UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

April 10, 2019

Korey L. Hosack
Product Line Regulatory Support
1000 Westinghouse Drive, Suite 259
Cranberry Township, PA 16066

SUBJECT: NUCLEAR REGULATORY COMMISSION VENDOR INSPECTION REPORT OF WESTINGHOUSE ELECTRIC COMPANY, NO. 99900404/2019-201

Dear Mr. Hosack:

On February 25-28, 2019, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an inspection at the Westinghouse Electric Company (WEC) facility in Cranberry Township, PA. This limited-scope routine inspection assessed WEC's compliance with provisions of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 21, "Reporting of Defects and Noncompliance," and selected portions of Appendix B, "Quality Assurance Program Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," regarding WEC's implementation of thermal conductivity degradation (TCD) modeling to demonstrate compliance with 10 CFR 50.46, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors," in core designs for domestic operating reactors. This inspection also verified WEC's compliance with the requirements of 10 CFR 73.21, "Protection of Safeguards Information: Performance Requirements," 10 CFR 73.22, "Protection of Safeguards Information: Specific Requirements," and the Commission Order No. EA-07-231, "Order Imposing Safeguards Information Protection Requirements and Fingerprinting and Criminal History Records Check Requirements for Access to Safeguards Information," for handling Safeguards Information (SGI) related to new reactor designs.

This technically-focused inspection specifically evaluated WEC's implementation of the quality activities associated with the treatment of TCD in safety-related computer codes used for operating U.S. nuclear power plants and the SGI program to determine its effectiveness in protecting SGI. The enclosed report presents the results of the inspection. This NRC inspection report does not constitute NRC endorsement of WEC's overall quality assurance (QA), 10 CFR Part 21 or SGI programs.

Based on the results of this inspection, the NRC inspection team found the implementation of your QA program with regards to the treatment of TCD and the implementation of your SGI program met the applicable requirements. No findings of significance were identified.

In accordance with 10 CFR 2.390, "Public inspections, exemptions, requests for withholding," of the NRC's "Rules of Practice," a copy of this letter, and its enclosure(s), will be made available electronically for public inspection in the NRC Public Document Room and 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.

If you have any questions concerning this matter, please contact Mr. Thomas Herrity of my staff at (301) 415-2351.

Sincerely,

/RA/ JJacobson for

Kerri A. Kavanagh, Chief
Quality Assurance Vendor Inspection Branches 1 and 2
Division of Construction Inspection
And Operational Programs
Office of New Reactors

Docket No.: 99900404

EPID: I-2019-201-0022

Enclosure:
Inspection Report No. 99900404/2019-201
and Attachment

SUBJECT: NUCLEAR REGULATORY COMMISSION VENDOR INSPECTION REPORT OF WESTINGHOUSE ELECTRIC COMPANY, REPORT NO. 99900404/2019-201
Dated: April 10, 2019

DISTRIBUTION:
ASakadales
KHeller
BParks
RLukes
NRO_DLSE_Distribution
hosackkl@westinghouse.com

ADAMS Accession No.: ML19080A112 *via e-mail NRO-002

OFFICE	NRO/DCIP	NRO/DCIP	NRR/DSS
NAME	THerrity	PNatividad	KHeller*
DATE	04/02/19	04/09/19	03/29/19
OFFICE	NRR/DSS	NRO/DCIP	NRO/DCIP
NAME	BParks*	YDiaz-Castillo	KKavanagh (JJacobson for)
DATE	03/29/19	04/03/19	04/10/19

OFFICIAL RECORD COPY

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

Docket No.:	99900404
Report No.:	99900404/2019-201
Vendor:	Westinghouse Electric Company 1000 Westinghouse Drive Cranberry Township, PA 16066
Vendor Contact:	Mr. Korey L. Hosack Email: hosackkl@westinghouse.com Phone: (412) 374-5130
Nuclear Industry Activity:	Westinghouse Electric Company (WEC) provides nuclear core design and fuel load pattern validation services as well as other engineering and design services for new and operating nuclear reactors. In addition, as part of its nuclear work, WEC implements a program for the management and protection of Safeguards Information associated with the AP600 and AP1000 reactor designs.
Inspection Dates:	February 25-28, 2019

Inspectors:		
	Yamir Diaz-Castillo	NRO/DCIP/QVIB-1, Team Leader
	Thomas Herrity	NRO/DCIP/QVIB-2
	Philip Natividad	NRO/DCIP/QVIB-1
	Benjamin Parks	NRR/DSS/SNPB
	Kevin Heller	NRR/DSS/SNPB

Approved by: Kerri A. Kavanagh, Chief
Quality Assurance Vendor Inspection Branches 1 and 2
Division of Construction Inspection
and Operational Programs
Office of New Reactors

Enclosure

EXECUTIVE SUMMARY

Westinghouse Electric Company
99900404/2019-201

The U.S. Nuclear Regulatory Commission (NRC) staff conducted a vendor inspection at the Westinghouse Electric Company (WEC) facility in Cranberry Township, PA, to verify that it had implemented an adequate quality assurance (QA) program that complies with the requirements 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," 10 CFR Part 21, "Reporting of Defects and Noncompliance," in addressing concerns associated with Thermal Conductivity Degradation (TCD) modeling to demonstrate compliance with 10 CFR 50.46, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors." In addition, the NRC inspection team verified that WEC had implemented a program to protect Safeguards Information (SGI) in accordance with the requirements of 10 CFR 73.21, "Protection of Safeguards Information: Performance Requirements," 10 CFR 73.22, "Protection of Safeguards Information: Specific Requirements," and Commission Order No. EA-07-231, "Order Imposing Safeguards Information Protection Requirements and Fingerprinting and Criminal History Records Check Requirements for Access to Safeguards Information" for handling of information associated related to new reactor designs.

In Information Notices (INs) 2009-23, "Nuclear Fuel Thermal Conductivity Degradation," and 2011-21, "Realistic Emergency Core Cooling System Evaluation Model Effects Arising from Nuclear Fuel Thermal Conductivity Degradation" the NRC described updated information on fuel temperature calculations, specifically those accounting for TCD effects on emergency core cooling. IN 2009-23 states that not accounting for TCD in safety analysis can cause the predicted results to be less conservative than previously understood, specifically the peak clad temperature (PCT) may be higher than previously understood. In response to these INs, WEC reviewed engineering data and concluded there is a reasonable assurance of safe operation. The WEC process, and report documenting it, are both referred to by WEC as "RASO". This inspection reviewed WEC's response to the revised guidance to assure that public safety is maintained.

The following regulations serve as the bases for the NRC inspection:

- Appendix B to 10 CFR Part 50
- 10 CFR Part 21
- 10 CFR Part 73
- 10 CFR 50.46

During this inspection, the NRC inspection team implemented Inspection Procedures (IP) 43002, "Routine Inspections of Nuclear Vendors," dated January 27, 2017; IP 36100, "Inspection of 10 CFR Part 21 and Programs for Reporting Defects and Noncompliance," dated February 13, 2012; and IP 81811, "Protection of Safeguards Information by Design Certification Applicants and Vendors," dated September 6, 2016.

Design and Software Control

The NRC inspection team reviewed a sample of WEC's calculation notes, guidance, issue reports (IRs), and inter-design group correspondence associated with assessing the effects of TCD to verify compliance with the regulatory requirements of 10 CFR 50.46 and Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. The NRC inspection team verified the technical adequacy of the identification, impact, and safety assessment of TCD on the Fuel Rod Performance Analysis and Designs (PAD) computer code versions 3.4, 4.0, 4.0+TCD, and 5.0, and the FATES-3B design computer code for loss-of-coolant accident (LOCA) and non-LOCA (i.e., transient) analyses. No findings of significance were identified.

10 CFR Part 21 and Corrective Action

The NRC inspection team reviewed WEC's screening for the 10 CFR Part 21 applicability and the corrective actions taken by WEC to address the TCD issue to verify compliance with the regulatory requirements of 10 CFR Part 21 and Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50. The NRC inspection team reviewed WEC's documentation associated with their analysis to determine the applicability and reportability of the TCD issue under 10 CFR Part 21 as well as a sample of corrective action reports, corrective action program and learning reports, root cause analyses, and corrective action commitments. No findings of significance were identified.

Safeguards Information (SGI) Program

The NRC inspection team reviewed WEC's policies and implementing procedures that govern the implementation of their program for the protection of SGI in accordance with the applicable requirements of 10 CFR 73.21, 10 CFR 73.22, and the Commission's Order No. EA-07-231. Since the Commission's Order No. EA-07-231 pre-dates the Vendor and Design Certification applicant rulemaking for 10 CFR 73.21 and 10 CFR 73.22, it was the original requirement for applicants to complete the SGI protection requirements which were later codified in 10 CFR Part 73. The NRC inspection team: (1) reviewed WEC's implementing procedures for controlling and protecting SGI; (2) interviewed WEC's SGI program personnel; (3) inspected the SGI secured location and locked SGI security containers; (4) reviewed a sample of SGI hardcopy materials for proper markings and storage; (5) verified labeling of electronic media such as SGI hard drives and laptops; and (6) reviewed a sample of logs, access lists, program self-assessments, and corrective actions. The NRC inspection team also reviewed a sample of personnel files regarding personnel conditions for access to SGI material. The NRC inspection team identified one SGI document to be inadequately marked as required by 10 CFR 73.22(d) and WEC's procedure No. APP-GW-GAP-300, "Safeguards Information Control," Revision 13, dated April 25, 2016. The NRC inspection team determined this issue to be minor since there was no release of SGI to the public. WEC initiated IR No. 2019-3938, dated February 28, 2019, to address this issue. No findings of significance were identified.

REPORT DETAILS

1. Design and Software Control

   a. Inspection Scope

   The NRC staff described TCD and the potential effects it can cause in Information Notices (INs) 2009-23, "Nuclear Fuel Thermal Conductivity Degradation," and 2011-21, "Realistic Emergency Core Cooling System Evaluation Model Effects Arising from Nuclear Fuel Thermal Conductivity Degradation." IN 2009-23 states that not accounting for TCD in safety analysis can cause the predicted results to be less conservative than previously understood, specifically the peak clad temperature may be higher than previously understood.

   The NRC inspection team reviewed WEC's policies and implementing procedures that govern the implementation of its design and software control programs to verify compliance with the requirements of Criterion III, "Design Control," of Appendix B, "Quality Assurance Program Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," and with 10 CFR 50.46, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors." Specifically, the NRC inspection team reviewed WEC's calculation notes, guidance, issue reports, and inter-design group correspondence associated with the identification, impact, and safety assessment of TCD on the PAD computer code versions 3.4, 4.0, 4.0+TCD, and 5.0, and the FATES-3B design code for loss of coolant accident (LOCA) and non-LOCA (i.e., transient) analyses. The NRC inspection team verified the effectiveness of WEC's corrections to, and maintenance of, the computer codes to properly account or compensate for the effects of TCD.

   The NRC inspection team reviewed WEC's calculation notes which evaluated the effects of TCD on WEC and Combustion Engineering (CE) fuel rod designs to verify compliance with 10 CFR 50.46. For WEC fuel designs, this was accomplished by comparing results from analyses performed using an NRC-approved fuel rod design computer code, PAD 4.0, to those performed using a modified code, PAD 4.0+TCD, which accounts for TCD effects explicitly. The NRC inspection team observed that the modified code was verified via comparison to another NRC-approved code, STAV 7.3, which also explicitly accounts for TCD. Using these results WEC was able to evaluate additional effects of TCD in subsequent safety analyses of emergency core cooling. The NRC inspection team verified that the method yielded results acceptable under 10 CFR 50.46 requirements. The regulatory limit of 10 CFR 50.46(b)1 is not violated for WEC cores.

   Many plants supplied with CE Nuclear Steam Supply Systems are analyzed using the FATES-3B design code. The NRC inspection team also reviewed calculation notes, safety assessments, and correspondence associated with the impact and assessment of TCD for this code to verify compliance with 10 CFR 50.46. The NRC inspection team noted that the method utilized for the CE calculation is different than described above for WEC designs. The CE calculation addresses transient events as a whole, (i.e., not on an event-specific basis) by conservatively bounding measured fuel temperature and fission gas release data. The NRC inspection team observed that WEC summarized

these considerations by indicating that FATES-3B intrinsically accounts for and compensates for the effects of TCD. The NRC inspection team observed that the calculation note discusses how the conservativisms in the FATES-3B code are passed on to subsequent calculation codes, and that the impact of TCD on departure from nucleate boiling analyses is minimal - provided the continued applicability of the existing transient state points and inputs from the Nuclear Design team remains valid.

The NRC inspection team reviewed additional calculation notes verifying that the FATES-3B code is conservative and bounds the effects of TCD based on FATES-3B benchmark comparisons. The NRC inspection team verified that conclusions presented within Topical Report CENPD-388-P, which was prepared by Allmänna Svenska Elektriska Aktiebolaget Brown Boveri in 1998, were conservative. The benchmarks presented in CENPD-388-P compare FATES-3B predictions to experimental fuel rods from high irradiation burnup experiments. The NRC inspection team observed that this additional comparison documented FATES-3B analyses to relevant experimental data against which to qualify the computer code, given the effects of TCD.

The NRC inspection team reviewed documentation comparing the FATES-3B code to the NRC approved PAD 5.0 code, which incorporates a TCD model. The NRC inspection team reviewed calculation notes documenting the comparisons. The NRC inspection team confirmed that the comparisons demonstrate that FATES-3B results are comparable or conservative with respect to PAD 5.0 results for fuel centerline temperature, average rod temperature, rod internal pressure, fuel melt limit, and the PCT. The comparisons appear to demonstrate FATES-3B intrinsically accounts for the effects of TCD through its conservative modeling. The regulatory limit of 10 CFR 50.46(b)1 is not violated for CE cores.

The NRC inspection team also discussed the design and software control programs as applicable to the TCD issue with WEC's management and technical staff. The attachment to this inspection report lists the documents reviewed and the staff interviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The NRC inspection team concluded that WEC implemented its design and software control programs with respect to the issues identified with TCD in accordance with the regulatory requirements of Criterion III of Appendix B to 10 CFR Part 50 and 10 CFR 50.46. Based on the limited sample of documents reviewed, the NRC inspection team also determined that WEC is implementing its policies and procedures associated with the design and software control. No findings of significance were identified.

2. 10 CFR Part 21 and Corrective Action

a. Inspection Scope

The NRC inspection team reviewed WEC's implementation of its 10 CFR Part 21, "Reporting Defects and Noncompliance," with respect to the evaluations generated in response to issues associated with TCD to verify compliance with that regulation. The NRC inspection team also reviewed a sample of WEC's corrective actions generated in response to the TCD issue to determine compliance with Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50.

Most NRC-licensed PWRs using WEC emergency core cooling system (ECCS) evaluation models submitted reports, pursuant to 10 CFR 50.46(a)(3), providing the estimated effect of TCD on the predicted PCT, which is a result provided by the ECCS evaluation model. In some cases, the estimated effect of TCD would have caused the predicted PCT to exceed 2200 °F, which is a regulatory limit established in 10 CFR 50.46(b)(1). These plant specific reports also included credit for peaking factor burndown, which counters the effect of TCD to keep the peak cladding temperature below 2200 °F in all cases. The NRC inspection team interviewed WEC personnel and confirmed that the peaking factor burndown credit was a plant-specific quantity derived from recent fuel cycle designs, meaning that the offset existed, when applied at any given plant. When only TCD is considered, it appears to cause PCT to exceed the 2200 °F regulatory limit, however, when all factors are realistically modelled it is shown that sufficient margin exists to assure that the regulatory limit is not challenged. Based on this information, the NRC inspection team determined that the possibility for TCD to increase the predicted PCT above 2200 °F did not represent a defect because WEC confirmed that additional margins existed.

The NRC inspection team reviewed communications that WEC furnished to its U.S. NRC-licensed customers concerning TCD at the time the NRC staff published IN 2009-23. These demonstrated that WEC was in communication with the NRC licensees concerning the effects of TCD in WEC fuel performance and safety analysis methods, and that no significant issues were identified. The NRC inspection team determined that, while WEC had not determined there was an issue associated with TCD, WEC did communicate with its customers about the potential existence of an issue.

The NRC inspection team reviewed specific evaluations that were provided by various functional groups within WEC. The evaluations revealed that when taken in total there was a reasonable assurance of safe operation. WEC refers to both the process and the report which documents it as "RASO". WEC concluded that there was a RASO because existing analyses had been performed with analytic methods that relied on very conservative assumptions, and these conservatisms afforded sufficient margin to offset the effects of TCD.

The NRC inspection team reviewed calculation notes, procedures, and interface agreements that WEC developed after completion of the RASO evaluation and 10 CFR Part 21 determination. The calculation notes included analytic evaluations of the effects of TCD on various safety analyses that WEC provides NRC licensees. The calculation notes confirmed the conclusion of the RASO. Namely, some calculations noted specific margins that would be required to offset the effects of TCD on fuel rod design

parameters such as transient cladding strain. Other calculations provided a quantitative assessment of the specific effect that TCD would have on fuel rod temperatures for various fuel rod designs currently used by WEC customers. The procedures and interface agreements that the team reviewed verified that WEC reload designs assure that these margins are preserved in cycle-specific design calculations.

The NRC inspection team reviewed a sample of corrective action documents associated with the TCD issue. These documents included corrective action requests, the root cause analysis, corrective action program and learning (CAPAL) and corrective action commitments. The NRC inspection team confirmed that all the corrective actions associated with the TCD issue were completed in a timely manner, closed with sufficient objective evidence, adequately implemented, and verified for their effectiveness.

The NRC inspection team also discussed the 10 CFR Part 21 and corrective action programs with WEC's management and technical staff. The attachment to this inspection report lists the documents reviewed and the staff interviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusions

The NRC inspection team concluded that WEC adequately implemented its 10 CFR Part 21 program with respect to the issues identified with TCD in accordance with the regulatory requirements. The NRC inspection team also concluded that WEC adequately implemented its corrective action programs in accordance with the regulatory requirements of Criterion XVI of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed, the NRC inspection team also determined that WEC is implementing its policies and procedures associated with the 10 CFR Part 21 and corrective action programs. No findings of significance were identified.

3. Safeguards Information Program

a. Inspection Scope

The NRC inspection team reviewed WEC's policies and implementing procedures to verify that WEC's information protection system effectively protects Safeguards Information (SGI), as defined in 10 CFR 73.21, "Protection of Safeguards Information: Performance Requirements," and 10 CFR 73.22, "Protection of Safeguards Information: Specific Requirements," and prevents unauthorized disclosure. This is inclusive of control of SGI information provided to applicants and vendors by the NRC.

The NRC inspection team (1) reviewed WEC's implementing procedures for controlling and protecting SGI; (2) interviewed WEC's SGI program personnel; (3) inspected the SGI secured location and locked SGI security containers; (4) reviewed a sample of SGI hardcopy materials for proper markings and storage; (5) verified labeling of electronic media such as SGI hard drives and laptops; and (6) reviewed a sample of logs, access

lists, program self-assessments, and corrective actions. The NRC inspection team also reviewed a sample of personnel files regarding personnel conditions for access to SGI material.

The NRC inspection team also discussed the SGI program with WEC's management and technical staff. The attachment to this inspection report lists the documents reviewed and the staff interviewed by the NRC inspection team.

b. Observations and Findings

During the review of a sample of SGI documents, the NRC inspection team noted that one SGI document was marked with the only the word "Safeguards" not the full "SAFEGUARDS INFORMATION" as required by Section 15.3 of WEC's SGI procedure No. APP-GW-GAP-300, "Safeguards Information Control," Revision 13, dated April 25, 2016. 10 CFR Part 73.22(d) requires that SGI documents must be marked "in a conspicuous manner on the top and bottom of each page." The NRC inspection team determined this issue to be minor since there was no mishandling or loss of control of the SGI. WEC initiated Issue Report No. 2019-3938 to address this issue.

The NRC inspection team observed that the WEC personnel interviewed were knowledgeable regarding the requirements of the SGI protection program. SGI materials were locked in a manner consistent with the requirements of 10 CFR 73.22.

c. Conclusion

The NRC inspection team concluded that, with the exception of the minor issue identified herein, WEC established its SGI protection program in accordance with the applicable requirements of 10 CFR 73.21, 10 CFR 73.22, and the Commission's Order No. EA-07-231. Based on the limited sample of documents reviewed and activities observed, the NRC inspection team determined that WEC is implementing its policies and procedures associated with the SGI program in accordance with the regulatory requirements of 10 CFR 73.21 and 10 CFR 73.22. No findings of significance were identified.

4. Entrance and Exit Meetings

On February 25, 2019, the NRC inspection team discussed the scope of the inspection with Jeff Bradfute, Vice President, Fuel Engineering & Safety Analysis, and other members of WEC's management and technical staff. On February 28, 2019, the NRC inspection team presented the inspection results and observations during an exit meeting with Mr. Bradfute, and other members of WEC's management and technical staff. The attachment to this report lists the attendees of the entrance and exit meetings, as well as those individuals whom the NRC inspection team interviewed.

Attachment

1. ENTRANCE/EXIT MEETING ATTENDEES

Name	Title	Affiliation	Entrance	Exit	Interviewed
Jeff Bradfute	Vice President, Fuel Engineering and Safety Analysis	Westinghouse Electric Company (WEC)	x*	x	
Doug Weaver	Vice President, Regulatory Affairs	WEC	x*		
Ho Lam	Fellow Engineer, Nuclear Design (ND)	WEC	x	x	x
Yixing Sung	Fellow Engineer, Pressurized Water Reactor (PWR) Core Methods	WEC	x		
Brian Frank	Fellow Engineer, Software & Systems Technology	WEC	x*		
Jeffrey Kobelack	Fellow Engineer, Loss of Coolant Accident (LOCA) Integrated Services II (LISII)	WEC			x
Dewey Olinski	Director, Safety Analysis (SA)	WEC	x	x	
Paul Russ	Director, Licensing & Regulatory Affairs	WEC	x	x	
Nancy DeAnggelis	Director, Global Quality Programs	WEC	x		
Cathy Swope	Director, Correction Action Programs	WEC	x		
Brian Beebe	Director, Core Engineering & Safety Analysis	WEC	x*		
Jason Beebe	Manager, LISII	WEC	x	x	x
Matt Cerone	Manager, Software & Systems Technology	WEC	x	x	

Name	Title	Affiliation	Entrance	Exit	Interviewed
Stephen Reed	Manager, Asset Protection and Development	WEC	x	x	x
John Kostelnik	Manager, Strategic Initiatives	WEC	x	x	x
Alex Baumann	Manager Access Programs	WEC			x
David J. Wotus	Manager, ND	WEC	x		
Amy Colussy	Manager, LISI	WEC	x	x	x
Greg Williams	Manager, Fuel Rod & Hydraulic Design (FRTHD)	WEC	x	x	
Korey Hosack	Manager, Product Line Regulatory Support (PLRS)	WEC	x	x	x
Kent Bonadio	Manager, Containment & Radiological Analysis (CRA)	WEC	x	x	
Zach McDaniel	Manager, PWR Core Methods	WEC	x*		
Camille Zozula	Manager, Infrastructure & Facilities Licensing	WEC	x	x	x
Amanda Charleroy	Manager, Transient Analysis (TA)	WEC	x	x	x
Karen Plute	Product Manager, SA	WEC	x	x	
Angela Zubroski	Principal Engineer, Global Internal & External Assessments	WEC	x		
James Laird	Principal Engineer, ND	WEC	x		x
Andrew Bowman	Principal Engineer, PLRS	WEC	x		
Parvez Khambatta	Principal Engineer, PLRS	WEC	x		x

Name	Title	Affiliation	Entrance	Exit	Interviewed
Mike Shockling	Principal Engineer, LISI	WEC	x		x
David Rumschlag	Principle Engineer, FRTHD	WEC	x	x	x
AnnMarie DiLutto	Principle Engineer, LISII	WEC	x	x	x
Mike Volodzko	Principal Engineer, LISII	WEC	x*		
Alli Fisher	Principle Engineer, SA	WEC	x	x	
William Higby	Principal Engineer, TA	WEC	x	x	x
Bill Smoody	Principal Engineer, Infrastructure and Facilities Licensing	WEC	x*		
Ron Wessel	Principal Engineer, Global Internal & External Assessments	WEC		x	
Bob Jakub	Principal Engineer, CRA	WEC			x
Jig Pung Lu	Senior Engineer, ND	WEC	x	x	x
Autumn Adauiak	Senior Project Engineer, Software & Systems Technology	WEC	x		
Carmen Teolis	Senior Engineer, PLRS	WEC	x		x
Kaitlyn Musser	Senior Engineer, LISI	WEC	x	x	x
Kyle Shelton	Senior Engineer, FRTHD	WEC	x*		
Thomas Herrity	Inspector	NRC	x	x	
Yamir Diaz-Castillo	Inspector	NRC	x	x	
Benjamin Parks	Inspector	NRC	x	x	
Philip Natividad	Inspector	NRC	x	x	
Kevin Heller	Inspector	NRC	x	x	

* Present via telephone

2. INSPECTION PROCEDURES USED

Inspection Procedure (IP) 36100, “Inspection of 10 CFR Part 21 and Programs for Reporting Defects and Noncompliance,” dated February 13, 2012

IP 43002, “Routine Inspections of Nuclear Vendors,” dated January 27, 2017

IP 81811, “Protection of Safeguards Information by Design Certification Applicants and Vendors,” dated September 6, 2016

3. DOCUMENTS REVIEWED

Design Documents

- LTR-SRC-11-98, “PD-0845 Closeout, Fuel Thermal Conductivity Degradation,” dated September 16, 2011
- LTR-RCPL-11-53, “Thermal Conductivity Degradation - Reasonable Assurance of Safe Operation,” dated September 13, 2011
- LTR-RC-12-68, “Revision 2 of Level 3 Procedure ES 21.1,” dated November 29, 2012
- SAE-LIS-97-285, “Assessment of US NRC’s knowledge of UO2 Thermal Conductivity at High Burnup,” dated July 21, 2007
- Power Point Presentation, “Thermal Conductivity Degradation Inspection - Safety and Reload Evaluations”
- WEC Procedure No. ES 21.1, “WEC 21.0 Level 3 Implementation Procedure,” Revision 1, dated December 6, 2010
- W2-5.1-201, “Identification and Reporting of Conditions Adverse to Quality,” Revision 1, dated September 29, 2016
- W-2-5.1-201.W01, “Safety Review Committee Staff Work Instruction,” Revision 0, dated September 19, 2016
- LTR-TA-11-148, “Transient Analysis RASO Evaluation Addressing Thermal Conductivity Degradation for Westinghouse NSSS Plants,” dated September 16, 2011
- LTR-LAM-11-78, “LOCA Analysis & Methods Group Input to TCD RASO,” Revision 0, dated September 15, 2011
- LTR-LIS-11-522, “PAD TCD Issue: Transmittal of LIS LBLOCA RASO Input – Revision 4,” dated December 12, 2011
- LTR-LIS-11-522, “PAD TCD Issue: Transmittal of LIS LBLOCA RASO Input,” Revision 0, dated September 15, 2011

- LTR-LIS-11-525, “SBLOCA Input to Thermal Conductivity Degradation RASO for Westinghouse Fleet,” dated September 15, 2011

- LTR-LIS-11-526, “Safety Significance Assessment of Fuel Thermal Conductivity Degradation for Long Term Cooling,” dated September 16, 2011

- LTR-CRA-11-522, “Containment and Radiological Analysis Input to the Fuel Thermal Conductivity Degradation RASO,” dated September 16, 2011

- CE-12-23, “Generic Thermal Conductivity Degradation Impact on Core Stored Energy,” dated January 11, 2012

- CE-11-709, “Fuel Thermal-Hydraulics Inputs to the Reasonable Assurance of Safe Operation for Thermal Conductivity Degradation,” dated September 15, 2011

- CE-11-717, “Safety Assessment of the Impact of Fuel Thermal Conductivity Degradation with Burnup on Westinghouse NSSS Fuel Rod Design,” dated September 15, 2011

- CE-11-719, “Core Design Input to Thermal Conductivity Degradation RASO,” dated September 16, 2011

- CN-GEN-FRD-178, “Revision 1**Assessment of the TCD Effect on Core Stored Energy,” Revision 1, dated August 16, 2012

- CN-TA-12-24, “Transient Analysis Evaluation Addressing Thermal Conductivity Degradation for Westinghouse NSSS Plants,” Revision 1, dated February 15, 2012

- LEP-12-23, “Guidance for Addressing TCD in Reload Evaluation Reports,” dated June 7, 2012

- NF-AE-09-65, “AMERICAN ELECTRIC POWER Donald C. Cook Nuclear Plants Units 1 and Unit 2 Pellet Thermal Conductivity Degradation (09-IC-11), Update 1,” Revision 1, dated October 15, 2009

- CN-GEN-FRD-174, “Thermal Conductivity Degradation Impact on Fuel Rod Design Criteria,” dated May 2, 2012

- LTR-NEM-06-618, “Offer to Exelon for Best-Estimate LOCA Reanalysis for Byron and Braidwood,” dated June 28, 2006

- NF-AE-05-168, “AMERICAN ELECTRIC POWER Donald C. Cook Nuclear Plant Units 1 and 2 Contract Amendment Number 6 for Contract C-8340,” dated November 29, 2005

- NF-AE-05-77, “AMERICAN ELECTRIC POWER Donald C. Cook Nuclear Plant Unit 1 Amendment 6 to Fuel Fabrication Contract C-8340,” dated May 25, 2005

- CE-12-502, “Standard Guidance for Addressing Westinghouse Nuclear Design (ND) TCD Impacts in Reload Evaluation Reports,” dated June 27, 2012

- CE-12-446, “FRD / LIS Interface Agreement Regarding LOCA Fuel Reload Evaluations and Thermal Conductivity Degradation,” Revision 1, dated January 16, 2014

- LTR-LIS-12-359, “FRD / LIS Interface Agreement Regarding LOCA Fuel Reload Evaluations and Thermal Conductivity Degradation,” Revision 1, January 16, 2014

- LTR-LIS-12-619, “Large Break LOCA PWROG TCD Program: Engineering Report,” Revision 0, dated May 16, 2013

- EDF-08-3, “EDF CPY Class BELOCA Analysis: Final Report Transmittal for Sensitivity Study #1,” dated March 12, 2008

- CE-14-26, “Nuclear Design Modeling and RSAC Results Using ANC8 with TCD,” dated January 13, 2014

- LTR-LIS-13-525, “LBLOCA and SBLOCA Safety Assessment for PAD5 Fuel Performance,” dated October 29, 2013

- LTR-LIS-13-535, “Safety Assessments of PAD5 Fuel Performance Completed by Safety Analysis and Licensing,” dated October 29, 2013

- CN-GEN-FRD-137, “PAD Assessment of STAV 7.3 Fuel Thermal Conductivity Degradation Model,” Revision 0, dated July 12, 2010

- CE-11-714, “Fuel Rod Design inputs for the CE Fleet to the RASO for Thermal Conductivity Degradation,” dated September 15, 2011

- LTR-OA-11-68, “CE NSSS Containment Analysis Input to TCD – RASO,” Revision 0, dated September 16, 2011

- LTR-TDA-11-60, “Thermal Conductivity Degradation – Reasonable assurance of safe operation Transient Analysis Assessment for CE-Fleet Plants,” Revision 0, dated September 15, 2011

- CN-LAM-12-1, “TCD Impact Response for CE Plants,” Revision 1, dated January 31, 2012

- CE-09-659, “Westinghouse Position on Pellet Thermal Conductivity with Burnup for FATES3B,” dated November 30, 2009.

- CE-17-98, “Confirmation of FATES3B TCD Allowance for the APS NGF LAR,” Revision 1, dated March 30, 2017

Corrective Action Documents

- WEC 21.0, “Identification and Reporting of Conditions Adverse to Nuclear Safety,” Revision 7, dated April 18, 2012

- WEC 21.0, “Identification and Reporting of Conditions Adverse to Safety,” Revision 6, dated August 13, 2009

- WCAP-16572-P, “Application of the Westinghouse Realistic Large Break LOCA Evaluation Methodology Using the Automated Statistical Treatment of Uncertainty Method (ASTRUM) to Swedish Nuclear Power Plants,” Revision 2, dated November 2016

- WCAP-16499-P, “Application of the Westinghouse Realistic Large Break LOCA Evaluation Methodology Using the Automated Statistical Treatment of Uncertainty Method (ASTRUM) to Belgium Nuclear Power Plants,” Revision 2, dated July 2007

- CAP Issue ID No. 100375391, “Unexpected Differences between PAD 4.0+TCD and Current PAD5 Fuel Performance Data,” closed on July 29, 2016

- CAP 12-195-M055, “Latent Organizational Problems that lead to Thermal Conductivity Degradation,” dated August 13, 2012

- CAP Commitment 12-195-M055.02, “Latent Organizational Problems that lead to Thermal Conductivity Degradation,” dated October 15, 2012

- CAP Commitment 12-195-M055.03, “Latent Organizational Problems that lead to Thermal Conductivity Degradation,” October 5, 2012

- CAP Commitment 12-195-M055.04, “Latent Organizational Problems that lead to Thermal Conductivity Degradation,” dated October 12, 2012

- CAP Commitment 12-195-M055.05, “Latent Organizational Problems that lead to Thermal Conductivity Degradation,” dated October 5, 2012

- CAP Commitment 12-195-M055.06, “Latent Organizational Problems that lead to Thermal Conductivity Degradation,” dated October 5, 2012

- CAP Commitment 12-195-M055.07, “Latent Organizational Problems that lead to Thermal Conductivity Degradation,” dated October 15, 2012

- CAP Discrete Issue/Suggestion for Improv. 100029959, “LBLOCA TCD Burnup-Related Issues,” dated July 7, 2014

- CAP Discrete Issue/Suggestion for Improv. 100095747, “Nuclear Fuel Thermal Conductivity Degradation, NRC Supplement 1 to NRC IN 2009-23,” dated November 5, 2012

- CAPAL ER 12-125-M055, “Latent Organizational Problems that lead to Thermal Conductivity Degradation,” dated April 14, 2014

- CAPAL/SI (Suggested Improvement) 100314966, “Incorrect Header in APP-GW-GAP-300 Revision 11,”, closed on October 20, 2015

- CAPAL/SI 100462494, “Improper Tracking of SGI Secure Container Combination”

- CAPAL/SI 100352790, “Error in APP-GW-GAP-300,” closed on April 25, 2016

- CAP IR-2017-2291, “Concern that unqualified resources were used in analysis process,” closed on February 27, 2018

- CAP IR-2017-9048, “SGI need-to-know,” closed on September 13, 2017

- CAP IR-2017-11357, “Improper Tracking of SGI Secure Container Combination,” closed on August 3, 2017

- CAP IR-2018-8717, “No personnel identified to perform periodic assessment,” closed on July 3, 2018

- CAP IR-2019-2765, “Removable Hard Drive for SGI Computers Remained in Locked Towers,” initiated on February 12, 2019

- CAP IR-2019-3067, “Noncompliance with Annual Training for APP-GW-GAP-300, Revision 13,” initiated on February 15, 2019

- CAP IR-2019-3711, “Annual Self-Assessment of SGI Program Not Documented in 2017,” initiated on February 25, 2019

- CAP RCA-12-195-M055, “Latent Organizational Problems that Led to Thermal Conductivity Degradation (TCD),” Revision 0, dated September 26, 2012

- Issue Report (IR) No. 11-231-M029, “Evaluate Impact of Information Notice 2009-23 on Fuel Thermal Conductivity Degradation,” dated August 19, 2011

Corrective Action Issue Report Opened During the NRC Inspection

- CAP IR-2019-3938, “Improper Safeguards Information Header and Footer Marking in APP-1000-GEC-001, Revision 4,” initiated on February 28, 2019

Safeguards Documents

- APP-GW-GAP-300, “Safeguards Information Control,” Revision 13, dated April 25, 2016

- APP-SES-J5-8070, “Plant Security System (SES) Alarm Interface Controller SES-EE-12304A02 Detailed Connections,” Revision 0, dated March 3, 2014

- APP-1000-GEC-001, “Aircraft Impact Analysis for AP1000 Nuclear Island,” Revision 4, dated September 2013

- APP-1000-GEC-002, “AP1000 Aircraft Impact Large Fire and Shock Damage Assessment,” Revision 3, dated March 2011

- APP-GW-GLR-068, “AP1000 Physical Security Plan,” Revision 1, dated March 2011

- Letter DCP_DCP_007019, dated April 13, 2015

- WSA-APD-18-01, “Westinghouse 2018 Self-Assessment of SGI Program,” dated February 24, 2019

- DCP_DCP_008164, “2015/2016 Standard Plant SGI Program Self-Assessment,” dated December 8, 2016
- “AP1000 Safeguards Information Access List,” Revision 75, dated February 4, 2019
- “AP1000 Safeguards Information Access List,” Revision 76, dated February 26, 2019
- SGI Inventory Listing, inspected on February 27, 2019

SAFEGUARDS INFORMATION Transmittal Log, inspected on February 27, 2019