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March 1, 2007

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

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

The purpose of this letter is to notify the U. S. Nuclear Regulatory Commission of the use of a Lead Test Assembly (LTA) as required by the referenced letter and the General Electric Standard Application for Reactor Fuel (GESTAR). In 2002, Global Nuclear Fuel (GNF) and Exelon Generation Company, LLC (Exelon) collaborated to introduce advanced channel materials of various types in the Limerick Generating Station (LGS), Unit 1. The advanced channel materials used included a zirconium-based alloy containing Niobium, called NSF, instead of Zircaloy 2. The channel material type is not specifically identified in the GNF licensing topical report (LTR), GESTAR; however, in LTRs referenced in GESTAR the channels are described as being manufactured from Zircaloys. Zircaloys, referring to the industry standard Zircaloy-2 and Zircaloy-4, are zirconium-based alloys that contain a specific composition of materials. Therefore, the use of these channels required the application of the LTA provision of GESTAR and the referenced letter, requiring that Exelon provide an information letter to the NRC describing the LTA program. Due to an oversight on the part of GNF and Exelon, this notification did not occur at the time the lead use channels were introduced at LGS.

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,

Pamela B. Cowan
Director, Licensing and Regulatory Affairs
Exelon Generation Company, LLC

Attachment: Information Submittal for Limerick-1 LTAs

cc: S. J. Collins, Regional Administrator, Region I, USNRC
S. Hansell, USNRC Senior Resident Inspector, LGS
J. Shea, Project Manager [LGS] USNRC

ATTACHMENT

Information Submittal for Limerick-1 LTAs

Global Nuclear Fuel

A Joint Venture of GE, Toshiba, & Hitachi

Global Nuclear Fuel – Americas, LLC
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Ref: MAD-EXN-HH1-07-003

February 11, 2007

TO: Candice Chou
Manager, TSSA
Exelon Nuclear

SUBJECT: INFORMATION SUBMITAL FOR LIMERICK-1 LTAs

REF. 1. Email from M.Downs to C.Chou, *LTA Channel Question*, sent Wednesday, January 03, 2007 1:33 PM

In 2002, GNF and Exelon collaborated to introduce advanced channel materials of various types, including NSF, in Limerick Unit 1 beginning in Cycle 10. As communicated in Reference 1, the use of these channels required the application of the Lead Test Assembly (LTA) provision of GESTAR, requiring that Exelon provide an information letter to the NRC describing the LTA program. Specifically, the agreed 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. It appears that GNF did not adequately communicate the notification requirement to Exelon at the onset of the program and, as a result, the notification was not made at the appropriate time. Upon realizing this in the last few months, GNF established an item in its Corrective Action Program and is actively pursuing corrective and preventative actions. This letter is intended to communicate the content required in the notification for Exelon's use in preparing the information letter.

Description of Lead Test Assemblies

Four LTAs were loaded into Limerick Unit 1 at the beginning of Cycle 10. The GNF-supplied assemblies contained standard GE14 components and fuel with the exception of the channel materials. The four channels were made of a zirconium-based alloy containing Niobium, called NSF, instead of the standard Zircaloy 2. All dimensions were identical to standard GE14 channels.

NSF Alloy

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 not commercially used in BWR's.

Low irradiation growth is the key feature for the consideration of NSF as a channel material because of the reduced likelihood of bowing due to fast-fluence gradient-induced channel bow. In addition, certain channel fabrication processes may potentially leave residual cold work in the finished channel assemblies. Unlike the standard Zircaloys that have a high sensitivity to cold work-enhanced irradiation growth, NSF exhibits a reduced sensitivity to cold work-enhanced irradiation growth, which reduces the likelihood of bowing or other deformations due to this mechanism.

The nominally 1% addition of niobium in NSF occurs at the expense of zirconium, resulting in mechanical properties that are similar to the standard Zircaloys. The mechanical properties of NSF are adequate for reactor service.

One notable feature of Zircaloy-2 has been its superior corrosion resistance when irradiated in a BWR environment. While NSF is expected to demonstrate adequate corrosion resistance for a channel material, it is not expected to be as good as Zircaloy-2.

Applicability of GESTAR

GNF has concluded that the analytical methodology for Zircaloy-2 channels can be applied to NSF channels. GNF has reviewed the properties of the NSF alloy relative to the properties of Zircaloy-2 alloy 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 applied as LTAs.

Objectives of LTA Program

The objective of this program is to characterize the dimensional performance of the NSF channel material, which is expected to be improved over that of reference Zircaloy-2. The program was designed and intended to characterize two of the three deformation mechanisms of significant magnitude – fast-fluence gradient-induced channel bow and channel creep bulge. As such, the channels were moved from central locations to peripheral positions in the latter cycles to characterize the fast-fluence gradient-induced channel bow behavior. This core placement approach is relatively common and will allow for representative bulge behavior to be characterized. Additionally, the corrosion resistance of NSF can be confirmed as adequate. Unfortunately, at the time this program was conceived, the industry was not familiar with control-blade shadow corrosion-induced channel bow such that these assemblies were not controlled in the first cycle of operation. Since the channels were controlled some in the second cycle, GNF hopes to get a sense of the shadow corrosion induced bow performance from inspection results.

Outline of Measurements

Since characterizing the dimensional performance is the primary objective of the program, bow and bulge will be characterized after each cycle. Also, adequate corrosion resistance will be confirmed via visual examinations of selected channels to characterize the nature and integrity of the oxide layer formed. Depending on the observed performance and the potential for long-term application, coupons (material samples from irradiated channels) may be extracted for hotcell examination.

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

Best regards,

Mark A. Dubecky
Manager, Materials Technology and Fuel Reliability

Cc. Exelon R.Ralph, M.Reitmeyer, M.Eyre
GNF: A.Lingenfelter; J.Harrison; M.Downs; G.Latter; D.White; Y.P. Lin