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10 CFR 50.90

July 2, 2009
TMI-09-082

United States Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Three Mile Island Nuclear Station, Unit 1
Facility Operating License No. DPR-50
NRC Docket No. 50-289

Subject: Three Mile Island Unit 1 Response to Request for Additional Information Related to License Amendment Request No. 326 to Adopt TSTF-490-A, Revision 0, "Deletion of E Bar Definition and Revision to Reactor Coolant System Specific Activity Technical Specification Using the Consolidated Line Item Improvement Process"

References:

(1) AmerGen Letter 5928-08-20201, Three Mile Island, Unit 1, "License Amendment Request No. 326 to Adopt TSTF-490-A, Revision 0, "Deletion of E Bar Definition and Revision to Reactor Coolant System Specific Activity Technical Specification" dated November 6, 2008.

(2) TSTF-490, Revision 0, Deletion of E Bar Definition and Revision to Reactor Coolant System Specific Activity Technical Specification Using the Consolidated Line Item Improvement Process, dated March 15, 2007.

(3) Federal Register Notice of Availability published on March 15, 2007 (72FR12217)

(4) Letter from P. Bamford (U. S. Nuclear Regulatory Commission) to C. Pardee (Exelon Generation Company, LLC), "Request for Additional Information Regarding License Amendment Request to Adopt Technical Specification Task Force Traveler TSTF-490-A" (TAC No. ME0100) dated June 24, 2009.

By letter dated November 6, 2008 (Reference 1), AmerGen Energy Company, LLC, now Exelon Generation Company, LLC (Exelon), requested an amendment to the Technical Specifications (TS) for Three Mile Island Nuclear Station, Unit 1 (TMI Unit 1) consistent with U.S. Nuclear Regulatory Commission (USNRC) approved Industry Technical Specification Task Force Standard Technical Specification Change Traveler, TSTF-490-A, Revision 0, "Deletion of E Bar Definition and Revision to Reactor Coolant System Specific Activity Technical Specification Using the Consolidated Line Item Improvement Process" (References 2 and 3).

The USNRC staff has been reviewing the Reference 1 submittal and has determined that additional information is needed to complete the review. The USNRC staff formally requested additional information on June 24, 2009 (Reference 4).

Exelon's responses to the USNRC questions are provided in Attachment 1 to this letter. Revised mark-ups of the TMI Unit 1 TS Pages and TS Bases Pages are provided in Attachment 2.

Exelon has determined that the information provided in response to this request for additional information does not impact the conclusions of the No Significant Hazards Consideration as stated in Reference 1.

There are no regulatory commitments contained in this submittal.

A copy of this letter and its attachments are being provided to the designated State Official and the chief executives of the township and county in which the facility is located.

Should you have any questions concerning this letter, please contact Wendy E. Croft at (610) 765-5726.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 2nd day of July, 2009.

Respectfully,

DCP

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

Attachment
1. Three Mile Island Unit 1 Response to Request for Additional Information Related to Technical Specification Change Request No. 326
2. Revised Mark-ups of Technical Specification Pages and TS Bases Pages

cc:
Regional Administrator, USNRC Region I
Project Manager, NRR, USNRC – Three Mile Island, Unit 1
Senior Resident Inspector, USNRC – Three Mile Island
Director, Bureau of Radiation Protection – Pennsylvania Department of Environmental Protection
Chairman, Board of County Commissioners of Dauphin County, PA
Chairman, Board of Supervisors of Londonderry Township, Dauphin County, PA
R. R. Janati, Commonwealth of Pennsylvania

ATTACHMENT 1

Three Mile Island Unit 1

Response to Request for Additional Information
Related to Technical Specification Change Request No. 326

Attachment 1
Three Mile Island Unit 1
Response to Request for Additional Information
Related to Technical Specification Change Request No. 326

NRC Question 1

The proposed Inserts 1 and 2 contained in the letter dated November 6, 2008, provide definitions for DEI and DEX, respectively. These definitions indicate that DEI and DEX may be determined using several references for dose conversion factors (DCFs). However, the purpose of the limiting condition for operation (LCO) for DEI and DEX is to satisfy Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.36, criterion 2, which establishes an operating restriction that is an initial condition of a design-basis accident (DBA). When surveillance of the RCS radionuclides is performed, each acceptable set of DCFs will yield a different DEI and DEX. As approved by the NRC staff, the intent of Technical Specification Task Force Traveler (TSTF)-490 was to allow the licensee to select, from the acceptable list, one DCF reference for the calculation of DEI, and one DCF reference for the calculation of DEX. Therefore, consistent with 10 CFR 50.36 and TSTF-490, the licensee should specify one DCF reference for each definition, which will be consistent with the specified LCO and DBA analysis, or justify why a list of several DCFs is consistent with the specified LCO and DBA analysis. Therefore, please justify how the use of multiple DCFs maintains consistency with the specified LCO values and DBA analyses or provide revised definitions for DEI and DEX that specify one DCF reference for each definition.

TMI Unit 1 Response

Exelon Generation Company, LLC (Exelon) has provided, in Attachment 2, revised mark-ups of Technical Specification (TS) pages and TS BASES pages to clarify the definitions for DOSE EQUIVALENT Iodine-131 (DEI) and DOSE EQUIVALENT Xenon-133 (DEX) to specify one dose conversion factor (DCF) reference for each definition that is consistent with the applicable limiting condition for operation (LCO) and design basis accident (DBA) analysis.

> **Note:** All of the TS pages and TS BASES pages associated with the original submittal are being re-submitted. All changes to the Inserts from the original submittal will be shown with a revision bar in the right margin.

NRC Question 2

Consistent with the safety evaluation for TSTF-490, please confirm that the site-specific limits for both DEI and DEX, and the DCFs used for the determination of DEI and DEX surveillances, are consistent with the current design bases radiological dose consequence analyses (for example, steam generator tube rupture and main steam line break). For DEX, please provide the information necessary (dose conversion factors and RCS radioisotopic concentrations) for the NRC staff to verify the proposed value in the LCO.

TMI Unit 1 Response

The current design bases radiological dose consequence analyses for the Loss of Coolant Accident and the Fuel Handling Accident are performed using Alternative Source Term with acceptance criteria in the form of total effective dose equivalent per 10 CFR 50.67. These analyses utilize dose conversion factors from EPA Federal Guidance Report No. 11, "Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion" and EPA Federal Guidance Report No.12, "External Exposure to Radionuclides in Air, Water, and Soil."

The radiological dose consequence analyses for the main steam line break and steam generator tube rupture accidents do not postulate fuel damage. These accidents are analyzed using the maximum reactor coolant system activity allowed by TS. This activity is presented in the form of DEI and noble gas activity. Since these accidents are the bounding design basis accidents that use DEI, the dose conversion factors associated with the determination of DEI used in the radiological dose consequence analyses are consistent with the site-specific limits for DEI and for the determination of DEI surveillances. These DCFs are from Table 2.1 of EPA Federal Guidance Report No. 11, 1988, "Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion." The DCFs for the determination of noble gas dose or DEX are from EPA Federal Guidance Report No. 12, "External Exposure to Radionuclides in Air, Water, and Soil" as described below.

DEX 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 DEX 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."

The effective dose conversion factors from Table III.1, Dose Coefficients for Air Submersion, of EPA Federal Guidance Report No.12, "External Exposure to Radionuclides in Air, Water, and Soil", 1993 are as follows:

Nuclide	Dose Coefficient h_T (Sv per Bq s m^{-3})
Kr-85m	7.48E-15
Kr-85	1.19E-16
Kr-87	4.12E-14
Kr-88	1.02E-13
Xe-131m	3.89E-16
Xe-133m	1.37E-15
Xe-133	1.56E-15
Xe-135m	2.04E-14
Xe-135	1.19E-14
Xe-138	5.77E-14

Attachment 1
Three Mile Island Unit 1
Response to Request for Additional Information
Related to Technical Specification Change Request No. 326

The dose equivalence factors (DEF) are calculated by normalizing the effective dose conversion factors from Table III.1 for each nuclide to Xe-133. The DEF terms are unitless. The significant figures for the calculated DEF terms are kept consistent with the significant figures from Table III.1.

$$DEF\ (nuclide\ i) = h_T^{nuclide\ i} / h_T^{Xe\text{-}133}$$

DEF (Kr-85m) = 7.48E-15 Sv per Bq s m^{-3}/1.56E-15 Sv per Bq s m^{-3} = 4.79
DEF (Kr-85) = 1.19E-16 Sv per Bq s m^{-3}/1.56E-15 Sv per Bq s m^{-3} = 0.0763
DEF (Kr-87) = 4.12E-14 Sv per Bq s m^{-3}/1.56E-15 Sv per Bq s m^{-3} = 26.4
DEF (Kr-88) = 1.02E-13 Sv per Bq s m^{-3}/1.56E-15 Sv per Bq s m^{-3} = 65.4
DEF (Xe-131m) = 3.89E-16 Sv per Bq s m^{-3}/1.56E-15 Sv per Bq s m^{-3} = 0.249
DEF (Xe-133m) = 1.37E-15 Sv per Bq s m^{-3}/1.56E-15 Sv per Bq s m^{-3} = 0.878
DEF (Xe-133) = 1.56E-15 Sv per Bq s m^{-3}/1.56E-15 Sv per Bq s m^{-3} = 1.00
DEF (Xe-135m) = 2.04E-14 Sv per Bq s m^{-3}/1.56E-15 Sv per Bq s m^{-3} = 13.1
DEF (Xe-135) = 1.19E-14 Sv per Bq s m^{-3}/1.56E-15 Sv per Bq s m^{-3} = 7.63
DEF (Xe-138) = 5.77E-14 Sv per Bq s m^{-3}/1.56E-15 Sv per Bq s m^{-3} = 37.0

In summary:

Radioisotope	Equivalence Factor	Radioisotope	Equivalence Factor
Kr-85m	4.79	Xe-133m	0.878
Kr-85	0.0763	Xe-133	1.00
Kr-87	26.4	Xe-135m	13.1
Kr-88	65.4	Xe-135	7.63
Xe-131m	0.249	Xe-138	37.0

For TMI Unit 1 the Primary Coolant Noble Gas Activity Based on 1% Fuel Defects is found in TMI-1 UFSAR Table 14.2-4 and are listed below.

Nuclide	Concentration (µCi/gm)
Kr-85m	2.43
Kr-85	9.75
Kr-87	1.28
Kr-88	3.95
Xe-131m	2.68
Xe-133m	4.22
Xe-133	392.0
Xe-135m	0.485
Xe-135	8.37
Xe-138	0.692

Using the dose equivalent factors from above, the DEX limit is calculated in Exelon Procedure CY-AA-130-3020, "Dose Equivalent Xenon" using the following equation.

$$DEX = \Sigma \text{ Nuclide}_i \text{ concentration @ 1\% fuel defects } (\mu Ci/gm) \times \text{Nuclide}_i \text{ DEF}$$

Dose Equivalent Xenon Calculation			
Radioisotope	Activity or MDA, uCi/gm	Equivalence Factor	Dose Equivalent Xenon, uCi/gm
Kr-85m	2.43	4.79	11.6
Kr-85	9.75	0.0763	0.744
Kr-87	1.28	26.4	33.8
Kr-88	3.95	65.4	258
Xe-131m	2.68	0.249	0.667
Xe-133m	4.22	0.878	3.71
Xe-133	392.0	1.00	392
Xe-135m	0.485	13.1	6.35
Xe-135	8.37	7.63	63.9
Xe-138	0.692	37.0	25.6
Total Dose Equivalent Xenon-133			797 uCi/gm

The DEX limit for TMI Unit 1 will be less than or equal to 797 µCi/gm.

NRC Question 3

The proposed TS Table 4.1-3, item 1(a) requires a verification that DEX is less than or equal to 797 microcuries/gram. The TS bases submitted with the application letter dated November 6, 2008 (Insert 6), state that "Due to the inherent difficulty in detecting [Krypton] Kr-85 in a reactor coolant sample due to masking from radioisotopes with similar decay energies, such as [Fluorine] F-18 and I-134, that it is acceptable to include the minimum detectable activity of Kr-85 in the [surveillance requirement] SR Table 4.1-3 calculation."

If no or little "masking" occurs, the use of the minimum detectible activity of Kr-85 would underestimate the amount of Kr-85 present in the reactor coolant sample. Therefore, please justify why use of the minimum detectable Kr-85 is an acceptable and conservative approach for performing this surveillance.

TMI Unit 1 Response

The intent of the TS BASES description is to describe that there may be difficultly in detecting Kr-85 due to radioisotope masking when a radioisotope is present with similar decay energies. In this circumstance, if Kr-85 is not detected, then the minimum detectable Kr-85 activity value will be utilized in the surveillance calculation. If a Kr-85 value is detected, then the detected value will be utilized in the surveillance calculation.

This is an acceptable and conservative approach for performing this surveillance because a Kr-85 value is assumed despite it not being detected.

In addition, it is important to note that this wording is identical to the NRC-approved TSTF-490, Revision 0, TS BASES wording as published in the Federal Register Notice of Availability on March 15, 2007 (72FR12217). See TSTF-490, Revision 0, page "BWOG STS B 3.4.16-4."

NRC Question 4

Inserts 4 and 5, contained in the letter dated November 6, 2008, refer to REFUELING as a mode in capital letters, indicating that REFUELING is defined in the TS Definition section. However, the current TMI-1 TS Definition section contains references to REFUELING SHUTDOWN, REFUELING OPERATION, and REFUELING INTERVAL, but not REFUELING. Please clarify the intended mode of applicability relating to inserts 4 and 5.

TMI Unit 1 Response

Exelon has provided, in Attachment 2, revised mark-ups of TS pages and TS BASES pages that clarify the intended mode of applicability (REFUELING SHUTDOWN) relating to inserts 4, 5, and 6.

Note that REFUELING OPERATION and REFUELING INTERVAL, as defined in the TMI Unit 1 TS, are not modes of operation but are a specific activity descriptor and a time period definition, respectively.

ATTACHMENT 2

Three Mile Island Unit 1

Revised Mark-Ups of Technical Specification Pages and TS BASES Pages

LIST OF FIGURES

Amendment Nos. ~~11, 17, 29, 39, 45, 50, 59, 72, 106, 109, 120, 126, 134, 142, 150, 164, 167, 168, 184, 211, 227, 234~~

1.9 DELETED

1.10 DELETED

1.11 DELETED

1.12 DOSE EQUIVALENT I-131

Insert 1

~~The DOSE EQUIVALENT I-131 shall be that concentration of I-131 (microcurie/gram) which 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 Table III of TID 14844, "Calculation of Distance Factors for Power and Test Reactor Sites". [Or in Table E-7 of NRC Regulatory Guide 1.109, Revision 1, October 1977.]~~

1.13 SOURCE CHECK

A SOURCE CHECK shall be the qualitative assessment of channel response when the channel sensor is exposed to a radioactive source.

1.14 DELETED

1.15 OFFSITE DOSE CALCULATION MANUAL (ODCM)

The OFFSITE DOSE CALCULATION MANUAL (ODCM) shall contain the methodology and parameters used in the calculation of offsite doses resulting from radioactive gaseous and liquid effluent, in the calculation of gaseous and liquid effluent monitoring Alarm/Trip Setpoints, and in the conduct of the Radiological Environmental Monitoring Program. The ODCM shall also contain (1) the Radioactive Effluent Controls and Radiological Environmental Monitoring Programs required by Section 6.8.4 and (2) descriptions of the information that should be included in the Annual Radiological Environmental Operating and Annual Radioactive Effluent Release Reports required by Specifications 6.9.3 and 6.9.4.

1.16 PROCESS CONTROL PROGRAM (PCP)

The PROCESS CONTROL PROGRAM (PCP) shall contain the current formulas, sampling, analyses, test, and determinations to be made to ensure that processing and packaging of solid radioactive wastes based on demonstrated processing of actual or simulated wet solid wastes will be accomplished in such a way as to assure compliance with 10 CFR Parts 20, 61, and 71, State regulations, burial ground requirements, and other requirements governing the disposal of solid radioactive waste.

1.17 GASEOUS RADWASTE TREATMENT

The GASEOUS RADWASTE TREATMENT SYSTEM is the system designed and installed to reduce radioactive gaseous effluent by collecting primary coolant system off gases from the primary system and providing for delay or holdup for the purpose of reducing the total radioactivity prior to release to the environment.

Insert 1:

DOSE EQUIVALENT I-131 shall be that concentration of I-131 (microcuries per gram) that alone would produce the same thyroid dose when inhaled as the combined activities of iodine isotopes I-131, I-132, I-133, I-134, and I-135 actually present. The determination of DOSE EQUIVALENT I-131 shall be performed using thyroid dose conversion factors from Table 2.1 of EPA Federal Guidance Report No. 11, 1988, "Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion."

1.24 CORE OPERATING LIMITS REPORT

The CORE OPERATING LIMITS REPORT is a TMI-1 specific document that provides core operating limits for the current operating reload cycle. These cycle-specific core operating limits shall be determined for each reload cycle in accordance with Specification 6.9.5. Plant operation within these operating limits is addressed in individual specifications.

1.25 FREQUENCY NOTATION

The FREQUENCY NOTATION specified for the performance of Surveillance Requirements shall correspond to the intervals defined in Table 1.2. All Surveillance Requirements shall be performed within the specified time interval with a maximum allowable extension not to exceed 25% of the surveillance interval. The 25% extension applies to all frequency intervals with the exception of "F." No extension is allowed for intervals designated "F."

TABLE 1.2

FREQUENCY NOTATION

NOTATION	FREQUENCY
S	Shiftly (once per 12 hours)
D	Daily (once per 24 hours)
W	Weekly (once per 7 days)
M	Monthly (once per 31 days)
Q	Quarterly (once per 92 days)
S/A	Semi-Annually (once per 184 days)
R	Refueling Interval (once per 24 months)
P S/U	Prior to each reactor startup, if not done during the previous 7 days
P S/A	Within six (6) months prior to each reactor startup
P	Completed prior to each release
N/A (NA)	Not applicable
E	Once per 18 months
F	Not to exceed 24 months

Insert 2 →

Insert 2:

1.26 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.

(RCS)

3.1.4 REACTOR COOLANT SYSTEM ACTIVITY

3.1.4.1 LIMITING CONDITION FOR OPERATION

Insert 3

~~The specific activity of the primary coolant shall be limited to:~~

~~a. Less than or equal to 0.35 microcurie/gram DOSE EQUIVALENT I-131, and~~

~~b. Less than or equal to 100/$\bar{E}$ microcuries/gram*~~

3.1.4.2 ~~APPLICABILITY: at all times except refueling~~ ← Insert 4

3.1.4.3 ACTION:

~~MODES: Power Operation, Start-Up, Hot Standby~~ ← Insert 5

~~a. With the specific activity of the primary coolant greater than 0.35 microcurie/gram DOSE EQUIVALENT I-131 for more than 48 hours** during one continuous time interval or exceeding the limit line shown on Figure 3.1-2a, be in at least HOT SHUTDOWN within 6 hours. Power operation may continue when DOSE EQUIVALENT I-131 is below 0.35 microcurie/gram.~~

~~b. With the specific activity of the primary coolant greater than 100/$\bar{E}$ microcuries/gram be in at least HOT SHUTDOWN within 6 hours. Power operation may continue when primary coolant activity is less than 100/$\bar{E}$ microcuries/gram.~~

~~MODES: At all times except refueling.~~

~~c. With the specific activity of the primary coolant greater than 0.35 microcurie/gram DOSE EQUIVALENT I-131 or greater than 100/$\bar{E}$ microcuries/gram perform the sampling and analysis requirements of Table 4.1-3 until the specific activity of the primary coolant is restored to within its limits.~~

Bases

INSERT 6

~~The limitations on the specific activity of the primary coolant ensure that the resulting 2 hour doses at the site boundary will be well within the Part 100 limit following a steam generator tube rupture accident or steam line break accident with postulated accident induced steam generator tube leakage in conjunction with an assumed steady state primary-to-secondary steam generator leakage rate of 1.0 GPM. The values for the limits on specific activity represent limits based on a parametric evaluation by the NRC of typical site locations. These values are conservative, in that the specific site parameters of TMI-1, such as site boundary, location and meteorological conditions, were not considered in this evaluation.~~

~~* $\bar{E}$ 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 per disintegration (in MeV) for isotopes, other than iodines, with half lives greater than 15 minutes, making up at least 95% of the total non-iodine activity in the coolant.~~

~~** The time period begins from the time the sample is taken.~~

Insert 3:

RCS DOSE EQUIVALENT I-131 and DOSE EQUIVALENT Xe-133 specific activity shall be limited to:

a. Less than or equal to 0.35 microcuries/gram DOSE EQUIVALENT I-131, and

b. Less than or equal to 797 microcuries/gram DOSE EQUIVALENT Xe-133.

Insert 4:

APPLICABILITY: At all times except REFUELING SHUTDOWN and COLD SHUTDOWN.

Insert 5:

MODES: At all times except REFUELING SHUTDOWN and COLD SHUTDOWN

a.1 With DOSE EQUIVALENT I-131 not within limit, perform the sampling and analysis requirements of Table 4.1.3 until the RCS DOSE EQUIVALENT I-131 is restored to within limit, AND

a.2 Verify that DOSE EQUIVALENT I-131 is less than or equal to 60 microcuries/gram, AND

a.3 Restore DOSE EQUIVALENT I-131 to within limit within 48 hours.

a.4 If the requirements of a.1, a.2 or a.3 cannot be met, be in at least HOT SHUTDOWN within 6 hours and in COLD SHUTDOWN within 36 hours.

b.1 With DOSE EQUIVALENT Xe-133 not within limit, restore DOSE EQUIVALENT Xe-133 to within limit within 48 hours.

b.2 If the requirements of b.1 cannot be met, be in at least HOT SHUTDOWN within 6 hours and in COLD SHUTDOWN within 36 hours.

Insert 6:

The maximum dose that an individual at the exclusion area boundary can receive for 2 hours following an accident, or at the low population zone outer boundary for the radiological release duration, is specified in 10 CFR 100.11 (Ref. 1) or 10 CFR 50.67 for accidents analyzed using AST. Doses to control room operators must be limited per GDC 19. The limits on specific activity ensure that the offsite and control room doses are appropriately limited during analyzed transients and accidents.

The RCS specific activity LCO limits the allowable concentration level of radionuclides in the reactor coolant. The LCO limits are established to minimize the dose consequences in the event of a steam line break (SLB) or steam generator tube rupture (SGTR) accident.

The LCO contains specific activity limits for both DOSE EQUIVALENT I-131 and DOSE EQUIVALENT Xe-133. The allowable levels are intended to ensure that offsite and control room doses meet the appropriate acceptance criteria in the Standard Review Plan (Ref. 2).

The LCO limits on the specific activity of the reactor coolant ensure that the resulting offsite and control room doses meet the appropriate 10CFR100.11 (Ref. 1) and 10CFR50 Appendix A GDC19 (Ref. 5) acceptance criteria following a SLB or SGTR accident. The safety analyses (Refs. 3 and 4) assume the specific activity of the reactor coolant is at the LCO limits, and an existing reactor coolant steam generator (SG) tube leakage rate of 1 gpm exists. The safety analyses assume the specific activity of the secondary coolant is at its limit of 0.1 μCi/gm DOSE EQUIVALENT I-131 from LCO 3.13, "Secondary Specific Activity."

The analyses for the SLB and SGTR accidents establish the acceptance limits for RCS specific activity. Reference to these analyses is used to assess changes to the unit that could affect RCS specific activity, as they relate to the acceptance limits.

The safety analyses consider two cases of reactor coolant iodine specific activity. One case assumes specific activity at 1.0 μCi/gm DOSE EQUIVALENT I-131 with a concurrent large iodine spike that increases the rate of release of iodine from the fuel rods containing cladding defects to the primary coolant immediately after a SLB (by a factor of 500), or SGTR (by a factor of 335), respectively. The second case assumes the initial reactor coolant iodine activity at 60.0 μCi/gm DOSE EQUIVALENT I-131 due to an iodine spike caused by a reactor or an RCS transient prior to the accident. In both cases, the noble gas specific activity is assumed to be 797 μCi/gm DOSE EQUIVALENT Xe-133.

The SGTR analysis assumes a rise in pressure in the ruptured SG causes radioactively contaminated steam to discharge to the atmosphere through the atmospheric dump valves or the main steam safety valves. The atmospheric discharge stops when the turbine bypass to the condenser removes the excess energy to rapidly reduce the RCS pressure and close the valves. The unaffected SG removes core decay heat by venting steam until the cooldown ends and the Decay Heat Removal (DHR) system is placed in service.

Insert 6 Continued:

The SLB radiological analysis assumes that offsite power is lost at the same time as the pipe break occurs outside containment. The affected SG blows down completely and steam is vented directly to the atmosphere. The unaffected SG removes core decay heat by venting steam to the atmosphere until the cooldown ends and the DHR system is placed in service.

Operation with iodine specific activity levels greater than the LCO limit is permissible, if the activity levels do not exceed 60.0 µCi/gm for more than 48 hours.

The limits on RCS specific activity are also used for establishing standardization in radiation shielding and plant personnel radiation protection practices.

RCS specific activity satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

LCO
The iodine specific activity in the reactor coolant is limited to 0.35 µCi/gm DOSE EQUIVALENT I-131, and the noble gas specific activity in the reactor coolant is limited to 797 µCi/gm DOSE EQUIVALENT Xe-133. The limits on specific activity ensure that offsite and control room doses will meet the appropriate 10CFR100.11 (Ref. 1) and 10CFR50 Appendix A GDC19 (Ref. 5) acceptance criteria.

The SLB and SGTR accident analyses (Refs. 3 and 4) show that the calculated doses are within acceptable limits. Violation of the LCO may result in reactor coolant radioactivity levels that could, in the event of a SLB or SGTR, lead to doses that exceed the 10CFR100.11 (Ref. 1) and 10CFR50 Appendix A GDC19 (Ref. 5) acceptance criteria.

APPLICABILITY
In all MODES other than REFUELING SHUTDOWN and COLD SHUTDOWN, operation within the LCO limits for DOSE EQUIVALENT I-131 and DOSE EQUIVALENT Xe-133 is necessary to limit the potential consequences of a SLB or SGTR to within the 10CFR100.11 acceptance criteria (Ref. 1) and 10CFR50 Appendix A GDC 19 acceptance criteria (Ref. 5).

In the REFUELING SHUTDOWN and COLD SHUTDOWN MODES, the steam generators are transitioning to decay heat removal and primary to secondary leakage is minimal. Therefore, the monitoring of RCS specific activity is not required.

ACTIONS
With the DOSE EQUIVALENT I-131 greater than the LCO limit, samples at intervals of 4 hours must be taken to demonstrate that the specific activity is $\leq$ 60.0 µCi/gm. The Completion Time of 4 hours is required to obtain and analyze a sample. Sampling is continued every 4 hours to provide a trend.

Insert 6 Continued:

The DOSE EQUIVALENT I-131 must be restored to within limit within 48 hours. The Completion Time of 48 hours is acceptable since it is expected that, if there were an iodine spike, the normal coolant iodine concentration would be restored within this time period. Also, there is a low probability of a SLB or SGTR occurring during this time period.

With the DOSE EQUIVALENT Xe-133 greater than the LCO limit, DOSE EQUIVALENT Xe-133 must be restored to within limit within 48 hours. The allowed Completion Time of 48 hours is acceptable since it is expected that, if there were a noble gas spike, the normal coolant noble gas concentration would be restored within this time period. Also, there is a low probability of a SLB or SGTR occurring during this time period.

If the Required Actions of 3.1.4.3.a and 3.1.4.3.b are not met, or if the DOSE EQUIVALENT I-131 is > 60.0 μCi/gm, the reactor must be brought to HOT SHUTDOWN within 6 hours and COLD SHUTDOWN within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS
Table 4.1-3 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. This measurement is the sum of the degassed gamma activities and the gaseous gamma activities in the sample taken. This Surveillance provides an indication of any increase in the noble gas specific activity.

Trending the results of this Surveillance allows proper remedial action to be taken before reaching the LCO limit under normal operating conditions. The 7-day Frequency considers the low probability of a gross fuel failure during this time.

Due to the inherent difficulty in detecting Kr-85 in a reactor coolant sample due to masking from radioisotopes with similar decay energies, such as F-18 and I-134, it is acceptable to include the minimum detectable activity for Kr-85 in the SR Table 4.1-3 calculation. If a specific noble gas nuclide listed in the definition of DOSE EQUIVALENT Xe-133 is not detected, it should be assumed to be present at the minimum detectable activity.

The SR allows entry into and operation in HOT SHUTDOWN, HOT STANDBY, and STARTUP prior to performing the SR. This allows the Surveillance to be performed in those MODES, prior to entering POWER OPERATION.

The Table 4.1-3 surveillance for isotopic analysis for DOSE EQUIVALENT I-131 concentration is performed to ensure iodine specific activity remains within the LCO limit during normal operation and following fast power changes when iodine spiking is more apt to occur. The 14-day Frequency is adequate to trend changes in the iodine activity level, considering noble gas activity is monitored every 7 days. The Frequency, between 2 and 6 hours after a power change > 15% RTP within a 1 hour period, is established because the iodine levels peak during this time following iodine spike initiation; samples at other times would provide inaccurate results.

Insert 6 Continued:

The SR allows entry into and operation in HOT SHUTDOWN, HOT STANDBY, and STARTUP prior to performing the SR. This allows the Surveillance to be performed in those MODES, prior to entering POWER OPERATION.

REFERENCES

1. 10 CFR 100.11.

2. Standard Review Plan (SRP) Section 15.1.5 Appendix A (SLB) and Section 15.6.3 (SGTR).

3. FSAR, Section 14.1.2.9.

4. FSAR, Section 14.1.2.10.

5. 10 CFR 50 Appendix A, General Design Criteria 19

The ACTION statement permitting POWER OPERATION to continue for limited time periods with the primary coolant's specific activity greater than 0.35 microcurie/gram DOSE EQUIVALENT I-131, but within the allowable limit shown on Figure 3.1-2a, accommodates possible iodine spiking phenomenon which may occur following changes in THERMAL POWER.

Proceeding to HOT SHUTDOWN prevents the release of activity should a steam generator tube rupture since the saturation pressure of the primary coolant is below the lift pressure of the atmospheric steam relief valves.

The surveillance requirements provide adequate assurance that excessive specific activity levels in the primary coolant will be detected in sufficient time to take corrective action. Information obtained on iodine spiking will be used to assess the parameters associated with spiking phenomena. A reduction in frequency of isotopic analyses following power changes may be permissible if justified by the data obtained.

The NRC staff has performed a generic analysis of airborne radiation released via the Reactor Building Purge Isolation Valves. The dose contribution due to the radiation contained in the air and steam released through the purge isolation valves prior to closure was found to be acceptable provided that the requirements of Specifications 3.1.4.1, 3.1.4.2 and 3.1.4.3 are met.

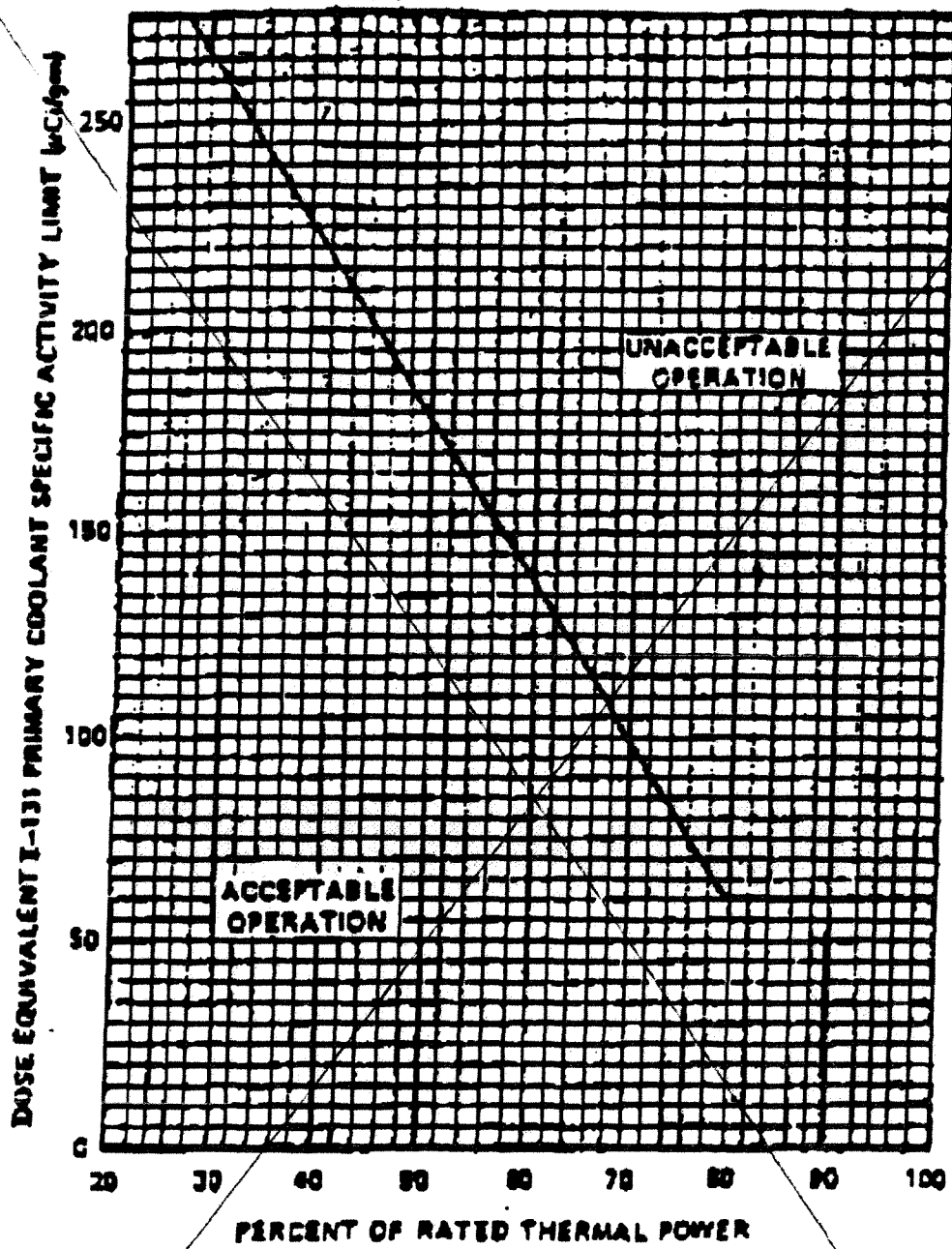

FIGURE 3.1-2a

Dose equivalent I-131 Primary Coolant Specific Activity Limit Versus Percent of RATED THERMAL POWER (with the Primary Coolant Specific Activity >0.35 µCi/gram Dose Equivalent 1-131).

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TABLE 4.1-3
MINIMUM SAMPLING FREQUENCY

Item	Check	Frequency
1. Reactor Coolant	a. ~~Specific Activity Determination to compare to the 100/Ē µCi/gm limit~~ ← Insert 7	At least once each 7 days during POWER OPERATION~~, HOT STANDBY, START-UP, and HOT SHUTDOWN.~~
	b. Isotopic Analysis for DOSE EQUIVALENT I-131 Concentration	i) 1 per 14 days during power operations.
		ii) One Sample between 2 and 6 hours following a THERMAL POWER change exceeding 15% of the RATED THERMAL POWER within a one hour period during power operation~~, start-up and hot standby.~~
		iii) # Once per 4 hours, whenever the specific activity exceeds 0.35 µCi/gram DOSE EQUIVALENT I-131 ~~or 100/Ē µCi/gram during all modes but refueling.~~
	C. Deleted ~~c. Radiochemical for Ē Determination~~	~~1 per 6 months* during power operation.~~
	d. Chemistry (Cl, F and O2)	5 times/week when Tavg IS GREATER THAN 200°F.
	e. Boron concentration	2 times/week
	f. Tritium Radioactivity	Monthly
2. Borated Water Storage Tank Water Sample	Boron concentration	Weekly and after each makeup when reactor coolant system pressure is greater than 300 psig or Tavg is greater than 200°F.
3. Core Flooding Tank Water Sample	Boron concentration	Monthly and after each makeup when RCS pressure is greater than 700 psig.

Insert 7:

Verify reactor coolant DOSE EQUIVALENT Xe-133 specific activity is less than or equal to 797 microcuries/gram.