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Proprietary Information – Withhold from Public Disclosure Under 10 CFR 2.390

RS-15-004 10 CFR 50.4

January 20, 2015

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

LaSalle County Station, Unit 2
Facility Operating License No. NPF-18
NRC Docket No. 50-374

Subject: LaSalle County Station Introduction of Lead Use Assemblies

Reference: Letter from T. A. Ippolito (U. S. Nuclear Regulatory Commission) to R. E. Engle (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 Lead Use Assemblies (LUAs) as required by the referenced letter and the General Electric Standard Application for Reactor Fuel (GESTAR II). Exelon Generation Company, LLC, (EGC) plans to load four (4) LUAs as part of the LaSalle County Station (LSCS), Unit 2, Reload 15 Cycle 16 during the LSCS 2015 refueling outage. These bundles, also referred to as GNF3 LUAs, are planned to be in operation as part of a joint program with Global Nuclear Fuel – Americas, LLC (GNF). Consistent with LSCS Technical Specifications Section 4.2, "Reactor Core," the GNF3 LUAs are to be loaded in non-limiting core regions.

Attachment 1 provides a description of the GNF3 LUAs, a discussion of the licensing analyses, a description of the LUA program objectives, and an outline of the kinds of measurements planned for the GNF3 LUAs.

Attachment 1 to this letter contains proprietary information as defined by 10 CFR 2.390, "Public inspections, exemptions, requests for withholding." GNF, as the owner of the proprietary information, has executed the enclosed affidavit, which identifies that the enclosed proprietary information has been handled and classified as proprietary, is customarily held in confidence, and has been withheld from public disclosure. The proprietary information was provided to EGC in a GNF transmittal that is referenced by the affidavit. The proprietary information has been faithfully reproduced in the attached information such that the affidavit remains applicable. GNF hereby requests that the attached proprietary information be withheld from public disclosure in accordance with the provisions of 10 CFR 2.390 and 10 CFR 9.17.

Attachment 1 contains Proprietary Information. Withhold from public disclosure under 10 CFR 2.390. When separated from Attachment 1, this document is decontrolled.

Proprietary Information – Withhold from Public Disclosure Under 10 CFR 2.390

A non-proprietary version of the information contained in Attachment 1 is provided in Attachment 2. The affidavit supporting the proprietary nature of the information in Attachment 1 is also provided in Attachment 1.

There are no regulatory commitments contained in this submittal.

Should you have any questions concerning this letter, please contact Ms. Lisa A. Simpson at (630) 657-2815.

Respectfully,

David M. Gullott
Manager – Licensing
Exelon Generation Company, LLC

Attachments:

1) Affidavit Supporting Proprietary Nature of GNF Report NEDC-33862P; GNF Report NEDC-33862P, "GNF3 Lead Use Assembly for LaSalle County Station, Unit 2," Revision 0, September 2014 (GNF Proprietary Information)

2) GNF Report NEDO-33862, "GNF3 Lead Use Assembly for LaSalle County Station, Unit 2," Revision 0, September 2014 (GNF Non-Proprietary Information)

cc: NRC Regional Administrator, Region III
NRC Senior Resident Inspector, LaSalle County Station
Illinois Emergency Management Agency – Division of Nuclear Safety

ATTACHMENT 2

GNF Report NEDO-33862
"GNF3 Lead Use Assembly for LaSalle County Station, Unit 2"
Revision 0
September 2014

GNF NON-PROPRIETARY INFORMATION

25 pages follow

Global Nuclear Fuel

A Joint Venture of GE,Toshiba, & Hitachi

Global Nuclear Fuel

NEDO-33862
Revision 0
September 2014

Non-Proprietary Information - Class I (Public)

GNF3 LEAD USE ASSEMBLY FOR LASALLE COUNTY STATION, UNIT 2

INFORMATION NOTICE

This is a non-proprietary version of the document NEDC-33862P Revision 0, which has the proprietary information removed. Portions of the document that have been removed are indicated by an open and closed bracket as shown here [[ ]].

IMPORTANT NOTICE REGARDING CONTENTS OF THIS REPORT

Please Read Carefully

The design, engineering, and other information contained in this document is furnished for the purpose contained in the contract between Exelon and GNF, and nothing contained in this document shall be construed as changing the contract. The use of this information by anyone for any purpose other than that for which it is intended is not authorized; and with respect to any unauthorized use, GNF makes no representation or warranty, and assumes no liability as to the completeness, accuracy, or usefulness of the information contained in this document.

REVISION HISTORY

Revision	Date	Description of Change
0	09/2014	Initial Issue

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ACRONYMS

Term	Definition
AOO	Anticipated Operational Occurrence
[[ ]]	[[ ]]
[[ ]]	[[ ]]
BPWS	Banked Position Withdrawal Sequence
COLR	Core Operating Limits Report
CPR	Critical Power Ratio
CRDA	Control Rod Drop Accident
ECCS	Emergency Core Cooling System
FLR	Full-Length Rod
GE	General Electric
GNF	Global Nuclear Fuel – Americas, LLC
LCS2	LaSalle County Station, Unit 2
LHGR	Linear Heat Generation Rate
LOCA	Loss-of-Coolant Accident
LPLR	Long Part-Length Rod
LTP	Lower Tie Plate
LUA	Lead Use Assembly
MAPLHGR	Maximum Average Linear Heat Generation Rate
MCPR	Minimum Critical Power Ratio
NRC	Nuclear Regulatory Commission
NSF	Zirconium-Tin-Niobium-Iron Alloy
OLMCPR	Operating Limit MCPR
PCI	Pellet/Cladding Interaction
PCT	Peak Cladding Temperature
PLR	Part-Length Rod
RWE	Rod Withdrawal Error
SPLR	Short Part-Length Rod
SRLR	Supplemental Reload Licensing Report
UTP	Upper Tie Plate

ABSTRACT

Exelon Generation Company, LLC plans to load four (4) Lead Use Assemblies (LUAs) as part of the LaSalle County Station, Unit 2 (LCS2) Reload 15 Cycle 16 during the 2015 refueling outage. These bundles, also referred to as GNF3 LUAs, are planned to be in operation as part of a joint program with Global Nuclear Fuel – Americas, LLC (GNF).

This report contains information that is to be provided to the Nuclear Regulatory Commission (NRC). Included in this report are a description of the GNF3 LUAs, a discussion of the licensing analyses, a description of the LUA program objectives, and an outline of the kinds of measurements planned for the GNF3 LUAs.

1.0 INTRODUCTION

Exelon Generation Company, LLC plans to load four (4) Lead Use Assemblies (LUAs) as part of the LaSalle County Station, Unit 2 (LCS2) Reload 15 Cycle 16 during the 2015 refueling outage. These bundles, also referred to as GNF3 LUAs, are planned to be in operation as part of a joint program with Global Nuclear Fuel – Americas, LLC (GNF).

This report contains information that is to be provided to the Nuclear Regulatory Commission (NRC) to comply with Reference 1 that provides guidelines to be followed to license LUAs. Included in this report are a description of the GNF3 LUAs, a discussion of the licensing analyses, a description of the LUA program objectives, and an outline of the kinds of measurements planned for the GNF3 LUAs.

The GNF3 fuel design is described in Section 2. GNF3 is designed to be compatible with other General Electric (GE)/GNF fuel designs. The thermal hydraulic design closely matches the overall pressure drop of previous designs. The external envelope of the fuel assembly is compatible to the GNF2[1] fuel assembly currently supplied to LCS2. The nuclear characteristics of these GNF3 LUAs are compatible with those of the current GNF2 fuel being loaded into LCS2.

Section 3 describes the licensing analyses that will be performed. Section 4 states the objectives of the LUA program. Section 5 describes the kinds of measurements planned as part of the LUA surveillance.

[1] Description and licensing compliance for GNF2 is provided by Reference 2.

2.0 GNF3 FUEL PRODUCT DESCRIPTION

A GNF3 fuel bundle schematic is shown in Figure 2-1. The GNF3 design consists of [[ ]] fuel rods and [[

]] fuel rods terminate just past the [[ ]] and are designated as Short Part-Length Rods (SPLRs). Additionally, [[ ]] fuel rods terminate just past the [[ ]] and are designated as Long Part-Length Rods (LPLRs). Eight peripheral fuel rods are used as tie rods. The GNF3 lattice arrangement is shown in Figure 2-2. The rods are spaced and supported by the upper and lower tie plates and [[ ]] spacers over the length of the fuel rods. The GNF3 channel has a [[

]] The GNF3 channel interacts with the Lower Tie Plate (LTP) [[ ]] to control leakage flow.

The fuel rods consist of high-density ceramic uranium dioxide or urania-gadolinia fuel pellets stacked within [[ ]] cladding. The cladding [[ ]] providing Pellet/Cladding Interaction (PCI) resistance. The fuel rod is evacuated and backfilled with helium to [[ ]] atm. Fuel rod dimensions are given in Table 2-1.

2.1 New Design Features

GNF3 was designed for mechanical, nuclear, and thermal-hydraulic compatibility with previous GE/GNF fuel designs. The design includes many proven features of the GE10, GE11/13, GE12/14, and GNF2 fuel designs including PCI resistant barrier cladding, Part-Length Rods (PLRs), and a thick-corner/thin-wall channel. New or improved features included in GNF3 are

- [[

]]

A discussion of each of these new design features is provided in the following sections.

2.2 Water Rod

The [[ ]] provides neutron moderation in the top region of the bundle where in-channel void fractions are higher while [[

]] as shown in Figure 2-1 and Figure 2-2. [[

]] has also been improved in the bundle [[
]] provides for a [[

]]

The GNF3 [[ ]] to the Upper Tie Plate (UTP). [[

]] The [[ ]] is connected to the LTP [[
]] as shown in Figure 2-3. [[
]]

2.3 Channel

[[

]] The GNF3 [[ ]] has a [[

]] as shown in Figure 2-4.

[[

]] thus providing similar structural and in-reactor behavioral characteristics as prior channel designs. Thus, the GNF3 [[ ]] can be considered a [[

]]. The [[ ]] provides for a more effective and efficient [[

]]. The interface between the [[ ]] and the LTP will [[ ]] channel-LTP interface. Thus, [[ ]], the leakage flow holes in the LTP are designed to provide similar overall bypass flow as GE14 and GNF2.

The material of the GNF3 [[ ]] is a zirconium alloy containing niobium (1%), tin (1%), and iron (0.35%) (NSF). The NSF alloy provides for enhanced resistance to channel-control blade interference. NSF is effectively resistant to fluence gradient and shadow corrosion-induced channel bow while maintaining equivalent creep bulge characteristics as Zircaloy.

2.4 Fuel Assembly Spacer

The GNF3 spacer is a similar design as the GNF2 spacer. The GNF3 spacer is a [[ ]], and the spacer structural material is Alloy X-750. The spacer structure is improved for [[ ]] The spacer grid has [[ ]] The spacer design also includes [[ ]]

The GNF3 fuel design includes [[ ]] The GNF3 spacer is shown in Figure 2-5.

2.5 Fuel Rods

The GNF3 FLRs and LPLRs are [[ ]]

2.6 Upper Tie Plate

The GNF3 UTP has been [[ ]] This was accomplished by [[ ]] as shown in Figure 2-6.

Table 2-1 GNF3 and GNF2 Nominal Dimensions

Fuel Assembly	GNF2	GNF3
Lattice array	10x10	No change
Total number of fuel rods	92	[[
Number of FLRs	78	
Number of SPLRs / LPLRs	6 / 8	
Number of water rods	2	
Rod-to-rod pitch (cm)	[[	
Typical assembly fuel mass (kgU)		
Active fuel length (cm) FLR SPLRs / LPLRs		
Rod length (cm) FLR SPLRs / LPLRs		
Fuel Rod		
Cladding material		
Cladding tube diameter, outer (cm)		
Cladding tube wall thickness (cm)		
Pellet diameter, outer (cm)		
Pellet stack density (g/cm^3)		
Pellet density with burnable absorber (g/cm^3)		
Helium backfill pressure (atm)		
Water Rod		
Tube material		
Tube diameter, outer (cm), [[ ]]		
Tube wall thickness (cm), [[ ]]	]]	]]
Spacer		
Material	Alloy X-750	No change
Number of spacers, [[ ]]	8	[[ ]]
Axial locations	Figure 2-7	Figure 2-7
Channel		
Material	Zr-2 / Zr-4 / NSF	NSF
Inside width (cm)	[[	[[
Inside corner radius (cm)		
Thickness (cm) [[ ]]	]]	]]

[2] [[
]]

[[

]]

Figure 2-1 GNF3 Fuel Bundle Assembly

[[

]]

Figure 2-2 GNF3 Lattice Arrangements

[[

]]

Figure 2-3 GNF3 Water Rod End Plug Connection

[[

]]

Figure 2-4 GNF3 Channel

[[

]]

Figure 2-5 GNF3 Spacers

[[

]]

Figure 2-6 GNF3 and GNF2 Upper Tie Plates

[[

]]

Figure 2-7 GNF3 and GNF2 Axial Spacer Pitch[3]

[3] Elevations correspond to the top of the lower tab attached to the water rod.

3.0 LICENSING ANALYSES

The GNF3 LUAs have been, or will be, analyzed using the NRC approved methods described in Reference 3. These methods are adequately capable of analyzing all of the GNF3 LUA features. Prior to loading of the GNF3 LUAs, cycle-specific analyses will have been performed for LCS2 Reload 15 Cycle 16 to establish fuel operating limits, documented in the Supplemental Reload Licensing Report (SRLR), for the GNF3 LUAs and to ensure that the core loading has been designed such that the GNF3 LUAs will not be the most limiting fuel assemblies at any time during Cycle 16 with respect to compliance with Linear Heat Generation Rate (LHGR), Maximum Average Linear Heat Generation Rate (MAPLHGR), and Minimum Critical Power Ratio (MCPR) limits based on planned control rod patterns. Furthermore, licensing analyses will be performed for the GNF3 LUAs for each cycle of their operation, wherein the effect of the GNF3 LUAs is considered for each of the appropriate licensing events and Anticipated Operational Occurrences (AOOs) to establish appropriate reactor core thermal limits for operation.

Exelon intends to insert the GNF3 LUAs into LCS2 and to operate Cycle 16 under the provisions of 10 CFR 50.59; however, cycle-specific analyses to establish fuel operating limits are not yet complete. When cycle specific analyses are complete, GNF will document the results in the SRLR and Exelon will update the LCS2 Core Operating Limits Report (COLR) accordingly.

The application of approved methods to analyze events and accidents whose results could be affected by the GNF3 LUA's design is discussed below. Because the analysis of the GNF3 LUAs using the approved methods meets, or will meet, the approved criteria, it is not anticipated that NRC approval is required prior to insertion.

3.1 Core Wide AOOs

Current approved methods described in Reference 3 are considered appropriate to determine the effect of core wide AOOs on the GNF3 LUAs. The GNF3 fuel rod(s) will be analyzed with PRIME to establish steady-state, and transient overpower, LHGR limits that ensure compliance with thermal mechanical licensing requirements as specified in Reference 3. Appropriate MCPR limits for the GNF3 LUAs will be established to ensure compliance with regulatory requirements governing boiling transition. As noted in Section 2.4, [[

]] As such, [[ ]]
MCPR operating limits as well as core monitoring.

3.2 Localized AOOs

Approved methods are considered adequate to evaluate core response to a Rod Withdrawal Error (RWE) because the nuclear inputs are available to represent the GNF3 LUAs. MCPR results will be [[ ]] provided in the SRLR.

An evaluation was performed to estimate the effect on the Critical Power Ratio (CPR) of the Fuel Loading Error (Misoriented Fuel Bundle). Preliminary results demonstrate that the change in CPR

for this event is bounded by that used to establish the Operating Limit MCPR (OLMCPR) for the GNF3 LUAs with significant margin, and therefore a Misoriented Fuel Bundle Error will not result in violation of the OLMCPR. This will be confirmed prior to Cycle 16 startup.

3.3 Control Rod Drop Accident

Compliance with licensing limits governing Control Rod Drop Accident (CRDA) is assured through adherence to the Banked Position Withdrawal Sequence (BPWS) as the associated analyses have generically demonstrated large margin to licensing limits governing acceptable enthalpy insertions. Due to the similarities in nuclear characteristics between the GNF3 LUAs and approved GE/GNF fuel designs, the Reference 3 methodology is applicable to the GNF3 LUAs. Operation with the GNF3 LUAs will not result in exceeding CRDA acceptance criteria.

3.4 Loss-of-Coolant Accident and Emergency Core Cooling System

The GNF3 LUAs are to be loaded in non-limiting locations with respect to Emergency Core Cooling System (ECCS)/Loss-of-Coolant Accident (LOCA) MAPLHGR limits. An evaluation will be performed to ensure that the GNF3 LUAs will meet the Peak Cladding Temperature (PCT) requirements in the event of a Design Basis Accident.

3.5 Refueling Accident

The effect of the GNF3 LUAs on the assumptions and consequences of a refueling accident will be evaluated.

3.6 Stability

The GNF3 LUAs will be evaluated in the LCS2 Cycle 16 stability analysis as part of the standard reload licensing. Licensing requirements governing stability will be assured and the results reported in the SRLR. The LCS2 Cycle 16 reload core will be designed such that the GNF3 LUAs will not be the most limiting bundles from a stability standpoint.

3.7 Shutdown Margin

The GNF3 LUAs have been designed with approved methods to provide minimum cold shutdown margin greater than or equal to the design criteria identified in Reference 3.

3.8 RAJ-II Shipping Container

Criticality safety analyses have been performed that confirm the adequacy of the RAJ-II shipping container to support the transportation of the GNF3 LUA fuel bundles. Application for a special package authorization to ship the GNF3 LUAs using the RAJ-II shipping container has been made to the regulatory authorities (Reference 4).

4.0 LUA PROGRAM OBJECTIVES

The purpose of the GNF3 LUA program is to obtain surveillance data to verify that fuel bundles with the design features described in Section 2 perform satisfactorily in service, prior to use of those features on a production basis.

5.0 LUA INSPECTIONS

As currently envisioned, measurements on the GNF3 LUAs will consist of pre-irradiation characterization of fuel pellets, clad tubing, fuel rods, components, and assembled fuel bundles. At subsequent refueling outages, the scope of inspections consists of some, or all, of the following:

- Fuel bundle, component, and channel visual examination
- Channel bow and bulge measurements
- Fuel rod and bundle length measurements
- Fuel rod liftoff and profilometry measurements

The extent of such inspections will be governed by the need to have no expected effect of these activities on the refueling outage critical path, the amount of inspections being performed on similar features at other reactor sites, and by the degree of technical interest in implementing the design changes demonstrated in the GNF3 LUAs.

Results obtained from this LUA program will be summarized in a timely manner in GNF's Technology Updates with NRC, as part of the Fuel Reliability and Experience update.

6.0 REFERENCES

1. Letter, T. A. Ippolito (NRC) to R. E. Engel (GE), "Lead Test Assembly Licensing," September 23, 1981.
2. Global Nuclear Fuel, "GNF2 Advantage Generic Compliance with NEDE-24011-P-A (GESTAR II)," NEDC-33270P, Revision 5, May 2013.
3. Global Nuclear Fuel, "General Electric Standard Application for Reactor Fuel (GESTAR II)," NEDE-24011-P-A-20, December 2013.
4. Letter, S. P. Murray (GNF) to Director, Division of Spent Fuel Storage and Transportation (NRC), "GNF-A Request for Letter Authorization to Use the RAJ-II Package," SPM 14-030, July 30, 2014.