Exelon Nuclear
200 Exelon Way
Kennett Square, PA 19348

www.exeloncorp.com

Exelon Nuclear

January 9, 2012

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Limerick Generating Station, Unit 1
Facility Operating License Nos. NPF-39
NRC Docket No. 50-352

Subject: Limerick Generating Station Introduction of Lead Use Channels

References:
1) Letter from T. A. Ippolito (U.S. Nuclear Regulatory Commission) to R. Engel (General Electric Company), "Lead Test Assembly Licensing," dated September 23, 1981

2) Letter from P. B. Cowan (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "Limerick Generating Station Introduction of Lead Use Channels," dated March 1, 2007

The purpose of this letter is to notify the U.S. Nuclear Regulatory Commission of the use of Lead Test Assemblies (LTAs) as required by the referenced letter (Reference 1) and the General Electric Standard Application for Reactor Fuel (GESTAR). The advanced channel materials used are manufactured with a zirconium-based alloy containing Niobium called NSF, instead of Zircaloy-2 or Zircaloy-4 material. The channel material type is not specifically identified in the GNF (Global Nuclear Fuel) licensing topical report (LTR), GESTAR; however, in LTRs referenced in GESTAR, the channels are described as being manufactured from Zircaloys.

Eight (8) LTAs will be loaded into the Limerick Generating Station, Unit 1, plant at the beginning of Cycle 15 (March 2012). The GNF supplied assemblies contain standard GNF2 components and fuel with the exception of the channel material. The channels were manufactured with a distortion-resistant material known as NSF. The NSF alloy is composed of 1% Niobium, 1% Tin, and 0.35% Iron. The term NSF reflects the presence of Niobium (Nb), Tin (Sn) and Iron (Fe) as the primary alloying metals combined with Zirconium. Similar Niobium alloys are commonly used in Pressurized Water Reactor (PWR) and Russian plants, but currently are not commercially used in BWRs. In addition, NSF channels have been operating in the United States on LTAs since 2002 – two of which are currently completing a 4th cycle of operation in Limerick Generating Station, Unit 1, and two of which were discharged after three cycles of operation in Limerick Generating Station, Unit 1 (Reference 2).

In accordance with GESTAR, the elements of an approved licensing process for LTA programs include the following.

- The analysis of the LTAs using approved methods meets approved criteria,
- The Licensee will provide an information letter to the NRC describing the LTAs, stating the applicability of GESTAR, describing the objectives of the LTA program, and outlining the kinds of measurements that will be made on the LTAs, and
- The results obtained from the LTA program will be summarized in a timely manner in subsequent GNF fuel experience reports.

Analysis of the NSF channels was previously conducted using an approved methodology and the channels were demonstrated to meet the approved criteria for use. The required information letter is provided in the attachment to this letter and contains the required information on the LTAs. As required by GESTAR, GNF will summarize the results obtained from the LTA program in a timely manner in subsequent reports.

There are no regulatory commitments contained in this letter.

Should you have any questions concerning this letter, please contact Mr. Thomas R. Loomis at (610) 765-5510.

Respectively,

Michael D. Jesse
Director, Licensing and Regulatory Affairs
Exelon Generation Company, LLC

Attachment: Information on NSF Fuel Channels as Part of Lead Test Assemblies (LTAs) at Limerick 1

cc: USNRC Region I, Regional Administrator
USNRC Senior Resident Inspector, LGS
USNRC Project Manager, LGS
R. R. Janati, Bureau of Radiation Protection

ATTACHMENT

Information on NSF Fuel Channels as Part of Lead Test Assemblies (LTAs) at Limerick 1

Global Nuclear Fuel
A Joint Venture of GE, Toshiba, & Hitachi

Paul E. Cantonwine
Senior Engineer, Materials Technology and Fuel Reliability

Global Nuclear Fuel – Americas, LLC
P.O. Box 780 (M/C H25)
Wilmington, North Carolina 28401
Phone: 910-819-5560
Fax: 910-362-5560

PEC011-012/eDRF Section 0000-0141-1304 November 9, 2011

SUBJECT: Information on NSF Fuel Channels as Part of Lead Test Assemblies (LTAs) at Limerick 1

REFERENCES:
1. NEDE-24011-P-A-18 & NEDE-24011-P-A-18-US, *General Electric Standard Application for Reactor Fuel & Supplement for United States*, (GESTAR II, Licensing Topical Report).
2. Letter from T.A. Ippolito (NRC) to R.E. Engel (GE), *Lead Test Assembly Licensing*, September 23, 1981

Exelon is required to provide an information letter to the NRC describing the subject LTA program per Section 1.2.1.b. of GESTAR (REF. 1). Specifically, the agreed upon content includes a description of the LTAs, a statement of applicability of GESTAR, a description of the objectives of the LTA program, and an outline of the kinds of measurements that will be made on the LTAs (REF. 2). This letter is intended to communicate the content required in the notification for use in preparing the information letter.

Description of Lead Test Assemblies
Eight LTAs will be loaded into the Limerick 1 plant at the beginning of Cycle 15 (March 2012). The GNF supplied assemblies contain standard GNF2 components and fuel with the exception of the channel. The channels were manufactured with a distortion-resistant material known as NSF. The NSF alloy is composed of 1% Niobium, 1% Tin, and 0.35% Iron. The term NSF reflects the presence of Niobium (Nb), Tin (Sn) and Iron (Fe) as the primary alloying metals combined with Zirconium. Similar Niobium alloys are commonly used in PWR and Russian plants, but currently are not commercially used in BWR's. In addition, NSF channels have been operating in the United States on LTAs since 2002 – two of which are completing a 4th cycle of operation in Limerick 1 and two of which were discharged after three cycles of operation in Limerick 1.

The NSF alloy is resistant to channel bowing and has a much lower sensitivity to cold-work compared to Zircaloy. The mechanical properties of NSF are similar to the standard Zircaloys and are considered adequate for reactor service. Corrosion performance of NSF is adequate based on visual examination after six years of operation.

The channels were delivered with two different surface conditions. Four of the NSF channels had an etched/polished surface condition that is standard on current Zircaloy

channels and similar to four previous NSF channels inserted into Limerick 1 in 2002. The remaining four channels had a pre-oxidized surface condition similar to the pre-oxidized surface condition that was standard on Zircaloy-4 channels prior to 1990.

Applicability of GESTAR Methodology

GNF has reviewed the properties of the NSF channels relative to the properties of Zircaloy-2 and Zircaloy-4 in the context of required functions, including safety, of fuel channels as described in GESTAR and the relevant LTRs. GNF has concluded that the use of NSF as a channel material meets the approved criteria of GESTAR and may be used in an LTA.

Objectives of LTA Program

The objectives of this program are to expand the experience base on NSF channels and to characterize the corrosion performance. Channel distortion will be monitored to confirm the observations already made regarding resistance to channel bow. Standard analyses will be performed to assure that the safety and licensing bases are maintained.

Outline of Measurements

Corrosion performance will be evaluated visually and potentially with a non-destructive system to measure oxide thickness. Distortion measurements will be taken after final discharge and potentially during both the 1st and/or 2nd refueling outages. Depending on the observed performance and the potential for long-term application, coupons (material samples from irradiated channels) may be extracted for hotcell examination. The results of these measurements will be documented according to the GESTAR II Section 1.2.1.C requirements.

Please let me know if you have any questions or concerns.

Paul E. Cantonwine
Senior Engineer
Fuel Performance and Design
Global Nuclear Fuel, America
3901 Castle Hayne Road
Wilmington, NC 28402