island or collapse in the safe shutdown earthquake, it would not impair the integrity of the reinforced concrete nuclear island. The ~~minimum~~ clearance between the structural elements of the radwaste building above grade and the nuclear island is 4 inches.

Three methods are used to demonstrate that a potential radwaste building impact on the nuclear island during a seismic event will not impair its structural integrity:

- The maximum kinetic energy of the impact during a seismic event considers the maximum radwaste building and nuclear island velocities. The total kinetic energy is considered to be absorbed by the nuclear island and converted to strain energy. The deflection of the nuclear island is less than 0.2". The shear forces in the nuclear island walls are less than the ultimate shear strength based on a minus one standard deviation of test data.

**Justification:** The evaluation of RB was made to consider its impact on NI or collapse in the safe shutdown earthquake. The gap between the NI and the RB is not an input to the impact evaluation of RB on NI, therefore the change does not affect the acceptance criteria of RB (no impairment on NI integrity) in UFSAR Subsection 3.7.2.8.2.





# Proposed Changes in Licensing Basis

- Propose to change the minimum seismic gap between the NI and the TB/AB above 100'-0" from 4" to 3" in UFSAR Subsection 3.8.5.1.
- Propose to clarify/separate the seismic gap requirements for TB/AB and RB.

## 3.8.5.1 Description of the Foundations

~~[Adjoining buildings<sup>(1)</sup>, such as the turbine building and annex building, are structurally separated from the nuclear island structures by a 2-inch gap at and below the grade. A 4-inch minimum gap is provided above grade.]\*~~ This provides space to prevent interaction between the nuclear island structures and the adjacent seismic Category II ~~and non seismic~~ structures during a seismic event. The maximum relative seismic displacement between the roof of the nuclear island and ~~any adjoining~~ buildings is less than 3 inches. This results in a clearance (gap) between buildings greater than 1 inch during a seismic event. Therefore, there are no interactions between adjacent buildings during a seismic event. Figure 3.8.5-1 shows the foundations for the nuclear island structures and the adjoining structures.

The radwaste building<sup>(1)</sup> is separated from the nuclear island by a 2-inch gap at and below grade, and a 4-inch gap above grade.

1. It should be noted that an evaluation of the radwaste building was made to consider its impact on the nuclear island or collapse in the safe shutdown earthquake; it was concluded that it would not impair the integrity of the nuclear island (see Subsection 3.7.2.8.2).

**Justification:** The proposed change does not affect the 1" margin between NI and TB/AB in seismic event. The maximum relative displacement between auxiliary roof and annex/turbine roof under safe shutdown earthquake is less than 2".



As discussed in footnote 1 of UFSAR 3.8.5.1, the gap requirement of RB should be separated from the requirements of TB/AB in UFSAR 3.8.5.1 as it is under a different analysis assumption as discussed in UFSAR 3.7.2.8.2. UFSAR 3.8.5.1 is adjusted accordingly.

# Schedule

- NRC Technical Exchange Meeting: 1/11/2018
- Planned date of LAR submittal to NRC: 2/1/2018
- Planned date of PAR submittal to NRC: 2/2/2018
- Planned date of PAR approval by NRC: 2/16/2018

