November 4, 2008

MEMORANDUM TO: Glenn M. Tracy, Director
Division of Construction, Inspection
& Operational Programs
Office of New Reactors

THRU: John A. Nakoski, Chief **/RA/**
Quality and Vendor Branch 2
Division of Construction Inspection
& Operational Programs
Office of New Reactors

FROM: Daniel Pasquale, Inspection Team Leader **/RA John Nakoski for/**
Quality and Vendor Branch-2
Division of Construction Inspection
& Operational Programs
Office of New Reactors

SUBJECT: TRIP REPORT BY DIVISION OF CONSTRUCTION INSPECTION & OPERATIONAL PROGRAMS (DCIP) STAFF OF THE JOINT UTILITY TEAM AUDIT AT GLOBAL NUCLEAR FUELS (GNF), WILMINGTON, NC

On September 8-12, 2008, Daniel Pasquale, Sabrina Cleavenger, and Damaris Arroyo of the Quality and Vendor Branch-2, Division of Construction Inspection and Operational Programs, Office of New Reactors observed the performance of a joint utility Limited Scope Audit (LSA) of the Global Nuclear Fuels (GNF) facility in Wilmington, NC. Exelon Corporation led the audit, with participation from, Energy Northwest, Florida Power & Light, Entergy, Public Service Electric & Gas, Nebraska Public Power District, and Detroit Edison using the Nuclear Procurement Issues Committee (NUPIC) checklist.

The purpose of the staff's observation was to assess the NUPIC Limited Scope Audit process used for suppliers of components to the nuclear industry. The trip report of the staff's observations including a list of the persons contacted during the trip is enclosed.

CONTACT: Daniel Pasquale, NRO/DCIP/CQVB
301-415-2498

The CQVB-2 staff also performed a limited scope inspection of GNF's compliance with 10 CFR Part 21, "Reporting of Defects and Noncompliance." The results of the staff's inspection of GNF's implementation of 10 CFR Part 21 requirements are documented in NRC Inspection Report 99901376/2008-201.

(ADAMS Accession # **ML082950692**).

Enclosure:
As stated

The CQVB-2 staff also performed a limited scope inspection of GNF's compliance with 10 CFR Part 21, "Reporting of Defects and Noncompliance." The results of the staff's inspection of GNF's implementation of 10 CFR Part 21 requirements are documented in NRC Inspection Report 99901376/2008-201.

(ADAMS Accession # **ML082950692**).

Enclosure:
As stated

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NRC TRIP REPORT

Subject

This trip report documents observations by members of the Nuclear Regulatory Commission (NRC) Office of New Reactors (NRO), Division of Construction Inspection & Operational Programs (DCIP), of a joint utility audit team during its Quality Assurance audit conducted on September 8-12, 2008, at Global Nuclear Fuel's (GNF) Wilmington, NC facility.

Dates of Audit and Organization Visited

September 8-12, 2008
Global Nuclear Fuel
3901 Castle Hayne Road
Wilmington, NC 28402

Author, Title and Agency Affiliation

Daniel Pasquale, Vendor Inspector
Sr. Operations Engineer
Quality and Vendor Branch 2 (CQVB2)
Office of New Reactors (NRO)

Sensitivity

The following documents were requested from GNF by the NRC staff to assist in generating this trip report and the 10 CFR Part 21 Inspection Report of GNF. They were returned to GNF, intact without copying, upon completion of the NRC's need for the documents as per agreement with GNF.

1. Nuclear Energy Corrective Action Request, CAR No. 43471 (GE Proprietary).
2. QUALITY CONTROL INSPECTION INSTRUCTIONS, Product Family: Fuel Tubing, Title: Final Inspection of Fuel Tubing 092, No. 17.6.5 Revision 77.
3. QUALITY INSPECTION STANDARD, Product Family: Fuel Channel, Title: Channel UT Inspection, Number: C20.03, Revision 30.
4. GNF Common Procedure, CP-18-02, Rev. 1, SUPPLIER QUALITY AUDITS.
5. Global Nuclear Fuel-Americas, Procedural Responsibilities and Instructions, PRI-17-01, PRODUCT QUALITY RECORDS.
6. GNF Common Procedure, CP-16-01, Rev. 3, CORRECTIVE ACTION PROCESS and SELF-ASSESSMENTS.
7. Global Nuclear Fuel, Policies and Procedures, P&P 70-42, Date Issue: 10/13/06.

This document is publicly available (ADAMS Accession # **ML082960066**).

Enclosure

Background/Purpose

This trip report documents the staff assessment of a joint utility (NUPIC) audit conducted at GNF Wilmington, NC facility on September 8-12, 2008. The NUPIC team was lead by Exelon (EXL) and assisted by six supplier auditors representing Energy Northwest (ENW), Florida Power & Light (FPL), Entergy (ENT), Public Service Electric & Gas (PSEG), Nebraska Public Power District (NPPD), and two Technical Specialists; one from Exelon and one from Detroit Edison (DTE). The team's review included an analysis of GNF's mechanical design processes (particularly in the area of safety classification of piece parts), procurement controls including the order entry and order fulfillment processes, (Quality Assurance) QA processes including internal audits, supplier audits and corrective action effectiveness, and Manufacturing/Test/Inspection activities (specifically, fuel bundle assembly, inspection, and channel inspection). The staff chose to observe this joint-utility audit based on GNF's performance during the previous NUPIC audit.

NUPIC was formed in 1989, as a partnership involving all domestic and several international nuclear utilities. The NUPIC program evaluates suppliers furnishing safety-related components and services and commercial-grade items to nuclear utilities. The audit team followed the NUPIC audit process and plans to provide the results to NUPIC members that procure parts and services from GNF. The purpose of the staff's observation of this audit was to ensure the NUPIC audit process remains an acceptable supplement to the NRC vendor inspection program. The staff implemented Inspection Procedure (IP) 43005, "NRC Oversight of Third-Party Organizations Implementing Quality Assurance Requirements." The staff continues to rely on the effectiveness of the NUPIC audit process for evaluating the implementation of QA programs of suppliers to the nuclear industry.

GNF provides nuclear fuel bundle assemblies and associated replacement parts for use in various nuclear reactor designs worldwide. Its finished products are sold predominately as safety related basic components in accordance with Appendix B to 10 CFR Part 50 and 10 CFR Part 21. GNF is the original equipment manufacturer for the products it sells. All products produced by GNF are manufactured in accordance with GNF's Appendix B to 10 CFR Part 50 QA program. Although the majority of sub-components and raw goods used in GNF's finished products are procured from sub-suppliers who comply with the requirements of Appendix B to 10 CFR Part 50 and 10 CFR Part 21, some items are procured commercial-grade and dedicated in accordance with the guidance of EPRI NP-5652, "Guideline for the Utilization of Commercial Grade Items in Nuclear Safety Related Applications." GNF procedures require serial numbers on all its manufactured components, and each component is tested to demonstrate acceptability of the parts. The testing is intended to provide reasonable assurance that commercially dedicated parts will be able to perform to the utility's procurement specifications. Presently, all of GNF's commercial-grade dedication testing has been in accordance with EPRI NP-5652, Method 1 guidance, which requires GNF to test all the critical characteristics of a component's safety related function. There was no in-process activities related to Method 1 testing being performed during the NUPIC audit to allow an evaluation of GNF's implementation of their testing program. GNF has expressed interest in performing Method 2 commercial grade dedications in accordance with EPRI NP-5652, which would allow them to shift some testing requirements from GNF onto its approved suppliers. GNF does not however, have a program or implementing procedures in place to support Method 2 activities.

In addition to observing the NUPIC audit, the staff implemented NRC IP 36100, "Inspection of 10 CFR Parts 21 and 50.55(e) Programs for Reporting Defects and Noncompliance." The staff identified one potential Notice of Nonconformance (NON) related to GNF's 10 CFR part 21

program. The NON was initiated to document that GNF failed to incorporate the latest definitions of program terms as presented in the most current issuance of 10 CFR Part 21 into its implementing procedures. The results of the staff's inspection of GNF's implementation of 10 CFR Part 21 requirements are documented in NRC Inspection Report 99901376/2008-201 (ADAMS Accession # **ML082950692**).

Discussion

The NUPIC audit scope was to determine the acceptability and verify the effective implementation of GNF's QA program in accordance with the requirements of Appendix B to 10 CFR Part 50. This audit was performed as a Limited Scope Audit (LSA) in accordance with NUPIC Document No. 40, "Vendor Performance Monitoring Procedure" Revision 1, which defines a LSA as: "A supplemental audit scheduled outside the normal NUPIC Audit Frequency, focused at specific vendor's performance deficiencies." In the case of GNF, NUPIC authorized the LSA of GNF based upon unresolved issues identified during NUPIC's last audit of GNF, led by Nebraska Public Power District, performed August 13-24, 2007 (Ref: NPP Supplier Audit Report No SA07-012). That audit report presented nine preliminary findings and recommendations with the implementation of the quality program and regulatory requirements. The audit findings and recommendations represented the following areas of Appendix B to 10 CFR Part 50: 1) Design; 2) Commercial Grade Dedication; 3) Procurement; 4) Tests, Inspections, and Calibration; 5) Document Control/Adequacy; 6) Internal Audit; 7) Corrective Action: and 8) Records. The audit report was issued to GNF on September 24, 2007.

The NUPIC audit team used NUPIC Document 7, Revision 13, "Nuclear Procurement Issues Committee Audit Checklist," that encompasses the 18 criteria of Appendix B to 10 CFR Part 50, for this audit. The NUPIC audit checklist can be downloaded by the public from the NUPIC web site: www.nupic.com. The audit team used the performance-based NUPIC audit checklist to verify the adequacy and overall effectiveness of the supplier's QA Program. The NUPIC audit checklist delineates the activities to be examined within each section and provides limited guidance on how to use the referenced data sheets to record the related objective evidence reviewed for each section. NUPIC procedure Document No. 4, "NUPIC Joint Audit Procedure," Revision 31, establishes the methodology to perform NUPIC Joint Audits and to complete the NUPIC audit checklist.

The NUPIC team was lead by Exelon and consisted of six auditors and two Technical Specialists. The NUPIC team's review included an analysis of GNF's mechanical design processes (particularly in the area of safety classification of piece parts), procurement controls including the order entry and order fulfillment processes, QA processes including internal audits, supplier audits and corrective action effectiveness, and Manufacturing/Test/Inspection activities (specifically, fuel bundle assembly, inspection, and channel inspection).

The NRC staff observed various aspects of the NUPIC team's conduct of the audit at the GNF facility, including observation of the NUPIC pre-Audit team meeting conducted the day before the audit to review the details and expectations of the audit. During that meeting, the NUPIC Audit Team Leader reiterated to the team the purpose for the LSA and reinforced the need to communicate all identified issues through the team leader. The team leader from the previous NUPIC audit presented a status of the findings issued to GNF during that audit, including a brief, but thorough assessment of those issues that remained to be resolved with the supplier. The previous audit (NPPD Supplier Audit No. SA07-012) was lead by Nebraska Public Power District (NPPD) and identified nine non-conformances and made 5 formal recommendations. At

the time of the LSA, only one of these issues remained unresolved. That issue, Finding SA07-12-01, dealt with inadequacies in GNF's program for determining the safety classification of the various piece parts that make up a fuel bundle assembly. Opinions from other licensee representatives on the NUPIC team regarding this issue were expressed and discussed by the team as they worked through their respective utility's positions to the issued findings. These issues formulated the basis for NUPIC initiating the LSA. The NUPIC Team Leader took care to ensure that the NUPIC team was aligned on the issues prior to entering the audit.

NRC staff attended and observed the audit's formal entrance and exit meetings, as well as the various daily meetings that the NUPIC audit team conducted among themselves and during the daily debrief with the senior GNF QA staff. The formal audit entrance and exit meetings included representation from both GNF & GE-Hitachi (GEH) senior management personal. A complete list of the attendees is presented later in this report.

The NRC staff observed the NUPIC auditors throughout the week as they conducted a performance-based review of the specific audit checklist sections. These observations included: 1) how documents were selected for inclusion into the audit sample population, 2) the adequacy of the NUPIC reviews and interviews conducted with GNF technical personnel, and 3) related testing observed of completed fuel bundle channels. The checklist sections selected for use during the LSA were divided among the NUPIC audit team members. The audit team reviewed the GNF QA manual and other lower tier implementing documents, such as procedures and purchase orders. The audit was performed by reviewing the requirements of the QA program and supporting implementing procedures, observing in-process activities, evaluating the documentation associated with the activities that had been performed, and discussing the activities with GNF personnel.

The NRC staff observed the two Technical Specialists using Performance Based Supplier Audit (PBSA) worksheets to review the technical adequacy associated with the GNF activities designated in the audit plan. The PBSA worksheet is included in NUPIC Document No. 4, Revision 31, and "NUPIC Joint Audit Procedure" as Form 4.1. NUPIC Document No. 4 also provides the implementing guidance for effective utilization of the PBSA worksheets. The PBSAs generated for this audit addressed the following areas: 1) safety classification of fuel bundle subcomponents, 2) control of design interfaces, 3) foreign material exclusion (FME) controls, 4) subcomponent procurement controls, 5) channel dimensional inspection (CHAD), 6) Final inspection activities, and 7) subcomponent procurement controls.

The NRC staff observed several discussions between the NUPIC team members and GNF technical personnel as they attempted to resolve the open issues left from the previous NUPIC Audit. Specifically, the safety classification of fuel bundle piece parts. The discussions were very detailed and technical in nature, as each part's service function as designed, was discussed. These discussions also included the consequences if the part fails to perform that function and if its failure would prevent an acknowledged safety related part from performing its intended safety function. The discussions were challenging and comprehensive and continued until mutual resolution was achieved. As a result of these discussions, several parts may change classification from non-safety to safety related. GNF initiated PSC 0824 to evaluate this condition and to determine if it is reportable under 10 CFR Part 21.

The second significant finding from the 2007 NUPIC Audit of GNF dealt with the capability of GNF to differentiate between Zircalloy 2 and Zircalloy 4 alloys used in the manufacture of fuel channels. It has been established by GNF and industry experience that the Zircalloy 2 alloy used in some versions of fuel channels exhibited a propensity to bow under certain operating

conditions. Although it has never been concluded that the bowing would be severe enough to prevent bundle travel, GNF has communicated its intentions to eliminate the Zircalloy 2 alloy in lieu of Zircalloy 4. The NUPIC LSA included a specific element to ensure that the GNF procedures were appropriately revised to enforce the change. The NUPIC Audit team observed that the affected procedure had been revised and that sufficient objective evidence had been established to indicate that the material change was being implemented on the shop floor prior to shipment to the customers.

During the NRC observation of the NUPIC audit of GNF, the NRC inspectors observed a GNF Level I tester performing ultrasonic testing (UT) on fuel channels per GNF Quality Inspection Standard (QIS) C20.03, "Channel UT Inspection," Revision 29, dated November 19, 2004. During UT inspection, the UT machine stops when it senses an indication on the channel surface that exceeds the procedural limit of nine squares on the UT screen. QIS C20.03 allows the tester to rescan a suspect area when an alarm condition occurs during scanning. If the alarm condition occurs again, QIS C20.30 directs the tester to mark the indication on the channel in pencil, remove the channel from the testing water, mark with a water based marker, then proceed to scrub the indication with Scotchbrite or sandpaper. Polishing with Scotchbrite or sandpaper is limited by the procedure to once per indication. Contrary to these instructions, the NUPIC auditor and NRC inspector observed the Level I tester using Scotchbrite on the channel surface while it was submerged in the testing bath when an alarm condition occurred, then rescanning the surface. The tester indicated that this practice is used to remove surface contaminants, primarily bubbles, from the channels during testing. However, this practice was not captured in GNF testing policies and procedures nor was it evaluated for impact on UT inspection results. Immediately following the observation, the NRC staff facilitated a meeting with the attending NUPIC auditor and the NUPIC Audit Leader to compare notes and to revisit the procedural requirements of the witnessed activity. As a result of this exchange, NUPIC captured the issue as part of Finding #1 in the NUPIC report for Audit Number SR-08-21. Criterion V, "Instructions, Procedures, and Drawings," of Appendix B to 10 CFR Part 50 was cited as the violated criterion.

The planned review of GNF's commercial grade item dedication process was terminated at the onset of the audit because no Method 1 dedications were being performed during the audit time frame, and therefore a performance based review would not be possible. Currently, GNF does not have a formal program for performing Method 2 dedications and has not performed any such dedications to date. Incorporation of a program including procedural guidance, training, and audit plans was recommended by the NUPIC team as a means to procure certain items, but until such time, audits of this area cannot be performed.

The staff observed all the audit team members, in part or in whole, conducting their portion of the audit. The members of the audit team adequately addressed the specific areas of the checklist. In general, the NUPIC audit team performed a sound, thorough, performance-based review of the audited areas.

The NUPIC Audit team's preliminary findings and recommendations were discussed in detail with GNF management during the exit meeting, as were the NRC staff's discussions of the preliminary findings.

Conclusions

Overall, the NRC staff concluded, based on the review of the audited areas, that the NUPIC audit process was effectively implemented by the audit team and resulted in sound

performance-based findings of the GNF Wilmington facility. The NUPIC Audit did not impose any procurement restrictions or unique order entry requirements on orders with this supplier as a result of this audit.

The NUPIC LSA process witnessed during this NRC observation proved to be effective in assisting the supplier to evaluate and correct nonconforming areas of its program. The collaborative activity solicited input from affected licensees and proved to be expeditious in substantiating the need for an LSA and to bring the appropriate resources to bear on the issues. The NUPIC Audit team leader performed daily briefings with the NUPIC audit team and GNF on each day's issues and potential findings. These daily briefings enhanced the audit team's understanding of issues and audit findings and provided an effective feedback mechanism from experienced audit team members on the significance of individual team findings. The NRC staff noted that the NUPIC audit team leader was effective at communicating audit findings to GNF's management. The auditors supported their findings with comprehensive objective evidence and went into sufficient depth in their respective areas of focus.

The NUPIC LSA Audit Team initiated two findings as a result of the observed LSA. Finding SR-08-21-1 identified, six instances of personnel not working in strict adherence to procedural requirements, and Finding SR-08-21-2 identified that GNF Procedure PRI-03-02, "Safety-Related Classifications" was inadequate for the determining safety classification of services. Additionally, the audit team concluded that PRI-03-02 was non-conservative in that it did not require consideration of the impact of a failed item or service on other safety related systems or components (e.g. consequences of a failure of a non-safety related item on a safety-related item).

The staff identified one potential Notice of Nonconformance (NON) related to GNF's 10 CFR Part 21 program. The NON documents GNF's failure to incorporate the latest definitions of program terms as presented in the most current issuance of 10CFR Part 21 into its implementing procedures. The results of the staff's inspection of GNF's implementation of 10 CFR Part 21 requirements are documented in NRC Inspection Report 99901376/2008-201 (ADAMS Accession # **ML082950692**).

Pending Actions/Planned Next Steps for NRC

Depending on the adequacy of the responses from GNF to the NUPIC findings, the staff may conduct a follow-up inspection. The NRC staff implemented NRC IP 36100, "Inspection of 10CFR Parts 21 and 50.55(e) Programs for Reporting Defects and Noncompliance." The results of the staff's inspection of GNF's implementation of 10 CFR Part 21 requirements are documented in NRC Inspection Report 99901376/2008-201 (ADAMS Accession # **ML082950692**).

Points for Commission Consideration/Items of Interest

None.

List of Meeting Participants

Arroyo, Damaris	Inspector-In-Training	U.S. NRC	Ent, Ext
Baldwin, John	QA Lead Auditor	GNF-A	Ent, Ext
Bastyr, Russ	NQA Leader	GEH	Ent, Ext
Bean, Christine	MR Mgr.	GNF	Ext
Bordeaux, Jim	QA Internal Auditor	GNF-A	Ent, Ext
Bough, Casey	DCP Mgr.	GNF	Ent, Ext
Bradley, Erbes J.	Mgr. Engrg Opns & Quality	GNF	Ent,
Buechler, Richard	NOVA PSEG Nuclear	NUPIC – PSEG	Ent, Ext
Casavant, Ron	Auditor Energy NW	NUPIC – ENW	Ent, Ext
Chanse, Gonde	Lean Mfg. Leader	GNF	Ext
Clark, Kimberly	Quality Leader	GNF/Fuel Cycle	Ent, Ext
Cleavenger, Sabrina	Inspector	U.S. NRC	Ent, Ext
Crawford, Doug	Mgr. Matls Tech & Fuel Reliability	GNF	Ext
Dickman, Greg	Ceramics MSO	GNF	Ent,
Downs, Mike	Customer Project Mgr	GNF	Ent, Ext
Ellis, Kurt	Mgr.. Mfg Technology	GNF	Ent, Ex
Elliott, Mark	Mgr. Engineering Quality	GNF	Ent, Ext
English, David	QA Internal Auditor	GNF-A	Ent, Ext
Fitzpatrick, Mike	FCO MSO-Turbine	GNF	Ent, Ex
Fresella, Frank	Auditor-In-Training, NOVA PSEG Nuclear	NUPIC – PSEG	Ent, Ext
Fuller, Shawn	COO	GNF-A	Ent, Ext
Godfrey, Mark	Sourcing Mgr.	GNF-A	Ent, Ext
Heppner, Andreas	Shipping & Traffic	GNF	Ent, Ex
Kirkland Mat	Principle Engr. RxE, Detroit Edison	NUPIC – DTE	Ent, Ext
Knight, Harry	Fuel Cycle EHS	GNF	Ext
Larson, John	NPPD ATM	NUPIC - NPPD	Ent, Ext
Lindquist, Stephanie	Field Quality Engineer	GNF	Ent,
Lingenfelter, Andy	VP, Fuel Engineering	GNF	Ent, Ext
Nasman, David	Quality Control Engr.	GNF	Ext
Malpass, Horace	New Fuel Receipt Inspector	GNF	Ext
Mui, Milton	Sr. Engineer	NUPIC - Entergy	Ent, Ext
Mulligan, Amber	Commercial Director	GNF	Ent,
O'Connor, Jennifer	Mgr. Quality Assurance Programs	GNF	Ent, Ext
Oar, Tammy	General Manager	GLE	Ent,
Pasquale, Daniel	Lead Inspector	U.S. NRC	Ent, Ext
Perry, Vickie	Customer Project Mgr.	GNF	Ext
Plowdin, Warren	New Fuel Receipt Inspector	GNF	Ent, Ext
Porter, Dale	Safety Evaluation Program Mgr.	GEH	Ent, Ext
Price, Lisa	CEO	GNF	Ent,
Rivera, John	Spvr. Nuclear Fuels Oversight	NUPIC - FPL	Ent, Ext
Robinson, James	Commercial Project Mgr.	GNF	Ent,
Schultz, Brett	Quality Engr.	GNF	Ent,
Scott, Wayne	QA Lead Auditor	GNF	Ext
Short, Michael	FCO MSO/Channels	GNF	Ent, Ext
Sledzik, David	Mgr. Custom Projects – Americas	GNF	Ext
Smith, Shauna	FCO Plant Mgr	GNF-A	Ent, Ext

Vexler, Amir	FMO Mgr.	GNF	Ent, Ext
Warmkessel, Glenn	Supplier Quality Mgr.	GNF-A	Ent, Ext
Watts, Lauren	Commercial Project Mgr.	GNF	Ent,
Wayne, Scott	Lead Auditor	GNF	Ent,
Whittmeier, Rich	Sr. VP Quality	GEH	Ent, Ext
Williams, Kerry	Quality Leader – Operations	GNF	Ent, Ext
Wise, Doug	Fuel Reliability Engr.	NUPIC – Exelon	Ent,