March 14, 2011

TSTF-10-22
PROJ0753

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

SUBJECT: Revision to Previously Approved Traveler TSTF-490, "Deletion of E Bar Definition and Revision to RCS Specific Activity Tech Spec"

REFERENCES:
1. Letter from TSTF to U.S. NRC, "Deletion of E Bar Definition and Revision to RCS Specific Activity Tech Spec," dated September 13, 2005.
2. Federal Register, Volume 72, Number 50, Thursday, March 15, 2007, Page 12217, "Notice of Availability of Model Application Concerning Technical Specification Improvement Regarding Deletion of E Bar Definition and Revision to Reactor Coolant System Specific Activity Technical Specification Using the Consolidated Line Item Improvement Process."

Dear Sir or Madam:

In Reference 1, the TSTF submitted a Traveler for NRC review entitled TSTF-490, Revision 0, "Deletion of E Bar Definition and Revision to RCS Specific Activity Tech Spec." The change is applicable to all Pressurized Water Reactor (PWR) plants. In Reference 2, the Notice of Availability for TSTF-490 was published in the Federal Register, signifying NRC approval of the proposed change.

Subsequent plant-specific license amendment requests to adopt TSTF-490 in accordance with the Notice of Availability have resulted in the NRC issuing Requests for Additional Information. The TSTF has worked with the NRC to identify the additional information and clarifications that are needed for successful plant-specific adoption of TSTF-490 and to incorporate that information into the TSTF-490 model.

Enclosed is Revision 1 of TSTF-490 incorporating those changes identified to by the NRC and TSTF to facilitate plant-specific adoption. The specific changes are described under the Revision 1 description.

Any review fees associated with TSTF-490 should be billed to the Pressurized Water Reactor Owners Group.

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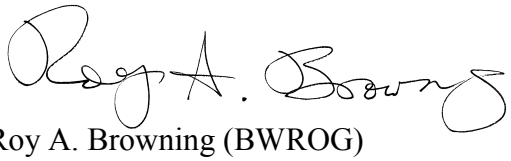
PWROG
PWR Owners Group
BWR OWNERS' GROUP

Should you have any questions, please do not hesitate to contact us.

Norman J. Stringfellow (PWROG/W)



Roy A. Browning (BWROG)

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Enclosed

cc: Robert Elliott, Technical Specifications Branch, NRC
Michelle Honcharik, Licensing Processes Branch, NRC

Technical Specification Task Force
Improved Standard Technical Specifications Change Traveler

Deletion of E Bar Definition and Revision to RCS Specific Activity Tech Spec

NUREGs Affected: ☑ 1430 ☑ 1431 ☑ 1432 ☐ 1433 ☐ 1434

Classification 1) Technical Change | Recommended for CLIIP?: Yes

Correction or Improvement: Correction | NRC Fee Status: Not Exempt

Benefit: Provides Longer Completion Time

See attached.

Revision History

OG Revision 0 Revision Status: Closed

Revision Proposed by: Wolf Creek

Revision Description:
Original Issue

Owners Group Review Information

Date Originated by OG: 27-Jul-04

Owners Group Comments
(No Comments)

Owners Group Resolution: Approved Date: 27-Jul-04

TSTF Review Information

TSTF Received Date: 05-Nov-04 Date Distributed for Review 29-Nov-04

OG Review Completed: ☐ BWOG ☑ WOG ☑ CEOG ☐ BWROG

TSTF Comments:
Withdrawn by WOG for revision.

TSTF Resolution: Withdrawn Date:

OG Revision 1 Revision Status: Closed

Revision Proposed by: WOG

Revision Description:
Clarified differences between AST plants and 10 CFR 100.11 plants.

OG Revision 1 Revision Status: Closed

Owners Group Review Information

Date Originated by OG: 08-Dec-04

Owners Group Comments
(No Comments)

Owners Group Resolution: Approved Date: 08-Dec-04

TSTF Review Information

TSTF Received Date: 01-Mar-05 Date Distributed for Review 02-Mar-05

OG Review Completed: ☑ BWOG ☑ WOG ☑ CEOG ☑ BWROG

TSTF Comments:

(No Comments)

TSTF Resolution: Approved Date: 13-Sep-05

NRC Review Information

NRC Received Date: 13-Sep-05

NRC Comments: Date of NRC Letter: 15-Mar-07

FRN for Comment issued on 11/20/06.
FRN for Availability issued on 3/15/07.

Final Resolution: Superceded by Revision Final Resolution Date: 15-Mar-07

TSTF Revision 1 Revision Status: Active

Revision Proposed by: NRC

Revision Description:
Plant-specific adoption experience with TSTF-490 identified the need for clarifications to avoid Requests for Additional Information. The TSTF agreed to revise TSTF-490 to facilitate licensee adoption.

Revision 1 makes the following changes:

Revised Section 1.1, "Definitions." The proposed Reviewer's Notes associated with the definitions of Dose Equivalent I-131 and XE-133 are revised to provide guidance on the selection of Dose Conversion Factors.

Revised TS 3.4.16:

1. Revised the proposed TS 3.4.16 Applicability to allow an option to retain the current Applicability, or to adopt an Applicability of "MODES 1, 2, 3, and 4," as required by the dose consequence analyses.

2. Revised the proposed Condition C Required Actions for consistency with changes in the Applicability.

3. Deleted the proposed Note to SR 3.4.16.1 allowing entry into Modes 4, 3, and 2 prior to performance of the SR. Added a Note allowing entry into Mode 4 and Mode 3 with RCS Tavg <500 deg. F, if the licensee's sampling system will not allow adequate sample flow or pressure in these Modes.

TSTF Revision 1 **Revision Status: Active**

4. Deleted the Note to SR 3.4.16.2 allowing entry into Modes 4, 3, and 2 prior to performance of the SR.

Revised the TS 3.4.16 Bases to reflect the changes described above, bracket discussion of Main Steam Line Break, and revise the discussion of minimum detectable activity in SR 3.4.16.1.

Revised the justification to reflect these changes.

Created a proposed the model application to require provision of additional information in the license amendment request.

Owners Group Review Information

Date Originated by OG: 26-Sep-10

Owners Group Comments
(No Comments)

Owners Group Resolution: Approved Date: 11-Oct-10

TSTF Review Information

TSTF Received Date: 11-Oct-10 Date Distributed for Review 11-Oct-10

OG Review Completed: ☑ BWOG ☑ WOG ☑ CEOG ☑ BWROG

TSTF Comments:
(No Comments)

TSTF Resolution: Approved Date: 14-Jan-11

Affected Technical Specifications

1.1	Definitions	
	Change Description:	Definition of "E - Average Disintegration Energy" replaced with "Dose Equivalent XE-133"
1.1	Definitions	
	Change Description:	Definition of "Dose Equivalent I-131"
Bkgnd 3.4.16 Bases	RCS Specific Activity	
S/A 3.4.16 Bases	RCS Specific Activity	
LCO 3.4.16	RCS Specific Activity	
	Change Description:	Figure 3.4.16-1 deleted
LCO 3.4.16	RCS Specific Activity	
LCO 3.4.16 Bases	RCS Specific Activity	
Appl. 3.4.16	RCS Specific Activity	
Appl. 3.4.16 Bases	RCS Specific Activity	

Ref. 3.4.16 Bases	RCS Specific Activity	
Action 3.4.16.A	RCS Specific Activity	
Action 3.4.16.A Bases	RCS Specific Activity	
Action 3.4.16.B	RCS Specific Activity	
Action 3.4.16.B Bases	RCS Specific Activity	
Action 3.4.16.C	RCS Specific Activity	
Action 3.4.16.C Bases	RCS Specific Activity	
SR 3.4.16.1	RCS Specific Activity	
SR 3.4.16.1 Bases	RCS Specific Activity	
SR 3.4.16.2	RCS Specific Activity	
SR 3.4.16.2 Bases	RCS Specific Activity	
SR 3.4.16.3	RCS Specific Activity	
	Change Description:	Deleted
SR 3.4.16.3 Bases	RCS Specific Activity	
	Change Description:	Deleted

1. SUMMARY DESCRIPTION

The proposed change replaces the current limit on primary coolant gross specific activity with a limit on primary coolant noble gas activity. The noble gas activity is defined as Dose Equivalent XE-133 and considers only the noble gas activity in the primary coolant.

The current figure of primary coolant iodine concentration as a function of reactor power is deleted and replaced with a single value of Dose Equivalent XE-133 that is applicable at any power level within the Applicability of the specification. A Reviewer's Note is added to the definition of Dose Equivalent I-131 to clarify the selection of dose conversion factors (DCFs) and additional DCFs are added to the definition.

Revision Description

TSTF-490, Revision 0, was approved by the NRC on March 15, 2007 (Federal Register Vol. 72, no. 60, Page 12217.) Plant-specific license amendment requests to adopt TSTF-490 received requests for additional information (RAIs). The TSTF and the NRC identified changes needed to TSTF-490 to avoid future RAIs on plant-specific adoption requests. The revised Traveler adds Reviewer's Notes, optional Bases information, and options on the LCO Applicability to address differences in licensing basis. The model application is revised to provide additional guidance to licensees requesting adoption of the Traveler. The justification was reorganized to be consistent with the NRC Safety Evaluation for TSTF-490, Revision 0, in order to facilitate review and implementation of the change. Technical changes to the justification are shown with revision bars.

2. DETAILED DESCRIPTION

The primary coolant specific activity level is used in design basis accident analyses to determine the radiological consequences of accidents that involve the release of primary coolant activity. For events that also include fuel damage, the contribution from the initial activity in the primary coolant is insignificant.

The current definition for Dose Equivalent I-131 is based on thyroid DCFs and reflects a licensing model in which the radiological consequences of iodine releases for accidents are reported as thyroid and whole body doses. The defined term Dose Equivalent I-131 is used in Specification 3.4.16 "RCS Specific Activity," and in the "Secondary Specific Activity" Specification: 3.7.17 (NUREG-1430), 3.7.18 (NUREG-1431) and Specification 3.7.19, "Secondary Specific Activity" (NUREG-1432).

A fourth thyroid DCF reference is added to this definition. In addition, for plants using the Alternate Source Term methodology (as described in Regulatory Guide 1.183), thyroid and whole body doses are not reported; instead, the doses are reported as Total Effective Dose Equivalent (TEDE). The TEDE dose is a summation of the Committed Effective Dose Equivalent (CEDE) dose and the whole body dose. It is more appropriate for those plants using the Alternative Source Term methodology to use a definition of Dose Equivalent I-131 based on the CEDE DCFs instead of the thyroid DCFs.

The defined term, "$\bar{E}$ - AVERAGE DISINTEGRATION ENERGY," is being replaced by the

defined term, "DOSE EQUIVALENT XE-133." This change is being made to support a specification that is more attuned to the whole body radiological consequence analyses which are sensitive to the noble gas activity in the primary coolant but not to other, non-gaseous activity currently captured in the $\bar{E}$ - Average Disintegration Energy definition.

LCO 3.4.16, "RCS Specific Activity," specifies the limit for primary coolant gross specific activity as 100/ $\bar{E}$ μCi/gm. $\bar{E}$ is defined as:

> "$\bar{E}$ 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 > [15] minutes, making up at least 95% of the total noniodine activity in the coolant."

In performing accident dose analysis in which primary coolant is released, the concentration of noble gas activity in the coolant is assumed to be that level associated with 1% failed fuel, which closely approximates the LCO limit of 100/ $\bar{E}$ μCi/gm.

The primary coolant iodine concentration is used in design basis accident analyses to determine the thyroid radiological consequences of accidents that involve the release of primary coolant activity. For events that also include fuel damage, the contribution from the initial activity in the primary coolant is insignificant.

LCO 3.4.16 specifies a limit for primary coolant iodine concentration during equilibrium operation. In recognition of the potential for exceeding the equilibrium iodine concentration due to iodine spiking following power transients, the LCO also permits the equilibrium value to be exceeded for a period of ≤ 48 hours. As currently presented, the value for the maximum allowable iodine concentration during the 48-hour period of elevated activity is a function of power level as provided in Figure 3.4.16-1. In accordance with the figure, as power is reduced below 80% of Rated Thermal Power, the allowable primary coolant iodine concentration increases from 60 μCi/gm Dose Equivalent I-131, to as high as 275 μCi/gm Dose Equivalent I-131 at 25% of rated thermal power. Below 25% of Rated Thermal Power, no further increase is defined. The earliest identifiable appearance of the curve contained in Figure 3.4.16-1 was in a letter from the Atomic Energy Commission letter dated June 12, 1974 on the subject, "Proposed Standard Technical Specifications for Primary Coolant Activity." However, this letter does not provide the technical basis for the curve. In the proposed change, the variable limit on allowable primary coolant iodine concentration is replaced with a single value with a documented analytical basis.

In summary, the following changes are being proposed to the Improved Standard Technical Specifications (ISTS):

Section 1.1, "Definitions," is modified as follows:

1. Revise the Section 1.1 definition of Dose Equivalent I-131 to list additional DCFs and to add a Reviewer's Note that explains the selection of DCFs.

2. Delete the Section 1.1 definition of "Ē - AVERAGE DISINTEGRATION ENERGY" and add a new definition for Dose Equivalent XE-133.

Specification 3.4.16, "RCS Specific Activity," is modified as follows:

3. Revise LCO 3.4.16 to delete references to gross specific activity, add a limit on Dose Equivalent XE-133, and delete Figure 3.4.16-1, "Reactor Coolant DOSE EQUIVALENT I-131 Specific Activity Limit versus Percent of RATED THERMAL POWER."

4. The Applicability of LCO 3.4.16 is revised to indicate the LCO is applicable in Modes 1, 2, 3, and 4 for those licensees whose accident analyses show the Steam Line Break (SLB) to be a limiting contributor to offsite and control room dose consequences.

The Specification 3.4.16 ACTIONS Table is modified as follows:

5. Condition A is modified to delete the reference to Figure 3.4.16-1, and to add an upper limit that is applicable at all power levels.

6. Condition B (was Condition C in NUREG-1430 and NUREG-1432) is modified to provide a Condition and Required Action for Dose Equivalent XE-133 outside the limit instead of gross specific activity. The Completion Time is changed from 6 hours to 48 hours. A Note allowing the applicability of LCO 3.0.4.c is added, consistent with the Note to Required Action A.1.

7. Condition C (was Condition B in NUREG-1430 and NUREG-1432) is modified based on the changes to Conditions A and B and to reflect the change in the LCO Applicability.

8. An editorial change is made to move Condition C to Condition B in NUREG-1430 and NUREG-1432.

The Specification 3.4.16 Surveillance Requirements (SR) are modified as follows::

9. SR 3.4.16.1 is revised to verify the limit for Dose Equivalent XE-133. A optional Note is added allowing entrance and operation in Mode 4 and Mode 3 with RCS average temperature < 500 °F when the LCO 3.4.16 Applicability includes Mode 4 and when the plant design does not support obtaining a total gas sample in lower Modes of operation.

10. SR 3.4.16.3 on gross specific activity is deleted.

3. TECHNICAL EVALUATION

1. Revise the Definition of Dose Equivalent I-131

The list of acceptable thyroid DCFs for use in the determination of Dose Equivalent I-131 includes the following:

a. Table III of TID-14844, AEC, 1962, "Calculation of Distance Factors for Power and Test Reactor Sites."

b. Table E-7 of Regulatory Guide 1.109, Rev. 1, NRC, 1977.

c. ICRP-30, 1979, Supplement to Part 1, page 192-212, Table titled, "Committed Dose Equivalent in Target Organs or Tissues per Intake of Unit Activity."

d. 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."

e. Committed Dose Equivalent (CDE) or Committed Effective Dose Equivalent (CEDE) dose conversion factors from Table 2.1 of EPA Federal Guidance Report No. 11.

The first set of thyroid DCFs (items a, b, c, or d) shall be used for plants licensed to 10CFR 100.11. The Committed Dose Equivalent (CDE) or Committed Effective Dose Equivalent (CEDE) conversion factors (item e) should be used for plants licensed to 10 CFR 50.67. However, plants licensed to 10 CFR 50.67 may reference multiple DCFs if consistent with their currently approved licensing basis analysis for a Steam Generator Tube Rupture (SGTR) or, if limiting, a Steam Line Break (SLB).

Licensees must ensure that the DCFs used in the determination of Dose Equivalent I-131 are consistent with the applicable dose consequence analyses and specifically address this in their license amendment request. Licensees licensed to 10 CFR 50.67 who propose the use of multiple DCFs must also justify how the use of multiple DCFs maintains consistency with the specified LCO values and design basis accident (DBA) analyses.

Licensees may currently use DCFs such as TID-14844, Regulatory Guide 1.109, ICRP-30, or EPA FGR 11 for dose analyses of events other than a SGTR or SLB and these other DCFs may be listed in their current definition of DOSE EQUIVALENT I-131. These additional DCFs are removed in the proposed change. The Dose Equivalent I-131 and Dose Equivalent XE-133 definitions should only list the DCFs assumed in the STGR and, if limiting, the SLB analyses. Other DCFs may continue to be used for analysis of other events, consistent with the licensee's licensing basis.

2. <u>Delete the Definition of $\bar{E}$ - Average Disintegration Energy and Add a New Definition for Dose Equivalent XE-133</u>

When $\bar{E}$ is determined using a design basis approach in which it is assumed that 1.0% 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 defects and the radioactive nuclide inventory can become dominated by tritium and by corrosion and 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 LCO limit has little value. It also results in an LCO limit that can vary during operation as different values for $\bar{E}$ are determined.

Additionally, since the concern associated with the coolant activity is the acute dose that the operators and the public might receive in the event of a postulated accident, the manner in which $\bar{E}$ is calculated gives undue importance to nuclides that are primarily beta-emitters. Beta radiation will contribute to a skin dose, but not to the whole body dose. Dose limits for the general population do not include consideration of the beta-skin dose. Therefore, the proposed change eliminates the use of the defined term $\bar{E}$ - AVERAGE DISINTEGRATION ENERGY and replaces it with a new defined term, Dose Equivalent XE-133.

The proposed definition of Dose Equivalent XE-133 is similar to the definition for Dose Equivalent I-131. The determination of Dose Equivalent XE-133 will be performed in a similar manner to that currently used in determining Dose Equivalent I-131, except that the calculation of Dose Equivalent XE-133 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 Dose Equivalent XE-133 may use either the effective DCFs for air submersion listed in Table III.1 of EPA Federal Guidance Report No. 12, 1993, "External Exposure to Radionuclides in Air, Water, and Soil" or the average gamma disintegration energies as provided in ICRP Publication 38, "Radionuclide Transformations," or a similar source. 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 the nuclide is present at the minimum detectable activity. This will result in a conservative calculation of Dose Equivalent XE-133.

Licensees must ensure that the DCFs used in the determination of Dose Equivalent XE-133 are consistent with the DCFs used in the SGTR and, if limiting, SLB dose consequence analyses and specifically address this in their license amendment request. Licensees may use other DCFs for other accident analyses, but those DCFs are not included in the Dose Equivalent XE-133 definition.

3. Revise LCO 3.4.16, "RCS Specific Activity"

LCO 3.4.16 is modified to specify that iodine specific activity limits in terms of Dose Equivalent I-131 and noble gas specific activity in terms of Dose Equivalent XE-133. Currently, the limiting indicators are not explicitly identified in the LCO, but are instead defined in current Condition B and SR 3.4.16.1 for gross non-iodine specific activity and in current Condition A and SR 3.4.16.2 for iodine specific activity. The proposed change revises the LCO to state, "RCS DOSE EQUIVALENT 1-131 and DOSE EQUIVALENT XE-133 specific activity shall be within limits."

The purpose of the LCO on RCS gross activity is to reflect the dose analyses for design basis accidents. It is more representative of the dose analysis for the LCO to provide limits on noble gas concentration in the primary coolant. Thus, it is recommended that the current limit on gross coolant activity be replaced by a limit on reactor coolant noble gas activity, which is represented by Dose Equivalent XE-133.

The Technical Specifications developed for the AP600 advanced reactor utilized an LCO on primary coolant Dose Equivalent XE-133 specific activity in place of the LCO on gross specific activity based on $\bar{E}$ - Average Disintegration Energy. This approach was approved by the NRC.

Typically, the radiological consequence analyses for accidents that consider a pre-existing iodine spike do not use the elevated primary coolant iodine concentrations permitted by the LCO for operation at power levels below 80% Rated Thermal Power. Instead, the analyses use the primary coolant concentration associated with 100% power operation (typically this is 60 μCi/gm Dose Equivalent I-131; however, for some licensees the 100% power LCO limit has been reduced to a lower limit).

It is not expected that plant operation at the reduced power levels would result in iodine concentrations that exceed the upper limit defined for full power operation. However, the current LCO allows operation at iodine concentrations higher than assumed in the plant accident analyses.

Licensees must ensure that the site-specific limits for both Dose Equivalent I-131 and Dose Equivalent XE-133 are consistent with the current SGTR and SLB radiological consequence analyses.

4. Revise the LCO 3.4.16 Applicability

The Specification 3.4.16 Applicability is revised to include two options. The current Applicability of "MODE 1, MODE 2, and MODE 3 with RCS average temperature (T_{avg}) ≥ 500°F," is retained. The Applicability is modified to also include an option requiring Dose Equivalent I-131 and Dose Equivalent XE-133 to be within limits in "MODE 1, 2, 3, and 4." The appropriate option is chosen based on the limiting plant-specific radiological dose consequence analysis.

An SLB is postulated to occur in Modes 1, 2, 3, or 4 and, therefore, the Applicability of "MODES 1, 2, 3, and 4" is applicable when the SLB accident is the limiting contributor to offsite and control room dose consequences in these Modes. An SGTR is postulated to occur in Modes 1 or 2, or Mode 3 with RCS average temperature (T_{avg}) ≥ 500°F. If an SGTR is the limiting contributor to offsite and control room dose consequences, the Applicability for LCO 3.4.16 is "MODES 1, 2, and MODE 3 with RCS average temperature (T_{avg}) ≥ 500°F."

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 monitoring of RCS-specific activity during Modes 5 and 6 is not required.

5. Revise Specification 3.4.16 Condition A

Specification 3.4.16, Condition A, is revised by replacing the Dose Equivalent I-131 site-specific limit "≥ 1.0 μCi/gm" with the words "not within limit" to be consistent with the revised LCO 3.4.16 format. The site-specific Dose Equivalent I-131 limit is contained in SR 3.4.16.2. This change is a format change to be consistent with the format of the ISTS and has no impact from the radiological dose perspective.

Specification 3.4.16, Required Action A.1, is revised to remove the reference to Figure 3.4.16-1 "Reactor Coolant DOSE EQUIVALENT 1-131 Specific Activity Limit versus Percent of RATED THERMAL POWER" and to insert a limit of less than or equal to a site-specific Dose Equivalent I-131 spiking limit. The curve contained in Figure 3.4.16-1 was provided by the Atomic Energy Commission (AEC) in a June 12, 1974, letter from the AEC on the subject, "Proposed Standard Technical Specifications for Primary Coolant Activity." Radiological dose consequence analyses for SGTR and SLB accidents do not consider the elevated RCS iodine specific activities permitted by Figure 3.4.16-1 for operation at power levels below 80% Rated Thermal Power (RTP). Instead, the analyses that consider a pre-accident iodine spike assume a Dose Equivalent I-131 concentration 60 times higher than the corresponding long-term equilibrium value, which corresponds to the Figure 3.4.16-1 specific activity limit associated with 100% RTP operation. Therefore, the Specification 3.4.16, Required Action A.1 limit, should be based on the short-term site-specific Dose Equivalent I-131 spiking limit in order to be consistent with the assumptions contained in the radiological consequence analyses.

6. Revise Specification 3.4.16 Condition B

The current Specification 3.4.16, Condition B, is replaced with a new Condition B for Dose Equivalent XE-133 not within limits. This change is made to be consistent with the change to LCO 3.4.16 which requires the Dose Equivalent XE-133 specific activity to be within limits. The Dose Equivalent XE-133 limit is site-specific and the numerical value, in units of μCi/gm, is contained in revised SR 3.4.16.1. The site-specific limit of Dose Equivalent XE-133 limit is established based on the maximum RCS activity assumed in the accident analysis corresponding to 1% fuel clad defects, with sufficient margin added to accommodate the exclusion of those isotopes with low concentration, short half life, or small DCFs.

The Completion Time for the proposed Required Action B.1 is 48 hours. This is consistent with the Completion Time for current Required Action A.2 for Dose Equivalent I-131 not within limit. The radiological consequences for the SGTR and the SLB accidents demonstrate that the calculated thyroid doses are generally a greater percentage of the applicable acceptance criteria than the calculated whole body doses. It then follows that the Completion Time for noble gas activity being above the limit should as long or longer than the Completion Time for iodine specific activity being above the limit. The Completion Time for Dose Equivalent I-131 is 48 hours. Therefore a Completion Time of 48 hours for revised Required Action B.1 is proposed. Also, there is a low probability of an accident occurring during this time period.

A NOTE is included in revised Required Action B.1 that states LCO 3.0.4.c is applicable. This NOTE would allow entry into a Mode or other specified condition in the LCO Applicability when LCO 3.4.16 is not met and is the same NOTE included in Required Actions A.1 and A.2. The proposed NOTE would allow entry into the Applicability while the Dose Equivalent XE-133 limit is exceeded and is being restored to within its limit. This Mode change is acceptable due to the significant conservatism incorporated into the Dose Equivalent XE-133 specific activity limit, the low probability of an event occurring which is limiting due to exceeding the Dose Equivalent XE-133 specific activity limit, and the ability to restore transient specific excursions while the plant remains at, or proceeds to power operation.

7. Revise Specification 3.4.16 Condition C

Specification 3.4.16, Condition C, is revised to apply when the Condition B (Dose Equivalent XE-133 not within limit) Required Action and associated Completion Time is not met. This is consistent with the changes made to Condition B which now provides the same Completion Time for both components of RCS specific activity as discussed in the revision to Condition B. The revision to Condition C also replaces the limit on Dose Equivalent I-131 from the deleted Figure 3.4.16-1 with a site-specific value. This change makes Condition C consistent with the changes made to Required Action A.1.

The change to Required Action C.1 requires those plants whose limiting dose contributor is the SGTR accident to be in Mode 3 with RCS $T_{avg} < 500°F$ within 6 hours. For operation in Mode 3 with RCS average temperature < 500°F, and in Modes 4 and 5, the release of radioactivity in the event of an SGTR is unlikely since the saturation pressure of the reactor coolant is below the lift pressure settings of the atmospheric dump valves and main steam safety valves.

The change to Required Action C.1 requires those plants whose limiting dose contributor is the SLB accident 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 Applicability. The revised LCO is applicable throughout all of Modes 1 through 4 to limit the potential radiological consequences of an SLB or SGTR that could occur during these Modes. In Mode 5 with the RCS loops filled, the steam generators are specified as a backup means of decay heat removal via natural circulation. In this Mode however, due to the reduced temperature of the RCS, the probability of a DBA involving the release of significant quantities of RCS inventory is greatly reduced. Therefore, monitoring of RCS specific activity is not required. In Mode 5 with the RCS loops not filled and in Mode 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 monitoring of RCS specific activity is not required. The Completion Time of Required Action C.2 is reasonable, based on operating experience, to reach Mode 5 from full-power conditions in an orderly manner and without challenging plant systems and the value of 36 hours is consistent with other Technical Specifications which have a Completion Time to reach Mode 5.

8. Editorial Changes to Move Condition C to Condition B in NUREG-1430 and NUREG-1432

In NUREG–1430 and NUREG–1432 (for Babcock & Wilcox and Combustion Engineering plants, respectively), the ACTIONS are reordered, moving Condition C on gross specific activity to Condition B and revising it as described above to address Dose Equivalent XE-133. This change is made to be consistent with the TSTF-GG-05-01, Revision 1, "Writer's Guide for Plant-Specific Improved Technical Specifications," which specifies that Conditions which are entered as a result of failing to satisfactorily complete another Required Action are to appear after the last Condition or Required Action to which it could apply.

9. Revise SR 3.4.16.1

The current SR 3.4.16.1 surveillance for RCS gross specific activity is deleted and replaced with a surveillance to verify that the reactor coolant Dose Equivalent XE-133 specific activity is less

than or equal to a specified site-specific value. This change provides a surveillance for the new LCO 3.4.16 limit on Dose Equivalent XE-133. The proposed 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 surveillance for RCS gross non-iodine specific activity. This measurement is the sum of the degassed gamma activities and the gaseous gamma activities in the sample taken. The surveillance provides an indication of any increase in the noble gas specific activity. The results of the surveillance on Dose Equivalent XE-133 allow proper remedial action to be taken before reaching the LCO limit under normal operating conditions.

SR 3.4.16.1 is modified by a Note that is applicable to those plants whose reactor coolant sample system is not designed to accommodate a total gas sample in lower Modes of operation and whose safety analyses require a Mode 4 Applicability. This Note allows entry into and operation in Mode 4 and Mode 3 with RCS average temperature < 500 °F prior to performing the SR. For these plants, the reactor coolant sample system is not designed to accommodate a total gas sample in lower Modes of operation. The necessary sample flow paths are either not in service or there is insufficient pressure to obtain the necessary sample flow from this sample point. Therefore, the proposed Note provides an allowance to only perform the surveillance in Modes 1, 2, and 3 with RCS temperature ≥ 500°F. In most startup and shutdown scenarios, operation in Mode 4 is usually temporary and the plant would be out of the Mode of Applicability before 7 days. However, plants may need to maintain the flexibility to operate in Mode 4 for greater than 7 days. If the Dose Equivalent XE-133 surveillance were adopted for Mode 4, should the Mode 4 extend beyond 7 days, the plant would need to exit the Modes of Applicability. This allowance is acceptable because an SLB or SGTR, while possible in the lower Modes of operation, are low likelihood events. In addition, the intent of the surveillance is to detect elevated levels of radionuclides in the RCS. Given that iodine is the dominant contributor in the dose analysis, and that the plant will now sample for it in Mode 4, the proposed changes are acceptable.

10. Delete SR 3.4.16.2

SR 3.4.16.2 is revised to present the specified I-131 specific activity as a plant-specific value. This provides consistency between the SR requirement and the dose consequence analyses.

Currently, a NOTE exists in SR 3.4.16.2 which reads, "Only required to be performed in MODE 1." This NOTE is not consistent with the Applicability of the LCO limits and is proposed to be deleted from SR 3.4.16.2. Hence, the Dose Equivalent I-131 Surveillance is required to be performed during all Modes of Applicability of the LCO (Modes 1, 2, 3, and 4 or Modes 1, 2 and Mode 3 with RCS T_{avg} ≥ 350°F, as appropriate).

Conclusion

The proposed change 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 radiological consequence analyses. In addition, the change 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, and will require monitoring of RCS iodine-specific activity during the Applicability of the LCO.

4. REGULATORY EVALUATION

4.1 Applicable Regulatory Requirements/Criteria

There are no specific regulatory requirements or criteria on primary coolant radioactivity affected by this change. 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 approval of the proposed change will not be inimical to the common defense and security or to the health and safety of the public.

4.2 Precedent

The Technical Specifications developed for the Westinghouse AP600 and AP1000 advanced reactor designs incorporate an LCO for RCS Dose Equivalent XE-133 activity in place of the LCO on gross-specific activity based on $\bar{E}$ - Average Disintegration Energy. This approach was approved by the NRC for the AP600 in NUREG-1512, "Final Safety Evaluation Report Related to the Certification of the AP600 Standard Design, Docket No. 52-003," dated August 1998 (ADAMS Accession No. ML081160453), and for the AP1000 in the NRC letter to Westinghouse Electric Company dated September 13, 2004 (ADAMS Accession No. ML042540268). In addition, the curve describing the maximum allowable iodine concentration during the 48-hour period of elevated activity as a function of power level was not included in the Technical Specifications approved for the AP600 and AP1000 advanced reactor designs.

4.3 No Significant Hazards Consideration

The proposed change replaces the current limits on primary coolant gross specific activity with limits on primary coolant noble gas activity. The noble gas activity would be based on Dose Equivalent XE–133 and would take into account only the noble gas activity in the primary coolant.

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

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

Response: No

Reactor coolant specific activity is not an initiator for any accident previously evaluated. The Completion Time when primary coolant gross activity is not within limit is not an initiator for any accident previously evaluated. The current variable limit on primary coolant iodine concentration is not an initiator to any accident previously evaluated. As a result, the proposed change does not significantly increase the probability of an accident.

The proposed change will limit primary coolant noble gases to concentrations consistent with the accident analyses. The proposed change to the Completion Time has no impact on the consequences of any design basis accident since the consequences of an accident during the extended Completion Time are the same as the consequences of an accident during the current Completion Time. As a result, the consequences of any accident previously evaluated are not significantly increased.

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

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

Response: No

The proposed change in specific activity limits does not alter any physical part of the plant nor does it affect any plant operating parameter. The change does not create the potential for a new or different kind of accident from any previously calculated.

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

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

Response: No

The proposed change revises the limits on noble gas radioactivity in the primary coolant. The proposed change is consistent with the assumptions in the safety analyses and will ensure the monitored values protect the initial assumptions in the safety analyses.

Therefore, the proposed change does not involve a significant reduction in a margin of safety.

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. ENVIRONMENTAL CONSIDERATION

A review has determined that the proposed change 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 change does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluents 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.

6. REFERENCES

None

Revised Model Application for Adoption of TSTF-490

[DATE] 10 CFR 50.90

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

SUBJECT: PLANT NAME
DOCKET NO. 50-[xxx]
APPLICATION TO REVISE TECHNICAL SPECIFICATIONS TO ADOPT TSTF-490, REVISION 1, "DELETION OF E-BAR DEFINITION AND REVISION TO RCS SPECIFIC ACTIVITY TECH SPEC"

Dear Sir or Madam:

Pursuant to 10 CFR 50.90, [LICENSEE] is submitting a request for an amendment to the Technical Specifications (TS) for [PLANT NAME, UNIT NOS.].

The proposed changes would replace the current pressurized water reactor (PWR) Technical Specification (TS) 3.4.16 limit on reactor coolant system (RCS) gross specific activity with a new limit on RCS noble gas specific activity. The noble gas specific activity limit would be based on a new dose equivalent Xe-133 definition that would replace the current E-Bar average disintegration energy definition. In addition, the current dose equivalent I-131 definition would be revised to allow the use of additional thyroid dose conversion factors (DCFs).

The changes are consistent with NRC-approved Industry Technical Specification Task Force (TSTF) Standard Technical Specification Change Traveler, TSTF-490, Revision 1, "Deletion of E-Bar Definition and Revision to RCS Specific Activity Tech Spec." The availability of this TS improvement was announced in the Federal Register on [DATE] ([ ]FR[ ]) as part of the consolidated line item improvement process (CLIIP).

Attachment 1 provides a description and assessment of the proposed changes. Attachment 2 provides the existing TS pages marked to show the proposed changes. Attachment 3 provides revised (clean) TS pages. Attachment 4 provides existing TS Bases pages for information marked to show the proposed changes.

Approval of the proposed amendment is requested by [date]. Once approved, the amendment shall be implemented within [ ] days.

In accordance with 10 CFR 50.91, a copy of this application, with attachments, is being provided to the designated [STATE] Official.

[In accordance with 10 CFR 50.30(b), a license amendment request must be executed in a signed original under oath or affirmation. This can be accomplished by attaching a notarized affidavit confirming the signature authority of the signatory, or by including the following statement in the cover letter: "I declare under penalty of perjury that the foregoing is true and correct. Executed on (date)." The alternative statement is pursuant to 28 USC 1746. It does not require notarization.]

If you should have any questions regarding this submittal, please contact [NAME, TELEPHONE NUMBER].

Sincerely,

[Name, Title]

Attachments:
1. Description and Assessment
2. Proposed Technical Specification Changes (Mark-Up)
3. Revised Technical Specification Pages
4. Proposed Technical Specification Bases Changes (Mark-Up)

cc: NRC Project Manager
NRC Regional Office
NRC Resident Inspector
State Contact

ATTACHMENT 1 - DESCRIPTION AND ASSESSMENT

1.0 DESCRIPTION

This letter is a request to amend Operating License(s) [LICENSE NUMBER(S)] for [PLANT/UNIT NAME(S)].

The proposed changes would replace the current limits on primary coolant gross specific activity with limits on primary coolant noble gas activity. The noble gas activity would be based on DOSE EQUIVALENT XE-133 and would take into account only the noble gas activity in the primary coolant.

The proposed amendment is consistent with TSTF-490, Revision 1, "Deletion of E-Bar Definition and Revision to RCS Specific Activity Tech Spec." The changes were approved by the NRC staff Safety Evaluation (SE) dated [DATE] (ADAMS XXXXXXXX) (Reference 1). Technical Specification Task Force (TSTF) Traveler TSTF–490, Revision 1, "Deletion of E Bar Definition and Revision to RCS Specific Activity Tech Spec," was announced for availability in the Federal Register on [DATE] (XX CFR XXXX).

2.0 ASSESSMENT

2.1 Applicability of Published Safety Evaluation

[LICENSEE] has reviewed the model safety evaluation dated [DATE] as part of the Federal Register Notice of Availability. This review included a review of the NRC staff's evaluation, as well as the information provided in TSTF-490. [As described in the subsequent paragraphs,] [LICENSEE] has concluded that the justifications presented in TSTF-490 and the model safety evaluation prepared by the NRC staff are applicable to [PLANT, UNIT NOS.] and justify this amendment for the incorporation of the changes to the [PLANT] TS.

2.2 Optional Changes and Variations

[LICENSEE is not proposing any variations or deviations from the TS changes described in the TSTF-490, Revision 1, or the applicable parts of the NRC staff's model safety evaluation dated [DATE].] [LICENSEE is proposing the following variations from the TS changes described in the TSTF-490, Revision 1, or the applicable parts of the NRC staff's model safety evaluation dated [DATE].]

[The [PLANT] TS utilize different [numbering][and][titles] than the Standard Technical Specifications on which TSTF-490 was based. Specifically, [describe differences between the plant-specific TS numbering and/or titles and the TSTF-490 numbering and titles.] These differences are administrative and do not affect the applicability of TSTF-490 to the [PLANT] TS.]

[The [PLANT] TS include a Surveillance Frequency Control Program. Therefore, the periodic Surveillance Frequencies shown in TSTF-490 are replaced with the statement, "In accordance with the Surveillance Frequency Control Program."]

2.3 Licensee Verifications and Plant-Specific Information

[LICENSEE] has analyzed the consistency of the proposed, current, and/or revised definitions for both Dose Equivalent I-131 and Dose Equivalent Xe-133, and their limits, and the dose conversion factors (DCFs) used for the determination of Dose Equivalent I-131 and Dose Equivalent Xe-133 surveillance limits. The site-specific limits for both Dose Equivalent Xe-133 and Dose Equivalent I-131, the DCFs, and the RCS radioistopic concentrations, are consistent with the current design basis dose analyses (Steam Generator Tube Rupture (SGTR) [and Main Steam Line Break (MSLB)] of [PLANT, UNIT NOS.]. Other DCFs may be used in the analysis of other events, but those DCFs are not used to calculate the limits in LCO [3.4.16], "RCS Specific Activity."

[The acceptability for the pre-accident and concurrent iodine spike source terms to be based on [RG 1.109] DCFs, and the doses to be calculated using [Federal Guidance Report No. 11 (FGR-11)], was submitted and approved in [DATE, ACCESSION NO.], [as supplemented by response to requests of additional information dated [DATE, ACCESSION NO.],] and approved in Amendments [AMENDMENT NOS.], dated [DATE, ACCESSION NOS.]. In addition, RG 1.183 requires that the pre-accident and concurrent iodine spikes used in design basis accident (DBA) analysis be based on the maximum value permitted by the TSs, which is [60] µCi/gm for [PLANT, UNIT NOS.]. The [PLANT, UNIT NOS.], [MSLB and] SGTR accidents are analyzed using the maximum allowed reactor coolant system activity. Dose conversion factors from [FGR-11] are used to calculate the TEDE consequences described using the guidance from RG 1.183, while the [1.0] µCi/gm Dose Equivalent I-131 inventory is calculated using [RG 1.109] dose conversion factors. [Regulatory Guide 1.109] DCFs result in a lower total allowable iodine inventory in the RCS than would be attainable using [FGR-11] DCFs.

The DCFs used to determine dose from iodine and the calculation of Dose Equivalent I-131 are from [TID-14844] [RG 1.109, Rev. 1] [ICRP-30] [FGR-11, Table 2.1] [FGR-11, Table 2.1 effective dose equivalents (EDE) and committed dose equivalent (CEDE)]. Dose Equivalent I-131 is that concentration of I 131 (microcuries per gram) that alone would produce the same dose when inhaled as the combined activities of iodine isotopes I-131, I-132, I-133, I-134, and I-135 actually present.

The DCFs used to determine dose from noble gases and the calculation of Dose Equivalent Xe-133 are from [Federal Guidance Report No. 12 (FGR-12)][ICRP Publication 38]. Dose Equivalent Xe-133 is 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-8Sm, 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 will be assumed to be present at the minimum detectable activity. The calculation of Dose Equivalent Xe-133 is shown below.

Primary Coolant Source Term, DCF, and Dose Equivalent Xe-133 Activity

Nuclide	[1%] Failed Fuel, μCi/gm	DCF	XE-133 Dose Equivalence Factors	[1%] Failed Fuel, μCi/gm	% of Dose Equivalent Xe-133 Limit
[Kr-85					
Kr-85m					
Kr-87					
Kr-88					
Xe-131m					
Xe-133m					
Xe-133					
Xe-135m					
Xe-135					
Xe-138]					

Total Dose Equivalent Xenon (Dose Equivalent Xe-133) [ ]

The [PLANT, UNIT NOS.] RCS mass is ~[RCS MASS] lbm at maximum pressurizer level. This mass translates into [MASS IN GRAMS] grams. Thus, the dose equivalent I-131 concentration in the RCS is ([Total Dose Equivalent I-131 Curies] / [RCS Mass in Grams] g) x 1E+06 μCi/Ci = [Calculated Dose Equivalent I-131 Value] μCi/g. The dose equivalent Xe-133 (Dose Equivalent Xe-133) concentration in the RCS is ([Total Dose Equivalent Xe-133 Curies] Ci / [RCS Mass in Grams] g) x 1E+06 μCi/Ci = [Calculated Dose Equivalent Xe-133 Value] μCi/g. A Dose Equivalent I-131 value of [1.0] μCi/g and a Dose Equivalent Xe-133 value of [280] μCi/g have been conservatively chosen for the proposed TS change.

[Licensee] has reviewed the MSLB and SGTR analyses to determine the appropriate Applicability for LCO 3.4.16. Based on this review, [Licensee] has determined that a Mode of Applicability of [Modes 1 and 2, Mode 3 with RCS average temperature (Tavg) ≥ 500°F] [Modes 1, 2, 3, and 4] is necessary to limit the potential radiological consequences of an SGTR [or MSLB] that may occur during these Modes. [For operation in Mode 3 with RCS average temperature < 500°F, and in Modes 4 and 5, the release of radioactivity in the event of an SGTR is unlikely since the saturation pressure of the reactor coolant is below the lift pressure settings of the atmospheric dump valves and main steam safety valves.]

[SR 3.4.16.1 has been modified by the addition of a Note which requires verification of Dose Equivalent Xe-133 only in Modes 1, 2, and 3 with RCS average temperature ≥ 500°F. This Note allows entry into and operation in Mode 4 and Mode 3 with RCS average temperature < 500 °F prior to performing the SR. The [PLANT, UNIT NOS.] reactor coolant sample system is not designed to accommodate a total gas sample in lower Modes of operation. [DESCRIBE SAMPLE SYSTEM INTERFACE WITH RCS,] The necessary sample flow paths are either not in-service or there is insufficient pressure to obtain the necessary sample flow from this sample point in Mode 4 and in Mode 3 with RCS temperature < 500°F. In most startup and shutdown scenarios, operation in Mode 4 is usually minimal and the plant would be out of the Mode of Applicability for this TS before 7 days elapsed. However, the plant must maintain the flexibility to operate in Mode 4 for greater than 7 days. If the Dose Equivalent Xe-133 surveillance were

adopted for Mode 4 and should operation in Mode 4 extend beyond 7 days, the plant would need to exit the Mode of Applicability for this TS. This allowance is acceptable because an MSLB or SGTR, while possible in the lower Modes of operation, are low likelihood events. In addition, the intent of the surveillance is to detect elevated levels of radionuclides in the RCS. Given that iodine is the dominant contributor in the dose analysis, and that the plant will sample for it in Mode 4, the proposed changes are acceptable.]

3.0 REGULATORY ANALYSIS

3.1 No Significant Hazards Consideration Determination

[LICENSEE] requests adoption of TSTF-490, Revision 1, "Deletion of E-Bar Definition and Revision to RCS Specific Activity Tech Spec," which is an approved change to the standard technical specifications (STS), into the [PLANT NAME, UNIT NOS] technical specifications (TS). The proposed changes would replace the current limits on primary coolant gross specific activity with limits on primary coolant noble gas activity. The noble gas activity would be based on DOSE EQUIVALENT XE-133 and would take into account only the noble gas activity in the primary coolant.

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

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

   Response: No.

   Reactor coolant specific activity is not an initiator for any accident previously evaluated. The Completion Time when primary coolant gross activity is not within limit is not an initiator for any accident previously evaluated. The current variable limit on primary coolant iodine concentration is not an initiator to any accident previously evaluated. As a result, the proposed change does not significantly increase the probability of an accident. The proposed change will limit primary coolant noble gases to concentrations consistent with the accident analyses. The proposed change to the Completion Time has no impact on the consequences of any design basis accident since the consequences of an accident during the extended Completion Time are the same as the consequences of an accident during the current Completion Time. As a result, the consequences of any accident previously evaluated are not significantly increased.

   Therefore, it is concluded that this change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

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

   Response: No.

The proposed change in specific activity limits does not alter any physical part of the plant nor does it affect any plant operating parameter. The change does not create the potential for a new or different kind of accident from any previously calculated.

Therefore, it is concluded that this change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

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

   Response: No.

   The proposed change revises the limits on noble gas radioactivity in the primary coolant. The proposed change is consistent with the assumptions in the safety analyses and will ensure the monitored values protect the initial assumptions in the safety analyses.

   Therefore, it is concluded that this change does not involve a significant reduction in a margin of safety.

Based on the above, [LICENSEE] concludes that the proposed change presents no 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.

4.0 ENVIRONMENTAL EVALUATION

The proposed change 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 change does not involve (i) a significant hazards consideration, (ii) a significant change in the types or 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 change 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 change.

Attachment 2 - Proposed Technical Specification Changes (Mark-Up)

Attachment 3 - Revised Technical Specification Pages

Attachment 4 - Proposed Technical Specification Bases Changes (Mark-Up)
(For Information Only)

1.1 Definitions

CHANNEL CHECK (continued)

the channel indication and status to other indications or status derived from independent instrument channels measuring the same parameter.

CHANNEL FUNCTIONAL TEST

A CHANNEL FUNCTIONAL TEST shall be the injection of a simulated or actual signal into the channel as close to the sensor as practicable to verify OPERABILITY of all devices in the channel required for channel OPERABILITY.

The ESFAS CHANNEL FUNCTIONAL TEST shall also include testing of ESFAS safety related bypass functions for each channel affected by bypass operation. The CHANNEL FUNCTIONAL TEST may be performed by means of any series of sequential, overlapping, or total steps.

CONTROL RODS

CONTROL RODS shall be all full length safety and regulating rods that are used to shut down the reactor and control power level during maneuvering operations.

CORE ALTERATION

CORE ALTERATION 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 unit specific document that provides cycle specific parameter limits for the current reload cycle. These cycle specific 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 [Table III of TID-14844, AEC, 1962, "Calculation of Distance Factors for Power and Test Reactor Sites," or those listed in Table E-7 of Regulatory Guide 1.109, Rev. 1, NRC, 1977, or ICRP 30, Supplement to Part 1, page 192-212, table titled, "Committed Dose Equivalent in Target Organs or Tissues per Intake of Unit Activity"].~~ DOSE EQUIVALENT I-131 shall be that concentration of I-131 (microcuries per gram) that alone would produce the same 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

---------- Reviewer's Note ----------
The thyroid dose conversion factors to be listed are those assumed in the steam generator tube rupture analysis and, if limiting, the steam line break analysis and must be those factors used to calculate the limit in LCO 3.4.16, "RCS Specific Activity." The first set of thyroid dose conversion factors shall be used for plants licensed to 10 CFR 100.11. The following Committed Dose Equivalent (CDE) or Committed Effective Dose Equivalent (CEDE) conversion factors should be used for plants licensed to 10 CFR 50.67.

[thyroid dose conversion factors from:

a. Table III of TID-14844, AEC, 1962, "Calculation of Distance Factors for Power and Test Reactor Sites," or

b. Table E-7 of Regulatory Guide 1.109, Rev. 1, NRC, 1977, or

c. ICRP-30, 1979, Supplement to Part 1, page 192-212, Table titled, "Committed Dose Equivalent in Target Organs or Tissues per Intake of Unit Activity," or

d. 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."

OR

Committed Dose Equivalent (CDE) or Committed Effective Dose Equivalent (CEDE) dose conversion factors from Table 2.1 of EPA Federal Guidance Report No. 11.]

DOSE EQUIVALENT XE-133

---------- Reviewer's Note ----------
The thyroid dose conversion factors to be listed are those assumed in the steam generator tube rupture analysis and, if limiting, the steam line break analysis and must be those factors used to calculate the limit in LCO 3.4.16, "RCS Specific Activity."

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, 1993, "External Exposure to Radionuclides in Air, Water, and Soil" or the average gamma disintegration energies as provided in ICRP Publication 38, "Radionuclide Transformations" or similar source].

1.1 Definitions

~~Ē - AVERAGE DISINTEGRATION ENERGY~~	~~Ē 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 > [15] minutes, making up at least 95% of the total noniodine activity in the coolant.~~
EMERGENCY FEEDWATER INITIATION AND CONTROL (EFIC) RESPONSE TIME	The EFIC RESPONSE TIME shall be that time interval from when the monitored parameter exceeds its EFIC actuation setpoint at the channel sensor until the emergency feedwater equipment is capable of performing its function (i.e., valves travel to their required positions, pumps discharge pressures reach their required values, etc.). Times shall include diesel generator starting and sequence loading delays, where applicable. The response time may be measured by means of any series of sequential, overlapping, or total steps so that the entire response time is measured.
ENGINEERED SAFETY FEATURE (ESF) RESPONSE TIME	The ESF RESPONSE TIME shall be that time interval from when the monitored parameter exceeds its ESF actuation setpoint at the channel sensor until the ESF equipment is capable of performing its safety function (i.e., the valves travel to their required positions, pump discharge pressures reach their required values, etc.). Times shall include diesel generator starting and sequence loading delays, where applicable. The response time may be measured by means of any series of sequential, overlapping, or total steps so that the entire response time is measured.
LEAKAGE	LEAKAGE shall be: a. <u>Identified LEAKAGE</u> 1. LEAKAGE, such as that from pump seals or valve packing (except RCP seal water injection or leakoff), that is captured and conducted to collection systems or a sump or collecting tank, 2. LEAKAGE into the containment atmosphere from sources that are both specifically located and known either not to interfere with the operation of leakage detection systems or not to be pressure boundary LEAKAGE, or

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.16 RCS Specific Activity

LCO 3.4.16 ~~The specific activity of the reactor coolant shall be within limits.~~ RCS DOSE EQUIVALENT I-131 and DOSE EQUIVALENT XE-133 specific activity shall be within limits.

APPLICABILITY: MODES 1[~~and~~ 2, 3 and 4.]
[MODE 3 with RCS average temperature (T_{avg}) ≥ 500°F.]

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. DOSE EQUIVALENT I-131 ~~> 1.0 µCi/gm~~ not within limit.	----------NOTE---------- LCO 3.0.4.c is applicable. ---------- A.1 Verify DOSE EQUIVALENT I-131 ~~within the acceptable region of Figure 3.4.16-1~~ ≤ [60] µCi/gm. AND A.2 Restore DOSE EQUIVALENT I-131 to within limit.	Once per 4 hours 48 hours
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

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~B~~C. Required Action and associated Completion Time of Condition A or B not met. OR DOSE EQUIVALENT I-131 > [60] µCi/gm~~in unacceptable region of Figure 3.4.16-1~~.	~~B~~C.1 Be in MODE 3 [with T_{avg} < 500°F.] [AND C.2 Be in MODE 5.]	6 hours [36 hours]
~~C. Gross specific activity of the coolant not within limit.~~	~~C.1 Be in MODE 3 with T_{avg} < 500°F.~~	~~6 hours~~

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.16.1	~~Verify reactor coolant gross specific activity ≤ 100/$\bar{E}$ µCi/gm.~~ [----------NOTE---------- Only required to be performed in MODE 1 and 2, MODE 3 with RCS average temperature ≥ 500 °F. ----------] Verify reactor coolant DOSE EQUIVALENT XE-133 specific activity ≤ [280] µCi/gm.	7 days

SURVEILLANCE		FREQUENCY
SR 3.4.16.2	~~NOTE~~ ~~Only required to be performed in MODE 1.~~ Verify reactor coolant DOSE EQUIVALENT I-131 specific activity ≤ [1.0] μCi/gm.	14 days AND Between 2 and 6 hours after THERMAL POWER change of ≥ 15% RTP within a 1 hour period
~~SR 3.4.16.3~~	~~NOTE~~ ~~Not required to be performed until 31 days after a minimum of 2 EFPD and 20 days of MODE 1 operation have elapsed since the reactor was last subcritical for ≥ 48 hours.~~ ~~Determine $\bar{E}$.~~	~~184 days~~

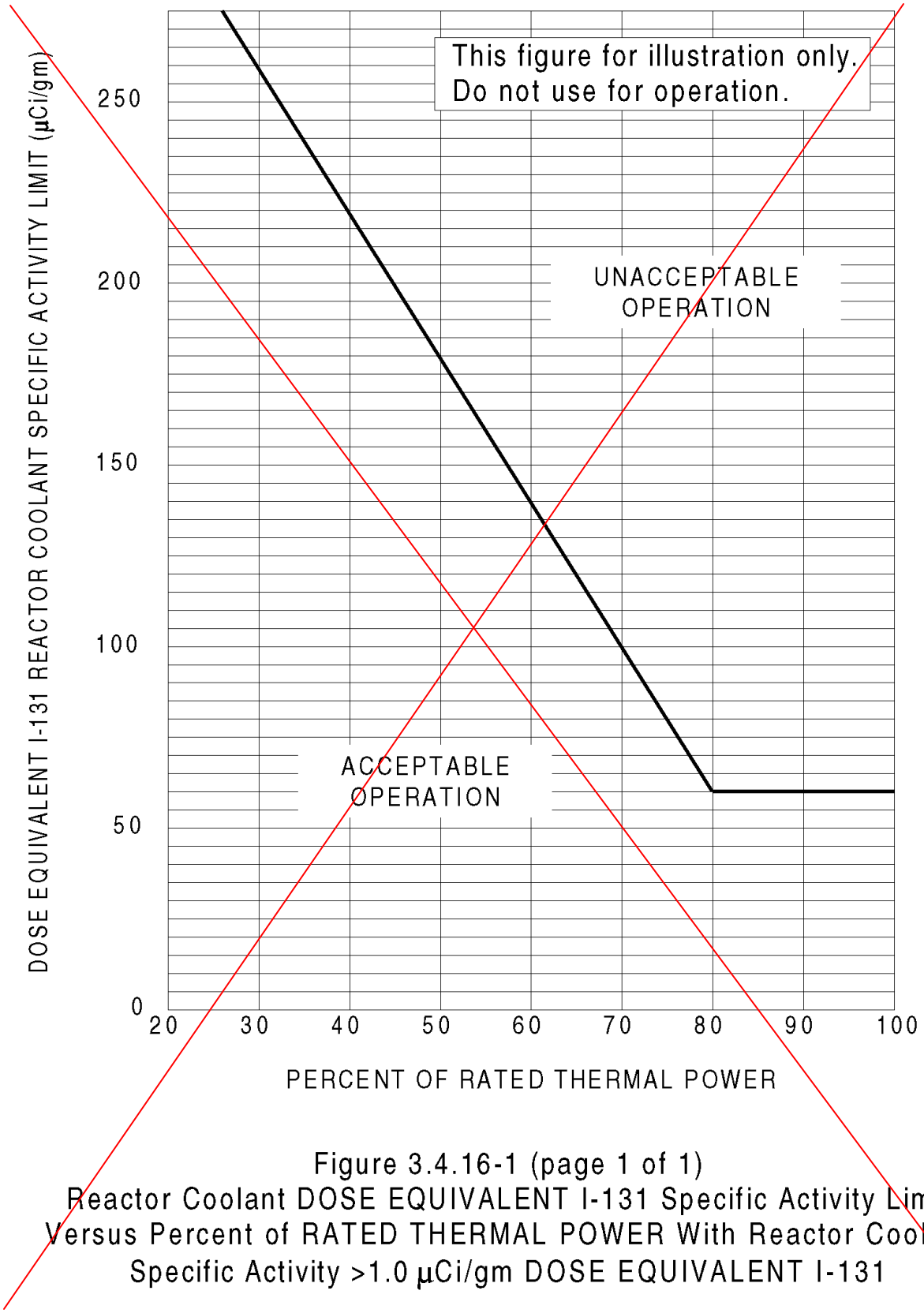

Figure 3.4.16-1 (page 1 of 1)
Reactor Coolant DOSE EQUIVALENT I-131 Specific Activity Limit
Versus Percent of RATED THERMAL POWER With Reactor Coolant
Specific Activity >1.0 µCi/gm DOSE EQUIVALENT I-131

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.16 RCS Specific Activity

BASES

BACKGROUND

----------REVIEWER'S NOTE----------
The bracketed information related to Steam Line Break must be incorporated for those licensees whose accident analyses show the Steam Line Break to be a limiting contributor to offsite and control room dose consequences.

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][10 CFR 50.67] (Ref. 1). 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).

APPLICABLE SAFETY ANALYSES

The LCO limits on the specific activity of the reactor coolant ensure that the resulting offsite and control room doses meet the appropriate SRP acceptance criteria following a [SLB or]SGTR accident. The safety analysis[es] (Ref[s. 3 and 4]) assume[s] 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 analysis[es] assume[s] the specific activity of the secondary coolant is at its limit of [0.1] μCi/gm DOSE EQUIVALENT I-131 from LCO 3.7.17, "Secondary Specific Activity."

The analysis[es] for the [SLB and] SGTR accident[s] establish[es] the acceptance limits for RCS specific activity utilizing the dose conversion factors assumed in the [SLB and] SGTR accident analysis[es], which are given in the definition of DOSE EQUIVALENT I-131 and DOSE EQUIVALENT XE-133. Reference to this[ese] analysis[es] is used to assess changes to the unit that could affect RCS specific activity, as it[they] relates[relate] to the acceptance limits.

BASES

APPLICABLE SAFETY ANALYSES (continued)

The safety analysis[es] consider[s] 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 [280] 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.

[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 [1.0] μCi/gm DOSE EQUIVALENT I-131, and the noble gas specific activity in the reactor coolant is limited to [280] μCi/gm DOSE EQUIVALENT XE-133. The limits on specific activity ensure that offsite and control room doses will meet the appropriate SRP acceptance criteria (Ref. 2).

BASES

LCO (continued)

The [SLB and]SGTR accident analysis[es] (Ref[s. 3 and 4]) show[s] that the doses calculated using the dose conversion factors in the definitions of DOSE EQUIVALENT I-131 and DOSE EQUIVALENT XE-133 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 SRP acceptance criteria (Ref. 2).

APPLICABILITY

----------REVIEWER'S NOTE----------
The Applicability is based on the licensee's safety analyses. The Applicability of "MODES 1, 2, 3, and 4" is applicable when the SLB accident is the limiting contributor to offsite and control room dose consequences in these Modes. The Applicability of "MODES 1, 2, and MODE 3 with RCS average temperature (T_{avg}) $\geq$ 500°F" is applicable if the SLB accident is not the limiting contributor to offsite and control room dose consequences.

In MODES 1, 2, [3, and 4][and MODE 3 with RCS average temperature (T_{avg}) $\geq$ 500°F], 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 SRP acceptance criteria (Ref. 2).

[[For operation in MODE 3 with RCS average temperature < 500°F, and in MODES 4 and 5, the release of radioactivity in the event of an SGTR is unlikely since the saturation pressure of the reactor coolant is below the lift pressure settings of the atmospheric dump valves and main steam safety valves.]

[In MODES 5 and 6, the steam generators are not being used for decay heat removal, the RCS and steam generators are depressurized, and primary to secondary leakage is minimal. Therefore, the monitoring of RCS specific activity is not required.]]

ACTIONS

A.1 and A.2

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.

BASES

ACTIONS (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.

A Note permits the use of the provisions of LCO 3.0.4.c. This allowance permits entry into the applicable MODE(S), relying on Required Actions A.1 and A.2 while the DOSE EQUIVALENT I-131 LCO limit is not met. This allowance is 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.

B.1

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.

A Note permits the use of the provisions of LCO 3.0.4.c. This allowance permits entry into the applicable MODES(S), relying on Required Action B.1 while the DOSE EQUIVALENT XE-133 LCO limit is not met. This allowance is 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.

C.1 [and C.2]

If the Required Action and associated Completion Time of Condition A or B is not met, or if the DOSE EQUIVALENT I-131 is > [60.0] µCi/gm, the reactor must be brought to MODE 3 [with T_{avg} < 500°F]within 6 hours [and MODE 5 within 36 hours]. The allowed Completion Time[s] [is][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.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.16.1

SR 3.4.16.1 requires performing a gamma isotopic analysis and calculating the DOSE EQUIVALENT XE-133 using the dose conversion factors in the DOSE EQUIVALENT XE-133 definition 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.

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.

----------REVIEWER'S NOTE----------
The Note allowing entrance and operation in MODE 4 and MODE 3 with RCS average temperature < 500 °F is necessary when the Applicability includes MODE 4 and only for those plant designs that do not support obtaining a total gas sample in lower Modes of operation. This allowance is acceptable because the plant samples for iodine in Mode 4, which is the dominant contributor in the dose analysis.

[A Note modifies the SR to allow entry into and operation in MODE 4, MODE 3 with RCS average temperature < 500 °F prior to performing the SR. This allows the establishment of the necessary plant conditions to produce sufficient sample flow.]

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.4.16.2

This Surveillance is performed to ensure iodine specific activity, calculated using the dose conversion factors in the DOSE EQUIVALENT I-131 definition, 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 $\geq$ 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.

REFERENCES

---------- Reviewer's Note ----------
The first listed References 1 and 2 are for plants that are licensed to 10 CFR 100.11. The second set of References are for plants that are licensed to 10 CFR 50.67.

[1. 10 CFR 100.11.

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

1. 10 CFR 50.67.

2. Standard Review Plan (SRP) Section 15.0.1 "Radiological Consequence Analyses Using Alternative Source Terms."]

3. [FSAR, Section [15.1.5].

4.] FSAR, Section [15.6.3].

1.1 Definitions

CHANNEL CHECK	A CHANNEL CHECK shall be the qualitative assessment, by observation, of channel behavior during operation. This determination shall include, where possible, comparison of the channel indication and status to other indications or status derived from independent instrument channels measuring the same parameter.
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 OPERABILITY of all devices in the channel required for channel OPERABILITY. The COT shall include adjustments, as necessary, of the required alarm, interlock, and trip setpoints required for channel OPERABILITY such that the setpoints are within the necessary range and accuracy. The COT may be performed by means of any series of sequential, overlapping, or total channel steps.
CORE ALTERATION	CORE ALTERATION 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 unit 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 [Table III of TID-14844, AEC, 1962, "Calculation of Distance Factors for Power and Test Reactor Sites," or those listed in Table E-7 of Regulatory Guide 1.109, Rev. 1, NRC, 1977, or ICRP 30, Supplement to Part 1, page 192-212, Table titled, "Committed Dose Equivalent in Target Organs or Tissues per Intake of Unit Activity"].~~ DOSE EQUIVALENT I-131 shall be that concentration of I-131 (microcuries per gram) that alone would produce the same 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

---------- Reviewer's Note ----------
The thyroid dose conversion factors to be listed are those assumed in the steam generator tube rupture analysis and, if limiting, the steam line break analysis and must be those factors used to calculate the limit in LCO 3.4.16, "RCS Specific Activity." The first set of thyroid dose conversion factors shall be used for plants licensed to 10 CFR 100.11. The following Committed Dose Equivalent (CDE) or Committed Effective Dose Equivalent (CEDE) conversion factors should be used for plants licensed to 10 CFR 50.67.

[thyroid dose conversion factors from:

a. Table III of TID-14844, AEC, 1962, "Calculation of Distance Factors for Power and Test Reactor Sites," or

b. Table E-7 of Regulatory Guide 1.109, Rev. 1, NRC, 1977, or

c. ICRP-30, 1979, Supplement to Part 1, page 192-212, Table titled, "Committed Dose Equivalent in Target Organs or Tissues per Intake of Unit Activity," or

d. 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."

OR

Committed Dose Equivalent (CDE) or Committed Effective Dose Equivalent (CEDE) dose conversion factors from Table 2.1 of EPA Federal Guidance Report No. 11.]

DOSE EQUIVALENT XE-133

---------- Reviewer's Note ----------
The thyroid dose conversion factors to be listed are those assumed in the steam generator tube rupture analysis and, if limiting, the steam line break analysis and must be those factors used to calculate the limit in LCO 3.4.16, "RCS Specific Activity."

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, 1993, "External Exposure to Radionuclides in Air, Water, and Soil" or the average gamma disintegration energies as provided in ICRP Publication 38, "Radionuclide Transformations" or similar source].

1.1 Definitions

~~Ē - AVERAGE DISINTEGRATION ENERGY~~	~~Ē 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 > [15] minutes, making up at least 95% of the total noniodine activity in the coolant.~~
ENGINEERED SAFETY FEATURE (ESF) RESPONSE TIME	The ESF RESPONSE TIME shall be that time interval from when the monitored parameter exceeds its actuation setpoint at the channel sensor until the ESF equipment is capable of performing its safety function (i.e., the valves travel to their required positions, pump discharge pressures reach their required values, etc.). Times shall include diesel generator starting and sequence loading delays, where applicable. The response time may be measured by means of any series of sequential, overlapping, or total steps so that the entire response time is measured. In lieu of measurement, response time may be verified for selected components provided that the components and methodology for verification have been previously reviewed and approved by the NRC.
LEAKAGE	LEAKAGE shall be: a. <u>Identified LEAKAGE</u> 1. LEAKAGE, such as that from pump seals or valve packing (except reactor coolant pump (RCP) seal water injection or leakoff), that is captured and conducted to collection systems or a sump or collecting tank, 2. LEAKAGE into the containment atmosphere from sources that are both specifically located and known either not to interfere with the operation of leakage detection systems or not to be pressure boundary LEAKAGE, or 3. Reactor Coolant System (RCS) LEAKAGE through a steam generator (SG) to the Secondary System;

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.16 RCS Specific Activity

LCO 3.4.16 ~~The specific activity of the reactor coolant shall be within limits.~~ RCS DOSE EQUIVALENT I-131 and DOSE EQUIVALENT XE-133 specific activity shall be within limits.

APPLICABILITY: MODES 1[~~and~~ 2, 3 and 4.]
[MODE 3 with RCS average temperature (T_{avg}) ≥ 500°F.]

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. DOSE EQUIVALENT I-131 not within limit~~> 1.0 µCi/gm~~.	----------NOTE---------- LCO 3.0.4.c is applicable. ---------- A.1 Verify DOSE EQUIVALENT I-131 ~~within the acceptable region of Figure 3.4.16-1~~ ≤ [60] µCi/gm. AND A.2 Restore DOSE EQUIVALENT I-131 to within limit.	 Once per 4 hours 48 hours
B. ~~Gross specific activity of the reactor coolant not within limit.~~DOSE EQUIVALENT XE-133 not within limit.	~~----------~~NOTE~~----------~~ LCO 3.0.4.c is applicable. ~~----------~~ B.1 ~~Be in MODE 3 with T_{avg} < 500°F.~~Restore DOSE EQUIVALENT XE-133 to within limit.	 ~~6~~48 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Required Action and associated Completion Time of Condition A or B not met. OR DOSE EQUIVALENT I-131 > [60] µCi/gm~~in the unacceptable region of Figure 3.4.16-1~~.	C.1 Be in MODE 3[with T_{avg} < 500°F.] [AND C.2 Be in MODE 5.]	6 hours [36 hours]

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.16.1	~~Verify reactor coolant gross specific activity ≤ 100/Ē µCi/gm.~~ [----------NOTE---------- Only required to be performed in MODE 1 and 2, MODE 3 with RCS average temperature ≥ 500 °F. ----------] Verify reactor coolant DOSE EQUIVALENT XE-133 specific activity ≤ [280] µCi/gm.	7 days
SR 3.4.16.2	~~----------NOTE---------- Only required to be performed in MODE 1. ----------~~ Verify reactor coolant DOSE EQUIVALENT I-131 specific activity ≤ [1.0] µCi/gm.	14 days AND Between 2 and 6 hours after a THERMAL POWER change of ≥ 15% RTP within a 1 hour period

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
~~SR 3.4.16.3~~	~~----------NOTE----------~~ ~~Not required to be performed until 31 days after a minimum of 2 effective full power days and 20 days of MODE 1 operation have elapsed since the reactor was last subcritical for ≥ 48 hours.~~ ~~----------~~ ~~Determine Ē from a sample taken in MODE 1 after a minimum of 2 effective full power days and 20 days of MODE 1 operation have elapsed since the reactor was last subcritical for ≥ 48 hours.~~	~~184 days~~

Figure 3.4.16-1 (page 1 of 1)
Reactor Coolant DOSE EQUIVALENT I-131 Specific Activity
Limit Versus Percent of RATED THERMAL POWER

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.16 RCS Specific Activity

BASES

BACKGROUND

----------REVIEWER'S NOTE----------
The bracketed information related to Steam Line Break must be incorporated for those licensees whose accident analyses show the Steam Line Break to be a limiting contributor to offsite and control room dose consequences.

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][10 CFR 50.67] (Ref. 1). 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).

APPLICABLE SAFETY ANALYSES

The LCO limits on the specific activity of the reactor coolant ensure that the resulting offsite and control room doses meet the appropriate SRP acceptance criteria following a [SLB or]SGTR accident. The safety analysis[es] (Ref[s. 3 and 4]) assume[s] 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 analysis[es] assume[s] the specific activity of the secondary coolant is at its limit of [0.1] μCi/gm DOSE EQUIVALENT I-131 from LCO 3.7.18, "Secondary Specific Activity."

The analysis[es] for the [SLB and]SGTR accident[s] establish[es] the acceptance limits for RCS specific activity utilizing the dose conversion factors assumed in the [SLB and] SGTR accident analysis[es], which are given in the definition of DOSE EQUIVALENT I-131 and DOSE EQUIVALENT XE-133. Reference to this[ese] analysis[es] is used to assess changes to the unit that could affect RCS specific activity, as it[they] relate[s] to the acceptance limits.

BASES

APPLICABLE SAFETY ANALYSES (continued)

The safety analysis[es] consider[s] 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 [280] μCi/gm DOSE EQUIVALENT XE-133.

The SGTR analysis also assumes a loss of offsite power at the same time as the reactor trip. The SGTR causes a reduction in reactor coolant inventory. The reduction initiates a reactor trip from a low pressurizer pressure signal [or an RCS overtemperature ΔT signal].

The loss of offsite power causes the steam dump valves to close to protect the condenser. The rise in pressure in the ruptured SG discharges radioactively contaminated steam to the atmosphere through the SG power operated relief valves [and the main steam safety valves]. The unaffected SGs remove core decay heat by venting steam to the atmosphere until the cooldown ends and the Residual Heat Removal (RHR) system is placed in service.

[The SLB radiological analysis assumes that offsite power is lost at the same time as the pipe break occurs outside containment. Reactor trip occurs after the generation of an SI signal on low steam line pressure. The affected SG blows down completely and steam is vented directly to the atmosphere. The unaffected SGs remove core decay heat by venting steam to the atmosphere until the cooldown ends and the RHR 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 [1.0] μCi/gm DOSE EQUIVALENT I-131, and the noble gas specific activity in the reactor coolant is limited to [280] μCi/gm DOSE EQUIVALENT XE-133. The limits on specific activity ensure that offsite and control room doses will meet the appropriate SRP acceptance criteria (Ref. 2).

The [SLB and]SGTR accident analysis[es] (Ref[s. 3 and 4]) show[s] that the doses calculated using the dose conversion factors in the definitions of DOSE EQUIVALENT I-131 and DOSE EQUIVALENT XE-133 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 SRP acceptance criteria (Ref. 2).

APPLICABILITY

----------REVIEWER'S NOTE----------
The Applicability is based on the licensee's safety analyses. The Applicability of "MODES 1, 2, 3, and 4" is applicable when the SLB accident is the limiting contributor to offsite and control room dose consequences in these Modes. The Applicability of "MODES 1, 2, and MODE 3 with RCS average temperature (T_{avg}) ≥ 500°F" is applicable if the SLB accident is not the limiting contributor to offsite and control room dose consequences.

In MODES 1, 2, [3, and 4][and MODE 3 with RCS average temperature (T_{avg}) ≥ 500°F], 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 SRP acceptance criteria (Ref. 2).

[[For operation in MODE 3 with RCS average temperature < 500°F, and in MODES 4 and 5, the release of radioactivity in the event of an SGTR is unlikely since the saturation pressure of the reactor coolant is below the lift pressure settings of the atmospheric dump valves and main steam safety valves.]

[In MODES 5 and 6, the steam generators are not being used for decay heat removal, the RCS and steam generators are depressurized, and primary to secondary leakage is minimal. Therefore, the monitoring of RCS specific activity is not required.]]

ACTIONS

A.1 and A.2

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 ≤ [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.

BASES

ACTIONS (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.

A Note permits the use of the provisions of LCO 3.0.4.c. This allowance permits entry into the applicable MODE(S), relying on Required Actions A.1 and A.2 while the DOSE EQUIVALENT I-131 LCO limit is not met. This allowance is 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.

B.1

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.

A Note permits the use of the provisions of LCO 3.0.4.c. This allowance permits entry into the applicable MODES(S), relying on Required Action B.1 while the DOSE EQUIVALENT XE-133 LCO limit is not met. This allowance is 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.

C.1 [and C.2]

If the Required Action and associated Completion Time of Condition A or B is not met, or if the DOSE EQUIVALENT I-131 is > [60.0] µCi/gm, the reactor must be brought to MODE 3 [with T_{avg} < 500°F] within 6 hours [and MODE 5 within 36 hours]. The allowed Completion Time[s] is[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.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.16.1

SR 3.4.16.1 requires performing a gamma isotopic analysis and calculating the DOSE EQUIVALENT XE-133 using the dose conversion factors in the DOSE EQUIVALENT XE-133 definition 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.

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.

----------REVIEWER'S NOTE----------
The Note allowing entrance and operation in MODE 4 and MODE 3 with RCS average temperature < 500 °F is necessary when the Applicability includes MODE 4 and only for those plant designs that do not support obtaining a total gas sample in lower Modes of operation. This allowance is acceptable because the plant samples for iodine in Mode 4, which is the dominant contributor in the dose analysis.

[A Note modifies the SR to allow entry into and operation in MODE 4, MODE 3 with RCS average temperature < 500 °F prior to performing the SR. This allows the establishment of the necessary plant conditions to produce sufficient sample flow.]

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.4.16.2

This Surveillance is performed to ensure iodine specific activity, calculated using the dose conversion factors in the DOSE EQUIVALENT I-131 definition, 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 $\geq$ 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.

REFERENCES

---------- Reviewer's Note ----------
The first listed References 1 and 2 are for plants that are licensed to 10 CFR 100.11. The second set of References are for plants that are licensed to 10 CFR 50.67.

[1. 10 CFR 100.11.

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

1. 10 CFR 50.67.

2. Standard Review Plan (SRP) Section 15.0.1 "Radiological Consequence Analyses Using Alternative Source Terms."]

3. [FSAR, Section [15.1.5].

4.] FSAR, Section [15.6.3].

1.1 Definitions

CHANNEL CHECK	A CHANNEL CHECK shall be the qualitative assessment, by observation, of channel behavior during operation. This determination shall include, where possible, comparison of the channel indication and status to other indications or status derived from independent instrument channels measuring the same parameter.
CHANNEL FUNCTIONAL TEST	A CHANNEL FUNCTIONAL TEST shall be: a. Analog and bistable channels - the injection of a simulated or actual signal into the channel as close to the sensor as practicable to verify OPERABILITY of all devices in the channel required for channel OPERABILITY, and b. Digital computer channels - the use of diagnostic programs to test digital computer hardware and the injection of simulated process data into the channel to verify OPERABILITY of all devices in the channel required for channel OPERABILITY. The CHANNEL FUNCTIONAL TEST may be performed by means of any series of sequential, overlapping, or total channel steps so that the entire channel is tested.
CORE ALTERATION	CORE ALTERATION shall be the movement of any fuel, sources, or reactivity control components [excluding control element assemblies (CEAs) withdrawn into the upper guide structure], 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 unit 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~~ DOSE EQUIVALENT I-131 shall be that concentration of I-131 (microcuries per gram) that alone would produce the same 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

---------- Reviewer's Note ----------
The thyroid dose conversion factors to be listed are those assumed in the steam generator tube rupture analysis and, if limiting, the steam line break analysis and must be those factors used to calculate the limit in LCO 3.4.16, "RCS Specific Activity." The first set of thyroid dose conversion factors shall be used for plants licensed to 10 CFR 100.11. The following Committed Dose Equivalent (CDE) or Committed Effective Dose Equivalent (CEDE) conversion factors should be used for plants licensed to 10 CFR 50.67.

[thyroid dose conversion factors from:

a. Table III of TID-14844, AEC, 1962, "Calculation of Distance Factors for Power and Test Reactor Sites," or

b. Table E-7 of Regulatory Guide 1.109, Rev. 1, NRC, 1977, or

c. ICRP-30, 1979, Supplement to Part 1, page 192-212, Table titled, "Committed Dose Equivalent in Target Organs or Tissues per Intake of Unit Activity," or

d. 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."

OR

Committed Dose Equivalent (CDE) or Committed Effective Dose Equivalent (CEDE) dose conversion factors from Table 2.1 of EPA Federal Guidance Report No. 11.]

DOSE EQUIVALENT XE-133

---------- Reviewer's Note ----------
The thyroid dose conversion factors to be listed are those assumed in the steam generator tube rupture analysis and, if limiting, the steam line break analysis and must be those factors used to calculate the limit in LCO 3.4.16, "RCS Specific Activity."

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, 1993, "External Exposure to Radionuclides in Air, Water, and Soil" or the average gamma disintegration energies as provided in ICRP Publication 38, "Radionuclide Transformations" or similar source].

1.1 Definitions

~~DOSE EQUIVALENT I-131 (continued)~~	
~~[Table III of TID-14844, AEC, 1962, "Calculation of Distance Factors for Power and Test Reactor Sites," or those listed in Table E-7 of Regulatory Guide 1.109, Rev. 1, NRC, 1977, or ICRP 30, Supplement to Part 1, page 192-212, Table titled, "Committed Dose Equivalent in Target Organs or Tissues per Intake of Unit Activity"].~~	
~~$\bar{E}$ - AVERAGE DISINTEGRATION ENERGY~~	~~$\bar{E}$ 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 > [15] minutes, making up at least 95% of the total noniodine activity in the coolant.~~
ENGINEERED SAFETY FEATURE (ESF) RESPONSE TIME	The ESF RESPONSE TIME shall be that time interval from when the monitored parameter exceeds its ESF actuation setpoint at the channel sensor until the ESF equipment is capable of performing its safety function (i.e., the valves travel to their required positions, pump discharge pressures reach their required values, etc.). Times shall include diesel generator starting and sequence loading delays, where applicable. The response time may be measured by means of any series of sequential, overlapping, or total steps so that the entire response time is measured. In lieu of measurement, response time may be verified for selected components provided that the components and methodology for verification have been previously reviewed and approved by the NRC.
LEAKAGE	LEAKAGE shall be: a. <u>Identified LEAKAGE</u> 1. LEAKAGE, such as that from pump seals or valve packing (except reactor coolant pump (RCP) seal water injection or leakoff), that is captured and conducted to collection systems or a sump or collecting tank, 2. LEAKAGE into the containment atmosphere from sources that are both specifically located and known either not to interfere with the operation of leakage detection systems or not to be pressure boundary LEAKAGE, or

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.16 RCS Specific Activity

LCO 3.4.16 ~~The specific activity of the reactor coolant shall be within limits.~~ RCS DOSE EQUIVALENT I-131 and DOSE EQUIVALENT XE-133 specific activity shall be within limits.

APPLICABILITY: MODES 1[~~and~~ 2, 3 and 4]
[MODE 3 with RCS average temperature (T_{avg}) ≥ 500°F.]

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. DOSE EQUIVALENT I-131 ~~> 1.0 µCi/gm~~ not within limit.	----------NOTE---------- LCO 3.0.4.c is applicable. ---------- A.1 Verify DOSE EQUIVALENT I-131 ~~within the acceptable region of Figure 3.4.16-1~~ ≤ [60] µCi/gm. AND A.2 Restore DOSE EQUIVALENT I-131 to within limit.	Once per 4 hours 48 hours
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

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~B~~C. Required Action and associated Completion Time of Condition A or B not met. OR DOSE EQUIVALENT I-131 > [60] µCi/gm~~in the unacceptable region of Figure 3.4.16-1~~.	~~C~~B.1 Be in MODE 3[with T_{avg} < 500°F]. [AND C.2 Be in MODE 5.]	6 hours [36 hours]
~~C. Gross specific activity of the reactor coolant not within limit.~~	~~C.1 Be in MODE 3 with T_{avg} < 500°F.~~	~~6 hours~~

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.16.1	~~Verify reactor coolant gross specific activity ≤ 100/$\bar{E}$ µCi/gm.~~ [----------NOTE---------- Only required to be performed in MODE 1 and 2, MODE 3 with RCS average temperature ≥ 500 °F. ----------] Verify reactor coolant DOSE EQUIVALENT XE-133 specific activity ≤ [280] µCi/gm.	7 days

SURVEILLANCE		FREQUENCY
SR 3.4.16.2	~~----------NOTE----------~~ ~~Only required to be performed in MODE 1.~~ ~~----------~~ Verify reactor coolant DOSE EQUIVALENT I-131 specific activity ≤ [1.0] µCi/gm.	14 days <u>AND</u> Between 2 and 6 hours after THERMAL POWER change of ≥ 15% RTP within a 1 hour period
~~SR 3.4.16.3~~	~~----------NOTE----------~~ ~~Not required to be performed until 31 days after a minimum of 2 EFPD and 20 days of MODE 1 operation have elapsed since the reactor was last subcritical for ≥ 48 hours.~~ ~~----------~~ ~~Determine Ē from a sample taken in MODE 1 after a minimum of 2 EFPD and 20 days of MODE 1 operation have elapsed since the reactor was last subcritical for ≥ 48 hours.~~	~~184 days~~

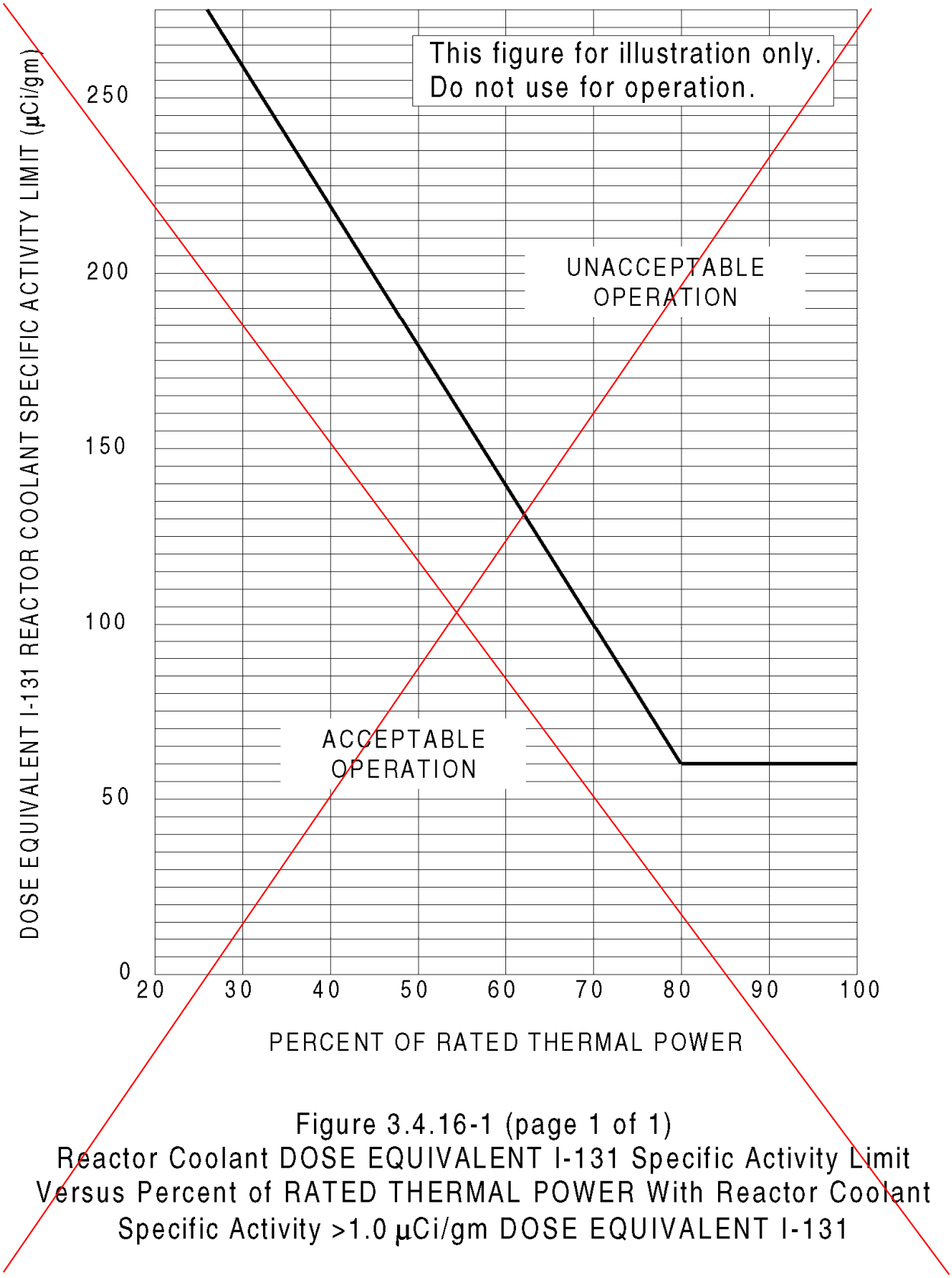

Figure 3.4.16-1 (page 1 of 1)
Reactor Coolant DOSE EQUIVALENT I-131 Specific Activity Limit
Versus Percent of RATED THERMAL POWER With Reactor Coolant
Specific Activity >1.0 µCi/gm DOSE EQUIVALENT I-131

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.16 RCS Specific Activity

BASES

BACKGROUND

----------REVIEWER'S NOTE----------
The bracketed information related to Steam Line Break must be incorporated for those licensees whose accident analyses show the Steam Line Break to be a limiting contributor to offsite and control room dose consequences.

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][10 CFR 50.67] (Ref. 1). 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).

APPLICABLE SAFETY ANALYSES

The LCO limits on the specific activity of the reactor coolant ensure that the resulting offsite and control room doses meet the appropriate SRP acceptance criteria following a [SLB or SGTR]accident. The safety analysis[es] (Ref[s. 3 and 4]) assume[s] 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 analysis[es] assume[s] the specific activity of the secondary coolant is at its limit of [0.1] μCi/gm DOSE EQUIVALENT I-131 from LCO 3.7.19, "Secondary Specific Activity."

The analysis[es] for the[SLB and] SGTR accident[s] establish[es] the acceptance limits for RCS specific activity utilizing the dose conversion factors assumed in the [SLB and] SGTR accident analysis[es], which are given in the definition of DOSE EQUIVALENT I-131 and DOSE EQUIVALENT XE-133. Reference to this[ese] analysis[es] is used to assess changes to the unit that could affect RCS specific activity, as it[they] relate[s] to the acceptance limits.

BASES

APPLICABLE SAFETY ANALYSES (continued)

The safety analysis[es] consider[s] 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 [280] 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 Shutdown Cooling (SDC) system is placed in service.

[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 SDC 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 [1.0] μCi/gm DOSE EQUIVALENT I-131, and the noble gas specific activity in the reactor coolant is limited to [280] μCi/gm DOSE EQUIVALENT XE-133. The limits on specific activity ensure that offsite and control room doses will meet the appropriate SRP acceptance criteria (Ref. 2).

BASES

LCO (continued)

The SLB and SGTR accident analysis[es] (Ref[s. 3 and 4]) show[s] that the doses calculated using the dose conversion factors in the definitions of DOSE EQUIVALENT I-131 and DOSE EQUIVALENT XE-133 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 SRP acceptance criteria (Ref. 2).

APPLICABILITY

----------REVIEWER'S NOTE----------
The Applicability is based on the licensee's safety analyses. The Applicability of "MODES 1, 2, 3, and 4" is applicable when the SLB accident is the limiting contributor to offsite and control room dose consequences in these Modes. The Applicability of "MODES 1, 2, and MODE 3 with RCS average temperature (T_{avg}) $\geq$ 500°F" is applicable if the SLB accident is not the limiting contributor to offsite and control room dose consequences.

In MODES 1, 2, [3, and 4][and MODE 3 with RCS average temperature (T_{avg}) $\geq$ 500°F], 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 SRP acceptance criteria (Ref. 2).

[[For operation in MODE 3 with RCS average temperature < 500°F, and in MODES 4 and 5, the release of radioactivity in the event of an SGTR is unlikely since the saturation pressure of the reactor coolant is below the lift pressure settings of the atmospheric dump valves and main steam safety valves.]

[In MODES 5 and 6, the steam generators are not being used for decay heat removal, the RCS and steam generators are depressurized, and primary to secondary leakage is minimal. Therefore, the monitoring of RCS specific activity is not required.]]

ACTIONS

A.1 and A.2

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.

BASES

ACTIONS (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.

A Note permits the use of the provisions of LCO 3.0.4.c. This allowance permits entry into the applicable MODE(S), relying on Required Actions A.1 and A.2 while the DOSE EQUIVALENT I-131 LCO limit is not met. This allowance is 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.

B.1

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.

A Note permits the use of the provisions of LCO 3.0.4.c. This allowance permits entry into the applicable MODES(S), relying on Required Action B.1 while the DOSE EQUIVALENT XE-133 LCO limit is not met. This allowance is 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.

C.1 [and C.2]

If the Required Action and associated Completion Time of Condition A or B is not met, or if the DOSE EQUIVALENT I-131 is > [60.0] µCi/gm, the reactor must be brought to MODE 3 [with T_{avg} < 500°F]within 6 hours [and MODE 5 within 36 hours]. The allowed Completion Time[s] is[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.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.16.1

SR 3.4.16.1 requires performing a gamma isotopic analysis and calculating the DOSE EQUIVALENT XE-133 using the dose conversion factors in the DOSE EQUIVALENT XE-133 definition 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.

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.

----------REVIEWER'S NOTE----------
The Note allowing entrance and operation in MODE 4 and MODE 3 with RCS average temperature < 500 °F is necessary when the Applicability includes MODE 4 and only for those plant designs that do not support obtaining a total gas sample in lower Modes of operation. This allowance is acceptable because the plant samples for iodine in Mode 4, which is the dominant contributor in the dose analysis.

[A Note modifies the SR to allow entry into and operation in MODE 4, MODE 3 with RCS average temperature < 500 °F prior to performing the SR. This allows the establishment of the necessary plant conditions to produce sufficient sample flow.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.4.16.2

This Surveillance is performed to ensure iodine specific activity, calculated using the dose conversion factors in the DOSE EQUIVALENT I-131 definition, 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 $\geq$ 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.

REFERENCES

---------- Reviewer's Note ----------
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[1. 10 CFR 100.11.

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

1. 10 CFR 50.67.

2. Standard Review Plan (SRP) Section 15.0.1 "Radiological Consequence Analyses Using Alternative Source Terms."]

3. [FSAR, Section [15.1.5].

4.] FSAR, Section [15.6.3].