

May 28, 2009

MEMORANDUM TO: Eileen M. McKenna, Chief  
AP1000 Projects Branch 2  
Division of New Reactor Licensing  
Office of New Reactors

FROM: William C. Gleaves, Sr. Project Manager  
AP1000 Projects Branch 2 /RA/  
Division of New Reactor Licensing  
Office of New Reactors

SUBJECT: SUMMARY OF A REGULATORY AUDIT HELD WITH  
WESTINGHOUSE ELECTRIC COMPANY REGARDING THE  
PROPOSED AP1000 SEISMIC DESIGN IN MONROEVILLE,  
PENNSYLVANIA ON APRIL 13-17, 2009

The U.S. Nuclear Regulatory Commission (NRC) held a regulatory audit April 13-17, 2009 at the Westinghouse Energy Center office in Monroeville, Pennsylvania. The Office of New Reactors (NRO) staff met with Westinghouse Electric Company (Westinghouse) staff and its representatives to discuss the technical review of the proposed AP1000 design submitted as part of their design certification amendment (DCA).

Enclosed with this memorandum summarizing the meeting, are enclosures providing additional information on the audit as follows: (1) meeting attendee list, (2) audit agenda, (3) non-proprietary technical presentation slides, (4) proprietary technical presentation slides, and (5) action items list.

This regulatory audit was for the purposes of continuing the staff review of the proposed DCA by allowing the staff to review and assess the information supporting the proposed DCA, such as calculations and computer codes and its results. Specifically, the participants discussed the technical issues related to the AP1000 proposed seismic design. The foundation for the meeting was Westinghouse's responses to previous NRC requests for additional information and on AP1000 Technical Reports (TR) submitted by Westinghouse to support the proposed DCA. The technical audit primarily focused on TR 3 "Extension of Nuclear Island Seismic Analysis to Soil Sites," TR 9 "Containment Vessel Design Adjacent to Large Penetrations," and TR 115 "Effect of High Frequency Seismic Content on SSCs."

The purpose of this meeting summary is to briefly describe the meeting, its participants, and to delineate the results. There were 23 participants at the audit. The meeting started promptly at 1:00 p.m. EST. on April 13, 2009 and ended at 1:05 p.m. EST. on April 17, 2009.

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### Discussion

Following the introductions of the attendees at the meeting, the Project Manager reviewed the purpose of the meeting; this NRC technical audit is to review documents and calculations that support Westinghouse's request for amendment to the certified AP1000 reactor.

The weeks discussions were prioritized as described in Enclosure 2, "Agenda for Technical Audit at Westinghouse Monroeville Offices." The discussion issues were prioritized in four priorities with the first three priorities being the focus of the audit and the remaining (fourth) priority if there is time remaining.

As discussed in the agenda, throughout the week, the presentations were made on the various issues and were normally accompanied by presentation slides. Those non-proprietary and proprietary slides are contained in Enclosures 3 and 4, respectively.

The action items resulting from the technical audit are summarized in Enclosure 5. Regarding the Priority 4, Items 1 and 2 that are shown as struck-out in the enclosure, this was done by NRC to indicate that those items were redundant and therefore no more consideration of those items was judged to be necessary as the necessary actions are carried by other items.

### Conclusion

In general, the staff found the meeting to be effective and resulted in significantly advancing NRC's review of Westinghouse's proposed amendment to the AP1000 design certification. At the conclusion of the meeting, the NRC staff reviewed the draft list of action items from the meeting and agreed to have another conference call on April 22, 2009 to settle both the final action items and the due dates for those items.

Following a summary meeting at 1:00 p.m. to summarize the progress and review the action items, the meeting, and the audit was complete.

Docket No. 52-006

Enclosures:  
As stated

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OFFICE	LA:NWE2:DNRL:NRO	PM:NWE2:DNRL:NRO	BC:NWE2: DNRL:NRO
NAME	RButler	BGleaves	EMcKenna
DATE	05/15/2009	05/28/2009	05/28/2009

Regulatory Audit on AP1000 Seismic Issues  
Attendance List  
Westinghouse, Monroeville  
April 13-17, 2009

<u>Name</u>	<u>Organization</u>
Brian Thomas	U.S. NRC
Pravin Patel	U.S. NRC
Bret Tegeler	U.S. NRC
Billy Gleaves	U.S. NRC
Sunwoo Park	U.S. NRC
Rich Morante	U.S. NRC/BNL
Carl Costantino	U.S. NRC/BNL
Ed Cummins	Westinghouse
Lee Tunon-Sanjur	Westinghouse
Rob Sisk	Westinghouse
Don Lindgren	Westinghouse
Bill LaPay	Westinghouse/consultant
John Iacovino	Westinghouse
Narendra Prasad	Westinghouse
Dan Ghiocel	Westinghouse/consultant
Dali Li	Westinghouse
Jim Parello	Westinghouse
Venky Pravu	Westinghouse
Scott Altmayer	Westinghouse
Brandon Schoonmaker	Westinghouse
John McConaghy	Duke/NuStart
Don Moore	Southern Nuclear
Eddie Grant	NuStart

**AP1000 Westinghouse Audit Agenda**



<p><b>Day 2 ( 4/14)</b></p> <ul style="list-style-type: none"> <li>Continuation of High Priority agenda items from previous day</li> </ul>	<ul style="list-style-type: none"> <li>See agenda detail and review previous day actions</li> </ul>	Pravin/Bret/ Carl /Rich(BNL)	8 hrs.
<p><b>Day 3 ( 4/15)</b></p> <ul style="list-style-type: none"> <li><u>Second and third priority items</u></li> </ul> <ol style="list-style-type: none"> <li>Review unresolved RAIs of TR 3, Extension of Soil Sites, (RAI-TR03-010, -014, -015, -017, -019,-024, -025, -026, -027, -028, -029, -030, -031,-016, -021 (part (e), -022, -023, -032, -033, and -036)</li> <li>Review Unresolved /confirmatory RAIs of TR 9 (Large Containment Penetration). RAI-TR9-4,-8, RAI-TR3-16 transferred to TR 9</li> </ol>	<ul style="list-style-type: none"> <li>See agenda detail and review previous day actions</li> </ul>	Pravin/Bret/ Carl /Rich	8 hrs.
<p><b>Day 4 (4/16)</b></p> <ul style="list-style-type: none"> <li><u>Fourth priority items</u></li> </ul> <ol style="list-style-type: none"> <li>RAIs for DCD, APP 3G and 3I, the seismic classification, method of seismic analysis, and the acceptance criteria for buildings not on the nuclear island need to be clarified RAI-SRP-3.7.1-SEB1-15</li> <li>Viscous damping values specified in DCD Section 3.7.1 are not consistent with the current staff guidance in RG 1.61, Revision 1 (March 2007). Westinghouse needs to address use of the specified values. RAI- SRP-3.7.1-</li> </ol>	<ul style="list-style-type: none"> <li>See agenda detail and review previous day actions</li> </ul>	Pravin/Bret/ Carl /Rich	8 hrs

<p>SEB1-16</p> <p>3. The seismic analysis methods described in DCD Section 3.7.2 are not consistent with the current staff guidance in SRP 3.7.2 (March 2007) and RG 1.92, Revision 2. Westinghouse needs to address use of the methods currently specified in DCD Section 3.7.2. RAI-SRP-3.7.1-SEB1-17.</p> <p><b>Day 5( 4/17)</b></p> <p>3. Review all priority items and prepare for exit</p>	<ul style="list-style-type: none"> <li>• See agenda detail and review previous day actions</li> </ul>	<p>Pravin/Bret/ Carl /Rich</p>	<p>Time as Required</p>
<p>Review new and old action items and identify any actions arising from this audit</p>	<p>– Understanding of Action, Responsibility, Due Dates</p>	<p>Brian Thomas/ Billy Gleaves</p>	<p>20 min</p>



**Non – Proprietary Technical Presentation Slides  
At Westinghouse Monroeville Offices**

**April 13-17, 2009**

1. “Seismic Incoherent SSI Methodology Applied to AP1000 NPP at Bellefonte Site”  
by D. Ghiocel (ML091340670)
2. SCV Equivalent Static Analysis Brandon Schoonmaker (ML091340774)
3. Effects of High Frequency on Piping (ML091420474)
4. Adjacent Building Seismic Design (ML091340725)
5. Damping Value for Seismic Qualification Analysis of AP1000 Electrical Cabinets  
and Panels James Parello (ML091340748)
6. AP1000 Safety-Related Equipment Seismic Qualification Testing  
James Parello (ML091340740)

Enclosure 3

**Proprietary Technical Presentation Slides at Westinghouse Monroeville Offices  
April 13-17, 2009**

**Proprietary Technical Presentation Slides**

1. "Adjacent Building Seismic Design" Proprietary (ML091480740)

Enclosure 4

**Draft List of Action Items as Compiled at the Regulatory Audit  
April 13-17, 2009**

Enclosure 5

## **NRC AUDIT OF AP1000 SEISMIC DESIGN APRIL 13-17, 2009**

### HIGH PRIORITY ITEMS – TR-115

ITEM 1: Implementation of Incoherency RAI-SRP3.7.1-SEB1-10, -11

Status: Audit Complete, NRC review continuing.

Action: 1) Westinghouse to provide to NRC the presentation (without animations) by Dan Ghiocels. In addition, Westinghouse committed to do additional work; 2) Additional calculations using EPRI model & rectangular foundation AP1000 on hard rock foundation, 3) More data, i.e., HRHF response spectra for 5 locations on the basemat (4 location at 4 corner and center) comparison of coherent at 5 nodes, 25 samples of incoherent and average of 25 incoherent response spectra, 4) Westinghouse will send Costantino. the latest (5 input data files) NI20 SASSI model, 5) Westinghouse will provide date for completion of these items as docketed information on April 22, 2009 conference call with NRC.

ITEM 2: NI10 & NI20 Models Status: Unresolved. Westinghouse should document its position on adequacy of NI20 on HRHF analysis in a revised response to RAI-SRP3.7.1-SEB1-06.

Action: Westinghouse should consider revising RAI-SRP3.7.1-SEB1-06.

ITEM 3: Shell Modes of Steel Containment. RAI-SRP3.7.1-SEB1-04.

Status: Audit Complete, NRC review continuing.

Action: See Item #1 (the incoherency analysis is under review)

ITEM 4: Coherent vs. Incoherent Response.

Status: Audit Complete, NRC review continuing.

Action: See Item #1

ITEM 5: Regarding Screening & Selection of Key Locations reported in TR115, and the inconsistency of results between 3 models.

Status: Unresolved

Action: 1) Westinghouse should revise a response to RAI-SRP3.7.1-SEB1-09(d)&(f) and RAI-SRP3.7.1-SEB1-08, 2) Westinghouse will provide date for completion of revised RAI responses on April 22, 2009 conference call with NRC.

### SECOND PRIORITY ITEMS – TR-03

ITEM 1: Limitations of 2D SASSI

Status: Audit complete, NRC review continuing. NRC has seen the draft RAI.

Action: 1) Westinghouse will submit new response to RAI-TR03-010, including DCD changes, and other related RAIs if necessary (-14, -15, -17, -19, 02) Westinghouse will provide date for completion of revised RAI responses on April 22, 2009 conference call with NRC.

ITEM 2: Lift-off Analysis Removed from TR3

Status: Audit Complete, NRC review continuing. NRC has not given feedback on the draft RAIs and will next week.

Action: 1) Westinghouse has given draft RAIs and will revise RAI-TR03-024, -025, -026, -027, -028, -029, -030, -031, 02) Westinghouse will provide date for completion of revised RAI responses on April 22, 2009 conference call with NRC.

ITEM 3: Justification of ESA for SCV RAI-TR03-016

Status: Audit Complete, NRC review continuing. NRC has not given feedback on the draft RAIs and will next week.

Action: 1) Westinghouse will submit Brandon Schoonmaker presentation as updated with missing mass at GPA to Time-History 2) Westinghouse submitted draft response on April 15, 2009 and will submit docketed update (or revision) to RAI-TR03-016, 03) Westinghouse will provide date for completion of presentation & revised RAI response on April 22, 2009 conference call with NRC.

### THIRD PRIORITY ITEMS – TR09

ITEM 1: Fatigue Evaluation Waiver in TR9-04.

Status: Audit complete. NRC review continuing. Audited Westinghouse calculation APP-MV50-GEC-001. NRC has not reviewed the revised calculation.

Action: 1) Westinghouse to revise discussion of Criterion 6 in Westinghouse calculation. This calculation will be available for NRC audit, when complete.

ITEM 2 Inadvertent Actuation of Containment Coolers. Related to RAI-TR09-08.

Status: Audit Complete, NRC review continuing.

Action: 1) NRC SEB1 contacted NRC/SPCV, 2) No action for Westinghouse.

ITEM 3: Compare Equivalent Static A vs. Response Spectra A

Status: Audit Complete, NRC review continuing.

Action 1) See Second Priority, Item 3 above. Draft revised RAI has been completed (See priority 2, Item 3).

### FOURTH PRIORITY ITEMS

ITEM 1: Technical Reports Status

Status: Audit Complete, NRC review continuing.

Action: None. This is more of a “motherhood” item to see that all information is appropriately dispositioned in Technical Reports.

ITEM 2: Technical Issues related to Content of DCD Section 3.7

Status: This item is explained in detail, and overtaken by, fourth priority, Items 3-5.

Action: None

ITEM 3: RAI-SRP3.7.1-SEB1-015, a&b) Annex Bldg SCI/SCII/NS, c) TB SC

Status: Audit Complete, NRC review continuing. We have made significant progress and Westinghouse will submit revised RAI response.

Action: 1) Westinghouse will clarify SC of all non-NI buildings, 2) Westinghouse committed to clarify the modeling non-NI buildings in RAI response and including DCD change, 3) Presentation by Lee Tunon-Sanjur (Thursday) on SC, 4) Westinghouse will submit revised RAI-SRP3.7.1.-SEB1-015 (including a DCD modification) to address application of 2D vs. 3D SASSI, how 2D & 3D will be used for building responses, how analyses will be done for various soil sites using CSDRS Ground motion input, evaluation of building response at hard rock sites using backfill with HRHF ground motion, 5) Westinghouse will provide date for completion of revised RAI response on April 22, 2009 conference call with NRC.

ITEM 4: RAI-SRP3.7.1-SEB1-016, Identify Structural Damping used in HRHF seismic analysis. We have made very good progress and Westinghouse committed to provide revised RAI response to clarify previous responses.

Status: under review. NRC and Westinghouse understand Finality Position.

Action: 1) Re: -16(a)&(c) Provide Jim Parelo's Safety-Related EQ Testing/Damping presentation, 2) supplement response to RAI to discuss, 3) Westinghouse will provide a revised response (including an example) to RAI-SRP3.7.1-SEB1-16(c) on damping, 4) Westinghouse will provide revised response to RAI-SRP3.7.1-SEB1-16(b) based of Bill LaPay's clarification of cable trays on Friday, 5) Westinghouse will provide date for completion of revised RAI response on April 22, 2009 conference call with NRC.

ITEM 5: RAI-SRP3.7.1-SEB1-017, Seismic Analysis of Nuclear Island

Status: No Change. NRC and Westinghouse understand Finality Position.

Action: None