UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 9, 2017

Mr. Bryan C. Hanson
President and Chief Nuclear Officer
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: R. E. GINNA NUCLEAR POWER PLANT – ISSUANCE OF AMENDMENT TO ADOPT TSTF-490, REVISION 0, "DELETION OF E BAR DEFINITION AND REVISION TO RCS SPECIFIC ACTIVITY TECH SPEC" (CAC NO. MF7339)

Dear Mr. Hanson:

The U.S. Nuclear Regulatory Commission (the Commission) has issued the enclosed Amendment No. 123 to Renewed Facility Operating License No. DPR-18 for the R. E. Ginna Nuclear Power Plant. The amendment consists of changes to the technical specifications (TSs) in response to your application dated February 4, 2016, as supplemented by letters dated April 14, June 28, and November 30, 2016.

The amendment revises the Reactor Coolant System (RCS) Specific Activity definition and associated surveillance requirements in the TSs. The changes replace the current TS limit for RCS gross specific activity with a new limit for RCS noble gas specific activity.

The noble gas specific activity limit is based on a new dose equivalent Xenon (Xe)-133 definition that replaces the current E-Bar ($\bar{E}$) average disintegration energy definition. The changes are consistent with Technical Specification Task Force (TSTF) Improved Standard Technical Specifications Change Traveler, TSTF-490, Revision 0, "Deletion of E Bar Definition and Revision to RCS Specific Activity Tech Spec."

A copy of the related Safety Evaluation is also enclosed. A Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

Douglas V. Pickett, Senior Project Manager
Plant Licensing Branch I
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-244

Enclosures:
1. Amendment No. 123 to DPR-18
2. Safety Evaluation

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
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R. E. GINNA NUCLEAR POWER PLANT, LLC

EXELON GENERATION COMPANY, LLC

DOCKET NO. 50-244

R. E. GINNA NUCLEAR POWER PLANT

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 123
Renewed License No. DPR-18

1. The Nuclear Regulatory Commission (the Commission or the NRC) has found that:

   A. The application for amendment filed by the Exelon Generation Company, LLC (the licensee) dated February 4, 2016, as supplemented by letters dated April 14, June 28, and November 30, 2016, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Renewed Facility Operating License No. DPR-18 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 123, are hereby incorporated in the renewed license. Exelon Generation shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of its issuance and shall be implemented within 60 days.

FOR THE NUCLEAR REGULATORY COMMISSION

Stephen S. Koenick, Acting Chief
Plant Licensing Branch I
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Facility Operating
License and Technical Specifications

Date of Issuance: February 9, 2017

ATTACHMENT TO LICENSE AMENDMENT NO. 123

R. E. GINNA NUCLEAR POWER PLANT

RENEWED FACILITY OPERATING LICENSE NO. DPR-18

DOCKET NO. 50-244

Replace the following page of the Renewed Facility Operating License with the attached revised page. The revised page is identified by amendment number and contains marginal lines indicating the areas of change.

Remove	Insert
3	3

Replace the following pages of the Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove	Insert
1.1-2	1.1-2
3.4.16-1	3.4.16-1
3.4.16-2	3.4.16-2

(b) Exelon Generation pursuant to the Act and 10 CFR Part 70, to possess and use four (4) mixed oxide fuel assemblies in accordance with the RG&E's application dated December 14, 1979 (transmitted by letter dated December 20. 1979). as supplemented February 20,1980, and March 5, 1980;

(3) Exelon Generation pursuant to the Act and 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 reactor startup, sealed sources for reactor instrumentation and radiation monitoring equipment calibration, and as fission detectors in amounts as required;

(4) Exelon Generation 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

(5) Exelon Generation pursuant to the Act and 10 CFR Parts 30 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.

C. This renewed license shall be deemed to contain and is subject to the conditions specified in the following Commission regulations in 10 CFR Part 20. Section 30.34 of Part 30, Section 40.41 of Part 40, Sections 50.54 and 50.59 of Part 50, and Section 70.32 of Part 70; and is subject to all applicable provisions of the Act and rules, regulations and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified below:

(1) Maximum Power Level

Exelon Generation is authorized to operate the facility at steady-state power levels up to a maximum of 1775 megawatts (thermal).

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 123 are hereby incorporated in the renewed license. Exelon Generation shall operate the facility in accordance with the Technical Specifications.

(3) Fire Protection

Exelon Generation shall implement and maintain in effect all provisions of the approved fire protection program that comply with 10 CFR 50.48(a) and 10 CFR 50.48(c), as specified in the licensee's amendment request dated March 28, 2013, supplemented by letters dated December 17, 2013; January 29, 2014; February 28, 2014; September 5, 2014; September 24, 2014; December 4, 2014; March 18, 2015; June 11, 2015; August 7, 2015; and as approved in the safety evaluation report dated November 23, 2015. Except where NRC approval for changes or deviations is required by 10 CFR 50.48(c), and provided no

CHANNEL OPERATIONAL TEST (COT)	A COT shall be the injection of a simulated or actual signal into the channel as close to the sensor as practicable to verify the OPERABILITY of required alarm, interlock, display, and trip functions. The COT shall include adjustments, as necessary, of the required alarm, interlock, and trip setpoints so that the setpoints are within the required range and accuracy.
CORE ALTERATIONS	CORE ALTERATIONS shall be the movement of any fuel, sources, or reactivity control components, within the reactor vessel with the vessel head removed and fuel in the vessel. Suspension of CORE ALTERATIONS shall not preclude completion of movement of a component to a safe position.
CORE OPERATING LIMITS REPORT (COLR)	The COLR is the plant specific document that provides cycle specific parameter limits for the current reload cycle. These cycle specific parameter limits shall be determined for each reload cycle in accordance with Specification 5.6.5. Plant operation within these limits is addressed in individual Specifications.
DOSE EQUIVALENT I-131	DOSE EQUIVALENT I-131 shall be that concentration of I-131 (microcuries/gram) that alone would produce the same thyroid dose as the quantity and isotopic mixture of I-131, I-132, I-133, I-134, and I-135 actually present. The thyroid dose conversion factors used for this calculation shall be those listed in ICRP 30, Supplement to Part 1, pages 192-212, table entitled, "Committed Dose Equivalent in Target Organs or Tissues per Intake of Unit Activity."
DOSE EQUIVALENT XE-133	DOSE EQUIVALENT XE-133 shall be that concentration of Xe-133 (microcuries per gram) that alone would produce the same acute dose to the whole body as the combined activities of noble gas nuclides Kr-85m, Kr-85, Kr-87, Kr-88, Xe-131m, Xe-133m, Xe-133, Xe-135m, Xe-135, and Xe-138 actually present. If a specific noble gas nuclide is not detected, it should be assumed to be present at the minimum detectable activity. The determination of DOSE EQUIVALENT XE-133 shall be performed using effective dose conversion factors for air submersion listed in Table III.1 of EPA Federal Guidance Report No. 12, "External Exposure to Radionuclides in Air, Water, and Soil," 1993.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.16 RCS Specific Activity

LCO 3.4.16 RCS DOSE EQUIVALENT I-131 AND DOSE EQUIVALENT XE-133 specific activity shall be within limits.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. DOSE EQUIVALENT I-131 specific activity not within limit.	- NOTE – LCO 3.0.4.c is applicable.	
	A.1 Verify DOSE EQUIVALENT I-131 ≤ 60 μCi/gm.	Once per 8 hours
	AND	
	A.2 Restore DOSE EQUIVALENT I-131 to within limit.	7 days
B. DOSE EQUIVALENT XE-133 not within limit.	- NOTE - LCO 3.0.4.c is applicable	
	B.1 Restore DOSE EQUIVALENT XE-133 to within limit.	48 hours
C. Required Action and associated Completion Time of Condition A or B not met.	C.1 Be in MODE 3.	6 hours
OR	AND	
DOSE EQUIVALENT I-131 specific activity > 60 μCi/gm.	C.2 Be in MODE 5.	36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.16.1	Verify reactor coolant DOSE EQUIVALENT XE-133 specific activity $\leq$ 650 μCi/gm.	In accordance with the Surveillance Frequency Control Program
SR 3.4.16.2	Verify reactor coolant DOSE EQUIVALENT I-131 specific activity $\leq$ 1.0 μCi/gm.	In accordance with the Surveillance Frequency Control Program AND Between 2 and 10 hours after a THERMAL POWER change of $\geq$ 15% RTP within a 1 hour period

UNITED STATES
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 123

TO RENEWED FACILITY OPERATING LICENSE NO. DPR-18

R. E. GINNA NUCLEAR POWER PLANT, LLC

EXELON GENERATION COMPANY, LLC

DOCKET NO. 50-244

1.0 INTRODUCTION

By application dated February 4, 2016, as supplemented by letters dated April 14, June 28, and November 30, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML16035A015, ML16105A243, ML16180A448, and ML16336A048, respectively), Exelon Generation Company, LLC (the licensee) requested changes to the R. E. Ginna Nuclear Power Plant (Ginna) Technical Specifications (TSs). The license amendment would revise the Reactor Coolant System (RCS) Specific Activity definition and associated surveillance requirements (SRs) in the TSs. The proposed changes would replace the current TS limit for RCS gross specific activity with a new limit for RCS noble gas specific activity. The noble gas specific activity limit would be based on a new dose equivalent Xenon (Xe)-133 definition that would replace the current E-Bar ($\bar{E}$) average disintegration energy definition. The changes are consistent with Technical Specification Task Force (TSTF) Improved Standard Technical Specifications Change Traveler, TSTF-490, Revision 0, "Deletion of E Bar Definition and Revision to RCS Specific Activity Tech Spec" (ADAMS Accession No. ML052630462).

By letter dated September 13, 2005 (ADAMS Accession No. ML052630462), the TSTF submitted TSTF-490 for U.S. Nuclear Regulatory Commission (NRC or the Commission) staff review. In the *Federal Register*, Volume 72, Number 52, dated March 19, 2007, page 12838, the notice of availability for TSTF-490 was published, signifying NRC approval of TSTF-490. This TSTF involves changes to NUREG-1430, NUREG-1431, and NUREG-1432, "Standard Technical Specifications," Section 3.4.16, "RCS Specific Activity," RCS gross specific activity limits with the addition of a new limit for noble gas specific activity. The noble gas specific activity limit would be based on a new dose equivalent Xe-133 (DEX) definition that replaces the current $\bar{E}$ average disintegration energy definition.

The supplemental letters dated April 14, June 28, and November 30, 2016, provided clarifying information that did not expand the scope of the application as originally noticed, and did not change the staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on March 29, 2016 (81 FR 17506).

2.0 REGULATORY EVALUATION

In Title 10 of the *Code of Federal Regulations* (10 CFR) 50.36, "Technical specifications," the NRC established its regulatory requirements related to the content of TSs. Pursuant to 10 CFR 50.36, TS are required to include items in the following five specific categories related to station operation: (1) safety limits, limiting safety system settings, and limiting control settings; (2) limiting conditions for operation; (3) surveillance requirements; (4) design features; and (5) administrative controls. The regulation is applicable since the licensee's proposed change concerns the Technical Specification limiting conditions for operation (LCO) 3.4.16, "RCS Specific Activity."

The NRC staff evaluated the impact of the proposed changes as they relate to the radiological consequences of affected design-basis accidents (DBAs) that use the RCS inventory as the source term. The source term assumed in radiological analyses should be based on the activity associated with the projected fuel damage or the maximum RCS TS values, whichever maximizes the radiological consequences. The limits on RCS specific activity ensure that the offsite doses are appropriately limited for accidents that are based on releases from the RCS with no significant amount of fuel damage.

The steam generator tube rupture (SGTR) accident and the main steam line break (MSLB) accident typically do not result in fuel damage and, therefore, the radiological consequence analyses are generally based on the release of primary coolant activity at maximum TS limits. For accidents that result in fuel damage, the additional dose contribution from the initial activity in the RCS is not normally evaluated, and it is considered to be insignificant in relation to the dose consequence resulting from the release of fission products from the damaged fuel.

License Amendment No. 87, dated February 25, 2005 (ADAMS Accession No. ML050320491), which modified the control room emergency air treatment system and changed the dose calculation methodology to the alternative source term (AST), used the AST methodology for analyzing the radiological consequences of seven DBAs using Regulatory Guide (RG) 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors," July 2000 (ADAMS Accession No. ML003716792).

License Amendment No. 97, dated July 11, 2006 (ADAMS Package Accession No. ML061380133), which approved the 16.8 percent extended power uprate, updated the AST radiological consequences of the design-basis accidents using RG 1.183.

The seven DBAs analyzed in License Amendment Nos. 87 and 97 include:

- Loss-of-coolant accident
- Fuel handling accident
- MSLB accident
- SGTR accident
- Reactor coolant pump locked rotor accident
- Rod ejection accident
- Tornado missile in spent fuel pool accident

For licensees using the AST in their dose consequence analyses, the NRC staff uses the regulatory guidance provided in NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition" (SRP), Section 15.0.1, "Radiological Consequence Analyses Using Alternative Source Terms," Revision 0, July 2000 (ADAMS Accession No. ML003734190), and the methodology and assumptions stated in RG 1.183.

Licensees using the AST are evaluated against the dose criteria specified in 10 CFR 50.67, "Accident source term." The offsite dose criteria are 25 roentgen equivalent man (rem) total effective dose equivalent (TEDE) at the exclusion area boundary (EAB) for any 2-hour period following the onset of the postulated fission product release and 25 rem TEDE at the outer boundary of the low population zone for the duration of the postulated fission product release. In addition, 10 CFR 50.67(b)(2)(iii) requires that adequate radiation protection be provided to permit access and occupancy of the control room under accident conditions, without personnel receiving radiation exposures in excess of 5 rem TEDE for the duration of the accident.

The NRC staff also considered relevant information in NUREG-0944, "Safety Evaluation Report Related to the Full-Term Operating License for R. E. Ginna Nuclear Power Plant"; NUREG-0821, "Integrated Plant Safety Assessment - Systematic Evaluation Program, R. E. Ginna Nuclear Power Plant," and the Ginna Updated Final Safety Analysis Report, which describes the DBAs and evaluation of their radiological consequences for Ginna.

3.0 TECHNICAL EVALUATION

3.1 Background

The primary coolant specific activity level is used in DBA analyses to determine the radiological consequences of accidents that involve the release of primary coolant activity with no substantial amount of fuel damage. For events that also include significant amounts of fuel damage, the contribution from the initial activity in the primary coolant is considered insignificant and is not normally evaluated.

The maximum allowable primary coolant specific activity is governed by TSs. Due to the importance of iodine in the dose consequence analyses, a separate limit is specified for the iodine isotopes. This limit is specified in units of dose equivalent iodine (DEI), which is the normalized quantity of iodine 131 that would result in the same dose consequence as the combination of the major isotopes of iodine present in the primary coolant. The TS for DEI includes both an equilibrium long-term limit, as well as a higher maximum allowable short-term limit to account for iodine spiking.

The Ginna TS definition of DEI is based on thyroid dose conversion factors (DCFs). The numerical determination of DEI is dependent on the relative quantities of the isotopes of iodine present in the RCS and on the DCFs used in the calculation. The TS definition of DEI lists the acceptable source for the thyroid DCFs to be used in the determination of DEI. The DCFs used in the determination of DEI are consistent with the DCFs used in the dose consequence analyses.

For plants implementing an AST methodology pursuant to 10 CFR 50.67, thyroid and whole body doses are not reported. Instead, doses are reported as TEDE. TEDE is defined as the

summation of the committed effective dose equivalent (CEDE) and the deep dose equivalent (DDE). RG 8.40, "Methods for Measuring Effective Dose Equivalent form External Exposure," dated July 31, 2010 (ADAMS Accession No. ML100610534), states that licensees are encouraged to use the effective dose equivalent (EDE) in place of the DDE in situations in which doses are calculated, rather than measured with personnel dosimetry. Therefore, in dose consequence analyses using the AST, the appropriate definition for TEDE would be the summation of the CEDE and the EDE. The EDE is equivalent to the whole body dose that is calculated for plants using Technical Information Document (TID) 14844, U.S. Atomic Energy Commission, "Calculation of Distance Factors for Power and Test Reactor Sites," dated March 23, 1962 (ADAMS Accession No. ML021720780), in their dose consequence analysis. RG 1.195, "Methods and Assumptions for Evaluating Radiological Consequences of Design Basis Accidents at Light-Water Nuclear Power Reactors" (ADAMS Accession No. ML031490640), Subsection 4.1, assumption 4.1.4, states that whole body doses should be calculated assuming submergence in a semi-infinite cloud with appropriate credit for attenuation by body tissue. Table III.1 of the U.S. EPA "Federal Guidance Report No. 12: External Exposure to Radionuclides in Air, Water, and Soil," provides external DCFs acceptable to the NRC staff. The factors in the column headed "effective" yield doses correspond to the whole body dose. The use of effective DCFs as a surrogate for whole body DCFs is appropriate because of the uniform body exposure associated with semi-infinite cloud dose modeling.

It is appropriate for those plants using the AST methodology to use a definition of DEI based on the CEDE DCFs instead of thyroid DCFs. Licensees converting to the AST have typically included revisions to their TS definition of DEI with reference to the inhalation DCFs from U.S. EPA "Federal Guidance Report No. 11: Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion." During Ginna's conversion to the AST, the licensee revised its TS definition of DEI to reference the inhalation DCFs from International Commission on Radiological Protection (ICR) Publication 30, Supplement to Part 1, pages 192-212, table entitled, "Committed Dose Equivalent in Target Organs or Tissues per Intake of Unit Activity." It should be noted that some licensees using the AST methodology have chosen to reference the committed dose equivalent (CDE) thyroid dose in their TS definition of DEI. Although technically it is more accurate to reference the CEDE DCFs, the numerical difference in the calculated value of DEI using either CEDE or CDE thyroid DCFs for a given isotope mixture is not significant.

A second limit is used to govern the non-iodine radioisotopes in the RCS. This limit has traditionally been based on an evaluation of the average beta and gamma disintegration energy of the total non-iodine activity in the RCS, which is referred to as $\bar{E}$. The Ginna TSs define $\bar{E}$ as the average (weighted in proportion to the concentration of each radionuclide in the reactor coolant at the time of sampling) of the sum of the average beta and gamma energies per disintegration for isotopes, other than iodines, with half-lives greater than 15 minutes, making up at least 95 percent of the total non-iodine activity in the coolant. The RCS non-iodine specific activity limit is then expressed as the quantity 100 divided by $\bar{E}$ in units of microcuries per gram (µCi/gm). In DBA dose consequence analyses based on releases from the RCS with no significant fuel damage, the concentration of noble gas activity in the coolant is assumed to be that level associated with 1 percent fuel clad defects. Operating experience has indicated that depending on the isotopes used to calculate $\bar{E}$ and the actual degree of fuel clad defects, the routinely calculated value of $\bar{E}$ may not be an effective indicator of the level of noble gas activity relative to the levels used in the DBA dose consequence analyses on which the limit is based.

3.2 Technical Evaluation of Proposed TSTF-490 RCS TS Changes

3.2.1 Deletion of the Definition of $\bar{E}$ and the Addition of a New Definition for DEX

The licensee proposes to delete the following TS Definition of $\bar{E}$ - Average Disintegration Energy in the Ginna TSs:

> $\bar{E}$ shall be the average (weighted in proportion to the concentration of each radionuclide in the reactor coolant at the time of sampling) of the sum of the average beta and gamma energies (in MeV) per disintegration for non-iodine isotopes, with half lives > 15 minutes, making up at least 95% of the total non-iodine activity in the coolant.

The licensee proposes to add the following definition for DEX to the Ginna TSs:

> DOSE EQUIVALENT XE-133 shall be that concentration of Xe-133 (microcuries per gram) that alone would produce the same acute dose to the whole body as the combined activities of noble gas nuclides Kr-85m, Kr-85, Kr-87, Kr-88, Xe-131m, Xe-133m, Xe-133, Xe-135m, Xe-135, and Xe-138 actually present. If a specific noble gas nuclide is not detected, it should be assumed to be present at the minimum detectable activity. The determination of DOSE EQUIVALENT XE-133 shall be performed using effective dose conversion factors for air submersion listed in Table III.1 of EPA Federal Guidance Report No. 12, "External Exposure to Radionuclides in Air, Water, and Soil," 1993.

The new definition for DEX proposed in TSTF-490, and adopted by Ginna, is similar to the definition for DEI. The determination of DEX will be performed in a similar manner to that currently used in determining DEI, except that the calculation of DEX is based on the acute dose to the whole body and considers the noble gases Kr-85m, Kr-85, Kr-87, Kr-88, Xe-131m, Xe-133m, Xe-133, Xe-135m, Xe-135, and Xe-138, which are significant in terms of contribution to whole body dose. Some noble gas isotopes are not included due to low concentration, short half-life, or small DCF. The calculation of DEX would use either the average gamma disintegration energies for the nuclides or the effective dose conversion factors from Table III.1 of U.S. EPA Federal Guidance Report No. 12. Using this approach, the limit on the amount of noble gas activity in the primary coolant would not fluctuate with variations in the calculated values of $\bar{E}$. If a specified noble gas nuclide is not detected, the new definition states that it should be assumed that the nuclide is present at the minimum detectable activity. This will result in a conservative calculation of DEX.

When $\bar{E}$ is determined using a design-basis approach, in which it is assumed that 1.0 percent of the power is being generated by fuel rods having cladding defects, and it is also assumed that there is no removal of fission gases from the letdown flow, the value of $\bar{E}$ is dominated by Xe-133. The other nuclides have relatively small contributions. However, during normal plant operation, there are typically only a small amount of fuel clad defects, and the radioactive nuclide inventory can become dominated by tritium and corrosion and/or activation products, resulting in the determination of a value of $\bar{E}$ that is very different than would be calculated using the design-basis approach. Because of this difference, the accident dose analyses become

disconnected from plant operation and the limiting conditions for operation (LCOs) become essentially meaningless. It also results in a TS limit that can vary during operation, as different values for $\bar{E}$ are determined.

This proposed change will implement an LCO that is consistent with the whole body radiological consequence analyses, which is sensitive to the noble gas activity in the primary coolant but not to other non-gaseous activity currently captured in the $\bar{E}$ definition. TS LCO 3.4.16 specifies the limit for reactor coolant gross specific activity as 100/$\bar{E}$ µCi/gm. The current $\bar{E}$ definition includes radioisotopes that decay by the emission of both gamma and beta radiation. Condition C of TS LCO 3.4.16 would rarely, if ever, be entered for exceeding 100/$\bar{E}$, since the calculated value is very high (the denominator is very low) if beta emitters such as tritium are included in the determination, as required by the $\bar{E}$ definition.

The NRC finds the licensee's proposed deletion of the above-stated definition for $\bar{E}$ and addition of a new definition for DEX in TS Section 1.1, "Definitions," acceptable from a radiological dose perspective, since it will result in an LCO that more closely relates the non-iodine RCS activity limits to the dose consequence analyses which form their bases.

3.2.2 Revision of TS 3.4.16, "RCS Specific Activity"

The licensee proposes to modify TS LCO 3.4.16 to specify that iodine specific activity in terms of DEI and noble gas specific activity in terms of DEX shall be within limits. Currently, the limiting indicators are not explicitly identified in the LCOs, but are instead defined in current Condition C and SR 3.4.16.1 for gross specific activity, and in current Condition A, and SR 3.4.16.2 for DEI.

The proposed change to the LCO states, "RCS DOSE EQUIVALENT I-131 and DOSE EQUIVALENT XE-133 specific activity shall be within limits." The proposed change incorporates the new DEX criteria and ensures that the specific limits for both DEI and DEX are consistent with the current SGTR and MSLB radiological consequence analyses; therefore, the NRC staff finds this change acceptable from a dose consequence perspective.

3.2.3 TS 3.4.16 Applicability Revision

The applicability of TS 3.4.16, "RCS Specific Activity," is currently limited to MODES 1, 2 and in MODE 3 when the RCS average temperature (T_{ave}) exceeds 500 °F. The licensee proposes to extend the applicability of TS 3.4.16 to include all portions of MODES 3 and 4. The NRC staff considers it appropriate for the LCO to apply during all portions of MODES 1 through 4 to limit the potential radiological consequences of an SGTR and MSLB that may occur during these modes.

The licensee did not propose to extend the applicability of TS 3.4.16 to MODES 5 and 6. During MODES 5 and 6, T_{ave} is ≤ 200 °F and the steam generators are not used for decay heat removal because steam cannot be produced. The RCS and steam generators are depressurized and primary to secondary leakage is minimal. Since steam will not be produced when T_{ave} is ≤ 200 °F, the potential to release significant quantities of RCS inventory is greatly reduced. During MODES 5 and 6, doses from either a postulated SGTR or MSLB would not be significant and the monitoring of RCS specific activity during Modes 5 and 6 is not necessary. Therefore,

the NRC staff concludes that the applicability of TS 3.4.16 to MODES 1 through 4, as proposed by the licensee, is acceptable from a dose consequence perspective.

3.2.4 TS 3.4.16 Condition C Revision to Include Required Action for DEX Limit

The licensee proposes to replace the current TS 3.4.16 Condition C, "Gross specific activity not within limit," with a new condition B, "DOSE EQUIVALENT XE-133 not within limit." This change is consistent with the change to the TS 3.4.16 LCO, which requires the DEX specific activity to be within limits as discussed above. The DEX limit is site-specific, and the numerical value of 650 µCi/gm is contained in revised SR 3.4.16.1. The site-specific limit of 650 µCi/gm DEX is established based on the maximum accident analysis RCS activity corresponding to 1 percent fuel clad defects with sufficient margin to accommodate the exclusion of those isotopes based on low concentration, short half-life, or small dose conversion factors. The primary purpose of the TS 3.4.16 LCO on RCS specific activity and its associated conditions is to support the radiological dose consequence analyses for DBAs. The whole body dose is primarily dependent on the noble gas activity, not the non-gaseous activity currently captured in the E-Bar definition.

The proposed completion time (CT) for revised TS 3.4.16 Required Action B will require restoration of DEX to within limit in 48 hours. On March 17, 2016 (ADAMS Accession No. ML16075A119), the NRC staff issued a request for additional information (RAI) from the licensee. In the RAI, the NRC staff noted that the new proposed CT is longer than the TS CT currently allowed, which is 8 hours. When the gross specific activity of the coolant is not within the limit, or the new proposed DEX specific activity is not within the limit, the plant is in a condition not analyzed in the DBA analyses. Therefore, the NRC staff asked the licensee to provide additional justification for the proposed change in duration.

On April 14, 2016, the licensee responded to the NRC staff's RAI of March 17, 2016. The staff reviewed the licensee's response, and in a teleconference on April 26, 2016, requested that the response be clarified. In a supplemental response dated June 28, 2016, the licensee stated that the RCS activity is an initial condition for the plant radiological safety analyses and is governed by TS 3.4.16. More specifically, the plant's RCS activity is limited to 60 µCi/gm DEI, and, in accordance with the proposed license amendment request (LAR), ≤ 650 µCi/gm DEX. These limits match the analyzed values in the MSLB, SGTR, locked rotor (LRA) and rod ejection (REA) accidents.

The licensee further stated that the acceptable duration of plant operation in excess of these limits can be evaluated based on dose consequences postulated for operating conditions in excess of the limits. The dose consequences were evaluated by the licensee to assess the safety significance and to justify the increase in the duration of operating with DEX not within limits from 8 hours to the proposed 48 hours. The LRA and REA accidents include assumptions that the fuel rods fail during the accident. The licensee's review of the source term in the LRA and REA accident analyses reveals that the majority of the dose is from the failed fuel and that the RCS activity contribution to the total dose equivalent source term is less than 0.3 percent. Therefore,

the increase from 8 hours to 48 hours will not significantly change the dose consequences for these events.

In Ginna's MSLB and SGTR accidents, the source term is derived from the RCS activity with the noble gas contributing about 1 percent to 10 percent of the total dose consequences, and the SGTR dose consequences are more limiting of the two accidents. The licensee determined that an increase in DEX does not yield as high of a dose consequence when compared to the same increase in DEI. Ginna's design-basis reactor coolant inventory corresponds to equilibrium operation with 1 percent failed fuel. The design-basis DEI value is approximately 4 µCi/gm. For this evaluation, the licensee assumes that DEX increases by the same proportion as DEI. Although the NRC staff does not agree with the licensee's statement that DEX increases by the same proportion as DEI, the NRC staff does find for the purposes of this evaluation that the assumption is conservative. The TS DEI limit is 60 µCi/gm, which is a factor of 15 times higher than the 1 percent failed fuel design-basis value of 4 µCi/gm. Applying the factor of 15 to the proposed 1 percent failed fuel DEX value of 650 µCi/gm yields a DEX value of 9,750 µCi/gm. The total dose consequences are determined by the licensee for a noble gas spike, along with the pre-incident iodine spike for the SGTR accident. The licensee's results show significant margin to the regulatory limit and are shown below. To further examine the DEX margin, the licensee ran an additional case to determine the limiting DEX associated with the 10 CFR 50.67 limit. This case shows a DEX value of 90,000 µCi/gm is necessary to exceed the lowest 10 CFR 50.67 limit, which is 5 rem TEDE in the control room. A DEX value of 90,000 µCi/gm is 138 times larger than the 1 percent failed fuel value, which would require more than 100 percent failed fuel to achieve this value.

Case	Coolant (µCi/gm)		SGTR pre-incident spike (rem TEDE)	
	DEI	DEX	Exclusion Area Boundary	Control Room
1 percent failed fuel	4	650	7.69E-02	9.29E-02
RG 1.183 analysis of record	60	650	4.75E-01	9.84E-01
15 percent failed fuel	60	9750	1.15E+00	1.39E+00
Limiting DEX	60	90000	7.14E+00	5.00E+00
10 CFR 50.67 limit			25	5

The licensee's evaluation shows that the dose consequences with DEX in excess of 650 µCi/gm is substantially below the limits in 10 CFR 50.67. In addition, the licensee examined plant data and confirmed that DEX is not expected to spike to a larger degree than DEI. Based on this, the licensee concludes that it is not possible to reach a DEX value that would exceed the limits stated in 10 CFR 50.67, without exceeding the DEI TS limit of 60 µCi/gm. The TSs require that the reactor be shutdown to Mode 3 within 6 hours and Mode 5 within 36 hours, if DEI exceeds the limit of 60 µCi/gm. Therefore, the licensee has determined the safety significance of allowing plant operation for 48 hours with DEX in excess of the proposed limit of 650 µCi/gm is very low.

The NRC staff reviewed the proposed changes in the LAR, the licensee's analysis stated above, and the current dose consequences as stated in Ginna's current licensing basis. In addition, the

NRC staff performed independent calculations of the dose consequences of the MSLB and SGTR accidents using the licensee's assumptions for input to the RADTRAD computer code. The staff's calculations confirmed the licensee's dose results shown above. The staff finds the CT is acceptable since the licensee's analysis provides reasonable assurance that there is sufficient safety margin to the 10 CFR 50.67 limits. Therefore, the NRC staff finds that the CT of 48 hours for Required Action B is acceptable from a radiological dose perspective.

The licensee proposes to include in the required action for new TS 3.4.16 Condition B, a note that permits the use of the provisions of LCO 3.0.4.c. This allowance permits entry into the applicable mode(s) while relying on the required actions. The NRC staff finds this allowance acceptable due to the significant conservatism incorporated into the specific activity limit; the low probability of an event, which is limiting due to exceeding this limit; and the ability to restore transient specific activity excursions while the plant remains at, or proceeds to, power operation.

3.2.5 TS 3.4.16 Condition B Revision

The licensee proposes to revise TS 3.4.16 Condition B so that it becomes new Condition C, such that the new Condition C will state, "Required Action and associated Completion Time of Condition A or B not met." This is consistent with the changes made to Condition C (new Condition B. The proposed change to TS 3.4.16 Required Action B.1 (new Required Action C.1) requires the plant to be in Mode 3 within 6 hours and adds a new Required Action C.2, which requires the plant to be in Mode 5 within 36 hours. These changes are consistent with the changes made to the TS 3.4.16 applicability. The revised TS 3.4.16 LCO is applicable throughout all of Modes 1 through 4 to limit the potential radiological consequences of an SGTR or MSLB that may occur during these modes. In Modes 5 and 6, the steam generators are not used for decay heat removal, the RCS and steam generators are depressurized, and primary to secondary leakage is minimal. Therefore, the NRC staff finds that monitoring RCS specific activity during Modes 5 and 6 is not required.

The licensee proposes a CT of 36 hours for the plant to reach Mode 5. The NRC staff finds that the CT is reasonable, based on operating experience, to reach Mode 5 from full power conditions in an orderly manner and without challenging plant systems. The value of 36 hours is consistent with other TSs, which have a CT to reach Mode 5. These required actions require an orderly plant shutdown when DEI or DEX exceeds the short-term spiking limit and, therefore, the NRC staff finds the proposed CT of 36 hours to be acceptable from a dose consequence perspective.

3.2.6 SR 3.4.16.1 Revision to Include Surveillance for DEX

The proposed change revises the current SR 3.4.16.1 for RCS gross specific activity to verify that the site-specific reactor coolant DEX specific activity is less than or equal to 650 µCi/gm. This change provides an SR for the new LCO limit added to TS 3.4.16 for DEX. The revised SR 3.4.16.1 requires performing a gamma isotopic analysis as a measure of the noble gas specific activity of the reactor coolant at least once every 7 days, which is the same frequency required under the current SR 3.4.16.1 for RCS gross non-iodine specific activity. The SR provides an indication of any increase in the noble gas specific activity. The results of the SR on DEX allow proper remedial action to be taken before reaching the LCO limit under normal

operating conditions. The NRC staff finds that this change is acceptable from a dose consequence perspective.

3.2.7 Deletion of NOTE to SR 3.4.16.2

Surveillance Requirement 3.4.16.2 requires periodic verification that the RCS DOSE EQUIVALENT I-135 specific activity remains within limits (i.e., ≤ 1.0 μC/gm). The frequency for this surveillance is once every 14 days and within 2 to 10 hours following a reactor thermal power change of ≥ 15 percent within a 1 hour period. As discussed in the TS Bases, the purpose of the 14-day surveillance is to ensure that dose calculations for the SGTR accident remain within limits and will be a small fraction of the dose limits of 10 CFR 50.67. The RCS DOSE EQUIVALENT I-135 specific activity is also monitored following fast power changes when fuel failure is more likely to occur. This is because iodine levels peak following fuel failure.

Surveillance Requirement 3.4.16.2 currently has a NOTE stating that the surveillance is "Only required to be performed in MODE 1." The licensee proposes to delete the NOTE which will make the surveillance applicable during MODES 1 through 4. As previously discussed in this safety evaluation, RCS T_{avg} during plant operations in MODES 1 through 4 exceeds 200 °F when steam can be produced and doses from a SGTR accident need to be considered. The NRC staff finds that removal of the NOTE in the SR enables monitoring of RCS DOSE EQUIVALENT I-135 during all MODES when a SGTR accident needs to be considered and is conservative. Therefore, the staff finds removal of the NOTE from SR 3.4.16.2 acceptable.

3.2.8 Deletion of SR 3.4.16.3

The licensee proposes to delete the current SR 3.4.16.3, which requires the determination of $\bar{E}$. The proposed TS 3.4.16 LCO on RCS specific activity supports the dose analyses for DBAs in which the whole body dose is primarily dependent on the noble gas concentration, not the non-gaseous activity currently captured in the $\bar{E}$ definition. With the elimination of the limit for RCS gross specific activity and the addition of the new LCO limit for noble gas specific activity, this SR to determine $\bar{E}$ is no longer required. The NRC staff finds that this change is acceptable from a dose consequence perspective.

3.3 Summary and Conclusion

The NRC staff has reviewed the proposed changes to delete the definition of $\bar{E}$, add a new definition for DEX, add a new LCO limit to TS 3.4.16 for DEX, increase the CT of Required Action b.1, and revise the TS 3.4.16 conditions and required actions accordingly. In addition, the NRC staff has reviewed the change in the applicability of TS LCO 3.4.16 to reflect the modes during which the SGTR and MSLB accidents are postulated to occur, the revision of SR 3.4.16.1 to verify DEX is within the prescribed limit, and the deletion of SR 3.4.16.3.

The NRC staff has determined that the proposed changes will not impact the dose consequences of the applicable DBAs because the proposed changes will limit the RCS noble gas specific activity to ensure consistency with the values assumed in the site-specific DBA radiological consequence analyses. The proposed changes will also limit the potential RCS iodine concentration excursion to the value currently associated with full power operation, which is more restrictive on plant operation than the existing allowable RCS iodine specific activity at

lower power levels. Therefore, the NRC staff finds that the proposed TS changes are acceptable from a radiological dose perspective and that the TSs, as revised, will continue to meet the requirements of 10 CFR 50.36.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the NRC staff notified the State of New York official of the proposed issuance of the amendment. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

This amendment changes a requirement with respect to installation or use of facility components located within the restricted area as defined in 10 CFR Part 20 and changes SRs. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration and there has been no public comment on such finding (81 FR 17506; March 29, 2016). Accordingly, this amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of this amendment.

6.0 CONCLUSION

Based on the aforementioned considerations, the NRC staff concluded that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) there is reasonable assurance that 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.

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Date of Issuance: February 9, 2017

SUBJECT: R. E. GINNA NUCLEAR POWER PLANT – ISSUANCE OF AMENDMENT TO ADOPT TSTF-490, REVISION 0, "DELETION OF E BAR DEFINITION AND REVISION TO RCS SPECIFIC ACTIVITY TECH SPEC" (CAC NO. MF7339) DATED FEBRUARY 9, 2017

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