**Tennessee Valley Authority**, 1101 Market Street, Chattanooga, Tennessee 37402

CNL-20-068

August 18, 2020

10 CFR 50.90

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

Watts Bar Nuclear Plant, Units 1 and 2
Facility Operating License Nos. NPF-90 and NPF-96
NRC Docket Nos. 50-390 and 50-391

Subject: **Watts Bar Nuclear Plant, Units 1 and 2, License Amendment Request to Adopt TSTF-490, "Deletion of E Bar Definition and Revision to RCS Specific Activity Tech Spec" (WBN-TS-20-07)**

References: TVA Letter to NRC, CNL-20-040, "Watts Bar Nuclear Plant, Units 1 and 2, License Amendment Request to Adopt TSTF-490, "Deletion of E Bar Definition and Revision to RCS Specific Activity Tech Spec" (WBN-TS-20-07)," dated July 17, 2020 (ML20199M343) (EPID L-2020-LLA-0160)

In the referenced letter, Tennessee Valley Authority (TVA) submitted a request for an amendment to Facility Operating License Nos. NPF-90 and NPF-96 for the Watts Bar Nuclear Plant (WBN), Units 1 and 2, respectively. The proposed changes would replace the current WBN, Units 1 and 2 Technical Specification (TS) 3.4.16, "RCS Specific Activity," 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 E Bar average disintegration energy definition. The proposed changes were consistent with the Nuclear Regulatory Commission (NRC) approved Technical Specification Task Force (TSTF) Standard Technical Specification Change Traveler-TSTF-490, Revision 0, "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 March 19, 2007, (72 FR 12838) as part of the Consolidated Line Item Improvement Process (CLIIP).

TVA has identified an error in the calculation of the DEX limit in the enclosure to the referenced letter and has entered the error in the TVA corrective action program.

Therefore, TVA is withdrawing the license amendment request (LAR) in the referenced letter and resubmitting the enclosed LAR, which supersedes, in its entirety, the referenced letter.

The enclosure provides a description and technical evaluation of the proposed change, a regulatory evaluation, and a discussion of environmental considerations. Attachment 1 provides the existing WBN TS pages marked up to show the proposed changes. Attachment 2 provides the existing WBN, Units 1 and 2 TS pages retyped to show the proposed changes. Attachment 3 provides the existing Units 1 and 2 TS Bases pages marked to show the proposed changes. Changes to the existing TS Bases are provided for information only and will be implemented under the TS Bases Control Program.

TVA has determined that there are no significant hazards considerations associated with the proposed change and that the TS change qualifies for a categorical exclusion from environmental review pursuant to the provisions of 10 CFR 51.22(c)(9). In accordance with 10 CFR 50.91, "Notice for Public Comment; State Consultation," TVA is sending a copy of this letter and the enclosure to the Tennessee Department of Environment and Conservation.

TVA requests approval of the proposed license amendment within one year from the date of this submittal with implementation within 60 days following NRC approval.

There are no new regulatory commitments associated with this submittal. Please address any questions regarding this submittal to Gordon R. Williams, Senior Manager, Fleet Licensing (Acting) at (423) 751-2687.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 18th day of August 2020.

Respectfully,

James Barstow
Vice President, Nuclear Regulatory Affairs & Support Services

Enclosure: Evaluation of Proposed Change

cc: (with Enclosure):

NRC Regional Administrator - Region II
NRC Senior Resident Inspector - Watts Bar Nuclear Plant
NRC Project Manager - Watts Bar Nuclear Plant
Division of Radiological Health - Tennessee Department of Environment and Conservation

Enclosure

Evaluation of Proposed Change

Subject: **Watts Bar Nuclear Plant, Units 1 and 2, License Amendment Request to Adopt TSTF-490, "Deletion of E Bar Definition and Revision to RCS Specific Activity Tech Spec," (WBN-TS-20-07)**

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3. Proposed TS Bases Page Changes (Mark-Ups) for WBN Units 1 and 2 (For Information Only)

## 1.0 DESCRIPTION

In accordance with the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR) 50.90, "Application for amendment of license, construction permit, or early site permit," Tennessee Valley Authority (TVA) is requesting a license amendment to Facility Operating License Nos. NPF-90 and NPF-96 for the Watts Bar Nuclear Plant (WBN), Units 1 and 2, respectively.

The proposed changes would replace the current Technical Specification (TS) limits for primary coolant gross specific activity with limits on primary coolant noble gas activity. The noble gas activity will be based on Dose Equivalent XE-133 (DEX) and would take into account only the noble gas activity in the primary coolant. The proposed changes are consistent with the Nuclear Regulatory Commission (NRC)-approved Technical Specification Task Force (TSTF), Improved Standard Technical Specifications Change Traveler-TSTF-490, Revision 0, "Deletion of E Bar Definition and Revision to RCS Specific Activity Tech Spec," (References 1 through 3) as part of the Consolidated Line Item Improvement Process (CLIIP). By memorandum from the Chief, Licensing Processes Branch, to the Plant Licensing Branch Chiefs, dated March 14, 2012 (Reference 4), the NRC staff indicated that license amendment requests (LAR) related to TSTF-490 can be accepted for review, but will be handled through the normal LAR review process, instead of the expedited six-month CLIIP schedule.

## 2.0 Proposed Changes

Consistent with NRC-approved TSTF–490, Revision 0, the proposed TS changes:

- Revise the definition of DOSE EQUIVALENT I-131
- Delete the definition of $\bar{E}$—AVERAGE DISINTEGRATION ENERGY
- Add a new definition for DOSE EQUIVALENT XE-133
- Revise Limiting Condition for Operation (LCO) 3.4.16, "RCS Specific Activity," to state "RCS DOSE EQUIVALENT I-131 and DOSE EQUIVALENT XE-133 Specific Activity shall be within limits."
- Revise LCO 3.4.16 "Applicability" to specify the LCO is applicable in MODES 1, 2, 3, and 4.
- Modify LCO 3.4.16 ACTIONS Table as follows:
    1. Condition B is modified to provide a Condition and Required Action for DOSE EQUIVALENT XE-133 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.
    2. Condition C is modified based on the changes to Conditions A and B and to reflect the change in the LCO Applicability.
- Revise Surveillance Request (SR) 3.4.16.1 to verify the limit for DOSE EQUIVALENT XE-133. A Note is added to state that the SR 3.4.16.1 is only required to be performed in Modes 1, 2, and 3 when $T_{avg} \geq 500°F$.
- Revise SR 3.4.16.2 to delete the surveillance Note, "Only required to be performed in MODE 1."
- Delete SR 3.4.16.3.

## 2.1 Variations

TVA is proposing the following variations from the TS changes described in TSTF-490 that do not affect the technical content of TSTF-490. Further information is provided below.

- The current WBN, Units 1 and 2 TS have incorporated TSTF-425, Revision 3, "Relocate Surveillance Frequencies to Licensee Control - Risk Informed Technical Specification Task Force (RITSTF) Initiative 5b," (Reference 5), which included relocation of the surveillance frequencies for SR 3.4.16.1 and 3.4.16.2 to the Surveillance Frequency Control Program required by WBN, Units 1 and 2 TS 5.7.2.23.
- The current verbiage of WBN, Units 1 and 2 TS 3.4.16 Condition A, which specifies a numerical limit for Dose Equivalent I-131 is maintained rather than the TSTF-490 wording of "not within limit." Similarly, WBN, Units 1 and 2 TS 3.4.16 Condition B specifies a numerical limit for DEX. These variations eliminate a potential human error trap for personnel.
- The specific activity for DEX in SR 3.4.16.1 is ≤1200 µCi/gm as discussed in Section 4.0 to this enclosure.
- Reference to the NRC Safety Evaluation (SE) dated September 27, 2006 (ML062700612), is changed to refer to the NRC staff SE in Reference 1 because the SE dated September 27, 2006, which is referred to in the model application, is not publicly available. The SE posted in the Federal Register on March 19, 2007 (Reference 1), is publicly available and approved for use.
- TSTF-490 proposes a Note to SR 3.4.16.1 that states that the SR is only required to be performed in Mode 1. NRC has previously expressed concerns related to this proposed Note (e.g., Section 3.1.8 of Reference 6). Therefore, TVA has revised the proposed Note for WBN, Units 1 and 2 SR 3.4.16.1 to state, "Only required to be performed in MODES 1, 2, and 3 with $T_{avg}$ ≥ 500°F." The proposed change is consistent with the current Mode of Applicability for WBN Units 1 and 2 LCO 3.4.16, the Sequoyah Nuclear Plant TS, and other precedence (e.g., Reference 6).
- WBN, Units 1 and 2 SR 3.4.16.2 has been revised to delete the Note, "Only required to be performed in MODE 1." Deleting this Note provides continued assessment of RCS activity for the modes of applicability because Dose Equivalent I-131 will no longer be limited to MODE 1 operation. Deleting this Note is consistent with other licensees that have adopted TSTF-490 (e.g., References 6, 7, and 8).

## 3.0 Background

The background for this application is as stated in the model SE in the NRC Notice of Availability published on March 19, 2007 (72 FR 12838) (Reference 1), the NRC Notice for Comment published on November 20, 2006 (71 FR 67170) (Reference 9), and TSTF-490, Revision 0.

## 4.0 Technical Analysis

TVA has reviewed References 1 and 9. TVA has applied the methodology in Reference 1 to develop the proposed TS changes. TVA has also concluded that the justifications presented in TSTF-490, Revision 0, and the model SE prepared by the NRC staff are applicable to WBN ,Units 1 and 2, and justify this amendment for the incorporation of the changes to the WBN TS.

To assist in the NRC staff, review of this amendment request, the inputs for determining DEX limits are summarized below.

The determination of DEX is performed using effective dose conversion factors for air submersion listed in Table III.1 of EPA Federal Guidance Report No. 12 (FGR-12) (Reference 10), as shown in Table 1 below. To normalize each radioisotope, each FGR-12 effective dose conversion factor is divided by the FGR-12 effective dose conversion factor for XE-133. The resultant number is each radioisotope's equivalence factor as shown in column 4 in Table 1.

As provided in column 2, Table 1, the equivalence factors are multiplied by the concentrations of noble gases used in the analyses that support the steam generator tube rupture and main steam line break accidents in the WBN updated Final Safety Analysis Report. The nuclide concentrations are assumed to be the total sum of the degassed gamma activities and the gaseous gamma activities for each appropriate nuclide. The products for each radionuclide are then summed to come up with the DEX TS limit. The DEX TS limit is calculated to be 1211 µCi/g; however, the DEX limit will be implemented, conservatively, as 1200 µCi/g.

**Table 1: Calculation of DEX Limit for WBN**

| Radioisotope | Concentration (µCi/gm) | EDE DCF per FGR-12 (Sv per Bq s $m^{-3}$) | DEX Equivalence Factor | DEX (µCi/gm) |
|---|---|---|---|---|
| Kr-85m | 5.08E+00 | 7.48E-15 | 4.79E+00 | 2.43E+01 |
| Kr-85 | 6.92E+00 | 1.19E-16 | 7.63E-02 | 5.28E-01 |
| Kr-87 | 4.78E+00 | 4.12E-14 | 2.64E+01 | 1.26E+02 |
| Kr-88 | 8.90E+00 | 1.02E-13 | 6.54E+01 | 5.82E+02 |
| Xe-131m | 1.84E+01 | 3.89E-16 | 2.49E-01 | 4.58E+00 |
| Xe-133m | 2.10E+00 | 1.37E-15 | 8.78E-01 | 1.85E+00 |
| Xe-133 | 7.29E+01 | 1.56E-15 | 1.00E+00 | 7.29E+01 |
| Xe-135m | 4.14E+00 | 2.04E-14 | 1.31E+01 | 5.42E+01 |
| Xe-135 | 2.67E+01 | 1.19E-14 | 7.63E+00 | 2.04E+02 |
| Xe-138 | 3.82E+00 | 5.77E-14 | 3.70E+01 | 1.41E+02 |
| **DEX Limit** | | | | **1.211E+03** |

## 5.0 Regulatory Analysis

A description of this proposed change and its relationship to applicable regulatory requirements and guidance was provided in the NRC Notice of Availability published on March 19, 2007 (Reference 1), the NRC Notice for Comment published on November 20, 2006 (Reference 9), and TSTF-490, Revision 0.

## 5.1 No Significant Hazards Consideration Determination

Tennessee Valley Authority (TVA) has reviewed the proposed no significant hazards consideration determination published in the Federal Register on March 19, 2007 (72 FR 12838) as part of the Consolidated Line Item Improvement Process (CLIIP). TVA has concluded that the proposed determination presented in the notice is applicable to WBN and the determination is hereby incorporated by reference to satisfy the requirements of 10 CFR 50.91(a).

## 6.0 Environmental Consideration

TVA has reviewed the environmental consideration included in the model SE published in the Federal Register on March 19, 2007 (72 FR 12838) as part of the CLIIP. TVA has concluded that the staff's findings presented therein are applicable to WBN and the determination is hereby incorporated by reference for this application.

## 7.0 References

1. Federal Register, 72 FR 12838, “Notice of Availability of Model Application Concerning Technical Specification (TS) Improvement Regarding TSTF-490 Deletion of E Bar Definition and Revision to Reactor Coolant System Specific Activity TS Using Consolidated Line Item Improvement Process,” dated March 19, 2007 (ML070250176)
2. Federal Register, 72 FR 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,” dated March 15, 2007
3. NRC letter to Technical Specifications Task Force, “Traveler TSTF-490, Revision 0, ‘Deletion of E Bar Definition and Revision to RCS Specific Activity Tech Spec’,” dated October 31, 2018 (ML18256A027)
4. NRC memorandum, “Plant-Specific Adoption of Traveler TSTF-490, ‘Deletion of E Bar Definition and Revision to RCSs [Reactor Coolant System] Specific Activity Tech Spec’,” dated March 14, 2012 (ML12039A201)
5. NRC letter to TVA, “Watts Bar Nuclear Plant, Units 1 and 2 - Issuance of Amendment Nos. 132 and 36 Regarding the Adoption of Technical Specifications Task Force Traveler TSTF-425, Revision 3 (EPID L-2018-LLA-0279),” dated February 28, 2020 (ML20028F733)
6. NRC letter to Duke Energy Carolinas, LLC, “Catawba Nuclear Station, Units 1 and 2 (Catawba 1 and 2), McGuire Nuclear Station, Units 1 and 2 (McGuire 1 and 2), and Oconee Nuclear Station, Units 1, 2, and 3 (Oconee 1, 2, and 3) Issuance of Amendments Regarding Deletion of E Bar Definition and Revision to Reactor Coolant System Specific Activity Technical Specifications (TAC Nos. ME8102, ME8103, Catawba; ME8104, ME8105, McGuire; ME8106, ME8107, ME8108, Oconee),” dated June 25, 2012 (ML120760079)
7. NRC letter to Exelon Generation Company, LLC, “Calvert Cliffs Nuclear Power Plant, Units 1 and 2 - Issuance of Amendment Nos. 333 and 311 Re: Deletion Of E-Bar Definition and Revision to Reactor Coolant System Specific Activity Technical Specifications (EPID L-2019-LLA-0102),” dated February 28, 2020 (ML19337D035)

8. NRC letter to Arizona Public Service Company, “Palo Verde Nuclear Generating Station, Units 1, 2, and 3- Issuance of Amendments Re: Adoption of TSTF-490, Revision 0, Deletion of E-Bar Definition and Revision to RCS Specific Activity Technical Specifications (TAC Nos. MF0397, MF0398, and MF0399),” dated November 25, 2013 (ML13294A576)
9. Federal Register, 71 FR 67170, "Notice of Opportunity To Comment on Model Safety Evaluation and Model License Amendment Request on Technical Specification Improvement Regarding Deletion of E Bar Definition and Revision to Reactor Coolant System Specific Activity Technical Specification; Babcock and Wilcox Pressurized Water Reactors, Westinghouse Pressurized Water Reactors, Combustion Engineering Pressurized Water Reactors Using the Consolidated Line Item Improvement Process," dated November 20, 2006
10. Federal Guidance Report No. 12, “External Exposure to Radionuclides in Air, Water, and Soil,” 1993.

Attachment 1

Proposed TS Changes (Mark-Ups) for WBN Units 1 and 2

1.1 Definitions (continued)

| | |
|---|---|
| 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 the OPERABILITY of required alarm, interlock, display, and trip functions. The COT shall include adjustments, as necessary, of the required alarm, interlock, and trip setpoints so that the setpoints are within the required range and accuracy. |
| CORE ALTERATION | CORE ALTERATION shall be the movement of any fuel, sources, or other 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 initial and current reload cycle. These cycle specific parameter limits shall be determined for the initial and each reload cycle in accordance with Specification 5.9.5. 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 when inhaled as the combined activities of iodine isotopes ~~as the quantity and isotopic mixture of~~ 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 ~~used for this calculation shall be those listed in~~ Table E-7 of Regulatory Guide 1.109, Rev. 1, NRC, 1977. |
| DOSE EQUIVALENT XE-133 | DOSE EQUIVALENT XE-133 shall be that concentration of Xe-133 (microcuries per gram) that alone would produce the same acute dose to the whole body as the combined activities of noble gas nuclides Kr-85m, Kr-85, Kr-87, Kr-88, Xe-131m, Xe-133m, Xe-133, Xe-135m, Xe-135, and Xe-138 actually present. If a specific noble gas nuclide is not detected, it should be assumed to be present at the minimum detectable activity. The determination of DOSE EQUIVALENT XE-133 shall be performed using effective dose conversion factors for air submersion listed in Table III.1 of EPA Federal Guidance Report No. 12, 1993, "External Exposure to Radionuclides in Air, Water, and Soil." |

(continued)

1.1 Definitions (continued)

| | |
|---|---|
| ~~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 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 the methodology for verification have been previously reviewed and approved by the NRC. |
| $L_a$ | The maximum allowable primary containment leakage rate, $L_a$, shall be .25% of primary containment air weight per day at the calculated peak containment pressure ($P_a$). |
| LEAKAGE | LEAKAGE shall be:<br>a. <u>Identified LEAKAGE</u><br>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;<br>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 |

(continued)

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. ~~The specific activity of the reactor coolant 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 > 0.265 μCi/gm. | ----------NOTE---------- LCO 3.0.4.c is applicable. ----------<br>A.1 Verify DOSE EQUIVALENT I-131 ≤ 14 μCi/gm<br>AND<br>A.2 Restore DOSE EQUIVALENT I-131 to within limit. | Once per 4 hours<br><br>48 hours |
| B. DOSE EQUIVALENT XE-133 > 1200 μCi/gm ~~Gross specific activity of the reactor coolant not within limit~~. | ----------NOTE---------- LCO 3.0.4.c is applicable. ----------<br>B.1 Restore DOSE EQUIVALENT XE-133 to within limit. ~~Perform SR 3.4.16.2.~~<br>~~AND~~<br>~~B.2 Be in MODE 3 with $T_{avg}$ < 500°F.~~ | ~~4 hours~~<br><br>~~6~~48 hours |

(continued)

ACTIONS (continued)

| CONDITION | REQUIRED ACTION | COMPLETION TIME |
|---|---|---|
| C. Required Action and associated Completion Time of Condition A or B not met.<br><br>OR<br><br>DOSE EQUIVALENT I-131 > 14 μCi/gm. | C.1 Be in MODE 3 ~~with $T_{avg}$ < 500°F~~.<br><br>AND<br><br>C.2 Be in MODE 5. | 6 hours<br><br>36 hours |

SURVEILLANCE REQUIREMENTS

| SURVEILLANCE | | FREQUENCY |
|---|---|---|
| SR 3.4.16.1 | ----------NOTE----------<br>Only required to be performed in MODES 1, 2, and 3 with $T_{avg} \geq 500°F$.<br>----------<br>~~Verify reactor coolant gross specific activity ≤ 100/ $\bar{E}$ μCi/gm.~~<br>Verify reactor coolant DOSE EQUIVALENT XE-133 specific activity ≤ 1200 μCi/gm. | In accordance with the Surveillance Frequency Control Program |

(continued)

SURVEILLANCE REQUIREMENTS (continued)

| SURVEILLANCE | FREQUENCY |
|---|---|
| SR 3.4.16.2 ~~NOTE Only required to be performed in MODE 1.~~<br><br>Verify reactor coolant DOSE EQUIVALENT I-131 specific activity ≤ 0.265 μCi/gm. | In accordance with the Surveillance Frequency Control Program<br><br>AND<br><br>Between 2 and 6 hours after a THERMAL POWER change of ≥ 15% RTP within a 1 hour period |
| ~~SR 3.4.16.3 NOTE 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 ≥ 48 hours.~~<br><br>~~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.~~ | ~~In accordance with the Surveillance Frequency Control Program~~ |

1.1 Definitions (continued)

| | |
|---|---|
| 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 the OPERABILITY of required alarm, interlock, display, and trip functions. The COT shall include adjustments, as necessary, of the required alarm, interlock, and trip setpoints so that the setpoints are within the required range and accuracy. |
| CORE ALTERATION | CORE ALTERATION shall be the movement of any fuel, sources, or other 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 initial and current reload cycle. These cycle specific parameter limits shall be determined for the initial and each reload cycle in accordance with Specification 5.9.5. 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 when inhaled as the combined activities of iodine isotopes ~~as the quantity and isotopic mixture of~~ 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 ~~used for this calculation shall be those listed in~~ Table E-7 of Regulatory Guide 1.109, Rev. 1, NRC, 1977. |

(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-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." |
| ~~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 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 the methodology for verification have been previously reviewed and approved by the NRC. |
| $L_a$ | The maximum allowable primary containment leakage rate, $L_a$, shall be .25% of primary containment air weight per day at the calculated peak containment pressure ($P_a$). |

(continued)

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. ~~The specific activity of the reactor coolant 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 > 0.265 μCi/gm. | ----------NOTE----------<br>LCO 3.0.4.c is applicable.<br>----------<br>A.1 Verify DOSE EQUIVALENT I-131 ≤ 14 μCi/gm.<br>AND<br>A.2 Restore DOSE EQUIVALENT I-131 to within limit. | <br><br>Once per 4 hours<br><br><br>48 hours |
| B. DOSE EQUIVALENT XE-133 > 1200 μCi/gm. ~~Gross specific activity of the reactor coolant not within limit.~~ | ~~----------NOTE----------~~<br>LCO 3.0.4.c is applicable.<br>~~----------~~<br>~~B.1 Perform SR 3.4.16.2.~~<br>~~AND~~<br>B.1~~2~~ Restore DOSE EQUIVALENT XE-133 to within limit. ~~Be in MODE 3 with $T_{avg}$ < 500°F.~~ | ~~4 hours~~<br><br><br><br><br>48 hours~~6 hours~~ |

(continued)

ACTIONS (continued)

| CONDITION | REQUIRED ACTION | COMPLETION TIME |
|---|---|---|
| C. Required Action and associated Completion Time of Condition A or B not met.<br><br>OR<br><br>DOSE EQUIVALENT I-131 > 14 μCi/gm. | C.1 Be in MODE 3 ~~with $T_{avg}$ < 500°F~~.<br><br>AND<br><br>C.2 Be in MODE 5. | 6 hours<br><br>36 hours |

SURVEILLANCE REQUIREMENTS

| SURVEILLANCE | | FREQUENCY |
|---|---|---|
| SR 3.4.16.1 | ----------NOTE----------<br>Only required to be performed in MODES 1, 2, and 3 with $T_{avg} \geq 500°F$.<br>----------<br><br>~~Verify reactor coolant gross specific activity ≤ 100/ $\bar{E}$ μCi/gm.~~Verify reactor coolant DOSE EQUIVALENT XE-133 specific activity ≤ 1200 μCi/gm. | In accordance with the Surveillance Frequency Control Program |

(continued)

SURVEILLANCE REQUIREMENTS (continued)

| SURVEILLANCE | | FREQUENCY |
|---|---|---|
| SR 3.4.16.2 | ~~NOTE~~<br>~~Only required to be performed in MODE 1.~~<br><br>Verify reactor coolant DOSE EQUIVALENT I-131 specific activity ≤ 0.265 μCi/gm. | In accordance with the Surveillance Frequency Control Program<br><br>AND<br>Between 2 hours and 6 hours after a THERMAL POWER change of ≥ 15% RTP within a 1 hour period |
| ~~SR 3.4.16.3~~ | ~~NOTE~~<br>~~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 ≥ 48 hours.~~<br><br>~~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.~~ | ~~In accordance with the Surveillance Frequency Control Program~~ |

Attachment 2

Proposed TS Changes (Final Typed) for WBN Units 1 and 2

1.1 Definitions (continued)

| | |
|---|---|
| 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 the OPERABILITY of required alarm, interlock, display, and trip functions. The COT shall include adjustments, as necessary, of the required alarm, interlock, and trip setpoints so that the setpoints are within the required range and accuracy. |
| CORE ALTERATION | CORE ALTERATION shall be the movement of any fuel, sources, or other 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 initial and current reload cycle. These cycle specific parameter limits shall be determined for the initial and each reload cycle in accordance with Specification 5.9.5. 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 when inhaled as the combined activities of iodine isotopes I-131, I-132, I-133, I-134, and I-135 actually present. The determination of DOSE EQUIVALENT I-131 shall be performed using thyroid dose conversion factors from Table E-7 of Regulatory Guide 1.109, Rev. 1, NRC, 1977. |
| DOSE EQUIVALENT XE-133 | DOSE EQUIVALENT XE-133 shall be that concentration of Xe-133 (microcuries per gram) that alone would produce the same acute dose to the whole body as the combined activities of noble gas nuclides Kr-85m, Kr-85, Kr-87, Kr-88, Xe-131m, Xe-133m, Xe-133, Xe-135m, Xe-135, and Xe-138 actually present. If a specific noble gas nuclide is not detected, it should be assumed to be present at the minimum detectable activity. The determination of DOSE EQUIVALENT XE-133 shall be performed using effective dose conversion factors for air submersion listed in Table III.1 of EPA Federal Guidance Report No. 12, 1993, "External Exposure to Radionuclides in Air, Water, and Soil." |

(continued)

1.1 Definitions (continued)

| | |
|---|---|
| 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 the methodology for verification have been previously reviewed and approved by the NRC. |
| $L_a$ | The maximum allowable primary containment leakage rate, $L_a$, shall be .25% of primary containment air weight per day at the calculated peak containment pressure ($P_a$). |
| LEAKAGE | LEAKAGE shall be:<br><br>a. <u>Identified LEAKAGE</u><br><br>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;<br><br>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 |

(continued)

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 > 0.265 μCi/gm. | ----------NOTE---------- LCO 3.0.4.c is applicable. ---------- | |
| | A.1 Verify DOSE EQUIVALENT I-131 ≤ 14 μCi/gm | Once per 4 hours |
| | AND | |
| | A.2 Restore DOSE EQUIVALENT I-131 to within limit. | 48 hours |
| B. DOSE EQUIVALENT XE-133 > 1200 μCi/gm. | ----------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.<br><br>OR<br><br>DOSE EQUIVALENT I-131 > 14 μCi/gm. | C.1 Be in MODE 3.<br><br>AND<br><br>C.2 Be in MODE 5. | 6 hours<br><br>36 hours |

SURVEILLANCE REQUIREMENTS

| SURVEILLANCE | | FREQUENCY |
|---|---|---|
| SR 3.4.16.1 | ----------NOTE----------<br>Only required to be performed in MODES 1, 2, and 3 with $T_{avg} \geq 500°F$.<br>----------<br><br>Verify reactor coolant DOSE EQUIVALENT XE-133 specific activity ≤ 1200 μCi/gm. | In accordance with the Surveillance Frequency Control Program |

(continued)

SURVEILLANCE REQUIREMENTS (continued)

| SURVEILLANCE | | FREQUENCY |
|---|---|---|
| SR 3.4.16.2 | Verify reactor coolant DOSE EQUIVALENT I-131 specific activity $\leq$ 0.265 $\mu$Ci/gm. | In accordance with the Surveillance Frequency Control Program<br><br>AND<br><br>Between 2 and 6 hours after a THERMAL POWER change of $\geq$ 15% RTP within a 1 hour period |

1.1 Definitions (continued)

| | |
|---|---|
| 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 the OPERABILITY of required alarm, interlock, display, and trip functions. The COT shall include adjustments, as necessary, of the required alarm, interlock, and trip setpoints so that the setpoints are within the required range and accuracy. |
| CORE ALTERATION | CORE ALTERATION shall be the movement of any fuel, sources, or other 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 initial and current reload cycle. These cycle specific parameter limits shall be determined for the initial and each reload cycle in accordance with Specification 5.9.5. 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 thyroid dose when inhaled as the combined activities of iodine isotopes I-131, I-132, I-133, I-134, and I-135 actually present. The determination of DOSE EQUIVALENT I-131 shall be performed using able E-7 of Regulatory Guide 1.109, Rev. 1, NRC, 1977. |

(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-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." |
| 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 the methodology for verification have been previously reviewed and approved by the NRC. |
| $L_a$ | The maximum allowable primary containment leakage rate, $L_a$, shall be .25% of primary containment air weight per day at the calculated peak containment pressure ($P_a$). |

(continued)

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 > 0.265 μCi/gm. | ----------NOTE---------- LCO 3.0.4.c is applicable. ---------- | | |
| | A.1 | Verify DOSE EQUIVALENT I-131 ≤ 14 μCi/gm. | Once per 4 hours |
| | AND | | |
| | A.2 | Restore DOSE EQUIVALENT I-131 to within limit. | 48 hours |
| B. DOSE EQUIVALENT XE-133 > 1200 μCi/gm. | ----------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.<br><br>OR<br><br>DOSE EQUIVALENT I-131 > 14 μCi/gm. | C.1 Be in MODE 3.<br><br>AND<br><br>C.2 Be in MODE 5. | 6 hours<br><br>36 hours |

SURVEILLANCE REQUIREMENTS

| SURVEILLANCE | | FREQUENCY |
|---|---|---|
| SR 3.4.16.1 | ----------NOTE----------<br>Only required to be performed in MODES 1, 2, and 3 with $T_{avg} \geq 500°F$.<br>---<br><br>Verify reactor coolant DOSE EQUIVALENT XE-133 specific activity ≤ 1200 μCi/gm. | In accordance with the Surveillance Frequency Control Program |

(continued)

SURVEILLANCE REQUIREMENTS (continued)

| SURVEILLANCE | | FREQUENCY |
|---|---|---|
| SR 3.4.16.2 | Verify reactor coolant DOSE EQUIVALENT I-131 specific activity $\leq$ 0.265 $\mu$Ci/gm. | In accordance with the Surveillance Frequency Control Program<br><br>AND<br>Between 2 hours and 6 hours after a THERMAL POWER change of $\geq$ 15% RTP within a 1 hour period |

Attachment 3

Proposed TS Bases Page Changes (Mark-Ups) for WBN Units 1 and 2 (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 maximum dose to the whole body and the thyroid that an individual occupying the Main Control Room can receive for the accident duration is specified in 10 CFR 50, Appendix A, GDC 19. The limits on specific activity ensure that the doses are held to a small fraction of the 10 CFR 100 limits and within the 10 CFR 50, Appendix A, GDC 19 limits 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 offsite and Main Control Room radioactivity dose consequences in the event of a steam generator tube rupture (SGTR) or main steam line break (MSLB) accident.

The LCO contains specific activity limits for both DOSE EQUIVALENT I-131 and DOSE EQUIVALENT XE-133~~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, and ensure the Main Control Room accident dose is within the appropriate 10 CFR 50, Appendix A, GDC 19 dose guideline limits.

The evaluations showed the potential offsite and Main Control Room dose levels for a SGTR and MSLB accident were within the appropriate 10 CFR 100 and GDC 19 guideline limits.

APPLICABLE SAFETY ANALYSES

The LCO limits on the specific activity of the reactor coolant ensures that the resulting 2 hour doses at the site boundary and Main Control Room accident doses will not exceed the appropriate 10 CFR 100 dose guideline limits and 10 CFR 50, Appendix A, GDC 19 dose guideline limits following a SGTR or MSLB accident. The SGTR and MSLB safety analysis (Ref. 2) assume the specific activity of the reactor coolant at the LCO limit and an existing reactor coolant steam generator (SG) tube leakage rate of 150 gallons per day (GPD). The safety analysis assumes the specific activity of the secondary coolant at its limit of 0.1 μCi/gm DOSE EQUIVALENT I-131 from LCO 3.7.14, "Secondary Specific Activity."

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

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

The analyses are for two cases of reactor coolant specific activity. One case assumes specific activity at 0.265 μCi/gm DOSE EQUIVALENT I-131 with an iodine spike immediately after the accident that increases the iodine activity in the reactor coolant by a factor of 500 times the iodine production rate necessary to maintain a steady state iodine concentration of 0.265 μCi/gm DOSE EQUIVALENT I-131. The second case assumes the initial reactor coolant iodine activity at 14 μCi/gm DOSE EQUIVALENT I-131 due to a pre-accident iodine spike caused by an RCS transient. In both cases, the noble gas activity in the reactor coolant equals the LCO limit of 1200 ~~/ Ē~~ μCi/gm DOSE EQUIVALENT XE-133~~for gross specific activity~~.

The analysis also assumes a loss of offsite power at the same time as the SGTR and MSLB event. 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 MSLB results in a reactor trip due to low steam pressure.

The coincident 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.

The safety analysis shows the radiological consequences of a SGTR and MSLB accident are within the appropriate 10 CFR 100 and 10 CFR 50, Appendix A, GDC 19 dose guideline limits. Operation with iodine specific activity levels greater than the LCO limit is permissible, if the activity levels do not exceed 14 μCi/gm DOSE EQUIVALENT I-131, in the applicable specification, for more than 48 hours. The safety analysis has concurrent and pre-accident iodine spiking levels up to 14 μCi/gm DOSE EQUIVALENT I-131.

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 the NRC Policy Statement.

(continued)

BASES

LCO

The specific iodine activity is limited to 0.265 μCi/gm DOSE EQUIVALENT I-131, and the noble gas~~gross~~ specific activity in the reactor coolant is limited to ~~the number of μCi/gm equal to 100 divided by $\bar{E}$ (average disintegration energy of the sum of the average beta and gamma energies of the coolant nuclides).~~1200 μCi/gm DOSE EQUIVALENT XE-133, which ensure that offsite and control room doses will meet the 10 CFR 100 (Ref. 1) and GDC 19 limits~~. The limit on DOSE EQUIVALENT I-131 ensures the 2 hour thyroid dose to an individual at the site boundary and accident dose to personnel in the Main Control Room during the Design Basis Accident (DBA) will be within the allowed thyroid dose. The limit on ensures the 2 hour whole body dose to an individual at the site boundary and accident dose to personnel in the Main Control Room during the DBA will be within the allowed whole body dose.~~

The SGTR and MSLB accident analysis (Ref. 2) shows that the 2 hour site boundary dose levels and Main Control Room accident dose are within acceptable limits. Violation of the LCO may result in reactor coolant radioactivity levels that could, in the event of a SGTR or MSLB, lead to site boundary doses that exceed the 10 CFR 100 dose guideline limits, or Main Control Room accident dose that exceed the 10 CFR 50, Appendix A, GDC 19 dose limits.

APPLICABILITY

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 a SGTR or MSLB to within the 10 CFR 100.11 (Ref. 1) and GDC 19 limits (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.~~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 accident to within the acceptable Main Control Room and site boundary dose values.~~

~~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 a SGTR is unlikely since the saturation pressure of the reactor coolant is below the lift pressure settings of the main steam safety valves.~~

(continued)

BASES (continued)

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 limit of 14 μCi/gm is not exceeded. The Completion Time of 4 hours is required to obtain and analyze a sample. Sampling is done to continue to provide a trend.

The DOSE EQUIVALENT I-131 must be restored to within limits within 48 hours. The Completion Time of 48 hours is required, if the limit violation resulted from normal iodine spiking.

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. 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 and B.2

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.~~With the gross specific activity in excess of the allowed limit, an analysis must be performed within 4 hours to determine DOSE EQUIVALENT I-131. The Completion Time of 4 hours is required to obtain and analyze a sample.The change within 6 hours to MODE 3 and RCS average temperature < 500°F lowers the saturation pressure of the reactor coolant below the setpoints of the main steam safety 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.~~

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

If a Required Action and the associated Completion Time of Condition A or B is not met, or if the DOSE EQUIVALENT I-131 is greater than 14 μCi/gm, the reactor must be brought to MODE 3 ~~with RCS average temperature < 500°F~~

(continued)

BASES (continued)

within 6 hours and MODE 5 within 36 hours. The allowed Completion Times are ~~of 6 hours is~~ 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.

(continued)

BASES

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. ~~While basically a quantitative measure of radionuclides with half lives longer than 15 minutes, excluding iodines, t~~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~~gross~~ 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 MODE 3 with $T_{avg}$ at least 500°F.~~ The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

Due to the inherent difficulty in detecting Kr-85 in a reactor coolant sample due to masking from radioisotopes with similar decay energies, such as F-18 and 1-134, it is acceptable to include the minimum detectable activity for Kr-85 in the SR 3.4.15.1 calculation. If a specific noble gas nuclide listed in the definition of DOSE EQUIVALENT XE-133 is not detected, it should be assumed to be present at the minimum detectable activity. A Note modifies the SR, which requires the SR to only be performed in MODE 1.

SR 3.4.16.2

This Surveillance is performed in MODE 1 only to ensure iodine remains within limit during normal operation and following rapid power changes when fuel failure is more apt to occur. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. 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 fuel failure; samples at other times would provide inaccurate results. A Note modifies the SR, which requires the SR to only be performed in MODE 1.

~~SR 3.4.16.3~~

~~A radiochemical analysis for $\bar{E}$ determination is required with the plant operating in MODE 1 equilibrium conditions. The $\bar{E}$ determination directly relates to the LCO and is required to verify plant operation within the specified gross activity LCO limit. The analysis for $\bar{E}$ is a measurement of the average energies per disintegration for isotopes with half lives longer than 15 minutes, excluding iodine. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.~~

~~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~~

(continued)

BASES

~~so the analysis for $\bar{E}$ is representative and not skewed by a crud burst or other similar abnormal event.~~

(continued)

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 maximum dose to the whole body and the thyroid that an individual occupying the Main Control Room can receive for the accident duration is specified in 10 CFR 50, Appendix A, GDC 19. The limits on specific activity ensure that the doses are held to a small fraction of the 10 CFR 100 limits and within the 10 CFR 50, Appendix A, GDC 19 limits 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 offsite and Main Control Room radioactivity dose consequences in the event of a steam generator tube rupture (SGTR) or main steam line break (MSLB) accident.

The LCO contains specific activity limits for both DOSE EQUIVALENT I-131 and DOSE EQUIVALENT XE-133~~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, and ensure the Main Control Room accident dose is within the appropriate 10 CFR 50, Appendix A, GDC 19 dose guideline limits.

The evaluations showed the potential offsite and Main Control Room dose levels for a SGTR and MSLB accident were within the appropriate 10 CFR 100 and GDC 19 guideline limits.

(continued)

BASES (continued)

APPLICABLE SAFETY ANALYSES

The LCO limits on the specific activity of the reactor coolant ensures that the resulting 2 hour doses at the site boundary and Main Control Room accident doses will not exceed the appropriate 10 CFR 100 dose guideline limits and 10 CFR 50, Appendix A, GDC 19 dose guideline limits following a SGTR or MSLB accident. The SGTR and MSLB safety analysis (Ref. 2) assumes the specific activity of the reactor coolant at the LCO limit and an existing reactor coolant steam generator (SG) tube leakage rate of 150 gallons per day (GPD). The safety analysis assumes the specific activity of the secondary coolant at its limit of 0.1 μCi/gm DOSE EQUIVALENT I-131 from LCO 3.7.14, "Secondary Specific Activity."

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

The analyses are for two cases of reactor coolant specific activity. One case assumes specific activity at 0.265 μCi/gm DOSE EQUIVALENT I-131 with an iodine spike immediately after the accident that increases the iodine activity in the reactor coolant by a factor of 500 times the iodine production rate necessary to maintain a steady state iodine concentration of 0.265 μCi/gm DOSE EQUIVALENT I-131. The second case assumes the initial reactor coolant iodine activity at 14 μCi/gm DOSE EQUIVALENT I-131 due to a pre-accident iodine spike caused by an RCS transient. In both cases, the noble gas activity in the reactor coolant equals the LCO limit of 1200/~~$\bar{E}$~~ μCi/gm DOSE EQUIVALENT XE-133~~for gross specific activity~~.

The analysis also assumes a loss of offsite power at the same time as the SGTR and MSLB event. 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 MSLB results in a reactor trip due to low steam pressure.

The coincident 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.

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

The safety analysis shows the radiological consequences of an SGTR and MSLB accident are within the appropriate 10 CFR 100 and 10 CFR 50, Appendix A, GDC 19 dose guideline limits. Operation with iodine specific activity levels greater than the LCO limit is permissible, if the activity levels do not exceed 14 μCi/gm DOSE EQUIVALENT I-131, in the applicable specification, for more than 48 hours. The safety analysis has concurrent and pre-accident iodine spiking levels up to 14 μCi/gm DOSE EQUIVALENT I-131.

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 specific iodine activity is limited to 0.265 μCi/gm DOSE EQUIVALENT I-131, and the noble gas~~gross~~ specific activity in the reactor coolant is limited to 1200 μCi/gm DOSE EQUIVALENT XE-133, which ensure that offsite and control room doses will meet the 10 CFR 100 (Ref. 1) and GDC 19 limits~~the number of μCi/gm equal to 100 divided by $\bar{E}$ (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 and accident dose to personnel in the Main Control Room during the Design Basis Accident (DBA) will be within the allowed thyroid dose. The limit on gross specific activity ensures the 2 hour whole body dose to an individual at the site boundary and accident dose to personnel in the Main Control Room during the DBA will be within the allowed whole body dose~~.

The SGTR and MSLB accident analysis (Ref. 2) shows that the 2 hour site boundary dose levels and Main Control Room accident dose are within acceptable limits. Violation of the LCO may result in reactor coolant radioactivity levels that could, in the event of a SGTR or MSLB, lead to site boundary doses that exceed the 10 CFR 100 dose guideline limits, or Main Control Room accident dose that exceed the 10 CFR 50, Appendix A, GDC 19 dose limits.

(continued)

BASES (continued)

APPLICABILITY

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 a SGTR or MSLB to within the 10 CFR 100.11 (Ref. 1) and GDC 19 limits (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. ~~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 accident to within the acceptable Main Control Room and site boundary dose values.~~

~~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 a SGTR is unlikely since the saturation pressure of the reactor coolant is below the lift pressure settings of the main steam safety valves.~~

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 limit of 14 μCi/gm is not exceeded. The Completion Time of 4 hours is required to obtain and analyze a sample. Sampling is done to continue to provide a trend.

The DOSE EQUIVALENT I-131 must be restored to within limits within 48 hours. The Completion Time of 48 hours is required, if the limit violation resulted from normal iodine spiking.

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. 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.

(continued)

BASES

ACTIONS (continued)

B.1 and B.2

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. ~~With the gross specific activity in excess of the allowed limit, an analysis must be performed within 4 hours to determine DOSE EQUIVALENT I-131. The Completion Time of 4 hours is required to obtain and analyze a sample.~~

~~The change within 6 hours to MODE 3 and RCS average temperature < 500°F lowers the saturation pressure of the reactor coolant below the setpoints of the main steam safety 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.~~

C.1

If a Required Action and the associated Completion Time of Condition A is not met or if the DOSE EQUIVALENT I-131 is greater than 14 μCi/gm, the reactor must be brought to MODE 3 ~~with RCS average temperature < 500°F~~ within 6 hours and MODE 5 within 36 hours. The allowed Completion Times are ~~of 6 hours is~~ 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 noble gas ~~gross~~ specific activity of the reactor coolant. ~~While~~

(continued)

~~basically a quantitative measure of radionuclides with half lives longer than 15 minutes, excluding iodines, th~~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~~gross~~ 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 MODE 3 with $T_{avg}$ at least 500°F.~~ The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

Due to the inherent difficulty in detecting Kr-85 in a reactor coolant sample due to masking from radioisotopes with similar decay energies, such as F-18 and 1-134, it is acceptable to include the minimum

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.4.16.1 (continued)

detectable activity for Kr-85 in the SR 3.4.15.1 calculation. If a specific noble gas nuclide listed in the definition of DOSE EQUIVALENT XE-133 is not detected, it should be assumed to be present at the minimum detectable activity. A Note modifies the SR, which requires the SR to only be performed in MODE 1.

SR 3.4.16.2

This Surveillance is performed in MODE 1 only to ensure iodine remains within limit during normal operation and following rapid power changes when fuel failure is more apt to occur. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Frequency, between 2 hours 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 fuel failure; samples at other times would provide inaccurate results. A Note modifies the SR, which requires the SR to only be performed in MODE 1.

~~SR 3.4.16.3~~

~~A radiochemical analysis for $\bar{E}$ determination is required with the plant operating in MODE 1 equilibrium conditions. The $\bar{E}$ determination directly relates to the LCO and is required to verify plant operation within the specified gross activity LCO limit. The analysis for $\bar{E}$ is a measurement of the average energies per disintegration for isotopes with half lives longer than 15 minutes, excluding iodines. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.~~

~~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 $\bar{E}$ is representative and not skewed by a crud burst or other similar abnormal event.~~

REFERENCES

1. Title 10, Code of Federal Regulations, Part 100.11, “Determination of Exclusion Area, Low Population Zone, and Population Center Distance,” 1973.

2. Watts Bar FSAR, Section 15.4, “Condition IV - Limiting Faults.”