Union Electric
Callaway Plant

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May 9, 2006

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
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ULNRC-05281

Ladies and Gentlemen:

DOCKET NUMBER 50-483
CALLAWAY PLANT
UNION ELECTRIC CO.
APPLICATION FOR AMENDMENT TO
FACILITY OPERATING LICENSE NPF-30
ADOPTION OF INDUSTRY TRAVELER TSTF-490

AmerenUE

AmerenUE herewith transmits an application for amendment to Facility Operating License Number NPF-30 for the Callaway Plant. The proposed license amendment request (LAR) would revise Technical Specification (TS) 1.1, "Definitions," and TS 3.4.16, "RCS Specific Activity."

The LAR proposes to replace the current 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 (corresponding to the Xenon-133 isotope) that would replace the current Ē - AVERAGE DISINTEGRATION ENERGY definition. In addition, the current DOSE EQUIVALENT I-131 definition (corresponding to the Iodine-131 isotope) would be revised to allow the use of alternate, NRC-approved thyroid dose conversion factors.

This change is being proposed in order to implement an RCS specific activity Limiting Condition for Operation (LCO) that reflects the whole body radiological consequence analysis assumptions. Those assumptions are sensitive to the noble gas activity in the primary coolant, but not to the other, non-gaseous activity currently captured in the Ē definition. The Ē definition includes radioisotopes that decay by the emission of both gamma and beta radiation. Current Condition B of LCO 3.4.16 would rarely, if ever, be entered for exceeding 100/Ē since that value is very high (the denominator is very low) if beta emitters such as H-3 (tritium) and Fluorine-18 (F-18) are included in that value, as required by the Ē definition. In addition, SR 3.4.16.1 requires the measurement of the degassed gamma activities and the gaseous gamma activities in the sample taken for the surveillance, resulting in a questionable

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determination of operability when the result is compared to 100/Ē with its beta-emitting isotopes. This has led to confusion over what to do with the beta-emitters when performing SR 3.4.16.1 and deciding whether Condition B entry is required. Satisfying LCO 3.4.16 should be incumbent upon satisfying the radiological consequence analysis assumptions, something that is not attained with the current construct of the LCO.

AmerenUE is submitting this LAR in conjunction with an industry consortium of six plants as a result of a mutual agreement known as Strategic Teaming and Resource Sharing (STARS). The STARS group consists of the six plants operated by AmerenUE, Wolf Creek Nuclear Operating Corporation, TXU Power, Pacific Gas and Electric Company (PG&E), STP Nuclear Operating Company, and Arizona Public Service Company.

PG&E's Diablo Canyon Power Plant is the lead STARS plant for this amendment request and submitted an amendment application on January 25, 2006. Wolf Creek Nuclear Operating Corporation (on October 27, 2005) and TXU Power (on February 21, 2006) have also submitted license amendment requests similar to this one. These license amendment requests contain plant-specific information presented within brackets (i.e., within [ ]) in Attachment 1 (other than TS LCO numbers which vary between the Standard TS of NUREG-0452, NUREG-1431, and NUREG-1432). All other Attachments are plant- specific in nature.

The TS developed for the Westinghouse AP600 and AP1000 advanced reactor designs utilized an LCO for RCS DOSE EQUIVALENT XE-133 specific activity in place of the LCO on gross specific activity based on Ē. 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 and for the AP1000 in the NRC letter to Westinghouse Electric Company dated September 13, 2004. This license amendment request is based on TSTF-490 which is currently under NRC staff review.

Attachments 1 through 6 provide the Evaluation, Markup of Technical Specifications, Retyped Technical Specifications, Proposed Technical Specification Bases Changes, Draft FSAR Changes, and Summary of Regulatory Commitments, respectively, in support of this amendment request. Attachments 4 and 5 are provided for information only. Final TS Bases changes will be implemented pursuant to TS 5.5.14, "Technical Specifications Bases Control Program," at the time the amendment is implemented. Final FSAR changes will be implemented after this amendment is approved, subject to the updating requirements of 10 CFR 50.71(e). A revision to the Fuel Clad Degradation Emergency Action Levels that reflects the new TS 3.4.16 limits will be made at the time this amendment is implemented.

It has been determined that this amendment application does not involve a significant hazard consideration as determined per 10 CFR 50.92. Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment needs to be prepared in connection with the issuance of this amendment.

The Callaway Onsite Review Committee and a subcommittee of the Nuclear Safety Review Board have reviewed and approved the attached licensing evaluations and have approved the submittal of this amendment application.

The changes in this LAR are not required to address an immediate safety concern. AmerenUE requests approval of this LAR prior to February 1, 2007. AmerenUE further requests that the license amendment be made effective upon NRC issuance, to be implemented within 90 days from the date of issuance. In accordance with 10 CFR 50.91, a copy of this amendment application is being provided to the designated Missouri State official.

If you have any questions on this amendment application, please contact me at (573) 676-8659, or Mr. Dave Shafer at (314) 554-3104.

I declare under penalty of perjury that the foregoing is true and correct.

Very truly yours,

Executed on: May 9, 2006

Keith D. Young

Keith D. Young
Manager, Regulatory Affairs

Attachments

1 - Evaluation
2 - Markup of Technical Specifications
3 - Retyped Technical Specifications
4 - Proposed Technical Specification Bases Changes
5 - Draft FSAR Changes
6 - Summary of Regulatory Commitments

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EVALUATION

EVALUATION

1.0 DESCRIPTION

The proposed amendment would revise Technical Specification (TS) 1.1, "Definitions," and TS 3.4.16, "RCS Specific Activity." The proposed changes would replace the current 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 (DEX) definition that would replace the current Ē - AVERAGE DISINTEGRATION ENERGY definition. In addition, the current DOSE EQUIVALENT I-131 (DEI) definition would be revised to allow alternate, NRC-approved thyroid dose conversion factors.

2.0 PROPOSED CHANGES

The TS Section 1.1 definition for DEI would be revised from:

> "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 derived from the data provided in International Commission on Radiological Protection Publication 30, "Limits for Intakes of Radionuclides by Workers," 1979.]

to

> "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 thyroid dose conversion factors from:
>
> [1) Table III of TID-14844, AEC, 1962, "Calculation of Distance Factors for Power and Test Reactor Sites," or
> 2) Table E-7 of Regulatory Guide 1.109, Revision 1, NRC, 1977, or
> 3) International Commission on Radiological Protection (ICRP) Publication 30, "Limits for Intakes of Radionuclides by Workers," Supplement to Part 1, pages 192-212, Table titled "Committed Dose Equivalent in Target Organs or Tissues per Intake of Unit Activity," 1979, or
> 4) Table 2.1 of EPA Federal Guidance Report No. 11, EPA-520/1-88-020, "Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion," 1988.]"

The TS Section 1.1 definition for Ē - AVERAGE DISINTEGRATION ENERGY would be deleted and replaced with a new definition for DEX which states:

> "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-87, Kr-88, 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, EPA-402-R-93-081, "External Exposure to Radionuclides in Air, Water, and Soil", 1993.]

TS Limiting Condition for Operation (LCO) 3.4.16, "RCS Specific Activity," would be revised from:

> "The specific activity of the reactor coolant shall be within limits."

to

> "RCS DOSE EQUIVALENT I-131 and DOSE EQUIVALENT XE-133 specific activity shall be within limits.

The current TS Figure 3.4.16-1, "Reactor Coolant DOSE EQUIVALENT I-131 Specific Activity Limit Versus Percent of RATED THERMAL POWER" would be deleted.

The Applicability of TS 3.4.16 would be revised from:

> "MODES 1 and 2, MODE 3 with RCS average temperature (T_{avg}) ≥ 500°F."

to

> "MODES 1, 2, 3, and 4."

TS 3.4.16 Condition A would be revised from:

> "DOSE EQUIVALENT I-131 > 1.0 μCi/gm."

to

> "DOSE EQUIVALENT I-131 not within limit."

TS 3.4.16 Required Action A.1 would be revised from:

> "Verify DOSE EQUIVALENT I-131 within the acceptable region of Figure 3.4.16-1."

to

> "Verify DOSE EQUIVALENT I-131 ≤ 60 μCi/gm."

[ ]

TS 3.4.16 Condition B would be revised from:

"Gross specific activity of the reactor coolant > 100/ $\bar{E}$ μCi/gm."

to

"DOSE EQUIVALENT XE-133 not within limit."

TS 3.4.16 Required Action B.1 would be revised from:

"Be in MODE 3 with $T_{avg} < 500°F$."

to

"----------------------------NOTE----------------------------
LCO 3.0.4.c is applicable.

Restore DOSE EQUIVALENT XE-133 to within limit."

TS 3.4.16 Required Action B.1 Completion Time would be revised from "6 hours" to "48 hours."

TS 3.4.16 Condition C would be revised from:

"Required Action and associated Completion Time of Condition A not met.

OR

DOSE EQUIVALENT I-131 in the unacceptable region of Figure 3.4.16-1."

to

"Required Action and associated Completion Time of Condition A or B not met.

OR

DOSE EQUIVALENT I-131 > 60 μCi/gm."

TS 3.4.16 Required Action(s) for Condition C would be revised from:

"C.1 Be in MODE 3 with $T_{avg} < 500°F$."

to

"C.1 Be in MODE 3."

AND

C.2 Be in MODE 5."

TS 3.4.16 Condition C would be revised to add a Completion Time for new Required Action C.2 of "36 hours." The Completion Time for Required Action C.1 would remain 6 hours.

Surveillance Requirement (SR) 3.4.16.1 would be revised from:

"Verify reactor coolant gross specific activity ≤100/ Ē μCi/gm."

to

"------------------------------------NOTE------------------------------------
Only required to be performed in MODE 1.

Verify reactor coolant DOSE EQUIVALENT XE-133 specific activity ≤ [225] μCi/gm."

Current SR 3.4.16.3 would be deleted.

In summary, the proposed changes will revise the definition of DEI, delete the definition of Ē - AVERAGE DISINTEGRATION ENERGY, add a new definition for DEX, revise TS 3.4.16 to specify an LCO limit on DEI, add a new LCO 3.4.16 limit for DEX, increase the Completion Time for Required Action B.1, delete TS Figure 3.4.16-1, and revise the Conditions and Required Actions accordingly. Also, the Applicability of LCO 3.4.16 is extended to reflect the MODES during which pertinent accidents (SGTR or MSLB) could be postulated to occur, SR 3.4.16.1 is revised to verify DEX prior to MODE 1 entry, and SR 3.4.16.3 is deleted.

The TS Bases for LCO 3.4.16 would be revised to expand upon the proposed changes. The TS Bases changes are included for information only.

[Attachments 2 and 3 provide the TS markups reflecting the above changes and the retyped TS. Attachment 4 provides an information-only copy of the associated TS Bases changes. Attachment 5 provides an information-only copy of related FSAR changes. Attachment 6 lists the regulatory commitments associated with this amendment application.]

3.0 BACKGROUND

3.1 Radiological Consequence Analyses

Radiological consequence analyses are performed for the Steam Generator Tube Rupture (SGTR) accident and for the Main Steam Line Break (MSLB) accident since these events involve the release of primary coolant activity. For events that also result in fuel damage (such as locked rotor, rod ejection, and loss-of-coolant accident) as a result of the accident, the dose contribution from the initial activity in the RCS is insignificant. The maximum dose to the whole body and the thyroid 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. The limits on RCS specific activity ensure that the offsite doses are appropriately limited as required by NUREG-0800, "U.S. Nuclear Regulatory Commission Standard Review

Plan," Section 15.1.5, "Steam System Piping Failures Inside and Outside of Containment (PWR)," Appendix A, "Radiological Consequences of Main Steam Line Failures Outside Containment," Revision 2, for MSLB accidents and NUREG-0800, "U.S. Nuclear Regulatory Commission Standard Review Plan," Section 15.6.3, "Radiological Consequences of Steam Generator Tube Failure (PWR)," Revision 2, for SGTR accidents.

The maximum dose to the whole body, or its equivalent to any part of the body, that an individual can receive in the plant control room for the duration of an accident is specified in General Design Criterion 19 (GDC 19) contained in Appendix A to 10 CFR 50. The limits on RCS specific activity ensure that the doses are less than the GDC 19 limits during analyzed transients and accidents, as required by NUREG-0800, "U.S. Nuclear Regulatory Commission Standard Review Plan," Section 6.4, "Control Room Habitability System," Revision 2, and Regulatory Position C.4.5 of NRC Regulatory Guide 1.195, "Methods and Assumptions for Evaluating Radiological Consequences of Design Basis Accidents at Light-Water Nuclear Power Reactors."

The SGTR and MSLB radiological consequence analyses establish the acceptance limits for the TS 3.4.16 RCS specific activity. These analyses consider two cases of RCS iodine specific activity. Case 1 assumes that an accident-initiated iodine spike occurs which results in an increase in the rate of iodine release from the fuel rods containing cladding defects to the primary coolant immediately after an MSLB or SGTR. Case 2 assumes that a pre-accident iodine spike occurs due to a transient prior to the MSLB or SGTR. The results of the SGTR radiological consequence analyses are described in [FSAR Section 15.6.3]. The results of the MSLB radiological consequence analyses are described in [FSAR Section 15.1.5].

[The Case 1 radiological consequence analyses for SGTR and MSLB assume that the initial reactor coolant iodine specific activity corresponds to an isotope mixture that bounds the SR 3.4.16.2 limit for both tight and open fuel defects. The isotopic mix is based on the initial RCS concentrations from FSAR Table 15A-5. This table provides conservative values for the iodine isotopic spectrum that bound the RCS concentrations which could be expected with either tight or open fuel defects. Since the assumed iodine spectrum represents bounding values for different types of fuel defects, the initial radioiodine inventory exceeds (by approximately 6% in the conservative direction) the SR 3.4.16.2 limit of 1.0 μCi/gm.]

This analysis assumption provides the basis for the iodine specific activity limit of 1.0 μCi/gm contained in current TS 3.4.16 Condition A and SR 3.4.16.2. Thyroid dose conversion factors based on [Table E-7 of NRC Regulatory Guide 1.109, Revision 1, 1977 or International Commission on Radiological Protection (ICRP) Publication 30, 1979, have been used in radiological consequence analyses performed to date; however, only ICRP 30 was used in support of the current MSLB and SGTR radiological consequence analyses which form the technical basis for the iodine specific activity limit in LCO 3.4.16.] Any of the NRC-approved thyroid dose conversion factor references cited in the revised definition of DOSE EQUIVALENT I-131 may be used in future analyses after this amendment is approved.

Case 1 also assumes an accident-initiated iodine spike that increases the rate of iodine release from the fuel rods containing cladding defects to the primary coolant immediately after an MSLB or SGTR. The iodine spiking factor is assumed to be [500 for the Case 1 radiological consequence evaluation for MSLB and 335 for the Case 1 radiological consequence evaluation for both SGTR radiological consequence analyses].

[The Case 2 radiological consequence analyses for SGTR and MSLB assume the initial reactor coolant iodine specific activity is a factor of 60 higher than Case 1 due to a pre-accident iodine spike caused by a transient prior the accident.] This [bounds] the allowable RCS specific activity value of 60 μCi/gm contained in current TS Figure 3.4.16-1 for RATED THERMAL POWER (RTP) between 80% and 100%. [Current] TS Figure 3.4.16-1 [which is being deleted by this amendment] provides DEI concentration limits during short periods in which iodine spiking may occur due to a power transient. In both Case 1 and Case 2 radiological consequence evaluations for SGTR and MSLB, the noble gas specific activity in the reactor coolant is assumed to be [approximately 3% higher than the proposed 225] μCi/gm DEX limit. The dose analysis assumptions are discussed further in [FSAR Tables 15.1-3 and 15.6-4]. The initial DEX concentrations were calculated assuming [1% fuel defects] and using [whole body dose conversion factors for air submersion listed in Table III.1 of EPA Federal Guidance Report No. 12, EPA-402-R-93-081, "External Exposure to Radionuclides in Air, Water, and Soil", 1993].

3.2 RCS Specific Activity

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

The current definition for DEI is based on thyroid dose conversion factors and reflects a licensing model in which the radiological consequences of iodine releases for accidents are reported as thyroid and whole body doses. [Two] additional NRC-approved source[s] of thyroid dose conversion factors [are] being added to the revised definition.

LCO 3.4.16 specifies the limit for RCS gross specific activity as 100/Ē μCi/gm. "Ē is defined as:

> "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 non-iodine activity in the coolant."

In performing accident dose analyses in which primary coolant is released, the concentration of noble gas activity in the coolant is assumed to be that level associated with [1% fuel defects], which closely approximates the TS 3.4.16 limit of 100/Ē μCi/gm under accident conditions.

LCO 3.4.16 specifies a limit for RCS 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 less than or equal to 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 TS Figure 3.4.16-1. In accordance with the figure, as power is reduced below 80% RTP, the allowable RCS iodine concentration increases from 60 μCi/gm DEI to as high as [280] μCi/gm DEI at [25%] RTP. Below [25%] RTP, no further increase is defined.

The curve contained in TS Figure 3.4.16-1 was initiated 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." This letter does not provide any technical basis for the curve.

3.3 Purpose for Proposed Amendments

The addition of the new DEX limit and TS 3.4.16 changes are being proposed in order to implement an RCS specific activity LCO that better reflects the whole body radiological consequence analyses which are sensitive to the noble gas activity in the primary coolant but not to the other, non-gaseous activity currently captured in the Ē definition. The Ē definition includes radioisotopes that decay by the emission of both gamma and beta radiation. Current Condition B of LCO 3.4.16 would rarely, if ever, be entered for exceeding 100/Ē since that value is very high (the denominator is very low) if beta emitters such as H-3 (tritium) and Fluorine-18 (F-18) are included in that value, as required by the Ē definition. [In addition, SR 3.4.16.1 requires the measurement of the degassed gamma activities and the gaseous gamma activities in the sample taken for the surveillance, resulting in a questionable determination of operability when the result is compared to 100/Ē with its beta-emitting isotopes. This has led to confusion over what to do with the beta-emitters when performing SR 3.4.16.1 and deciding whether Condition B entry is required. Satisfying LCO 3.4.16 should be incumbent upon satisfying the radiological consequence analysis assumptions, something that is not attained with the current construct of the LCO.]

4.0 TECHNICAL ANALYSIS

4.1 TS Changes

Revision to Definition of DEI

The current TS 1.1 definition for DEI is revised to add new reference[s] for acceptable thyroid dose conversion factors. Also, the word "thyroid" is deleted from the first sentence.

New thyroid dose conversion factor reference[s are] added to the definition. The new reference[s are] "Table 2.1 of EPA Federal Guidance Report No. 11, EPA-520/1-88-020, "Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion," 1988 [and Table E-7 of Regulatory Guide 1.109, Revision 1, NRC, 1977]. EPA Federal Guidance Report No. 11 is referenced in Regulatory Guide 1.195, "Methods and Assumptions for Evaluating Radiological Consequences of Design Basis Accidents at Light-Water Nuclear Power Reactors," May 2003, Section C, "Regulatory Position," Subsection 4, "Dose Calculational Methodology," Subsection 4.1, "Offsite Dose Consequences," assumption 4.1.2 as acceptable for determining thyroid dose from inhalation. [The thyroid dose conversion factor values contained in Table 2.1 of EPA Federal Guidance Report No. 11 are provided to three significant digits. The thyroid dose conversion factor values contained in ICRP Publication 30, Supplement to Part 1, pages 192-212 are the same as those listed in Table 2.1 of EPA Federal Guidance Report No. 11 when the EPA Federal Guidance Report No. 11 values are rounded to two significant digits.]

The deletion of the word "thyroid" from the first sentence is an editorial change only.

Deletion of Definition for Ē - AVERAGE DISINTEGRATION ENERGY and Addition of New Definition for DEX

The current TS 1.1 Definition for Ē - AVERAGE DISINTEGRATION ENERGY is deleted and replaced with a new Definition for DEX.

When Ē is determined using a design basis approach in which it is assumed that 1% of the power is generated by fuel rods having cladding defects and there is no removal of fission gases from the RCS letdown flow, the value of Ē is dominated by the Xe-133 isotope. The other nuclides have relatively small contributions. However, during normal plant operation there is typically only a small amount of fuel defects and the radioactive nuclide inventory can become dominated by tritium and corrosion and/or activation products, resulting in the determination of a value of Ē that is very different than that which would be calculated using the design basis approach. Therefore, the radiological consequence analyses for accidents become disconnected from normal plant operation and the current TS 3.4.16 limit on gross specific activity is not relevant. The use of Ē also results in a TS limit that can vary during operation as different values for Ē are determined, resulting in different values for the gross specific activity limit (100/Ē μCi/gm).

Additionally, since the concern associated with the RCS noble gas activity is the acute whole body dose that the operators and the general public might receive in the event of a postulated accident, the manner in which Ē is calculated gives undue importance to nuclides that are primarily beta radiation 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 deletion of the current TS 1.1 Definition for Ē - AVERAGE DISINTEGRATION ENERGY and addition of a new definition for DEX will result in TS 3.4.16 requirements for RCS specific activity which are consistent with the assumptions contained in the radiological consequence analyses.

The new definition for DEX is similar to the definition for DEI. The determination of DEX will be performed in a similar manner to that currently used in determining DEI, except that the calculation of DEX is based on the acute dose to the whole body and considers the noble gases [Kr-85m, Kr-87, Kr-88, 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 initial RCS concentrations, short half-lives, or small dose conversion factors. The excluded isotopes [Kr-83m, Kr-85, Kr-89, Xe-131m, and Xe-137] contribute less than 2.3% of the whole body dose from noble gases in the MSLB and SGTR radiological consequence analyses that form the technical basis for the noble gas specific activity limit in LCO 3.4.16. The DEX limit has been lowered to accommodate the exclusion of these five isotopes.] If a specific 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 DEX.

The new definition of DEX states that the determination of DEX shall be performed using the effective dose conversion factors for air submersion listed in Table III.1 of EPA Federal Guidance Report No. 12, EPA-402-R-93-081, "External Exposure to Radionuclides in Air, Water, and Soil," 1993. [ ] These dose conversion factors are applicable for determination of DEX. The use of the dose conversion factors for air submersion listed in Table III.1 of EPA Federal Guidance Report No. 12 is endorsed by Regulatory Guide 1.195, Subsection 4.1, assumption 4.1.4 as acceptable for determining whole body doses because of the uniform body exposure associated with semi-infinite cloud dose modeling.

TS 3.4.16 LCO Revision

The TS 3.4.16 LCO is modified to specify that the iodine specific activity in terms of DEI and noble gas activity in terms of DEX shall be within limits.

Currently TS 3.4.16 states that the specific activity of the reactor coolant shall be within limits. The limits are currently not explicitly identified in the LCO, but are instead defined in current Condition B and SR 3.4.16.1 for gross specific activity and in current

Condition A and SR 3.4.16.2 for iodine specific activity.

The proposed change states "RCS DOSE EQUIVALENT I-131 and DOSE EQUIVALENT XE-133 specific activity shall be within limits." The DEI limit of ≤ 1.0 μCi/gm, contained in current Condition A and SR 3.4.16.2, will now be listed only in SR 3.4.16.2. In addition, the limit of 1.0 μCi/gm is [conservative with respect to] the current SGTR and MSLB radiological consequence analyses discussed in Section 3.1 above.

The DEX limit of [225] μCi/gm contained in revised SR 3.4.16.1 is [conservative with respect to the current SGTR and MSLB radiological consequences discussed in Section 3.1 above and has been lowered to accommodate the exclusion of five noble gas isotopes due to low initial RCS concentrations, short half-lives, or small dose conversion factors].

The primary purpose of the TS 3.4.16 LCO on RCS specific activity is to support the dose analyses for design basis accidents. Whole body doses are primarily dependent on the noble gas concentrations, not the non-gaseous activity currently captured in the $\bar{E}$ definition. It is appropriate to have the TS 3.4.16 LCO apply to the noble gas specific activity in the RCS. Thus, it is acceptable that the current TS 3.4.16 limit on gross specific activity can be replaced by an LCO limit based on RCS noble gas specific activity in the form of DEX. The limit on the amount of noble gas activity in the RCS remains consistent with the design basis accident radiological consequence analyses and would not fluctuate with variations in the calculated value of $\bar{E}$ during normal operation as is currently the case.

<u>TS 3.4.16 Applicability Revision</u>

The TS 3.4.16 Applicability is modified to include all of MODE 3 and MODE 4. It is necessary for the LCO to apply during all of MODES 1 through 4 to limit the potential radiological consequences of an SGTR or MSLB that may occur during these MODES. In MODES 5 and 6, the steam generators are not used for decay heat removal, the RCS and steam generators are depressurized, and primary to secondary leakage is minimal. Therefore, the monitoring of RCS specific activity during MODES 5 and 6 is not required.

<u>TS 3.4.16 Condition A Revision</u>

TS 3.4.16 Condition A is revised by replacing the limit "> 1.0 μCi/gm" with the words "not within limit" to be consistent with the Revised TS 3.4.16 LCO format. The DEI limit of ≤ 1.0 μCi/gm is contained in SR 3.4.16.2. [ ]

<u>TS 3.4.16 Required Action[] A.1 [ ] Revision</u>

TS 3.4.16 Required Action A.1 is modified to remove the reference to Figure 3.4.16-1 and insert a limit of less than or equal to 60 μCi/gm for DEI.

The curve contained in Figure 3.4.16-1 was initiated by the AEC in a June 12, 1974 letter from the AEC on the subject, "Proposed Standard Technical Specifications for Primary Coolant Activity." However, this letter does not provide any technical basis for the curve.

The Case 2 radiological consequence analyses for SGTR and MSLB accidents that take into account the pre-accident iodine spike do not consider the elevated RCS iodine specific activities permitted by current TS Figure 3.4.16-1 for operation at power levels below 80% RTP (i.e. DEI of 60 μCi/gm at 80% RTP increasing linearly to [225] μCi/gm at [25%] RTP). Instead, the Case 2 analyses assume a DEI concentration 60 times higher than the corresponding accident's Case 1 analysis assumption [,which corresponds to the 60 μCi/gm specific activity limit associated with 100% RTP operation as discussed in Section 3.1 above]. Therefore, TS 3.4.16 Required Action A.1 should be based on a limit of 60 μCi/gm to be consistent with the assumptions contained in the radiological consequence analyses. It is not expected that plant operation at reduced power levels would result in iodine specific activity levels that exceed the 60 μCi/gm upper limit defined for full power operation.

[ ]

<u>TS 3.4.16 Condition B Revision to Include Action for DEX Limit</u>

Current TS 3.4.16 Condition B is replaced with a new Condition B for DEX not within limit. This change is made to be consistent with the change to the TS 3.4.16 LCO which requires the DEX specific activity to be within limit as discussed above. The DEX limit of [225] μCi/gm is contained in revised SR 3.4.16.1 and is [conservative with respect to the current SGTR and MSLB radiological consequences discussed in Section 3.1 above.] The primary purpose of the TS 3.4.16 LCO on RCS specific activity and its associated Conditions is to support the dose analyses for design basis accidents. The whole body dose is primarily dependent on the noble gas activity, not the non-gaseous activity currently captured in the Ē definition and limited by current TS 3.4.16 Condition B.

The Completion Time for revised TS 3.4.16 Required Action B.1 will require restoration of DEX to within limit in 48 hours. This is consistent with the Completion Time for current Required Action A.2 for DEI. [Since the radiological consequences reported for SGTR and MSLB in [FSAR Tables 15.6-5, 15.6-5A, and 15.1-4 at Callaway] demonstrate that thyroid doses are a greater percentage of the applicable SRP acceptance criteria than whole body doses, it then follows that the Completion Time for noble gas activity being out of specification in revised Required Action B.1 should be at least as great as the Completion Time for iodine specific activity being out of specification in current Required Action A.2.] The Completion Time of 48 hours for revised Required Action B.1 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 an MSLB or SGTR occurring during this time period.

A Note is added which states that LCO 3.0.4.c is applicable. This is consistent with the Note applicable to current Required Actions A.1 and A.2 for DEI. This Note permits entry into the applicable MODE(s), relying on Required Action B.1 while the DEX LCO limit is not met. This MODE change allowance is acceptable due to the significant conservatism incorporated into the specific activity limit, the low probability of an event that 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.

TS 3.4.16 Condition C Revision

TS 3.4.16 Condition C is revised to include Condition B if the Required Action and associated Completion Time of Condition B is not met. This is consistent with the changes made to Condition B which will no longer specify a shutdown track. Condition C is also revised to replace the limit on DEI from Figure 3.4.16-1 with a value of > 60 μCi/gm. This change makes Condition C consistent with the changes made to TS 3.4.16 Required Action A.1.

TS 3.4.16 Required Action C.1 is changed to require the plant to be in MODE 3 within 6 hours and a new Required Action C.2 is added which requires the plant to be in MODE 5 within 36 hours. These changes are consistent with the changes made to the TS 3.4.16 Applicability. The revised LCO is applicable throughout all of MODES 1 through 4 to limit the potential radiological consequences of an SGTR or MSLB that may occur during these MODES. Therefore, Condition C needs to default to a MODE 5 end state for TS 3.4.16 to no longer be applicable.

A new TS 3.4.16 Required Action C.2 Completion Time of 36 hours is added for the plant to reach MODE 5. This Completion Time is reasonable, based on operating experience, to reach MODE 5 from full power conditions in an orderly manner and without challenging plant systems. The Completion Time of 36 hours is consistent with other TS which specify a Completion Time to reach MODE 5.

SR 3.4.16.1 Revision to Include Surveillance for DEX

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 DEX specific activity is ≤ [225] μCi/gm. This change provides a surveillance for the new LCO limit added to TS 3.4.16 for DEX.

The revised SR 3.4.16.1 surveillance requires performing a gamma isotopic analysis as a measure of the noble gas specific activity of the reactor coolant at least once every 7 days. This measurement is the sum of the degassed gamma activities and the gaseous gamma activities in the sample taken. The surveillance provides an indication of any increase in the noble gas specific activity.

The results of the surveillance on DEX allow proper remedial action to be taken before reaching the LCO limit under normal operating conditions. The 7 day Frequency considers the unlikelihood of a gross fuel failure during this time.

If a specific noble gas nuclide listed in the new definition for DEX in Specification 1.1 is not detected, it should be assumed to be present at the minimum detectable activity. This is consistent with the new TS 1.1 Definition for DEX and will ensure a conservative calculation of DEX when noble gas nuclides are not detected.

The SR is modified by a NOTE which allows entry into MODE 4, MODE 3, and MODE 2 prior to performing the surveillance. This allows the surveillance to be performed in any of those MODES, prior to entering MODE 1, similar to the current surveillance SR 3.4.16.2 for DEI.

SR 3.4.16.3 Deletion

Current SR 3.4.16.3 is deleted. The TS 3.4.16 LCO on RCS specific activity supports the dose analyses for design basis accidents, in which the whole body dose is primarily dependent on the noble gas concentration, not the non-gaseous activity currently captured in the Ē definition. Therefore, with the elimination of the limit for RCS gross specific activity and the addition of the new LCO limit for noble gas specific activity, this SR to determine Ē is no longer required.

4.2 Impact on Radiological Consequence Analyses

The proposed changes do not impact the radiological consequences of any design basis accident. Replacing the limit on Ē with a limit on DEX based on the value used in the current radiological consequence analyses will limit the RCS noble gas concentrations to values which are consistent with the radiological consequence analyses for those noble gases which are significant in terms of contribution to dose. These changes will also limit any potential RCS iodine specific activity excursion to the value currently associated with full power operation (i.e. 60 μCi/gm DEI). This concentration is more restrictive on plant operation than the current LCO which allows operation up to [225] μCi/gm DEI as indicated in Figure 3.4.16-1. The proposed changes eliminate the potential for radiological consequences of a postulated accident to exceed those previously calculated.

4.3 Summary

In summary, the proposed changes will revise the definition of DOSE EQUIVALENT I-131, delete the definition of Ē - AVERAGE DISINTEGRATION ENERGY, add a new definition for DOSE EQUIVALENT XE-133, revise TS 3.4.16 to specify an LCO limit on DOSE EQUIVALENT I-131, add a new LCO limit to TS 3.4.16 for DOSE EQUIVALENT XE-133, increase the Completion Time for Required Action B.1, delete TS Figure 3.4.16-1, and revise the TS 3.4.16 Conditions and Required Actions accordingly. Also, the Applicability of LCO 3.4.16 is extended to reflect the MODES during which pertinent accidents (SGTR and MSLB) could be postulated to occur, SR 3.4.16.1 is revised to verify DOSE EQUIVALENT XE-133 is within the prescribed limit, and SR 3.4.16.3 is deleted.

The revised definition of DOSE EQUIVALENT I-131 allows the use of thyroid dose conversion factors which are acceptable for determining thyroid dose. The above changes will result in TS 3.4.16 requirements for RCS specific activity which are consistent with the assumptions contained in the radiological consequence analyses. The primary purpose of the TS 3.4.16 LCO on RCS specific activity is to support the dose analyses for design basis accidents, in which the whole body dose is primarily dependent on the noble gas specific activity, not the non-gaseous activity currently captured in the Ē definition. The TS 3.4.16 Conditions, Required Actions, and Surveillance Requirements are revised accordingly to support the deletion of the requirements for gross specific activity based on Ē and the addition of the new LCO limit for DOSE EQUIVALENT XE-133. The proposed changes do not impact the radiological consequences of any design basis accident.

5.0 REGULATORY SAFETY ANALYSIS

This section addresses the standards of 10 CFR 50.92 as well as the applicable regulatory requirements and acceptance criteria.

The proposed amendment would revise the definition of DOSE EQUIVALENT I-131, delete the definition of Ē - AVERAGE DISINTEGRATION ENERGY, add a new definition for DOSE EQUIVALENT XE-133, revise TS 3.4.16 to specify an LCO limit on DOSE EQUIVALENT I-131, add a new LCO limit to TS 3.4.16 for DOSE EQUIVALENT XE-133, increase the Completion Time for Required Action B.1, delete TS Figure 3.4.16-1, and revise the TS 3.4.16 Conditions and Required Actions accordingly. In addition, the Applicability of LCO 3.4.16 is extended to reflect the MODES during which pertinent accidents (SGTR and MSLB) could be postulated to occur, SR 3.4.16.1 is revised to verify DOSE EQUIVALENT XE-133 is within the prescribed limit, and SR 3.4.16.3 is deleted.

5.1 No Significant Hazards Consideration (NSHC)

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

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

Response: No

The proposed changes would add new thyroid dose conversion factor reference[s] to the definition of DOSE EQUIVALENT I-131, eliminate the definition of Ē - AVERAGE DISINTEGRATION ENERGY, add a new definition of DOSE EQUIVALENT XE-133, replace the Technical Specification (TS) 3.4.16 limit on reactor coolant system (RCS) gross specific activity with a limit on noble gas specific activity in the form of a Limiting Condition for Operation (LCO) on DOSE EQUIVALENT XE-133, increase the Completion Time for Required Action B.1, replace TS Figure 3.4.16-1 with a maximum limit on DOSE EQUIVALENT I-131, extend the Applicability of LCO 3.4.16, and make corresponding changes to TS 3.4.16 to reflect all of the above. The proposed changes are not accident initiators and have no impact on the probability of occurrence of any design basis accidents.

The proposed changes will have no impact on the consequences of a design basis accident because they will limit the RCS noble gas specific activity to be consistent with the values assumed in the radiological consequence analyses. The changes will also limit the potential RCS iodine concentration excursion to the value currently associated with full power operation, which is more restrictive on plant operation than the existing allowable RCS iodine specific activity at lower power levels.

Therefore, the proposed changes do 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 changes do not alter any physical part of the plant nor do they affect any plant operating parameters besides the allowable specific activity in the RCS. The changes which impact the allowable specific activity in the RCS are consistent with the assumptions assumed in the current radiological consequence analyses.

Therefore, the proposed changes do not create the possibility of a new or different accident from any accident previously evaluated.

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

Response: No

The acceptance criteria related to the proposed changes involve the allowable control room and offsite radiological consequences following a design basis accident. The proposed changes will have no impact on the radiological consequences of a design basis accident because they will limit the RCS noble gas specific activity to be consistent with the values assumed in the radiological consequence analyses. The changes will also limit the potential RCS iodine specific activity excursion to the value currently associated with full power operation, which is more restrictive on plant operation than the existing allowable RCS iodine specific activity at lower power levels.

Therefore, the proposed changes do not involve a significant reduction in a margin of safety.

Conclusion:

Based on the above evaluation, [AmerenUE] concludes that the proposed amendment 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.

5.2 Applicable Regulatory Requirements / Criteria

The regulatory guidance documents associated with this amendment application include:

- NUREG-0800, "U.S. Nuclear Regulatory Commission Standard Review Plan," Section 15.1.5, "Steam System Piping Failures Inside and Outside of Containment (PWR)," Appendix A, "Radiological Consequence of Main Steam Line Failures Outside Containment," Revision 2, identifies the thyroid and whole body offsite radiological consequence acceptance criteria for main steam line break accidents.

- NUREG-0800, "U.S. Nuclear Regulatory Commission Standard Review Plan," Section 15.6.3, "Radiological Consequences of Steam Generator Tube Failure (PWR)," Revision 2, identifies the thyroid and whole body offsite radiological consequence acceptance criteria for steam generator tube rupture accidents.

- NUREG-0800, "U.S. Nuclear Regulatory Commission Standard Review Plan," Section 6.4, "Control Room Habitability System," Revision 2, identifies the thyroid, whole body, and beta skin radiological consequence acceptance criteria for control room occupants.

- Regulatory Guide 1.195, "Methods and Assumptions for Evaluating Radiological Consequences of Design Basis Accidents at Light-Water Nuclear Power Reactors," provides acceptable dose conversion factors, radiological consequence acceptance criteria, and other dose analysis methodology parameters.

There are no changes being proposed in this amendment application such that commitments to the regulatory guidance documents above would come into question. The evaluations documented above confirm that [Callaway Plant] will continue to comply with all applicable regulatory requirements.

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) issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

6.0 ENVIRONMENTAL CONSIDERATION

[AmerenUE] has evaluated the proposed amendment and has determined that the proposed amendment 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 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.

7.0 REFERENCES

7.1 <u>References</u>

1. Environmental Protection Agency (EPA) Federal Guidance Report No. 11, EPA-520/1-88-020,"Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion," September 1988.

2. Environmental Protection Agency (EPA) Federal Guidance Report No. 12, EPA-402-R-93-081, "External Exposure to Radionuclides in Air, Water, and Soil," 1993.

3. International Commission on Radiological Protection (ICRP) Publication 30, “Limits for Intakes of Radionuclides by Workers,” ICRP, 1979.

4. Atomic Energy Commission (AEC) letter "Proposed Standard Technical Specifications for Primary Coolant Activity," dated June 12, 1974.

5. Regulatory Guide 1.195, "Methods and Assumptions for Evaluating Radiological Consequences of Design Basis Accidents at Light-Water Nuclear Power Reactors," May 2003.

6. Regulatory Guide 1.109, Revision 1, “Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I,” October1977.

7. Atomic Energy Commission (AEC) Report TID-14844, “Calculation of Distance Factors for Power and Test Reactor Sites,” March 1962.

8. NUREG-0800, "U.S. Nuclear Regulatory Commission Standard Review Plan," Section 15.1.5, "Steam System Piping Failures Inside and Outside of Containment (PWR)," Appendix A, "Radiological Consequences of Main Steam Line Failures Outside Containment," Revision 2, July 1981.

9. NUREG-0800, "U.S. Nuclear Regulatory Commission Standard Review Plan," Section 15.6.3, "Radiological Consequences of a Steam Generator Tube Failure (PWR)," Revision 2, July 1981.

10. NUREG-0800, "U.S. Nuclear Regulatory Commission Standard Review Plan," Section 6.4, "Control Room Habitability System," Revision 2, July 1981.

11. NUREG-1512, "Final Safety Evaluation Report Related to the Certification of the AP600 Standard Design, Docket No. 52-003," August 1998.

12. NUREG-1431, Volume 1, Revision 3, "Standard Technical Specifications Westinghouse Plants," dated June 2004.

7.2 Precedent

The Technical Specifications developed for the Westinghouse AP600 and AP1000 advanced reactor designs utilize an LCO for RCS DEX activity in place of the LCO on gross specific activity based on $\bar{E}$. 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 and for the AP1000 in the NRC letter to Westinghouse Electric Company dated September 13, 2004. The curve in current TS Figure 3.4.16-1 was not included in the TS approved for the AP600 and AP1000 advanced reactor designs.

ATTACHMENT 2

MARKUP OF TECHNICAL SPECIFICATIONS

1.1 Definitions (continued)

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	INSERT 1.1-2A ~~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 derived from the data provided in International Commission on Radiological Protection Publication 30, "Limits for Intakes of Radionuclides by Workers," 1979.~~
~~$\bar{E}$ - 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.~~
DOSE EQUIVALENT XE-133	INSERT 1.1-2B

(continued)

INSERT 1.1-2A

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 thyroid dose conversion factors from:

1) Table III of TID-14844, AEC, 1962, "Calculation of Distance Factors for Power and Test Reactor Sites," or
2) Table E-7 of Regulatory Guide 1.109, Revision 1, NRC, 1977, or
3) International Commission on Radiological Protection (ICRP) Publication 30, "Limits for Intakes of Radionuclides by Workers," Supplement to Part 1, pages 192-212, Table titled "Committed Dose Equivalent in Target Organs or Tissues per Intake of Unit Activity," 1979, or
4) Table 2.1 of EPA Federal Guidance Report No. 11, EPA-520/1-88-020, "Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion," 1988.

INSERT 1.1-2B

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-87, Kr-88, 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 the effective dose conversion factors for air submersion listed in Table III.1 of EPA Federal Guidance Report No. 12, EPA-402-R-93-081, "External Exposure to Radionuclides in Air, Water, and Soil", 1993.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.16 RCS Specific Activity

LCO 3.4.16 The specific activity of the reactor coolant shall be within limits.

APPLICABILITY: MODES 1 and 2,
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.	------------------- 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.	Once per 4 hours
	AND		
	A.2	Restore DOSE EQUIVALENT I-131 to within limit.	48 hours
B. Gross specific activity of the reactor coolant > 100/Ē µCi/gm.	B.1	Be in MODE 3 with T_{avg} < 500°F.	6 hours

(continued)

Replace with Insert 3.4-40

INSERT 3.4-40

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.16 RCS Specific Activity

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

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. DOSE EQUIVALENT I-131 not within limit.	---------------NOTE-------------- LCO 3.0.4.c is applicable. -------------------------------------	
	A.1 Verify DOSE EQUIVALENT I-131 ≤ 60 μCi/gm.	Once per 4 hours
	AND	
	A.2 Restore DOSE EQUIVALENT I-131 to within limit.	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
C. Required Action and associated Completion Time of Condition A not met. or B OR DOSE EQUIVALENT I-131 ~~in the unacceptable region of Figure 3.4.16-1.~~ > 60 μCi/gm.	C.1 Be in MODE 3. ~~with T_{avg} < 500°F.~~ AND C.2 Be in MODE 5.	6 hours 36 hours

---------- NOTE ----------
Only required to be performed in MODE 1.

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.4.16.1	Verify reactor coolant ~~gross specific activity ≤ 100/Ē μCi/gm.~~ DOSE EQUIVALENT XE-133 specific activity ≤ 225 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

~~(continued)~~

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

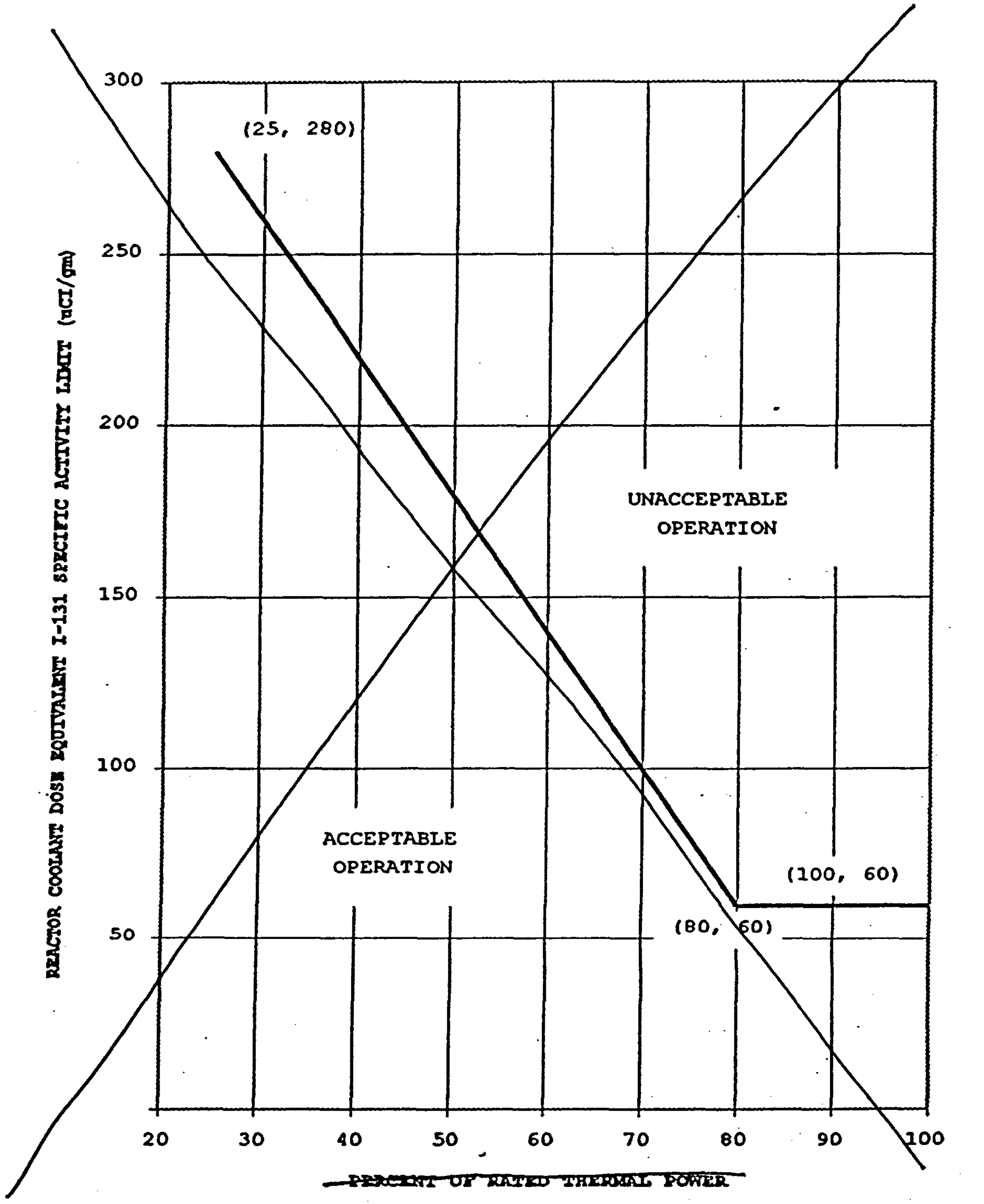

Figure 3.4.16-1 (page 1 of 1)
Reactor Coolant DOSE EQUIVALENT I-131 Specific Activity
Limit Versus Percent of RATED THERMAL POWE

ATTACHMENT 3

RETYPED TECHNICAL SPECIFICATIONS

1.1 Definitions (continued)

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 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 thyroid dose conversion factors from: 1) Table III of TID-14844, AEC, 1962, "Calculation of Distance Factors for Power and Test Reactor Sites," or 2) Table E-7 of Regulatory Guide 1.109, Revision 1, NRC, 1977, or 3) International Commission on Radiological Protection (ICRP) Publication 30, "Limits for Intakes of Radionuclides by Workers," Supplement to Part 1, pages 192-212, Table titled "Committed Dose Equivalent in Target Organs or Tissues per Intake of Unit Activity," 1979, or 4) Table 2.1 of EPA Federal Guidance Report No. 11, EPA-520/1-88-020, "Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion," 1988.

(continued)

1.1 Definitions (continued)

DOSE EQUIVALENT XE-133

DOSE EQUIVALENT XE-133 shall be that concentration of Xe-133 (microcuries per gram) that alone would produce the same acute dose to the whole body as the combined activities of noble gas nuclides Kr-85m, Kr-87, Kr-88, 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 the effective dose conversion factors for air submersion listed in Table III.1 of EPA Federal Guidance Report No. 12, EPA-402-R-93-081, "External Exposure to Radionuclides in Air, Water, and Soil", 1993.

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. Identified LEAKAGE

1. LEAKAGE, such as that from pump seals or valve packing (except reactor coolant pump (RCP) seal water 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 to the Secondary System (primary to secondary LEAKAGE);

(continued)

1.1 Definitions

LEAKAGE (continued)

b. Unidentified LEAKAGE

All LEAKAGE (except RCP seal water leakoff) that is not identified LEAKAGE;

c. Pressure Boundary LEAKAGE

LEAKAGE (except primary to secondary LEAKAGE) through a nonisolable fault in an RCS component body, pipe wall, or vessel wall.

MASTER RELAY TEST

A MASTER RELAY TEST shall consist of energizing all master relays in the channel required for channel OPERABILITY and verifying the OPERABILITY of each required master relay. The MASTER RELAY TEST shall include a continuity check of each associated required slave relay. The MASTER RELAY TEST may be performed by means of any series of sequential, overlapping, or total steps.

MODE

A MODE shall correspond to any one inclusive combination of core reactivity condition, power level, average reactor coolant temperature, and reactor vessel head closure bolt tensioning specified in Table 1.1-1 with fuel in the reactor vessel.

OPERABLE - OPERABILITY

A system, subsystem, train, component, or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified safety function(s) and when all necessary attendant instrumentation, controls, normal or emergency electrical power, cooling and seal water, lubrication, and other auxiliary equipment that are required for the system, subsystem, train, component, or device to perform its specified safety function(s) are also capable of performing their related support function(s).

PHYSICS TESTS

PHYSICS TESTS shall be those tests performed to measure the fundamental nuclear characteristics of the reactor core and related instrumentation. These tests are:

a. Described in Chapter 14 of the FSAR;

b. Authorized under the provisions of 10 CFR 50.59; or

c. Otherwise approved by the Nuclear Regulatory Commission.

(continued)

1.1 Definitions (continued)

PRESSURE AND TEMPERATURE LIMITS REPORT (PTLR)	The PTLR is the unit specific document that provides the reactor vessel pressure and temperature limits, including heatup and REPORT (PTLR) cooldown rates, the power operated relief valve (PORV) lift settings, and the Cold Overpressure Mitigation System (COMS) arming temperature, for the current reactor vessel fluence period. These pressure and temperature limits shall be determined for each fluence period in accordance with Specification 5.6.6. Plant operation within these operating limits is addressed in LCO 3.4.3, "RCS Pressure and Temperature (P/T) Limits," and LCO 3.4.12, "Cold Overpressure Mitigation System (COMS)."
QUADRANT POWER TILT RATIO (QPTR)	QPTR shall be the ratio of the maximum upper excore detector calibrated output to the average of the upper excore detector calibrated outputs, or the ratio of the maximum lower excore detector calibrated output to the average of the lower excore detector calibrated outputs, whichever is greater.
RATED THERMAL POWER (RTP)	RTP shall be a total reactor core heat transfer rate to the reactor coolant of 3565 MWt.
REACTOR TRIP SYSTEM (RTS) RESPONSE TIME	The RTS RESPONSE TIME shall be that time interval from when the monitored parameter exceeds its RTS trip setpoint at the channel sensor until loss of stationary gripper coil voltage. 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.
SHUTDOWN MARGIN (SDM)	SDM shall be the instantaneous amount of reactivity by which the reactor is subcritical or would be subcritical from its present condition assuming: a. All rod cluster control assemblies (RCCAs) are fully inserted except for the single RCCA of highest reactivity worth, which is assumed to be fully withdrawn. With any RCCA not capable of being fully inserted, the reactivity worth of the RCCA must be accounted for in the determination of SDM; and b. In MODES 1 and 2, the fuel and moderator temperatures are changed to the hot zero power temperatures.

(continued)

1.1 Definitions (continued)

SLAVE RELAY TEST	A SLAVE RELAY TEST shall consist of energizing all slave relays in the channel required for channel OPERABILITY and verifying the OPERABILITY of each required slave relay. The SLAVE RELAY TEST shall include a continuity check of associated required testable actuation devices. The SLAVE RELAY TEST may be performed by means of any series of sequential, overlapping, or total steps.
STAGGERED TEST BASIS	A STAGGERED TEST BASIS shall consist of the testing of one of the systems, subsystems, channels, or other designated components during the interval specified by the Surveillance Frequency, so that all systems, subsystems, channels, or other designated components are tested during *n* Surveillance Frequency intervals, where *n* is the total number of systems, subsystems, channels, or other designated components in the associated function.
THERMAL POWER	THERMAL POWER shall be the total reactor core heat transfer rate to the reactor coolant.
TRIP ACTUATING DEVICE OPERATIONAL TEST (TADOT)	A TADOT shall consist of operating the trip actuating device and verifying the OPERABILITY of all devices in the channel required for trip actuating device OPERABILITY. The TADOT shall include adjustment, as necessary, of the trip actuating device so that it actuates at the required setpoint within the necessary accuracy. The TADOT may be performed by means of any series of sequential, overlapping, or total channel steps.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.16 RCS Specific Activity

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

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. DOSE EQUIVALENT I-131 not within limit.	------------------ NOTE ------------------ LCO 3.0.4.c is applicable. --	
	A.1 Verify DOSE EQUIVALENT I-131 $\leq$ 60 μCi/gm.	Once per 4 hours
	AND	
	A.2 Restore DOSE EQUIVALENT I-131 to within limit.	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

(continued)

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.	C.1 Be in MODE 3. AND C.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.16.1	---------- NOTE ---------- Only required to be performed in MODE 1. -------------------- Verify reactor coolant DOSE EQUIVALENT XE-133 specific activity ≤ 225 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

ATTACHMENT 4

PROPOSED TECHNICAL SPECIFICATION BASES CHANGES
(for information only)

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.16 RCS Specific Activity

BASES

BACKGROUND

~~The maximum dose to the whole body and the thyroid that an individual at the site boundary can receive for 2 hours during an accident is specified in 10 CFR 100 (Ref. 1). The limits on specific activity ensure that the doses are held to a small fraction of the 10 CFR 100 limits during analyzed transients and accidents.~~ INSERT A

The RCS specific activity LCO limits the allowable concentration level of radionuclides in the reactor coolant. The LCO limits are established to minimize the ~~offsite radioactivity~~ 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 INSERT B ~~gross specific activity. The allowable levels are intended to limit the 2 hour dose at the site boundary to a small fraction of the 10 CFR 100 dose guideline limits. The limits in the LCO are standardized, based on parametric evaluations of offsite radioactivity dose consequences for typical site locations.~~

~~The parametric evaluations showed the potential offsite dose levels for a SGTR accident were an appropriately small fraction of the 10 CFR 100 dose guideline limits. Each evaluation assumes a broad range of site applicable atmospheric dispersion factors in a parametric evaluation.~~

APPLICABLE SAFETY ANALYSES

The LCO limits on the specific activity of the reactor coolant ensure that the resulting INSERT C ~~2 hour doses at the site boundary will not exceed a small fraction of the 10 CFR 100 dose guideline limits following a SGTR accident. The SGTR safety analysis (Ref. 2) assumes the initial specific activity of the reactor coolant is greater than the LCO limit and assumes an existing reactor coolant steam generator (SG) tube leakage rate of 1 gpm. The safety analysis assumes the initial specific activity of the secondary coolant is greater than the limit of 0.1 μCi/gm DOSE EQUIVALENT I-131 from LCO 3.7.18, "Secondary Specific Activity."~~

~~The analysis for the SGTR accident establishes the acceptance limits for RCS specific activity. Reference to this analysis is used to assess changes to the unit that could affect RCS specific activity, as they relate to the acceptance limits.~~

~~The analysis is performed for two cases of reactor coolant specific activity. Case 1 assumes a concurrent large iodine spike~~

(continued)

INSERT A

The maximum dose to the whole body and the thyroid that an individual at the exclusion area boundary can receive for 2 hours following an accident, or at the low population zone outer boundary for the radiological release duration, is specified in 10 CFR 100.11 (Ref. 1). 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.

INSERT B

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).

INSERT C

offsite and control room doses meet the appropriate SRP acceptance criteria following an SLB or SGTR accident. The safety analyses (Refs. 3 and 4) assume the initial iodine specific activity of the reactor coolant is greater than the LCO limit (see the discussion of Case 1 below), and a pre-accident reactor coolant steam generator (SG) tube leakage rate of 1 gpm exists. The safety analyses assume the initial iodine specific activity of the secondary coolant is 10% of the Case 1 reactor coolant iodine specific activity, greater than the limit of 0.1 μCi/gm DOSE EQUIVALENT I-131 from LCO 3.7.18, "Secondary Specific Activity."

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

The safety analyses consider two cases of reactor coolant iodine specific activity. In Case 1, the initial reactor coolant iodine specific activity corresponds to an isotope mixture that bounds the SR 3.4.16.2 limit for both tight and open fuel defects. The isotopic mix is based on the initial RCS concentrations from FSAR Table 15A-5. This table provides conservative values for the iodine isotopic spectrum that bound the RCS concentrations which could be expected with either tight or open fuel defects. Since the assumed iodine spectrum represents bounding values for different types of fuel defects, the initial radioiodine inventory exceeds the SR 3.4.16.2 limit of 1.0 μCi/gm.

Case 1 also assumes an accident-initiated iodine spike that increases the rate of iodine release from the fuel rods containing cladding defects to the primary coolant immediately after an SLB or SGTR. The iodine spiking factor is assumed to be 500 for the Case 1 radiological consequence evaluations for SLB and 335 for the Case 1 radiological consequence evaluation for both SGTR radiological consequence analyses.

Case 2 radiological consequence evaluations for SLB and SGTR assume the initial reactor coolant iodine specific activity is a factor of 60 higher than Case 1 due to a pre-accident iodine spike caused by a transient prior to the accident.

In both Case 1 and Case 2 radiological consequence evaluations, the noble gas specific activity in the reactor coolant is assumed to be greater than the 225 μCi/gm DOSE EQUIVALENT XE-133 limit in SR 3.4.16.2. The dose analysis assumptions are discussed further in Tables 15.1-3 and 15.6-4 of Reference 4.

BASES

APPLICABLE SAFETY ANALYSES (continued)

~~that increases the rate of iodine release into the reactor coolant by a factor of about 500 immediately after the accident. Case 2 assumes the initial reactor coolant iodine activity is a factor of 60 higher than Case 1 due to a pre-accident iodine spike caused by an RCS transient. In both cases, the noble gas activity in the reactor coolant assumes 1% failed fuel, which closely equals the LCO limit of 100/Ē μCi/gm for gross specific activity. These assumptions are discussed further in Table 15.6-4 of Reference 2.~~

The SGTR analysis also assumes a loss of offsite power at the same time as the reactor trip, ~~after an SGTR event.~~ The SGTR causes a reduction in reactor coolant inventory. The reduction initiates a reactor trip from a low pressurizer pressure signal, INSERT D

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 atmospheric steam dump valves. 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.

~~The safety analysis shows the radiological consequences of an SGTR accident are within the SRP 15.6.3 fractions of the Reference 1 dose guideline limits. Operation with iodine specific activity levels greater than the LCO limit is permissible, if the activity levels do not exceed the limits shown in Figure 3.4.16-1, in the applicable specification, for more than 48 hours. The safety analysis has concurrent and pre-accident iodine spiking cases.~~

~~The remainder of the above limit permissible iodine levels shown in Figure 3.4.16-1 are acceptable because of the low probability of a SGTR accident occurring during the established 48 hour time limit. The occurrence of an SGTR accident at these permissible levels could increase the site boundary dose levels, but still be within 10 CFR 100 dose guideline limits.~~

INSERT E →

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 10CFR50.36(c)(2)(ii).

LCO

~~The specific iodine activity is limited to 1.0 μCi/gm DOSE EQUIVALENT I-131, and the gross specific activity in the reactor coolant is limited to the~~

→ INSERT F

(continued)

INSERT D

in the analysis of an SGTR with a failed ASD on the faulted steam generator. In the analysis of an SGTR with a failed AFW flow control valve on the faulted steam generator, reactor trip and safety injection are assumed to occur at the time of the tube rupture to maximize the potential for overfilling the ruptured steam generator.

INSERT E

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 steamline 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 μCi/gm for more than 48 hours.

INSERT F

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 225 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 analyses (Refs. 3 and 4) show that the calculated doses are within acceptable limits. Violation of the LCO may result in reactor coolant radioactivity levels that could, in the event of an SLB or SGTR, lead to doses that exceed the SRP acceptance criteria (Ref. 2).

BASES

LCO (continued)

~~number of µCi/gm equal to 100 divided by Ē (average disintegration energy of the sum of the average beta and gamma energies of the coolant nuclides). The limit on DOSE EQUIVALENT I-131 ensures the 2 hour thyroid dose to an individual at the site boundary during the Design Basis Accident (DBA) will be a small fraction of the allowed thyroid dose. The limit on gross specific activity ensures the 2 hour whole body dose to an individual at the site boundary during the DBA will be a small fraction of the allowed whole body dose.~~

~~The SGTR accident analysis (Ref. 2) shows that the 2 hour site boundary dose levels are within acceptable limits. Violation of the LCO may result in reactor coolant radioactivity levels that could, in the event of an SGTR, lead to site boundary doses that exceed the 10 CFR 100 dose guideline limits.~~

APPLICABILITY

→ INSERT G

~~In MODES 1 and 2, and in MODE 3 with RCS average temperature ≥ 500°F, operation within the LCO limits for DOSE EQUIVALENT I-131 and gross specific activity are necessary to contain the potential consequences of an SGTR to within the acceptable site boundary dose values.~~

~~For operation in MODE 3 with RCS average temperature < 500°F, and in MODES 4 and 5, the offsite 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 main steam safety and atmospheric steam dump valves.~~

ACTIONS

A.1 and A.2

move to page B 3.4.16-4

A Note permits the use of the provisions of LCO 3.0.4.c. This allowance permits entry into the applicable MODE(S) ~~while relying on the ACTIONS.~~ 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.

With the DOSE EQUIVALENT I-131 greater than the LCO limit, samples at intervals of 4 hours must be taken to demonstrate that the ~~limits of Figure 3.4.16-1 are not exceeded.~~ specific activity is ≤ 60 µCi/gm. The Completion Time of 4 hours is required to obtain and analyze a sample. Sampling is done to continue to provide a trend.

(continued)

INSERT G

In MODES 1, 2, 3, and 4, operation within the LCO limits for DOSE EQUIVALENT I-131 and DOSE EQUIVALENT XE-133 is necessary to limit the potential consequences of an SLB or SGTR to within the SRP acceptance criteria (Ref. 2).

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.

BASES

ACTIONS

A.1 and A.2 (continued)

INSERT H

The DOSE EQUIVALENT I-131 must be restored to within limit~~s~~ within 48 hours. The Completion Time of 48 hours is ~~required if the limit violation resulted from normal iodine spiking and is acceptable because of the low probability of an SGTR occurring during this period.~~

→ (move from page B 3.4.16-3) – new ¶

B.1

~~With the gross specific activity in excess of the allowed limit, the unit must be placed in MODE 3 and T_{avg} must be reduced to < 500°F within 6 hours. This Action lowers the saturation pressure of the reactor coolant below the setpoints of the main steam safety and atmospheric steam dump valves and prevents venting the SG to the environment in an SGTR event. The allowed Completion Time of 6 hours is reasonable, based on operating experience, to reach MODE 3 below 500°F from full power conditions in an orderly manner and without challenging plant systems.~~

→ INSERT I

C.1 and C.2

If ~~a~~ the Required Action and ~~the~~ associated Completion Time of Condition A or B is not met, or if the DOSE EQUIVALENT I-131 is > 60.0 μCi/gm, ~~in the unacceptable region of Figure 3.4.16-1,~~ the reactor must be brought to MODE 3 ~~and RCS average temperature must be reduced to < 500°F~~ within 6 hours and MODE 5 within 36 hours. The Completion Times ~~of 6 hours is~~ are reasonable, based on operating experience, to reach the required plant conditions ~~MODE 3 below 500°F~~ from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.4.16.1

SR 3.4.16.1 requires performing a gamma isotopic analysis as a measure of the ~~gross~~ noble gas specific activity of the reactor coolant at least once every 7 days. ~~While basically a quantitative measure of radionuclides with half lives longer than 15 minutes, excluding iodines,~~ 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 ~~gross~~ 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 Surveillance is applicable in MODES 1 and 2, and in~~

(continued)

INSERT H

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 an SLB or SGTR occurring during this time period.

INSERT I

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 an 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 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.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.16.1 (continued)

~~MODE 3 with T_{avg} at least 500°F.~~ The 7 day Frequency considers the unlikelihood of a gross fuel failure during ~~the~~ this time.

INSERT J

SR 3.4.16.2

This Surveillance is performed to ensure iodine specific activity remains within the LCO limit during normal operation and following fast power changes when ~~fuel failure is~~ iodine spiking is more apt to occur. The 14 day Frequency is adequate to trend changes in the iodine activity level, considering ~~gross~~ noble gas activity is monitored every 7 days. The Frequency, between 2 and 6 hours after a power change ≥ 15% RTP within a 1 hour period, is established because the iodine levels peak during this time following ~~fuel failure;~~ iodine spike initiation; samples at other times would provide inaccurate results. ~~The Note modifies this SR to allow entry into and operation in MODE 2 and in MODE 3 with T_{avg} ≥ 500°F prior to performing the SR. This allows the surveillance to be performed in those MODES, prior to entering MODE 1.~~

INSERT K

~~SR 3.4.16.3~~

~~A radiochemical analysis for Ē determination is required every 184 days (6 months) with the plant operating in MODE 1 equilibrium conditions. The Ē determination directly relates to the LCO and is required to verify plant operation within the specified gross activity LCO limit. The analysis for Ē is a measurement of the average energies per disintegration for isotopes with half lives longer than 15 minutes, excluding iodines. The Frequency of 184 days recognizes Ē does not change rapidly.~~

~~This SR has been modified by a Note that indicates sampling is required to be performed within 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 at least 48 hours. This ensures that the radioactive materials are at equilibrium so the analysis for Ē is representative and not skewed by a crud burst or other similar abnormal event.~~

REFERENCES

1. 10 CFR 100.11, 1973.

~~2.~~ 4. FSAR, Section 15.6.3.

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

3. FSAR, Section 15.1.5.

INSERT J

If a specific noble gas nuclide listed in the definition of DOSE EQUIVALENT XE-133 in Specification 1.1, "Definitions," is not detected, it should be assumed to be present at the minimum detectable activity.

The Note modifies this SR to allow entry into and operation in MODE 4, MODE 3, and MODE 2 prior to performing the SR. This allows the Surveillance to be performed in those MODES, prior to entering MODE 1.

INSERT K

The Note modifies this SR to allow entry into and operation in MODE 4, MODE 3, and MODE 2 prior to performing the SR. This allows the Surveillance to be performed in those MODES, prior to entering MODE 1.

ATTACHMENT 6

SUMMARY OF REGULATORY COMMITMENTS

SUMMARY OF REGULATORY COMMITMENTS

The following table identifies those actions committed to by AmerenUE in this document. Any other statements in this submittal are provided for information purposes and are not considered to be commitments. Please direct questions regarding these commitments to Mr. Dave E. Shafer, Superintendent Licensing, (314) 554-3104.

COMMITMENT	Due Date/Event
Changes to the Fuel Clad Degradation Emergency Action Levels will be implemented within 90 days after NRC approval of the amendment application.	Within 90 days of amendment approval.