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

May 4, 2022

Mr. Stanley Griffin
Nuclear Programs Quality Leader
GE Hitachi Nuclear Energy
3901 Castle Hayne Road
Wilmington, NC 28402

SUBJECT: NUCLEAR REGULATORY COMMISSION VENDOR INSPECTION REPORT OF GLOBAL NUCLEAR FUEL – AMERICAS, LLC, NO. 99901376/2022-201

Dear Mr. Griffin:

From March 21 through March 25, 2022, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an inspection at the Global Nuclear Fuels – Americas, LLC (GNF-A) facility in Wilmington, NC. The purpose of this limited-scope inspection was to assess GNF-A's compliance with the 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."

This technically-focused inspection specifically evaluated GNF-A's implementation of the quality activities associated with design, fabrication and testing of safety-related components being supplied to the U.S. operating nuclear power plants. The enclosed report presents the results of the inspection. This NRC inspection report does not constitute NRC endorsement of GNF-A's overall quality assurance (QA) or 10 CFR Part 21 programs.

This limited-scope inspection specifically evaluated GNF-A's implementation of activities associated with the protection of Safeguards Information (SGI) associated with the GNF-A's reactor design components for use in the U.S. nuclear power plant. The enclosed report presents the results of the inspection. This NRC inspection report does not constitute NRC endorsement of GNF-A's overall SGI protection program.

During this inspection, the NRC inspectors observed the physical protections and programmatic processes utilized by GNF-A to protect safeguards information. Based on the results of this inspection, the NRC inspection team found the implementation of your SGI protection program met the requirements imposed on you by the NRC. No findings of significance were identified.

Based on the results of this inspection, the NRC inspection team found the implementation of your QA program met the applicable technical and regulatory requirements imposed on you by your customers or NRC licensees. 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. Aaron Armstrong of my staff at (301) 415-8396.

Sincerely,

Signed by Kavanagh, K on 05/04/22

Kerri A. Kavanagh, Chief
Quality Assurance and Vendor Inspection Branch
Division of Reactor Oversight
Office of Nuclear Reactor Regulation

Docket No.: 99901376

EPID No.: I-2022-201-0010

Enclosure:
Inspection Report No. 99901376/2022-201
and Attachment

SUBJECT: NUCLEAR REGULATORY COMMISSION VENDOR INSPECTION REPORT GLOBAL NUCLEAR FUELS – AMERICAS, LLC, NO. 99901376/2022-201 DATED: MAY 4, 2022

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U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
DIVISION OF REACTOR OVERSIGHT
QUALITY ASSURANCE AND VENDOR INSPECTION REPORT

Docket No.:	99901376	
Report No.:	99901376/2022-201	
Vendor:	Global Nuclear Fuels – Americas, LLC 3901 Castle Hayne Road Wilmington, NC 28402	
Vendor Contact:	Mr. Stanley Griffin Nuclear Programs Quality Leader GE Hitachi Nuclear Energy Email: Stanley.Griffin@ge.com Phone: (910) 616-4019	
Nuclear Industry Activity:	Global Nuclear Fuel - Americas, LLC manufactures uranium dioxide (UO_2) powder, pellets, and light water reactor fuel bundles at its Wilmington facility. The facility converts uranium hexafluoride (UF_6) to UO_2 using a Dry Conversion Process and performs UO_2, gadolinium pellet, and fuel fabrication operations.	
Inspection Dates:	March 21 - 25, 2022	
Inspection Team Leader	Aaron Armstrong	NRR/DRO/IQVB Team Lead
Inspectors:	Yiu Law Dong Park Benjamin Parks Joshua Kaizer	NRR/DRO/IQVB NRR/DRO/IQVB NRR/DSS/SFNB NRR/DSS/SFNB
Approved by:	Kerri A. Kavanagh, Chief Quality Assurance and Vendor Inspection Branch Division of Reactor Oversight Office of Nuclear Reactor Regulation	

Enclosure

EXECUTIVE SUMMARY

Global Nuclear Fuels – Americas, LLC

99901376/2022-201

The U.S. Nuclear Regulatory Commission (NRC) staff conducted a vendor inspection at the Global Nuclear Fuels – Americas, LLC (GNF-A) facility in Wilmington, NC 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" and 10 CFR Part 21, "Reporting of Defects and Noncompliance." This was the 3rd NRC vendor inspection at GNF-A.

This technically-focused inspection specifically evaluated GNF-A's implementation of the quality activities associated with the design, fabrication and testing of safety-related fuel bundles being supplied to U.S. nuclear power plants.

These regulations served as the bases for the NRC inspection:

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

During the course of this inspection, the NRC inspection team implemented Inspection Procedure (IP) 43002, "Routine Inspections of Nuclear Vendors," dated January 27, 2017; IP 43004, "Inspection of Commercial-Grade Dedication Programs," dated January 27, 2017; IP 36100, "Inspection of 10 CFR Part 21 and Programs for Reporting of Defects and Noncompliance," dated May 16, 2019; and IP 81811, "Protection of Safeguards Information by Design Certification Applicants and Vendors," dated April 8, 2020.

The NRC inspection team observed the following specific activities:

- Shop area walkdown and work practices of GNF-A's implementation for identification of parts and materials, including the area for nonconforming materials
- Automated welding and ultrasonic testing of the fuel rod end plugs
- Calibration of the outer diameter micrometer standard
- Calibration lab and out of tolerance measurement and test equipment (M&TE) storage walkdown

The NRC inspection team concluded that GNF-A's QA policies and procedures comply with the applicable requirements of Appendix B to 10 CFR Part 50 and 10 CFR Part 21, and that GNF-A's personnel are implementing these policies and procedures effectively. The results of this inspection are summarized below.

10 CFR Part 21 Program

The NRC inspection team reviewed GNF-A's policies and implementing procedures that govern the implementation of its 10 CFR Part 21 program to verify compliance with the requirements of 10 CFR Part 21. The NRC inspection team: 1) reviewed the 10 CFR Part 21 postings; 2) reviewed a sample of safety-related purchase orders to ensure 10 CFR Part 21 was specified;

3) verified that GNF-A's nonconformance and correction action programs provide a link to the 10 CFR Part 21 program; and 4) reviewed GNF-A's process for Part 21 evaluations. No findings of significance were identified.

Nonconforming Materials, Parts, or Components and Corrective Action

The NRC inspection team reviewed GNF-A's policies and implementing procedures that govern the nonconforming materials, parts, or components and corrective action program to verify compliance with the requirements of Criterion XV, "Nonconforming Materials, Parts, or Components," and Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50. The NRC inspection team verified that the procedures contained sufficient guidance for evaluating non-conforming conditions, ensuring that conditions are evaluated for possible corrective action and checking for 10 CFR Part 21 applicability. The NRC inspection team reviewed a sample of inspection reports (IRs) and condition reports (CRs) to verify that they demonstrate compliance with regulatory requirements and adherence to GNF-A's procedures.

In addition, the NRC inspection team reviewed the implementation and closure of the corrective actions opened to address the Notice of Nonconformances documented in the NRC's inspection report No. 99901376/2018-201, dated April 4, 2018. No findings of significance were identified.

Commercial-Grade Dedication and Supplier Oversight

The NRC inspection team reviewed GNF-A's policies and implementing procedures that govern the implementation of its commercial-grade dedication (CGD) program to verify compliance with the requirements of Criterion III, "Design Control," and Criterion VII, "Control of Purchase Material, Equipment, and Services," of Appendix B to 10 CFR Part 50. The NRC inspection team reviewed and evaluated a sample of completed CGD documentation including technical evaluations used to identify critical characteristics and acceptance criteria. The NRC inspection team also reviewed a sample of surveys and confirmed that the surveys addressed the appropriate critical characteristics and were performed based on a plan and by trained personnel. No findings of significance were identified.

Design Control

The NRC inspection team reviewed GNF-A's policies and implementing procedures that govern the implementation of its design control program to verify compliance with the requirements of Criterion III of Appendix B to 10 CFR Part 50. The NRC inspection team reviewed and evaluated a sample of design documentation associated with the thermal-hydraulic performance of a fitting installed on the lower end of fuel bundles in Boiling Water Reactor (BWR)/6 facilities that GNF-A supplies both fuel and safety analysis products. No findings of significance were identified.

Manufacturing Control

The NRC inspection team reviewed GNF-A's policies and implementing procedures that govern the implementation of its manufacturing control program to verify compliance with the requirements of Criterion XI, "Control of Special Processes," of Appendix B to 10 CFR Part 50. The NRC inspection team witnessed the automated welding and ultrasonic testing (UT) of the Fuel Rod End Plugs. The NRC inspection team also reviewed the training and qualification records for the operator supervising the automated welding and UT process. No findings of significance were identified.

Control of Measuring and Test Equipment (M&TE)

The NRC inspection team reviewed GNF-A's policies and implementing procedures that govern the implementation of its control of the M&TE program to verify compliance with the requirements of Criterion XII, "Control of Measuring and Test Equipment," of Appendix B to 10 CFR Part 50. The NRC inspection team observed that M&TE was calibrated, labeled, tagged, handled, stored, or otherwise controlled to indicate the calibration status and its traceability to nationally recognized standards. In addition, the NRC inspection team confirmed that when M&TE is lost or found to be out of calibration, GNF-A initiated a nonconformance report and performed an evaluation to determine the extent of condition. No findings of significance were identified.

Internal Audits

The NRC inspection team reviewed GNF-A's policies and implementing procedures that govern the implementation of its internal audits program to verify compliance with the requirements of Criterion XVIII, "Audits," of Appendix B to 10 CFR Part 50. The NRC inspection team reviewed a sample of internal audit reports and confirmed that the internal audits were performed by qualified individuals using checklists and/or procedures, the checklists and/or procedures included an audit plan, documented objective evidence, audit results, and a review of audit results by responsible management. No findings of significance were identified.

Control of Safeguards Information

The NRC inspection team implemented IP 81811, "Protection of Safeguards Information by Design Certification Applicants and Vendors," dated April 8, 2020. In accordance with the IP, the NRC inspection team conducted the following activities:

- Observed the physical security measures GNF-A has in place to control access to the safeguards information (SGI)
- Reviewed records for receipt, retention, distribution, and destruction of SGI
- Reviewed GNF-A's procedures for governing the handling of SGI and granting access to individuals and sub-contractor firms
- Conducted interviews with GNF-A staff to assess knowledge of processes and procedures
- Reviewed personnel records for screening of information users to assess decisions granting access to individual

The NRC inspection team concluded that GNF-A's SGI protection policies and implementing procedures comply with the applicable requirements of 10 CFR 73.21 and 10 CFR 73.22, and the Commission's Order No. EA-07-231, dated September 12, 2007. The NRC inspection team also verified that GNF-A's personnel are implementing these policies and procedures effectively. No findings of significance were identified.

REPORT DETAILS

1. 10 CFR Part 21 Program

   a. Inspection Scope

   The U.S. Nuclear Regulatory Commission (NRC) inspection team reviewed Global Nuclear Fuels – Americas, LLC's (GNF-A's) policies and implementing procedures that govern the implementation of its Title 10 of the *Code of Federal Regulations* (10 CFR) Part 21, "Reporting of Defects and Noncompliance," program to verify compliance with the regulatory requirements. The NRC inspection team also evaluated the 10 CFR Part 21 postings and a sample of GNF-A's purchase orders (POs) for compliance with the requirements of 10 CFR 21.21, "Notification of Failure to Comply or Existence of a Defect and its Evaluation,' and 10 CFR 21.31, "Procurement Documents." The NRC inspection team verified that GNF-A's nonconformance and corrective action procedures provided a link to the 10 CFR Part 21 program. The NRC inspection team verified that the guidance for notifications were in accordance with the requirements of 10 CFR 21.21, as applicable.

   The NRC inspection team discussed the 10 CFR Part 21 program with GNF-A's management and technical staff. The attachment to this inspection report lists the documents reviewed and personnel interviewed by the NRC inspection team.

   b. Observations and Findings

   No findings of significance were identified.

   c. Conclusion

   The NRC inspection team concluded that GNF-A was implementing its 10 CFR Part 21 program in accordance with the regulatory requirements of 10 CFR Part 21. Based on the limited sample of documents reviewed, the NRC inspection team determined that GNF-A was implementing its policies and procedures associated with the 10 CFR Part 21 program. No findings of significance were identified.

2. Nonconforming Materials, Parts, or Components and Corrective Action

   a. Inspection Scope

   The NRC's inspection team reviewed GNF-A's policies and implementing procedures that govern the implementation of its control of nonconforming materials, parts or components; and corrective action programs to verify compliance with the requirements of Criterion XV, "Nonconforming Materials, Parts, or Components," and Criterion XVI, "Corrective Action," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities."

   GNF-A's process for controlling nonconforming material is based on the issuance of inspection reports (IRs). The NRC inspection team reviewed a sample of IRs to verify that GNF-A: (1) dispositioned the IRs in accordance with the applicable procedures, (2) documented an appropriate technical justification for various dispositions, and (3) took

adequate corrective action to address the nonconforming items. For IRs that were dispositioned use-as-is, the NRC inspection team confirmed that the technical justifications were documented to verify the acceptability of the nonconforming item.

GNF-A's process for corrective actions is based on the issuance of condition reports (CRs). The NRC inspection team reviewed a sample of CRs to ensure that conditions adverse to quality were promptly identified and corrected. In addition, the NRC inspection team verified the CRs provided: (1) adequate documentation and description of conditions adverse to quality; (2) an appropriate analysis of the cause of these conditions and the corrective actions taken to prevent recurrence, as applicable; (3) direction for review and approval by the responsible authority; (4) a description of the current status of the corrective actions; and (5) the follow-up actions taken to verify timely and effective implementation of the corrective actions. In addition, the NRC inspection team verified that GNF-A's CRs provide a link to the 10 CFR Part 21 program. The NRC inspection team also reviewed GNF-A's corrective actions in response to the inspection findings identified in NRC Inspection Report (IR) No. 99901376/2018-201 dated April 4, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18079A613).

The NRC inspection team discussed the nonconforming materials, parts, or components and corrective action programs with GNF-A's management and technical personnel. The attachment to this inspection report lists the documents reviewed and personnel interviewed by the NRC inspection team.

b. Observations and Findings

b.1. Corrective Action Associated with Notice of Nonconformance No. 99901376/2018-201-01

Following the April 2018 inspection at GNF-A, the NRC issued Notice of Nonconformance (NON) No. 99901376/2018-201-01 for GNF-A's failure to assure that conditions adverse to quality were effectively identified and corrected. Specifically, in December of 2016, GNF-A initiated a CR to address a significant number of gages (as determined by the gage lab supervisor) that were past their calibration due date and were still on the manufacturing floor. Subsequently, in March of 2017, GNF-A initiated another CR to address a significant number of gages that were past their calibration due date and were also still on the manufacturing floor. Then, during the review of GNF-A's calibration program, the NRC inspection team identified that a large number of gages were past their calibration due date and were still on the manufacturing floor.

In a follow-up response dated April 4, 2018, GNF-A stated, in part, that the reason for the nonconformance was that personnel accountability for the gage control process, predominantly at remote sites and/or vendors, was less than adequate. Corrective actions were taken to improve electronic workflow processes that would enhance communication between the Gage Lab and remote sites when gages are sent out for calibration. Additional actions would be underway to bring existing delinquent gages at remote sites and vendors into compliance, and to reinforce expectations for gage control. In addition, further consolidation of gage laboratory activities to a single geographical location and formal transfer to select gages to vendor control would be completed. GNF-A issued CR 31349 to address this issue.
GNF-A's corrective actions process self-identified a torque gage was due for calibration

on 1/12/2022 in CR 38721. This gage was past due for calibration and was used for torquing the channel fastener in a fuel bundle assembly for Nine Mile Point 2 on 1/27/2022. The fuel bundle was returned to GNF-A for emergent repairs due to damage done by Nine Mile Point 2. The NRC inspection team noted the priority level for the CR was determined to be "C," which is defined as "a condition that has or would have minimal effect on the safe or reliable operation of the plant or minimal customer impact," in accordance with GNF-A procedure CP-16-108, "Corrective Action Program." The NRC inspection team discussed with GNF-A the classification level of this CR and identified that the required torque for the channel fastener was 75 inch-lbs as specified on the specification drawing. The NRC inspection team verified that the torque gage was later re-calibrated and found to be in calibration and the bolt was found to be appropriately torqued. The NRC inspection team determined this was not a more than minor finding. The NRC inspection team did not identify any other incidences since the corrective action program changes were implemented to address the 2018 NRC inspection finding. The fuel bundle was out of GNF-A's normal routine manufacturing process and work was emergent to accommodate the licensee's schedule. GNF-A's implemented corrective action program changes self-identified the issue. The NRC inspection team verified the bolt was appropriately torqued. The NRC inspection team also noted that the CR is still open and will be reviewed to ensure appropriate corrective actions are implemented. The NRC inspection team determined that GNF-A's assessment that the CR had a minimal effect on safety. The NRC inspection team reviewed the above documentation that provided objective evidence for the completion of the corrective actions. The trend of delinquent gages shows a decline in delinquency that are past their calibration due dates. The NRC inspection team determined that GNF-A's corrective actions were adequate to address the NON 99901376/2018-201-01. Based on the review of the corrective action implementation, the NRC inspection team closed NON 99901376/2018-201-01.

c. Conclusion

The NRC inspection team concluded that GNF-A is implementing its nonconforming materials, parts, or components and corrective action program activities in accordance with the regulatory requirements of Criterion XV and Criterion XVI of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed and activities observed, the NRC inspection team determined that GNF-A is implementing its policies and procedures associated with nonconforming materials, parts, or components and corrective action program activities. No findings of significance were identified.

3. Commercial-Grade Dedication

a. Inspection Scope

The NRC inspection team reviewed GNF-A's policies and implementing procedures that govern the implementation of its Commercial-Grade Dedication (CGD) to verify compliance with the requirements of Criterion VII "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR Part 50. The NRC inspection team also reviewed GNF-A's policies and implementing procedures that govern oversight of contracted commercial items and services to verify compliance with the requirements of Criterion IV, "Procurement Document Control," and Criterion VII of Appendix B to 10 CFR Part 50. The NRC inspection team discussed the CGD process with GNF-A's management.

The NRC inspection team reviewed the CGD methodology for items and services for safety-related components and services, including the development of critical characteristics (CCs), technical evaluations, failure mode and effects analysis, acceptance criteria methods, sampling methodology, checklists, survey reports, and associated POs. The NRC inspection team reviewed the CGD process for various product types including testing and calibration services. The NRC inspection team evaluated a sample of technical evaluations and concluded that the technical evaluations of the dedication methodology appropriately identified the CCs necessary to provide reasonable assurance that the item would perform its intended safety function.

The NRC inspection team reviewed GNF-A's Approved Supplier List (ASL) and selected a sample of suppliers to review the methodology of conducting and documenting surveys. The NRC inspection team reviewed GNF-A's process of selecting and approving commercial suppliers and service providers. The NRC inspection team verified that GNF-A had prepared and approved plans that identify the scope and applicable CCs to be verified before initiation of the survey.

The NRC inspection team discussed the CGD program with GNF-A's management and technical personnel. The attachment to this inspection report lists the documents reviewed and the personnel interviewed by the NRC inspection team.

b. Observation and Findings

No findings of significance were identified.

c. Conclusion

The NRC inspection team concluded that GNF-A is implementing its CGD program activities in accordance with the regulatory requirements of Criterion IV and Criterion VII of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed and activities observed, the NRC inspection team determined that GNF-A is implementing its policies and procedures associated with CGD program and oversight of contracted activities. No findings of significance were identified.

4. Design Control

a. Inspection Scope

The NRC inspection team reviewed GNF-A's policies and implementing procedures that govern the implementation of its design control program to verify compliance with the requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. The NRC inspection team reviewed and evaluated a sample of design documentation associated with the thermal-hydraulic loss coefficients used for the side entry orifices (SEOs) located on the lower end of fuel bundles at Boiling Water Reactor (BWR)/6 facilities.

GNF-A sent the NRC three notification letters pursuant to 10 CFR 21.21(d) regarding these coefficients. These letters were sent in 2002, 2020, and 2021 (ADAMS Accession No. ML022820028, ML20176A432, and ML21168A217). In these letters,

GNF-A described differences between the loss coefficients assumed in safety analysis at the time and the actual expected values of those loss coefficients. In all three cases, GNF-A determined that the difference between the assumed and observed loss coefficients had a non-conservative impact on the safety analysis. Each time, GNF-A analyzed the impact of the change in the loss coefficients on the critical power ratio (CPR), the primary safety analysis fuel design limit which would be impacted by such a change. GNF-A recommended that its customers increase the CPR limit by introducing penalties of 0.01, 0.02, and 0.05 respectively. For the BWR licensees to which GNF-A supplies fuel and safety analysis, CPR limits are contained in the plant Technical Specifications both as a safety limit and an operating limit. Adherence to these limits helps to ensure that GNF-A customers comply with requirements of GDC 10, "Reactor Design," of Appendix A, "General Design Criteria for Nuclear Power Plants," of 10 CFR 50.

Between the 2002 issuance of the first notification letter and the issuance of the second in 2020, GNF-A personnel, among others, published data in academic journals suggesting the thermal-hydraulic loss coefficients for the SEO, which is a parameter used in safety analysis, may be too low.

Given (1) the similarity of the material addressed by these notification letters; (2) the assessments performed by GNF-A; (3) the need for increasing CPR penalties; and (4) new data available concerning SEO loss coefficient performance; the NRC inspection team focused on examining the supporting design records for each Part 21 notification letter to ensure that the analysis used in determining each CPR penalty was technically adequate. The NRC inspection team verified that actions taken by GNF-A assured: (1) the penalties were based on the most accurate information known at the time; (2) GNF-A acted in a timely fashion based on that information; and (3) GNF-A's analysis assured that the penalties would provide for appropriate margin such that CPR design limits would not be exceeded during any condition of normal operation or during an anticipated operational occurrence at each affected facility. This would ensure that, given the information and recommendations contained in each Part 21 notification, NRC licensees would continue to meet the requirements of 10 CFR Part 50, Appendix A, General Design Criterion 10.

b. Observations and Findings

The inspection team reviewed each Part 21 notification letter to determine the cause of the non-conservatisms in the assumed SEO loss coefficients. The notification from 2002 identified that the CPR performance of legacy fuel designs was less sensitive to differences in the SEO loss coefficients than that of then-current fuel designs. The sensitivity arose from the location of certain SEOs in relation to lower core support hardware. Based on more detailed study, GNF-A determined that the heightened sensitivity of then-current fuel designs could be bounded by each affected plant applying a CPR penalty by adding 0.01 to the CPR limit. The notification from 2020 factored in international operating experience and attributed another, increased sensitivity in CPR performance to the SEO loss coefficients, to the presence of core monitoring hardware near some SEO locations. Based on its studies, GNF-A then determined that this newly identified effect could be bounded by applying a 0.02 CPR penalty. In the 2021 notification letter, GNF-A identified another design consideration in the lower core support hardware that caused an additional sensitivity in the SEO loss coefficients, this time addressed by a CPR penalty of 0.05.

The NRC inspection team reviewed design documentation supporting each Part 21 report and determined that, while GNF-A was often presented with new evidence which may seem to indicate that the SEO loss coefficients were being underestimated, GNF-A also had substantial evidence (including empirical data) which indicated that there was no basis to make a change to the SEO's loss coefficient values. The NRC inspection team found that some of the evidence (such as evidence published in open literature) indicated higher SEO loss coefficients may be more appropriate, but that evidence occurred at flow conditions which were lower than those which occur in a reactor. Further, GNF-A design documentation included empirical data which substantially agreed with that data, but also demonstrated that the factors causing the higher SEO losses did not exist at typical reactor flow rates. The NRC inspection team determined that the only evidence which possibly suggested that the SEO loss coefficients should have been higher was data from early test runs which measured higher pressure loss than expected. However, as these higher pressure losses were only indicated in a few of the test runs (the vast majority of the test runs did not see this behavior), these higher pressure losses were attributed to a design change. Later testing in which these higher pressures losses were not observed would have been validation of this assumption. Further, GNF-A identified multiple times in which other analytical methods were used to investigate the SEO pressure losses and these analytical methods did not suggest any reason to believe that these pressure losses were higher than anticipated.

During investigations resulting from markings on fuel rods in an international reactor, newer and more powerful analytical methods were used which indicated that pressure losses at SEOs installed in specific locations in the core may be higher than previously anticipated. Upon learning about this new analysis, GNF-A performed their own computational fluid dynamics (CFD) analysis, reviewed recently released data, and re-investigated their earlier test data. This design review indicated that it was likely the SEO pressure losses were higher than anticipated, and the earlier test data initially believed to be based on a design change, may provide a good estimate of the pressure loss, as this value did agree with their analytical results. GNF-A investigated the reason that this higher pressure loss was not seen in more recent data and concluded that the phenomena causing the increased pressure loss would likely be extremely sensitive to certain factors that were not considered when the experiments were designed. Therefore, GNF-A assumed that the all SEO locations facing two cross-beams had the higher pressure losses, and determined that this would result in a penalty of 0.05 on the limiting CPR. The NRC inspection team found that GNF-A acted in a timely fashion when presented new data. The NRC inspection team found that in estimating the impact on CPR, GNF-A used an approach which adequately estimated the higher SEO loss coefficient based on the currently known data, and that GNF-A's analysis of the impact of the change in the SEO loss coefficient's value adequately accounted for the unknowns in the analysis by conservatively estimating the loss coefficient's prevalence.

c. Conclusion

The NRC inspection team concluded that GNF-A is implementing its design control and test control in accordance with the regulatory requirements of Criterion III of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed and activities observed, the NRC inspection team determined that GNF-A is implementing

its policies and procedures associated with design control and test control. No findings of significance were identified.

5. Identification and Control of Materials, Parts, and Components

a. Inspection Scope

The NRC inspection team reviewed GNF-A's policies and implementing procedures that govern the implementation of its material control program to verify compliance with the regulatory requirements of Criterion VIII, "Identification and Control of Materials, Parts, and Components," of Appendix B to 10 CFR Part 50.

The NRC inspection team witnessed on-going shop activities related to product receipt and acceptance and verified that GNF-A staff adequately performed intake activities including material identification, assignment of unique certification numbers to orders, and determining additional routing of materials necessary for formal receipt inspection, material certification, and entry into inventory.

The NRC inspection team also reviewed in-process activities in accordance with shop work orders and reviewed both material staging areas and nonconforming material segregation areas to verify material identification control methods including stamping, tagging, and pen markings. The NRC inspection team reviewed a sample of in-process and completed discrete job router documentation and confirmed material identification for each process step was adequately documented in accordance with procedures governing those activities.

The NRC inspection team discussed material identification methods with quality control inspectors, quality assurance personnel, and fabrication/craft personnel and confirmed understanding of identification and control of materials. The attachment to this inspection report lists the documents reviewed and personnel interviewed by the NRC inspection team.

b. Observation and Findings

No findings of significance were identified.

c. Conclusion

The NRC inspection team concluded that GNF-A is implementing its materials, parts, and components control program in accordance with the regulatory requirements of Criterion VIII of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed, the NRC inspection team also determined that GNF-A is implementing its policies and procedures associated with the materials, parts, and components control program. No findings of significance were identified.

6. Manufacturing Control

a. Inspection Scope

The NRC inspection team reviewed GNF-A's policies and implementing procedures that govern the implementation of its manufacturing control program to verify compliance with the regulatory requirements of Criterion IX, "Control of Special Processes," of Appendix B to 10 CFR Part 50.

The NRC inspection team witnessed the automated weld of the lower end plugs. The NRC inspection team verified that; (1) the welder operator was qualified to operate the welding station, (2) the welding procedures were appropriately qualified and contained the required information (e.g., welding parameters, etc.), and (3) the equipment used in the welding stations was within calibration.

The NRC inspection team also witnessed the ultrasonic testing (UT) of the lower end plugs. The UT instrumentation is calibrated at the beginning of every shift. The NRC inspection team verified that the nondestructive examination (NDE) procedures used by GNF-A provide adequate guidance to perform UT inspections by qualified personnel. A qualified inspector verifies every UT image data result for each lot. The NRC inspection team verified that the operator performed the inspection in accordance with the procedural requirements.

The NRC inspection team also discussed the manufacturing control program with GNF-A's management and technical staff. The attachment to this inspection report lists the documents reviewed and personnel interviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The NRC inspection team concluded that GNF-A is implementing its manufacturing control program in accordance with the regulatory requirements of Criterion IX of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed, the NRC inspection team also determined that GNF-A is implementing its policies and procedures associated with the manufacturing control program. No findings of significance were identified.

7. Control of Measuring and Test Equipment (M&TE)

a. Inspection Scope

The NRC inspection team reviewed GNF-A's policies and implementing procedures that govern the implementation of its control of the M&TE program to verify compliance with the regulatory requirements of Criterion XII, "Control of Measuring and Test Equipment," of Appendix B to 10 CFR Part 50.

For the sample of M&TE reviewed, the NRC inspection team determined that the M&TE had the appropriate calibration stickers and current calibration dates, including the calibration due date. The NRC inspection team also verified that the M&TE had been calibrated, adjusted, and maintained at prescribed intervals prior to use. In addition, the calibration records reviewed by the NRC inspection team indicated the as-found or as-left conditions, accuracy required, calibration results, calibration dates, and the due date

for recalibration. Furthermore, the NRC inspection team also verified that the selected M&TE was calibrated using procedures traceable to known industry standards.

The NRC inspection team confirmed that when M&TE equipment is found to be out of calibration, the M&TE is removed from use and segregated to prevent further usage. GNF-A then initiates an Out-of-Tolerance report and a CR until the out-of-tolerance condition is reviewed and dispositioned. Through the CR, GNF-A performs an evaluation to identify which items have been accepted using this equipment since the last valid calibration date and perform an extent of condition review.

The NRC inspection team performed a walk-down of GNF-A's laboratories to observe that M&TE were labeled, handled, and stored in a manner that indicated the calibration status of the instrument and ensured its traceability to calibration test data. The NRC inspection team observed the calibration of an internal caliper and confirmed that the calibration was performed in accordance with GNF-A's procedures.

The NRC inspection team also discussed the control of M&TE program with GNF-A's management and technical staff. The attachment to this inspection report lists the documents reviewed and personnel interviewed by the NRC inspection team.

b. Observation and Findings

No findings of significance were identified.

c. Conclusion

The NRC inspection team concluded that GNF-A is implementing its control of the M&TE program in accordance with the regulatory requirements of Criterion XII of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed and activities observed, the NRC inspection team determined that GNF-A is implementing its policies and procedures associated with the control of M&TE. No findings of significance were identified.

8. Internal Audits

a. Inspection Scope

The NRC inspection team reviewed GNF-A's policies and implementing procedures that govern the implementation of its internal audits program to verify compliance with the requirements of Criterion XVIII, "Audits," of Appendix B to 10 CFR Part 50.

For the sample of internal audits reviewed, the NRC inspection team verified the audit reports included an audit plan, audit results, adequately documented objective evidence with the applicable requirements, and a review by GNF-A's responsible management. These audits were performed at the minimum frequency as specified in GNF-A's procedures and follow-up actions were taken to resolve identified findings and deficiencies. In addition, the NRC inspection team also verified that the internal audits were performed by qualified auditors. Furthermore, the NRC inspection team reviewed a sample of training and qualification records of GNF-A's lead auditors and confirmed that auditing personnel had completed all the required training and had maintained the

applicable qualification and certification in accordance with GNF-A's policies and procedures.

The NRC inspection team also discussed the internal audits programs with GNF-A's management and technical staff. The attachment to this inspection report lists the documents reviewed and personnel interviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The NRC inspection team concluded that GNF-A is implementing its internal audits program in accordance with the regulatory requirements of Criterion XVIII of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed and activities observed, the NRC inspection team also determined that GNF-A is implementing its policies and procedures associated with the internal audits program. No findings of significance were identified.

9. Safeguards Information Program

a. Inspection Scope

The NRC inspection team reviewed GNF-A's policies and implementing procedures to verify that GNF-A'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 GNF-A's implementing procedures for controlling and protecting SGI; (2) interviewed GNF-A'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 GNF-A'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 GNF-A 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 GNF-A 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.

10. Entrance and Exit Meetings

On March 21, 2022, the NRC inspection team discussed the scope of the inspection with Mr. Stanley Griffin, Nuclear Programs Quality Leader, and GNF-A's management. On March 25, 2022, the NRC inspection team presented the inspection results and observations during an exit meeting with Mr. Stanley Griffin and GNF-A's management. 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 and Persons Interviewed

Name	Title	Affiliation	Entrance	Exit	Interviewed
Aaron Armstrong	Inspection Team Leader	NRC	X	X	
Yiu Law	Inspector	NRC	X	X	
Dong Park	Inspector	NRC	X	X	
Benjamin Parks	Inspector	NRC		X	
Joshua Kaizer	Inspector	NRC	X	X	
Paul Prescott	Branch Chief (Acting)	NRC		X	
Stanley Griffin	Nuclear Programs Quality Leader	GNF-A	X	X	X
Brian Neely	Manufacturing Quality Manager	GNF-A	X	X	X
Mark Elliott	Services Quality Leader	GNF-A	X		X
Michelle Catts	Senior Vice President Nuclear Programs	GNF-A	X		X
Jesus Diaz-Quiroz	US Licensing Manager NPP	GNF-A	X		X
Brian Moore	Engineering Manager	GNF-A	X		
Russell Stachawski	Chief Consulting Engineer	GNF-A	X		
Michael Thomas	Principal Engineer	GNF-A	X		
Scott Bowman	Consulting Engineer	GNF-A	X		X
Jennifer O'Connor	Senior Industry Standards Compliance Manager	GNF-A			X
Bret Schulz	FMO Manager	GNF-A			X
Marianna Staks	Support Services Leader	GNF-A			X
William McCormick	Gage Lab Inspector	GNF-A			X
Billy Hanna	Flex Fuel Fab Operator	GNF-A			X
Jens Andersen	Engineer	GNF-A	X	X	
Keith Bentley	Senior Engineer	GNF-A	X		
Adam Dickerson	Engineering Manager	GNF-A	X	X	
Christopher Edgar	Technical Leader	GNF-A	X		
Shawn Lamb	Engineering Manager	GNF-A	X	X	
Justin Lamy	Engineering Manager	GNF-A	X	X	
Kathryn Martin	Corrective Action Program Manager	GNF-A	X	X	

Name	Title	Affiliation	Entrance	Exit	Interviewed
Wade Mattox	Senior Security Manager	GNF-A	X	X	
Duane Wilson	General Manager	GNF-A		X	
Michelle Catts	Nuclear Programs & Regulatory Affairs Leader	GNF-A		X	

* Via teleconference

2. INSPECTION PROCEDURES USED

- Inspection Procedure (IP) 43002, "Routine Inspections of Nuclear Vendors," dated January 27, 2017
- IP 43004, "Inspection of Commercial-Grade Dedication Programs," dated January 27, 2017
- IP 36100, "Inspection of 10 CFR Part 21 and Programs for Reporting Defects and Noncompliance," dated May 16, 2019
- IP 81811, "Protection of Safeguards Information by Design Certification Applicants and Vendors," dated April 8, 2020

3. LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Item Number	Status	Type	Description
99901376/2018-201-01	Closed	NON	Criterion XVI

4. DOCUMENTS REVIEWED

Policies and Procedures

- Nuclear Engineering Design Operations No. 11209-A, "GE Hitachi Nuclear Energy Quality Assurance Program Description," Revision 16, dated December 23, 2020
- WI-16-108-07, "Reporting of Defects and Noncompliance Under 10 CFR Part 21," Revision 9.0, dated December 03, 2021
- CP-15-104, "Material Review Process," Revision 0.5, dated November 30, 2016
- WI-15-100-02, "GNF-A Nonconforming Material Control," Revision 0.5, dated October

24, 2019

- CP-16-108, “Corrective Action Program,” Revision 13.3, dated March 5, 2022
- CP-03-100, “Design Control,” Revision 8.0, dated December 15, 2021
- CP-03-100-G330, “Technical Reviews,” Revision 1.0, dated November 13, 2017
- CP-03-113, “Engineering Change Control,” Revision 2.2, dated August 13, 2021
- WI-03-100-30, “Design Verification,” Revision 3.4, dated November 17, 2021
- WI-03-100-41, “BWREDB Interface Control,” Revision 00, dated November 18, 2014
- WI-16-108-01, “Condition Review Process,” Revision 12.0, dated November 30, 2021
- TDP-0160, “3D MONICORE PANAC11 Databank Update,” Revision 7, dated December 9, 2020
- Operating Procedure (OP) No. 1060.18.202, “No. 2 Lower End Plug Welder - Normal Operations,” Revision 05, dated April 26, 2021
- Process/Product Quality Plan No. 1.1.0, “Quality at The Source Implementation and Maintenance Plan - FMO,” Station 1911, Revision 27, dated November 29, 2021
- Quality Control Inspection Instruction (QCII) 1.1.0, “FMO Surveillance Plan,” Station 1911, Revision 93
- QCII 4.3.1, “Flush Weld Shear UT Evaluation,” Station 1914, Revision 8
- QCII 5.2.7, “Fuel Rod/Bundle Leak Check,” Station 1910, Revision 47
- Quality Information Equipment Plan B-10.2, “FMO Bundle Leak Check Operation and Test Procedure,” Station 1910, Revision 12
- F01-9453NE, “Receiving Inspection Quality Control Inspection Instruction,” DWG NO: 234C5373P001, Rev: 3 Part Name: GNF-J LOWERV PLUG, Rev: 2
- CP-18-100, “Quality Assurance Internal Audit Requirements,” Revision 10, dated May 13, 2020
- CP-12-101, “Calibration Control Program,” Revision 10, dated August 11, 2021
- GIS-B-01, “Calibration of Outside Micrometers,” Revision 11.0, dated November 16, 2021
- OP 1060.18.202, “No. 2 Lower End Plug Welder – Normal Operations,” Rev. 05, dated April 26, 2021
- Product Quality Certification, Shipment No. 33419709, dated October 15, 2021

- Gage Inspection Standard No. A-07, “Lost or Damaged M&TE Control,” Revision 8.0

- Gage Inspection Standard No. A-17, “Out-of-Tolerance/ Nonconforming Gages,” Revision 20.0

Part 21 Reports

- PRC 20-01, PRC 20-07, PRC 20-08, PRC 21-05, PRC 21-07

- DBR-0051115, “PRC 20-01 Evaluation Summary Report,” dated January 23, 2019

- SC 02-15, “Fuel Support Side Entry Orifice Loss Coefficient in Core Monitoring System Databank,” dated October 4, 2002

- SC 08-05, “Update to GEN Surveillance Program for Channel-Control Blade Interference Monitoring,” Revision 3, dated January 29, 2021

- SC 20-06 006N3548, “Impact of Ex-core Flux on Control Rod Lifetime Limits,” dated February 26, 2021

- SC 21-05, “Dedicated Relay DA317A6541P004 with ‘Use-As-Is’ Disposition for Drop-Out Time Requirement, Transfer of Information,” Revision 0, dated May 10, 2021

- DBR-0055904, “PRC 20-07 SDM Calculations

- PRC Log.xlsx

- 006N4868, “PRC 21-04 – BWR/6 SEO induced Metastable Flow impacts on CPR,” Revision 0, dated May 2021

- 006N6158, “PRC 21-04 – BWR/6 SEO induced Metastable Flow impacts on CPR Phase II – Grand Gulf Cycle 23 & 24,” Revision 0, dated June 2021

- 006N5258.5, In Support of SC 21-04, Revision 1 and SC 21-06 Summary Evaluation - Fuel Support Side Entry Orifice Meta-Stable Flow for 2 Beam Locations in the BWR/6 Reactors, dated June 17, 2021.

Discrepant Material Reports/Corrective Action Report

Nonconformance Reports (NCR)

- FCO I List, “IR Snapshot Report Time Period 06-Jun-20 to 11-Mar-22,” dated March 11, 2022

- FCO Defect Codes, “Defect Detail Codes for Bldg. Code C,” dated March 22, 2022

- FCO Defect Groups, “Defect Group Codes for Bldg. Code C,” dated March 22, 2022

- FMO IR List, “IR Snapshot Report Time Period 01-Jun-20 to 11-Mar-22,” dated March

11, 2022

- FMO Defect Codes, “Defect Detail Codes for Bldg. Code F,” dated March 22, 2022
- FMO Defect Groups, “Defect Group Codes for Bldg. Code F,” dated March 22, 2022
- C1-1875, C1-1877, C1-1902, C1-1903, C1-1975
- IR-F1-3868, IR-F1-3898, IR-F1-3910, IR-F1-3927, IR-F1-4165
- PSR_Ovality_Clampslide.xlsx
- PSR-March22-IRs.xlsx
- 225247178

Condition Reports (CRs)

- 28026, 31349, 33502, 34185, 34572, 35108, 35304, 35841, 36127, 36137, 36443, 36886, 37011, 37012, 37116, 37116, 37120, 37121, 37118, 37271, 37830, 38719, 38721
- NRC Inspection 2022-Feb 2022 CAP A-B-C CRs.xlsx

Measuring and Testing Equipment (M&TE) Records

- Record of calibration for a parallelism gage, asset number W85728, dated January 18, 2022
- Record of calibration for a dial indicator, asset number W13150, dated April 5, 2021
- Record of calibration for a ring gage, asset number WG000102, dated August 18, 2021
- Record of calibration for a plug diameter, asset number W83068, dated December 2, 2021
- Record of calibration for a OD MIC 2-3”, asset number W00519, dated March 23, 2023
- Record of calibration for a gage block set – Grade 2, asset number W04063, dated November 8, 2021
- Out of tolerance report Nos. 222706712, 225094369, 225110212, 225110473, 225110841, 225111551, 225145832, 225204460, 225247178, 225279952, 225340559, 225390352, 225390950, 225391064, 225391078, 225481192, 225482408, 225535935, 225247178
- Nonconformance Tag W17321, “Fluke 87 III Multimeter, NCR No. 225247178,” Dated March 9, 2022

Internal Audits

- 2020 Nuclear Programs Quality Internal Audit Schedule Revision 3, dated October 07, 2020
- 2021 Nuclear Programs Quality Internal Audit Schedule Revision 2, dated October 07, 2021
- 2022 Nuclear Programs Quality Internal Audit Schedule Revision 0, dated January 07, 2022
- NQA-2021-02 Internal Audit Plan
- NQA-2021-02 Internal Audit Checklist
- NQA-2021-02 Internal Audit Report
- NQA-2021-03 Internal Audit Plan
- NQA-2021-03 Internal Audit Checklist
- NQA-2021-03 Internal Audit Report
- NQA-2021-04 Internal Audit Plan
- NQA-2021-04 Internal Audit Checklist
- NQA-2021-04 Internal Audit Report

Purchase Orders and Commercial-Grade Surveys (CGD)/Audit Reports

- CP-07-104, "Purchase Order Technical Evaluation and Dedication of Commercial Grade Items and Services," Revision 6.7, dated February 10, 2021
- WI-07-104-01, "Motor Dedication and Inspection Processes," Revision 3, dated April 29, 2021
- WI-07-104-02, "Dedication Specification Generation," Revision 6.2, dated December 02, 2021
- WI-07-104-03, "Commercial Grade Dedication of Digital Components Containing Software," Revision 1.0, dated December 6, 2017
- WI-10-105-02, "Commercial Grade Dedication," Revision 11.0, dated May 21, 2020
- WI-10-105-03, "Clarifications for Verification Methods Required by Dedication Specifications," Revision 7.0, dated March 03, 2022
- GNF Approved Suppler List 202-03-21

- 0000-0103-5780, “Critical Characteristics of GNF Safety-Related Fuel Assembly Components,” Revision 2

- 003N2282, “Safety Classification of GNF Fuel Assembly and Related Component,” Revision 1

- 003N9811, “Critical Characteristics of GNF Safety-Related Fuel Assembly Components,” Revision 2

- “Dedication Package of Specialty Gas for Dedication Spec (DS) 0129-9334,” Revision 01, dated October 23, 2018

- Purchase order (PO) 437131165, “Specialty Gas,” Revision 3, dated March 14, 2022

- Dedication Package for Screw and Machine Products to DS 001N1989, Revision 2, 001N1987 Revision 0 and 004N2877 Revision 0, dated February 4, 2021

- PO 437131831, “Screw and Machine Products,” Revision 1, dated February 22, 2022

- Dedication Package for Safety Related Raw material for the manufacturing of Tube to DS 001N1012 Revision 3, 26A8507 Revision 3; 002N8689 Revision 0; 26A8514 Revision 0, dated May 13, 2021

- PO 437129520, “Safety Related Raw Material for the Manufacturing of Tube,” Revision 12, dated January 7, 2022

- PO 437135285, “Calibration of Gages to Quality Record #QA0007-8892,” Revision 0, dated November 23, 2021

- PO 437136617, “Procurement of Calibration or Testing Services to QA Requirements for QAR-017,” Revision 0, dated January 7, 2022

- QAR-017, “QA Requirements for Procurement of Calibration or Testing Services,” Revision 13, dated March 23, 2015

Training Records

- Lead auditor Certificates of Qualification and associated training records for personnel #2332,personnel #1602, and personnel #2318

- Inspector Certificates of Qualification and associated training records for personnel #2220 and personnel #2230

- Fuel Rod First Flush Welding No. 807, Certification for welder, dated March 1, 2020

SGI Program

- CP-06-104, “Protection of Safeguards Information,” Revision 6, dated 07/31/2020

- SGI Internal Audit 2021-01, “Safeguards Information Program,” dated 3/01/202\
- Condition Report #36276, “SGI Internal Audit identified Program Deficiency,” dated February 22, 2021

Others

- Drawing 002N3410, “Channeled Fuel,” Revision 0
- Overdue Gage History 2022-03-18.xlsx
- DBR-0057855, “CFD Simulations of BWR/6 Side Entry Orifice Pressure Losses,” dated March 25, 2021
- 006N1548, “Side Entry Orifice Loss Coefficient Updates for US BWR/6 Plants in Core Monitoring,” Revision 1, dated October 2020.
- 006N1549, “Grand Gulf Cycle 23 SEO Update Installation Instructions,” Revision 0, [no date]
- 006N1555, “Perry Cycle 18 SEO Update Installation Instructions,” Revision 0, [no date]
- 006N1557, “River Bend Cycle 21 SEO Update Installation Instructions, Revision 0, [no date]
- 006N1559, “Clinton Cycle 20 SEO Update Installation Instructions, Revision 0 [no date]
- 006N1276, “Design Summary: PRC 20-05 SEO Loss Coefficients at IRM/SRM Locations for US BWR/6 Plants,” Revision 3, dated June 23, 2020
- 006N1894, “Summary Report: SEO Loss Coefficients Applied to Core and Fuel Design for US BWR/6 Plants,” Revision 0, dated July 17, 2020
- 006N4785, “Potentially Reportable Condition – PRC 21-04, Fuel Support Side Entry Orifice Loss Coefficient with Bi-Stable Flow Patterns,” Open Memo dated February 19, 2021 and Close Memo dated June 17, 2021
- 006N4882, “SEO Hydraulic Losses for the BWR/6,” dated April 8, 2021
- 006N6160, “PRC 21-04 – BWR/6 SEO Induced Metastable Flow Impacts on CPR Phase II – River Bend Cycle 22,” Revision 0, dated June 2021
- 006N6177, “PRC 21-04 – BWR/6 SEO Induced Metastable Flow Impacts on CPR Phase II – Clinton Cycle 20 & 21,” Revision 0, dated June 2021
- 006N6178, “PRC 21-04 – BWR/6 SEO Induced Metastable Flow Impacts on CPR Phase II – Perry Cycle 18 & 19,” Revision 0, dated June 2021
- DBR-0057885, “CFD Simulations of BWR/6 Side Entry Orifice Pressure Losses,”

Revision 0, [no date]

- DBR-0057827, “BWR/6 SEO Hydraulic Loss Coefficients (PRC 21-04) Technical Review,” dated March 25, 2021

- UE-OG-3060, “Study of ABWR Fuel Support Side Entry Orifice Coefficient,” dated April 29, 2005

- NEDE-21343, “ATLAS Hydraulic Tests in support of Incore Vibration Fix,” dated August 1976

ACRONYMS

ASL	Approved Suppliers List
ATR	Acceptance Test Report
CMTRs	Certified Material Test Reports
CP	Common Procedure
CPR	Critical Power Ratio
CRs	Condition Reports
CRG	Condition Review Group
DS	Dedication Specification
ECPs	Engineering Computer Packages
GNF-A	General Electric Hitachi
GNF-A	Global Nuclear Fuel - Americas
IRs	Inspection Reports
MIDAS	Multi-Inspection and Data Acquisition System
M&TE	Measuring and Test Equipment
NIAC	Nuclear Industry Assessment Committee
NRC	Nuclear Regulatory Commission
POs	Purchase Orders
PPQP	Process/Product Quality Plan
P&P	Policy and Procedure
WI	Work Instruction