TECHNICAL SPECIFICATIONS - FIGURES

TABLE OF CONTENTS

2.0 **LIMITING CONDITIONS FOR OPERATION**
2.8 Refueling
2.8.3 Refueling Operations - Spent Fuel Pool

2.8.3(6) Spent Fuel Cask Loading

Applicability

Applies to storage of spent fuel assemblies whenever any fuel assembly is located in a spent fuel cask in the spent fuel pool. The provisions of Specification 2.0.1 for Limiting Conditions for Operation are not applicable.

Objective

To minimize the possibility of an accident occurring during REFUELING OPERATIONS that could affect public health and safety.

Specification

(1) The spent fuel pool boron concentration shall be ≥ 800 ppm, and

(2) The combination of initial enrichment and burnup of each spent fuel assembly located in a spent fuel storage cask in the spent fuel pool shall be within the acceptable burnup domain of Figure 2-11.

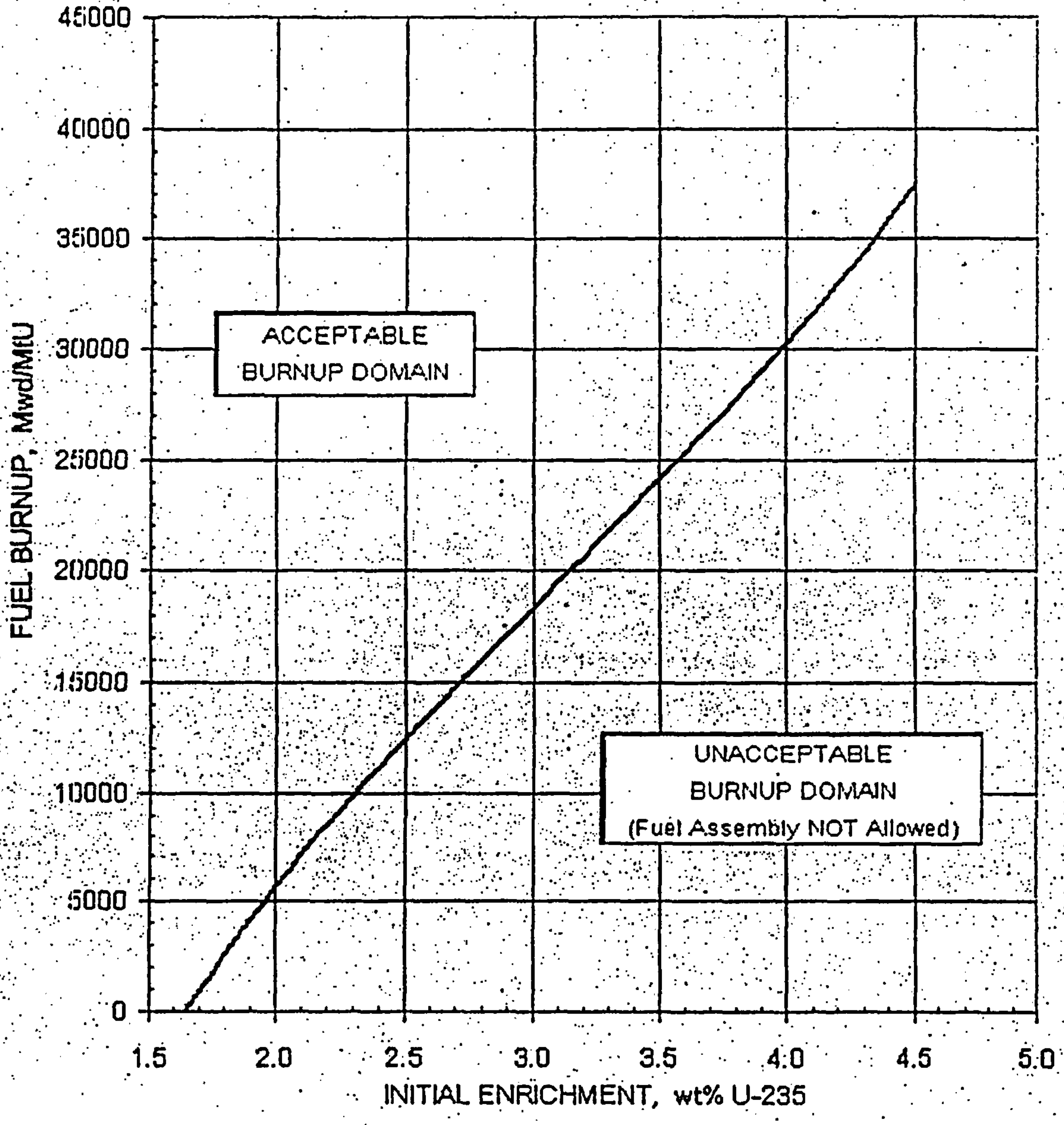
Required Actions

(1) With the spent fuel pool boron concentration <800 ppm, suspend REFUELING OPERATIONS involving spent fuel cask loading immediately, and

(2) Restore spent fuel pool boron concentration to ≥ 800 ppm immediately.

(3) With the requirements of the LCO 2.8.3(6)(2) not met, initiate action to remove the noncomplying fuel assembly from the spent fuel cask immediately.

Figure 2-11



LIMITING BURNUP CRITERIA
FOR
ACCEPTABLE STORAGE IN
SPENT FUEL CASK

2.0 LIMITING CONDITIONS FOR OPERATION
2.8 Refueling

Bases

2.8.1 Refueling Shutdown

2.8.1(1) Boron Concentration

The boron concentration of the water filling the reactor refueling cavity (of at least the REFUELING BORON CONCENTRATION) is sufficient to maintain the reactor subcritical by more than 5%, including allowance for uncertainties, in the cold condition with all rods withdrawn. The REFUELING BORON CONCENTRATION is specified in the COLR. Periodic checks of the refueling water boron concentration ensure the proper shutdown margin.

When "immediately" is used as a completion time, the required action should be pursued without delay and in a controlled manner. Suspension of CORE ALTERATIONS shall not preclude completion of movement of a component to a safe, conservative position.

2.8.1(2) Nuclear Instrumentation

Two OPERABLE source (wide) range neutron monitors are required to provide a signal to ensure that redundant monitoring capability is available to detect changes in core reactivity. With only one source range neutron monitor OPERABLE, redundancy has been lost. Since these instruments are the only direct means of monitoring core reactivity conditions, CORE ALTERATIONS and positive reactivity additions must be suspended immediately. When "immediately" is used as a completion time, the required action should be pursued without delay and in a controlled manner.

With no source range neutron monitor OPERABLE, there is no means of detecting changes in core reactivity. However, since CORE ALTERATIONS and positive reactivity additions are not being made, the core reactivity condition is stabilized until the monitors are returned to OPERABLE status. This stabilized condition is determined by verifying that the required boron concentration exists. The completion time of 4 hours is sufficient to obtain and analyze a reactor coolant sample for boron concentration. The frequency of once per 12 hours ensures that unplanned changes in boron concentration would be identified. The 12 hour frequency is reasonable, considering the low probability of a change in core reactivity during this period.

2.0 **LIMITING CONDITIONS FOR OPERATION**
2.8 Refueling

Bases (Continued)

2.8.1(3) Shutdown Cooling System - High Water Level

The purposes of the SDC system in MODE 5 with fuel in the reactor and with one or more reactor vessel head closure bolt less than fully tensioned, are to remove decay heat and sensible heat from the RCS, provide mixing of borated coolant, to provide sufficient coolant circulation to minimize the effects of a boron dilution accident, and to prevent boron stratification.

Inadequate cooling of the reactor coolant could result in boiling of the reactor coolant which could lead to a reduction in boron concentration in the coolant due to the boron plating out on components near the areas of boiling activity, and because of the possible addition of water to the reactor vessel with a lower boron concentration than is required to keep the reactor subcritical. The loss of reactor coolant and the reduction of boron concentration in the reactor coolant would eventually challenge the integrity of the fuel cladding, which is a fission product barrier.

An OPERABLE SDC loop consists of a SDC pump, a heat exchanger, valves, piping, instruments and controls to ensure an OPERABLE flowpath and to determine the low end temperature. The flowpath starts in one of the RCS hot legs and is returned to the RCS cold legs. The containment spray pumps can be considered as available shutdown cooling pumps only if the RCS temperature is less than 120°F and the RCS is vented with a vent area greater than or equal to 47 in^2. This restrictions ensure that the SI/CS pumps' suction header piping is not subjected to an unanalyzed condition in this mode. Analysis has determined that the minimum required RCS vent area is 47 in^2. This requirement may be met by removal of the pressurizer manway which has a cross-sectional area greater than 47 in^2.

Specification 2.8.1(3) is modified by an exception that allows the required operating SDC loop to be removed from service for up to 1 hour in each 8 hour period, provided no operations are permitted that would cause a reduction of the RCS boron concentration. This permits operations such as core mapping or alterations in the vicinity of the reactor vessel hot leg nozzles, and RCS to SDC isolation valve testing. During this 1 hour period, decay heat is removed by natural convection to the large mass of water in the refueling cavity. Boron concentration reduction is prohibited because uniform concentration distribution cannot be assured without forced circulation.

2.8.1(3) Shutdown Cooling System - High Water Level (Continued)

Specification 2.8.1(3) is modified by an exception to allow both trains of SDC out of service for up to eight hours provided, in part, that at least one SDC train is available under administrative controls. This allows evolutions such as Engineered Safety Feature testing to be completed when the SDC system is not fully OPERABLE but is considered available since only minor operator actions are required to restore the SDC system to OPERABLE status and place it IN OPERATION. A SDC loop is considered available under administrative controls if there are: (1) approved procedures, (2) a dedicated operator stationed at the controls if they are outside of the control room, and (3) direct communication between the dedicated operator and the control room. Similarly, the SDC system is considered available under administrative controls when an operator is not at the location of the controls provided: (1) procedural guidance is consulted prior to removing SDC from service to determine the time-to-boil, and (2) there is sufficient time for the operator to travel to the local controls and perform the required actions.

With the water level ≥ 23 feet above the top of the core, only one SDC loop is required for decay heat removal. Only one is required because the volume of water above the top of the core provides backup decay heat removal capability. The 23 ft level was selected because it ensures that adequate time is available to initiate emergency procedures to cool the core. For example, assuming the amount of decay heat generated one day after shutdown with an initial reactor coolant temperature of 200°F, this level provides approximately 25 minutes before the reactor coolant would boil. More time is available under conditions more representative of when this specification applies (i.e., when the reactor vessel closure head is removed). For example, five days after shutdown with the initial reactor coolant temperature of 130°F provides more than four hours before the reactor coolant would boil.

If the SDC loop requirements are not met, there will be no forced circulation to provide mixing to establish uniform boron concentrations. Therefore, actions that reduce boron concentration are required to be suspended immediately. Additionally, suspending any operation that would increase the decay heat load, such as loading a fuel assembly, is a prudent action under this condition. Closing the containment penetrations that provide direct access to the outside environment prevents fission products, if released from a loss of decay heat removal event, from escaping the containment. A completion time of 4 hours is reasonable because most SDC problems can be repaired within 4 hours and because there is a low probability of the cooling boiling in that time.

When "immediately" is used as a completion time, the required action should be pursued without delay and in a controlled manner.

2.0 **LIMITING CONDITIONS FOR OPERATION**
2.8 Refueling

Bases (Continued)

2.8.1(4) Shutdown Cooling System - Low Water Level

With the water level < 23 feet above the top of the core, two OPERABLE SDC loops are required since the volume of water above the top of the core will not provide sufficient backup decay heat removal capability.

With one SDC loop inoperable, actions shall be immediately initiated and continued until the SDC loop is restored to OPERABLE status, or until ≥ 23 feet of water is established above the top of the core. With the water level ≥ 23 feet above the top of the core, this Specification is no longer applicable, and Specification 2.8.1(3) is applicable.

An OPERABLE SDC loop consists of a SDC pump, a heat exchanger, valves, piping, instruments and controls to ensure an OPERABLE flowpath and to determine the low end temperature. The flowpath starts in one of the RCS hot legs and is returned to the RCS cold legs. The containment spray pumps can be considered as available shutdown cooling pumps only if the RCS temperature is less than 120°F and the RCS is vented with a vent area greater than or equal to 47 in^2.

With both SDC loops inoperable, there will be no forced circulation to provide mixing to establish uniform boron concentrations. Therefore, actions that reduce boron concentration are required to be suspended immediately. Closing the containment penetrations that provide direct access to the outside environment prevents fission products, if released from a loss of decay heat removal event, from escaping the containment. A completion time of 4 hours is reasonable because most SDC problems can be repaired within 4 hours and because there is a low probability of the coolant boiling in that time.

When "immediately" is used in a completion time, the required action should be pursued without delay and in a controlled manner.

2.0 LIMITING CONDITIONS FOR OPERATION
2.8 Refueling

Bases (Continued)

2.8.2(1) Containment Penetrations

During CORE ALTERATIONS or REFUELING OPERATIONS inside containment, a release of fission product radioactivity within the containment will be minimized from escaping to the environment when the LCO requirements are met. In MODE 5, the potential for containment pressurization as a result of an accident is not likely; therefore, requirements to isolate the containment from the outside atmosphere are less stringent than when the reactor is at power. The LCO does not require CONTAINMENT INTEGRITY. Since there is no potential for containment pressurization as a result of a fuel handling accident, the Appendix J leakage criteria and tests are not required.

For a fuel handling accident in containment, the very conservative assumption that all the rods in a single assembly fail with no credit for containment isolation or atmosphere filtration yields worst 2-hour doses at the exclusion area boundary (EAB) and low population zone (LPZ) that remain well within the limits of 10 CFR 50.67.

During CORE ALTERATIONS or REFUELING OPERATIONS inside of containment, the Equipment Hatch Enclosure (Room 66) doors or the equipment hatch shall be capable of being closed within one hour after a fuel handling accident per administrative controls. Placing administrative controls (closure requirements) on the Equipment Hatch Enclosure (Room 66) doors or the equipment hatch ensures that the release of fission products is minimized (defense in depth).

The Personnel Air Lock (PAL), which is also part of the containment pressure boundary, provides a means for personnel access into containment. The doors are normally interlocked to prevent simultaneously opening when CONTAINMENT INTEGRITY is required. During periods of shutdown when containment closure is not required, the interlock may be disabled and both PAL doors allowed to remain open for extended periods when frequent containment entry is necessary. During CORE ALTERATIONS or REFUELING OPERATIONS inside containment, CONTAINMENT INTEGRITY is not required, therefore the door interlock mechanism may remain disabled, but one PAL door shall always remain capable of being closed.

The other containment penetrations that provide direct access from containment atmosphere to outside atmosphere shall be capable of being closed within one hour, per administrative controls, on at least one side. The specification is met when one of the two automatic isolation valves per penetration is OPERABLE, or by closure of a manual isolation valve, blind flange, or equivalent. Equivalent isolation methods must be approved (through 10 CFR 50.59 safety evaluation process) and may include use of a material that can provide a temporary, atmospheric pressure ventilation barrier for the other containment penetrations during fuel movements.

2.0 LIMITING CONDITIONS FOR OPERATION
2.8 Refueling

Bases (Continued)

2.8.2(1) Containment Penetrations (Continued)

The administrative controls to ensure closure of the Equipment Hatch Enclosure (Room 66) doors or equipment hatch, one PAL door, and other penetrations within one hour of a FHA will be implemented in plant procedures. These administrative controls are as follows:

a. the Equipment Hatch Enclosure (Room 66) doors or the equipment hatch and one door in the PAL shall be capable of being closed in less than one hour of a FHA,

b. the Equipment Hatch Enclosure (Room 66) doors or the equipment hatch and one door in the PAL shall not be obstructed unless capability for rapid removal of obstructions is provided (such as quick disconnects for hoses),

c. penetrations providing direct access from the containment atmosphere to the outside atmosphere shall be capable of being closed on one side in less than one hour of a FHA,

d. an individual or individuals shall be designated and available during CORE ALTERATIONS and REFUELING OPERATIONS, capable of closing the Equipment Hatch Enclosure (Room 66) doors or equipment hatch, one door in the PAL, and penetrations that provide direct access from the containment atmosphere to the outside atmosphere.

The required actions shall be completed within one hour after the time of a FHA. Provision of these required actions minimizes the release of fission product radioactivity. The fuel handling accident in containment uses the conservative assumptions that activity is instantaneously released to the reactor coolant cavity water and then released over a two-hour time period from containment to the environment. Implementing closure of containment within one hour from the time of accident minimizes the dose consequences to the EAB and LPZ.

When "immediately" is used as a completion time, the required action should be pursued without delay and in a controlled manner.

2.8.2(2) Refueling Water Level

Prior to REFUELING OPERATIONS inside containment, the reactor refueling cavity is filled with approximately 250,000 gallons of borated water. The minimum refueling water level meets the assumption of iodine decontamination factors following a fuel handling accident. When the water level is lower than the required level, CORE ALTERATIONS and REFUELING OPERATIONS inside of containment shall be suspended immediately. This effectively precludes a fuel handling accident from occurring. When "immediately" is used as a completion time, the required action

2.0 **LIMITING CONDITIONS FOR OPERATION**
2.8 Refueling

Bases (Continued)

2.8.2(2) Refueling Water Level (Continued)

should be pursued without delay and in a controlled manner. Suspension of REFUELING OPERATIONS and CORE ALTERNATIONS shall not preclude completion of movement of a component to a safe, conservative position. In addition to suspending REFUELING OPERATIONS and CORE ALTERATIONS, action to restore the refueling water level must be initiated immediately.

Movement of irradiated fuel from the reactor core is not initiated before the reactor core has been subcritical for a minimum of 72 hours if the reactor has been operated at power levels in excess of 2% rated power. The restriction of not moving fuel in the reactor for a period of 72 hours after the power has been removed from the core takes advantage of the decay of the short half-life fission products and allows for any failed fuel to purge itself of fission gases, thus reducing the consequences of a fuel handling accident.

2.8.2(3) Ventilation Isolation Actuation Signal (VIAS)

A Ventilation Isolation Actuation Signal (VIAS) is initiated by a Safety Injection Actuation Signal (SIAS), a Containment Spray Actuation Signal (CSAS) or a Containment Radiation High Signal (CRHS). During CORE ALTERATIONS and REFUELING OPERATIONS only the CRHS is required to respond to a fuel handling or reactivity accident. At least one of the following three radiation monitors (Containment Monitor (RM-051), Containment/Auxiliary Building Stack Swing Monitor (RM-052), Auxiliary Building Stack Radiation Monitor (RM-062) must be OPERABLE and aligned to monitor the containment atmosphere or stack effluents. (Note, the Offsite Dose Calculation Manual may have additional requirements/restrictions concerning operation of these monitors.)

In the event that none of the above radiation monitors are OPERABLE or VIAS manual actuation capability is inoperable, CORE ALTERATIONS and REFUELING OPERATIONS must be suspended thus precluding the possibility of a fuel handling/reactivity accident.

For the fuel handling accident in containment, the very conservative assumption that all the rods in a single assembly fail with no credit taken for containment isolation or atmosphere filtration yields doses at the exclusion area boundary (EAB) and low population zone (LPZ) that remain well within the limits of 10 CFR 50.67.

VIAS initiates closure of the containment pressure relief, air sample, and purge system valves, if open. This action minimizes release of significant radionuclides from the containment to the environment. VIAS also initiates other actions, such as opening of the air supply and exhaust dampers in the safety injection pump rooms in preparation for safety injection pump operation. These other functions are not required to mitigate the consequences of a fuel handling accident, and therefore are not required to be OPERABLE.

2.0 LIMITING CONDITIONS FOR OPERATION
2.8 Refueling
Bases (Continued)

2.8.2(3) Ventilation Isolation Actuation Signal (VIAS) (Continued)

Requiring one (1) radiation monitor to be OPERABLE and aligned to monitor the containment atmosphere [or stack effluents] is a conservative measure to reduce exposure. Radiation monitoring will assure operators are alerted if a radiological incident occurs in containment to enable implementation of administrative controls as specified in the Bases for 2.8.2(1) "Containment Penetrations." During CORE ALTERATIONS and REFUELING OPERATIONS, the OPERABILITY of the control room ventilation system is addressed by Specification 2.8.2(4). The control room ventilation system is placed in Filtered Air mode as a conservative measure to reduce control room operator exposure. Specification 2.8.2(4) allows the radiological consequences analysis for a fuel handling accident to credit the Filtered Air mode at the time of the accident.

When VIAS is inoperable, CORE ALTERATIONS and REFUELING OPERATIONS in containment are immediately suspended. This effectively precludes a fuel handling accident from occurring. When "immediately" is used as a completion time, the required action should be pursued without delay and in a controlled manner. Suspension of CORE ALTERATIONS and REFUELING OPERATIONS shall not preclude completion of movement of a component to a safe, conservative position.

2.8.2(4) Control Room Ventilation System

Operating the control room ventilation system in the Filtered Air mode is a conservative measure to reduce control room operator exposure. This allows the radiological consequences analysis for a fuel handling accident to credit the Filtered Air mode at the time of the accident. When "immediately" is used as a completion time, the required action should be pursued without delay and in a controlled manner. Suspension of CORE ALTERATIONS and REFUELING OPERATIONS shall not preclude completion of movement of a component to a safe, conservative position.

2.8.3(1) Spent Fuel Assembly Storage

The spent fuel pool is designed for noncriticality by use of neutron absorbing material. The restrictions on the placement of fuel assemblies within the spent fuel pool, according to Figure 2-10, and the accompanying LCO, ensures that the k_{eff} of the spent fuel pool always remains < 0.95 assuming the pool to be flooded with unborated water.

A spent fuel assembly may be transferred directly from the reactor core to the spent fuel pool Region 2 provided an independent verification of assembly burnups has been completed and the assembly burnup meets the acceptance criteria identified in Figure 2-10. When the configuration of fuel assemblies stored in Region 2 (including the peripheral cells) is not in accordance with Figure 2-10, immediate action must be taken to make the necessary fuel assembly movement(s) to bring the configuration into compliance with Figure 2-10. Acceptable fuel assembly burnup is not a prerequisite for Region 1 storage because Region 1 will maintain any type of fuel assembly that the plant is licensed for in a safe, coolable, subcritical geometry.

2.0 LIMITING CONDITIONS FOR OPERATION
2.8 Refueling

Bases (Continued)

2.8.3(1) Spent Fuel Assembly Storage (Continued)

The provisions of Specification 2.0.1 for Limiting Conditions for Operations are not applicable. If moving fuel assemblies while in MODES 4 or 5, LCO 2.0.1 would not specify any actions. If moving fuel assemblies in MODES 1, 2, or 3, 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. When "immediately" is used as a completion time, the required action should be pursued without delay and in a controlled manner.

2.8.3(2) Spent Fuel Pool Water Level

The minimum water level in the spent fuel pool meets the assumption of iodine decontamination factors following a fuel handling accident. When the water level is lower than the required level, the movement of irradiated fuel assemblies in the spent fuel pool is immediately suspended. This effectively precludes a fuel handling accident from occurring in the spent fuel pool. Suspension of REFUELING OPERATION shall not preclude completion of movement of a component to a safe, conservative position. The provisions of Specification 2.0.1 for Limiting Conditions for Operations are not applicable. If moving fuel assemblies while in MODES 4 or 5, LCO 2.0.1 would not specify any actions. If moving fuel assemblies in MODES 1, 2, or 3, 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. When "immediately" is used as a completion time, the required action should be pursued without delay and in a controlled manner.

2.8.3(3) Spent Fuel Pool Boron Concentration

The basis for the 500 ppm boron concentration requirement with Boral poisoned storage racks is to maintain the k_{eff} below 0.95 in the event a misloaded unirradiated fuel assembly is located next to a spent fuel assembly. A misloaded unirradiated fuel assembly at maximum enrichment condition, in the absence of soluble poison, may result in exceeding the design effective multiplication factor. Soluble boron in the spent fuel pool water, for which credit is permitted under these conditions, would assure that the effective multiplication factor is maintained substantially less than the design condition.

This LCO applies whenever unirradiated fuel assemblies are stored in the spent fuel pool. The boron concentration is periodically sampled in accordance with Specification 3.2. Sampling is performed prior to movement of unirradiated fuel to the spent fuel pool and periodically when unirradiated fuel is stored in the spent fuel pool.

The provisions of Specification 2.0.1 for Limiting Conditions for Operations are not applicable. If moving fuel assemblies while in MODES 4 or 5, LCO 2.0.1 would not specify any actions. If moving fuel assemblies in MODES 1, 2, or 3, 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.

2.0 **LIMITING CONDITIONS FOR OPERATION**
2.8 Refueling

Bases (Continued)

2.8.3(3) Spent Fuel Pool Boron Concentration (Continued)

When "immediately" is used as a completion time, the required action should be pursued without delay and in a controlled manner. Suspension of refueling operations shall not preclude completion of movement of a component to a safe, conservative position.

2.8.3(4) Spent Fuel Pool Area Ventilation

The spent fuel pool area ventilation system contains a charcoal filter to prevent release of significant radionuclides to the outside atmosphere. The system does not automatically realign and therefore must be IN OPERATION prior to REFUELING OPERATIONS in the spent fuel pool. When the spent fuel pool area ventilation system is not IN OPERATION, the movement of irradiated fuel assemblies in the spent fuel pool is immediately suspended. This effectively precludes a fuel handling accident from occurring in the spent fuel pool. When "immediately" is used as a completion time, the required action should be pursued without delay and in a controlled manner. Suspension of REFUELING OPERATIONS shall not preclude completion of movement of a component to a safe, conservative position.

The provisions of Specification 2.0.1 for Limiting Conditions for Operations are not applicable. If moving fuel assemblies while in MODES 4 or 5, LCO 2.0.1 would not specify any actions. If moving fuel assemblies in MODES 1, 2, or 3, 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.

2.8.3(5) Control Room Ventilation System

Operating the control room ventilation system in the Filtered Air mode and requiring a radiation monitor to be IN OPERATION are conservative measures to reduce control room operator exposure. This allows the radiological consequences analysis for a fuel handling accident to credit the Filtered Air mode at the time of the accident.

Radiation monitoring will assure operators are alerted if a radiological incident occurs. This specification can be satisfied by using a permanent spent fuel pool area radiation monitor or a portable area radiation monitor.

When "immediately" is used as a completion time, the required action should be pursued without delay and in a controlled manner. Suspension of REFUELING OPERATIONS shall not preclude completion of movement of a component to a safe, conservative position.

2.0 **LIMITING CONDITIONS FOR OPERATION**
2.8 Refueling

Bases (Continued)

2.8.3(6) Spent Fuel Cask Loading

(1) Soluble Boron

The basis for the 800 ppm minimum boron concentration requirement during spent fuel cask loading operations is to maintain the k_{eff} in the cask system less than or equal to 0.95 in the event a mis-loaded unirradiated fuel assembly is located anywhere in the cask with up to 31 other fuel assemblies meeting the burnup and enrichment requirements of LCO 2.8.3(6)(2). This boron concentration also ensures the k_{eff} in the cask system will be less than or equal to 0.95 if an unirradiated fuel assembly is dropped in the space between the spent fuel racks and the cask loading area during cask loading operations next to a spent fuel assembly. A mis-loaded or dropped irradiated fuel assembly at maximum enrichment condition, in the absence of soluble poison, may result in exceeding the design effective multiplication factor. Soluble boron in the spent fuel pool water, for which credit is permitted during spent fuel cask loading operations, assures that the effective multiplication factor is maintained substantially less than the design basis limit.

This LCO applies whenever a fuel assembly is located in a spent fuel cask submerged in the spent fuel pool. The boron concentration is periodically sampled in accordance with Specification 3.2. Sampling is performed prior to movement of fuel into the spent fuel cask and periodically thereafter during cask loading operations, until the cask is removed from the spent fuel pool.

The provisions of Specification 2.0.1 for Limiting Conditions for Operations are not applicable. If moving fuel assemblies while in MODES 4 or 5, LCO 2.0.1 would not specify any actions. If moving fuel assemblies in MODES 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, inability to suspend movement of fuel assemblies is not sufficient reason to require a reactor shutdown.

When "immediately" is used as a completion time, the required action should be pursued without delay and in a controlled manner. Suspension of refueling operations shall not preclude completion of movement of a component to a safe, conservative position.

2.0 **LIMITING CONDITIONS FOR OPERATION**
2.8 Refueling

Bases (Continued)

2.8.3(6) Spent Fuel Cask Loading (Continued)

(2) Burnup vs. Enrichment

The spent fuel cask is designed for subcriticality by use of neutron absorbing material. The restrictions on the placement of fuel assemblies within the spent fuel pool, according to Figure 2-11, and the accompanying LCO, ensure that the k_{eff} of the spent fuel pool always remains ≤ 0.95 assuming the pool to be flooded with borated water and <1.0 assuming the pool is flooded with unborated water, in accordance with 10 CFR 50.68(b)(4).

A spent fuel assembly may be transferred directly from the spent fuel racks to the spent fuel cask provided an independent verification of assembly burnups has been completed and the assembly burnup meets the acceptance criteria identified in Figure 2-11. If any fuel assembly located in the spent fuel cask is not in accordance with Figure 2-11, immediate action must be taken to make the remove of non-complying fuel assembly from the spent fuel cask and return it to the spent fuel rack.

The provisions of Specification 2.0.1 for Limiting Conditions for Operations are not applicable. If moving fuel assemblies while in MODES 4 or 5, LCO 2.0.1 would not specify any actions. If moving fuel assemblies in MODES 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, inability to suspend movement of fuel assemblies is not sufficient reason to require a reactor shutdown. When "immediately" is used as a completion time, the required action should be pursued without delay and in a controlled manner.

References

(1) USAR Section 9.5
(2) USAR Section 14.18

TABLE 3-4 (Continued)

MINIMUM FREQUENCIES FOR SAMPLING TESTS

	Type of Measurement and Analysis	Sample and Analysis Frequency
1. Reactor Coolant (Continued)		
(c) Cold Shutdown (Operating Mode 4)	(1) Chloride	1 per 3 days
(d) Refueling Shutdown (Operating Mode 5)	(1) Chloride (2) Boron Concentration	1 per 3 days(3) 1 per 3 days(3)
(e) Refueling Operation	(1) Chloride (2) Boron Concentration	1 per 3 days(3) 1 per 3 days(3)
2. SIRW Tank	Boron Concentration	M
3. Concentrated Boric Acid Tanks	Boron Concentration	W
4. SI Tanks	Boron Concentration	M
5. Spent Fuel Pool	Boron Concentration	See Footnote 4 below
6. Steam Generator Blowdown (Operating Modes 1 and 2)	Isotopic Analysis for Dose Equivalent I-131	W(5)

(1) Until the radioactivity of the reactor coolant is restored to ≤1 μCi/gm DOSE EQUIVALENT I-131.

(2) Sample to be taken after a minimum of 2 EFPD and 20 days of power operation have elapsed since reactor was subcritical for 48 hours or longer.

(3) Boron and chloride sampling/analyses are not required when the core has been off-loaded. Reinitiate boron and chloride sampling/analyses prior to reloading fuel into the cavity to assure adequate shutdown margin and allowable chloride levels are met.

(4) Prior to placing unirradiated fuel assemblies in the spent fuel pool or placing fuel assemblies in a spent fuel cask in the spent fuel pool, and weekly when unirradiated fuel assemblies are stored in the spent fuel pool, or every 48 hours when fuel assemblies are in a spent fuel storage cask in the spent fuel pool.

(5) When Steam Generator Dose Equivalent I-131 exceeds 50 percent of the limits in Specification 2.20, the sampling and analysis frequency shall be increased to a minimum of 5 times per week. When Steam Generator Dose Equivalent I-131 exceeds 75 percent of this limit, the sampling and analysis frequency shall be increased to a minimum of once per day.

TABLE 3-5
MINIMUM FREQUENCIES FOR EQUIPMENT TESTS

		Test	Frequency
19.	Refueling Water Level	Verify refueling water level is ≥ 23 ft. above the top of the reactor vessel flange.	Prior to commencing, and daily during CORE ALTERATIONS and/or REFUELING OPERATIONS inside containment.
20.	Spent Fuel Pool Level	Verify spent fuel pool water level is ≥ 23 ft. above the top of irradiated fuel assemblies seated in the storage racks.	Prior to commencing, and weekly during REFUELING OPERATIONS in the spent fuel pool.
21.	Containment Penetrations	Verify each required containment penetration is in the required status.	Prior to commencing, and weekly during CORE ALTERATIONS and/or REFUELING OPERATIONS in containment.
22.	Spent Fuel Assembly Storage	Verify by administrative means that initial enrichment and burnup of the fuel assembly is in accordance with Figure 2-10.	Prior to storing the fuel assembly in Region 2 (including peripheral cells).
23.	P-T Limit Curve	Verify RCS Pressure, RCS temperature, and RCS heatup and cooldown rates are within the limits specified by the P-T limit Figure(s) shown in the PTLR.	This test is only required during RCS heatup and cooldown operations and RCS inservice leak and hydrostatic testing. While these operations are occurring, this test shall be performed every 30 minutes.
24.	Spent Fuel Cask Loading	Verify by administrative means that initial enrichment and burnup of the fuel assembly is in accordance with Figure 2-11.	Prior to placing the fuel assembly in a spent fuel cask in the spent fuel pool.

4.0 **DESIGN FEATURES** (Continued)

c. A nominal 8.6 inch center to center distance between fuel assemblies placed in Region 2, the high density fuel storage racks,

d. A nominal 9.8 inches (East-West) by 10.3 inches (North South) center to center distances between fuel assemblies placed in Region 1, the low density fuel storage racks,

e. New or partially spent fuel assemblies with a discharge burnup in the "acceptable domain" of Figure 2-10 for "Region 2 Unrestricted" may be allowed unrestricted storage in any of the Region 2 fuel storage racks in compliance with Reference (1).

f. Partially spent fuel assemblies with a discharge burnup between the "acceptable domain" and "Peripheral Cells" of Figure 2-10 may be allowed unrestricted storage in the peripheral cells of the Region 2 fuel storage racks in compliance with Reference (1).

g. New or partially spent fuel assemblies with a discharge burnup in the "unacceptable domain" of Figure 2-10 will be stored in Region 1 in compliance with Reference (1).

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

a. Fuel assemblies having a maximum 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 Reference (2).

c. $k_{eff} \leq 0.98$ if moderated by aqueous foam, which includes an allowance for uncertainties as described in Reference (2).

d. A nominal 16 inch center to center distance between fuel assemblies placed in the storage racks.

4.3.1.3 The spent fuel casks are designed and shall be maintained with:

a. Fuel assemblies having a maximum U-235 enrichment of 4.5 weight percent,

b. $k_{eff} < 1.0$ if fully flooded with unborated water, which includes an allowance for uncertainties as described in Section 9.5 of the USAR,

c. $k_{eff} \leq 0.95$ if fully flooded with borated water ≥ 800 ppm, which includes an allowance for uncertainties as described in Section 9.5 of the USAR,

d. A nominal 9.075-inch center-to-center distance between fuel assemblies placed in the spent fuel cask,

e. Spent fuel assemblies with a combination of discharge burnup and initial average assembly enrichment in the "acceptable" range of Figure 2-11.

4.0 **DESIGN FEATURES** (Continued)

4.3.2 Drainage

The spent fuel storage pool is designed and shall be maintained to prevent inadvertent draining of the pool below elevation 23 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 1083 fuel assemblies.

References:

(1) Letter from R. Wharton (NRC) to T. Patterson (OPPD), Amendment 174 to Facility Operating License No. DPR-40, (TAC NO. M94789) Dated July 30, 1996, NRC-96-0126.

(2) Ft. Calhoun USAR, Reference 9.5-1