(2) Technical Specifications

The Technical Soecifications contained in Appendix A, as revised through Amendment No 233 which are attached hereto, are hereby incorporated into this renewed operating license. Duke Power Company LLC shall operate the facility in accordance with the Technical Specifications.

(3) Updated Final Safety Analysis Report

The Updated Final Safety Analysis Report supplement submitted pursuant to 10 CFR 54.21(d), as revised on December 16, 2002, describes certain future activities to be completed before the period of extended operation. Duke shall complete these activities no later than December 6, 2024, and shall notify the NRC in writing when implementation of these activities is complete and can be verified by NRC inspection.

The Updated Final Safety Analysis Report supplement as revised on December 16, 2002, described above, shall be included in the next scheduled update to the Updated Final Safety Analysis Report required by 10 CFR 50.71(e)(4), following issuance of this renewed operating license. Until that update is complete, Duke may make changes to the programs described in such supplement without prior Commission approval, provided that Duke evaluates each such change pursuant to the criteria set forth in 10 CFR 50.59 and otherwise complies with the requirements in that section.

(4) Antitrust Conditions

Duke Power Company LLC shall comply with the antitrust conditions delineated in Appendix C to this renewed operating license.

(5) Fire Protection Program (Section 9.5.1, SER, SSER #2, SSER #3, SSER #4, SSER #5)*

Duke Power Company LLC shall implement and maintain in effect all provisions of the approved fire protection program as described in the Updated Final Safety Analysis Report, as amended, for the facility and as approved in the SER through Supplement 5, subject to the following provision:

> The licensee may make changes to the approved fire protection program without prior approval of the Commission only if those changes would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire.

---

*The parenthetical notation following the title of this renewed operating license condition denotes the section of the Safety Evaluation Report and/or its supplement wherein this renewed license condition is discussed.

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No 229 which are attached hereto, are hereby incorporated into this renewed operating license. Duke Power Company LLC shall operate the facility in accordance with the Technical Specifications.

(3) Updated Final Safety Analysis Report

The Updated Final Safety Analysis Report supplement submitted pursuant to 10 CFR 54.21(d), as revised on December 16, 2002, describes certain future activities to be completed before the period of extended operation. Duke shall complete these activities no later than February 24, 2026, and shall notify the NRC in writing when implementation of these activities is complete and can be verified by NRC inspection.

The Updated Final Safety Analysis Report supplement as revised on December 16, 2002, described above, shall be included in the next scheduled update to the Updated Final Safety Analysis Report required by 10 CFR 50.71(e)(4), following issuance of this renewed operating license. Until that update is complete, Duke may make changes to the programs described in such supplement without prior Commission approval, provided that Duke evaluates each such change pursuant to the criteria set forth in 10 CFR 50.59 and otherwise complies with the requirements in that section.

(4) Antitrust Conditions

Duke Power Company LLC shall comply with the antitrust conditions delineated in Appendix C to this renewed operating license.

(5) Fire Protection Program (Section 9.5.1, SER, SSER #2, SSER #3, SSER #4, SSER #5)*

Duke Power Company LLC shall implement and maintain in effect all provisions of the approved fire protection program as described in the Updated Final Safety Analysis Report, as amended, for the facility and as approved in the SER through Supplement 5, subject to the following provision:

> The licensee may make changes to the approved fire protection program without prior approval of the Commission only if those changes would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire.

*The parenthetical notation following the title of this renewed operating license condition denotes the section of the Safety Evaluation Report and/or its supplements wherein this renewed license condition is discussed.

3.7 PLANT SYSTEMS

3.7.16 Spent Fuel Assembly Storage

LCO 3.7.16 The combination of initial enrichment and burnup of each new or spent fuel assembly stored in the spent fuel pool storage racks shall be within the following configurations:

a. Unrestricted storage (new or irradiated low enriched uranium fuel enriched up to an initial nominal 5.0 wt% U-235); or

b. Restricted storage in accordance with Figure 3.7.16-1.

APPLICABILITY: Whenever any fuel assembly is stored in the spent fuel pool.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Requirements of the LCO not met.	A.1 --------------NOTE------------- LCO 3.0.3 is not applicable. --------------------------------- Initiate action to move the noncomplying fuel assembly to the correct location.	Immediately

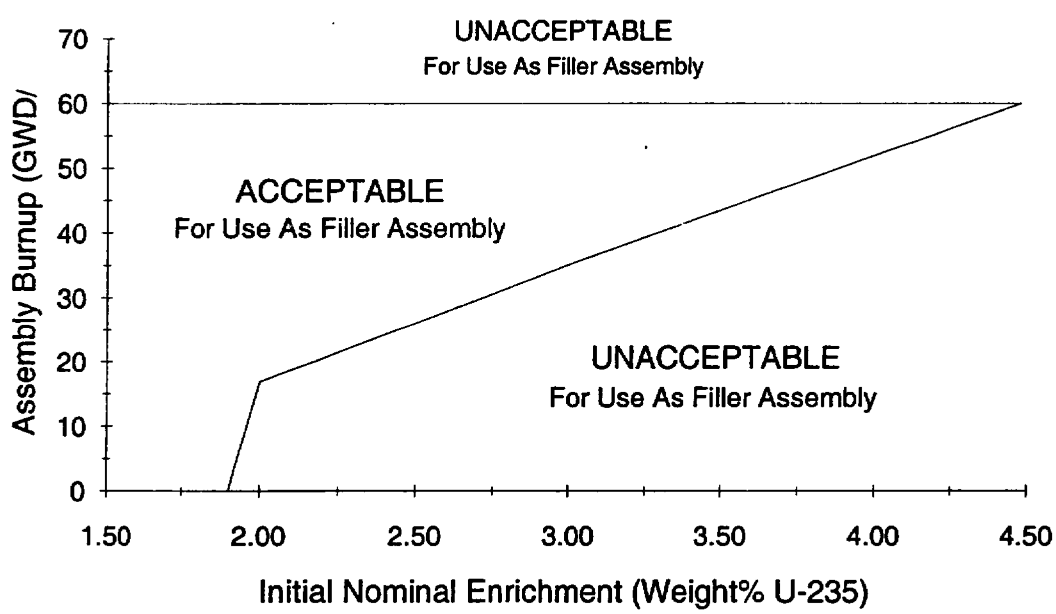
SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.7.16.1 Verify by administrative means the planned spent fuel pool location is acceptable for the fuel assembly being stored.	Prior to storing the fuel assembly in the spent fuel pool

Table 3.7.16-1

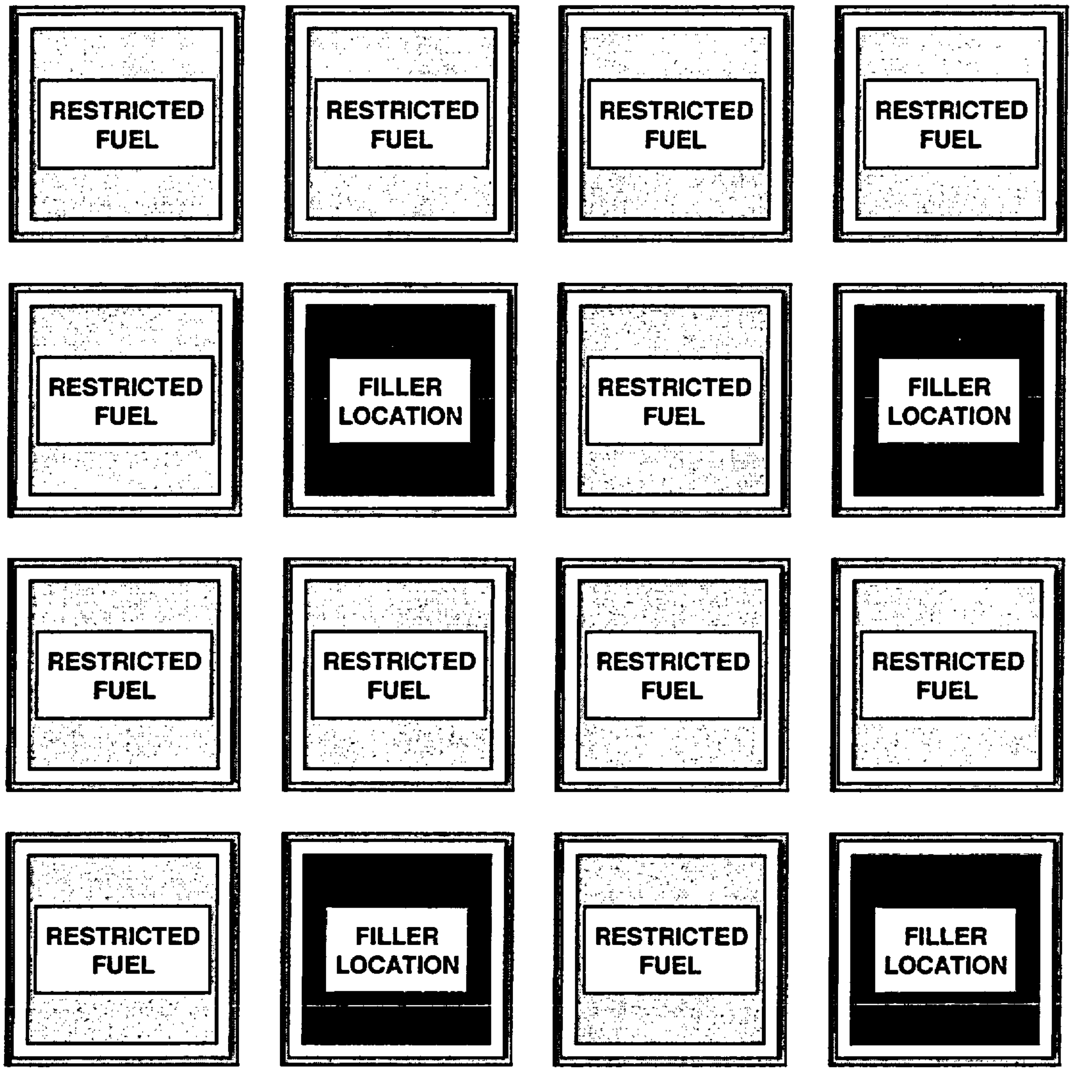
Minimum Qualifying Burnup Versus Initial Enrichment for Low Enriched Uranium Filler Assemblies

Initial Nominal Enrichment (Weight% U-235)	Assembly Burnup (GWD/MTU)
1.90 (or less)	0
2.00	16.83
2.50	26.05
3.00	35.11
3.50	43.48
4.00	51.99
4.48	60.00



NOTES:

Fuel which differs from those designs used to determine the requirements of Table 3.7.16-1 must be qualified for use as a Filler Assembly by means of an analysis using NRC approved methodology to assure that k_{eff} is less than or equal to 0.95.



Restricted Fuel:	Fuel which is a mixed oxide fuel assembly with a maximum nominal fissile plutonium concentration of 4.15 weight percent and a maximum nominal U-235 enrichment of 0.35 weight percent. (Fuel defined for Unrestricted Storage per LCO 3.7.16.a, or non-fuel components, or an empty cell may be used in Restricted Fuel locations as needed)
Filler Location:	Either low enriched uranium fuel which meets the minimum burnup requirements of Table 3.7.16-1, or an empty cell.
Boundary Condition:	Any row bounded by an Unrestricted Storage Area shall contain a combination of Restricted Fuel assemblies and filler locations arranged such that no Restricted Fuel assemblies are adjacent to each other. Example: In the figure above, row 1 or column 1 can <u>not</u> be adjacent to an Unrestricted Storage Area, but row 4 or column 4 can be.

Figure 3.7.16-1
Required 3 out of 4 Loading Pattern for Restricted Storage

4.0 DESIGN FEATURES

4.3 Fuel Storage (continued)

a. Low enriched uranium fuel assemblies having a maximum nominal U-235 enrichment of 5.0 weight percent or mixed oxide fuel assemblies having a maximum nominal fissile plutonium concentration up to 4.15 weight percent and a maximum nominal U-235 enrichment of 0.35 weight percent;

b. k_{eff} < 1.0 if fully flooded with unborated water, which includes an allowance for uncertainties as described in Section 9.1 of the UFSAR;

c. $k_{eff} \leq 0.95$ if fully flooded with water borated to a minimum of 200 ppm, which includes an allowance for uncertainties as described in Section 9.1 of the UFSAR; and

d. A nominal 13.5 inch center to center distance between fuel assemblies placed in the fuel storage racks.

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

a. Fuel assemblies having a maximum nominal U-235 enrichment of 5.0 weight percent;

b. $k_{eff} \leq 0.95$ if fully flooded with unborated water, which includes an allowance for uncertainties as described in Section 9.1 of the UFSAR;

c. $k_{eff} \leq 0.98$ if moderated by aqueous foam, which includes an allowance for uncertainties as described in Section 9.1 of the UFSAR; and

d. A nominal 21 inch center to center distance between fuel assemblies placed in the storage racks.

4.3.2 Drainage

The spent fuel storage pool is designed and shall be maintained to prevent inadvertent draining of the pool below elevation 596 ft.

4.3.3 Capacity

The spent fuel storage pool is designed and shall be maintained with a storage capacity limited to no more than 1421 fuel assemblies.

B 3.7 PLANT SYSTEMS

B 3.7.15 Spent Fuel Pool Boron Concentration

BASES

BACKGROUND

The spent fuel storage rack (Ref. 1) is limited to a capacity of 1421 fuel assemblies. The spent fuel storage rack is designed to accommodate fuel with a maximum nominal enrichment of 5.0 wt% U-235 (maximum tolerance of ± 0.05 wt%). The storage rack can also accommodate mixed oxide fuel assemblies with a maximum nominal fissile plutonium concentration up to 4.15 weight percent (maximum tolerance of +/- 0.075 weight percent fissile Pu) and a maximum nominal Uranium-235 enrichment of 0.35 weight percent. The mixed oxide fuel assembly design is radially zoned with fuel rods at three different plutonium concentrations. The nominal fissile plutonium concentration limit is the volume weighted average for the entire fuel assembly.

The spent fuel storage racks have been analyzed taking credit for soluble boron as allowed in Reference 2. The methodology ensures that the spent fuel rack multiplication factor, k_{eff}, is less than or equal to 0.95 as recommended in ANSI/ANS-57.2-1983 (Reference 3) and NRC guidance (Reference 4). The spent fuel storage racks are analyzed to allow storage of fuel assemblies with enrichments up to a maximum nominal value of 5.00 weight percent Uranium-235 while maintaining $k_{eff} \leq 0.95$ including uncertainties, tolerances, biases, and credit for soluble boron. Soluble boron credit is used to offset off-normal conditions and to provide subcritical margin such that the spent fuel pool k_{eff} is maintained less than or equal to 0.95. The soluble boron concentration required to maintain k_{eff} less than or equal to 0.95 under normal conditions is 200 ppm. In addition, sub-criticality of the spent fuel pool ($k_{eff} < 1.0$) is assured on an overall 95 percent probability, at a 95 percent confidence (95/95) basis, without the presence of the soluble boron in the spent fuel pool. The criticality analysis performed shows that the regulatory subcriticality requirements are met for fuel assembly storage within an allowable storage configuration, when the criteria specified in LCO 3.7.16 are satisfied. Prior to movement of an assembly, it is necessary to perform SR 3.7.15.1.

APPLICABLE SAFETY ANALYSES

Most accident conditions do not result in an increase in the reactivity of the spent fuel storage rack. An example of these accident conditions is the dropping of a fuel assembly on the top of the rack. However, accidents can be postulated that could increase the reactivity.

BASES

APPLICABLE SAFETY ANALYSES (continued)

The postulated accidents are basically of two types. A fuel assembly could be incorrectly positioned (e.g., an unirradiated fuel assembly or an insufficiently depleted fuel assembly). The second type of postulated accident is associated with a fuel assembly which is dropped adjacent to the fully loaded storage rack. For an occurrence of these postulated accidents, the double contingency principle discussed in ANSI N-16.1-1975 and the April 1978 NRC letter (Reference 5) can be applied. This states that one is not required to assume two unlikely, independent, concurrent events to ensure protection against a criticality accident. Thus, for these postulated accident conditions, the presence of additional soluble boron in the spent fuel pool water (above the 200 ppm required to maintain k_{eff} less than or equal to 0.95 under normal conditions) can be assumed as a realistic initial condition since not assuming its presence would be a second unlikely event.

Calculations show that the soluble boron concentrations needed to maintain the spent fuel pool Keff below 0.95 for the postulated accidents related to fuel assembly movement are far less than the minimum amount available in the spent fuel pools (per the LCO for TS 3.7.15).

Specification 4.3.1.1 c. requires that the spent fuel rack k_{eff} be less than or equal to 0.95 when flooded with water borated to 200 ppm. A spent fuel pool boron dilution analysis was performed which confirmed that sufficient time is available to detect and mitigate a dilution of the spent fuel pool before the 0.95 k_{eff} design basis is exceeded. The spent fuel pool boron dilution analysis concluded that an unplanned or inadvertent event which could result in the dilution of the spent fuel pool boron concentration to 200 ppm is not a credible event.

NUREG-0612,"Control of Heavy Loads at Nuclear Power Plants," requires that the criticality consequences of dropping a load heavier than a fuel assembly on the spent fuel pool rack be considered. This accident condition allows full credit for the minimum required boron concentration in the spent fuel pools. That minimum boron concentration is controlled though the COLR as described in the LCO for TS 3.7.15.

The largest loads that may be moved over the spent fuel pool storage racks are the weir gates. An analysis of the criticality consequences of a worst-case weir gate drop on these racks demonstrates that even with up to six (6) fuel assemblies crushed by the weir gate into an optimum-reactivity configuration, the maximum achievable 95/95 k_{eff} is well below the 0.95 subcriticality criterion, when full credit is taken for the minimum soluble boron concentration in the spent fuel pools as required by the LCO for TS 3.7.15.

BASES

APPLICABLE SAFETY ANALYSES (continued)

The concentration of dissolved boron in the spent fuel pool satisfies Criterion 2 of 10 CFR 50.36 (Ref. 7).

LCO

The spent fuel pool boron concentration is required to be within the limits specified in the COLR. The specified concentration of dissolved boron in the spent fuel pool preserves the assumptions used in the analyses of the potential critical accident scenarios as described in Reference 6. This concentration of dissolved boron is the minimum required concentration for fuel assembly storage and movement within the spent fuel pool.

APPLICABILITY

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

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.

If the LCO is not met while moving irradiated fuel assemblies in MODE 5 or 6, LCO 3.0.3 would not be applicable. If moving irradiated 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 3.7.15.1

This SR verifies that the concentration of boron in the spent fuel 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.

BASES

REFERENCES

1. UFSAR, Section 9.1.2.

2. 10 CFR 50.68, "Criticality Accident Requirements."

3. American Nuclear Society, "American National Standard Design Requirements for Light Water Reactor Fuel Storage Facilities at Nuclear Power Plants," ANSI/ANS-57.2-1983, October 7, 1983.

4. Nuclear Regulatory Commission, Memorandum to Timothy Collins from Laurence Kopp, "Guidance on the Regulatory Requirements for Criticality Analysis of Fuel Storage at Light Water Reactor Power Plants," August 19, 1998.

5. Double contingency principle of ANSI N16.1-1975, as specified in the April 14, 1978 NRC letter (Section 1.2) and implied in the proposed revision to Regulatory Guide 1.13 (Section 1.4, Appendix A).

6. UFSAR, Section 15.7.4.

7. 10 CFR 50.36, Technical Specifications, (c)(2)(ii).

B 3.7 PLANT SYSTEMS

B 3.7.16 Spent Fuel Assembly Storage

BASES

BACKGROUND

The spent fuel storage rack (Ref. 1) is limited to a capacity of 1421 fuel assemblies. The spent fuel storage rack is designed to accommodate fuel with a maximum nominal enrichment of 5.0 wt% U-235 (maximum tolerance of $\pm$ 0.05 wt%). The storage rack can also accommodate mixed oxide fuel assemblies with a maximum nominal fissile plutonium concentration up to 4.15 weight percent (maximum tolerance of +/- 0.075 weight percent fissile Pu) and a maximum nominal Uranium-235 enrichment of 0.35 weight percent. The mixed oxide fuel assembly design is radially zoned with fuel rods at three different plutonium concentrations. The nominal fissile plutonium concentration limit is the weighted average for the entire fuel assembly.

The spent fuel storage racks have been analyzed taking credit for soluble boron as allowed in Reference 2. The methodology ensures that the spent fuel rack multiplication factor, k_{eff}, is less than or equal to 0.95 as recommended in ANSI/ANS-57.2-1983 (Reference 3) and NRC guidance (Reference 4). The spent fuel storage racks are analyzed to allow storage of fuel assemblies with enrichments up to a maximum nominal value of 5.00 weight percent Uranium-235 while maintaining $k_{eff} \leq 0.95$ including uncertainties, tolerances, biases, and credit for soluble boron. Soluble boron credit is used to offset off-normal conditions and to provide subcritical margin such that the spent fuel pool k_{eff} is maintained less than or equal to 0.95. The soluble boron concentration required to maintain k_{eff} less than or equal to 0.95 under normal conditions is 200 ppm. In addition, sub-criticality of the spent fuel pool ($k_{eff} < 1.0$) is assured on an overall 95 percent probability, at a 95 percent confidence (95/95) basis, without the presence of the soluble boron in the spent fuel pool. The criticality analysis performed shows that the regulatory subcriticality requirements are met for fuel assembly storage within an allowable storage configuration, when the criteria specified in the accompanying LCO are satisfied. Prior to movement of an assembly, it is necessary to perform SR 3.7.15.1.

BASES

APPLICABLE SAFETY ANALYSES

The hypothetical accidents can only take place during or as a result of the movement of an assembly or movement of heavy loads in the spent fuel pool (Ref. 6). For these accident occurrences, the presence of soluble boron in the spent fuel pool (controlled by LCO 3.7.15, "Spent Fuel Pool Boron Concentration") prevents criticality in the spent fuel pool storage racks. By closely controlling the movement of each assembly and by checking the location of each assembly after movement, the time period for potential accidents may be limited to a small fraction of the total operating time. During the remaining time period with no potential for accidents, the operation may be under the auspices of the accompanying LCO.

For an occurrence of these postulated accidents, the double contingency principle discussed in ANSI N-16.1-1975 and the April 1978 NRC letter (Reference 5) can be applied. This states that one is not required to assume two unlikely, independent, concurrent events to ensure protection against a criticality accident. Thus, for these postulated accident conditions, the presence of additional soluble boron in the spent fuel pool water (above the 200 ppm required to maintain k_{eff} less than or equal to 0.95 under normal conditions) can be assumed as a realistic initial condition since not assuming its presence would be a second unlikely event.

Calculations show that the soluble boron concentrations needed to maintain the spent fuel pool k_{eff} below 0.95 for the postulated accidents related to fuel assembly movement are far less than the minimum amount available in the spent fuel pools (per the LCO for TS 3.7.15).

Specification 4.3.1.1.c requires that the spent fuel rack k_{eff} be less than or equal to 0.95 when flooded with water borated to 200 ppm. A spent fuel pool boron dilution analysis was performed which confirmed that sufficient time is available to detect and mitigate a dilution of the spent fuel pool before the 0.95 k_{eff} design basis is exceeded. The spent fuel pool boron dilution analysis concluded that an unplanned or inadvertent event which could result in the dilution of the spent fuel pool boron concentration to 200 ppm is not a credible event.

NUREG-0612,"Control of Heavy Loads at Nuclear Power Plants," requires that the criticality consequences of dropping a load heavier than a fuel assembly on the spent fuel pool rack be considered. This accident condition allows full credit for the minimum required boron concentration in the spent fuel pools. That minimum boron concentration is controlled though the COLR as described in the LCO for TS 3.7.15.

The largest loads that may be moved over the spent fuel pool storage racks are the weir gates. An analysis of the criticality consequences of a worst-case weir gate drop on these racks demonstrates that even with up

BASES

APPLICABLE SAFETY ANALYSES (continued)

to six (6) fuel assemblies crushed by the weir gate into an optimum-reactivity configuration, the maximum achievable 95/95 k_{eff} is well below the 0.95 subcriticality criterion, when full credit is taken for the minimum soluble boron concentration in the spent fuel pools as required by the LCO for TS 3.7.15.

The configuration of fuel assemblies in the spent fuel pool satisfies Criterion 2 of 10 CFR 50.36 (Ref. 7).

LCO

Unrestricted storage of fuel assemblies within the spent fuel pool is allowed provided that the maximum nominal Uranium-235 enrichment is equal to or less than 5.00 weight percent. This ensures the k_{eff} of the spent fuel pool will always remain $\leq$ 0.95, assuming the pool is flooded with water borated to 200 ppm. Restricted storage of fuel assemblies is also allowed, in accordance with the configuration and definitions provided in TS Figure 3.7.16-1.

APPLICABILITY

This LCO applies whenever any fuel assembly is stored in the spent fuel pool.

ACTIONS

A.1

Required Action A.1 is modified by a Note indicating that LCO 3.0.3 does not apply.

When the configuration of fuel assemblies stored in the spent fuel pool is not in accordance with the LCO, the immediate action is to initiate action to make the necessary fuel assembly movement(s) to bring the configuration into compliance.

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.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.7.16.1

This SR verifies by administrative means that the fuel assembly is in accordance with the configurations specified in the accompanying LCO.

REFERENCES

1. UFSAR, Section 9.1.2.
2. 10 CFR 50.68, "Criticality Accident Requirements."
3. American Nuclear Society, "American National Standard Design Requirements for Light Water Reactor Fuel Storage Facilities at Nuclear Power Plants," ANSI/ANS-57.2-1983, October 7, 1983.
4. Nuclear Regulatory Commission, Memorandum to Timothy Collins from Laurence Kopp, "Guidance on the Regulatory Requirements for Criticality Analysis of Fuel Storage at Light Water Reactor Power Plants," August 19, 1998.
5. Double contingency principle of ANSI N16.1-1975, as specified in the April 14, 1978 NRC letter (Section 1.2) and implied in the proposed revision to Regulatory Guide 1.13 (Section 1.4, Appendix A).
6. UFSAR, Section 15.7.4.
7. 10 CFR 50.36, Technical Specifications, (c)(2)(ii).