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November 30, 2000
BVY 00-90

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Subject: **Vermont Yankee Nuclear Power Station**
License No. DPR-28 (Docket No. 50-271)
Technical Specification Proposed Change No. 239
Refueling Interlocks

Pursuant to 10CFR50.90, Vermont Yankee (VY) hereby proposes to amend its Facility Operating License, DPR-28, by incorporating the attached proposed change into the VY Technical Specifications (TS). The proposed change would revise the operability requirements for the refueling interlocks contained within TS 3.12.A as well as the surveillance requirements specified within 4.12.A. In addition, TS 3.12.F will be clarified to articulate that there must be a minimum of 24 hours fission product decay prior to fuel handling.

Through this change, the refueling equipment interlocks are more concisely defined, redundant interlocks are eliminated, action statements are clearly articulated for inoperable interlocks and the surveillance frequency for refueling interlock testing is extended. In addition, operational flexibility is increased by acknowledging that the interlocks are only required for that equipment associated with the movement of fuel within the reactor vessel.

Attachment 1 to this letter contains supporting information and the safety assessment of the proposed change. Attachment 2 contains the determination of no significant hazards consideration. Attachment 3 provides the marked-up version of the current Technical Specification and Bases pages. Attachment 4 is the retyped Technical Specification and Bases pages.

VY has reviewed the proposed Technical Specification change in accordance with 10CFR50.92 and concludes that the proposed change does not involve a significant hazards consideration.

VY has also determined that the proposed change satisfies the criteria for a categorical exclusion in accordance with 10CFR51.22(c)(9) and does not require an environmental review. Therefore, pursuant to 10CFR51.22(b), the preparation of an environmental impact statement or environmental assessment is not warranted.

A001

Upon acceptance of this proposed change by the NRC, VY requests that a license amendment be issued by April 6, 2001 for implementation within 30 days of its effective date.

If you have any questions on this transmittal, please contact Mr. Thomas B. Silko at (802) 258-4146.

Sincerely,

VERMONT YANKEE NUCLEAR POWER CORPORATION

Michael A. Balduzzi
Vice President, Operations

STATE OF VERMONT)
)ss
WINDHAM COUNTY)

Then personally appeared before me, Michael A. Balduzzi, who, being duly sworn, did state that he is Vice President, Operations of Vermont Yankee Nuclear Power Corporation, that he is duly authorized to execute and file the foregoing document in the name and on the behalf of Vermont Yankee Nuclear Power Corporation, and that the statements therein are true to the best of his knowledge and belief.

Thomas B. Silko, Notary Public
My Commission Expires February 10, 2003

Attachments

cc: USNRC Region 1 Administrator
USNRC Resident Inspector - VYNPS
USNRC Project Manager - VYNPS
Vermont Department of Public Service

Attachment 1

Vermont Yankee Nuclear Power Station

Proposed Technical Specification Change No. 239

Refueling Interlocks

Supporting Information and Safety Assessment of Proposed Change

SUPPORTING INFORMATION

Purpose

The proposed change would revise the operability requirements for the refueling interlocks contained within TS 3.12.A as well as the surveillance requirements specified within 4.12.A. Through this change, the refueling equipment interlocks are more concisely defined, redundant interlocks are eliminated, action statements are clearly articulated for inoperable interlocks and the surveillance frequency for refueling interlock testing is extended. In addition, operational flexibility is increased and the existing margins of safety are maintained by acknowledging that the interlocks are only required for the specific equipment associated with the movement of fuel within the reactor vessel.

In addition, TS 3.12.F will be clarified to articulate that there must be a minimum of 24 hours fission product decay prior to fuel handling.

Background

Refueling interlocks restrict the operation of the refueling equipment or the withdrawal of control rods to reinforce procedures that prevent the reactor from achieving criticality during refueling. The refueling interlock circuitry senses the conditions of the refueling equipment and the control rods. Depending on the sensed conditions, interlocks are actuated to prevent the operation of the refueling equipment or the withdrawal of control rods, thus eliminating the potential for inadvertent criticality.

One channel of instrumentation is provided to sense the position of the refueling platform, the loading of the refueling platform fuel grapple, and the full insertion of all control rods. Additionally, inputs are provided for the loading of the refueling platform frame mounted hoist, the loading of the refueling platform monorail mounted hoist, the full retraction of the fuel grapple, and the loading of the service platform hoist. With the reactor mode switch in the shutdown or refueling position, the indicated conditions are combined in logic circuits to determine if all restrictions on refueling equipment operations and control rod insertion are satisfied.

A control rod not at its full-in position interrupts power to the refueling equipment and prevents operating the equipment over the reactor core when loaded with a fuel assembly. Conversely, the refueling equipment located over the core and loaded with fuel, inserts a control rod withdrawal block in the Control Rod Drive System to prevent withdrawing a control rod.

The refueling platform has two mechanical switches that open before the platform or any of its hoists are physically located over the reactor vessel. All refueling hoists have switches that open when the hoists are loaded with fuel. The refueling interlocks use these indications to prevent operation of the refueling equipment with fuel loaded over the core whenever any control rod is withdrawn, or to prevent control rod withdrawal whenever fuel loaded refueling equipment is over the core.

The hoist switches open at a load lighter than the weight of a single fuel assembly in water.

Comparison to Standard Technical Specifications (STS)

This proposed change is consistent with Standard Technical Specifications[1]. STS Limiting Condition for Operation (LCO) 3.9.1 specifies that the refueling equipment interlocks shall be operable during in-vessel fuel movement with equipment associated with the interlocks. STS Surveillance Requirement (SR) 3.9.1.1 identifies that a CHANNEL FUNCTIONAL TEST be performed on certain required refueling equipment interlock inputs. This proposed change is consistent with the above LCO and SR.

In addition, this License Amendment request is consistent with the industry proposed change to NUREG 1433 as identified in TSTF-225 "Fuel Movement with Inoperable Refueling Equipment Interlocks."

Updated Final Safety Analysis Report (FSAR)

The refueling interlocks are described in VY FSAR section 7.6. Section 10.4.4.6 provides a description of the Refueling Equipment.

FSAR section 14.6.4 "Refueling Accident" states "Accidents that result in the release of radioactive materials directly to the containment can occur when the drywell is open... Various mechanisms for fuel failure under this condition have been investigated. The refueling interlocks, which impose restrictions on the movement of refueling equipment and control rods, prevent an inadvertent criticality during refueling operations... It is concluded that the only accident that could result in the release of significant quantities of fission products to the containment during this mode of operation is one resulting from the accidental dropping of a fuel bundle onto the top of the core." The proposed change to the refueling interlocks identified within Technical Specifications continues to impose restrictions on the movement of refueling equipment and control rods to prevent an inadvertent criticality during refueling operations.

SAFETY ASSESSMENT

The accident of concern during refueling operations is the dropping of a fuel bundle. The refueling interlocks have no bearing on the consequences to public health and safety of a postulated fuel handling accident, and accordingly, this proposed change will have no impact on this limiting accident. Refueling interlocks are established to prevent an inadvertent criticality during refueling operations. Control rods, when fully inserted, serve as the system capable of maintaining the reactor subcritical in cold conditions during all fuel movement activities and accidents.

The following provide input to one or both channels of the interlock instrumentation:

1. the full insertion of all control rods,
2. the position of the refueling platform, and
3. the loading of the refueling platform hoists.

[1] NUREG 1433, Revision 1, Standard Technical Specifications General Electric Plants, BWR/4, dated April 7, 1995

During refueling operations, the indicated conditions (the "all-rods-in", the "refueling platform position", and the "refueling platform hoist-fuel loaded" inputs) are combined in logic circuits to determine if all restrictions on refueling operations and control rod insertion are satisfied.

Criticality and, therefore, subsequent prompt reactivity excursions, are prevented during the loading of fuel, provided all control rods are fully inserted during the fuel loading. The refueling interlocks accomplish this by preventing loading fuel into the core with any control rod withdrawn, or by preventing withdrawal of a control rod from the core during fuel loading by inserting a control rod block. This proposed change will continue to ensure against inadvertent criticality via the refueling interlocks or through an appropriate alternative action and provides an equivalent level of assurance that fuel will not be loaded into a core cell with a control rod withdrawn. The alternative action portion of this proposed change is consistent with a recently approved license amendment for Perry Nuclear Power Plant, Unit 1[2].

This proposed change would continue to ensure that all control rods are fully inserted prior to loading fuel into the core. While this practice will ensure against inadvertent criticality, it is noted that the design of the plant is such that the core would remain subcritical during fuel loading even if a control rod was inadvertently withdrawn. Specifically, TS 3.3.A.1 reads: "The core loading shall be limited to that which can be made subcritical in the most reactive condition during the operating cycle with the highest worth rod in its fully withdrawn position and all other rods inserted." In addition, TS Surveillance Requirement 4.3.A.1 reads, in part: "Verify that the required SDM [shutdown margin] is met prior to each in-vessel fuel movement during the fuel loading sequence."

<u>Summary</u>

The proposed change revises the operability requirements for the refueling interlocks contained within TS 3.12.A as well as the surveillance requirements specified within 4.12.A. Through this change, the refueling equipment interlocks are more concisely defined, redundant interlocks are eliminated, action statements are clearly articulated for inoperable interlocks and the surveillance frequency for refueling interlock testing is extended. In addition, operational flexibility is increased and the existing margins of safety are maintained by acknowledging that the interlocks are required only for the specific equipment actually being utilized for the movement of fuel within the reactor vessel.

In addition, TS 3.12.F is clarified to articulate that there must be a minimum of 24 hours fission product decay prior to fuel handling.

Revising the operability requirements for the refueling interlocks and surveillance requirements is consistent with the BWR/4 STS and is not a safety concern as explained in Table 1. Table 1 details each proposed change and provides the basis and safety assessment for each change.

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2 Reference USNRC Letter to FirstEnergy Nuclear Operating Company, dated September 12, 2000, "Perry Nuclear Power Plant, Unit 1 – Issuance of Amendment Re: Refueling Equipment Interlocks (TAC No. MA6237)

Table 1

Change #	Current Technical Specification	Proposed Change
1	CTS 3.12.A states: "The reactor mode switch shall be locked in the "Refuel" position during core alterations and the refueling interlocks, listed below, shall be operable except as specified in Specifications 3.12.D and 3.12.E."	The proposed change will revise TS 3.12.A to the following: "The reactor mode switch shall be locked in the "Refuel" position during core alterations and; 1) The refueling interlocks shall be operable during in-vessel fuel movement for the equipment utilized in moving fuel. If one or more of the required refueling interlocks are inoperable; Immediately suspend fuel movement with equipment associated with the inoperable interlock(s), - or – Immediately insert a control rod withdrawal block and verify all control rods are fully inserted. 2) The refueling interlocks shall be operable except as specified in Specification 3.12.D and 3.12.E."

Basis/Safety Assessment:
The proposed change will retain the requirement that the interlocks be operable and that the exceptions identified within 3.12.D and 3.12.E apply. In addition, the proposed change will add required actions to be taken should the interlocks be rendered inoperable during core alterations or in-vessel fuel movement. The required actions will be to suspend fuel movement with equipment associated with the inoperable interlock. While currently not explicitly stated within Technical Specifications, this is the current action that would be taken should an interlock be rendered inoperable. It is noted that the suspension of in-vessel fuel movement shall not preclude completion of movement of a component to a safe position. In addition, the proposed change offers an alternative to the cessation of fuel movement following identification of an inoperable interlock. This alternative would apply should the interlocks become inoperable for any reason, whether it be due to an administrative declaration (because the surveillance is overdue) or if they became inoperable due to an actual hardware difficulty (that needs to undergo corrective maintenance). This alternative is to immediately block control rod withdrawal and then perform a verification that all control rods are fully inserted. As discussed in the Background discussion above, the purpose of the Refueling Interlocks is to prevent inadvertent criticality by ensuring that fuel is not loaded into a cell with a withdrawn control rod. The proposed alternative to continue fuel movement with inoperable interlocks satisfies this goal. The first refueling interlock safety function is to block control rod withdrawal whenever fuel is being moved in the reactor vessel. The proposed alternative will perform this function by requiring that a control rod block be placed in effect. The second refueling interlock safety function is to prevent fuel from being loaded into the vessel when a control rod is withdrawn. This function will continue to be performed by the second step of the proposed alternative which is to verify that all control rods are fully inserted. Therefore, the proposed alternative will provide equal assurance against inadvertent criticality during fuel handling within the reactor vessel with inoperable interlocks. It is noted the proposed alternative is consistent with a recently approved license amendment for Perry Nuclear Power Plant, Unit 1.

Change #	Current Technical Specification	Proposed Change
2	CTS 3.12.A.1.a identify the following "Control Rod Blocks" Refuel Interlock: "Mode switch in Startup/Hot Standby and the refueling platform over the reactor." Similarly, CTS 3.12.A.2.a identifies the following "Refueling Platform Reverse Motion (toward reactor vessel) Block" Refuel Interlock: "Mode switch in Startup/Hot Standby."	The proposed change would delete TS 3.12.A.1.a and 3.12.A.2.a.

Basis/Safety Assessment:
TS 3.12.A.1.a and TS 3.12.A.2.a (platform over the reactor) are not being retained since these two similar interlocks are not instrumental in satisfying the safety function of the interlocks which is to prevent reactor criticality during refueling evolutions. In addition, Specification 3.12.A requires that the mode switch be locked in the "Refuel" position during core alterations. It is noted that although this interlock will be deleted from the specifications, the function of prohibiting platform motion over the vessel while the mode switch is in Startup/Hot Standby exists as plant hardware and is controlled through plant procedures.

Change #	Current Technical Specification	Proposed Change
3	CTS 3.12.A.1.b & c, 3.12.A.2.b and 3.12.A.3.a identify several refueling interlocks that will be maintained. These interlocks deal with rod blocks when a hoist is loaded over the core and platform blocks when a rod is withdrawn. In addition, the one rod out interlock with the mode switch in refuel is identified.	The proposed change would identify the refueling equipment interlock inputs that need to be functionally tested. These will be properly identified as part of the Surveillance Requirements of TS 4.12.A.
Basis/Safety Assessment: As discussed in the Background discussion above, the purpose of the Refueling Interlocks is to prevent inadvertent criticality by ensuring that fuel is not loaded into a cell with a withdrawn control rod. The first refueling interlock safety function is to block control rod withdrawal whenever fuel is being moved in the reactor vessel. The second refueling interlock safety function is to prevent fuel from being loaded into the vessel when a control rod is withdrawn. These are the interlocks from CTS that are being maintained. Inadvertent criticality is prevented during the insertion of fuel, provided all control rods are fully inserted during the fuel insertion. The refueling interlocks being maintained accomplish this by preventing loading of fuel into the core with any control rod withdrawn from the core during fuel loading. The refuel platform location switches activate at a point outside of the reactor core such that, with a fuel assembly loaded and a control rod withdrawn, the fuel is not over the core.		

Change #	Current Technical Specification	Proposed Change
4	Current TS 3.12.A.3 identifies the following "Refueling Platform Hoist Blocks" Refuel Interlocks: "b. Hoist overload. c. High position limitation."	It is proposed that the interlocks identified in TS 3.12.A.3.b & c not be retained since they are not instrumental in satisfying the intent of the interlocks.

Basis/Safety Assessment:

TS 3.12.A.3.b & c are not being retained since they are not instrumental in satisfying the safety function of the interlocks, which is to prevent reactor criticality during refueling evolutions. The high position limitation interlock is an input assumption to the fuel handling accident and as such was considered for retention within the specifications. However, since the assumption in the fuel handling accident (FHA) analysis is that the fuel assembly is dropped from the maximum height allowed by the fuel handling equipment mechanical stops, retaining this information is not warranted. Since these items do serve equipment and personnel protection functions, these equipment functions will be retained and controlled through plant procedures.

Change #	Current Technical Specification	Proposed Change
5	The current surveillance frequency stated in CTS 4.12.A is to verify that the refueling interlocks are operable prior to fuel handling and at weekly intervals thereafter.	The proposed change would modify the surveillance frequency from weekly (every 7 days) to once every 31 days.

Basis/Safety Assessment:

Research as to the justification and selection of the original 7 day surveillance frequency was inconclusive. Discussion with several of the original technical specification writers from the late 1960s and early 1970s indicate that the 7 day period was considered adequate since fuel movement was not anticipated to take more than 7 days. However, current day outage schedules are such that there is an initial set of fuel moves to set up the vessel for core alterations and inspections, and then several days later a final phase of fuel movement. This change in outage scheduling usually results in fuel movement operations lasting 6-16 days and a suspension of fuel movement to perform the required weekly surveillance. Performance of the weekly interlock surveillance takes approximately 12 hours, represents critical path time and is considered disruptive to plant outage operations.

The reliability of the refueling interlocks, and the ability to identify problems with the interlock circuitry during the time between performance of surveillances, was borne out by reviews performed by a reference BWR plant. No difficulties were identified in the performance of over 30 surveillances on the interlocks. The corrective maintenance that was required on this circuitry was identified by the indications normally available to the operators between performance of surveillances. It is concluded that extending the surveillance frequency would not allow an inoperability to go undetected until the next performance of the surveillance. This license amendment request is consistent with the industry proposed change to NUREG 1433 as identified in TSTF-225 "Fuel Movement with Inoperable Refueling Equipment Interlocks."

In summary, the 31 day surveillance frequency is considered reasonable based on engineering judgement and is considered adequate in view of other indications of refueling interlocks and their associated input status. In addition, considering that the 31 day frequency is one-third of the 92 day interval for Functional Tests permitted for the Control Rod Block Instrumentation (reference Table 4.2.5) when the plant is in power operations, the change to a 31 day surveillance period is viewed as very conservative.

Change #	Current Technical Specification	Proposed Change
6	The current surveillance requirement stated in CTS 4.12.A is to verify the refueling interlocks at weekly intervals and "following any repair work associated with the interlocks."	The proposed change would delete the statement: "following any repair work associated with the interlocks."

Basis/Safety Assessment:

The deletion of text from Technical Specifications to perform post maintenance testing is considered administrative in nature. As part of any repair work conducted at Vermont Yankee, the appropriate post maintenance / post modification testing is required prior to declaring equipment operable. This is also required as part of Appendix B to 10CFR50. Accordingly, maintaining this information within Technical Specifications is not necessary and can be removed.

Change #	Current Technical Specification	Proposed Change
7	Technical Specification 3.12.F currently states "Fuel shall not be moved or handled in the reactor core for 24 hours following reactor shutdown to cold shutdown conditions." There is also a similarly worded surveillance requirement identified in TS 4.12.F.	The proposed change would modify the wording to articulate that there must be 24 hours of fission product decay prior to fuel handling within the reactor vessel.

Basis/Safety Assessment:

Clarification of the text to Technical Specification 3.12.F is considered administrative in nature. The safety analysis for a postulated refueling accident assumes that the reactor has been shutdown for 24 hours for fission product decay prior to any fuel handling which could result in dropping of a fuel assembly. The Bases correctly identifies that the intent of this specification is to ensure that the reactor has been shutdown for 24 hours for fission product decay. However, the current technical specification and surveillance wording could be interpreted to imply that fuel movement may not commence unless the reactor mode switch has been in the shutdown position for 24 hours. Since the radiological consequences of a fuel handling accident is independent of mode switch position, the wording of the specifications will be enhanced to reflect decay time rather than mode switch position. This change will continue to ensure that fuel movement within the reactor vessel is consistent with VY's safety analysis.

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Attachment 2

Vermont Yankee Nuclear Power Station

Proposed Technical Specification Change No. 239

Refueling Interlocks

Determination of No Significant Hazards Consideration

Determination of No Significant Hazards Consideration

Description of amendment request:

The proposed change would revise the operability requirements for the refueling interlocks contained within TS 3.12.A as well as the surveillance periodicity specified within 4.12.A. Through this change, the refueling equipment interlocks are more concisely defined, redundant interlocks are eliminated, action statements are clearly articulated for inoperable interlocks and the surveillance frequency for refueling interlock testing is extended. In addition, operational flexibility is increased and the existing margins of safety are maintained by acknowledging that the interlocks are only required for the specific equipment associated with the movement of fuel within the reactor vessel.

In addition, TS 3.12.F will be clarified to articulate that there must be a minimum 24 hours of fission product decay prior to fuel handling.

The proposed change is only applicable to the plant in a cold shutdown or refueling condition.

Basis for no significant hazards determination:

Pursuant to 10CFR50.92, Vermont Yankee (VY) has reviewed the proposed change and concludes that the change does not involve a significant hazards consideration since the proposed change satisfies the criteria in 10CFR50.92(c).

1. The operation of Vermont Yankee Nuclear Power Station in accordance with the proposed amendment will not involve a significant increase in the probability or consequences of an accident previously evaluated.

   The only accident described within the FSAR while the plant is in Cold Shutdown or Refueling is a fuel handling (dropped bundle) accident. The proposed change involves equipment that is not involved in the mitigation or prevention of a fuel handling accident as described in the FSAR. Accordingly, the proposed amendment will not involve a significant increase in the probability or consequences of an accident previously evaluated.

   The proposed change will not effect the ability of the refueling interlocks to satisfy the safety function which is to prevent reactor criticality during refueling operations. The change only effects those interlocks which are not instrumental in satisfying the safety function of the interlocks.

   Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. The operation of Vermont Yankee Nuclear Power Station in accordance with the proposed amendment will not create the possibility of a new or different kind of accident from any accident previously evaluated.

   The proposed change does not involve any physical alteration of plant equipment or to the status of the reactor core during refueling. The specifications will ensure either through the interlocks or the proposed alternative, that control rods are not withdrawn and cannot be

inappropriately withdrawn. This will ensure that fuel is not loaded into the core when a control rod is withdrawn.

Therefore, no new failure modes are introduced and the proposed change will not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. The operation of Vermont Yankee Nuclear Power Station in accordance with the proposed amendment will not involve a significant reduction in a margin of safety.

The proposed change does not involve a significant reduction in a margin of safety since the refueling interlocks will continue to ensure against an inadvertent criticality. This is achieved by physical interlocks or Technical Specification restrictions on refueling operations which will prevent fuel from being loaded into a core cell void of a control rod. This is accomplished by blocking control rod withdrawal whenever fuel is being loaded into the reactor vessel or by preventing fuel from being loaded into the vessel when a control rod is withdrawn.

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

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Attachment 3

Vermont Yankee Nuclear Power Station

Proposed Technical Specification Change No. 239

Refueling Interlocks

Marked-up Version of the Current Technical Specifications

3.12 LIMITING CONDITIONS FOR OPERATION

3.12 REFUELING AND SPENT FUEL HANDLING

Applicability:

Applies to fuel handling, core reactivity limitations, and spent fuel handling.

Objective:

To assure core reactivity is within capability of the control rods, to prevent criticality during refueling, and to assure safe handling of spent fuel casks.

Specification:

A. Refueling Interlocks

The reactor mode switch shall be locked in the "Refuel" position during core alterations and; ~~the refueling interlocks, listed below, shall be operable except as specified in Specifications 3.12.D and 3.12.E.~~

INSERT 1 ⇒ [1]

1. Control Rod Blocks

a. Mode switch in Startup/Hot Standby and refueling platform over the reactor. [2]

b. Fuel on any refueling hoist and refueling platform over the reactor. [3]

c. Mode switch in Refuel with one control rod withdrawal permit. [3]

2. Refueling Platform Reverse Motion (toward reactor vessel) Block

a. Mode switch in Startup/Hot Standby. [2]

4.12 SURVEILLANCE REQUIREMENTS

4.12 REFUELING AND SPENT FUEL HANDLING

Applicability:

Applies to the periodic testing of those interlocks and instruments used during refueling and to the testing of the reactor building crane.

Objective:

To verify the operability of instrumentation and interlocks used in refueling and the operability of the reactor building crane.

Specification:

A. Refueling Interlocks

Prior to any fuel handling, with the Head off the reactor vessel, the [Following REQUIRED] refueling interlock~~s~~, [INPUTS] shall be functionally tested [ONCE EVERY 31 DAYS:]. ~~They shall also be tested at weekly intervals thereafter until no longer required and following any repair work associated with the interlocks.~~ [5] [6]

[3] INSERT 2

3.12 LIMITING CONDITIONS FOR OPERATION

[3]

b. Any control rod out and fuel on any refueling hoist.

3. Refueling Platform Hoists Blocks

[3]

a. Any control rod out and fuel on any refueling hoist over the vessel.

[4]

b. Hoist overload.

c. High position limitation.

B. Core Monitoring

During core alterations two SRM's shall be operable, one in the core quadrant where fuel or control rods are being moved and one in an adjacent quadrant. For an SRM to be considered operable the following conditions shall be satisfied:

1. The SRM shall be inserted to the normal operating level. (Use of special movable, dunking type detectors during initial fuel loading and major core alterxations in place of normal detectors is permissible as long as the detectors is connected into the proper circuitry which contain the required rod blocks).

2. The SRM shall have a minimum of 3 cps with all rods fully inserted in the core.

4.12 SURVEILLANCE REQUIREMENTS

B. Core Monitoring

Prior to making any alterations to the core the SRM's shall be functionally tested and checked for neutron response. Thereafter, the SRMs shall be checked daily for response.

ARE

3.12 LIMITING CONDITIONS FOR OPERATION

D. Control Rod and Control Rod Drive Maintenance

One control rod may be withdrawn from the core for the purpose of performing control rod and/or control rod drive maintenance provided the following conditions are satisfied:

1. The reactor mode switch shall be locked in the "Refuel" position AND THE REQUIRED ~~All~~ refueling interlocks shall be operable.

2. Specification 3.3.A.1 shall be met, or the control rod directional control valves for a minimum of eight control rods surrounding the drive out of service for maintenance shall be disarmed electrically and sufficient margin to criticality demonstrated.

3. SRMs shall be operable in the core quadrant containing the control rod on which maintenance is being performed and in an adjacent quadrant. The requirements for an SRM to be considered operable are given in Specification 3.12.B.

4.12 SURVEILLANCE REQUIREMENTS

D. Control Rod and Control Rod Drive Maintenance

1. Prior to performing this maintenance, core shutdown margin shall be determined in accordance with Specification 3.3.A.1 to ensure that the core can be made subcritical at any time during the maintenance with the strongest operable control rod fully withdrawn and all other operable rods fully inserted.

2. Alternately, if a minimum of eight control rods surrounding the control rod out of service for maintenance are to be fully inserted and have their directional control valves electrically disarmed, the required shutdown margin shall be met with the strongest control rod remaining in service during the maintenance period fully withdrawn.

3.12 LIMITING CONDITIONS FOR OPERATION

E. <u>Extended Core Maintenance</u>

One or more control rods may be withdrawn or removed from the reactor core provided the following conditions are satisfied:

1. The reactor mode switch shall be locked in the "Refuel" position. The refueling interlock which prevents more than one control rod from being withdrawn may be bypassed on a withdrawn control rod after the fuel assemblies in the cell containing (controlled by) that control rod have been removed from the reactor core. ~~All~~ other refueling interlocks shall be operable.

2. SRMs shall be operable in the core quadrant where fuel or control rods are being moved, and in an adjacent quadrant. The requirements for an SRM to be considered operable are given in Specification 3.12.B.

3. If the spiral unload/reload method of core alteration is to be used, the following conditions shall be met:

   a. Prior to spiral unload and reload, the SRMs shall be proven operable as stated in Specification 3.12.B1 and 3.12.B2. However, during spiral unloading, the count rate may drop below 3 cps.

4.12 SURVEILLANCE REQUIREMENTS

E. <u>Extended Core Maintenance</u>

Prior to control rod withdrawal for extended core maintenance, that control rod's control cell shall be verified to contain no fuel assemblies.

1. This surveillance requirement is the same as that given in Specification 4.12.A.

2. This surveillance requirement is the same as that given in Specification 4.12.B.

3.12 LIMITING CONDITIONS FOR OPERATION

F. Fuel Movement

~~Fuel shall not be moved or handled in the reactor core for 24 hours following reactor shutdown to cold shutdown conditions.~~

THE REACTOR SHALL BE SHUT DOWN FOR A MINIMUM OF 24 HOURS PRIOR TO FUEL MOVEMENT WITHIN THE REACTOR CORE.

G. Crane Operability

1. The Reactor Building crane shall be operable when the crane is used for handling of a spent fuel cask.

4.12 SURVEILLANCE REQUIREMENTS

F. Fuel Movement

Prior to any fuel handling or movement in the reactor core, the licensed operator shall verify that the reactor has been ~~in the cold shutdown condition~~ SHUTDOWN for a minimum of 24 hours.

G. Crane Operability

1. a. Within one month prior to spent fuel cask handling operations, an inspection of crane cables, sheaves, hook, yoke, and cask lifting trunnions will be made. These inspections shall meet the requirements of ANSI Standard B30.2, 1967. A crane rope shall be replaced if any of the replacement criteria given in ANSI B30.2.0-1967 are met.

   b. No-load mechanical and electrical tests will be conducted prior to lifting the empty cask from its transport vehicle to verify proper operation of crane controls, brakes and lifting speeds. A functional test of the crane brakes will be conducted each time an empty cask is lifted clear of its transport vehicle.

BASES:

INSERT 3

3.12 & 4.12 REFUELING

A. During refueling operations, the reactivity potential of the core is being altered. It is necessary to require certain interlocks and restrict certain refueling procedures such that there is assurance that inadvertent criticality does not occur.

To minimize the possibility of loading fuel into a cell containing no control rod, it is required that all control rods are fully inserted when fuel is being loaded into the reactor core. This requirement assures that during refueling the refueling interlocks, as designed, will prevent inadvertent criticality. The core reactivity limitation of Specification 3.3 limits the core alterations to assure that the resulting core loading can be controlled with the Reactivity Control System and interlocks at any time during shutdown or the following operating cycle.

The addition of large amounts of reactivity to the core is prevented by operating procedures, which are in turn backed up by refueling interlocks on rod withdrawal and movement of the refueling platform. When the mode switch is in the "Refuel" position, interlocks prevent the refueling platform from being moved over the core if a control rod is withdrawn and fuel is on a hoist.

Likewise, if the refueling platform is over the core with fuel on a hoist, control rod motion is blocked by the interlocks. With the mode switch in the refuel position, only one control rod can be withdrawn.

INSERT 4

B. The SRMs are provided to monitor the core during periods of station shutdown and to guide the operator during refueling operations and station startup. Requiring two operable SRMs in or adjacent to any core quadrant where fuel or control rods are being moved assures adequate monitoring of that quadrant during such alterations. The requirement of 3 counts per second provides assurance that neutron flux is being monitored. Under the special condition of complete spiral core unloading, it is expected that the count rate of the SRMs will drop below 3 cps before all the fuel is unloaded. Since there will be no reactivity additions, a lower number of counts will not present a hazard. When all of the fuel has been removed to the spent fuel storage pool, the SRMs will no longer be required. Requiring the SRMs to be operational prior to fuel removal assures that the SRMs are operable and can be relied on even when the count rate may go below 3 cps.

Prior to spiral reload, two diagonally adjacent fuel assemblies, which have previously accumulated exposure in the reactor, will be loaded into core positions next to each of the 4 SRMs to obtain the required 3 cps. Exposed fuel continuously produces neutrons by spontaneous fission of certain plutonium isotopes, photo fission, and photo disintegration of deuterium in the moderator. This neutron production is normally great enough to meet the 3 cps minimum SRM requirement, thereby providing a means by which SRM response may be demonstrated before the spiral reload begins. During the spiral reload, the fuel will be loaded in the reverse sequence that it was unloaded with the exception of the initial eight (8) fuel assemblies which are loaded next to the SRMs to provide a means of SRM response.

BASES: 3.12 & 4.12 (Cont'd)

Additionally, at least 50% of the fuel assemblies to be reloaded into the core shall have previously accumulated a minimum exposure of 1000 Mwd/T to ensure the presence of a minimum neutron flux as described in Bases Section 3.12.B.

F. The intent of this specification is to assure that the reactor core has been SHUT DOWN ~~in the cold shutdown condition~~ for at least 24 hours following power operation and prior to fuel handling or movement. The safety analysis for the postulated refueling accident assumed that the reactor had been shut down for 24 hours for fission product decay prior to any fuel handling which could result in dropping of a fuel assembly.

G. The operability requirements of the reactor building crane ensures that the redundant features of the crane have been adequately inspected just prior to using it for handling of a spent fuel cask. The redundant hoist system ensures that a load will not be dropped for any postulated credible single component failures. Details of the design of the redundant features of the crane and specific testing requirements for the crane are delineated in the Vermont Yankee document entitled "Reactor Building Crane Modification" (December 1975).

H. The Spent Fuel Pool Cooling System is designed to maintain the pool water temperature below 125°F during normal refueling operations. If the reactor core is completely discharged, the temperature of the pool water may increase to greater than 125°F. The RHR System supplemental fuel pool cooling may be used under these conditions to maintain the pool water temperature less than 150°F.

INSERT 1

1) The refueling interlocks shall be operable during in-vessel fuel movement for the equipment utilized in moving fuel.

If one or more of the required refueling interlocks are inoperable;
Immediately suspend fuel movement with equipment associated with the inoperable interlock(s),

- or –

Immediately insert a control rod withdrawal block and verify all control rods are fully inserted.

2) The refueling interlocks shall be operable except as specified in Specification 3.12.D and 3.12.E

INSERT 2

a. All-rods-in;
b. Refuel platform position;
c. Refuel platform fuel grapple, fuel loaded;
d. Refuel platform frame mounted hoist, fuel loaded;
e. Refuel platform monorail mounted hoist, fuel loaded.

INSERT 3

Should the interlocks be made or found to be inoperable, the specifications offer an alternative to the cessation of fuel movement, not withstanding the completion of movement of a component to a safe position. The alternative is to immediately block control rod withdrawal and then perform a verification that all control rods are fully inserted.

INSERT 4

As discussed above, the purpose of the refueling interlocks is to prevent inadvertent criticality by ensuring that fuel is not loaded into a cell with a withdrawn control rod. The alternative identified within the specifications to continue fuel movement with inoperable interlocks satisfies this goal. The first refueling interlock safety function is to block control rod withdrawal whenever fuel is being moved in the reactor vessel. The alternative performs this function by requiring that a control rod block be placed in effect. The second refueling interlock safety function is to prevent fuel from being loaded into the vessel when a control rod is withdrawn. This function will continue to be performed by the second step of the alternative which is to verify that all control rods are fully inserted. Therefore, the alternative provides equal assurance against inadvertent criticality during fuel handling within the reactor vessel with inoperable interlocks.

The Surveillance Requirements for the refueling interlocks identify that the "required interlock inputs" shall be functionally tested. The intent of this statement is that only the interlock inputs associated with the equipment actually used to facilitate the core alteration is required to be functionally tested. For example, if the main mast is to be used for fuel movement, then the interlock inputs associated

with the main mast need to be functionally tested. Conversely, if the frame mounted hoist and monorail mounted hoist, will not be utilized, then the interlock inputs associated with the frame mounted hoist and monorail mounted hoist need not be functionally tested.

Attachment 4

Vermont Yankee Nuclear Power Station

Proposed Technical Specification Change No. 239

Refueling Interlocks

Retyped Technical Specification Pages

Listing of Affected Technical Specifications Pages

Replace the Vermont Yankee Nuclear Power Station Technical Specifications pages listed below with the revised pages. The revised pages contain vertical lines in the margin indicating the areas of change.

Remove	**Insert**
229	229
230	230
232	232
233	233
235	235
237	237
238	238
239	239

3.12 LIMITING CONDITIONS FOR OPERATION

3.12 REFUELING AND SPENT FUEL HANDLING

Applicability:

Applies to fuel handling, core reactivity limitations, and spent fuel handling.

Objective:

To assure core reactivity is within capability of the control rods, to prevent criticality during refueling, and to assure safe handling of spent fuel casks.

Specification:

A. Refueling Interlocks

The reactor mode switch shall be locked in the "Refuel" position during core alterations and;

1. The refueling interlocks shall be operable during in-vessel fuel movement for the equipment utilized in moving fuel.

   If one or more of the required refueling interlocks are inoperable;

   Immediately suspend fuel movement with equipment associated with the inoperable interlock(s),

   -or-

   Immediately insert a control rod withdrawal block and verify all control rods are fully inserted.

2. The refueling interlocks shall be operable except as specified in Specification 3.12.D and 3.12.E.

4.12 SURVEILLANCE REQUIREMENTS

4.12 REFUELING AND SPENT FUEL HANDLING

Applicability:

Applies to the periodic testing of those interlocks and instruments used during refueling and to the testing of the reactor building crane.

Objective:

To verify the operability of instrumentation and interlocks used in refueling and the operability of the reactor building crane.

Specification:

A. Refueling Interlocks

Prior to any fuel handling, with the Head off the reactor vessel, the following required refueling interlock inputs shall be functionally tested once every 31 days:

a. All-rods-in;
b. Refuel platform position;
c. Refuel platform fuel grapple, fuel loaded;
d. Refuel platform frame mounted hoist, fuel loaded;
e. Refuel platform monorail mounted hoist, fuel loaded.

3.12 LIMITING CONDITIONS FOR OPERATION

B. Core Monitoring

During core alterations two SRMs shall be operable, one in the core quadrant where fuel or control rods are being moved and one in an adjacent quadrant. For an SRM to be considered operable the following conditions shall be satisfied:

1. The SRM shall be inserted to the normal operating level. (Use of special movable, dunking type detectors during initial fuel loading and major core alterations in place of normal detectors is permissible as long as the detectors are connected into the proper circuitry which contain the required rod blocks).

2. The SRM shall have a minimum of 3 cps with all rods fully inserted in the core.

4.12 SURVEILLANCE REQUIREMENTS

B. Core Monitoring

Prior to making any alterations to the core the SRMs shall be functionally tested and checked for neutron response. Thereafter, the SRMs shall be checked daily for response.

3.12 LIMITING CONDITIONS FOR OPERATION

D. Control Rod and Control Rod Drive Maintenance

One control rod may be withdrawn from the core for the purpose of performing control rod and/or control rod drive maintenance provided the following conditions are satisfied:

1. The reactor mode switch shall be locked in the "Refuel" position and the required refueling interlocks shall be operable.

2. Specification 3.3.A.1 shall be met, or the control rod directional control valves for a minimum of eight control rods surrounding the drive out of service for maintenance shall be disarmed electrically and sufficient margin to criticality demonstrated.

3. SRMs shall be operable in the core quadrant containing the control rod on which maintenance is being performed and in an adjacent quadrant. The requirements for an SRM to be considered operable are given in Specification 3.12.B.

4.12 SURVEILLANCE REQUIREMENTS

D. Control Rod and Control Rod Drive Maintenance

1. Prior to performing this maintenance, core shutdown margin shall be determined in accordance with Specification 3.3.A.1 to ensure that the core can be made subcritical at any time during the maintenance with the strongest operable control rod fully withdrawn and all other operable rods fully inserted.

2. Alternately, if a minimum of eight control rods surrounding the control rod out of service for maintenance are to be fully inserted and have their directional control valves electrically disarmed, the required shutdown margin shall be met with the strongest control rod remaining in service during the maintenance period fully withdrawn.

3.12 LIMITING CONDITIONS FOR OPERATION

E. Extended Core Maintenance

One or more control rods may be withdrawn or removed from the reactor core provided the following conditions are satisfied:

1. The reactor mode switch shall be locked in the "Refuel" position. The refueling interlock which prevents more than one control rod from being withdrawn may be bypassed on a withdrawn control rod after the fuel assemblies in the cell containing (controlled by) that control rod have been removed from the reactor core. The required refueling interlocks shall be operable.

2. SRMs shall be operable in the core quadrant where fuel or control rods are being moved, and in an adjacent quadrant. The requirements for an SRM to be considered operable are given in Specification 3.12.B.

3. If the spiral unload/reload method of core alteration is to be used, the following conditions shall be met:

   a. Prior to spiral unload and reload, the SRMs shall be proven operable as stated in Specification 3.12.B1 and 3.12.B2. However, during spiral unloading, the count rate may drop below 3 cps.

4.12 SURVEILLANCE REQUIREMENTS

E. Extended Core Maintenance

Prior to control rod withdrawal for extended core maintenance, that control rod's control cell shall be verified to contain no fuel assemblies.

1. This surveillance requirement is the same as that given in Specification 4.12.A.

2. This surveillance requirement is the same as that given in Specification 4.12.B.

3.12 LIMITING CONDITIONS FOR OPERATION

F. Fuel Movement

The reactor shall be shut down for a minimum of 24 hours prior to fuel movement within the reactor core.

G. Crane Operability

1. The Reactor Building crane shall be operable when the crane is used for handling of a spent fuel cask.

4.12 SURVEILLANCE REQUIREMENTS

F. Fuel Movement

Prior to any fuel handling or movement in the reactor core, the licensed operator shall verify that the reactor has been shut down for a minimum of 24 hours.

G. Crane Operability

1. a. Within one month prior to spent fuel cask handling operations, an inspection of crane cables, sheaves, hook, yoke, and cask lifting trunnions will be made. These inspections shall meet the requirements of ANSI Standard B30.2, 1967. A crane rope shall be replaced if any of the replacement criteria given in ANSI B30.2.0-1967 are met.

   b. No-load mechanical and electrical tests will be conducted prior to lifting the empty cask from its transport vehicle to verify proper operation of crane controls, brakes and lifting speeds. A functional test of the crane brakes will be conducted each time an empty cask is lifted clear of its transport vehicle.

BASES:

3.12 & 4.12 REFUELING

A. During refueling operations, the reactivity potential of the core is being altered. It is necessary to require certain interlocks and restrict certain refueling procedures such that there is assurance that inadvertent criticality does not occur.

To minimize the possibility of loading fuel into a cell containing no control rod, it is required that all control rods are fully inserted when fuel is being loaded into the reactor core. This requirement assures that during refueling the refueling interlocks, as designed, will prevent inadvertent criticality. Should the interlocks be made or found to be inoperable, the specifications offer an alternative to the cessation of fuel movement, not withstanding the completion of movement of a component to a safe position. The alternative is to immediately block control rod withdrawal and then perform a verification that all control rods are fully inserted. The core reactivity limitation of Specification 3.3 limits the core alterations to assure that the resulting core loading can be controlled with the Reactivity Control System and interlocks at any time during shutdown or the following operating cycle.

The addition of large amounts of reactivity to the core is prevented by operating procedures, which are in turn backed up by refueling interlocks on rod withdrawal and movement of the refueling platform. When the mode switch is in the "Refuel" position, interlocks prevent the refueling platform from being moved over the core if a control rod is withdrawn and fuel is on a hoist.

Likewise, if the refueling platform is over the core with fuel on a hoist, control rod motion is blocked by the interlocks. With the mode switch in the refuel position, only one control rod can be withdrawn.

As discussed above, the purpose of the refueling interlocks is to prevent inadvertent criticality by ensuring that fuel is not loaded into a cell with a withdrawn control rod. The alternative identified within the specifications to continue fuel movement with inoperable interlocks satisfies this goal. The first refueling interlock safety function is to block control rod withdrawal whenever fuel is being moved in the reactor vessel. The alternative performs this function by requiring that a control rod block be placed in effect. The second refueling interlock safety function is to prevent fuel from being loaded into the vessel when a control rod is withdrawn. This function will continue to be performed by the second step of the alternative which is to verify that all control rods are fully inserted. Therefore, the alternative provides equal assurance against inadvertent criticality during fuel handling within the reactor vessel with inoperable interlocks.

The Surveillance Requirements for the refueling interlocks identify that the "required interlock inputs" shall be functionally tested. The intent of this statement is that only the interlock inputs associated with the equipment actually used to facilitate the core alteration is required to be functionally tested. For example, if the main mast is to be used for fuel movement, then the interlock inputs associated with the main mast need to be functionally tested. Conversely, if the frame mounted hoist and monorail mounted hoist, will not be utilized, then the interlock inputs associated with the frame mounted hoist and monorail mounted hoist need not be functionally tested.

BASES: 3.12 & 4.12 (Cont'd)

B. The SRMs are provided to monitor the core during periods of station shutdown and to guide the operator during refueling operations and station startup. Requiring two operable SRMs in or adjacent to any core quadrant where fuel or control rods are being moved assures adequate monitoring of that quadrant during such alterations. The requirement of 3 counts per second provides assurance that neutron flux is being monitored. Under the special condition of complete spiral core unloading, it is expected that the count rate of the SRMs will drop below 3 cps before all the fuel is unloaded. Since there will be no reactivity additions, a lower number of counts will not present a hazard. When all of the fuel has been removed to the spent fuel storage pool, the SRMs will no longer be required. Requiring the SRMs to be operational prior to fuel removal assures that the SRMs are operable and can be relied on even when the count rate may go below 3 cps.

Prior to spiral reload, two diagonally adjacent fuel assemblies, which have previously accumulated exposure in the reactor, will be loaded into core positions next to each of the 4 SRMs to obtain the required 3 cps. Exposed fuel continuously produces neutrons by spontaneous fission of certain plutonium isotopes, photo fission, and photo disintegration of deuterium in the moderator. This neutron production is normally great enough to meet the 3 cps minimum SRM requirement, thereby providing a means by which SRM response may be demonstrated before the spiral reload begins. During the spiral reload, the fuel will be loaded in the reverse sequence that it was unloaded with the exception of the initial eight (8) fuel assemblies which are loaded next to the SRMs to provide a means of SRM response.

C. To assure that there is adequate water to shield and cool the irradiated fuel assemblies stored in the pool, a minimum pool water level is established. This minimum water level of 36 feet is established because it would be a significant change from the normal level, well above a level to assure adequate cooling (just above active fuel).

D. During certain periods, it is desirable to perform maintenance on a single control rod and/or control rod drive. This specification provides assurance that inadvertent criticality does not occur during such maintenance.

The maintenance is performed with the mode switch in the "Refuel" position to provide the refueling interlocks normally available during refueling operations as explained in Part A of these Bases. Refueling interlocks restrict the movement of control rods and the operation of the refueling equipment to reinforce operational procedures that prevent the reactor from becoming critical during refueling operations. During refueling operations, no more than one control rod is permitted to be withdrawn from a core cell containing one or more fuel assemblies. The refueling interlocks use the "full-in" position indicators to determine the position of all control rods. If the "full-in" position signal is not present for every control rod, then the "all-rods-in" permissive for the refueling equipment interlocks is not present and fuel loading and control rod withdrawal is prevented. The refuel position one-rod-out interlock will not allow the withdrawal of a second control rod. The requirement that an adequate shutdown margin be determined with the control rods remaining in service ensures that inadvertent criticality cannot occur during this maintenance. Disarming the directional control valves does not inhibit control rod scram capability.

BASES: 3.12 & 4.12 (Cont'd)

E. The intent of this specification is to permit the unloading of a portion of the reactor core for such purposes as inservice inspection requirements, examination of the core support plate, control rod, control rod drive maintenance, etc. This specification provides assurance that inadvertent criticality does not occur during such operation.

This operation is performed with the mode switch in the "Refuel" position to provide the refueling interlocks normally available during refueling as explained in the Bases for Specification 3.12.A. In order to withdraw more than one control rod, it is necessary to bypass the refueling interlock on each withdrawn control rod which prevents more than one control rod from being withdrawn at a time. The requirement that the fuel assemblies in the cell controlled by the control rod be removed from the reactor core before the interlock can be bypassed ensures that withdrawal of another control rod does not result in inadvertent criticality. Each control rod essentially provides reactivity control for the fuel assemblies in the cell associated with that control rod. Thus, removal of an entire cell (fuel assemblies plus control rod) results in a lower reactivity potential of the core.

One method available for unloading or reloading the core is the spiral unload/reload. Spiral reloading and unloading encompass reloading or unloading a cell on the edge of a continuous fueled region (the cell can be reloaded or unloaded in any sequence.) The pattern begins (for reloading) and ends (for unloading) around a single SRM. The spiral reloading pattern is the reverse of the unloading pattern, with the exception that two diagonally adjacent bundles, which have previously accumulated exposure in-core, and placed next to each of the four SRMs before the actual spiral reloading begins. The spiral reload can be to either the original configuration or a different configuration.

Additionally, at least 50% of the fuel assemblies to be reloaded into the core shall have previously accumulated a minimum exposure of 1000 Mwd/T to ensure the presence of a minimum neutron flux as described in Bases Section 3.12.B.

F. The intent of this specification is to assure that the reactor core has been shut down for at least 24 hours following power operation and prior to fuel handling or movement. The safety analysis for the postulated refueling accident assumed that the reactor had been shut down for 24 hours for fission product decay prior to any fuel handling which could result in dropping of a fuel assembly.

G. The operability requirements of the reactor building crane ensures that the redundant features of the crane have been adequately inspected just prior to using it for handling of a spent fuel cask. The redundant hoist system ensures that a load will not be dropped for any postulated credible single component failures. Details of the design of the redundant features of the crane and specific testing requirements for the crane are delineated in the Vermont Yankee document entitled "Reactor Building Crane Modification" (December 1975).

H. The Spent Fuel Pool Cooling System is designed to maintain the pool water temperature below 125°F during normal refueling operations. If the reactor core is completely discharged, the temperature of the pool water may increase to greater than 125°F. The RHR System supplemental fuel pool cooling may be used under these conditions to maintain the pool water temperature less than 150°F.