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LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE REQUIREMENTS

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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 \geq 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.

PLANT SYSTEMS

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:

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

PLANT SYSTEMS

SURVEILLANCE REQUIREMENTS (continued)

- 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.

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

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.

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

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.

- 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.

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

- 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.

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

3/4.9 REFUELING OPERATIONS

BORON CONCENTRATION

LIMITING CONDITION FOR OPERATION

3.9.1 The boron concentration of the Reactor Coolant System, the fuel storage pool, 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, the fuel storage pool and refueling cavity when connected to the Reactor Coolant System)

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.

PLANT SYSTEMS
BASES

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.

PLANT SYSTEMS
BASES

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 K_{eff} 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.

PLANT SYSTEMS
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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.

PLANT SYSTEMS
BASES

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).

PLANT SYSTEMS
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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 REFUELING OPERATIONS
BASES

3/4.9.1 BORON CONCENTRATION

The limit on the boron concentration of the Reactor Coolant System (RCS), the refueling cavity, the fuel storage pool 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 $K_{eff} \leq 0.95$ 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 fuel storage pool is also adjusted to the refueling boron concentration specified in the COLR.

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.

3/4.9 REFUELING OPERATIONS BASES

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 K_{eff} of the core will remain ≤ 0.95 during the refueling operation. Hence, at least a 5% $\Delta k/k$ 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 10CFR50.36(c)(2)(ii).

The LCO requires that a minimum boron concentration be maintained in the RCS, the refueling canal, the fuel storage pool and the refueling cavity while in MODE 6. The boron concentration limit specified in the COLR ensures that a core $K_{eff} \leq 0.95$ 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 $K_{eff} \leq 0.95$. A note to this LCO modifies the Applicability. The note states that the limits on boron concentration are only applicable to the refueling canal, the fuel storage pool and the refueling cavity when those volumes are connected to the Reactor Coolant System. When the refueling canal, the fuel storage pool and the refueling cavity are isolated from the RCS, no potential path for boron dilution exists. Above MODE 6, LCOs 3.1.1.1 and 3.1.1.2 ensure 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, the fuel storage pool 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.

3/4.9 REFUELING OPERATIONS

BASES

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, the fuel storage pool 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, the fuel storage pool 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. The 100-hour decay time is consistent with the assumptions used in the fuel handling accident analyses and the resulting dose calculations using the Alternative Source Term described in Reg. Guide 1.183.

3/4.9 REFUELING OPERATIONS

BASES

The minimum requirement for reactor subcriticality also ensures that the decay time is consistent with that assumed in the Spent Fuel Pool cooling analysis. Delaware River water average temperature between October 15th and May 15th is determined from historical data taken over 30 years. The use of 30 years of data to select maximum temperature is consistent with Reg. Guide 1.27, "Ultimate Heat Sink for Nuclear Power Plants".

A core offload has the potential to occur during both applicability time frames. In order not to exceed the analyzed Spent Fuel Pool cooling capability to maintain the water temperature below 180°F, two decay time limits are provided. In addition, PSEG has developed and implemented a Spent Fuel Pool Integrated Decay Heat Management Program as part of the Salem Outage Risk Assessment. This program requires a pre-outage assessment of the Spent Fuel Pool heat loads and heatup rates to assure available Spent Fuel Pool cooling capability prior to offloading fuel.

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.

DESIGN FEATURES

- 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.

DESIGN FEATURES

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DESIGN FEATURES

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.

ADMINISTRATIVE CONTROLS

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_0 , 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.
 6. Refueling boron concentration per Specification 3.9.1
- 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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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.

PLANT SYSTEMS

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:

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

PLANT SYSTEMS

SURVEILLANCE REQUIREMENTS (continued)

- 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.

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

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.

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

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.

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

- 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.

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

3/4.9 REFUELING OPERATIONS

BORON CONCENTRATION

LIMITING CONDITION FOR OPERATION

3.9.1 The boron concentration of the Reactor Coolant System, the fuel storage pool, 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, the fuel storage pool and refueling cavity when connected to the Reactor Coolant System)

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

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

PLANT SYSTEMS
BASES

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 mislocated 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.

PLANT SYSTEMS
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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 ($<0.0001 \delta k$). The misplacement of a fuel assembly could result in K_{eff} 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.

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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.

PLANT SYSTEMS
BASES

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).

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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 REFUELING OPERATIONS
BASES

3/4.9.1 BORON CONCENTRATION

The limit on the boron concentration of the Reactor Coolant System (RCS), the refueling cavity, the fuel storage pool 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 $K_{eff} \leq 0.95$ 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 fuel storage pool is also adjusted to the refueling boron concentration specified in the COLR.

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.

3/4.9 REFUELING OPERATIONS

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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 K_{eff} of the core will remain ≤ 0.95 during the refueling operation. Hence, at least a 5% $\Delta k/k$ 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 10CFR50.36(c)(2)(ii).

The LCO requires that a minimum boron concentration be maintained in the RCS, the refueling canal, the fuel storage pool and the refueling cavity while in MODE 6. The boron concentration limit specified in the COLR ensures that a core $K_{eff} \leq 0.95$ 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 $K_{eff} \leq 0.95$. A note to this LCO modifies the Applicability. The note states that the limits on boron concentration are only applicable to the refueling canal, the fuel storage pool and the refueling cavity when those volumes are connected to the Reactor Coolant System. When the refueling canal, the fuel storage pool and the refueling cavity are isolated from the RCS, no potential path for boron dilution exists. Above MODE 6, LCOs 3.1.1.1 and 3.1.1.2 ensure 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, the fuel storage pool 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.

3/4.9 REFUELING OPERATIONS
BASES

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, the fuel storage pool 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, the fuel storage pool 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. The 100-hour decay time is consistent with the assumptions used in the fuel handling accident analyses and the resulting dose calculations using the Alternative Source Term described in Reg. Guide 1.183.

3/4.9 REFUELING OPERATIONS

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The minimum requirement for reactor subcriticality also ensures that the decay time is consistent with that assumed in the Spent Fuel Pool cooling analysis. Delaware River water average temperature between October 15th and May 15th is determined from historical data taken over 30 years. The use of 30 years of data to select maximum temperature is consistent with Reg. Guide 1.27, "Ultimate Heat Sink for Nuclear Power Plants".

A core offload has the potential to occur during both applicability time frames. In order not to exceed the analyzed Spent Fuel Pool cooling capability to maintain the water temperature below 180°F, two decay time limits are provided. In addition, PSEG has developed and implemented a Spent Fuel Pool Integrated Decay Heat Management Program as part of the Salem Outage Risk Assessment. This program requires a pre-outage assessment of the Spent Fuel Pool heat loads and heatup rates to assure available Spent Fuel Pool cooling capability prior to offloading fuel.

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.

DESIGN FEATURES

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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:

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

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.

DESIGN FEATURES

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DESIGN FEATURES

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.

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, $PF_{\Delta H}$ for Specification 3/4.2.3.
 6. Refueling boron concentration per Specification 3.9.1
- 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.