

April 19, 2016

Mr. Ron Wessel, Principal Engineer
Westinghouse Electric Company LLC
Cranberry Headquarters
1000 Westinghouse Drive
Cranberry Township, PA 16066

SUBJECT: NUCLEAR REGULATORY COMMISSION INSPECTION OF WESTINGHOUSE
ELECTRIC COMPANY REPORT NO. 99900404/2015-203

Dear Mr. Wessel:

On July 27-31, 2015, December 9-10, 2015, and February 11, 2016, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an inspection at the Westinghouse Electric Company, LLC (WEC) facility in Cranberry Township, PA. The purpose of the limited-scope inspection was to assess WEC's compliance with the provisions of selected portions of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," and 10 CFR 50.150, "Aircraft Impact Assessment," pertaining to safety-related activities associated with control of design changes for the advanced passive (AP)1000 reactor design and the consideration of the effects these changes may have on the AP1000's aircraft impact assessment (AIA).

Within the scope of this inspection, two minor violations were identified. Specially, WEC failed to identify how a key design feature met the assessment requirements in accordance with 10 CFR 50.150(b)(2). In addition, WEC failed to perform a design-specific AIA in accordance with 10 CFR 50.150(a)(1). Since these failures constitute violations of minor significance, they are not subject to formal enforcement action and do not require a response; however, they are being documented to track deficiencies associated with the AP1000 design control document (DCD) and the AP1000 AIA.

In accordance with 10 CFR 2.390, the NRC will make a copy of this letter, its enclosure(s), and your response, if applicable, available electronically for public inspection in the NRC's Public Document Room or from the NRC's Agencywide Documents Access and Management System (ADAMS), accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>. To the extent possible, your response should not include any personal privacy, proprietary, or Safeguards Information so that it can be made available to the public without redaction. If

personal privacy or proprietary information is necessary to provide an acceptable response, please submit a bracketed copy of your response that identifies the information that should be protected, along with a redacted copy of your response that deletes such information. If you request that such material be withheld from public disclosure, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information). If the inclusion of Safeguards Information is necessary to provide an acceptable response, please ensure that your document is prepared and transmitted in accordance with the levels of protection described in 10 CFR 73.21, "Protection of Safeguards Information: Performance Requirements."

Sincerely,

/RA/

Terry W. Jackson, Branch Chief
Quality Assurance Vendor Inspection Branch 1
Division of Construction Inspection
and Operational Programs
Office of New Reactors

Docket No.: 99900404

Enclosure:
Inspection Report 99900404/2015-203
and Attachment

personal privacy or proprietary information is necessary to provide an acceptable response, please submit a bracketed copy of your response that identifies the information that should be protected, along with a redacted copy of your response that deletes such information. If you request that such material be withheld from public disclosure, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information). If the inclusion of Safeguards Information is necessary to provide an acceptable response, please ensure that your document is prepared and transmitted in accordance with the levels of protection described in 10 CFR 73.21, "Protection of Safeguards Information: Performance Requirements."

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 Division of Construction Inspection
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NRO-002

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**U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NEW REACTORS
DIVISION OF CONSTRUCTION INSPECTION AND OPERATIONAL PROGRAMS
VENDOR INSPECTION REPORT**

Docket No.: 99900404

Report No.: 99900404/2015-203

Inspection Location: Westinghouse Electric Company, LLC
Cranberry Headquarters
1000 Westinghouse Drive
Cranberry Township, PA 16066

Contact: Mr. Ron Wessel, Principal Engineer
Westinghouse Electric Company, LLC
Cranberry Headquarters
1000 Westinghouse Drive
Cranberry Township, PA 16066

Nuclear Industry Activities: WEC provides safety-related design for the Advance Passive (AP) 1000 reactor design, as a vendor to AP1000 combined license holders, in accordance with 10 CFR Part 50, Appendix B. WEC also completed the aircraft impact assessment of the AP1000 reactor design to comply with 10 CFR 50.150 in 2010 as the applicant for the AP1000 design certification. The NRC performed an aircraft impact assessment inspection of WEC, as an applicant, in October 2010 (ADAMS Accession No. ML102980583) and October 2011(ADAMS Accession No. ML112650748).

Inspection Dates: July 27-31, 2015,
December 9-10, 2015, and
February 11, 2016.

Inspectors: Stacy Smith, Team Leader, NRO/DCIP/QVIB-1
Dennis Andrukat, NRO/DSRA/SPSB
John Budzynski, NRO/DSRA/SRSB
Ata Istar, NRO/DEIA/SEB
Andrea Johnson, NRO/DCIP/CIPB, Observer
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Ryan Nolan, NRO/DSRA/SPSB
Jonathan Ortega-Luciano, NRO/DCIP/QVIB-2
Marie Pohida, NRO/DSRA/SPRA

Approved by: Terry W. Jackson, Chief
Quality Assurance Vendor Inspection Branch 1
Division of Construction Inspection
and Operational Programs
Office of New Reactors

Enclosure

EXECUTIVE SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) conducted a vendor inspection to verify that Westinghouse Electric Company (WEC) implemented an adequate quality assurance (QA) program that complies with the regulatory requirements in Criterion III, "Design Control," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities." In addition, WEC assessed if design changes made to the AP1000 could impact the aircraft impact assessment (AIA) for the AP1000 combined license holders in accordance with 10 CFR 50.150, "Aircraft impact assessment." Specifically, WEC utilized their Appendix B design control program to control and evaluate changes associated with 10 CFR 50.150(c), "Control of Changes."

The NRC conducted the inspection at WEC's headquarters facility in Cranberry Township, PA, July 27-31, 2015, December 9-10, 2015, and February 11, 2016. The NRC performed the AIA inspection of the AP1000 September 27-October 1, 2010, and performed a follow-up inspection May 23, 2011, through August 12, 2011. These reports can be viewed in NRC's Agencywide Document Access and Management System (ADAMS) under accession numbers ML102980583 and ML112650748, respectively.

The following served as the bases for the NRC inspection:

- Appendix B to 10 CFR Part 50, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," and
- 10 CFR 50.150, "Aircraft impact assessment."

During this inspection, the NRC inspection team implemented Inspection Procedure (IP) 43002, "Routine Inspections of Nuclear Vendors."

This inspection was performed to verify that design changes made by WEC were in accordance with Criterion III, "Design Control," of 10 CFR Part 50, Appendix B. In addition, the inspection verified that design changes associated with key design features or capabilities defined in the AP1000 AIA were controlled in accordance with 10 CFR 50.150(c), "Control of changes." The inspection reviewed design change processes that were in effect pre- and post-certification of the design.

The results of the inspection are summarized below.

Design Change Process

The NRC inspection team concluded that the design change procedures and evaluations performed by WEC are consistent with the regulatory requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50.

Aircraft Impact Assessment

The NRC inspection team assessed AIA design changes associated with plant systems, fire impacts, and structural impacts. The team identified two examples of minor significance of WEC's failure to comply with regulatory requirements of 10 CFR 50.150. Specially, WEC failed to identify how a key design feature met the assessment requirements in accordance with 10 CFR 50.150(b)(2). In addition, WEC failed to perform a design-specific AIA in accordance

with 10 CFR 50.150(a)(1). Both failures occurred at the time WEC was the applicant for the AP1000 design certification. Since these failures constitute violations of minor significance, they are not subject to formal enforcement action; however, they are being documented to track deficiencies associated with the AP1000 design control document (DCD) and the AP1000 AIA.

Design Changes - Systems

The NRC inspection team concluded that WEC appropriately considered the effect the system related changes had on the AP1000 AIA consistent with their design control processes which are in accordance with the regulatory requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50 and 10 CFR 50.150(c), "Control of changes."

Design Changes - Fire

The NRC inspection team concluded that WEC appropriately considered the effect the fire related design changes on the AP1000 AIA consistent with their design control processes which are in accordance with the regulatory requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50 and 10 CFR 50.150(c), "Control of changes."

Design Changes - Structural

The NRC inspection team concluded that WEC appropriately considered the effect structural related design changes had on the AP1000 AIA consistent with their design control processes which are in accordance with the regulatory requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50 and 50.150(c), "Control of changes."

REPORT DETAILS

1. Design Change Process

a. Inspection Scope

The NRC inspection team reviewed design change proposals (DCPs) evaluated before the AP1000 design certification in September 2011 and after the design was certified. The design changes evaluated before certification were evaluated against the regulatory requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50 and using the guidance found in Interim Staff Guidance DC/COL-ISG-011, "Finalizing Licensing Basis Information." The DCPs issued after design certification were evaluated against 10 CFR Part 52, Appendix D, Section VIII, "Processes for Changes and Departures" and Criterion III, "Design Control," of Appendix B to 10 CFR Part 50.

Specifically, the team reviewed the following procedures:

- APP-GW-GAP-140, " AP1000 Licensing Applicability Determination and 10 CFR 50.59/10 CFR Part 52 Appendix D Section VIII Screening," Revision 0 dated June 27, 2011,
- APP-GW-GAP-147, "AP1000 Current Licensing Basis Review," Revision 1 dated September 2012,
- APP-GW-GAP-604, "AP1000 Stage Gate Design Change Control Process," Revision 6 dated September 18, 2014, and
- WEC 3.4.1, "Change Control for the AP1000 Plant Program," Revision 3.

In addition, the NRC inspection team reviewed the following DCPs and licensing determination samples:

- DCP 1852, "RNS P&ID Changes to support piping isometrics," dated August 13, 2010,
- DCP 2317, "Clarification of RNS sloping requirements," dated May 31, 2011,
- DCP 2688, "Nuclear Systems Gas Intrusion Response," dated April 29, 2011,
- DCP 1402, "PXS changes due to gas accumulation, GL 2008-01," dated April 1, 2010,
- DCP 4786, "Hydrogen Vent Path Design Change," dated June 30, 2014
- APP-FSAR-GLN-180 AP1000 Licensing Applicability Determination and 10CFR50.59/10CFR52 Appendix D Section VIII Screening App-GW-GEE-2317 and 2821, Revision 0,
- APP-GW-GAP-129 Title: Preparation of ISG-11 Evaluations Revision 0, dated March 29, 2010,
- APP-GW-GLA-381 Title: AP1000 ISG-11 Evaluation for DCP APP-GW-GEE-1852 RNS P&ID Changes to support piping isometrics Revision 0,
- APP-GW-GLA-469 Title: AP 1000 ISG -11 Evaluation for APP-GW-GEE-2688 Nuclear Systems Gas Intrusion Response June 10, 2011, Revision 0,
- APP-GW-GLA-155, Title: AP 1000 ISG -11 Evaluation for DCP APP-GW-GEE -1402 PXS Changes due to Gas Accumulation, Revision 0,

- APP-GW-GLA-482, Title: AP1000 ISG-11 Evaluation for DCP APP-GW-GEE-2317 clarification of RNS Sloping Requirements August 12, 2011, Revision 0,
- APP-FSAR-GLN-267 AP1000 Licensing Applicability Determination and 10 CFR 50.59 / 10 CFR Part 52 Appendix D Section VIII Screening APP-GW-GEE- 1852, DP242, Revision 0,
- APP-FSAR-GLN-202 AP1000 Licensing Applicability Determination and 10 CFR 50.59 / 10 CFR Part 52 Appendix D Section VIII Screening APP-GW-GEE- 2688 Revision 0,
- APP-FSAR-GLN-134, "AP1000 Licensing Applicability Determination and 10 CFR 50.59 / 10 CFR Part 52 Appendix D Section VIII Screening: APP-GW-GEE-2450, DP-310," Revision 0,
- APP-GW-GEE-2356, "Security Door Upgrades Based on Aircraft Impact Assessment," Revision 0, and
- APP-GW-GEE-2450, "Relocation of AIA Blast Doors and Addition of Shielding Doors to Annulus Personnel Access Portals," Revision 0.

b. Observations and Findings

The NRC inspection team evaluated DCPs against WEC policies and procedures to verify adequate implementation. The NRC inspection team did not identify any deficiencies with WEC's evaluations and conclusions of the sample selected. However, the team was not able to verify DCP 2317, DCP 4786, and the licensing applicability determinations for DCP 2317 and DCP 4786, since these packages were still being evaluated by WEC.

c. Conclusions

The NRC inspection team concluded that the design change procedures and evaluations performed by WEC are consistent with the regulatory requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50.

2. Aircraft Impact Assessment

a. Inspection Scope

The NRC inspection team verified that design changes made to the AP1000 did not invalidate conclusions made in the AIA. The team reviewed design changes in areas that could affect the assessment, including systems, fire, and structural samples. WEC elected to control AIA design changes in accordance with Criterion III, "Design Control," of 10 CFR Part 50, Appendix B. The team assessed whether their design change processes were implemented in accordance with regulatory requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50, in order to control changes associated with the AIA as required by 10 CFR 50.150(c), "Control of Changes."

b. Observations and Findings

The NRC inspection team observed two minor violations associated with the AIA as the violations occurred when WEC was the applicant for the AP1000 design certification. 10 CFR 50.150(b)(2) requires, in part, the final safety analysis report (FSAR) must include a description of how the design features and functional capabilities meet the assessment requirements in (a)(1). The NRC inspection team determined that although WEC identified appropriate key design features, they failed to identify how these features met the assessment requirements in accordance with 10 CFR 50.150(b)(2). Specially, the auxiliary building is listed in Chapter 19F, "Malevolent Aircraft Impact" of the AP1000 DCD, as a key design feature for spent fuel pool liner integrity and fire barriers. However, WEC's AIA credits the auxiliary building for core cooling as well. Appendix 19F fails to describe this capability. In addition, the NRC inspection team interviewed WEC staff responsible for assessing design change impacts on the AIA. Specifically, Procedure APP-GW-GAP-140 provided instructions for performing licensing applicability determinations. Question 12 of the procedure directs an assessment to whether the activity involves an impact to the AIA. The NRC staff determined that not all staff could accurately answer Question 12 in order to identify if a design change impacted the AIA based on the auxiliary building's description in Appendix 19F of the AP1000 DCD. WEC took the following corrective actions:

- Issue ID 100334948, dated October 14, 2015, identified that WEC will consider an enhancement to the wording in the existing FSARs for AP1000 licensees. This change would require licensee approval to change their FSARs. This Issue ID was updated on February 11, 2016, to include the following: "Make sure this issue is addressed in a departure. Once the departure is complete, this issue can be closed. As part of the departure, DCD Appendix 19F shall be updated to enhance the current wording to show how the structural integrity of the auxiliary building for protection equipment needed to manually actuate equipment needed for reactor core cooling is credited."
- Issue ID 100316582, dated July 29, 2015, discussed WEC's development of a guidance document for authors of licensing change packages to aid in their reviews of Appendix 19F.
- Issue ID 100316582, dated February 11, 2016, was generated to ensure the guidance document discussed in Issue ID 100316582 will be incorporated into the next revision of Procedure F-APP-GW-GAP-140.

The NRC inspection team determined this finding was of minor significance since the AP1000 sites are still under construction and no adverse consequences resulted. Since WEC took corrective actions to address the finding and based on its low safety significance, the team determined the finding to be a minor violation.

10 CFR 50.150(a)(1) requires, in part, a design-specific assessment of the effects on the facility of the impact of a large, commercial aircraft. The NRC inspection team identified that WEC did not perform a design-specific AIA in accordance with 10 CFR 50.150(a)(1). Specially, WEC initiated a design change to address a fire spread violation identified by the NRC inspection team during the AIA inspection in 2010. WEC's design change process identified the addition and location of doors to the AP1000 DCD, Chapter 9A, and fire drawings for AP1000 licensees. However, WEC failed to identify the need to

update the drawings used in the AIA and the DCD. As such, the AIA does not present an accurate fire spread footprint of the design in the DCD. WEC took the following corrective actions:

- Issue ID 100332851, dated October 5, 2015, identified the need for a Westinghouse safeguards information qualified analyst to review the technical report that supports the fire, shock, and systems analysis for the AP1000 AIA to ensure that fire damage footprints are accurately reflected.
- Engineering and Design Coordination Report (E&DCR) APP-SES-GEF-025, Revision 0, was initiated as a result of Issue ID 100332851. It identified a number of locations which should have additional fire spread areas outlined. WEC noted that these areas were not marked correctly, but are necessary to show the complete result of a fire from an AIA.
- DCP-007590, dated October 28, 2015, is the safeguards information document that discusses the document changes on the figures in the safeguards document APP-1000-GEC-002, "AP1000 Aircraft Impact Large Fire and Shock Damage Assessment," Revision 3.

The NRC inspection team determined this finding was of minor significance since the AP1000 sites are still under construction and no adverse consequences resulted. Since WEC took corrective actions to address the finding and based on its low safety significance, the team determined the finding to be a minor violation.

c. Conclusions

The NRC inspection team assessed AIA design changes associated with plant systems, fire impacts, and structural impacts. The team identified two examples of minor significance of WEC's failure to comply with regulatory requirements of 10 CFR 50.150. Specially, WEC failed to identify how a key design feature met the assessment requirements in accordance with 10 CFR 50.150(b)(2). In addition, WEC failed to perform a design-specific AIA in accordance with 10 CFR 50.150(a)(1). Both failures occurred at the time WEC was the applicant for the AP1000 design certification. Since these failures constitute violations of minor significance, they are not subject to formal enforcement action; however, they are being documented to track deficiencies associated with the AP1000 DCD and the AP1000 AIA.

3. Design Change - Systems

a. Inspection Scope

The NRC inspection team reviewed system related design changes for the AP1000 AIA to consider the effect which the changed features or capabilities may have had on the original assessment. The team reviewed these changes in accordance with WEC's

design change process and procedures, including APP-GW-GAP-140. Specifically, the team verified that WEC appropriately considered the effect that specific design changes may have had on the original AIA, including:

- Location of credited structures, systems, and components (SSC),
- State of SSCs in the aircraft impact scenarios,
- Determination of accident conditions, and
- Identification of success paths.

b. Observations and Findings

The inspection team reviewed the following samples and verified they were appropriately considered:

- APP-1243-GEF-001, "Reactor Trip Switchgear Cabinet; penetration and anchorage adjustments," Revision 0,
- APP-OCS-GEF-341, "MCR/RSR Transfer Panel Requirements Documentation Update," Revision 0,
- APP OCS-GEF-492, "Changes to MCR/RSR Transfer Panel Drawing Packages," Revision 0,
- APP-AD02-GEF-100005, "Aux. Bldg. Door Requirements and Details Clarification," Revision 0,
- APP-GW-GEE-2614, "PXS Recirculation Piping Changes Due to Squib Valve Loads," Revision 0,
- APP-GW-GEE-2779, "AP1000 Reactor Trip Switchgear Anchor Bolt and Conduit Locations," Revision 0,
- APP-GW-GEE-3068, "PXS Remote Transmitter Location, Penetrations, and Powering," Revision 0,
- APP-GW-GEE-3141, "Beyond Design Basis for Squib Valve Actuation," Revision 0, and
- APP-GW-GEE-3649, "AP1000 DDS Main Control Room (MCR)/ Remote Shutdown Room (RSR) Transfer System Design," Revision 0.

c. Conclusions

The NRC inspection team concluded that WEC appropriately considered the effect the system related changes had on the AP1000 AIA consistent with their design control processes which are in accordance with the regulatory requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50 and 10 CFR 50.150(c), "Control of changes."

4. Design Change - Fire

a. Inspection Scope

The NRC inspection team reviewed design changes that could impact the fire damage assessment for the AP1000 AIA. The team verified that WEC appropriately considered the effect which the changed features or capabilities may have had on the original assessment. The team reviewed these changes in accordance with WEC's design

change process and procedures. Specifically, the team verified that WEC appropriately considered the effect that specific design changes may have had on the original aircraft impact assessment, including:

- AP1000 DCPs, and
- AP1000 E&DCRs.

b. Observations and Findings

The inspection team reviewed the following samples and verified they were appropriately considered:

- APP-AD02-GEF-100005, "Aux. Bldg. Door Requirements and Details Clarification," Revision 0,
- APP-OCS-GEF-341, "MCR/RSR Transfer Panel Requirements Documentation Update," Revision 0,
- APP-GW-GEF-755, "Extend Turbine Building First Bay by 12 Feet," Revision 0.
- APP-GW-GEE-2356, "Security Door Upgrades Based on Aircraft Impact Assessment," Revision 0,
- APP-GW-GEE-2450, "Relocation of AIA Blast Doors and Addition of Shielding Doors to Annulus Personnel Access Portals," Revision 0,
- APP-GW-GEF-3044, "Fuel Handling Area Removable Hatches," Revision 0.
- APP-GW-GEF-3282, "Fire Area Updates," Revision 0,
- APP-GW-GLR-218, "Licensing Position - AP1000 DCD Tier 2* Fire Area Figure Changes," Revision 2,
- E&DCR# APP-OCS-GEF-492, "Changes to MCR/RSR Transfer Panel Drawing Packages," Revision 0,
- Drawing APP-1030-AD-001, "Doors, Windows, Hatches Numbering/Classification Nuclear Island Plan at EL 100'-0" / 107'-2"," Revision 2,
- Drawing APP-1050-AD-001, "Doors, Windows, Hatches Numbering/Classification Nuclear Island Plan at EL 135'-3"," Revision 1, and
- APP-SES-ADX-001, "AP1000 Security Doors List," Revision 2.

c. Conclusions

The NRC inspection team concluded that WEC appropriately considered the effect the fire related design changes on the AP1000 AIA consistent with their design control processes which are in accordance with the regulatory requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50 and 10 CFR 50.150(c), "Control of changes."

5. Design Change - Structural

a. Inspection Scope

The NRC inspection team reviewed design changes that could impact the structural damage assessment for the AP1000 AIA. The team verified that WEC appropriately considered the effect which the changed features or capabilities may have had on the original assessment, including the effects on the passive cooling system tank, shield building roof, and assessment of the effect of postulated debris on the steel containment.

The team reviewed these changes in accordance with WEC's design change process and procedures. Specifically, the team verified that WEC appropriately considered the effect that specific design changes may have had on the original aircraft impact assessment of the shield building, including:

- AP1000 DCPs, and
- AP1000 E&DCRs.

b. Observations and Findings

b.1 Design Change Samples

The NRC inspection team verified that WEC design changes that affected the AP1000 Shield Building structural design and AIA requirements such as wall thicknesses, reinforcement details, and material specifications, were appropriately considered in the evaluation of the effect of the changes on the original assessment. The WEC AP1000 design changes represent improvements to the structural and AIA designs.

The inspection team reviewed the following samples and verified they were appropriately considered:

- APP-GW-GEE-1119, Revision 0, Class 1, "Additional Miscellaneous Changes to the enhanced Shield Building design,"
- APP-GW-GEE-3826, Revision 0, Class 1, "Design change to Shield Building/Auxiliary Building Connections,"
- APP-GW-GEE-437, Revision 0, Class 1, "Shield Building Structure: Enhanced Design Finalization,"
- APP-GW-GEE-4950, Revision 0, Class 1, "Alternate tie reinforcement for steel concrete composite (SC) Shield Building panels,"
- APP-GW-GEE-4465, Revision 0, Class 2, "Shield Building air inlet louver modification,"
- APP-GW-GEE-605, Revision 0, Class 1, "Enhanced Shield Building Connection Reconfiguration,"
- APP-GW-GEE-3044, Revision 0, Class 2, "Fuel Handling Area Removable Hatches,"
- APP-CR01-GEF-034, Revision 0, "Shield Building Rebar Clarification,"
- APP-1208-GEF-048, Revision 0, "Shield Building Liner Plate Thickness clarification,"
- APP-1208-GEF-066, Revision 9, "Shield Building, SC Panel Size and Internal Reinforcement Revision at Q-Wall Connection,"
- APP-1208-GEF-079, Revision 0, "Shield Building, D-112 Splice Bar Drawing Clarification,"
- APP-1208-GEF-118, Revision 0, "Shield Building - #8 Tie Bar Relocation,"
- APP-1208-GEF-133, Revision 0, "Shield Building - Alternate weld joint configurations,"
- APP-1208-GEF-150, Revision 0, "Shield Building - Update concrete reinforcement drawings from EL 100'-00" to 146'-10","
- APP-1208-CCC-159, Revision 0, "Shield Building -Update of calculation APP-1208-CCC-003, Rev.2,"

- APP-1208-GEF-165, Revision 0, "Shield Building - Update Area 3 Roof Connection Calculation Near Wall 7.3,"
- APP-1208-GEF-166, Revision 0, "App-1208-S3C - 022 Enhanced SB design margin for tie-bar and liner plate,"
- APP-1208-GEF-179, Revision 0, "Shield Building - update references on general notes drawings,"
- APP-1208-GEF-240, Revision 0, "Shield Building - SC Panel Fillet weld size change to C3J weldable coupler,"
- APP-1000-GEF-087, Revision 0, "Shield Building - wall reinforcement detail,"
- APP-1000-GEF-015, Revision 0, "Input for piping penetrations through Shield Building," and
- APP-1208-GEF-028, Revision 0, "Clarification of Charpy Impact Requirement for AP1000 SB SC panel.

b.2. Shield Plate Impact on Containment Vessel

APP-1000-S2C-042, Revision 0, documented a study of the potential impact of the shield plate assembly on the steel containment due to two postulated scenarios: complete platform falling on the containment or slip downwards impact on the containment vessel due to partial failure of the connection beams. The NRC inspection team verified that the analysis was adequate.

b.3. Shield Building Shield Plate Impact Analysis

APP-1000-S2C-098, Revision 0, described an analysis of the shield platform assembly impacted by a single, large piece of debris falling from above. The analysis showed that the shield platform assembly did not break from the connecting beams and consequently would not be possible to impact the containment. The assumption of the size of the debris and the modeling of the shield platform assembly were reviewed and were considered acceptable to the NRC inspection team.

b.4. Aircraft Impact With PCS Platform

APP-1000-S2C-167, Revision 0, documented an assessment of the response of the PCS platform (i.e., the shield platform assembly) when the shield building would be impacted by a large aircraft on postulated locations. The NRC inspection team determined the assessment of the response of the PCS platform was acceptable.

b.5. Commercial Airplane Impact of the PCS Tank

APP-1000-S2C-169, Revision 0, described impact analyses of the PCS tank assuming several impact scenarios using a missile-target interaction analysis method, which is one of the two methods provided by the NEI 07-13, Revision 7 guidance.

The staff noticed that the missile (i.e. the airplane model) and its initial speed appeared to be inconsistent with the NRC forcing functions and there was no comparison of the resultant force function from the missile with the NRC force function following the NEI 07-13 guidance. In addition, the NRC inspection team

observed that the deformation of the outer wall of the PCS tank was very large and did not appear to be consistent with the typical behavior of the concrete material.

The NRC inspection team identified additional modeling and analysis deficiencies in WEC's analysis performed after the July inspection; therefore, WEC performed a second round of reruns of the AIA model with improvements in material representation and the forcing functions. The additional analyses are documented in APP-1000-GEF-193, Revision 0 and APP-1000-GEF-199. The NRC inspection team verified that the final runs were acceptable; the implemented forcing functions enveloped the NRC forcing functions; and, the behavior of the concrete material was found to be reasonable. The staff found the other assumptions in the modeling and analysis were reasonable and realistic.

b.6 Aircraft Collision Study to the SB Roof Portion

APP-1000-S2C-085, Revision 0, documented an AIA of the shield building roof portion assuming impact scenarios from different aircraft types. The NRC inspection team found that the parameters and assumptions used in these analyses were within the reasonable range for this type of loading condition and considered WECs conclusion acceptable.

c. Conclusions

The NRC inspection team concluded that WEC appropriately considered the effect structural related design changes had on the AP1000 AIA consistent with their design control processes which are in accordance with the regulatory requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50 and 10 CFR 50.150(c), "Control of changes."

6. Entrance and Exit Meetings

On July 27, 2015, the NRC inspection team discussed the scope of the inspection with representatives from WEC and SCANA. On February 11, 2016, the NRC inspection team presented the final inspection results and observations during an exit meeting with representatives from WEC.

ATTACHMENT

1. PERSONS CONTACTED

Name	Title/Inspection Area	Affiliation	Entrance	Exit	Interviewed
Mike Klinvex	Licensing	WEC	X	X	X
Joe Cole	Manager	WEC	X		
Bill Moore	Engineering	WEC	X		
Andrew Novotny	Engineering	WEC	X		
Mike Sleigh	Engineering	WEC	X	X	X
Stephen Reed	Engineering	WEC	X		X
Kevin May	Engineering	WEC	X		
Adana Stanish	Engineering	WEC	X		
Richard Paese	Licensing	WEC	X		
Leonardo Tunon-Sanjur	Engineering	WEC			X
Hank Hu	Engineering	WEC			X
Greg Glenn	Licensing	WEC	X		
Luca Oriani	VP New Plant Engineering	WEC	X		
Robert Crittenden	Quality	WEC	X		
Jonathan Durffe	Engineering	WEC	X		
Chuck Brockhoff	Engineering	WEC	X		
James H. Scobel	Engineering	WEC	X		
Jim Mermigos	Manager	WEC	X		
Fletcher Wilkins	Licensing	WEC	X		
Rod Cook	Licensing	WEC	X		
Pedro M. Sanchez	Engineering	WEC	X		
Andrew Pfister	Manager	WEC	X		
Michael Miller	Director	WEC	X		
Thom Ray	Director	WEC	X		
Chris Long	Engineering	WEC	X		
Jill Watson	Engineering	WEC	X	X	X
Marcus Imrid	Engineering	WEC	X		
Paul Russ	Director	WEC	X		
Bernie Copsey	Director	WEC	X		
Jerry G. Sims	President	SNC	X		
Ronnie Gardner	VP	WEC	X		
Timothy Northcutt	Manager	WEC	X		
John Kostelnik	Manager	WEC		X	X
Sarah DiTommaso	Manager	WEC		X	X

2. Inspection Procedures Used

Inspection Procedure (IP) 43002, "Routine Inspections of Nuclear Vendors."

3. List of Items Opened, Closed, and Discussed

None.

4. Documents Reviewed

Documentation and Quality Assessment

- E&DCR No. App-MP01-GEF-002, AP1000 Reactor Coolant Pump E&DCR: Mechanical Testing of Flywheel Retainer Ring
- E&DCR No. App-MP01-GEF-003, AP1000 Reactor Coolant Pump E&DCR: Bearing Water R TD Changes
- E&DCR No. App-MP01-GEF-007, AP1000 Reactor Coolant Pump E&DCR: Flywheel NDE Requirements
- APP-GW-GAP-420, "Engineering and Design Coordination Report," Revision 8 dated October 21, 2013
- APP-GW-GAP-147, "AP1000 Current Licensing Basis Review," Revision 1 dated September 2012
- APP-GW-GAP-140, "AP1000 Licensing Applicability Determination and 10 CFR 50.59/10 CFR Part 52 Appendix D Section VIII Screening," Revision 0 dated June 27, 2011
- WEC 3.4.1, "Change Control for the AP1000 Plant Program," Revision 3
- F-APP-GW-GAP-140-1, "AP1000 Licensing Applicability Determination and 10 CFR 50.59/10 CFR Part 52 Appendix D Section VIII Screening," Revision 2
- Issue ID 100311679, "RNS Line Sloping & APP-FSAR-GLN-180," dated July 1, 2015
- APP-GW-GAP-604, "AP1000 Stage Gate Design Change Control Process," Revision 6 dated September 18, 2014
- Issue ID: 100178863, "Gas Intrusion in the PXS system," dated February 11, 2010
- Issue ID: 100012031, "DCP-1402 Missed Impact to DCD Tier 1.2.2.3 and Tier 2 Appendix 3B/3E
- Issue ID: 100096296, "DCD integration change for DCD-1852 DP-242," dated November 14, 2012

Systems-Loss Assessment

- APP-1000-GEC-001, "Aircraft Impact Analysis for AP1000 Nuclear Island," Revision 4.
- APP-1000-GEC-002, "AP1000 Aircraft Impact Large Fire and Shock Damage Assessment," Revision 3.
- APP-1243-GEF-001, "Reactor Trip Switchgear Cabinet; penetration and anchorage adjustments," Revision 0.
- APP-OCS-GEF-341, "MCR/RSR Transfer Panel Requirements Documentation Update," Revision 0.
- APP OCS-GEF-492, "Changes to MCR/RSR Transfer Panel Drawing Packages," Revision 0.
- APP-AD02-GEF-100005, "Aux. Bldg. Door Requirements and Details Clarification," Revision 0.

- APP-GW-GEE-2614, "PXS Recirculation Piping Changes Due to Squib Valve Loads," Revision 0.
- APP-GW-GEE-2779, "AP1000 Reactor Trip Switchgear Anchor Bolt and Conduit Locations," Revision 0.
- APP-GW-GEE-3068, "PXS Remote Transmitter Location, Penetrations, and Powering," Revision 0.
- APP-GW-GEE-3141, "Beyond Design Basis for Squib Valve Actuation," Revision 0.
- APP-GW-GEE-3649, "AP1000 DDS Main Control Room (MCR)/ Remote Shutdown Room (RSR) Transfer System Design," Revision 0.

Fire Damage Assessment

- APP-1000-GEC-002, "AP1000 Aircraft Impact Large Fire and Shock Damage Assessment," Revisions 2 and 3.
- APP-AD02-GEF-100005, "Aux. Bldg. Door Requirements and Details Clarification," Revision 0.
- APP-OCS-GEF-341, "MCR/RSR Transfer Panel Requirements Documentation Update," Revision 0.
- APP-GW-GEF-755, "Extend Turbine Building First Bay by 12 Feet," Revision 0.
- APP-GW-GEE-2356, "Security Door Upgrades Based on Aircraft Impact Assessment," Revision 0
- APP-GW-GEE-2450, "Relocation of AIA Blast Doors and Addition of Shielding Doors to Annulus Personnel Access Portals," Revision 0.
- APP-GW-GEF-3044, "Fuel Handling Area Removable Hatches," Revision 0.
- APP-GW-GEF-3282, "Fire Area Updates," Revision 0.
- APP-GW-GLR-218, "Licensing Position – AP1000 DCD Tier 2* Fire Area Figure Changes," Revision 2
- E&DCR# APP-OCS-GEF-492, "Changes to MCR/RSR Transfer Panel Drawing Packages," Revision 0
- Drawing APP-1030-AD-001, "Doors, Windows, Hatches Numbering/Classification Nuclear Island Plan at EL 100'-0" / 107'-2"," Revision 2
- Drawing APP-1050-AD-001, "Doors, Windows, Hatches Numbering/Classification Nuclear Island Plan at EL 135'-3"," Revision 1
- APP-SES-ADX-001, "AP1000 Security Doors List," Revision 2

Structural Damage Assessment

- APP-GW-GAP-140, Rev.0, "AP1000 Licensing Application Determination and 10 CFR 50.59/10 CFR Part 52 Appendix D Section VIII Screening."
- APP-GW-GEE-1119, Rev.0, Class 1, "Additional Miscellaneous Changes to the enhanced Shield Building design."
- APP-GW-GEE-3826, Rev. 0, Class 1, "Design change to Shield Building/Auxiliary Building Connections."
- APP-GW-GEE-437, Rev. 0, Class 1, "Shield Building Structure: Enhanced Design Finalization."
- APP-GW-GEE-4950, Rev. 0, Class 1, "Alternate tie reinforcement for steel concrete composite (SC) Shield Building panels."

- APP-GW-GEE-4465, Rev. 0, Class 2, "Shield Building air inlet louver modification."
- APP-GW-GEE-605, Rev. 0, Class 1, "Enhanced Shield Building Connection Reconfiguration."
- APP-GW-GEE-3044, Rev. 0, Class 2, "Fuel Handling Area Removable Hatches."
- APP-CR01-GEF-034, Rev.0, "Shield Building Rebar Clarification."
- APP-1208-GEF-048, Rev. 0, "Shield Building Liner Plate Thickness clarification."
- APP-1208-GEF-066, Rev. 9, "Shield Building, SC Panel Size and Internal Reinforcement Revision at Q-Wall Connection."
- APP-1208-GEF-079, Rev. 0, "Shield Building, D-112 Splice Bar Drawing Clarification."
- APP-1208-GEF-118, Rev. 0, "Shield Building - #8 Tie Bar Relocation."
- APP-1208-GEF-133, Rev. 0, "Shield Building - Alternate weld joint configurations."
- APP-1208-GEF-150, Rev. 0, "Shield Building - Update concrete reinforcement drawings from EL 100'-00" to 146'-10"."
- APP-1208-CCC-159, Rev. 0, "Shield Building - Update of calculation
APP-1208-CCC-003, Rev. 2."
- APP-1208-GEF-165, Rev. 0, "Shield Building - Update Area 3 Roof Connection Calculation Near Wall 7.3."
- APP-1208-GEF-166, Rev. 0, "App-1208-S3C-022 Enhanced SB design margin for tie-bar and liner plate."
- APP-1208-GEF-179, Rev. 0, "Shield Building - update references on general notes drawings."
- APP-1208-GEF-240, Rev. 0, "Shield Building - SC Panel Fillet weld size change to C3J weldable coupler."
- APP-1000-GEF-087, Rev. 0, "Shield Building - wall reinforcement detail."
- APP-1000-GEF-015, Rev. 0, "Input for piping penetrations through Shield Building."
- APP-1208-GEF-028, Rev. 0, "Clarification of Charpy Impact Requirement for AP1000 SB SC panel."
- APP-1000-S2C-042, Rev. 0, "Shield Plate Impact on Containment Vessel"
- APP-1000-S2C-098, Rev. 0, "Shield Building Shield Plate Impact Analysis"
- APP-1000-S2C-167, Rev. 0, "Aircraft Impact With PCS Platform"
- APP-1000-S2C-169, Rev. 0, "Commercial Airplane Impact of the PCS Tank"
- APP-1000-S2C-085, Rev. 0, "Aircraft Collision Study to the SB Roof Portion"
- APP-1000-GEF-193, Rev. 0, "Additional Analysis Using Force Function"
- APP-1000-GEF-199, Rev. 0, "Revision to APP-1000-S2C-169"
- APP-1000-GEC-001, Rev. 4, "Aircraft Impact Analysis for AP1000 Nuclear Island"

5. ACRONYMS USED:

AIA	aircraft impact assessment
ADAMS	Agencywide Documents Access and Management System
AP	advanced passive
10 CFR	Title 10 of the <i>Code of Federal Regulations</i>
DCD	design control document
DCIP	Division of Construction Inspection and Operational Programs
DCP	design change proposal
DE	Division of Engineering
DSRA	Division of Safety Systems and Risk Assessment
E&DCR	Engineering & Design Coordination Reports
FSAR	final safety analysis report
IP	inspection procedure
NEI	Nuclear Energy Institute
NRC	(U.S.) Nuclear Regulatory Commission
NRO	Office of New Reactors
QA	quality assurance
QVIB	Quality Assurance Vendor Inspection Branch
SSC	systems, structures, and components
WEC	Westinghouse Electric Company, LLC
U.S.	United States (of America)