

10 CFR 50.90

RS-09-014
April 8, 2009

U.S. Nuclear Regulatory Commission
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Washington, DC 20555-0001

Clinton Power Station, Unit 1
Facility Operating License No. NPF-62
NRC Docket No. 50-461

Subject: License Amendment Request to Modify Clinton Power Station Facility
Operating License in Support of Bulk Isotope Generation Project

In accordance with 10 CFR 50.90, "Application for amendment of license, construction permit, or early site permit," Exelon Generation Company, LLC (EGC) requests an amendment to Facility Operating License No. NPF-62 for Clinton Power Station (CPS), Unit 1. Specifically, the proposed change modifies CPS License Conditions 1.I and 2.B.(6) and creates new License Conditions 1.J and 2.B.(7) as part of a pilot program to irradiate Cobalt (Co)-59 targets to produce Co-60. The Co-60 would ultimately be sold to the medical industry for use in cancer treatments and to the food industry for irradiation sterilization. The use of fuel bundles containing the Co-59 targets will be done under a Lead Test Assembly (LTA) program. In addition to the proposed license condition changes, EGC also requests an amendment to Appendix A, Technical Specifications (TS), of the CPS Facility Operating License. This proposed change would modify TS 4.2.1, "Fuel Assemblies," to describe the LTAs being used.

EGC is collaborating with Global Nuclear Fuel – Americas, LLC (GNF) and GE – Hitachi Nuclear Energy Americas, LLC (GEH) to develop and implement a program to evaluate the potential for producing Co-60 in the CPS reactor during power operation. EGC plans to load 8 to 12 LTAs as part of the CPS Reload 12 Cycle 13 core reload, during the January 2010 refueling outage. This proposed technology would allow Co-60 to be generated in bulk quantities in the CPS commercial nuclear reactor. This agreement between EGC and GEH will allow for a sustainable domestic source of cobalt radioisotopes for use in the medical and food processing industries.

Attachment 1 to this letter provides an evaluation supporting the proposed changes. The marked-up Operating License and TS pages, with the proposed changes indicated, are provided in Attachment 2 to this letter.

Attachment 3 to this letter provides GEH Report NEDC-33476P, "GE14i Lead Test Assembly (LTA) for Clinton Power Station," dated January 2009, which GEH considers to contain proprietary information. The proprietary information is identified by bracketed text. GEH requests that the proprietary information in Attachment 3 be withheld from public

disclosure, in accordance with the requirements of 10 CFR 2.390, "Public inspections, exemptions, requests for withholding," paragraph (a)(4). A signed affidavit supporting this request is provided in Attachment 3 to this letter. Attachment 4 to this letter provides a non-proprietary version of the GEH Report (i.e., NEDC-33476).

Attachment 5 summarizes the formal regulatory commitments pending NRC approval of the proposed amendment.

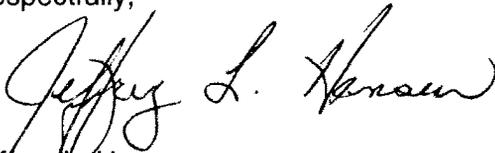
The proposed change has been reviewed by the CPS Plant Operations Review Committee and approved by the Nuclear Safety Review Board in accordance with the requirements of the EGC Quality Assurance Program. EGC requests approval of the proposed change by January 11, 2010, with the amendment being implemented within 30 days of issuance.

In accordance with 10 CFR 50.91, "Notice for public comment; State consultation," EGC is notifying the State of Illinois of this application for a change to the TS by sending a copy of this letter and its attachments to the designated State Official.

Should you have any questions concerning this letter, please contact Mr. Timothy A. Byam at (630) 657-2804.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 8th day of April 2009.

Respectfully,



Jeffrey L. Hansen
Manager - Licensing
Exelon Generation Company, LLC

Attachments:

- Attachment 1: Evaluation of Proposed Changes
- Attachment 2: Mark-up of Proposed Operating License and Technical Specification Pages
- Attachment 3: GE14i Lead Test Assembly (LTA) for Clinton Power Station (Proprietary)
- Attachment 4: GE14i Lead Test Assembly (LTA) for Clinton Power Station (Non-Proprietary)
- Attachment 5: Summary of Regulatory Commitments

ATTACHMENT 1
Evaluation of Proposed Changes

Subject: License Amendment Request to Modify Clinton Power Station Facility
Operating License in Support of Bulk Isotope Generation Project

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1.0 SUMMARY DESCRIPTION

In accordance with 10 CFR 50.90, "Application for amendment of license, construction permit, or early site permit," Exelon Generation Company, LLC (EGC) requests an amendment to the Facility Operating License No. NPF-62 for Clinton Power Station (CPS), Unit 1. Specifically, the proposed change modifies CPS License Conditions 1.I and 2.B.(6) and creates new License Conditions 1.J and 2.B.(7) as part of a pilot program to irradiate Cobalt (Co)-59 targets to produce Co-60. The Co-60 targets would ultimately be sold to the medical industry for use in cancer treatments and to the food industry for irradiation sterilization. The use of fuel bundles containing the Co-59 targets will be done under a Lead Test Assembly (LTA) program. In addition to the proposed license condition changes, EGC also requests an amendment to Appendix A, Technical Specifications (TS), of the CPS Facility Operating License. This proposed change would modify TS 4.2.1, "Fuel Assemblies," to describe the LTAs being used.

2.0 DETAILED DESCRIPTION

Condition 1.I of the current Operating License for CPS is revised to state, "The receipt, possession, and use of source and special nuclear material as authorized by this license will be in accordance with the Commission's regulations in 10 CFR Parts 40 and 70." This license condition is revised to delete reference to byproduct material that will be addressed in a new license condition 1.J.

EGC proposes to add a new License Condition 1.J which states, "The receipt, production, possession, transfer, and use of byproduct material as authorized by this license will be in accordance with the Commission's regulations in 10 CFR Part 30." This new license condition allows for the production and transfer of byproduct material in accordance with 10 CFR Part 30.

Condition 2.B.(6) of the current Operating License for CPS is revised to state, "Exelon Generation Company, pursuant to the Act and 10 CFR Parts 30, 40, and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility. Mechanical disassembly of items or components containing byproduct material is not considered separation." This change is intended to provide clarification of the term "separation" relative to the removal of enclosed rods containing byproduct material from the CPS reactor core.

EGC proposes to add a new License Condition 2.B.(7) which states, "Exelon Generation Company, pursuant to the Act and 10 CFR Part 30, to intentionally produce, possess, receive, transfer, and use byproduct material." This new License Condition supports the pilot bulk isotope generation project at CPS by allowing intentional production of byproduct material during operation of the CPS facility.

EGC also proposes to add the following sentence to the end of TS 4.2.1.

"A limited number of lead test assemblies may be placed in non-limiting core regions, beginning with Reload 12 Cycle 13 core reload, with the purpose of obtaining

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surveillance data to verify that the GE14i fuel bundles perform satisfactorily in service prior to use of these design features on a production basis."

A copy of the affected CPS Operating License and TS pages marked-up to show the proposed changes identified above is provided in Attachment 2.

3.0 TECHNICAL EVALUATION

The radionuclide Co-60 is the most commonly used source of gamma radiation for radiation technology, both for medical and industrial purposes. There is a growing demand for Co-60 as applications for this material are expanding at a rapid rate, as is the demand within existing applications. Co-60 is currently used in applications such as neurosurgical devices, food irradiation, and gamma sterilization of medical devices.

In medicine, Co-60 has been used to effectively treat hundreds of thousands of patients over the last 30 years. It is widely used in applications for treating benign and malignant brain tumors, vascular malformations, and pain or other functional problems. It also plays a significant role in the food pasteurization industry. Food irradiation is the process of imparting ionizing energy to food to kill microorganisms. A third significant use of the Co-60 radionuclide is in the medical sterilization industry. More than 40% of U. S. made medical devices (i.e., syringes, bandages, etc.) are sterilized using medical isotopes.

Production of radioactive cobalt starts with natural cobalt, which is an element composed of 100% Co-59, a stable isotope. Pellets made of 99.4% pure cobalt are placed in a nuclear reactor, where they stay for varying amounts of time that depend upon neutron flux and the desired specific activity. While in the reactor, a Co-59 atom absorbs a neutron and is converted into a Co-60 atom. The resulting Co-60 is then sent offsite for further processing.

EGC plans to load 8 to 12 lead test assemblies (LTAs) as part of CPS Reload 12 Cycle 13 core reload during the January 2010 refueling outage. These bundles, also referred to as GE14i LTAs, are planned to be in operation as part of a joint program with Global Nuclear Fuel – Americas, LLC (GNF) and GE - Hitachi Nuclear Energy Americas, LLC (GEH). The purpose of this LTA program is to obtain surveillance data to verify that fuel bundles with the design features of the GE14i fuel bundle perform satisfactorily in service, prior to use of those features on a production basis. CPS TS 4.2.1 states that a limited number of lead test assemblies that have not completed representative testing may be placed in non-limiting core locations. EGC intends to implement this LTA program in accordance with this TS requirement.

GEH proprietary report NEDC-33476P is provided in Attachment 3. This report contains the information required to license the use of these LTAs. Included in this report are a description of the GE14i LTAs, a discussion of the applicability of approved methods to the licensing analyses, a description of the objectives of the LTA program, and an outline of the kinds of measurements planned for the LTAs. A non-proprietary version of this report is provided in Attachment 4.

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Prior to loading the LTAs, cycle-specific analyses will be performed to establish fuel operating limits for the LTAs. This will ensure that the core loading has been designed such that the LTAs will not be the most limiting fuel assemblies at any time during the operating cycles, based on planned control rod patterns. Documentation of the results of the cycle-specific licensing analyses will be provided in the Supplemental Reload Licensing Report. EGC commits to verify that all required licensing analyses as defined in the CPS Updated Safety Analysis Report (USAR) and NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel," latest approved revision, are completed prior to loading the LTAs in the CPS core as stated in Attachment 5.

Once the LTAs are introduced to the CPS reactor core they will remain in the core for a predetermined number of cycles. At subsequent refueling outages, a number of inspections will take place. These inspections are identified in Attachment 3. In addition to the LTA measurements, Co-60 target rods will be periodically harvested intact from the LTAs using the fuel prep machine located in the CPS spent fuel pool. The intact Co-60 target rods will then be shipped in an approved shipping cask to the GEH Vallecitos facility in California for examination, removal and sale of the Co-60. No removal of Co-60 from the target rods will take place at CPS. Removal of the Co-60 sources from the target rods will only take place at the GEH facilities under the GEH license.

CPS TS 4.2.1 provides a description of the fuel assemblies used at CPS. While the TS states that each "assembly shall consist of a matrix of Zircaloy or ZIRLO clad fuel rods with an initial composition of natural or slightly enriched uranium dioxide (UO_2) as fuel material, and water rod(s)," the TS also allows use of a limited number of LTAs in non-limiting core regions. As noted above, the LTA program described in this amendment request complies with the LTA requirements specified in TS 4.2.1. EGC is proposing a change to TS 4.2.1, however, to provide additional detail that is intended to address how the LTAs containing the Co-59 targets differ from the fuel assemblies described in this TS. This proposed change is editorial and does not impact the description of the existing fuel assemblies or any assemblies other than the proposed LTAs. As noted above, TS 4.2.1 allows CPS to use LTAs in non-limiting core regions, however, additional description of the LTAs was provided in this case since the assemblies contain material other than uranium dioxide.

Activities requiring a byproduct material license are covered under the requirements specified in 10 CFR Part 30, "Rules of General Applicability to Domestic Licensing of Byproduct Material," section 30.3, "Activities requiring license." This section states that except as provided for in 10 CFR 30.3, "...no person shall manufacture, produce, transfer, receive, acquire, own, possess, or use byproduct material except as authorized in a specific or general license issued in accordance with the regulations in this chapter." EGC has reviewed the requirements for a specific byproduct material license as defined in 10 CFR Parts 32, 33, 34, 35, 36, 39, and 40 to determine which of these requirements are applicable to the generation of Co-60 in the operating CPS reactor. It has been determined that none of these requirements are applicable to this situation. In addition, it has been determined that a general byproduct license, as defined in 10 CFR Part 31, is not required since Co-60 is the only byproduct material produced as part of this LTA program and it will be transferred to GEH for handling. Therefore, it has been determined that a Part 30 byproduct material license will not be required to proceed with the LTA program described above.

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EGC is proposing to revise several operating license conditions to provide clarification as to how the proposed LTA program meets the requirements of 10 CFR Parts 30 and 50. This clarification is provided by acknowledging that CPS will be producing and transferring byproduct material (i.e., Co-60) in accordance with Parts 30 and 40. In addition, the license condition indicating that EGC is licensed to possess but not separate byproduct material will be revised to clarify that the removal of the intact Co-60 target rods by disassembly of the fuel bundle does not constitute separation of the byproduct material as defined in 10 CFR Part 30. Finally, EGC is also proposing to add a new license condition that will acknowledge the intentional production of byproduct material in accordance with Part 30.

In summary, EGC plans to implement an LTA program at CPS that will result in the generation of byproduct material in the core during power operation. This program will not affect the operation of the plant as demonstrated in the licensing report provided in Attachment 3. EGC has determined that the proposed LTA program continues to comply with the requirements of 10 CFR Parts 30 and 40. EGC is proposing to revise the applicable license conditions, however, to provide clarification as to how CPS continues to meet the requirements for possessing and handling byproduct material.

4.0 REGULATORY ANALYSIS

4.1 Applicable Regulatory Requirements/Criteria

The proposed changes have been evaluated to determine whether applicable regulations and requirements continue to be met. As described above, EGC has verified that CPS will continue to meet the requirements of 10 CFR 30 and 10 CFR 40 while implementing the LTA program.

10 CFR 50.36, "Technical specifications," requires that the facility's TS will include a section addressing design features. In accordance with 10 CFR 50.36(d)(4), the design features to be included in this section are "those features of the facility such as materials of construction and geometric arrangements, which, if altered or modified, would have a significant effect on safety" and are not addressed in other sections of the TS. While the proposed change adds clarification as to the LTA materials of construction, the proposed change has no significant effect on safety. As a result, this change is only editorial. Based on the above, the only required change to TS is the proposed clarification to TS 4.2.1 as a result of the intentional production of Co-60 and implementation of the LTA program. CPS will continue to meet the requirements of 10 CFR 50, "Domestic Licensing of Production and Utilization Facilities."

EGC has determined that the proposed changes do not require any exemptions or relief from regulatory requirements, other than the facility operating license and technical specifications, and do not affect conformance with any General Design Criteria (GDC) differently than described in the USAR.

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4.2 Precedent

EGC has identified two instances where a commercial power reactor facility was specifically authorized by the NRC to be operated to produce byproduct material. The Tennessee Valley Authority's (TVA) Watts Barr Nuclear Plant, Unit 1 and Sequoyah Nuclear Plant, Units 1 and 2 were authorized to produce tritium as documented in References 1 and 2, respectively. There was no need for an operating license change identified.

The NRC has also evaluated the use of LTAs in the past. In Reference 3, the NRC provided guidelines on the information required to evaluate the acceptability of a LTA program. The information provided in the Attachment 3 report complies with the guidelines provided in Reference 3.

4.3 No Significant Hazards Consideration

In accordance with 10 CFR 50.90, "Application for amendment of license, construction permit, or early site permit," Exelon Generation Company, LLC (EGC) requests an amendment to Facility Operating License No. NPF-62 for Clinton Power Station (CPS), Unit 1. Specifically, the proposed change modifies CPS License Conditions 1.I and 2.B.(6) and creates new License Conditions 1.J and 2.B.(7) as part of a pilot program to irradiate Cobalt (Co)-59 targets to produce Co-60. The Co-60 targets would ultimately be sold to the medical industry for use in cancer treatments and to the food industry for irradiation sterilization. The use of fuel bundles containing the Co-59 targets will be done under a Lead Test Assembly (LTA) program. In addition to the proposed license condition changes, EGC also requests an amendment to Appendix A, Technical Specifications (TS), of the CPS Facility Operating License. This proposed change would modify TS 4.2.1, "Fuel Assemblies," to describe the LTAs being used.

EGC has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

1. Does the proposed amendment involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No.

The proposed changes to the license conditions simply provide clarification and do not impact plant operation in any way. The proposed change to TS 4.2.1 also provides clarification and additional description of the proposed LTAs to be used in the CPS core. These changes are editorial and therefore, these changes do not involve an increase in the probability or consequences of an accident previously evaluated.

Because the use of the described LTAs, referred to as GE14i LTAs, meets the criteria for an acceptable LTA program, the use of these LTAs does not adversely affect accident initiators or precursors nor alter the design assumptions, conditions, and configuration or the manner in which the plant is operated and maintained. The

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LTAAs do not adversely affect the ability of any structures, systems or components (SSCs) to perform their intended safety function to mitigate the consequences of an initiating event within the assumed acceptance limits.

The consequences of a previously analyzed event are dependent on the initial conditions assumed in the analysis, the availability and successful functioning of equipment assumed to operate in response to the analyzed event, and the setpoints at which these actions are initiated. The consequences of a previously evaluated accident are not significantly increased by the proposed change. The proposed change does not affect the performance of any equipment credited to mitigate the radiological consequences of an accident.

Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed amendment create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No.

The proposed revision to the CPS license conditions and TS 4.2.1 will not introduce any new or modified equipment since these changes are intended to provide clarification only. These clarifications will not result in operation of the facility in a different way than currently operated.

While the proposed LTA program does result in the use of several modified fuel bundles, the LTAs are installed and used in accordance with the requirements of an approved LTA program and CPS TS 4.2.1. Use of the proposed LTAs does not involve the addition or modification of any plant equipment other than the bundles modified to include the Cobalt target rods. Also, use of the proposed LTAs will not alter the design configuration, or method of operation of plant equipment beyond its normal functional capabilities. The LTA program does not create any new credible failure mechanisms, malfunctions or accident initiators.

Therefore, the proposed change does not create the possibility of a new or different kind of accident from any previously evaluated.

3. Does the proposed amendment involve a significant reduction in a margin of safety?

Response: No.

The proposed change to the CPS operating license conditions are intended to provide clarification as to how the generation of byproduct material in the CPS reactor core meets the requirements of 10 CFR Part 30. The proposed change to TS 4.2.1 also provides clarification and additional description of the proposed LTAs to be used in the CPS core. These proposed changes will not affect the design or operation of any equipment important to safety. In addition, since the proposed

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changes to the license conditions and TS provide clarification only, these changes do not affect the results of any safety calculations.

The proposed LTA program has no impact on equipment design or fundamental operation, other than the modifications made to the fuel bundle as part of the program. There are no changes being made to safety limits or safety system allowable values that would adversely affect plant safety as a result of the proposed LTAs. The performance of the systems important to safety is not significantly affected by the use of the proposed LTAs. The margin of safety can be affected by the thermal limits existing at the time of the postulated accident; however, the LTA design has been evaluated and demonstrated to have no significant effect on the calculated thermal limits. The proposed change does not affect safety analysis assumptions or initial conditions and therefore, the margin of safety in the original safety analyses is maintained.

As documented above, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above, EGC concludes that the proposed amendment does not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of no significant hazards consideration is justified.

4.4 Conclusions

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

5.0 ENVIRONMENTAL CONSIDERATION

A review has determined that the proposed amendment would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or a significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

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6.0 REFERENCES

1. Letter from Mr. R. E. Martin (NRC) to Mr. O. D. Kingsley, Jr. (TVA), "Issuance of Amendment on Tritium Producing Burnable Absorber Rod Lead Test Assemblies (TAC No. M98615)," dated September 15, 1997
2. Letter from Mr. R. W. Hernan (NRC) to Mr. J. A. Scalice (TVA), "Issuance of Amendments Regarding Technical Specification Change No. 00-06 (TAC No. MB2972 and MB2973)," dated September 30, 2002
3. Letter from Mr. T. A. Ippolito (NRC) to Mr. R. E. Engle (GE), "Lead Test Assembly Licensing," dated September 23, 1981

ATTACHMENT 2

Mark-up of Proposed Operating License and Technical Specification Pages

- G. The issuance of this license will not be inimical to the common defense and security or to the health and safety of the public;
- H. After weighing the environmental, economic, technical, and other benefits of the facility against environmental and other costs and considering available alternatives, the issuance of Facility Operating License No. NPF-62, subject to the conditions for protection of the environment set forth in the Environmental Protection Plan attached as Appendix B, is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied; and
- I. The receipt, possession, and use of source ~~(byproduct)~~ and special nuclear material as authorized by this license will be in accordance with the Commission's regulations in 10 CFR Parts ~~20, 40,~~ and 70.

Insert
#1

2. Based on the foregoing findings regarding this facility, and pursuant to approval by the Nuclear Regulatory Commission at a meeting on April 10, 1987, Facility Operating License No. NPF-62, which supersedes the license for fuel loading and low power testing, License No. NPF-55, issued on September 29, 1986, is hereby issued to Exelon Generation Company to read as follows:

- A. This license applies to the Clinton Power Station, Unit No. 1, a boiling water nuclear reactor and associated equipment (the facility), owned by Exelon Generation Company. The facility is located in Harp Township, DeWitt County, approximately six miles east of the city of Clinton in east-central Illinois and is described in the licensee's Final Safety Analysis Report, as supplemented and amended, and in the licensee's Environmental Report-Operating License Stage, as supplemented and amended.
- B. Subject to the condition and requirements incorporated herein, the Commission hereby licenses:
 - (1) Exelon Generation Company, pursuant to section 103 of the Act and 10 CFR Part 50, to possess, use and operate the facility at the designated location in Harp Township, DeWitt County, Illinois, in accordance with the procedures and limitations set forth in this license;
 - (2) Deleted
 - (3) Exelon Generation Company, pursuant to the Act and 10 CFR Part 70, to receive, possess and to use at any time special nuclear material as reactor fuel, in accordance with the limitations for storage and amounts required for reactor operation, as described in the Final Safety Analysis Report, as supplemented and amended;

- (4) Exelon Generation Company, pursuant to the Act and to 10 CFR Parts 30, 40, and 70, to receive, possess, and use at any time any byproduct, source and special nuclear material as sealed neutron sources for and reactor startup, sealed sources for reactor instrumentation and radiation monitoring equipment calibration, and as fission detectors in amounts as required;
- (5) Exelon Generation Company, pursuant to the Act and 10 CFR Parts 30, 40, and 70, to receive, possess, and use in amounts as required any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactive apparatus or components; and
- (6) Exelon Generation Company, pursuant to the Act and 10 CFR Parts 30, 40, and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.

Insert #3

C.

This license shall be deemed to contain and is subject to the conditions specified in the Commission's regulations set forth in 10 CFR Chapter I and is subject to all applicable provisions of the Act and to the rules, regulations and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

Insert #2

(1) Maximum Power Level

Exelon Generation Company is authorized to operate the facility at reactor core power levels not in excess of 3473 megawatts thermal (100 percent rated power) in accordance with the conditions specified herein.

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 183 are hereby incorporated into this license. Exelon Generation Company shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

Insert #1:

- J. The receipt, production, possession, transfer, and use of byproduct material as authorized by this license will be in accordance with the Commission's regulations in 10 CFR Part 30.

Insert #2:

Mechanical disassembly of items or components containing byproduct material is not considered separation.

Insert #3:

- (7) Exelon Generation Company, pursuant to the Act and 10 CFR Part 30, to intentionally produce, possess, receive, transfer, and use byproduct material.

4.0 DESIGN FEATURES

4.1 Site Location

The site for the Clinton Power Station is located in Harp Township, DeWitt County, approximately six miles east of the city of Clinton in east-central Illinois. The exclusion area boundary shall have a radius of 975 meters from the Standby Gas Treatment System vent.

4.2 Reactor Core

4.2.1 Fuel Assemblies

The reactor shall contain 624 fuel assemblies. Each assembly shall consist of a matrix of Zircaloy or ZIRLO clad fuel rods with an initial composition of natural or slightly enriched uranium dioxide (UO₂) as fuel material, and water rod(s). Limited substitutions of zirconium alloy or stainless steel filler rods for fuel rods, in accordance with approved applications of fuel rod configurations, may be used. Fuel assemblies shall be limited to those fuel designs that have been analyzed with applicable NRC staff approved codes and methods and shown by tests or analyses to comply with all safety design bases. A limited number of lead test assemblies that have not completed representative testing may be placed in nonlimiting core regions. ←

4.2.2 Control Rod Assemblies

The reactor core shall contain 145 cruciform shaped control rod assemblies. The control material shall be boron carbide or hafnium metal, or both.

(continued)

A limited number of lead test assemblies may be placed in non-limiting core regions, beginning with Reload 12 Cycle 13 core reload, with the purpose of obtaining surveillance data to verify that the GE14c fuel bundles perform satisfactorily in service prior to use of these design features on a production basis.

ATTACHMENT 3

GE14i Lead Test Assembly (LTA) for Clinton Power Station
(Proprietary)

GE-Hitachi Nuclear Energy Americas LLC
AFFIDAVIT

I, James F. Harrison, state as follows:

- (1) I am Vice President, Fuel Licensing, Regulatory Affairs, GE-Hitachi Nuclear Energy Americas LLC (“GEH”), have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.
- (2) The information sought to be withheld is contained in NEDC-33476P, *GE14i Lead Test Assembly (LTA) for Clinton Power Station*, dated June 2008. The proprietary information in NEDC-33476P, is identified by a single [[dotted underline inside double square brackets⁽³⁾]]. Figures and other large objects are identified with double square brackets before and after the object. In each case, the superscript notation ⁽³⁾ refers to Paragraph (3) of this affidavit, which provides the basis for the proprietary determination.
- (3) In making this application for withholding of proprietary information of which it is the owner or licensee, GEH relies upon the exemption from disclosure set forth in the Freedom of Information Act (“FOIA”), 5 USC Sec. 552(b)(4), and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4), and 2.390(a)(4) for “trade secrets” (Exemption 4). The material for which exemption from disclosure is here sought also qualify under the narrower definition of “trade secret”, within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d1280 (DC Cir. 1983).
- (4) Some examples of categories of information which fit into the definition of proprietary information are:
 - a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by GEH's competitors without license from GEH constitutes a competitive economic advantage over other companies;
 - b. Information which, if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product;

GEH Proprietary Information
Class III

-
- c. Information which reveals aspects of past, present, or future GEH customer-funded development plans and programs, resulting in potential products to GEH;
 - d. Information which discloses patentable subject matter for which it may be desirable to obtain patent protection.

The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs (4)a. and (4)b. above.

- (5) To address 10 CFR 2.390(b)(4), the information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by GEH, and is in fact so held. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GEH, no public disclosure has been made, and it is not available in public sources. All disclosures to third parties, including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in paragraphs (6) and (7) following.
- (6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge, or subject to the terms under which it was licensed to GEH. Access to such documents within GEH is limited on a "need to know" basis.
- (7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist, or other equivalent authority for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GEH are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.
- (8) The information identified in paragraph (2), above, is classified as proprietary because it contains detailed results including the process and methodology for the design and analysis of the GE14i Lead Test Assembly. GE14i Lead Test Assembly has been developed by GEH at a total cost in excess of a million dollars. The development, evaluation, and design details, as they relate to the BWR, was achieved at a significant cost to GEH.

GEH Proprietary Information
Class III

The development of the GE14i Lead Test Assembly is derived from the extensive experience database that constitutes a major GEH asset.

- (9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GEH's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GEH's comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology and includes development of the expertise to determine and apply the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC-approved methods.

The research, development, engineering, analytical and NRC review costs comprise a substantial investment of time and money by GEH.

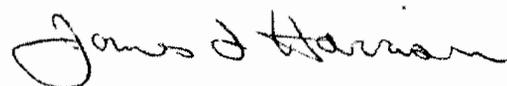
The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

GEH's competitive advantage will be lost if its competitors are able to use the results of the GEH experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GEH would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GEH of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing and obtaining these very valuable analytical tools.

I declare under penalty of perjury that the foregoing affidavit and the matters stated therein are true and correct to the best of my knowledge, information, and belief.

Executed on this 18th day of December 2008.



James F. Harrison
Vice President, Fuel Licensing
Regulatory Affairs
GE-Hitachi Nuclear Energy Americas LLC

ATTACHMENT 4

GE14i Lead Test Assembly (LTA) for Clinton Power Station
(Non-Proprietary)



HITACHI

NEDO-33476

Revision 0

GEH Non-Proprietary Information Class I

January 2009

GE14i Lead Test Assembly (LTA) for Clinton Power Station

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Melissa Allen

Information Notice

This document is a non-proprietary version of NEDC-33476P, which has the proprietary information removed. Portions of the document that have been removed are indicated by double open and closed brackets as shown here [[]].

Important Notice Regarding Contents of this Report

Please Read Carefully

This report contains information that is to be provided to the Nuclear Regulatory Commission (NRC) to comply with the requirements for the installation of Lead Test Assemblies (LTAs) at the Clinton Power Station for Reload 12 Cycle 13 during the 2010 refueling outage.

The only undertakings of GEH with respect to information in this document are contained in contracts between GEH and Exelon, LLC, and nothing contained in this document shall be construed as changing those contracts. The use of this information by anyone other than those participating entities and for any purposes other than those for which it is intended is not authorized; and with respect to any unauthorized use, GEH makes no representation or warranty, and assumes no liability as to the completeness, accuracy, or usefulness of the information contained in this document.

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Class I

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Revision Status

Revision Number	Page	Description of Change	Signature
0	Various	Original GE14i LTA Report for Clinton Power Station	

Document Title: GE14i Lead Test Assembly for Clinton Power Station**Abstract**

Exelon Generation Company, LLC plans to load eight to twelve (8 to 12) Lead test assemblies as part of the Clinton Reload 12 Cycle 13 during the 2010 refueling outage. These bundles, also referred to as GE14i LTAs, are planned to be in operation as part of a joint program with Global Nuclear Fuel – Americas, LLC (GNF), GE-Hitachi Nuclear Energy Americas, LLC (GEH), and Exelon Generation Company, LLC.

This report contains information that is to be provided to the Nuclear Regulatory Commission (NRC) to comply with the Reference 1 letter that provides guidelines to be followed to license LTAs. Included in this report are a description of the GE14i LTAs, a discussion of the applicability of approved methods to the licensing analyses, a description of the objectives of the LTA program, and an outline of the kinds of measurements planned for the LTAs.

1. Introduction

The radionuclide cobalt-60 is the most commonly used source of gamma radiation for radiation technology, both for industrial and medical purposes. There is a growing demand for cobalt-60 as applications for this material are expanding at a rapid rate, as is the demand within existing applications. Cobalt-60 is currently used in applications such as neurosurgical devices, food irradiation, and gamma sterilization of medical devices.

Production of radioactive cobalt starts with natural cobalt (metal), which is an element composed of 100% cobalt-59, a stable isotope. Pellets made of 99.4% pure cobalt are placed in a nuclear reactor, where they stay for varying amounts of time that depend upon the neutron flux and the desired specific activity. While in the reactor, a cobalt-59 atom absorbs a neutron and is converted into a cobalt-60 atom. This resulting cobalt-60 is then packaged for various applications.

In medicine, cobalt-60 has been used to effectively treat hundreds of thousands of patients over the last 30 years. It is widely used in applications for treating benign and malignant brain tumors, vascular malformations, and pain or other functional problems. It also plays a significant role in the food pasteurization industry. Food irradiation is the process of imparting ionizing energy to food to kill microorganisms. These microorganisms result in 76 million cases of food poisoning in the U.S. alone each year. Just like traditional heat pasteurization, food irradiation enhances the safety of foods such as meat, chicken, seafood, and spices. This FDA approved process has been in practice by some 50 countries worldwide and applied commercially in the USA, Japan, and several European countries for many years. A third significant use of the cobalt-60 radionuclide is in the medical sterilization industry. More than 40% of U.S. made medical devices (syringes, bandages, etc.) are sterilized using medical isotopes.

GEH's innovative isotope generation technology will allow cobalt-60 to be generated in bulk quantities in Exelon's Clinton commercial nuclear reactor. This agreement leverages existing commercial reactors and innovative, reliable GEH technology to arrive at a sustainable domestic source of radioisotopes like cobalt.

Exelon, LLC plans to load eight to twelve (8 to 12) Lead Test Assemblies as part of the Clinton Reload 12 Cycle 13 during the 2010 refueling outage. These bundles, also referred to as GE14i LTAs, are planned to be in operation as part of a joint program with Global Nuclear Fuel – Americas, LLC (GNF) and GE-Hitachi Nuclear Energy Americas, LLC.

This report contains information that is to be provided to the Nuclear Regulatory Commission (NRC) to comply with the Reference 1 letter that provides guidelines to be followed to license LTAs. Included in this report are a description of the GE14i LTAs, a discussion of the applicability of approved methods to the licensing analyses, a

description of the objectives of the LTA program, and an outline of the kinds of measurements planned for the LTAs.

The GE14i fuel design is described in Section 2. GE14i is designed to be compatible with other GNF fuel designs. [[

]] currently supplied to Clinton. The nuclear characteristics of these GE14i LTAs are compatible with those of the current GE14 fuel being loaded into Clinton.

Section 3 describes the licensing analyses that will be performed. The objectives of the LTA program are stated in Section 4. The kinds of measurements planned as part of the LTA surveillance are described in Section 5.

2. GE14i Fuel Product Description

A GE14i bundle schematic is shown in Figure 1 on page 7. GE14i consists of [[]], and two large central water rods in a 10 x 10 array. The two water rods encompass eight fuel rod positions. For the GE14i product, [[]] identified by hashed circles in the lattice design of Figure 2 on page 8. With this specific bundle design, there will be no [[]]

[[]]. In addition, these locations indicate where enrichment is typically lower relative to internal locations. Consequently, a [[]] is displaced when a GE14i bundle is utilized. [[]]

[[]] as allowed by fuel and core design constraints.

2.1. New Design Features

GE14i was designed for mechanical, nuclear, and thermal-hydraulic compatibility with the GE14 fuel designs. In addition to its similarities with the GE14 design, the GE14i includes [[]]

[[]]. Below is a list of new GE14i features.

- GE14i Bundle Schematic
- GE14i Lattice Design
- [[]]
- [[]]
- [[]]
- [[]]
- [[]]
- [[]]
- [[]]
- [[]]
- [[]]

2.2. [[]]

[[]]

GEH Non-Proprietary Information
Class I

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2.3. [[]]
[[]]

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2.4. [[]]
[[]]

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2.5. [[]]
[[]]

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2.6. [[]]
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2.7. [[]]
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2.8. [[]]
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2.9. [[]]
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2.10. [[]]
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2.11. Defender Lower Tie Plate

The GE14i fuel bundle will incorporate the Defender lower tie plate. The Defender lower tie plate maintains the same debris resistance utilized by the rest of the GE14 fuel in the reload batch.

[[

]]

Figure 1. GE14i Bundle Schematic

[[

]]

Figure 2. GE14i Lattice Arrangement

GEH Non-Proprietary Information
Class I

[[]]

Figure 3. [[]] Isometric View

[[]]

Figure 4. [[]] Detailed View

GEH Non-Proprietary Information
Class I

[[]]

Figure 5. [[]] Isometric View

[[]]

Figure 6. [[]] Detailed View

[[

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Figure 7. [[]] Cladding Isometric View

[[

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Figure 8. [[]] Cladding Detailed View

GEH Non-Proprietary Information
Class I

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Figure 9. [[]] Isometric View

[[

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Figure 10. [[]] Detailed View

GEH Non-Proprietary Information
Class I

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Figure 11. [[]] Isometric View

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Figure 12. [[]] Detailed View

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Figure 13. [[Isometric View

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Figure 14. [[Detailed View

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Figure 15. [[Isometric View

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Figure 16. [[Detailed View

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Figure 17. [[

]] Isometric View

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Figure 18. [[

]] Detailed View

GEH Non-Proprietary Information
Class I

[[
Figure 19. [[Isometric View]]

[[
Figure 20. [[Detailed View]]

3. Licensing Analyses

The GE14i LTAs will be analyzed using the NRC approved methods described in Reference 2. These methods are fully capable of analyzing all of the LTA features. Prior to loading of the LTAs, cycle-specific analyses will have been performed for Clinton Reload 12 Cycle 13 to establish fuel operating limits for the LTAs. This will also ensure that the core loading has been designed such that the LTAs will not be the most limiting fuel assemblies at any time during all operating cycles, with respect to compliance with LHGR, MAPLHGR and MCPR limits based on planned control rod patterns. Results of the licensing analyses will be documented in the Supplemental Reload Licensing Report (SRLR). Furthermore, licensing analyses will be performed for the LTAs for each cycle of their operation, wherein the effects of the LTAs are considered for each of the appropriate licensing events and anticipated operational occurrences (AOOs) to establish appropriate reactor core thermal limits for operation.

Exelon, LLC intends to insert the GE14i LTAs into Clinton and to operate Cycle 13 under the provisions of 10CFR50.59. However, cycle specific analyses to establish fuel-operating limits are not yet complete. When the cycle specific analyses are complete, GNF will document the results in the SRLR and Exelon, LLC will update the Clinton Core Operating Limits Report (COLR) accordingly. The application of approved methods to analyze events and accidents whose results could be affected by the LTA's design is discussed below. Since the analysis of the LTAs 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 2 are considered appropriate to determine the impact of core-wide AOOs on the LTAs. The GE14i fuel rods have been analyzed with GSTRM (GE Stress, Thermal, and Mechanical) to establish steady state and transient overpower LHGR limits that ensure compliance with thermal mechanical licensing requirements as specified in Reference 2 and Reference 4. Appropriate MCPR limits will be established to ensure safe operation of the LTAs based on these results. Note that GEXL14 is conservatively applied by over predicting the onset of boiling transition when applied to zero-powered isotope rods.

3.2. Localized AOOs

Approved methods are considered adequate to evaluate core response to a Rod Withdrawal Error (RWE), since the nuclear inputs are available to represent the LTAs distinctly. MCPR results will be based on the conservative application of GEXL14 and provided in the SRLR. Existing core monitoring processes will be sufficient to handle any inadvertent rotated bundle occurrence. The LTA fuel designs will be analyzed explicitly for the Fuel Loading Error (FLE) events. Results of the RWE and FLE will be documented in the SRLR.

3.3. Control Rod Drop Accident (CRDA)

Compliance with licensing limits governing 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 LTAs and approved GE14 fuel designs, the Reference 2 methodology is applicable to the LTAs. Operation with the LTAs will not result in exceeding CRDA acceptance criteria.

3.4. Loss of Coolant Accident and ECCS

The LTAs are to be loaded in non-limiting locations with respect to ECCS/LOCA MAPLHGR limits. An evaluation will be performed to assure that the LTAs will meet the PCT requirements in the event of a Design Basis Accident. The evaluation results will be listed in the SRLR.

3.5. Fuel Handling Accident

The impact of the LTAs on the assumptions and consequences of a fuel handling accident will be evaluated. [[

]]. Results of the fuel handling accident are expected to be bounded by previous product lines.

3.6. Stability

The GE14i LTAs will be explicitly modeled in Clinton Cycle 13 stability analysis as part of the standard reload licensing. Licensing requirements governing stability will be assured and the results reported in the SRLR.

3.7. Shutdown Margin

The LTAs have been designed with approved methods to provide minimum cold shutdown margin greater than or equal to the design criteria identified in Reference 2. This therefore assures that all technical specifications for shutdown margin are satisfied and will be documented in the SRLR.

3.8. RAJ-II Shipping Container

Criticality safety analyses have been performed that effectively confirm the adequacy of the RAJ-II shipping container to support the transportation of GE14i fuel bundles. Application for modification of the RAJ-II certificate has been made to the regulatory authorities.

3.9. [[]]

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3.10. Fuel Storage Reactivity

The fuel storage reactivity calculations will be performed. All reload bundles, including the GE14i bundle design, will be below the fuel storage reactivity limit.

4. LTA Program Objectives

The purpose of the GE14i LTA 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. LTA Measurements

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

- Fuel bundle visual
- Channel bow and bulge measurements
- Fuel rod and bundle length measurements
- Rod integrity and profilometry measurements
- Corrosion thickness measurements
- [[]]
- [[]]

The extent of such measurements will be governed by the need to minimize the impact 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 LTA. Results obtained from this LTA Program will be summarized in a timely manner in GE14i Fuel Experience Reports and provided to the NRC. The above evaluations and corresponding Fuel Experience Report is consistent with the NRC licensing agreement for LTAs in Reference 1.

6. References

1. Letter, T.A. Ippolito (NRC) to R.E. Engel (GE), "Lead Test Assembly Licensing," September 23, 1981.
2. NEDE-24011-P-A-16, "General Electric Standard Application for Reactor Fuel," October 2007.
3. GE14 Compliance with Amendment 22 of NEDE-24011-P-A-16 (GESTAR II), NEDC-32868P, Rev.2, September 2007.
4. NEDE-23785-1-PA, Class III, October 1984, "The GESTR LOCA and Safer Models for the Evaluation of the Loss-of-Coolant Accident", Volume 1, 2, 3.

ATTACHMENT 5

SUMMARY OF REGULATORY COMMITMENTS

The following table identifies those actions committed to by Exelon Generation Company, LLC (EGC) in this document. Any other statements in the submittal are provided for information purposes and are not considered to be regulatory commitments.

COMMITMENT	COMMITTED DATE OR "OUTAGE"	COMMITMENT TYPE	
		ONE-TIME ACTION (Yes/No)	Programmatic (Yes/No)
Verify that all required licensing analyses as defined in the CPS USAR and NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel," latest approved revision, are completed prior to loading the LTAs in the CPS core.	Prior to the start of C1R12	Yes	No