ATTACHMENT 3

MARKED-UP TECHNICAL SPECIFICATIONS BASES
(FOR INFORMATION ONLY)

The following pages depict the changes proposed to the existing Technical Specification Bases. These pages are provided for information only with the final changes processed in accordance with the provisions of TS 5.5.14, Technical Specification (TS) Bases Control Program.

6 pages follow this cover sheet

B 3.7 PLANT SYSTEMS

B 3.7.16 Fuel Storage Pool Boron Concentration

BASES

BACKGROUND

In the High Density Rack (HDR) design (Refs. 1 and 2), each fuel pool storage rack location is designated as either Region 1 (checkerboard), Region 2, or empty (in the checkerboarding configuration). Numerous configurations of region designation are possible. Criteria are established for determining an acceptable configuration (Ref. 1). The HDRs will store a maximum of 2363 fuel assemblies in the spent fuel pool and potentially an additional 279 fuel assemblies in the cask loading pool (with racks installed). Full-core offload capability will be maintained. The fuel storage pool consists of the spent fuel pool and the cask loading pool (with racks installed). Region 1 locations are designed to accommodate new fuel with a maximum nominal enrichment of 5.0 wt% U-235 or spent fuel which meets the requirements of Specification 4.3.1.1. Region 2 locations are designed to accommodate fuel of various initial enrichments which have accumulated minimum burnups within the acceptable domain according to Figure 3.7.17-1, in the accompanying LCO. Fuel assemblies not meeting the criteria of Figure 3.7.17-1 shall be stored in accordance with Specification 4.3.1.1. Locations designated as empty cells shall not contain fuel assemblies or other non-fuel hardware.

The water in the fuel storage pool normally contains soluble boron, which results in large subcriticality margins under actual operating conditions. In accordance with 10 CFR 50.68(b)(4) (Ref. 4), the HDR design maintains the fuel storage pool in a subcritical condition during normal operations with the fuel storage pool racks fully loaded, $k_{eff} < 1.0$ when flooded with unborated water and $k_{eff} \leq 0.95$ when flooded with borated water, all for 95% probability at a 95% confidence level. Safe operation of the HDR therefore requires maintaining a minimum boron concentration in addition to controlling the location of each assembly in accordance with LCO 3.7.17, "Spent Fuel Assembly Storage."

(continued)

BASES

APPLICABLE SAFETY ANALYSES

Accidents can be postulated that could increase the reactivity of the fuel storage pool which are unacceptable with unborated water in the fuel storage pool. Examples include misloading fuel into cells for which it is not approved (violating TS 3.7.17 and/or Specification 4.3.1.1) or mislocating fuel outside of designed locations altogether (adjacent to or on top of the HDRs). The double contingency principle states, "process designs should incorporate sufficient factors of safety to require at least two unlikely, independent, and concurrent changes in process conditions before a criticality accident is possible" (Ref. 5). Since a loss of soluble boron is an unlikely event that is independent from such postulated accident conditions, credit for borated water during those accidents is allowed. The negative reactivity effect of the soluble boron compensates for the increased reactivity caused by such a postulated accident. Accident analyses provided in FSAR, Appendix 9.1A (Ref. 1) demonstrate the storage pool maintains subcriticality with $k_{eff} \leq 0.95$ during these accident occurrences. Safety analyses assume a B-10 enrichment of 19.9 a/o (Ref. 1). Administrative controls on the soluble boron concentration in the fuel storage pool ensure that there is equivalent B-10 concentration.

The concentration of dissolved boron in the fuel storage pool satisfies Criterion 2 of 10 CFR 50.36 (c)(2)(ii).

LCO

The fuel storage pool boron concentration is required to be $\geq$ 2165 ppm. The fuel storage pool consists of the spent fuel pool and cask loading pool (with racks installed). The specified concentration of dissolved boron in the fuel storage pool preserves the assumptions used in the analyses as described in Reference 1. Specifically, this concentration envelops the requirements for normal operation and various accident conditions with sufficient margin to demonstrate the loss of soluble boron below credited concentration is an unlikely event. This concentration of dissolved boron is the minimum required concentration for fuel assembly storage and movement within the fuel storage pool.

APPLICABILITY

This LCO applies whenever fuel assemblies are stored in the fuel storage pool.

(continued)

BASES (Continued)

ACTIONS

A.1 and A.2

The Required Actions are modified by a Note indicating that LCO 3.0.3 does not apply.

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. This does not preclude movement of a fuel assembly to a safe position.

If the LCO is not met while moving fuel assemblies in MODE 5 or 6, LCO 3.0.3 would not be applicable. If moving fuel assemblies 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.

SURVEILLANCE REQUIREMENTS

SR 3.7.16.1

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 assumptions of the analyses as described in Reference 1 are preserved. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

REFERENCES

1. FSAR, Appendix 9.1A, The High Density Rack (HDR) Design Concept.

2. Amendment No. 129 dated January 19, 1999 to the Callaway Operating License.

3. Deleted.

4. 10 CFR 50.68(b)(4).

5. NEI 12-16, Rev. 4, Guidance for Performing Criticality Analyses of Fuel Storage at Light-Water Reactor Power Plants, as endorsed by Regulatory Guide 1.240, Rev. 0.

B 3.7 PLANT SYSTEMS

B 3.7.17 Spent Fuel Assembly Storage

BASES

BACKGROUND

The High Density Rack (HDR) modules for the fuel storage pool are designed for storage of both new fuel and spent fuel. Region 1 locations are designed to accommodate new fuel with a maximum nominal enrichment of 5.0 wt% U-235. Region 2 locations are designed to accommodate fuel of various initial enrichments which have accumulated minimum burnups within the acceptable domain according to Figure 3.7.17-1, in the accompanying LCO.

Prior to storage of fuel assemblies in the fuel storage pool, overall pool storage configurations are prepared in accordance with administrative controls. The pool layouts include sufficient Region 1 storage to accommodate new and discharged fuel assemblies with low burnup. Numerous configurations of Region 1 and 2 locations are possible and can occur within the same rack. Rules to govern these interfaces are as follows. Rack cells that face each other across a rack-to-rack gap are still considered face-adjacent.

For a given Region 1 location

- 1.1 None of the face-adjacent cells may be a Region 1 location.
- 1.2 A minimum of two of the face-adjacent cells must be empty.
- 1.3 A maximum of two of the remaining face-adjacent cells may be Region 2 locations. See also Rule 2.3.
- 1.4 If both of the remaining face-adjacent cells are Region 2 locations, then Rule 2.1 is restricted to one Region 1 location for those cells.

For a given Region 2 location

- 2.1 A maximum of two of the face-adjacent cells may be Region 1 locations. See also Rule 1.4.
- 2.2 The remaining face-adjacent cells may be Region 2 locations or empty.
- 2.3 If two face-adjacent cells are Region 1 locations, then Rule 1.3 is restricted to one Region 2 location for those cells.

In the most efficient form, these rules create a checkerboard pattern in Region 1, alternating between empty and Region 1 locations in face-adjacent cells, and a uniform pattern in Region 2, designating all cells as Region 2 locations, allowing for irregular boundaries between them.

BASES

BACKGROUND (continued)	The water in the fuel storage pool normally contains soluble boron, which results in large subcriticality margins under actual operating conditions. In accordance with 10 CFR 50.68(b)(4) (Ref. 3), the HDR design maintains the fuel storage pool in a subcritical condition during normal operations with the fuel storage pool racks fully loaded, $k_{eff} < 1.0$ when flooded with unborated water and $k_{eff} \leq 0.95$ when flooded with borated water, all for 95% probability at a 95% confidence level.
APPLICABLE SAFETY ANALYSES	Accidents can be postulated that could increase the reactivity of the fuel storage pool which are unacceptable with unborated water in the fuel storage pool. Examples include misloading fuel into cells for which it is not approved (violating TS 3.7.17 and/or Specification 4.3.1.1) or mislocating fuel outside of designed locations altogether (adjacent to or on top of the HDRs). The double contingency principle states, "process designs should incorporate sufficient factors of safety to require at least two unlikely, independent, and concurrent changes in process conditions before a criticality accident is possible" (Ref. 4). Since a loss of soluble boron is an unlikely event that is independent from such postulated accident conditions, credit for borated water during those accidents is allowed. The negative reactivity effect of the soluble boron compensates for the increased reactivity caused by such a postulated accident. Accident analyses provided in FSAR, Appendix 9.1A (Ref. 1) demonstrate the storage pool maintains subcriticality with $k_{eff} \leq 0.95$ during these accident occurrences. The configuration of fuel assemblies in the fuel storage pool satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).
LCO	The restrictions on the placement of fuel assemblies within the fuel storage pool, in accordance with Figure 3.7.17-1 or Specification 4.3.1.1, in the accompanying LCO, preserve the assumptions used in the analyses as described in Reference 1.
APPLICABILITY	This LCO applies whenever any fuel assembly is stored in the fuel storage pool.
ACTIONS	<u>A.1</u> Required Action A.1 is modified by a Note indicating that LCO 3.0.3 does not apply.

(continued)

BASES

ACTIONS

A.1 (continued)

When the configuration of fuel assemblies stored in the fuel storage pool is not in accordance with Figure 3.7.17-1, or Specification 4.3.1.1, the immediate action is to initiate action to make the necessary fuel assembly movement(s) to bring the configuration into compliance with Figure 3.7.17-1 or Specification 4.3.1.1.

If unable to move irradiated fuel assemblies while in MODE 5 or 6, LCO 3.0.3 would not be applicable. If unable to move irradiated 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.

SURVEILLANCE REQUIREMENTS

SR 3.7.17.1

This SR verifies by administrative means that the initial enrichment, cooling time, and burnup of the fuel assembly is in accordance with Figure 3.7.17-1 in the accompanying LCO. For fuel assemblies in the unacceptable range of Figure 3.7.17-1, performance of this SR will ensure compliance with Specification 4.3.1.1. The burnup of each spent fuel assembly stored in Region 2 shall be ascertained by analysis, and independently verified prior to storage in Region 2. Shuffling of fuel within a Region does not require performance of this surveillance.

REFERENCES

1. FSAR, Appendix 9.1A, Spent Fuel Storage Rack Analysis.

2. Deleted.

3. 10 CFR 50.68(b)(4).

4. NEI 12-16, Rev. 4, Guidance for Performing Criticality Analyses of Fuel Storage at Light-Water Reactor Power Plants, as endorsed by Regulatory Guide 1.240, Rev. 0.