

June 12, 2014

Mr. J. A. Gresham, Manager
Westinghouse Electric Company
Nuclear Services
1000 Westinghouse Drive
Cranberry Township, PA 16066

SUBJECT: AUDIT SUMMARY FOR REVIEW OF SUPPORTING SEISMIC RESPONSE
INFORMATION FOR TOPICAL REPORT WCAP-17524-P, "AP1000 CORE
REFERENCE REPORT"

Dear Mr. Gresham:

On April 16, 2013, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an audit related to the review of the fuel assembly seismic response testing in support of the Westinghouse topical report, WCAP-17524-P, "AP1000 Core Reference Report." The following enclosures identify the audit participants, describe the review process, and list the documents reviewed.

If you have any questions, please contact the Project Manager, Bruce Baval, at (301) 415-6715 or Bruce.Baval@NRC.gov.

Sincerely,

/RA Bruce Baval for:/

Lawrence Burkhart, Chief
Licensing Branch 4
Division of New Reactor Licensing
Office of New Reactors

Project No. 0793

Enclosures:

1. Audit Participation
2. Audit Summary (Non-Proprietary)
3. Audit Summary (Proprietary)

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Table 1: Audit Participation – April 16, 2013

The following table provides a comprehensive list of the audit participants from the NRC, WEC, and applicable licensees.

| Name | Affiliation |
|---------------------|--------------------|
| Amrit Patel | NRC |
| Jeff Schmidt | NRC |
| Chris VanWert | NRC |
| Paul Clifford | NRC |
| Andrew Proffitt | NRC |
| Kristopher Cummings | Westinghouse |
| Ryan Lenahan | Westinghouse |
| Mike Misvel | Westinghouse |
| Roger Lu | Westinghouse |
| Jin Liu | Westinghouse |
| Carrie copenhagen | Westinghouse |
| Naomi Marshall | Westinghouse |
| Paul Evans | Westinghouse |

**Audit Summary for Review of Supporting Seismic Response Information for Topical
Report WCAP-17524-P, "AP1000 Core Reference Report"
Westinghouse Electric Company
Project No. 0793
April 16, 2013**

Summary:

On April 16, 2013, staff of the Nuclear Regulatory Commission (NRC) conducted an audit at the Westinghouse office in Columbia, South Carolina. The purpose of this audit was to review the testing procedures and results related to the AP1000 fuel seismic response. The staff participated in a tour of the grid crush testing facility, questioned Westinghouse staff regarding testing procedures, and reviewed the test result documents used to support the Core Reference Report Supplemental Information.

The tour consisted of the dynamic crush testing machine, fuel assembly mechanical properties test apparatus, and example grids used to develop the AP1000 grid P_{crit} values. Westinghouse staff explained the testing procedures used during grid crush testing and explained how the grids were tested []. The staff confirmed that the vibrational mode testing used to support the AP1000 analysis (performed in the fuel assembly mechanical properties test apparatus) was based on a full-sized AP1000 assembly as detailed by the Core Reference Report (WCAP-17524-P).

Staff primarily focused on document GCCD-12-138, Rev. 1, "AP1000 Mid Grid End-of-Life (EOL) Dynamic Crush Strength Test Report," which detailed the test results from the AP1000 grid crush testing and forms the basis for the AP1000 fuel seismic response analysis. This document details the testing of EOL surrogate and beginning-of-life (BOL) grids and also identifies the different backplates used in the analysis. For core locations that would result in grid to grid collisions, a standard backplate was used, consisting of a single solid piece of flat metal that contained a load cell. For core locations that would result in grid to core shroud collisions, an alternate backplate was use which was [

]. This simulated the contact face between the grid and core shroud.

The staff noted that there is [] reported in the EOL grid crush test results. This was not apparent in the BOL grid crush test results. The report stated that the limiting P_{crit} value was defined as the lower 95% confidence level taken about the mean of the tests for both directions. The staff noted that the guidance provided in SRP Section 4.2 Appendix A does not specify that the P_{crit} value be based only on values from tests conducted on the direction that yields the lowest average result. However, this would be non-conservative for grid designs demonstrating a strong directional dependence. The staff concluded that the directional difference for the AP1000 grids is not large enough to affect the overall safety conclusions.

Enclosure 2

The results indicate that the limiting grid crush strength was for an EOL grid [

]. This value is used as P_{crit} in the AP1000 fuel seismic response analyses in the limiting locations.

Documents Reviewed:

1. GCCD-12-138, Rev. 1, "AP1000 Mid Grid End-of-Life (EOL) Dynamic Crush Strength Report," April 11, 2013.
2. GCCD-12-99, Rev. 0, "AP1000 eRFA Mid Grid End of Life (EOL) Dynamic Crush Strength Scoping Test Prospectus" Sept. 19, 2012
3. PD1-97-101, Rev. 1, "Generic Grid Crush Test Prospectus" Nov. 18, 1997.

Requests for Additional Information (RAIs):

No RAIs were required as a result of this audit.

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cc:

(Revised 06/05/2014)

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