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PSEG *Nuclear LLC*

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U.S. Nuclear Regulatory Commission
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SALEM GENERATING STATION UNIT 1 AND UNIT 2
REVISION TO REQUEST FOR CHANGE TO TECHNICAL SPECIFICATIONS
- **FUEL STORAGE POOL BORON CONCENTRATION**
- **FUEL ASSEMBLY STORAGE IN THE SPENT FUEL POOL**
- **BORON CONCENTRATION**

FACILITY OPERATING LICENSE NOS. DPR-70 AND DPR-75
DOCKET NO. 50-272 AND 50-311

Reference: Letter LRN-02-0248 dated September 20, 2002
Request for Change to Technical Specifications
- *Fuel Storage Pool Boron Concentration*
- *Fuel Assembly Storage in the Spent Fuel Pool*
- *Boron Concentration*

Pursuant to 10 CFR 50.90, PSEG Nuclear LLC (PSEG) hereby requests a revision to the Technical Specifications (TS) for the Salem Generating Station Unit 1 and 2 (SGS). In accordance with 10CFR50.91(b)(1), a copy of this submittal has been sent to the State of New Jersey.

On September 20, 2002 PSEG submitted the referenced request for a revision to the Technical Specifications for Salem Generating Station Unit 1 and 2. The proposed amendment will add new Limiting Conditions for Operation (LCO) for Fuel Storage Pool Boron Concentration, Fuel Assembly Storage in the Spent Fuel Pool, relocate requirements for spent fuel storage, revise existing TS 3/4.9.1 for Boron Concentration during refueling operations, and revise existing Administrative Controls TS 6.9.1.9 which describes the Core Operating Limits Report (COLR). The changes proposed herein supercede the referenced letter LRN-02-0248 dated September 20, 2002.

PSEG previously requested adding a new TS 3/4.7.11, Fuel Storage Pool Boron Concentration that required a minimum fuel storage boron concentration greater than or equal to 2300 ppm when fuel assemblies are stored in the fuel storage pool and a fuel storage pool verification has not been performed since the last movement of fuel assemblies in the fuel storage pool. Additional analysis was performed subsequent to the original submittal to justify a lower acceptable minimum fuel storage boron concentration.

A001

PSEG has modified the License Change Request to specify a minimum fuel storage pool boron concentration greater than or equal to 800 ppm. Attachments 1 and 3 of our referenced letter LRN-02-0248 dated September 20, 2002 have been revised. A minor change to the No Significant Hazards Analysis deleting the reference to a soluble boron concentration of 600 ppm was made for clarification. There are no changes to the No Significant Hazards Analysis conclusions. Attachment 2 to our September 20, 2002 letter is not affected by this revision.

PSEG requests NRC approval of the proposed License Amendment by August 15, 2003. Once approved the License Amendment will be implemented within 60 days to provide sufficient time for associated administrative activities.

Should you have any questions or require additional information, please contact Mr. Kennard Buddenbohn at (856) 339-5653.

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

Executed on 2/14/03

Sincerely,

T. J. O'Connor
Vice President – Nuclear Operations

Attachments (3):

C: Mr. H. Miller, Administrator – Region I
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SALEM GENERATING STATION
FACILITY OPERATING LICENSE NOS. DPR-70 AND DPR-75
DOCKET NO. 50-272 AND 50-311

EVALUATION OF PROPOSED CHANGES TO TECHNICAL SPECIFICATIONS
ADDITION OF LIMITING CONDITIONS FOR OPERATION FOR
FUEL STORAGE POOL BORON CONCENTRATION
AND
FUEL ASSEMBLY STORAGE IN THE SPENT FUEL POOL

1.0 DESCRIPTION

The proposed change would revise the Salem Generating Station (SGS) Technical Specifications (TS) to add new TS 3/4.7.11 FUEL STORAGE POOL BORON CONCENTRATION, add new TS 3/4.7.12 FUEL ASSEMBLY STORAGE IN THE SPENT FUEL POOL, modify 5.6 DESIGN FEATURES, and change the applicable Bases.

2.0 PROPOSED CHANGE

The proposed change would add a new TS 3/4.7.11 FUEL STORAGE POOL BORON CONCENTRATION for the control of spent fuel storage pool soluble boron concentration and add a new TS 3/4.7.12 FUEL ASSEMBLY STORAGE IN THE SPENT FUEL POOL by relocating the control of spent fuel assembly storage from TS Section 5.0 (Design Features). Design Feature 5.6.1 FUEL STORAGE – CRITICALITY has been modified with certain material related to storage in Region 1 and 2 spent fuel storage racks being relocated to the new TS 3/4.7.12. This follows the guidance provided in the improved Standard Technical Specifications for Westinghouse plants, NUREG-1431 Revision 2 (ISTS) (REF 1) which provides for TS 3.7.16 for Fuel Storage Pool Boron Concentration and TS 3.7.17 for Spent Fuel Pool Storage. Proposed TS 3/4.7.11 is consistent with ISTS 3.7.16, Fuel Storage Pool Boron Concentration. Proposed TS 3/4.7.12 incorporates the SGS specific spent fuel design features of TS 5.6.1.2 d to establish Limiting Conditions of Operation and Surveillance Requirements consistent with the approach used for ISTS 3.7.17, Spent Fuel Pool Storage. Editorial and format changes have been included as necessary to allow for addition and deletion of text. The proposed changes to the TS are included in Attachment 3 to this submittal.

In summary, the proposed change as described above provides for improved TS control of fuel storage pool boron concentration and fuel assembly storage in the spent fuel pool while protecting the health and safety of the public and station personnel.

3.0 BACKGROUND

The Salem Updated Final Safety Analysis (UFSAR) (REF 2) Section 9.1 describes fuel storage and handling systems for Salem Unit 1 and Unit 2. As a result of the latest spent fuel pool reracking project in 1994, Salem Unit 1 and Salem Unit 2 spent fuel pools utilized the Maximum Density Rack (MDR) design. In the MDR design, the spent fuel storage pool is divided into two separate and distinct regions. Region 1, with 300 storage positions, is designed to accommodate new fuel with a maximum enrichment of 4.25 weight percent (w/o) U-235. Unirradiated and irradiated fuel with initial enrichments up to 5.0 w/o U-235 can also be stored in Region 1 with some restrictions. Region 2, with 1332 storage positions, is designed to accommodate unirradiated and irradiated fuel with stricter controls as compared to Region 1. The plant specific basis previously evaluated in the Safety Evaluation by the Office of Nuclear Reactor Regulation related to Amendments Nos. 151 and 131 for SGS date May 4, 1994 (REF 4) is being used in conjunction with guidance provided in ISTS (REF 1) to justify the proposed changes.

4.0 TECHNICAL ANALYSIS

In the MDR design, the spent fuel storage pool is divided into two separate and distinct regions, Region 1 and Region 2. The water in the spent fuel storage pool normally contains soluble boron, which results in large subcriticality margins under actual operating conditions. However, the NRC guidelines, based upon the accident condition in which all soluble poison is assumed to have been lost, specify that the limiting k_{eff} of 0.95 be evaluated in the absence of soluble boron. Hence, the design of both regions is based on the use of unborated water, which maintains each region in a subcritical condition during normal operation with the regions fully loaded. The double contingency principle discussed in ANSI N-16.1-1975 and the USNRC letter of April 14, 1978, to all Power Reactor Licensees – OT Position for Review and Acceptance of Spent Fuel Storage and Handling Applications (Accession # 7910310568) allows credit for soluble boron under other abnormal or accident conditions, consistent with postulated accident scenarios. For example, the most severe accident scenario is associated with the abnormal location of a fresh fuel assembly of 5.0 wt% enrichment which could, in the absence of soluble poison, result in exceeding the design reactivity limitation (k_{eff} of 0.95). This could occur if a fresh fuel assembly of 5.0 wt% enrichment were to be inadvertently loaded into a Region 1 or Region 2 storage cell otherwise filled to capacity. To mitigate these postulated criticality related accidents, boron is dissolved in the pool water. Calculations for the worst case configuration confirmed that 600 ppm soluble boron is adequate to compensate for a mis-located fuel assembly. Subcriticality of the MDR with no movement of assemblies is achieved without credit for soluble boron. Prior to movement of an assembly, it is necessary to verify the fuel storage pool boron concentration is within limit.

Most postulated abnormal conditions or accidents in the spent fuel pool do not result in an increase in the reactivity of either MDR region. For example, an event that results in an increase in spent fuel pool temperature or a decrease in water density will not result in a reactivity increase. An event that results in the spent fuel pool cooling water temperature below normal conditions does not impact the criticality analysis since the analysis assumes a water temperature of 4°C. This assures that the reactivity will always be lower over the expected range of water temperatures.

However, accidents can be postulated that could increase the reactivity. This increase in reactivity is unacceptable with unborated water in the storage pool. Thus, for these accident occurrences, the presence of soluble boron in the storage pool prevents criticality exceeding limits in both regions. The postulated accidents are basically of three types. The first type of postulated accident is an abnormal location of a fuel assembly, the second type of postulated accident is associated with lateral rack movement, and the third type of postulated accident is a dropped fuel assembly on the top of the rack. The dropped fuel assembly and the lateral rack movement have been previously shown to have negligible reactivity effects (<0.0001 δk).

The misplacement of a fuel assembly could have a sufficiently positive reactivity effect that would result in Keff exceeding the 0.95 limit. However, the negative reactivity effect of a minimum soluble boron concentration of 600 ppm compensates for the increased reactivity caused by any of the postulated accident scenarios.

The determination of 600 ppm has included the necessary tolerances and uncertainties associated with fuel storage rack criticality analyses. To ensure that soluble boron concentration measurement uncertainty is appropriately considered, additional margin will be incorporated into the limiting condition for operation. As such, increasing the minimum required boron concentration in the fuel storage pool to 800 ppm conservatively covers the expected range of boron reactivity worth along with allowances associated with boron measurements.

Additionally, the proposed changes have no impact on UFSAR Chapter 15 accident analysis. (REF 2)

5.0 REGULATORY SAFETY ANALYSIS

5.1 No Significant Hazards Consideration

PSEG Nuclear LLC (PSEG) has evaluated whether or not a significant hazards consideration is involved with the proposed amendments by focusing on the three standards set forth in 10CFR50.92, "Issuance of amendment," as discussed below:

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

Response: No.

The postulated accidents are basically of three types. The first type of postulated accident is an abnormal location of a fuel assembly, the second type of postulated accident is associated with lateral rack movement, and the third type of postulated accident is a dropped fuel assembly on the top of the rack. The dropped fuel assembly and the lateral rack movement have been previously shown to have negligible reactivity effects (<0.0001 δk). The misplacement of a fuel assembly could have a small positive reactivity effect, however, the negative reactivity effect of a minimum soluble boron concentration compensates for the increased reactivity caused by any of the postulated accident scenarios.

There is no increase in the probability of the accidental misloading of irradiated fuel assemblies into the spent fuel pool racks when considering the presence of soluble boron in the pool water for criticality control. Fuel assembly placement will continue to be controlled pursuant to approved fuel handling procedures and will be in accordance with the Technical Specification (TS) spent fuel rack storage configuration limitations.

There is no increase in the consequences of the accidental misloading of irradiated fuel assemblies into the spent fuel pool racks because criticality analyses demonstrate that the pool will remain subcritical following an accidental misloading if the pool contains an adequate boron concentration. This has been previously evaluated in the Safety Evaluation by the Office of Nuclear Reactor Regulation related to Amendment Nos 151 and 131 to Facility Operating Licenses DPR-70 and DPR-75 for the Salem Nuclear Generating Station Units 1 and 2, dated May 4, 1994 (Spent Fuel Reracking, TAC NOS. M85797 and M85798). The proposed TS limitations will ensure that an adequate spent fuel pool boron concentration will be maintained.

The proposed change will revise the Salem Generating Station (SGS) TS to be consistent with the improved Standard Technical Specifications for Westinghouse plants, NUREG-1431 Revision 2, 4/30/01. The new Technical Specifications are not an accident initiator. Specifying a minimum boron concentration in a new TS and relocating fuel assembly storage requirements in a new TS are conservative approaches to operational control.

Therefore, this proposed amendment does not involve a significant increase in the probability of occurrence or consequences of an accident previously analyzed.

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

Response: No

Criticality accidents in the spent fuel pool have been analyzed in the previous criticality safety analyses documented in PSEG letter NLR-N93058 dated April 28, 1993 transmitting License Change Request (LCR) 93-02 and Attachment D, The Licensing Report for Spent Fuel Storage Capacity Expansion, Public Service Electric and Gas Company, Salem Generating Stations 1 & 2, USNRC Docket Nos 50-272 & 50-311, prepared by Holtec International. This is the bases for the present TS. The addition of a Limiting Condition for Operation (LCO) for boron concentration does not alter the assumptions or the results of the existing spent fuel criticality analyses or accident analyses described in the Salem Updated Final Safety Analysis Report. The addition of Technical Specifications which provide for TS control where previous administrative controls had been in place and relocation of material within existing TS does not alter the results of the criticality safety analyses described in PSEG letter NLR-N93058 dated April 28, 1993 transmitting License Change Request (LCR) 93-02 and Attachment D, The Licensing Report for Spent Fuel Storage Capacity Expansion, Public Service Electric and

Gas Company, Salem Generating Stations 1 & 2, USNRC Docket Nos 50-272 & 50-311, prepared by Holtec International.

Therefore, this proposed amendment does not create the possibility of a new or different kind of accident from any previously analyzed.

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

Response: No

The TS changes proposed and the resulting spent fuel storage operation limits will continue to provide adequate safety margin to ensure that the stored fuel assembly array will remain subcritical. Those limits are based on a plant specific criticality analysis and are unchanged by this application. The addition of Technical Specifications which provide for TS control where previous administrative controls had been in place and relocation of material within existing TS continue to establish conservative operational control.

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

Based on the above, PSEG concludes that the proposed amendment presents no significant hazards consideration under the standards set forth in 10CFR50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

5.2 Applicable Regulatory Requirements/Criteria

The applicable criterion from 10CFR50 Appendix A, General Design Criteria for Nuclear Plants, associated with the fuel storage are criterion 61 (Fuel storage and handling and radioactivity control) and 62 (Prevention of criticality in fuel storage and handling). As stated in section 3.1.3 of the Salem Updated Final Safety Analysis Report , the Salem plant design conforms with the intent of the "General Design Criteria for Nuclear Power Plants," dated July 7, 1971. The proposed change to add a new TS for Fuel Storage Pool Boron Concentration and relocate material within existing TS to provide for TS control of fuel assembly storage in the spent fuel pool does not impact the above 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) the 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

PSEG has determined that the proposed amendment would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed 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

1. Improved Standard Technical Specifications for Westinghouse plants, NUREG-1431 Revision 2, 4/30/01 (ISTS)

2. Salem Updated Final Safety Analysis Report (UFSAR)

3. PSEG letter NLR-N93058 dated April 28, 1993 transmitting License Change Request (LCR) 93-02 and Attachment D, The Licensing Report for Spent Fuel Storage Capacity Expansion, Public Service Electric and Gas Company, Salem Generating Stations 1 & 2, USNRC Docket Nos 50-272 & 50-311, prepared by Holtec International (Criticality Safety Analyses).

4. Safety Evaluation by the Office of Nuclear Reactor Regulation related to Amendment Nos. 151 and 131 to Facility Operating Licenses DPR-70 and DPR-75 for the Salem Nuclear Generating Station Units 1 and 2, dated May 4, 1994 (Spent Fuel Reracking, TAC NOS. M85797 and M85798)

SALEM GENERATING STATION
FACILITY OPERATING LICENSE NOS. DPR-70 AND DPR-75
DOCKET NO. 50-272 AND 50-311

EVALUATION OF PROPOSED CHANGE TO TECHNICAL SPECIFICATIONS
REVISION TO TECHNICAL SPECIFCATION 3/4.9.1
BORON CONCENTRATION

1.0 DESCRIPTION

The proposed change would revise the Salem Generating Station (SGS) Technical Specifications (TS) to revise TS 3/4.9.1 BORON CONCENTRATION, modify Administrative Control TS 6.9.1.9 CORE OPERATING LIMITS REPORT, and change the applicable Bases.

2.0 PROPOSED CHANGE

The proposed change will revise existing TS 3/4.9.1 BORON CONCENTRATION by relocating requirements for boron concentration during refueling operations from TS Section 3.0 and 4.0 (Limiting Conditions for Operation and Surveillance Requirements) to Section 6.0 (Administrative Controls) as part of the Core Operating Limits Report (COLR). This follows the guidance provided in the improved Standard Technical Specifications for Westinghouse plants, NUREG-1431 Revision 2 (ISTS) (REF 1) which provides for TS 3/4.9.1 for Boron Concentration during refueling operations and administrative control of boron concentration limits during refueling operations by the COLR.

Editorial and format changes have been included as necessary to allow for addition and deletion of text. The proposed changes to the TS are included in Attachments to this submittal.

In summary, the proposed change as described above provides the flexibility of controlling the required refueling boron concentration in the COLR report, while protecting the health and safety of the public and station personnel.

3.0 BACKGROUND

The Salem Updated Final Safety Analysis (UFSAR) (REF 2) Section 9.1 describes fuel storage and handling systems for Salem Unit 1 and Unit 2. The limitations on minimum boron concentration ensure that: 1) the reactor will remain subcritical during CORE ALTERATIONS, and 2) a uniform boron concentration is maintained for reactivity control in the water volume having direct access to the reactor vessel. The purpose of the proposed change is to provide consistency between the SGS TS and NUREG 1431, thus avoiding the potential for misinterpretation of the TS, while maintaining the same level of conservatism.

As core designs have evolved to incorporate greater cycle lengths and energy requirements, facilities like Salem that include the minimum required refueling boron concentration in their TS have been approaching this TS limit. Therefore, with continued performance improvements the potential exists that the refueling boron concentration requirements in TS 3/4.9.1 may not be sufficiently restrictive for subsequent cycles.

4.0 TECHNICAL ANALYSIS

Design Basis

As specified in SGS TS 3/4.9.1, the minimum refueling boron concentration is established at 2000 ppm with an allowance for 50 ppm uncertainty. For each reload core, boron concentration calculations are performed at two conditions (Case #1 and Case #2) to verify that the 2000 ppm requirement remains conservative or to establish a higher refueling boron concentration requirement: The two calculations are:

Case #1: Boron concentration (C_B) at K-effective (K_{eff}) = 0.95, All Rods In (ARI), Cold Zero Power (CZP), with 1% ΔK/K uncertainty added

Case #2: C_B at K_{eff} = 0.99, All Rods Out (ARO), CZP with 1% ΔK/K uncertainty added

It should be noted that Case #1 is specifically addressed in TS 3/4.9.1 and is verified on a reload basis. Case #2 is performed to be consistent with the assumptions documented in Chapters 4 and 9 of the Salem Updated Final Safety Analysis Report (UFSAR) (REF 2).

Historically, these two calculations resulted in refueling boron concentrations which were significantly less limiting than the minimum TS 3/4.9.1 boron concentration requirement. However, as core designs have evolved to incorporate greater cycle lengths and energy requirements, significantly more cycle energy is typically loaded into current industry standard 18-month high capacity factor reload cores. This has resulted in the minimum refueling boron concentration of 2000 ppm no longer being as conservative as it once was. It is reasonable to assume that with continued performance improvements in subsequent cycles, there is a potential for the 2000 ppm refueling boron concentration requirement of TS 3/4.9.1 to no longer be the most limiting.

To ensure the TS continue to establish a sufficiently restrictive refueling boron concentration, PSEG proposes to adopt the NUREG 1431 TS requirements and incorporate the refueling boron concentration limit into the COLR. PSEG will continue to perform the same two boron concentration cases listed above on a reload basis. The minimum refueling boron concentration will be established as the greater of the Case #1 result or the Case #2 result, but not lower than 2000 ppm.

The COLR is performed as part of each core reload safety evaluation to ensure that the limits of safety analysis are met. The analytical methods utilized to calculate the core operating limits are those reviewed and approved by the NRC and specified in the SGS TS Administrative Control Section 6.9. Additionally, the COLR is submitted to the NRC in accordance with the requirements of the SGS TS 6.9.

5.0 REGULATORY SAFETY ANALYSIS

5.1 No Significant Hazards Consideration

PSEG Nuclear LLC (PSEG) has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10CFR50.92, "Issuance of amendment," as discussed below:

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

Response: No

The proposed Technical Specification (TS) change revises the Salem Generating Station (SGS) TS 3/4.9.1 REFUELING OPERATIONS to be consistent with the improved Standard Technical Specifications for Westinghouse Plants,NUREG-1431 Revision 2, 4/30/01. Relocating the required boron concentration from the TS to the Core Operating Limits Report (COLR) is not an accident initiator. Relocation of the required minimum boron concentration to the COLR will ensure that the proper boron concentration will be maintained in accordance with all the assumptions of the boron dilution event during MODE 6 accident analyses.

The proposed change to revise the surveillance testing brings consistency between the new limiting condition for operations wording and the testing requirement. Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

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

Response: No

The proposed TS change revises the SGS TS 3/4.9.1 REFUELING OPERATIONS to be consistent with the improved Standard Technical Specifications Westinghouse Plants NUREG-1431 Revision 2, 4/30/01. The proposed revision does not change the physical facility or the manner in which the plant is operated or tested. The proposed change to revise the surveillance testing brings consistency between the new limiting condition for operations wording and the testing requirement.

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

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

   Response: No

   The proposed TS change revises the SGS TS 3/4.9.1 REFUELING OPERATIONS to be consistent with the improved Standard Technical Specifications for Westinghouse Plants, NUREG-1431 Revision 2, 4/30/01.

   The COLR is performed as part of each core reload safety evaluation to ensure that the limits of safety analysis are met. The analytical methods utilized to calculate the core operating limits are those reviewed and approved by the NRC and specified in the SGS TS Administrative Control Section 6.9. Additionally, the COLR is submitted to the NRC in accordance with the requirements of the SGS TS Section 6.9.

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

Based on the above, PSEG 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 applicable criterion from 10CFR50 Appendix A, General Design Criteria for Nuclear Plants, associated with the maintenance of reactor core subcriticality under cold conditions is criterion 26 (Reactivity control system redundancy and capability). As stated in section 3.1.3 of the Salem Updated Final Safety Analysis Report (UFSAR) the Salem plant design conforms with the intent of the "General Design Criteria for Nuclear Power Plants," dated July 7, 1971. The proposed change to revise existing TS 3/4.9.1 BORON CONCENTRATION by relocating requirements for boron concentration during refueling operations from TS Section 3.0 and 4.0 (Limiting Conditions for Operation and Surveillance Requirements) to Section 6.0 (Administrative Controls) as part of the Core Operating Limits Report (COLR) does not impact the above 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) the 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 CONSIDERATIONS

PSEG has determined that the proposed amendment would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed 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

1. (Improved) Standard Technical Specifications for Westinghouse plants, NUREG-1431 Revision 2, 4/30/01 (ISTS)

2. Salem Updated Final Safety Analysis Report (UFSAR)

SALEM GENERATING STATION
FACILITY OPERATING LICENSE NOS. DPR-70 AND DPR-75
DOCKET NO. 50-272 AND DOCKET NO. 50-311

TECHNICAL SPECIFICATION PAGES WITH PROPOSED CHANGES

The following pages to the Technical Specification for Facility Operating License DPR-70 are affected by this License Change Request (LCR):

Technical Specification	Page
INDEX	VII, XIV, XV
3/4.7.11	New page 3/4 7-35
3/4.7.12	New page 3/4 7-36, 37
3/4.9.1	Revised page 3/4 9-1
BASES (3.0 / 4.0)	New pages B 3/4 7-9 to 13 Revised B 3/4 9-1 New pages B 3/4 9-1a, to 1c
5.6	Revised 5-5a, deleted 5-6 and revised 5- 6a
6.9.1.9	Revised 6-24

The following pages to the Technical Specification for Facility Operating License DPR-75 are affected by this LCR:

Technical Specification	Page
INDEX	VII, XIV, XV
3/4.7.11	New page 3/4 7-30
3/4.7.12	New pages 3/4 7-31, 32
3/4.9.1	Revised page 3/4 9-1
BASES (3.0 / 4.0)	New pages B 3/4 7-9 to 13, Revised B 3/4 9-1 New page B 3/4 9-1a to 1c
5.6	Revised 5-5, deleted 5-5a, and revised 5-5b
6.9.1.9	Revised 6-24

LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE REQUIREMENTS

delete

ADD

delete

BASES

delete

SECTION PAGE

ADP

PLANT SYSTEMS

3/4.7.11 FUEL STORAGE POOL BORON CONCENTRATION

LIMITING CONDITION FOR OPERATION

3.7.11 The fuel storage pool boron concentration shall be ≥ 800 ppm.

APPLICABILITY: When fuel assemblies are stored in the fuel storage pool and a fuel storage pool verification has not been performed since the last movement of fuel assemblies in the fuel storage pool.

ACTION:

With fuel storage pool boron concentration not within limit:

a. Immediately suspend movement of fuel assemblies in the fuel storage pool and

b. Initiate action to:

    1. immediately restore fuel storage pool boron concentration to within limit or

    2. immediately perform a fuel storage pool verification.

c. LCO 3.0.3 and 3.0.4 are not applicable.

SURVEILLANCE REQUIREMENTS

4.7.11 Verify the fuel storage pool boron concentration is within limit every 7 days.

APP

3/4.7.12 FUEL ASSEMBLY STORAGE IN THE SPENT FUEL POOL

LIMITING CONDITION FOR OPERATION

3.7.12 The combination of initial enrichment, burnup, and Integral Fuel Burnable Absorber (IFBA) of each fuel assembly stored in Region 1 or Region 2, shall be within the acceptable limits described in the surveillance requirements below.

APPLICABILITY: When any fuel assembly is stored in Region 1 or Region 2 of the spent fuel storage pool.

ACTION:

If the requirements of the LCO are not met:

a. Immediately verify the fuel storage boron concentration meets the requirements of TS 3.7.11 and

b. Immediately initiate action to move the non-complying fuel assembly to a location that complies with the surveillance requirements.

c. The provisions of Specifications 3.0.3 and 3.0.4 are not applicable.

SURVEILLANCE REQUIREMENTS

4.7.12.1 Prior to storing fuel assemblies in Region 1, verify by administrative means that the fuel assemblies meet one of the following storage constraints:

a. Unirradiated fuel assemblies with a maximum enrichment of 4.25 wt% U-235 have unrestricted storage.

b. Unirradiated fuel assemblies with enrichments greater than 4.25 wt% U-235 and less than or equal to 5.0 wt% U-235, that do not contain IFBA pins, may only be stored in the peripheral cells facing the concrete wall.

c. Unirradiated fuel assemblies with enrichments (E) greater than 4.25 wt% U-235 and less than or equal to 5.0 wt% U-235, which contain a minimum number of IFBA pins have unrestricted storage. This minimum number of IFBA pins shall have an equivalent reactivity hold-down which is greater than or equal to the reactivity hold-down associated with N IFBA pins, at a nominal 2.35 mg B-10/linear inch loading (1.5x), determined by the equation below:

$$N = 42.67\ (E - 4.25)$$

ADD:

d. Irradiated fuel assemblies with enrichments (E) greater than 4.25 wt% U-235 and less than or equal to 5.0 wt%, that have attained the minimum burnup (BU) as determined by the equation below, have unrestricted storage.

$$BU\ (MWD/kg\ U) = -26.212 + 6.1677E$$

4.7.12.2 Prior to storing fuel assemblies in Region 2, verify by administrative means that the fuel assemblies meet one of the following storage constraints:

a. Unirradiated fuel assemblies with a maximum enrichment of 5.0 wt% U-235 may be stored in a checkerboard pattern with intermediate cells containing only water or non-fissile bearing material.

b. Unirradiated fuel assemblies with a maximum enrichment (E) of 5.0 wt% U-235 may be stored in the central cell of any 3x3 array of cells provided the surrounding eight cells are empty or contain fuel assemblies that have attained the minimum burnup (BU) as determined by the equation below.

$$BU\ (MWD/kg\ U) = -15.48 + 17.80E - 0.7038E^2$$

In this configuration, none of the nine cells in any 3x3 array shall be common to cells in any other similar 3x3 array. Along the rack periphery, the concrete wall is equivalent to 3 outer cells in a 3x3 array.

c. Irradiated fuel assemblies with a maximum enrichment (E) of 5.0 wt% U-235 that have attained the minimum burnup (BU) as determined by the equation below, have unrestricted storage.

$$BU\ (MWD/kg\ U) = -32.06 + 25.21E - 3.723E^2 + 0.3535E^3$$

d. Irradiated fuel assemblies with a maximum enrichment (E) of 5.0 wt% U-235 that have attained the minimum burnup (BU) as determined by the equation below, may be stored in a peripheral cell facing the concrete wall.

$$BU\ (MWD/kg\ U) = -25.56 + 15.14E - 0.602E^2$$

delete

BORON CONCENTRATION

LIMITING CONDITION FOR OPERATION

3.9.1 With the reactor vessel head unbolted or removed, the boron concentration of all filled portions of the Reactor Coolant System and the refueling canal shall be maintained uniform and sufficient to ensure that the more restrictive of the following reactivity conditions is met:

a. Either a K_{eff} of 0.95 or less, which includes a 1% $\Delta k/k$ conservative allowance for uncertainties, or

b. A boron concentration of ≥ 2000 ppm, which includes a 50 ppm conservative allowance for uncertainties.

APPLICABILITY: MODE 6*

ACTION:

With the requirements of the above specification not satisfied, immediately suspend all operations involving CORE ALTERATIONS or positive reactivity changes and initiate and continue boration at ≥ 33 gpm of a solution containing ≥ 6,560 ppm boron or its equivalent until K_{eff} is reduced to ≤ 0.95 or the boron concentration is restored to ≥ 2000 ppm, whichever is the more restrictive. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.1.1 The more restrictive of the above two reactivity conditions shall be determined prior to:

a. Removing or unbolting the reactor vessel head, and

b. Withdrawal of any full length control rod in excess of 3 feet from its fully inserted position.

4.9.1.2 The boron concentration of the reactor coolant system and the refueling canal shall be determined by chemical analysis at least 3 times per 7 days with a maximum time interval between samples of 72 hours.

* The reactor shall be maintained in MODE 6 whenever fuel is in the reactor with the reactor vessel head closure bolts less than fully tensioned or with the head removed.

ADD:

3/4.9 REFUELING OPERATIONS

BORON CONCENTRATION

LIMITING CONDITION FOR OPERATION

3.9.1 The boron concentration of the Reactor Coolant System, the refueling canal, and the refueling cavity shall be maintained within the limit specified in the CORE OPERATING LIMITS REPORT (COLR).

APPLICABILITY: MODE 6 (Only applicable to the refueling canal and refueling cavity when connected to the RCS)

ACTION:
With the requirements of the above specification not satisfied, immediately

a. Suspend CORE ALTERATIONS and

b. Suspend positive reactivity additions and

c. Initiate action to restore boron concentration to within limit specified in the COLR.

d. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.1. Verify the boron concentration is within the limit of the COLR every 72 hours.

ADD:

3/4.7.11 FUEL STORAGE POOL BORON CONCENTRATION

In the Maximum Density Rack (MDR) design, the spent fuel storage pool is divided into two separate and distinct regions. Region 1, with 300 storage positions, is designed to accommodate new fuel with a maximum enrichment of 4.25 wt% U-235. Unirradiated and irradiated fuel with initial enrichments up to 5.0 wt% U-235 can also be stored in Region 1 with some restrictions. These restrictions are stated in TS 3/4.7.12. Region 2, with 1332 storage positions, is designed to accommodate unirradiated and irradiated fuel with stricter controls as compared to Region 1. These controls are also stated in TS 3/4.7.12.

The water in the spent fuel storage pool normally contains soluble boron, which results in large subcriticality margins under actual operating conditions. However, the NRC guidelines, based upon the accident condition in which all soluble poison is assumed to have been lost, specify that the limiting k_{eff} of 0.95 be evaluated in the absence of soluble boron. Hence, the design of both regions is based on the use of unborated water, which maintains each region in a subcritical condition during normal operation with the regions fully loaded. The double contingency principle discussed in ANSI N-16.1-1975 and the USNRC letter of April 14, 1978, to all Power Reactor Licensees - OT Position for Review and Acceptance of Spent Fuel Storage and Handling Applications (Accession # 7910310568) allows credit for soluble boron under other abnormal or accident conditions, consistent with postulated accident scenarios. For example, the most severe accident scenario is associated with the abnormal location of a fresh fuel assembly of 5.0 wt% enrichment which could, in the absence of soluble poison, result in exceeding the design reactivity limitation (k_{eff} of 0.95). This could occur if a fresh fuel assembly of 5.0 wt% enrichment were to be inadvertently loaded into a Region 1 or Region 2 storage cell otherwise filled to capacity. To mitigate these postulated criticality related accidents, boron is dissolved in the pool water. Calculations for the worst case configuration confirmed that 800 ppm soluble boron (includes an appropriate allowance for boron concentration measurement uncertainty) is adequate to compensate for a mis-located fuel assembly. Subcriticality of the MDR with no movement of assemblies is achieved without credit for soluble boron and by controlling the location of each assembly in accordance with TS 3/4.7.12. Prior to movement of an assembly, it is necessary to verify the fuel storage pool boron concentration is within limit in accordance with TS 3/4.7.11.

Most postulated abnormal conditions or accidents in the spent fuel pool do not result in an increase in the reactivity of either MDR region. For example, an event that results in an increase in spent fuel pool temperature or a decrease in water density will not result in a reactivity increase. An event that results in the spent fuel pool cooling down below normal conditions does not impact the criticality analysis since the analysis assumes a water temperature of 4°C. This assures that the reactivity will always be lower over the expected range of water temperatures.

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3/4.7.11 FUEL STORAGE POOL BORON CONCENTRATION (continued)

However, accidents can be postulated that could increase the reactivity. This increase in reactivity is unacceptable with unborated water in the storage pool. Thus, for these accident occurrences, the presence of soluble boron in the storage pool prevents criticality exceeding limits in both regions. The postulated accidents are basically of three types. The first type of postulated accident is an abnormal location of a fuel assembly, the second type of postulated accident is associated with lateral rack movement, and the third type of postulated accident is a dropped fuel assembly on the top of the rack. The dropped fuel assembly and the lateral rack movement have been previously shown to have negligible reactivity effects (<0.0001 δk). The misplacement of a fuel assembly could result in Keff exceeding the 0.95 limit. However, the negative reactivity effect of a minimum soluble boron concentration of 600 ppm compensates for the increased reactivity caused by any of the postulated accident scenarios. The accident analyses are summarized in the FSAR Section 9.1.2.

The determination of 600 ppm has included the necessary tolerances and uncertainties associated with fuel storage rack criticality analyses. To ensure that soluble boron concentration measurement uncertainty is appropriately considered, additional margin is incorporated into the limiting condition for operation. As such, increasing the minimum required boron concentration in the fuel storage pool to 800 ppm conservatively covers the expected range of boron reactivity worth along with allowances associated with boron measurements.

The concentration of dissolved boron in the fuel storage pool satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii). The fuel storage pool boron concentration is required to be greater than or equal to 800 ppm. The specified concentration of dissolved boron in the fuel storage pool preserves the assumptions used in the analyses of the potential critical accident scenarios. This concentration of dissolved boron is the minimum required concentration for fuel assembly storage and movement within the fuel storage pool.

This LCO applies whenever fuel assemblies are stored in the spent fuel storage pool, until a complete spent fuel storage pool verification has been performed following the last movement of fuel assemblies in the spent fuel storage pool. This LCO does not apply following the verification, since the verification would confirm that there are no misloaded fuel assemblies. With no further fuel assembly movements in progress, there is no potential for a misloaded fuel assembly or a dropped fuel assembly.

ADD:

3/4.7.11 FUEL STORAGE POOL BORON CONCENTRATION (continued)

The Required Actions are modified indicating that LCO 3.0.3 and LCO 3.0.4 do not apply. Storage of fuel assemblies and the boron concentration in the spent fuel storage pool are independent of reactor operation. Therefore TS 3/4 3.7.11 and TS 3/4 3.7.12 include the exception to LCO 3.0.3 and LCO 3.0.4 to preclude an inappropriate reactor shutdown and clarify that LCO 3.0.4 does not impose mode change restrictions for these specifications. When the concentration of boron in the fuel storage pool is less than required, immediate action must be taken to preclude the occurrence of an accident or to mitigate the consequences of an accident in progress. This is most efficiently achieved by immediately suspending the movement of fuel assemblies. The concentration of boron is restored simultaneously with suspending movement of fuel assemblies. Alternatively, beginning a verification of the fuel storage pool fuel locations, to ensure proper locations of the fuel, can be performed. However, prior to resuming movement of fuel assemblies, the concentration of boron must be restored. This does not preclude movement of a fuel assembly to a safe position.

If the LCO is not met while moving fuel assemblies in the spent fuel pool while in MODE 5 or 6, LCO 3.0.3 would not be applicable. If moving fuel assemblies in spent fuel pool while in MODE 1, 2, 3, or 4, the fuel movement is independent of reactor operation. Therefore, inability to suspend movement of fuel assemblies is not sufficient reason to require a reactor shutdown or impose mode change restrictions.

This SR verifies that the concentration of boron in the fuel storage pool is within the required limit. As long as this SR is met, the analyzed accidents are fully addressed. The 7 day Frequency is appropriate because no major replenishment of pool water is expected to take place over such a short period of time.

ADD:

3/4.7.12 FUEL ASSEMBLY STORAGE IN THE SPENT FUEL POOL

In the Maximum Density Rack (MDR) design, the spent fuel storage pool is divided into two separate and distinct regions. Region 1, with 300 storage positions, is designed to accommodate new fuel with a maximum enrichment of 4.25 wt% U-235. Unirradiated and irradiated fuel with initial enrichments up to 5.0 wt% U-235 can also be stored in Region 1 with some restrictions. These restrictions are stated in TS 3/4.7.12. Region 2, with 1332 storage positions, is designed to accommodate unirradiated and irradiated fuel with stricter controls as compared to Region 1. These controls are also stated in TS 3/4.7.12.

The water in the spent fuel storage pool normally contains soluble boron, which results in large subcriticality margins under actual operating conditions. However, the NRC guidelines, based upon the accident condition in which all soluble poison is assumed to have been lost, specify that the limiting k_{eff} of 0.95 be evaluated in the absence of soluble boron. Hence, the design of both regions is based on the use of unborated water, which maintains each region in a subcritical condition during normal operation with the regions fully loaded. The double contingency principle discussed in ANSI N-16.1-1975 and the USNRC letter of April 14, 1978, to all Power Reactor Licensees - OT Position for Review and Acceptance of Spent Fuel Storage and Handling Applications (Accession # 7910310568) allows credit for soluble boron under other abnormal or accident conditions, since only a single accident need be considered at one time. For example, the most severe accident scenario is associated with the abnormal location of a fresh fuel assembly of 5.0 wt% enrichment which could, in the absence of soluble poison, result in exceeding the design reactivity limitation (k_{eff} of 0.95). This could occur if a fresh fuel assembly of 5.0 wt% enrichment were to be inadvertently loaded into a Region 1 or Region 2 storage cell otherwise filled to capacity, for any of the configurations. To mitigate these postulated criticality related accidents, boron is dissolved in the pool water. Calculations for the worst case configuration confirmed that 800 ppm soluble boron (includes an appropriate allowance for boron concentration measurement uncertainty)is adequate to compensate for a mis-located fuel assembly. Safe operation of the MDR with no movement of assemblies may therefore be achieved by controlling the location of each assembly in accordance with TS 3/4.7.12. Prior to movement of an assembly into a fuel assembly storage location in Region 1 or Region 2, it is necessary to perform SR 4.7.11 and either SR 4.7.12.1 or SR 4.7.12.2. In summary, before moving an assembly into the storage racks it is necessary to:

- validate that its final location meets the criticality requirements;
- and since there is a potential to misload the assembly, we need to ensure that the Fuel Storage Pool boron concentration is greater than the minimum required to preclude exceeding criticality limits prior to moving.

The configuration of fuel assemblies in the fuel storage pool satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

ADD:

3/4.7.12 FUEL ASSEMBLY STORAGE IN THE SPENT FUEL POOL (CONTINUED)

The restrictions on the placement of fuel assemblies within the spent fuel pool in accordance with TS 3/4.7.12, in the accompanying LCO, ensures the k_{eff} of the spent fuel storage pool will always remain < 0.95, assuming the pool to be flooded with unborated water.

This LCO applies whenever any fuel assembly is stored in Region 1 or Region 2 of the fuel storage pool.

The Required Actions are modified indicating that LCO 3.0.3 and LCO 3.0.4 does not apply. Storage of fuel assemblies and the boron concentration in the spent fuel storage pool are independent of reactor operation. Therefore TS 3/4.3.7.11 and TS 3/4.3.7.12 include the exception to LCO 3.0.3 and LCO 3.0.4 to preclude an inappropriate reactor shutdown and clarify that LCO 3.0.4 does not impose mode change restrictions for these specifications. When the configuration of fuel assemblies stored in Region 1 or Region 2 of the spent fuel storage pool is not in accordance with TS 3/4.7.12, the immediate action is to initiate action to make the necessary fuel assembly movement(s) to bring the configuration into compliance with TS 3/4.7.12. If unable to move fuel assemblies while in MODE 5 or 6, LCO 3.0.3 would not be applicable. If unable to move fuel assemblies while in MODE 1, 2, 3, or 4, the action is independent of reactor operation. Therefore, inability to move fuel assemblies is not sufficient reason to require a reactor shutdown or impose mode change restrictions.

The SR verifies by administrative means that the initial enrichment and burnup of the fuel assembly is in accordance with TS 3/4.7.12 in the accompanying LCO.

3/4.9.1 BORON CONCENTRATION

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The limitations on minimum boron concentration (2000 ppm) ensure that: 1) the reactor will remain subcritical during CORE ALTERATIONS, and 2) a uniform boron concentration is maintained for reactivity control in the water volume having direct access to the reactor vessel. The limitation on K_{eff} of no greater than 0.95 which includes a conservative allowance for uncertainties, is sufficient to prevent reactor criticality during refueling operations.

The sampling and analysis required by surveillance requirement 4.9.1.2 ensures the boron concentration required by Limiting Condition of Operation 3.9.1 is met. Sampling and analysis of the refueling canal is required if water exists in the refueling canal, regardless of the amount.

3/4.9.2 INSTRUMENTATION

The OPERABILITY of the source range neutron flux monitors ensures that redundant monitoring capability is available to detect changes in the reactivity condition of the core.

3/4.9.3 DECAY TIME

The minimum requirement for reactor subcriticality prior to movement of irradiated fuel assemblies in the reactor pressure vessel ensures that sufficient time has elapsed to allow the radioactive decay of the short lived fission products. This decay time is consistent with the assumptions used in the accident analyses.

3/4.9.4 CONTAINMENT BUILDING PENETRATIONS

During CORE ALTERATIONS or movement of irradiated fuel assemblies within containment the requirements for containment building penetration closure and OPERABILITY ensure that a release of fission product radioactivity within containment will be restricted from leaking to the environment. In MODE 6, the potential for containment pressurization as a result of an accident is not likely. Therefore, the requirements to isolate the containment from the outside atmosphere can be less stringent. The LCO requirements during CORE ALTERATIONS or movement of irradiated fuel assemblies within containment are referred to as "containment closure" rather than containment OPERABILITY. For the containment to be OPERABLE, CONTAINMENT INTEGRITY must be maintained. Containment closure means that all potential release paths are closed or capable of being closed. Closure restrictions must be sufficient to provide an atmospheric ventilation barrier to restrict radioactive material released from a fuel element rupture during refueling operations.

The containment serves to limit the fission product radioactivity that may be released from the reactor core following an accident, such that offsite radiation exposures are maintained well within the requirements of 10CFR100. Additionally, the containment provides radiation shielding from the fission products that may be present in the containment atmosphere following accident conditions.

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3/4.9.1 BORON CONCENTRATION

ADD:

The limit on the boron concentration of the Reactor Coolant System (RCS), the refueling cavity, and the refueling canal during refueling ensures that the reactor remains subcritical during Mode 6. Refueling boron concentration is the soluble boron concentration in the coolant in each of these volumes having direct access to the reactor core during refueling.

The soluble boron concentration offsets the core reactivity and is measured by chemical analysis of a representative sample of the coolant in each of the volumes. The refueling boron concentration limit is specified in the Core Operating Limits Report (COLR). Plant procedures ensure the specified boron concentration in order to maintain an overall core reactivity of Keff ≤ 0.95 during fuel handling, with control rods and fuel assemblies assumed to be in the most adverse configuration (least negative reactivity) allowed by plant procedures.

General Design Criterion 26 of 10CFR 50, Appendix A requires that two independent reactivity control systems of different design principles be provided. One of these systems must be capable of holding the reactor core subcritical under cold conditions. The Chemical and Volume Control System (CVCS) is the system capable of maintaining the reactor subcritical in cold conditions by maintaining the boron concentration.

The reactor is brought to shutdown conditions before beginning operations to open the reactor vessel for refueling. After the RCS is cooled and depressurized and the vessel head is unbolted, the head is slowly removed to form the refueling cavity. The refueling canal and the refueling cavity are then flooded with borated water from the refueling water storage tank through the open reactor vessel by gravity feeding or by the use of the Residual Heat Removal (RHR) System pumps.

The pumping action of the RHR System in the RCS and the natural circulation due to thermal driving heads in the reactor vessel and refueling cavity mix the added concentrated boric acid with the water in the refueling canal. The RHR System is in operation during refueling (see TS 3/4.9.8, "Residual Heat Removal (RHR) and Coolant Circulation - All Water levels," and "Low Water Level") to provide forced circulation in the RCS and assist in maintaining the boron concentrations in the RCS, the refueling canal, and the refueling cavity above the COLR limit.

ADD:

During refueling operations, the reactivity condition of the core is consistent with the initial conditions assumed for the boron dilution accident in the accident analysis and is conservative for MODE 6. The boron concentration limit specified in the COLR is based on the core reactivity at the beginning of each fuel cycle (the end of refueling) and includes an uncertainty allowance. The required boron concentration and the plant refueling procedures that verify the correct fuel-loading plan (including full core mapping) ensure that the Keff of the core will remain ≤ 0.95 during the refueling operation. Hence, at least a 5% Δk/k margin of safety is established during refueling. During refueling, the water volume in the spent fuel pool, the transfer canal, the refueling canal, the refueling cavity, and the reactor vessel form a single mass. As a result the soluble boron concentration is relatively the same in each of these volumes.

The RCS boron concentration satisfies Criterion 2 of 10CFR50.36(c)(2)(ii).

The LCO requires that a minimum boron concentration be maintained in the RCS, the refueling canal, and the refueling cavity while in MODE 6. The boron concentration limit specified in the COLR ensures that a core Keff ≤ 0.95 is maintained during fuel handling operations. Violation of the LCO could lead to an inadvertent criticality during MODE 6.

This LCO is applicable in MODE 6 to ensure that the fuel in the reactor vessel will remain subcritical. The required boron concentration ensures a Keff ≤ 0.95. A note to this LCO modifies the Applicability. The note states that the limits on boron concentration are only applicable to the refueling canal and the refueling cavity when those volumes are connected to the Reactor Coolant System. When the refueling canal and the refueling cavity are isolated from the RCS, no potential path for boron dilution exists. Above MODE 6, LCO 3.1.1, "SHUTDOWN MARGIN", ensures that an adequate amount of negative reactivity is available to shut down the reactor and maintain it subcritical.

Continuation of CORE ALTERATIONS or positive reactivity additions (including actions to reduce boron concentration) is contingent upon maintaining the unit in compliance with the LCO. If the boron concentration of any coolant volume in the RCS, the refueling canal, or the refueling cavity is less than its limit, all operations involving CORE ALTERATIONS or positive reactivity additions must be suspended immediately. Suspension of CORE ALTERATIONS and positive reactivity additions shall not preclude moving a component to a safe position. Operations that individually add limited positive reactivity (e.g. temperature fluctuations from inventory addition or temperature control fluctuations), but when combined with all other operations affecting core reactivity (e.g., intentional boration) result in overall net negative reactivity addition, are not precluded by this action.

ADD:

In addition to immediately suspending CORE ALTERATIONS and positive reactivity additions, boration to restore the concentration must be initiated immediately.

In determining the required combination of boration flow rate and concentration, no unique Design Basis Event must be satisfied. The only requirement is to restore the boron concentration to its required value as soon as possible. In order to raise the boron concentration as soon as possible, the operator should begin boration with the best source available for unit conditions. Once actions have been initiated, they must be continued until the boron concentration is restored. The restoration time depends on the amount of boron that must be injected to reach the required concentration.

The Surveillance Requirement (SR) ensures that the coolant boron concentration in the RCS, and connected portions of the refueling canal and the refueling cavity, is within the COLR limits. The boron concentration of the coolant in each required volume is determined periodically by chemical analysis. Prior to reconnecting portions of the refueling canal or the refueling cavity to the RCS, this SR must be met per SR 4.0.4. If any dilution activity has occurred while the cavity or canal was disconnected from the RCS, this SR ensures the correct boron concentration prior to communication with the RCS. A minimum frequency of once every 72 hours is a reasonable amount of time to verify the boron concentration of representative samples. The frequency is based on operating experience, which has shown 72 hours to be adequate.

3/4.9.2 INSTRUMENTATION

The OPERABILITY of the source range neutron flux monitors ensures that redundant monitoring capability is available to detect changes in the reactivity condition of the core.

3/4.9.3 DECAY TIME

The minimum requirement for reactor subcriticality prior to movement of irradiated fuel assemblies in the reactor pressure vessel ensures that sufficient time has elapsed to allow the radioactive decay of the short lived fission products. This decay time is consistent with the assumptions used in the accident analyses.

3/4.9.4 CONTAINMENT BUILDING PENETRATIONS

During CORE ALTERATIONS or movement of irradiated fuel assemblies within containment the requirements for containment building penetration closure and OPERABILITY ensure that a release of fission product radioactivity within containment will be restricted from leaking to the environment. In MODE 6, the potential for containment pressurization as a result of an accident is not likely. Therefore, the requirements to isolate the containment from the outside atmosphere can be less stringent. The LCO requirements during CORE ALTERATIONS or movement of irradiated fuel assemblies within containment are referred to as "containment closure" rather than containment OPERABILITY. For the containment to be OPERABLE, CONTAINMENT INTEGRITY must be maintained. Containment closure means that all potential release paths are closed or capable of being closed. Closure restrictions must be sufficient to provide an atmospheric ventilation barrier to restrict radioactive material released from a fuel element rupture during refueling operations.

The containment serves to limit the fission product radioactivity that may be released from the reactor core following an accident, such that offsite radiation exposures are maintained well within the requirements of 10CFR100. Additionally, the containment provides radiation shielding from the fission products that may be present in the containment atmosphere following accident conditions.

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5.6.1.2 The spent fuel storage racks are designed and shall be maintained with:

a. A maximum K_{eff} equivalent of 0.95 with the storage racks filled with unborated water.

b. A nominal 10.5 inch center-to-center distance between fuel assemblies stored in Region 1 (flux trap type) racks.

c. A nominal 9.05 inch center-to-center distance between fuel assemblies stored in Region 2 (non-flux trap) racks.

d. Fuel assemblies stored in Region 1 racks shall meet one of the following storage constraints.

1. Unirradiated fuel assemblies with a maximum enrichment of 4.25 w/o U-235 have unrestricted storage.

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2. Unirradiated fuel assemblies with enrichments greater than 4.25 w/o U-235 and less than or equal to 5.0 w/o U-235, that do not contain Integral Fuel Burnable Absorber (IFBA) pins, may only be stored in the peripheral cells facing the concrete wall.

3. Unirradiated fuel assemblies with enrichments (E) greater than 4.25 w/o U-235 and less than or equal to 5.0 w/o U-235, which contain a minimum number of Integral Fuel Burnable Absorber (IFBA) pins have unrestricted storage. This minimum number of IFBA pins shall have an equivalent reactivity hold-down which is greater than or equal to the reactivity hold down associated with N IFBA pins, at a nominal 2.35 mg B-10/linear inch loading (1.5X), determined by the equation below:

$$N = 42.67 (E - 4.25)$$

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4. Irradiated fuel assemblies with enrichments (E) greater than 4.25 w/o U-235 and less than or equal to 5.0 w/o, that have attained the minimum burnup (BU) as determined by the equation below, have unrestricted storage.

$$BU \text{ (MWD/kg U)} = -26.212 + 6.1677E$$

e. Fuel assemblies stored in Region 2 racks shall meet one of the following storage constraints.

1. Unirradiated fuel assemblies with a maximum enrichment of 5.0 w/o U-235 may be stored in a checkerboard pattern with intermediate cells containing only water or non-fissile bearing material.

2. Unirradiated fuel assemblies with a maximum enrichment (E) of 5.0 w/o U-235 may be stored in the central cell of any 3x3 array of cells provided the surrounding eight cells are empty or contain fuel assemblies that have attained the minimum burnup (BU) as determined by the equation below.

$$BU \text{ (MWD/kg U)} = -15.48 + 17.80E - 0.7038E^2$$

In this configuration, none of the nine cells in any 3x3 array shall be common to cells in any other similar 3x3 array. Along the rack periphery, the concrete wall is equivalent to 3 outer cells in a 3x3 array.

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3. Irradiated fuel assemblies with a maximum enrichment (E) of 5.0 w/o U-235 that have attained the minimum burnup (BU) as determined by the equation below, have unrestricted storage.

$$BU\ (MWD/kg\ U) = -32.06 + 25.21E - 3.723E^2 + 0.3535E^3$$

4. Irradiated fuel assemblies with a maximum enrichment (E) of 5.0 w/o U-235 that have attained the minimum burnup (BU) as determined by the equation below, may be stored in a peripheral cell facing the concrete wall.

$$BU\ (MWD/kg\ U) = -25.56 + 15.14E - 0.602E^2$$

DRAINAGE

5.6.2 The spent fuel storage pool is designed and shall be maintained to prevent inadvertent draining of the pool below elevation 124'8".

CAPACITY

5.6.3 The spent fuel storage pool is designed and shall be maintained with a storage capacity limited to no more than 1632 fuel assemblies.

5.7 COMPONENT CYCLIC OR TRANSIENT LIMIT

5.7.1 The components identified in Table 5.7-1 are designed and shall be maintained within the cyclic or transient limits of Table 5.7-1.

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6. Refueling boron concentration per Specification 3.9.1

6.9.1.9 CORE OPERATING LIMITS REPORT (COLR)

a. Core operating limits shall be established prior to each reload cycle, or prior to any remaining portion of a reload cycle, and shall be documented in the COLR for the following:

1. Moderator Temperature Coefficient Beginning of Life (BOL) and End of Life (EOL) limits and 300 ppm surveillance limit for Specification 3/4.1.1.4,

2. Control Bank Insertion Limits for Specification 3/4.1.3.5,

3. Axial Flux Difference Limits and target band for Specification 3/4.2.1,

4. Heat Flux Hot Channel Factor, F_Q, its variation with core height, K(z), and Power Factor Multiplier PF_{xy}, Specification 3/4.2.2, and

5. Nuclear Enthalpy Hot Channel Factor, and Power Factor Multiplier, PF_z for Specification 3/4.2.3.

ADD

b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:

1. WCAP-9272-P-A, Westinghouse Reload Safety Evaluation Methodology, July 1985 (W Proprietary), Methodology for Specifications listed in 6.9.1.9.a. Approved by Safety Evaluation dated May 28, 1985.

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LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE REQUIREMENTS

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ADD:

3/4.7.11 FUEL STORAGE POOL BORON CONCENTRATION

LIMITING CONDITION FOR OPERATION

3.7.11 The fuel storage pool boron concentration shall be ≥ 800 ppm

APPLICABILITY: When fuel assemblies are stored in the fuel storage pool and a fuel storage pool verification has not been performed since the last movement of fuel assemblies in the fuel storage pool.

ACTION:

With fuel storage pool boron concentration not within limit:

a. Immediately suspend movement of fuel assemblies in the fuel storage pool and

b. Initiate action to:

   1. immediately restore fuel storage pool boron concentration to within limit or

   2. immediately perform a fuel storage pool verification.

c. LCO 3.0.3 and 3.0.4 are not applicable.

SURVEILLANCE REQUIREMENTS

4.7.11 Verify the fuel storage pool boron concentration is within limit every 7 days.

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3/4.7.12 FUEL ASSEMBLY STORAGE IN THE SPENT FUEL POOL

LIMITING CONDITION FOR OPERATION

3.7.12 The combination of initial enrichment, burnup, and Integral Fuel Burnable Absorber (IFBA) of each fuel assembly stored in Region 1 or Region 2, shall be within the acceptable limits described in the surveillance requirements below.

APPLICABILITY: When any fuel assembly is stored in Region 1 or Region 2 of the spent fuel storage pool.

ACTION:

If the requirements of the LCO are not met:

a. Immediately verify the fuel storage boron concentration meets the requirements of TS 3.7.11 and

b. Immediately initiate action to move the non-complying fuel assembly to a location that complies with the surveillance requirements.

c. The provisions of Specifications 3.0.3 and 3.0.4 are not applicable.

SURVEILLANCE REQUIREMENTS

4.7.12.1 Prior to storing fuel assemblies in Region 1, verify by administrative means that the fuel assemblies meet one of the following storage constraints:

a. Unirradiated fuel assemblies with a maximum enrichment of 4.25 wt% U-235 have unrestricted storage.

b. Unirradiated fuel assemblies with enrichments greater than 4.25 wt% U-235 and less than or equal to 5.0 wt% U-235, that do not contain IFBA pins, may only be stored in the peripheral cells facing the concrete wall.

c. Unirradiated fuel assemblies with enrichments (E) greater than 4.25 wt% U-235 and less than or equal to 5.0 wt% U-235, which contain a minimum number of IFBA pins have unrestricted storage. This minimum number of IFBA pins shall have an equivalent reactivity hold-down which is greater than or equal to the reactivity hold-down associated with N IFBA pins, at a nominal 2.35 mg B-10/linear inch loading (1.5x), determined by the equation below:

$$N = 42.67\ (E - 4.25)$$

ADD:

d. Irradiated fuel assemblies with enrichments (E) greater than 4.25 wt% U-235 and less than or equal to 5.0 wt%, that have attained the minimum burnup (BU) as determined by the equation below, have unrestricted storage.

$$BU\ (MWD/kg\ U) = -26.212 + 6.1677E$$

4.7.12.2 Prior to storing fuel assemblies in Region 2, verify by administrative means that the fuel assemblies meet one of the following storage constraints:

a. Unirradiated fuel assemblies with a maximum enrichment of 5.0 wt% U-235 may be stored in a checkerboard pattern with intermediate cells containing only water or non-fissile bearing material.

b. Unirradiated fuel assemblies with a maximum enrichment (E) of 5.0 wt% U-235 may be stored in the central cell of any 3x3 array of cells provided the surrounding eight cells are empty or contain fuel assemblies that have attained the minimum burnup (BU) as determined by the equation below.

$$BU\ (MWD/kg\ U) = -15.48 + 17.80E - 0.7038E^2$$

In this configuration, none of the nine cells in any 3x3 array shall be common to cells in any other similar 3x3 array. Along the rack periphery, the concrete wall is equivalent to 3 outer cells in a 3x3 array.

c. Irradiated fuel assemblies with a maximum enrichment (E) of 5.0 wt% U-235 that have attained the minimum burnup (BU) as determined by the equation below, have unrestricted storage.

$$BU\ (MWD/kg\ U) = -32.06 + 25.21E - 3.723E^2 + 0.3535E^3$$

d. Irradiated fuel assemblies with a maximum enrichment (E) of 5.0 wt% U-235 that have attained the minimum burnup (BU) as determined by the equation below, may be stored in a peripheral cell facing the concrete wall.

$$BU\ (MWD/kg\ U) = -25.56 + 15.14E - 0.602E^2$$

3/4.9.1 BORON CONCENTRATION

DELETE

LIMITING CONDITION FOR OPERATION

3.9.1 With the reactor vessel head closure bolts less than fully tensioned or with the head removed, the boron concentration of all filled portions of the Reactor Coolant System and the refueling canal shall be maintained uniform and sufficient to ensure that the more restrictive of the following reactivity conditions is met:

a. Either a K_{eff} of 0.95 or less, which includes a 1% $\Delta k/k$ conservative allowance for uncertainties, or

b. A boron concentration of greater than or equal to 2000 ppm, which includes a 50 ppm conservative allowance for uncertainties.

APPLICABILITY: MODE 6*

ACTION:

With the requirements of the above specification not satisfied, immediately suspend all operations involving CORE ALTERATIONS or positive reactivity changes and initiate and continue boration at ≥ 33 gpm of a solution containing ≥ 6,560 ppm boron or its equivalent until K_{eff} is reduced to less than or equal to 0.95 or the boron concentration is restored to greater than or equal to 2000 ppm, whichever is the more restrictive. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.1.1 The more restrictive of the above two reactivity conditions shall be determined prior to:

a. Removing or unbolting the reactor vessel head, and

b. Withdrawal of any full length control rod in excess of 3 feet from its fully inserted position.

4.9.1.2 The boron concentration of the reactor coolant system and the refueling canal shall be determined by chemical analysis at least once per 72 hours.

* The reactor shall be maintained in MODE 6 whenever fuel is in the reactor with the reactor vessel head closure bolts less than fully tensioned or with the head removed.

ADD:

3/4.9 REFUELING OPERATIONS

BORON CONCENTRATION

LIMITING CONDITION FOR OPERATION

3.9.1 The boron concentration of the Reactor Coolant System, the refueling canal, and the refueling cavity shall be maintained within the limit specified in the CORE OPERATING LIMITS REPORT (COLR).

APPLICABILITY: MODE 6 (Only applicable to the refueling canal and refueling cavity when connected to the RCS)

ACTION:
With the requirements of the above specification not satisfied, immediately

a. Suspend CORE ALTERATIONS and

b. Suspend positive reactivity additions and

c. Initiate action to restore boron concentration to within limit specified in the COLR.

d. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.1. Verify the boron concentration is within the limit of the COLR every 72 hours.

AOD

3/4.7.11 FUEL STORAGE POOL BORON CONCENTRATION

In the Maximum Density Rack (MDR) design, the spent fuel storage pool is divided into two separate and distinct regions. Region 1, with 300 storage positions, is designed to accommodate new fuel with a maximum enrichment of 4.25 wt% U-235. Unirradiated and irradiated fuel with initial enrichments up to 5.0 wt% U-235 can also be stored in Region 1 with some restrictions. These restrictions are stated in TS 3/4.7.12. Region 2, with 1332 storage positions, is designed to accommodate unirradiated and irradiated fuel with stricter controls as compared to Region 1. These controls are also stated in TS 3/4.7.12.

The water in the spent fuel storage pool normally contains soluble boron, which results in large subcriticality margins under actual operating conditions. However, the NRC guidelines, based upon the accident condition in which all soluble poison is assumed to have been lost, specify that the limiting k_{eff} of 0.95 be evaluated in the absence of soluble boron. Hence, the design of both regions is based on the use of unborated water, which maintains each region in a subcritical condition during normal operation with the regions fully loaded. The double contingency principle discussed in ANSI N-16.1-1975 and the USNRC letter of April 14, 1978, to all Power Reactor Licensees - OT Position for Review and Acceptance of Spent Fuel Storage and Handling Applications (Accession # 7910310568) allows credit for soluble boron under other abnormal or accident conditions, consistent with postulated accident scenarios. For example, the most severe accident scenario is associated with the abnormal location of a fresh fuel assembly of 5.0 wt% enrichment which could, in the absence of soluble poison, result in exceeding the design reactivity limitation (k_{eff} of 0.95). This could occur if a fresh fuel assembly of 5.0 wt% enrichment were to be inadvertently loaded into a Region 1 or Region 2 storage cell otherwise filled to capacity. To mitigate these postulated criticality related accidents, boron is dissolved in the pool water. Calculations for the worst case configuration confirmed that 800 ppm soluble boron (includes an appropriate allowance for boron concentration measurement uncertainty)is adequate to compensate for a mis-located fuel assembly. Subcriticality of the MDR with no movement of assemblies is achieved without credit for soluble boron and by controlling the location of each assembly in accordance with TS 3/4.7.12. Prior to movement of an assembly, it is necessary to verify the fuel storage pool boron concentration is within limit in accordance with TS 3/4.7.11.

Most postulated abnormal conditions or accidents in the spent fuel pool do not result in an increase in the reactivity of either MDR region. For example, an event that results in an increase in spent fuel pool temperature or a decrease in water density will not result in a reactivity increase. An event that results in the spent fuel pool cooling down below normal conditions does not impact the criticality analysis since the analysis assumes a water temperature of 4°C. This assures that the reactivity will always be lower over the expected range of water temperatures.

ADD:

3/4.7.11 FUEL STORAGE POOL BORON CONCENTRATION (continued)

However, accidents can be postulated that could increase the reactivity. This increase in reactivity is unacceptable with unborated water in the storage pool. Thus, for these accident occurrences, the presence of soluble boron in the storage pool prevents criticality exceeding limits in both regions. The postulated accidents are basically of three types. The first type of postulated accident is an abnormal location of a fuel assembly, the second type of postulated accident is associated with lateral rack movement, and the third type of postulated accident is a dropped fuel assembly on the top of the rack. The dropped fuel assembly and the lateral rack movement have been previously shown to have negligible reactivity effects ($<0.0001\ \delta k$). The misplacement of a fuel assembly could result in Keff exceeding the 0.95 limit. However, the negative reactivity effect of a minimum soluble boron concentration of 600 ppm compensates for the increased reactivity caused by any of the postulated accident scenarios. The accident analyses are summarized in the FSAR Section 9.1.2.

The determination of 600 ppm has included the necessary tolerances and uncertainties associated with fuel storage rack criticality analyses. To ensure that soluble boron concentration measurement uncertainty is appropriately considered, additional margin is incorporated into the limiting condition for operation. As such, increasing the minimum required boron concentration in the fuel storage pool to 800 ppm conservatively covers the expected range of boron reactivity worth along with allowances associated with boron measurements.

The concentration of dissolved boron in the fuel storage pool satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii). The fuel storage pool boron concentration is required to be greater than or equal to 800 ppm. The specified concentration of dissolved boron in the fuel storage pool preserves the assumptions used in the analyses of the potential critical accident scenarios. This concentration of dissolved boron is the minimum required concentration for fuel assembly storage and movement within the fuel storage pool.

This LCO applies whenever fuel assemblies are stored in the spent fuel storage pool, until a complete spent fuel storage pool verification has been performed following the last movement of fuel assemblies in the spent fuel storage pool. This LCO does not apply following the verification, since the verification would confirm that there are no misloaded fuel assemblies. With no further fuel assembly movements in progress, there is no potential for a misloaded fuel assembly or a dropped fuel assembly.

ADD!

3/4.7.11 FUEL STORAGE POOL BORON CONCENTRATION (continued)

The Required Actions are modified indicating that LCO 3.0.3 and LCO 3.0.4 do not apply. Storage of fuel assemblies and the boron concentration in the spent fuel storage pool are independent of reactor operation. Therefore TS 3/4 3.7.11 and TS3/ 4 3.7.12 include the exception to LCO 3.0.3 and LCO 3.0.4 to preclude an inappropriate reactor shutdown and clarify that LCO 3.0.4 does not impose mode change restrictions for these specifications. When the concentration of boron in the fuel storage pool is less than required, immediate action must be taken to preclude the occurrence of an accident or to mitigate the consequences of an accident in progress. This is most efficiently achieved by immediately suspending the movement of fuel assemblies. The concentration of boron is restored simultaneously with suspending movement of fuel assemblies. Alternatively, beginning a verification of the fuel storage pool fuel locations, to ensure proper locations of the fuel, can be performed. However, prior to resuming movement of fuel assemblies, the concentration of boron must be restored. This does not preclude movement of a fuel assembly to a safe position.

If the LCO is not met while moving fuel assemblies in the spent fuel pool while in MODE 5 or 6, LCO 3.0.3 would not be applicable. If moving fuel assemblies in the spent fuel pool while in MODE 1, 2, 3, or 4, the fuel movement is independent of reactor operation. Therefore, inability to suspend movement of fuel assemblies is not sufficient reason to require a reactor shutdown or impose mode change restrictions.

This SR verifies that the concentration of boron in the fuel storage pool is within the required limit. As long as this SR is met, the analyzed accidents are fully addressed. The 7 day Frequency is appropriate because no major replenishment of pool water is expected to take place over such a short period of time.

ADD!

3/4.7.12 FUEL ASSEMBLY STORAGE IN THE SPENT FUEL POOL

In the Maximum Density Rack (MDR) design, the spent fuel storage pool is divided into two separate and distinct regions. Region 1, with 300 storage positions, is designed to accommodate new fuel with a maximum enrichment of 4.25 wt% U-235. Unirradiated and irradiated fuel with initial enrichments up to 5.0 wt% U-235 can also be stored in Region 1 with some restrictions. These restrictions are stated in TS 3/4.7.12. Region 2, with 1332 storage positions, is designed to accommodate unirradiated and irradiated fuel with stricter controls as compared to Region 1. These controls are also stated in TS 3 / 4.7.12.

The water in the spent fuel storage pool normally contains soluble boron, which results in large subcriticality margins under actual operating conditions. However, the NRC guidelines, based upon the accident condition in which all soluble poison is assumed to have been lost, specify that the limiting k_{eff} of 0.95 be evaluated in the absence of soluble boron. Hence, the design of both regions is based on the use of unborated water, which maintains each region in a subcritical condition during normal operation with the regions fully loaded. The double contingency principle discussed in ANSI N-16.1-1975 and the USNRC letter of April 14, 1978, to all Power Reactor Licensees - OT Position for Review and Acceptance of Spent Fuel Storage and Handling Applications (Accession # 7910310568) allows credit for soluble boron under other abnormal or accident conditions, since only a single accident need be considered at one time. For example, the most severe accident scenario is associated with the abnormal location of a fresh fuel assembly of 5.0 wt% enrichment which could, in the absence of soluble poison, result in exceeding the design reactivity limitation (k_{eff} of 0.95). This could occur if a fresh fuel assembly of 5.0 wt% enrichment were to be inadvertently loaded into a Region 1 or Region 2 storage cell otherwise filled to capacity, for any of the configurations. To mitigate these postulated criticality related accidents, boron is dissolved in the pool water. Calculations for the worst case configuration confirmed that 800 ppm soluble boron (includes an appropriate allowance for boron concentration measurement uncertainty) is adequate to compensate for a mis-located fuel assembly. Safe operation of the MDR with no movement of assemblies may therefore be achieved by controlling the location of each assembly in accordance with TS 3/4.7.12. Prior to movement of an assembly into a fuel assembly storage location in Region 1 or Region 2, it is necessary to perform SR 4.7.11 and either SR 4.7.12.1 or SR 4.7.12.2. In summary, before moving an assembly into the storage racks it is necessary to:

- validate that its final location meets the criticality requirements;
- and since there is a potential to misload the assembly, we need to ensure that the Fuel Storage Pool boron concentration is greater than the minimum required to preclude exceeding criticality limits prior to moving.

The configuration of fuel assemblies in the fuel storage pool satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

APP.

3/4.7.12 FUEL ASSEMBLY STORAGE IN THE SPENT FUEL POOL (CONTINUED)

The restrictions on the placement of fuel assemblies within the spent fuel pool in accordance with TS 3/4.7.12, in the accompanying LCO, ensures the k_{eff} of the spent fuel storage pool will always remain < 0.95, assuming the pool to be flooded with unborated water.

This LCO applies whenever any fuel assembly is stored in Region 1 or Region 2 of the fuel storage pool.

The Required Actions are modified indicating that LCO 3.0.3 and LCO 3.0.4 does not apply. Storage of fuel assemblies and the boron concentration in the spent fuel storage pool are independent of reactor operation. Therefore TS 3/4.3.7.11 and TS 3/4.3.7.12 include the exception to LCO 3.0.3 and LCO 3.0.4 to preclude an inappropriate reactor shutdown and clarify that LCO 3.0.4 does not impose mode change restrictions for these specifications. When the configuration of fuel assemblies stored in Region 1 or Region 2 of the spent fuel storage pool is not in accordance with TS 3/4.7.12, the immediate action is to initiate action to make the necessary fuel assembly movement(s) to bring the configuration into compliance with TS 3/4.7.12. If unable to move fuel assemblies while in MODE 5 or 6, LCO 3.0.3 would not be applicable. If unable to move fuel assemblies while in MODE 1, 2, 3, or 4, the action is independent of reactor operation. Therefore, inability to move fuel assemblies is not sufficient reason to require a reactor shutdown or impose mode change restrictions.

The SR verifies by administrative means that the initial enrichment and burnup of the fuel assembly is in accordance with TS 3/4.7.12 in the accompanying LCO.

3/4.9.1 BORON CONCENTRATION

DELETE

The limitations on minimum boron concentration (2000 ppm) ensure that: 1) the reactor will remain subcritical during CORE ALTERATIONS, and 2) a uniform boron concentration is maintained for reactivity control in the water volume having direct access to the reactor vessel. The limitation on K_{eff} of no greater than 0.95 which includes a conservative allowance for uncertainties, is sufficient to prevent reactor criticality during refueling operations.

The sampling and analysis required by surveillance requirement 4.9.1.2 ensures the boron concentration required by Limiting Condition of Operation 3.9.1 is met. Sampling and analysis of the refueling canal is required if water exists in the refueling canal, regardless of the amount.

3/4.9.2 INSTRUMENTATION

The OPERABILITY of the source range neutron flux monitors ensures that redundant monitoring capability is available to detect changes in the reactivity condition of the core.

3/4.9.3 DECAY TIME

The minimum requirement for reactor subcriticality prior to movement of irradiated fuel assemblies in the reactor pressure vessel ensures that sufficient time has elapsed to allow the radioactive decay of the short lived fission products. This decay time is consistent with the assumptions used in the accident analyses.

3/4.9.4 CONTAINMENT BUILDING PENETRATIONS

During CORE ALTERATIONS or movement of irradiated fuel assemblies within containment the requirements for containment building penetration closure and OPERABILITY ensure that a release of fission product radioactivity within containment will be restricted from leaking to the environment. In MODE 6, the potential for containment pressurization as a result of an accident is not likely. Therefore, the requirements to isolate the containment from the outside atmosphere can be less stringent. The LCO requirements during CORE ALTERATIONS or movement of irradiated fuel assemblies within containment are referred to as "containment closure" rather than containment OPERABILITY. For the containment to be OPERABLE, CONTAINMENT INTEGRITY must be maintained. Containment closure means that all potential release paths are closed or capable of being closed. Closure restrictions must be sufficient to provide an atmospheric ventilation barrier to restrict radioactive material released from a fuel element rupture during refueling operations.

The containment serves to limit the fission product radioactivity that may be released from the reactor core following an accident, such that offsite radiation exposures are maintained well within the requirements of 10CFR100. Additionally, the containment provides radiation shielding from the fission products that may be present in the containment atmosphere following accident conditions.

DELETE

3/4.9.1 BORON CONCENTRATION

ADD:

The limit on the boron concentration of the Reactor Coolant System (RCS), the refueling cavity, and the refueling canal during refueling ensures that the reactor remains subcritical during Mode 6. Refueling boron concentration is the soluble boron concentration in the coolant in each of these volumes having direct access to the reactor core during refueling.

The soluble boron concentration offsets the core reactivity and is measured by chemical analysis of a representative sample of the coolant in each of the volumes. The refueling boron concentration limit is specified in the Core Operating Limits Report (COLR). Plant procedures ensure the specified boron concentration in order to maintain an overall core reactivity of Keff ≤ 0.95 during fuel handling, with control rods and fuel assemblies assumed to be in the most adverse configuration (least negative reactivity) allowed by plant procedures.

General Design Criterion 26 of 10CFR 50, Appendix A requires that two independent reactivity control systems of different design principles be provided. One of these systems must be capable of holding the reactor core subcritical under cold conditions. The Chemical and Volume Control System (CVCS) is the system capable of maintaining the reactor subcritical in cold conditions by maintaining the boron concentration.

The reactor is brought to shutdown conditions before beginning operations to open the reactor vessel for refueling. After the RCS is cooled and depressurized and the vessel head is unbolted, the head is slowly removed to form the refueling cavity. The refueling canal and the refueling cavity are then flooded with borated water from the refueling water storage tank through the open reactor vessel by gravity feeding or by the use of the Residual Heat Removal (RHR) System pumps.

The pumping action of the RHR System in the RCS and the natural circulation due to thermal driving heads in the reactor vessel and refueling cavity mix the added concentrated boric acid with the water in the refueling canal. The RHR System is in operation during refueling (see TS 3/4.9.8, "Residual Heat Removal (RHR) and Coolant Circulation - All Water levels," and "Low Water Level") to provide forced circulation in the RCS and assist in maintaining the boron concentrations in the RCS, the refueling canal, and the refueling cavity above the COLR limit.

During refueling operations, the reactivity condition of the core is consistent with the initial conditions assumed for the boron dilution accident in the accident analysis and is conservative for MODE 6. The boron concentration limit specified in the COLR is based on the core reactivity at the beginning of each fuel cycle (the end of refueling) and includes an uncertainty allowance. The required boron concentration and the plant refueling procedures that verify the correct fuel-loading plan (including full core mapping) ensure that the Keff of the core will remain ≤ 0.95 during the refueling operation. Hence, at least a 5% Δk/k margin of safety is established during refueling. During refueling, the water volume in the spent fuel pool, the transfer canal, the refueling canal, the refueling cavity, and the reactor vessel form a single mass. As a result the soluble boron concentration is relatively the same in each of these volumes.

The RCS boron concentration satisfies Criterion 2 of 10CFR50.36(c)(2)(ii).

The LCO requires that a minimum boron concentration be maintained in the RCS, the refueling canal, and the refueling cavity while in MODE 6. The boron concentration limit specified in the COLR ensures that a core Keff ≤ 0.95 is maintained during fuel handling operations. Violation of the LCO could lead to an inadvertent criticality during MODE 6.

This LCO is applicable in MODE 6 to ensure that the fuel in the reactor vessel will remain subcritical. The required boron concentration ensures a Keff ≤ 0.95. A note to this LCO modifies the Applicability. The note states that the limits on boron concentration are only applicable to the refueling canal and the refueling cavity when those volumes are connected to the Reactor Coolant System. When the refueling canal and the refueling cavity are isolated from the RCS, no potential path for boron dilution exists. Above MODE 6, LCO 3.1.1, "SHUTDOWN MARGIN", ensures that an adequate amount of negative reactivity is available to shut down the reactor and maintain it subcritical.

Continuation of CORE ALTERATIONS or positive reactivity additions (including actions to reduce boron concentration) is contingent upon maintaining the unit in compliance with the LCO. If the boron concentration of any coolant volume in the RCS, the refueling canal, or the refueling cavity is less than its limit, all operations involving CORE ALTERATIONS or positive reactivity additions must be suspended immediately. Suspension of CORE ALTERATIONS and positive reactivity additions shall not preclude moving a component to a safe position. Operations that individually add limited positive reactivity (e.g. temperature fluctuations from inventory addition or temperature control fluctuations), but when combined with all other operations affecting core reactivity (e.g., intentional boration) result in overall net negative reactivity addition, are not precluded by this action.

ADD:

In addition to immediately suspending CORE ALTERATIONS and positive reactivity additions, boration to restore the concentration must be initiated immediately.

In determining the required combination of boration flow rate and concentration, no unique Design Basis Event must be satisfied. The only requirement is to restore the boron concentration to its required value as soon as possible. In order to raise the boron concentration as soon as possible, the operator should begin boration with the best source available for unit conditions. Once actions have been initiated, they must be continued until the boron concentration is restored. The restoration time depends on the amount of boron that must be injected to reach the required concentration.

This Surveillance Requirement (SR) ensures that the coolant boron concentration in the RCS, and connected portions of the refueling canal and the refueling cavity, is within the COLR limits. The boron concentration of the coolant in each required volume is determined periodically by chemical analysis. Prior to reconnecting portions of the refueling canal or the refueling cavity to the RCS, this SR must be met per SR 4.0.4. If any dilution activity has occurred while the cavity or canal was disconnected from the RCS, this SR ensures the correct boron concentration prior to communication with the RCS. A minimum frequency of once every 72 hours is a reasonable amount of time to verify the boron concentration of representative samples. The frequency is based on operating experience, which has shown 72 hours to be adequate.

3/4.9.2 INSTRUMENTATION

The OPERABILITY of the source range neutron flux monitors ensures that redundant monitoring capability is available to detect changes in the reactivity condition of the core.

3/4.9.3 DECAY TIME

The minimum requirement for reactor subcriticality prior to movement of irradiated fuel assemblies in the reactor pressure vessel ensures that sufficient time has elapsed to allow the radioactive decay of the short lived fission products. This decay time is consistent with the assumptions used in the accident analyses.

3/4.9.4 CONTAINMENT BUILDING PENETRATIONS

During CORE ALTERATIONS or movement of irradiated fuel assemblies within containment the requirements for containment building penetration closure and OPERABILITY ensure that a release of fission product radioactivity within containment will be restricted from leaking to the environment. In MODE 6, the potential for containment pressurization as a result of an accident is not likely. Therefore, the requirements to isolate the containment from the outside atmosphere can be less stringent. The LCO requirements during CORE ALTERATIONS or movement of irradiated fuel assemblies within containment are referred to as "containment closure" rather than containment OPERABILITY. For the containment to be OPERABLE, CONTAINMENT INTEGRITY must be maintained. Containment closure means that all potential release paths are closed or capable of being closed. Closure restrictions must be sufficient to provide an atmospheric ventilation barrier to restrict radioactive material released from a fuel element rupture during refueling operations.

The containment serves to limit the fission product radioactivity that may be released from the reactor core following an accident, such that offsite radiation exposures are maintained well within the requirements of 10CFR100. Additionally, the containment provides radiation shielding from the fission products that may be present in the containment atmosphere following accident conditions.

5.5 METEOROLOGICAL TOWER LOCATION

5.5.1 The meteorological tower shall be located as shown on Figure 5.1-1.

5.6 FUEL STORAGE

CRITICALITY

5.6.1.1 The new fuel storage racks are designed and shall be maintained with:

a. A maximum K_{eff} equivalent of equal to 0.95 with the storage racks flooded with unborated water.

b. A nominal 21.0 inch center-to-center distance between fuel assemblies.

c. Unirradiated fuel assemblies with enrichments less than or equal to 4.25 weight percent (w/o) U-235 with no requirements for Integral Fuel Burnable Absorber (IFBA) pins.

d. Unirradiated fuel assemblies with enrichments (E) greater than 4.25 w/o U-235 and less than or equal to 5.0 w/o U-235 which contain a minimum number of Integral Fuel Burnable Absorber (IFBA) pins. This minimum number of IFBA pins shall have an equivalent reactivity hold-down which is greater than or equal to the reactivity hold down associated with N IFBA pins, at a nominal 2.35 mg B-10/linear inch loading (1.5X), determined by the equation below:

$$N = 42.67 (E - 4.25)$$

DELETE

5.6.1.2 The spent fuel storage racks are designed and shall be maintained with:

a. A maximum Keff equivalent of 0.95 with the storage racks filled with unborated water.

b. A nominal 10.5 inch center-to-center distance between fuel assemblies stored in Region 1 (flux trap type) racks.

c. A nominal 9.05 inch center-to-center distance between fuel assemblies stored in Region 2 (non-flux trap) racks.

DELETE

d. Fuel assemblies stored in Region 1 racks shall meet one of the following storage constraints.

1. Unirradiated fuel assemblies with a maximum enrichment of 4.25 w/o U-235 have unrestricted storage.

2. Unirradiated fuel assemblies with enrichments greater than 4.25 w/o U-235 and less than or equal to 5.0 w/o U-235, that do not contain Integral Fuel Burnable Absorber (IFBA) pins, may only be stored in the peripheral cells facing the concrete wall.

3. Unirradiated fuel assemblies with enrichments (E) greater than 4.25 w/o U-235 and less than or equal to 5.0 w/o U-235, which contain a minimum number of Integral Fuel Burnable Absorber (IFBA) pins have unrestricted storage. This minimum number of IFBA pins shall have an equivalent reactivity hold-down which is greater than or equal to the reactivity hold down associated with N IFBA pins, at a nominal 2.35 mg B-10/linear inch loading (1.5X), determined by the equation below:

$$N = 42.67 (E - 4.25)$$

4. Irradiated fuel assemblies with enrichments (E) greater than 4.25 w/o U-235 and less than or equal to 5.0 w/o, that have attained the minimum burnup (BU) as determined by the equation below, have unrestricted storage.

$$BU \text{ (MWD/kg U)} = -26.212 + 6.1677E$$

DELETE

e. Fuel assemblies stored in Region 2 racks shall meet one of the following storage constraints.

1. Unirradiated fuel assemblies with a maximum enrichment of 5.0 w/o U-235 may be stored in a checkerboard pattern with intermediate cells containing only water or non-fissile bearing material.

2. Unirradiated fuel assemblies with a maximum enrichment (E) of 5.0 w/o U-235 may be stored in the central cell of any 3x3 array of cells provided the surrounding eight cells are empty or contain fuel assemblies that have attained the minimum burnup (BU) as determined by the equation below.

$$BU \text{ (MWD/kg U)} = -15.48 + 17.80E - 0.7038E^2$$

In this configuration, none of the nine cells in any 3x3 array shall be common to cells in any other similar 3x3 array. Along the rack periphery, the concrete wall is equivalent to 3 outer cells in a 3x3 array.

3. Irradiated fuel assemblies with a maximum enrichment (E) of 5.0 w/o U-235 that have attained the minimum burnup (BU) as determined by the equation below, have unrestricted storage.

$$BU \text{ (MWD/kg U)} = -32.06 + 25.21E - 3.723E^2 + 0.3535E^3$$

4. Irradiated fuel assemblies with a maximum enrichment (E) of 5.0 w/o U-235 that have attained the minimum burnup (BU) as determined by the equation below, may be stored in a peripheral cell facing the concrete wall.

$$BU\ (MWD/kg\ U) = -25.56 + 15.14E - 0.602E^2$$

DELETE

DRAINAGE

5.6.2 The spent fuel storage pool is designed and shall be maintained to prevent inadvertent draining of the pool below elevation 124'8".

CAPACITY

5.6.3 The spent fuel storage pool is designed and shall be maintained with a storage capacity limited to no more than 1632 fuel assemblies.

5.7 COMPONENT CYCLIC OR TRANSIENT LIMIT

5.7.1 The components identified in Table 5.7-1 are designed and shall be maintained within the cyclic or transient limits of Table 5.7-1.

delete

6. Refueling boron concentration per Specification 3.9.1

6.9.1.9 CORE OPERATING LIMITS REPORT (COLR)

1. Core operating limits shall be established prior to each reload cycle, or prior to any remaining portion of a reload cycle, and shall be documented in the COLR for the following:

   1. Moderator Temperature Coefficient Beginning of Life (BOL) and End of Life (EOL) limits and 300 ppm surveillance limit for Specification 3/4.1.1.3,

   2. Control Bank Insertion Limits for Specification 3/4.1.3.5,

   3. Axial Flux Difference Limits and target band for Specification 3/4.2.1,

   4. Heat Flux Hot Channel Factor, F_Q, its variation with core height, K(z), and Power Factor Multiplier PF_{xy}, Specification 3/4.2.2, and

   5. Nuclear Enthalpy Hot Channel Factor, and Power Factor Multiplier, $PF_{\Delta H}$ for Specification 3/4.2.3.

ADD

b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:

   1. WCAP-9272-P-A, Westinghouse Reload Safety Evaluation Methodolocry, July 1985 (W Proprietary), Methodology for Specifications listed in 6.9.1.9.a. Approved by Safety Evaluation dated May 28, 1985.

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