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December 15, 2004

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

SUBJECT: Entergy Nuclear Operations, Inc.
Vermont Yankee Nuclear Power Station
Docket No.: 50-271
License No.: DPR-28

Technical Specification Proposed Change No. 266
Revision to Control Rod Operability, Scram Time Testing and Control Rod Accumulators

REFERENCE: 1. NUREG 1433, Revision 3, "Standard Technical Specifications General Electric Plants, BWR/4," dated March 31, 2004

LETTER NUMBER: BVY 04-60

Dear Sir or Madam:

This letter submits Proposed Technical Specification Change No. 266 in accordance with 10CFR50.90.

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 surveillance requirements (SR's) for verifying control rod coupling integrity as described in TS 4.3.B.1, revise the scram insertion time limiting conditions for operation (LCO) and SR's as described in TS 3.3.C and 4.3.C, and enhance TS 3.3.D and 4.3.D, the LCO and SR for Control Rod Accumulators.

Through this change, VY would revise the control rod coupling integrity SR's by eliminating the surveillances that do not provide positive identification of coupling, enhancing the control rod coupling integrity surveillance test and increasing the frequency in which coupling integrity testing is required. This change also proposes to modify the Scram Insertion Time LCO by establishing a category of "slow" rods. The corresponding Scram Insertion Time SR changes would increase the frequency of scram time testing surveillances in; and the testing would be performance based utilizing a representative sample of control rods in accordance with NRC approved TSTF-460. The proposed changes to the control rod accumulator specifications primarily involve identifying that accumulator operability, and the corresponding SR, is based upon accumulator pressure. Corresponding changes to the BASES for each of these sections is also proposed as appropriate. All of the proposed changes are consistent with Standard Technical Specifications (Reference 1); including administrative changes associated with usage rules, content and format.

Enclosure 1 to this letter contains supporting information and the safety assessment of the proposed change. Enclosure 2 contains the determination of no significant hazards

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consideration. Enclosure 3 provides the marked-up version of the current Technical Specification and Bases pages. Enclosure 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.

This letter contains no commitments.

Upon acceptance of this proposed change by the NRC, VY requests that the license amendment be implemented within 60 days of its effective date.

Please feel free to contact Mr. James M. DeVincentis at (802) 258-4236, if there are any questions regarding this subject.

Sincerely,

Jay K. Thayer
Site Vice President – Vermont Yankee

JKT/tbs

STATE OF VERMONT)
)ss
WINDHAM COUNTY)

Then personally appeared before me, Jay K. Thayer, who, being duly sworn, did state that he is Site Vice President of Vermont Yankee Nuclear Power Station, that he is duly authorized to execute and file the foregoing document 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, 2007

Enclosure 1: 17 pages
Enclosure 2: 2 pages
Enclosure 3: 25 pages
Enclosure 4: 16 pages

cc:

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Enclosure 1

Vermont Yankee Nuclear Power Station

Proposed Technical Specification Change No. 266

Revision to Control Rod Operability, Scram Time Testing and Control Rod Accumulators

Supporting Information and Safety Assessment of Proposed Change

SUPPORTING INFORMATION

Purpose

The proposed change would revise the surveillance requirements (SR's) for verifying control rod coupling integrity as described in TS 4.3.B.1, revise the scram insertion time limiting conditions for operation (LCO) and SR's as described in TS 3.3.C and 4.3.C, and enhance TS 3.3.D and 4.3.D, the LCO and SR for Control Rod Accumulators.

Through this change, Vermont Yankee (VY) would revise the control rod coupling integrity SR's by eliminating the surveillances that do not provide positive identification of coupling, enhancing the control rod coupling integrity surveillance test and increasing the frequency in which coupling integrity testing is required. This change also proposes to modify the Scram Insertion Time LCO by establishing a category of "slow" rods. The corresponding Scram Insertion Time SR changes would increase the frequency of scram time testing surveillances; and the testing would be performance based utilizing a representative sample of control rods in accordance with NRC approved TSTF-460. The proposed changes to the control rod accumulator specifications primarily involve identifying that accumulator operability, and the corresponding SR, is based upon accumulator pressure. Corresponding changes to the BASES for each of these sections is also proposed as appropriate. All of the proposed changes are consistent with Standard Technical Specifications[1] (STS); including administrative changes associated with usage rules, content and format, such as capitalizing terms which are defined within the Definitions section of the technical specifications.

Background

Control rods are components of the Control Rod Drive (CRD) System, which is the primary reactivity control system for the reactor. In conjunction with the Reactor Protection System, the CRD System provides the means for the reliable control of reactivity changes to ensure under conditions of normal operation, including anticipated operational occurrences that specified acceptable fuel design limits are not exceeded. In addition, the control rods provide the capability to hold the reactor core subcritical under all conditions and to limit the potential amount and rate of reactivity increase if there were to be a malfunction in the CRD System.

The first part of this proposed technical specification change request involves control rod operability and in particular control rod coupling integrity surveillances. The CRD system at VY consists of 89 locking piston control rod drive mechanisms (CRDMs) and a hydraulic control unit for each drive mechanism. The locking piston type CRDM is a double acting hydraulic piston, which uses condensate water as the operating fluid. Accumulators provide additional energy for scram. An index tube and piston, coupled to the control rod, are locked at fixed increments by a collet mechanism. The collet fingers engage notches in the index tube to prevent unintentional withdrawal of the control rod, but without restricting insertion.

The second part of this change involves control rod scram time testing. The control rods are scrammed by positive means using hydraulic pressure exerted on the CRD piston. When a scram signal is initiated, control air is vented from the scram valves, allowing them to open by spring action. Opening the exhaust valve reduces the pressure above the main drive piston to atmospheric pressure, and opening the inlet valve applies the accumulator or reactor pressure to the bottom of the piston. Since the notches in the index tube are tapered on the lower edge,

[1] NUREG 1433, Revision 3, "Standard Technical Specifications General Electric Plants, BWR/4," dated March 31, 2004

the collet fingers are forced open by cam action, allowing the index tube to move upward without restriction because of the high differential pressure across the piston. As the drive moves upward, and the accumulator pressure reduces below the reactor pressure, a ball check valve opens, letting the reactor pressure complete the scram action. If the reactor pressure is low, such as during startup, the accumulator will fully insert the control rod in the required time without assistance from reactor pressure.

The third major part of this proposed technical specification change is with regard to the control rod accumulators. The accumulators are part of the CRD System and are provided to ensure that the control rods scram under varying reactor conditions. The control rod scram accumulators store sufficient energy to fully insert a control rod at any reactor vessel pressure. The accumulator is a hydraulic cylinder with a free floating piston. The piston separates the water used to scram the control rods from the nitrogen, which provides the required energy. The scram accumulators are necessary to scram the control rods within the required insertion times of TS 3.3.C "Scram Insertion Times."

Comparison to Standard Technical Specifications (STS)

This proposed Technical Specification change request is consistent with Standard Technical Specifications (STS). Each of the individually proposed changes is discussed in the Safety Assessment portion below with a comparison being drawn between the proposed specifications and STS.

STS Surveillance Requirements (SR) for 3.1.3 "Control Rod Operability" are being fully implemented within the VY Specifications. This includes the adoption in total of STS SR 3.1.3.5 regarding the verification that each control rod does not go to the overtravel position.

The proposed change to the control rod scram time LCO and SR's is also consistent with STS. Of particular note is the adoption of STS LCO 3.1.4 for "Control Rod Scram Times" regarding the limitation of "slow" rods and the corresponding surveillance requirements for STS 3.1.4.

Current Technical Specification (TS) section 3.3.D "Control Rod Accumulators" is proposed to be replaced in its entirety by the adoption of STS Section 3.1.5 "Control Rod Scram Accumulators."

Updated Final Safety Analysis Report (FSAR)

VY FSAR Section 3.4 describes the mechanical aspects of the control rods. The text contains, among other things, an evaluation of the control rods, scram times, analysis of postulated malfunctions related to rod withdrawal, and scram reliability.

SAFETY ASSESSMENT

The proposed change would revise the surveillance requirements (SR's) for verifying control rod coupling integrity as described in TS 4.3.B.1, revise the scram insertion time limiting conditions for operation (LCO) and SR's as described in TS 3.3.C and 4.3.C, and enhance TS 3.3.D and 4.3.D, the LCO and SR for Control Rod Accumulators.

Through this change, VY would revise the control rod coupling integrity SR's by eliminating the surveillances that do not provide positive identification of coupling, enhancing the control rod coupling integrity surveillance test and increasing the frequency in which coupling integrity testing is required. This change also proposes to modify the Scram Insertion Time LCO by establishing a category of "slow" rods. The corresponding Scram Insertion Time SR changes would increase the frequency of scram time testing surveillances; and the testing would be performance based utilizing a representative sample of control rods. The proposed changes to the control rod accumulator specifications primarily involve identifying that accumulator operability, and the corresponding SR, is based upon accumulator pressure. Corresponding changes to the BASES for each of these sections is also proposed as appropriate. All of the proposed changes are consistent with Standard Technical Specifications[2] (STS).

Administrative changes are also being proposed by capitalizing terms which are defined within the Definitions section of the technical specifications. This change is consistent with the use of defined terms within STS.

The below Table details each proposed change and provides the basis and safety assessment for each change. It is noted that TS 3.3.C.1.1 & 3.3.C.1.2 are to be revised consistent with the mark-ups identified in Enclosure 3. Each material change has been identified and justified within the Table below and then for consistency with STS, the entire text is being replaced by Insert #1. Similar mark-ups and justifications are being made to TS 4.3.C.1 and 4.3.C.2 and then for consistency with STS, the entire text is being replaced by Inserts #2 (the SR's) and #3 (Table 4.3.C-1). The same process is followed for TS Section 3.3.D "Control Rod Accumulators" which is being replaced in its entirety by Insert #5.

Change #	Current Technical Specification	Proposed Change
1	Technical Specification (TS) 4.3.B.1(a) currently reads "When a rod is withdrawn the first time subsequent to each refueling outage or after maintenance, observe discernable response of the nuclear instrumentation; however, for initial rods when response is not discernable, subsequent exercising of these rods after the reactor is critical shall be performed to verify instrumentation response;"	The subject text of TS 4.3.B.1(a) would be deleted based upon the justification provided below.
Basis/Safety Assessment: The requirement to verify control rod coupling by withdrawing a control rod and observing discernable response of the nuclear instrumentation is deleted. If sufficient friction is present to uncouple the control rod from its drive, the control rod would not follow the drive being withdrawn. In this case, a lack of neutron flux level change may be indicative of an uncoupled rod. However, this is not a positive check that the control rod is uncoupled since if sufficient friction is not present an uncoupled rod would follow the drive being withdrawn. TS SR 4.3.B.1(b) (which is being renumbered to be 4.3.B.1) requires verification that a control rod does not go to the withdrawn over-travel position. The over-travel feature provides a positive check of coupling integrity since only an uncoupled control rod can go to the over-travel position. This change is consistent with STS 3.1.3 "Control Rod OPERABILITY."		

2 NUREG 1433, Revision 3, "Standard Technical Specifications General Electric Plants, BWR/4," dated June 2004

Change #	Current Technical Specification	Proposed Change
2	TS SR 4.3.B.1(b) currently requires that control rod coupling verification be performed prior to startup following a refueling outage by withdrawing each control rod "continuously to observe that the rate of withdrawal is proper."	The subject text of TS 4.3.B.1(b) would be deleted based upon the justification provided below.

Basis/Safety Assessment:

TS SR 4.3.B.1(b) currently requires a control rod coupling verification prior to startup following a refueling outage by withdrawing each control rod continuously to observe that the rate of withdrawal is proper. If sufficient friction is present to uncouple the control rod from its drive, the control rod would not follow the drive being withdrawn and the rate of control rod drive withdrawal may be slower than normal. However, this is not a positive check that the control rod is uncoupled since, if sufficient friction is not present an uncoupled rod would follow the drive being withdrawn and the rate of withdrawal may not be affected. The proposed revision to SR 4.3.B.1(b) (which is consistent with STS SR 3.1.3.5) requires verification that a control rod does not go to the withdrawn over-travel position. The over-travel feature provides a positive check of coupling integrity since only an uncoupled control rod can go to the over-travel position. This verification is required to be performed in STARTUP and RUN MODEs any time a control rod is withdrawn to the full out position and prior to declaring a control rod OPERABLE after work on the control rod or Control Rod Drive system that could affect coupling. As a result, SR 4.3.B.1(b) (which is being renumbered to be 4.3.B.1(a) and 4.3.B.1(b)) provides adequate assurance that the control rods are coupled.

This change is consistent with STS 3.1.3 "Control Rod OPERABILITY."

Change #	Current Technical Specification	Proposed Change
3	TS SR 4.3.B.1(b) currently requires that each control rod be verified as coupled prior to startup following a refueling outage and following uncoupling. In addition, it also requires that following uncoupling, each drive and blade be coupled and fully withdrawn to verify positive coupling.	The subject text of TS 4.3.B.1(b) would be revised based upon the justification provided below.

Basis/Safety Assessment:

The TS SR 4.3.B.1(b) requirement to verify that each control rod is coupled prior to startup following a refueling outage and following uncoupling are deleted. In addition, TS 4.3.B.1(b) requirement to couple the drive and blade and fully withdraw it is implicit in the coupling verification requirement of TS SR 4.3.1(b) and is also deleted. The proposed revision to TS SR 4.3.B.1(b) (which is the same as STS SR 3.1.3.5) requires verification that a control rod does not go to the withdrawn over-travel position. The over-travel feature provides a positive check of coupling integrity since only an uncoupled control rod can go to the over-travel position. This verification is required to be performed in STARTUP and RUN MODEs any time a control rod is withdrawn to the full out position and prior to declaring a control rod OPERABLE after work on the control rod or Control Rod Drive system that could affect coupling. As a result, SR 4.3.B.1(b) (which is being renumbered to be SR 4.3.B.1) provides adequate assurance that the control rods are coupled.

This change is consistent with STS 3.1.3 "Control Rod OPERABILITY."

Change #	Current Technical Specification	Proposed Change
4	TS SR 4.3.B.1(b) currently requires that the results of each coupling check / test be recorded.	The subject text of TS 4.3.B.1(b) would be deleted based upon the justification provided below.

Basis/Safety Assessment:

The TS SR 4.3.B.1(b) provides details regarding record keeping. These details are not necessary to ensure the associated CRD and control rod blade are coupled and are to be deleted. The proposed revision to TS SR 4.3.B.1(b) (which is the same as STS SR 3.1.3.5) requires the same testing without going into record keeping details and demonstrates the same OPERABILITY; these requirements are adequate for ensuring each associated CRD and control rod blade are coupled. The requirement for retention of records related to activities affecting quality is contained in 10CFR50, Appendix B, Criterion XVII and other sections of 10CFR50 that are applicable to VYNPS (i.e., 10CFR50.71, 10CFR73, etc.). These record retention requirements provide a record of certain activities important to plant safety, but the records themselves do not assure safe operation of the facility since review of these records is a post-compliance review. As such, the relocated details do not need to be duplicated in the TS to provide adequate protection of the public health and safety.

This change is consistent with STS 3.1.3 "Control Rod OPERABILITY."

Change #	Current Technical Specification	Proposed Change
5	TS 4.3.B.1(b) currently reads "The position and over-travel lights shall be observed."	The subject text of TS 4.3.B.1(b) would be deleted based upon the justification provided below.

Basis/Safety Assessment:

The TS 4.3.B.1(b) details of how to determine if a control rod has reached the over-travel position are relocated to the Bases for TS 4.3.B.1. These details are not necessary to ensure the associated CRD and control rod blade are coupled. TS SR 4.3.B.1(b) requirements (which is being renumbered to be 4.3.B.1) for verifying each control rod does not go to the withdrawn over-travel position are adequate for ensuring the associated CRD and control rod blade are coupled. As such, these relocated details are not required to be in the technical specifications to provide adequate protection of the public health and safety. Changes to the Bases are controlled by the provisions of the Bases Control Program as described in Chapter 6 of the TS.

This change is consistent with STS 3.1.3 "Control Rod OPERABILITY."

Change #	Current Technical Specification	Proposed Change
6	TS 3.3.C.1.1 & 3.3.C.1.2 currently require that control rod scram times are within certain limits and also contain the control rod scram time surveillance acceptance criteria.	TS 3.3.C.1.1 & 3.3.C.1.2 are to be revised consistent with the mark-ups identified (with each material change identified and justified) and then replaced in total by Insert #1.

Basis/Safety Assessment:

Proposed TS 3.3.C.1 provides a different method to determine if measured scram insertion times are sufficient to insert the amount of negative reactivity assumed in the accident and transient analyses than TS 3.3.C.1.1 & 3.3.C.1.2. A description and supporting analysis for the proposed TS 3.3.C.1 method (which is identical to that utilized by STS LCO 3.1.4) is contained in BWROG-8754, letter from R.F. Janecek (BWROG) to R.W. Starostecki (NRC), dated September 17, 1987. The purpose of the control rod scram time LCO is to ensure the negative scram reactivity corresponding to that used in licensing basis calculations is supported by individual control rod drive scram performance distributions allowed by the Technical Specifications. Current TS 3.3.C.1.1 & 3.3.C.1.2 accomplishes the above purpose by placing requirements on maximum individual control Rod Drive scram times (7.00 second requirement), average scram times and local scram times (average of three fastest control rods in all groups of four).

Because the methodology used in the design basis transient analysis (one dimensional neutronics), all control rods are assumed to scram at the same speed. This is called the analytical scram time requirement. Performing an evaluation assuming all control rods scram at the analytical limit will result in the generation of a scram reactivity versus time curve that is called the analytical scram reactivity curve. It is the purpose of the scram time LCO to ensure that, under allowed plant conditions, this analytical scram reactivity will be met. Since scram reactivity cannot be readily measured at the plant, the safety analyses use appropriately conservative scram reactivity versus insertion fraction curves to account for the variation in scram reactivity during a cycle. Therefore, the technical specifications must only ensure the scram times are satisfied.

If all control rods scram at least as fast as the analytical limit, the analytical scram reactivity curve will be met. However, it is also known that a distribution of scram times (some slower and some faster than the analytical limit) can also provide adequate scram reactivity. By definition, for a situation where all control rods do not satisfy the analytical scram time limits, the condition is acceptable if the resulting scram reactivity meets or exceeds the analytical scram reactivity curve. This can be evaluated using models which allow for a distribution of scram speeds. It follows that the more control rods that scram slower than the analytical limit, the faster the remaining control rods must scram to compensate for the reduced scram reactivity rate of the slower control rods. Proposed TS 3.3.C.1 incorporates this philosophy by specifying scram time limits for each individual control rod instead of specifying limits on the average of all control rods or the average of groups of four control rods. This philosophy is similar to that currently being used for BWR/4 plants that have converted to Improved Technical Specifications. Proposed TS 3.3.C.1 scram time limits have margin to the analytical scram time limits to allow for a specified number and distribution of slow control rods, a single stuck control rod and an assumed single failure.

Therefore, if all control rods meet the proposed LCO scram time limits found in proposed Table 4.3.C-1 (as measured from the de-energization of scram pilot valve solenoids at time zero (Note a)), the analytical scram reactivity assumptions are satisfied. If any control rods do not meet the LCO time limit, the LCO specifies the number and distribution of these "slow" control rods to ensure the analytical scram reactivity assumptions are still satisfied.

Basis/Safety Assessment (continued):

If the "slow" rods are excessive (> 7% of 89 or > 6) or do not meet the distribution requirements, the unit must be shutdown. This change is considered more restrictive on plant operation since the proposed individual times are more restrictive from the average times. That is, currently, the "average time" of all rods or a group can be improved by a few fast scramming rods, even when there may be more than 6 "slow" rods, as defined in the proposed specification. Therefore, the proposed specification limits the number of slow rods to 6 and ensures no more than 2 OPERABLE control rods that are "slow" occupy adjacent locations.

The current maximum scram time requirement of TS 3.3.C.2 has been retained for the purpose of defining the threshold between a "slow" control rod and an inoperable control rod even though the analyses to determine the LCO scram time limits assumed "slow" control rods did not scram. The proposed Note to Table 4.3.C-1 (Note 2) ensures that a control rod is not inadvertently considered "slow" when the scram time exceeds 7 seconds.

This change is consistent with STS 3.1.4 "Control Rod Scram Times."

Change #	Current Technical Specification	Proposed Change
7	VY's current technical specifications require that the control rod scram times satisfy the requirements of the tables in TS 3.3.C.1 during "...reactor power operation condition..."	The proposed change would expand the applicability of control rod scram times to be in STARTUP or RUN MODEs.

Basis/Safety Assessment:

TS 3.3.C.1.1 and 3.3.C.1.2 establishes the Applicability of minimum scram times as "in the reactor power operation condition." The proposed TS 3.3.C.1 has minimum scram time limits applicable during the STARTUP and RUN MODEs. This change is more restrictive than the existing requirement because it would apply to all conditions where a reactor scram may be required by the accident analysis, including reactor startup and power ascension.

This change is consistent with STS 3.1.4 "Control Rod Scram Times."

Change #	Current Technical Specification	Proposed Change
8	In TS 3.3.C.1 the scram insertion time limits are specified in terms of "% Inserted From Fully Withdrawn."	The subject text of TS 3.3.C.1 would be deleted based upon the justification provided below.

Basis/Safety Assessment:

TS 3.3.C.1.1 and 3.3.C.1.2 scram insertion time limits are specified in terms of "% inserted from fully withdrawn." Scram times are measured from signals generated by reed switches corresponding to control rod notch positions. The proposed TS 3.3.C.1 would specify the scram insertion time limits in terms of "notch position" within a specified number of seconds. This will eliminate the need to convert notch position to "% inserted from fully withdrawn" to verify acceptance criteria. Since the only effect of specifying limits in terms of notch position instead of "% inserted from fully withdrawn" is to eliminate the need to convert the units after performance of a test, this is an administrative change.

This change is consistent with STS 3.1.4 "Control Rod Scram Times."

Change #	Current Technical Specification	Proposed Change
9	TS 3.3.C.2 states "The maximum scram insertion time for 90% insertion of any operable control rod shall not exceed 7.00 seconds." TS currently do not contain a surveillance requirement (SR) to verify the subject LCO.	The subject text of TS 3.3.C.2 would be revise to state "The maximum scram insertion time to notch position 04 of any operable control rod shall not exceed 7.00 seconds." In addition, TS SR 4.3.C.2 is being proposed (reference Insert # 4) to verify the subject maximum scram times.

Basis/Safety Assessment:

TS 3.3.C.2 requires the maximum scram insertion time for 90% insertion of any operable control rod to not exceed 7.00 seconds. It is proposed that TS 3.3.C.2 require that each operable control rod have a maximum scram time from fully withdrawn to notch position 04 be ≤ 7.00 seconds. In addition, TS SR 4.3.C.2 is being proposed (reference Insert # 4) to perform a verification of the above maximum scram time.

Redefining the 90% insertion to a notch position and adding a SR to perform a verification of the LCO does not eliminate any of the existing requirements or impose a new or different treatment of the requirement. In addition, the 90% insertion is conservatively converted to notch position 04. Therefore, this change is considered administrative.

This change is consistent with STS 3.1.3 "Control Rod Operability."

Change #	Current Technical Specification	Proposed Change
10	TS 4.3.C.1 requires each control rod to be scram time tested with reactor steam dome pressure > 800 psig prior to exceeding 30% RATED THERMAL POWER (RTP) after each refueling outage.	The proposed text of TS 4.3.C.1 would require each control rod to be scram time tested with reactor steam dome pressure ≥ 800 psig prior to exceeding 30% RTP after each refueling outage and prior to exceeding 30% RTP after each reactor shutdown ≥ 120 days.

Basis/Safety Assessment:

TS 4.3.C.1 requires each control rod to be scram time tested with reactor steam dome pressure > 800 psig prior to exceeding 30% RTP after each refueling outage. The proposed TS 4.3.C.1 would require each control rod to be scram time tested with reactor steam dome pressure ≥ 800 psig prior to exceeding 30% RTP after each refueling and prior to exceeding 30% RTP after each reactor shutdown ≥ 120 days. To ensure that scram time testing is performed within a reasonable time following a refueling or after a shutdown duration ≥ 120 days or longer, control rods are required to be tested before exceeding 30% RTP following the shutdown. As such, this is an additional restriction on plant operation which constitutes a more restrictive change.

This change is consistent with STS 3.1.4 "Control Rod Scram Times."

Change #	Current Technical Specification	Proposed Change
11	TS 4.3.C.2 requires control rod scram time testing during or following a controlled shutdown of the reactor, but not more frequently than 16 weeks nor less frequently than 32 week [224 days] intervals for 50% of the control rod drives in each quadrant of the reactor core.	The proposed text of TS 4.3.C.1 would require a verification, for a representative sample, that each tested control rod scram time is within limits with reactor steam dome pressure ≥ 800 psig each 200 days cumulative operation in the RUN MODE.

Basis/Safety Assessment:

TS 4.3.C.2 requires control rod scram time testing during or following a controlled shutdown of the reactor, but not more frequently than 16 weeks nor less frequently than 32 week intervals [224 days] for 50% of the control rod drives in each quadrant of the reactor core. The proposed text of TS 4.3.C.1 would require a verification, for a representative sample, that each tested control rod scram time is within limits with reactor steam dome pressure ≥ 800 psig each 200 days cumulative operation in RUN MODE. The 200 day Frequency is based on industry operating experience that has shown control rod scram times do not significantly change over an operating cycle. This increased surveillance frequency is an additional restriction on plant operation which constitutes a more restrictive change.

This change is consistent with a notice announcing the availability of a similar proposed TS change using the consolidated line item improvement process was published in the Federal Register on August 23, 2004 (69 FR 51854). These changes are based on TS Task Force (TSTF) change traveler TSTF-460 (Revision 0) that has been approved generically for the boiling water reactor (BWR) Standard TS, NUREG-1433 (BWR/4) and NUREG-1434 (BWR/6) by revising the frequency of SR 3.1.4.2, control rod scram time testing, from "120 days cumulative operation in MODE 1 [RUN MODE]" to "200 days cumulative operation in MODE 1."

VY has reviewed the safety evaluation (SE) published on August 23, 2004 (69 FR 51854) as part of the CLIIP Notice of Availability. This verification included a review of the NRC staff's SE and the supporting information provided to support TSTF-460. VY has concluded that the justifications presented in the TSTF proposal and the SE prepared by the NRC staff are applicable to VY and justify this amendment for the incorporation of the changes to the VY TS.

As described in the CLIIP model SE, part of the justification for the change in surveillance frequency is the high reliability of the VY control rod drive system. As requested in the notice of availability published on August 23, 2004 (69 FR 51854), the historical performance of the control rod drive system at VY is as follows:

> Over a period of approximately the last 9 years, there have been over 1600 scram time tests conducted. During this period, none the rods had scram times that would have required the rods to be declared "slow" and none of the rods were determined to be "inoperable."

It is noted that the corresponding BASES for this proposed change would be revised to reflect that the control rod insertion time acceptance criterion for the percentage of slow rods allowed, would be 7.5 percent of the random at-power surveillance sample (with the surveillance period extended to 200 cumulative days of operation in RUN MODE). The more restrictive 7.5 percent acceptance criterion for testing the random sample is consistent with the TS 4.3.C.2 (STS TS 3.1.4) objective of ensuring that no more than 6 OPERABLE control rods are slow at any given time.

Change #	Current Technical Specification	Proposed Change
12	TS 4.3.C.2 currently states "50% control rod drives in each quadrant of the reactor core shall be measured for scram times specified in Specification 3.3.C. All control rod drives shall have experienced scram-time measurements each year."	The corresponding proposed change to TS 4.3.C.2 (to be renumbered as SR 4.3.C.1) would require a verification, for a representative sample, that each tested control rod scram time is within limits with reactor steam dome pressure ≥ 800 psig each 200 days cumulative operation in RUN MODE.

Basis/Safety Assessment:

TS 4.3.C.2 requires control rod scram time testing during or following a controlled shutdown of the reactor, but not more frequently than 16 weeks nor less frequently than 32 week intervals for 50% of the control rod drives in each quadrant of the reactor core. Proposed TS SR 4.3.C.1 would require a verification, for a representative sample, that each tested control rod scram time is within limits with reactor steam dome pressure ≥ 800 psig each 200 days cumulative operation in the RUN MODE. A representative sample contains at least 10% of the control rods. The sample remains representative if no more than 7.5% of the control rods in the sample tested are determined to be "slow." With more than 7.5% of the sample declared to be "slow" per the criteria in TS SR 4.3.C.1, Table 4.3.C-1, additional control rods are tested until this 7.5% criterion (i.e., 7.5% of the entire sample size) is satisfied, or until the total number of "slow" control rods (throughout the core, from all surveillances) exceeds the LCO limit.

The proposed change is less restrictive since the number of control rods tested during each control rod scram time test is reduced from 50% to 10% and the total amount tested in a calendar year is reduced from 100% to the 10% to 20% range. While the total number of rods scram timed will be reduced, the frequency of the testing will be increased (see change # 11) from as much as once every 224 days to once every 200 days. Accordingly, the proposed change will ensure that the control rod scram times are maintained within required limits. The consequences of an accident will not be significantly affected by this change because the Surveillance Requirement will still be performed at a frequency that industry operating experience has shown to be adequate for maintaining control rod scram times within required limits. The 200 day Frequency and the number of control rods tested is based on industry operating experience that has shown control rod scram times do not significantly change over an operating cycle.

This change is consistent with a notice announcing the availability of a similar proposed TS change using the consolidated line item improvement process was published in the Federal Register on August 23, 2004 (69 FR 51854). These changes are based on TS Task Force (TSTF) change traveler TSTF-460 (Revision 0) that has been approved generically for the boiling water reactor (BWR) Standard TS, NUREG-1433 (BWR/4) and NUREG-1434 (BWR/6) by revising the frequency of SR 3.1.4.2, control rod scram time testing, from "120 days cumulative operation in MODE 1" to "200 days cumulative operation in MODE 1." Please reference the expanded discussion and justification contained within proposed change #11 above.

Change #	Current Technical Specification	Proposed Change
13	TS 4.3.C.2 currently states "Whenever 50% of the control rod drives scram times have been measured, an evaluation shall be made to provide reasonable assurance that proper control rod drives performance is being maintained. The results of measurements performed on the rod drives shall be submitted in the start up test report."	The subject text of TS 4.3.C.2 would be deleted based upon the justification provided below.

Basis/Safety Assessment:

It is proposed that the TS 4.3.C.2 details concerning the evaluation of control rod performance be deleted. The records associated with the performance of Technical Specification required Surveillances are required to be maintained as part of the VY Quality Assurance Program. Specifying these details in the technical specifications are not necessary to ensure control rod scram times are within limits. Proposed SR 4.3.C.2 (to be renumbered as SR 4.3.C.1) and associated Table 4.3.C-1 are adequate to ensure scram time testing is performed and the scram times are within limits. As such, these relocated details are not required to be in the technical specifications to provide adequate protection of the public health and safety. Changes to the Quality Assurance Program are controlled by 10CFR50.54(a).

This change is consistent with STS 3.1.4 "Control Rod Scram Times."

Change #	Current Technical Specification	Proposed Change
14	TS 3.3.C.3 currently identifies "If Specification 3.3.C.1.2 cannot be met ...the reactor [if operating] shall be shut down immediately upon determination that average scram time is deficient."	The subject would revised text would be revised to read "If Specification 3.3.C.1 cannot be met ...the reactor [if operating] shall be placed in the HOT SHUTDOWN condition within 12 hours."

Basis/Safety Assessment:

TS 3.3.C.3 would be revised to identify the that specification 3.3.C.1.2 has been renumbered to be 3.3.C.1 In addition, the proposed change would define the action "immediately" as "12 hours" and would define the condition "shut down" as HOT SHUTDOWN.

Since the rate of negative reactivity insertion during a scram may not be within the assumptions of the safety analysis when control rod scram time requirements in TS 3.3.C.3 are not met, placing the unit in the HOT SHUTDOWN condition ensures that the unit is brought into a condition where TS 3.3.C.3 does not apply. Cooling down the unit does not provide any additional margin and, in some cases, could be counterproductive since positive reactivity is inserted during a cool down. Given that the only difference between HOT SHUTDOWN and COLD SHUTDOWN is the temperature requirement, this proposed administrative change is acceptable.

This change is consistent with STS 3.1.4 "Control Rod Scram Times."

Change #	Current Technical Specification	Proposed Change
15	TS 3.3.C.4 currently reads "If Specification 3.3.C.2 cannot be met [scram time ≤ 7.00 seconds], the deficient control rod shall be considered inoperable, fully inserted into the core and electrically disarmed." Similar wording (i.e.; electrically disarmed) is utilized in TS 3.3.A.2.	The subject text of TS 3.3.C.4 would be revised to specify that the deficient control rod be considered inoperable, fully inserted and disarmed. The details of the method to disarm would be relocated to the BASES. A similar change is proposed for TS 3.3.A.2 to delete the word electrically.

Basis/Safety Assessment:

The TS 3.3.C.4 details of the methods for disarming control rod drives (electrically) are proposed to be relocated to the Bases. These details are not necessary to ensure the associated CRDs of inoperable control rods are disarmed. Proposed TS 3.3.C.4, which requires disarming the associated CRDs of inoperable control rods, is adequate for ensuring associated CRDs and inoperable control rods are disarmed. As such, these relocated details are not required to be in the Technical Specifications to provide adequate protection of the public health and safety. Changes to the Bases are controlled by the provisions of the Bases Control Program described in Chapter 6 of the Technical Specifications.

A similar change is proposed for TS 3.3.A.2 to delete the word electrically. This change is administrative in that the specifications would still require the subject control rods to be disarmed. The proposed change would allow for the disarming to be either hydraulically or electrically. Since either method provides adequate protection, the change is considered administrative.

This change is consistent with STS 3.1.3 "Control Rod Operability."

Change #	Current Technical Specification	Proposed Change
16	TS 3.3.C.4 currently reads "If Specification 3.3.C.2 cannot be met [scram time ≤ 7.00 seconds], the deficient control rod shall be considered inoperable, fully inserted into the core and electrically disarmed." However, the LCO fails to specify the time frames in which these actions are required to be completed.	The subject text of TS 3.3.C.4 would be enhanced by a more restrictive change that would require the insertion of an inoperable rod within 3 hours and to have the rod disarmed within the following 4 hours.

Basis/Safety Assessment:

TS 3.3.C.2 identifies that the maximum scram time for any operable control rod shall not exceed 7.00 seconds.

The current TS 3.3.C.4 requires any control rod which can not satisfy TS 3.3.C.2 to be considered inoperable, fully inserted into the core, and disarmed. The proposed change would require that if a control rod can not satisfy TS 3.3.C.2, the subject rod is to be declared inoperable and then fully inserted within 3 hours and disarmed within 4 hours. Inserting a control rod ensures the shutdown and scram capabilities are not adversely affected. The control rod is disarmed to prevent inadvertent withdrawal during subsequent operations. The allowed completion times are reasonable, considering the small number of allowed inoperable control rods, and provide time to insert and disarm the control rods in an orderly manner and without challenging plant systems. As such, this is an additional restriction on plant operation which constitutes a more restrictive change.

This change is consistent with STS 3.1.3 "Control Rod Operability."

Change #	Current Technical Specification	Proposed Change
17	TS 3.3.D provides conditions associated with when a control rod accumulator may be inoperable.	It is proposed that TS 3.3.D would be revised and replaced in its entirety with Insert #5.

Basis/Safety Assessment:
TS 3.3.D provides conditions associated with when a control rod accumulator may be inoperable. The proposed TS 3.3.D would require each control rod scram accumulator to be OPERABLE in STARTUP and RUN MODEs. The OPERABILITY of the control rod scram accumulators is required to ensure that adequate scram insertion capability exists when needed over the entire range of reactor pressures. The OPERABILITY of the scram accumulators is based on maintaining adequate accumulator pressure. In STARTUP and RUN MODEs, the scram function is required for mitigation of DBAs and transients, and therefore the scram accumulators must be OPERABLE to support the scram function.

Proposed TS 3.3.D.1, 3.3.D.2 and 3.3.D.3, allow up to 8 hours, depending upon the number of inoperable accumulators and the reactor pressure, before the control rod associated with the inoperable accumulator must be declared inoperable.

Proposed TS 3.3.D.1 would allow for one control rod scram accumulator to be inoperable for up to 8 hours, provided the reactor pressure is ≥ 800 psig (pressure based upon current TS BASES). An inoperable control rod scram accumulator affects the associated control rod scram time. However, at sufficiently high reactor pressure, the accumulators only provide a portion of the scram force. With this reactor pressure, the control rod will scram even without the associated accumulator, although probably not within the required scram times. The allowed Completion Time of 8 hours is reasonable, based on the large number of control rods available to provide the scram function and the ability of the affected control rod to scram only with reactor pressure at high reactor pressures. In addition, proposed TS 3.3.D.1.a provides an option to declare a control rod with an inoperable scram accumulator "slow." Action to declare the control rod "slow" allows the rod to remain withdrawn but not disarmed. Disarming the inoperable rod is intended to prevent inadvertent operation. The limits and allowances for numbers and distribution of inoperable and "slow" control rods (found in TS 3.3.A.2 and 3.3.C.1 respectively) are appropriately applied to control rods with inoperable scram accumulators whether declared inoperable or "slow." The option for declaring the control rod with an inoperable accumulator "slow" is restricted (by a Note to 3.3.D.1.a and 3.3.D.2.b.1) to control rods that were not previously known to be "slow." This restriction prevents allowing a "slow" control rod from remaining OPERABLE with the additional degradation to scram time caused by an inoperable scram accumulator.

Proposed TS 3.3.D.2 allows two or more control rod scram accumulators to be inoperable for up to 1 hour when reactor pressure is ≥ 800 psig. The requirement for declaration of "slow" or inoperable (and the implied concurrent restoration allowed time) is provided in proposed TS 3.3.D.2.b.1 and b.2. This 1 hour allowance provides a reasonable time to attempt investigation and restoration of the inoperable accumulator. The allowed Completion Time of 1 hour is reasonable, based on the ability of only the reactor pressure to scram the control rods and the low probability of a DBA or transient occurring while the affected accumulators are inoperable. Furthermore, proposed TS 3.3.D.2.a addresses the situation where additional accumulators may be rapidly becoming inoperable due to loss of charging water header pressure. Once verification of adequate charging water header pressure is made (20 minutes is provided), and considering that reactor pressure is adequate to assure the scram function of the control rods with inoperable accumulators, the 1 hour extension is not significant.

Basis/Safety Assessment (Continued)
Proposed TS 3.3.D.3 allows one or more control rod scram accumulators to be inoperable for up to 1 hour when reactor pressure is < 800 psig. This 1 hour allowance provides a reasonable time to attempt investigation and restoration of the inoperable accumulators. Proposed 3.3.D.3.a addresses the situation where additional accumulators may be rapidly becoming inoperable due to a loss of charging water header pressure. The verification is similar to that described in proposed TS 3.3.D.2.a above; however, the verification must be made immediately since adequate scram pressure is not guaranteed without the CRD system in operation. Once verification of adequate charging water header pressure is made, and considering that reactor pressure is adequate to assure the scram function of the control rods with inoperable accumulators, the 1 hour extension is not significant. In addition, since the reactor pressure may not be adequate to scram the rods in a proper time, the allowance provided in proposed TS 3.3.D.1 and 2 (to declare the rod "slow") is not provided under the lower pressure condition.

Proposed TS 3.3.D.4 provides the required actions if the CRD system verification is not satisfactory. If the system pressure is not adequate, a scram within one hour is required. This ensures that the extensions of proposed TS 3.3.D.2 and 3 will not be used unless adequate CRD pressure is available to scram the reactor.

Proposed TS 3.3.D includes a Note ("Separate action item entry is allowed for each control rod scram accumulator") which provides more explicit instructions for proper application of the required actions to ensure technical specification compliance. This Note provides direction consistent with the intent of the existing actions for inoperable control rod scram accumulators. Upon discovery of each inoperable accumulator, it is intended that each specified action be applied regardless of it having been applied previously for other inoperable accumulators.

This change is consistent with STS 3.1.5 "Control Rod Scram Accumulators" except for proposed TS 3.3.D.4 which is proposing an l hour Completion Time vs. an immediate Completion Time as in STS. However, this 1 hour remains acceptable and is significantly more restrictive than the current TS requirement to be in Cold Shutdown within 24 hours.

Change #	Current Technical Specification	Proposed Change
18	TS 4.3.D currently requires "Once a shift check the status of the pressure and level alarms for each accumulator."	The subject text would be revised to read "Once every 7 days verify each control rod scram accumulator pressure is ≥ 940 psig."

Basis/Safety Assessment:

Technical Specification SR 4.3.D currently requires the status of the pressure and level alarms for each accumulator to be checked once a shift. It is proposed to modify SR 4.3.D to be consistent with STS SR 3.1.5.1 which requires verification that each control rod accumulator pressure is ≥ 940 psig every 7 days. This change in SR frequency from once per shift to once every 7 days has been shown to be acceptable through industry operating experience and takes into account indications available in the control room. The change in value covered by the SR (accumulator pressure vs. alarms) is addressed in the Change # 19 below.

This change is consistent with STS 3.1.5 "Control Rod Scram Accumulators."

Change #	Current Technical Specification	Proposed Change
19	TS 4.3.D currently requires a check of the status of the pressure and level alarms for each accumulator once per shift.	The subject text would be revised to require that each control rod scram accumulator pressure be verified to be ≥ 940 psig every 7 days.

Basis/Safety Assessment:

Technical Specification SR 4.3.D currently requires a check of the status of the pressure and level alarms for each accumulator once each shift. It is proposed to modify SR 4.3.D to be consistent with STS SR 3.1.5.1 which requires that each control rod scram accumulator pressure be verified to be ≥ 940 psig every 7 days to ensure adequate accumulator pressure exists to provide sufficient scram force. The primary indicator of accumulator OPERABILITY is the accumulator pressure. A minimum accumulator pressure is specified, below which the capability of the accumulator to perform its intended function becomes degraded and the accumulator is considered inoperable. Verifying level does not assure OPERABILITY. No change in the intent of the requirement occurs with this change.

This change is consistent with STS 3.1.5 "Control Rod Scram Accumulators."

Change #	Current Technical Specification	Proposed Change
20	TS 3.3.F currently requires that the plant be placed in the cold shutdown condition within 24 if specifications 3.3.B through 3.3.D are not satisfied.	TS 3.3.F would be deleted and a corresponding shutdown action statement would be added as 3.3.B.6.

Basis/Safety Assessment:

TS 3.3.F currently requires that the plant be placed in the cold shutdown condition within 24 hours if specifications 3.3.B through 3.3.D are not satisfied. The proposed change would relocate the shutdown action statement to 3.3.B.6 and would provide Required Actions if specifications 3.3.B.1 through 3.3.B.5 are not satisfied. TS 3.3.F is not warranted for TS 3.3.C since it already contains acceptable and duplicate action statements. TS 3.3.F is also not warranted for 3.3.D due to the addition of action statements as proposed in Changes #17, 18 and 19 above.

The proposed action statement for TS 3.3.B.6 would also require that the plant be placed in HOT SHUTDOWN within 12 hours if the required actions of TS 3.3.B.1 through 3.3.B.5 are not satisfied (in lieu of the 24 hours to cold shutdown as required by current TS 3.3.F). This ensures that all insertable control rods are inserted and places the reactor in a condition that does not require the active function (i.e., scram) of the control rods. The allowed completion time of 12 hours is reasonable, based upon operating experience to reach HOT SHUTDOWN from full power in an orderly manner and without challenging plant systems.

This change is consistent with STS 3.1.3 "Control Rod Operability."

Enclosure 2

Vermont Yankee Nuclear Power Station

Proposed Technical Specification Change No. 266

Revision to Control Rod Operability, Scram Time Testing and Control Rod Accumulators

Determination of No Significant Hazards Consideration

Determination of No Significant Hazards Consideration

Description of amendment request:

The proposed change would revise the surveillance requirements (SR's) for verifying control rod coupling integrity as described in Technical Specification (TS) 4.3.B.1, revise the scram insertion time limiting conditions for operation (LCO) and SR's as described in TS 3.3.C and 4.3.C, and enhance TS 3.3.D and 4.3.D, the LCO and SR for Control Rod Accumulators.

Through this change, Vermont Yankee Nuclear Power Station (Vermont Yankee) would revise the control rod coupling integrity SR's by eliminating the surveillances that do not provide positive identification of coupling, enhancing the control rod coupling integrity surveillance test and increasing the frequency in which coupling integrity testing is required. This change also proposes to modify the Scram Insertion Time LCO by establishing a category of "slow" rods. The corresponding Scram Insertion Time SR changes would increase the frequency of scram time testing surveillances; and the testing would be performance based utilizing a representative sample of control rods. The proposed changes to the control rod accumulator specifications primarily involve identifying that accumulator operability, and the corresponding SR, is based upon accumulator pressure. Corresponding changes to the BASES for each of these sections is also proposed as appropriate. All of the proposed changes are consistent with Standard Technical Specifications[3] (STS); including administrative changes associated with usage rules, content and format, such as capitalizing terms which are defined within the Definitions section of the technical specifications.

Basis for no significant hazards determination:

Pursuant to 10CFR50.92, Vermont Yankee 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 proposed changes do not significantly affect the design or fundamental operation and maintenance of the plant. Accident initiators or the frequency of analyzed accident events are not significantly affected as a result of the proposed changes; therefore, there will be no significant change to the probabilities of accidents previously evaluated.

   The proposed changes do not significantly alter assumptions or initial conditions relative to the mitigation of an accident previously evaluated. The proposed changes continue to ensure process variables, structures, systems, and components (SSCs) are maintained consistent with the safety analyses and licensing basis. The revised technical specifications continue to require that SSCs are properly maintained to ensure operability and performance of safety functions as assumed in the safety analyses. The design basis events analyzed in the safety analyses will not change significantly as a result of the proposed changes to the TS.

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[3] NUREG 1433, Revision 3, "Standard Technical Specifications General Electric Plants, BWR/4," dated March 31, 2004

Therefore, the proposed changes do 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 changes do not involve any physical alteration of the plant (no new or different type of equipment being installed) and do not involve a change in the design, normal configuration or basic operation of the plant. The proposed changes do not introduce any new accident initiators. In some cases, the proposed changes impose different requirements; however, these new requirements are consistent with the assumptions in the safety analyses and current licensing basis. Where requirements are relocated to other licensee-controlled documents, adequate controls exist to ensure their proper maintenance.

The proposed changes do not involve significant changes in the fundamental methods governing normal plant operation and do not require unusual or uncommon operator actions. The proposed changes provide assurance that the plant will not be operated in a mode or condition that violates the essential assumptions or initial conditions in the safety analyses and that SSCs remain capable of performing their intended safety functions as assumed in the same analyses. Consequently, the response of the plant and the plant operator to postulated events will not be significantly different

Therefore, the proposed TS change does not create the possibility of a new or different kind of accident from any 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.

Margin of safety is related to the confidence in the ability of the fission product barriers to perform their design functions during and following an accident situation. The proposed changes do not significantly affect any of the assumptions, initial conditions or inputs to the safety analyses. Plant design is unaffected by these proposed changes and will continue to provide adequate defense-in-depth and diversity of safety functions as assumed in the safety analyses.

There are no proposed changes to any of the Safety Limits or Limiting Safety System Setting requirements. The proposed changes maintain requirements consistent with safety analyses assumptions and the licensing basis. Fission product barriers will continue to meet their design capabilities without any significant impact to their ability to maintain parameters within acceptable limits. The safety functions are maintained within acceptable limits without any significant decrease in capability.

Therefore, the proposed changes do not involve a significant reduction in a margin of safety.

Enclosure 3

Vermont Yankee Nuclear Power Station

Proposed Technical Specification Change No. 266

Revision to Control Rod Operability, Scram Time Testing and Control Rod Accumulators

Marked-up Version of the Current Technical Specifications

3.3 LIMITING CONDITIONS FOR OPERATION

3.3 CONTROL ROD SYSTEM

Applicability:

Applies to the operational status of the control rod system.

Objective:

To assure the ability of the control rod system to control reactivity.

Specification:

A. Reactivity Limitations

1. Reactivity Margin - Core Loading

The core loading shall be limited to that which can be made subcritical in the most reactive condition during the operation cycle with the highest worth, operable control rod in its fully withdrawn position and all other operable rods inserted.

To ensure this capability, the shutdown margin shall be provided as follows any time there is fuel in the core:

(a) $\geq$0.38% $\Delta k/k$ with the highest worth rod analytically determined;

or

(b) $\geq$0.28% $\Delta k/k$ with the highest worth rod determined by test.

With the required shutdown margin not met during power operation, either restore the required shutdown margin within 6 hours, or be in hot shutdown within the next 12 hours.

4.3 SURVEILLANCE REQUIREMENTS

4.3 CONTROL ROD SYSTEM

Applicability:

Applies to the surveillance requirements of the control rod system.

Objective:

To verify the ability of the control rod system to control reactivity.

Specification:

A. Reactivity Limitations

1. Reactivity Margin - Core Loading

Verify that the required SDM is met prior to each in-vessel fuel movement during the fuel loading sequence.

Within 4 hours after criticality following fuel movement within the reactor pressure vessel or control rod replacement, verify the required shutdown margin will be met at any time in the subsequent operation cycle with the highest worth operable control rod fully withdrawn and all other operable rods inserted (except as provided in Specifications 3.12.D and 3.12.E).

NO CHANGES TO THIS PAGE - INCLUDED FOR COMPLETENESS OF REVIEW

3.3 LIMITING CONDITIONS FOR OPERATION

With the required shutdown margin not met and the mode switch in the "Refuel" position, immediately suspend Alteration of the Reactor Core except for control rod insertion and fuel assembly removal; immediately initiate action to fully insert all insertable control rods in core cells containing one or more fuel assemblies; within 1 hour, initiate action to restore the integrity of the Secondary Containment System.

2. Reactivity Margin - Inoperable Control Rods

Control rod drives which cannot be moved with control rod drive pressure shall be considered inoperable. If a partially or fully withdrawn control rod drive cannot be moved with drive or scram pressure, the reactor shall be brought to a shutdown condition within 48 hours unless investigation demonstrates that the cause of the failure is not due to a failed control rod drive mechanism collet housing. The control rod directional control valves for inoperable control rods shall be

4.3 SURVEILLANCE REQUIREMENTS

NO CHANGES TO THIS PAGE - INCLUDED FOR COMPLETENESS OF REVIEW

2. Reactivity Margin - Inoperable Control Rods

Each partially or fully withdrawn operable control rod shall be exercised one notch at least once each week. This test shall be performed at least once per 24 hours in the event power operation is continuing with two or more inoperable control rods or in the event power operation is continuing with one fully or partially withdrawn rod which cannot be moved and for which control rod drive mechanism damage has not been ruled out. The surveillance need not be completed within 24 hours if the number

3.3 LIMITING CONDITIONS FOR OPERATION

disarmed ~~electrically~~ [15]
except for control rods which are inoperable because of scram times greater than those specified in Specification 3.3.C. In no case shall the number of inoperable rods which are not fully inserted be greater than six during power operation.

B. Control Rods

1. Each control rod shall be either coupled to its drive or placed in the inserted position and its directional valves disarmed electrically. When removing up to one control rod drive per quadrant for inspection and the reactor is in the refueling mode, this requirement does not apply.

4.3 SURVEILLANCE REQUIREMENTS

of inoperable rods has been reduced to less than two and if it has been demonstrated that control rod drive mechanism collet housing failure is not the cause of an immovable control rod.

B. Control Rods

1. The coupling integrity shall be verified:

~~(a) When a rod is withdrawn the first time subsequent to each refueling outage or after maintenance, observe discernable response of the nuclear instrumentation; however, for initial rods when response is not discernable, subsequent exercising of these rods after the reactor is critical shall be performed to verify instrumentation response; and~~ [1]

(A) (b) When a rod is fully withdrawn, observe that the rod does not go to the over-travel position. (B) Prior to ~~startup following a refueling outage,~~ Declaring A Control Rod OPERABLE AFTER WORK ON A CONTROL ROD OR THE CRD SYSTEM THAT COULD AFFECT COUPLING, [3] each rod shall be fully withdrawn ~~continuously to observe that the rate of withdrawal is proper~~ [2] and VERIFIED that the rod does not go to the over-travel position. ~~Following uncoupling, each control rod drive and blade shall be tested to verify~~ [3]

3.3 LIMITING CONDITIONS FOR OPERATION

4.3 SURVEILLANCE REQUIREMENTS

[3] positive coupling and the results of each test shall be recorded. The drive and blade shall be coupled and fully withdrawn. The position and over travel lights shall be observed. [4] [5]

2. The Control Rod Drive Housing Support System shall be in place when the Reactor Coolant System is pressurized above atmospheric pressure with fuel in the reactor vessel unless all operable control rods are fully inserted.

3. While the reactor is below 20% power, the Rod Worth Minimizer (RWM) shall be operating while moving control rods except that:

   (a) If after withdrawal of at least 12 control rods during a startup, the RWM fails, the startup may continue provided a second licensed operator verifies that the operator at the reactor console is following the control rod program; or

   (b) If all rods, except those that cannot be moved with control rod drive

2. The Control Rod Drive Housing Support System shall be inspected after reassembly and the results of the inspection recorded.

3. Prior to control rod withdrawal for startup the Rod Worth Minimizer (RWM) shall be verified as operable by performing the following:

   (a) Verify that the control rod withdrawal sequence for the Rod Worth Minimizer computer is correct.

   (b) The Rod Worth Minimizer diagnostic test shall be performed.

3.3 LIMITING CONDITIONS FOR OPERATION

pressure, are fully inserted, no more than two rods may be moved.

4. Control rod patterns and the sequence of withdrawal or insertion shall be established such that the rod drop accident limit of 280 cal/g is not exceeded.

5. Control rods shall not be withdrawn for startup or refueling unless at least two source range channels have an observed count rate greater than or equal to three counts per second.

6. ~~Deleted.~~

IF THE ABOVE SPECIFICATIONS ARE NOT SATISFIED, THE REACTOR SHALL BE PLACED IN HOT SHUTDOWN WITHIN 12 HOURS.

See TS 3.3.F on Page 88 [20]

4.3 SURVEILLANCE REQUIREMENTS

(c) Out-of-sequence control rods in each distinct RWM group shall be selected and the annunciator of the selection errors verified.

(d) An out-of-sequence control rod shall be withdrawn no more than three notches and the rod block function verified.

4. The control rod pattern and sequence of withdrawal or insertion shall be verified to comply with Specification 3.3.B.4.

5. Prior to control rod withdrawal for startup or during refueling, verification shall be made that at least two source range channels have an observed count rate of at least three counts per second.

6. Deleted.

3.3 LIMITING CONDITIONS FOR OPERATION

Replace Sections C.1.1 and C.1.2 with Insert #1 [6]

[6]→

C. Scram Insertion Times

1.1 The average scram time, based on the de-energization of the scram pilot valve solenoids of all operable control rods in the reactor power operation condition shall be no greater than:

Drop-Out of Position	% Inserted From Fully Withdrawn	Avg. Scram Insertion Time (sec)
46	4.51	0.358
36	25.34	0.912
26	46.18	1.468
06	87.84	2.686

The average of the scram insertion times for the three fastest control rods of all groups of four control rods in a two by two array shall be no greater than:

Drop-Out of Position	% Inserted From Fully Withdrawn	Avg. Scram Insertion Time (sec)
46	4.51	0.379
36	25.34	0.967
26	46.18	1.556
06	87.84	2.848

4.3 SURVEILLANCE REQUIREMENTS

7. The scram discharge volume drain and vent valves shall be verified open at least once per month. These valves may be closed intermittently for testing under administrative control.

Replace Sections C.1 and C.2 with Inserts #2 & #3

C. Scram Insertion Times

[10] And prior to exceeding 30% RTP after each reactor shutdown ≥ 120 days

1. After refueling outage and prior to operation above 30% power, with reactor pressure ~~above~~ ≥ 800 psig all control rods shall be subject to scram-time measurements from the fully withdrawn position. The scram times for single rod scram testing shall be measured without reliance on the control rod drive pumps.

[11] Each 200 days cumulative operation in Run Mode, for a representative sample

2. ~~During or following a controlled shutdown of the reactor, but not more frequently than 16 weeks nor less frequently than 32 weeks intervals,~~ 50% control rod drives ~~in each quadrant of the reactor core~~ shall be measured for scram times specified in Specification 3.3.C. ~~All control rod drives shall have experienced scram-time measurements each year.~~ [12] ~~Whenever 50% of the control rod drives scram times have been measured, an evaluation shall be made to provide reasonable assurance that proper control rod drives performance is being maintained. The results of measurements performed on the control rod drives shall be submitted in the start up test report.~~ [13]

Replace Sections C.1.1 and C.1.2 with Insert #1 [6]

3.3 LIMITING CONDITIONS FOR OPERATION

[6] → 1.2 If Specification 3.3.C.1.1 cannot be met, the average scram time, based on the de-energization of the scram pilot valve solenoids of all operable control rods in the reactor power operation condition shall be no greater than:

WHEN IN STARTUP OR RUN MODES [7]

[8] [6]

Drop-Out of Position	% Inserted From Fully Withdrawn	Avg. Scram Insertion Time (sec)
46	4.51	.358
36	25.34	1.096
26	46.18	1.860
06	87.84	3.419

[6] → The average of the scram insertion times for the three fastest control rods of all groups of four control rods in a two by two array shall be no greater than:

Drop-Out of Position	% Inserted From Fully Withdrawn	Avg. Scram Insertion Time (sec)
46	4.51	.379
36	25.34	1.164
26	46.18	1.971
06	87.84	3.624

2. The maximum scram insertion time for 90% insertion of any operable control rod shall not exceed 7.00 seconds.

TO NOTCH POSITION 04 [9]

All CAPS

4.3 SURVEILLANCE REQUIREMENTS

INSERT #4 (SR 4.3.C.2) [9]

3.3 LIMITING CONDITIONS FOR OPERATION

4.3 SURVEILLANCE REQUIREMENTS

4

3. If Specification 3.3.C.1 (2) cannot be met, the reactor shall not be made supercritical; if operating, the reactor shall be shut down immediately upon determination that average scram time is deficient.

[14] placed in the Hot Shutdown Condition within 12 Hours

4. If Specification 3.3.C.2 cannot be met, the deficient control rod shall be considered inoperable, fully inserted into the core, and ~~electrically~~ disarmed.

[15] within 3 Hours [16] within the following 4 Hours

D. Control Rod Accumulators

At all reactor operating pressures, a rod accumulator may be inoperable provided that no other control rod in the nine-rod square array around this rod has a:

1. Inoperable accumulator.
2. Directional control valve electrically disarmed while in a non-fully inserted position.
3. Scram insertion greater than maximum permissible insertion time.

If a control rod with an inoperable accumulator is inserted "full-in" and its directional control valves are electrically disarmed, it shall not be considered to have an inoperable accumulator.

Replace 3.3.D with Insert #5 [17]

D. Control Rod Accumulators

Once a shift check the status of the pressure and level alarms for each accumulator.

every 7 days [18]

Verify each control rod scram accumulator pressure is ≥ 940 psig [19]

3.3 LIMITING CONDITIONS FOR OPERATION

E. Reactivity Anomalies

The reactivity equivalent of the difference between the actual critical rod configuration and the expected configuration during power operation shall not exceed 1% Δk/k. If this limit is exceeded, the reactor will be shut down until the cause has been determined and corrective actions have been taken if such actions are appropriate.

F. If Specifications 3.3.B through 3.3.D above are not met, an orderly shutdown shall be initiated and the reactor shall be in the cold shutdown condition within 24 hours.

[20]

4.3 SURVEILLANCE REQUIREMENTS

E. Reactivity Anomalies

During the startup test program and startups following refueling outages, the critical rod configurations will be compared to the expected configurations at selected operating conditions. These comparisons will be used as base data for reactivity monitoring during subsequent power operation throughout the fuel cycle. At specific power operating conditions, the critical rod configuration will be compared to the configuration expected based upon appropriately corrected past data. This comparison will be made at least every equivalent full power month.

NO CHANGES TO THIS PAGE - INCLUDED FOR COMPLETENESS OF REVIEW

BASES:

3.3 & 4.3 CONTROL ROD SYSTEM

A. Reactivity Limitations

1. Reactivity Margin - Core Loading

The specified shutdown margin (SDM) limit accounts for the uncertainty in the demonstration of SDM by testing. Separate SDM limits are provided for testing where the highest worth control rod is determined analytically or by measurement. This is due to the reduced uncertainty in the SDM test when the highest worth control rod is determined by measurement (e.g., SDM may be demonstrated by an in-sequence control rod withdrawal, in which the highest worth control rod is analytically determined, or by local criticals, where the highest worth rod is determined by testing).

Following a refueling, adequate SDM must be demonstrated to ensure that the reactor can be made subcritical at any point during the cycle. Since core reactivity will vary during the cycle as a function of fuel depletion and poison burnup, the beginning of cycle (BOC) test must also account for changes in core reactivity during the cycle. Therefore, to obtain the SDM, the initial measured value must exceed LCO 3.3.A.1 by an adder, "R", which is the difference between the calculated value of maximum core reactivity during the operating cycle and the calculated BOC core reactivity. If the value of "R" is negative (that is, BOC is the most reactive point in the cycle), no correction to the BOC measured value is required. The value of R shall include the potential shutdown margin loss assuming full B_4C settling in all inverted poison tubes present in the core. The frequency of 4 hours after reaching criticality is allowed to provide a reasonable amount of time to perform the required calculations and have appropriate verification.

When SDM is demonstrated by calculations not associated with a test (e.g., to confirm SDM during the fuel loading sequence), additional margin must be included to account for uncertainties in the calculation. During refueling, adequate SDM is required to ensure that the reactor does not reach criticality during control rod withdrawals. An evaluation of each in-vessel fuel movement during fuel loading (including shuffling fuel within the core) is required to ensure adequate SDM is maintained during refueling. This evaluation ensures that the intermediate loading patterns are bounded by the safety analyses for the final core loading pattern. For example, bounding analyses that demonstrate adequate SDM for the most reactive configurations during the refueling may be performed to demonstrate acceptability of the entire fuel movement sequence. These bounding analyses include additional margins to account for the associated uncertainties in the calculation.

2. Reactivity Margin - Inoperable Control Rods

Specification 3.3.A.2 requires that a rod be taken out of service if it cannot be moved with drive pressure. If a rod is disarmed electrically, its position shall be consistent with the shutdown reactivity limitation stated in Specification 3.3.A.1. This assures that the core can be shutdown at all times with the remaining control rods, assuming the highest worth, operable control rod does rod insert. An allowable pattern for control rods valved out of service will be available to the reactor operator. The number of rods permitted to be inoperable could be

BASES: 3.3 & 4.3 (Cont'd)

many more than the six allowed by the Specification, particularly late in the operation cycle; however, the occurrence of more than six could be indicative of a generic control rod drive problem and the reactor will be shutdown. Also if damage within the control rod drive mechanism and in particular, cracks in drive internal housing, cannot be ruled out, then a generic problem affecting a number of drives cannot be ruled out. Circumferential cracks resulting from stress assisted intergranular corrosion have occurred in the collet housing of drives at several BWRs. This type of cracking could occur in a number of drives and if the cracks propagated until severance of the collet housing occurred, scram could be prevented in the affected rods. Limiting the period of operation with a potentially severed collet housing and requiring increased surveillance after detecting one stuck rod will assure that the reactor will not be operated with a large number of rods with failed collet housings.

¶ INSERT RELOCATED BASES FROM 3.3.C (see page 91).

B. Control Rods

1. Control rod dropout accidents as discussed in the ~~FSAR~~ UFSAR can lead to significant core damage. If coupling integrity is maintained, the possibility of a rod dropout accident is eliminated. ~~Neutron instrumentation response to rod movement provides a verification that the rod is following its drive. Coupling verification is performed to ensure the control rod is connected to the control rod drive mechanism and will perform its intended function when necessary. The surveillance requires verifying a control rod does not go to the withdrawn over-travel position. The over-travel position feature provides a positive check on the coupling integrity since only an uncoupled CRD can reach the over-travel position. The verification is required to be performed when a control rod is fully withdrawn after each refueling outage (since work on the control rod or CRD System may have affected coupling), and after each uncoupling.~~

Replace with Insert #6

BASES: 3.3 & 4.3 (Cont'd)

2. The control rod housing support restricts the outward movement of a control rod to less than 3 inches in the extremely remote event of a housing failure. The amount of reactivity which could be added by this small amount of rod withdrawal, which is less than a normal single withdrawal increment, will not contribute to any damage of the primary coolant system. The design basis is given in Subsection 3.5.2 of the FSAR, and the design evaluation is given in Subsection 3.5.4. This support is not required if the reactor coolant system is at atmospheric pressure since there would then be no driving force to rapidly eject a drive housing.

3. In the course of performing normal startup and shutdown procedures, a pre-specified sequence for the withdrawal or insertion of control rods is followed. Control rod dropout accidents which might lead to significant core damage, cannot occur if this sequence of rod withdrawals or insertions is followed. The Rod Worth Minimizer restricts withdrawals and insertions to those listed in the pre-specified sequence and provides an additional check that the reactor operator is following prescribed sequence. Although beginning a reactor startup without having the RWM operable would entail unnecessary risk, continuing to withdraw rods if the RWM fails subsequently is acceptable if a second licensed operator verifies the withdrawal sequence. Continuing the startup increases core power, reduces the rod worth and reduces the consequences of dropping any rod. Withdrawal of rods for testing is permitted with the RWM inoperable, if the reactor is subcritical and all other rods are fully inserted. Above 20% power, the RWM is not needed since even with a single error an operator cannot withdraw a rod with sufficient worth, which if dropped, would result in anything but minor consequences.

4. Refer to the "General Electric Standard Application for Reactor Fuel (GESTAR II)," NEDE-24011-P-A, (the latest NRC-approved version will be listed in the COLR).

5. The Source Range Monitor (SRM) system provides a scram function in noncoincident configuration. It does provide the operator with a visual indication of neutron level. The consequences of reactivity accidents are a function of the initial neutron flux. The requirement of at least three counts per second assures that any transient, should it occur, begins at or above the initial value of 10^{-8} of rated power used in the analyses of transients from cold conditions. One operable SRM channel is adequate to monitor the approach to criticality, therefore, two operable SRM's are specified for added conservatism.

6. ~~Deleted.~~

Replace with Insert #7

BASES: 3.3 & 4.3 (Cont'd)

Replace with Insert #8

7. Periodic verification that the Scram Discharge Volume (SDV) drain and vent valves are maintained in the open position provides assurance that the SDV will be available to accept the water displaced from the control rod drives in the event of a scram.

C. Scram Insertion Times

The Control Rod System is designed to bring the reactor subcritical at a rate fast enough to prevent fuel damage. Each operating cycle, the limiting power transient delta CPR is determined based on the average response of all the drives given in the above specification to ensure that the MPCR remains greater than the fuel cladding integrity safety limit.

The scram times for all control rods shall be determined during each operating cycle. The weekly control rod exercise test serves as a periodic check against deterioration of the Control Rod System and also verifies the ability of the control rod drive to scram. The frequency of exercising the control rods under the conditions of two or more control rods valved out of service provides even further assurance of the reliability of the remaining control rods.

Relocate to Bases 3.3.A.2 (page 89a)

D. Control Rod Accumulators

Replace with Insert #9

Requiring no more than one inoperable accumulator in any nine-rod (3x3) square array is based on a series of XY PDQ-4 quarter core calculations of a cold, clean core. The worst case in a nine-rod withdrawal sequence resulted in a $K_{eff} \leq 1.0$. Other repeating rod sequences with more rods withdrawn resulted in $K_{eff} > 1.0$. At reactor pressures in excess of 800 psig, even those control rods with inoperable accumulators will be able to meet required scram insertion times due to the action of reactor pressure. In addition, they may be normally inserted using the Control-Rod-Drive Hydraulic System. Procedural control will assure that control rods with inoperable accumulators will be spaced in a one-in-nine array rather than grouped together.

E. Reactivity Anomalies

During each fuel cycle, excess operating reactivity varies as fuel depletes and as any burnable poison in supplementary control is burned. The magnitude of this excess reactivity may be inferred from the critical rod configuration. As fuel burnup progresses, anomalous behavior in the excess reactivity may be detected by comparison of the critical rod pattern selected base states to the predicted rod inventory at that state. Power operation base conditions provide the most sensitive and directly interpretable data relative to core reactivity. Furthermore, using power operating base conditions permits frequent reactivity comparisons. Reactivity anomaly is used as a measure of the predicted versus measured core reactivity during power operation. If the measured and predicted rod density for identical core conditions at BOC do not reasonably agree, then the assumptions used in the reload cycle design analysis or the calculation models used to predict rod density may not be accurate. If reasonable agreement between measured and predicted core reactivity exists at BOC, then the prediction may be normalized to the measured value. Requiring a reactivity comparison at the specified frequency assures that a comparison will be made before the core reactivity change exceeds 1% $\Delta k/k$. Deviations in core reactivity greater than 1% $\Delta k/k$ are not expected and require thorough evaluation. One percent reactivity limit is considered safe since an insertion of the reactivity into the core would not lead to transients exceeding design conditions of the Reactor System.

INSERT 1 [TS 3.3.C.1]

When the reactor is in the STARTUP or RUN MODES;

a. No more than 6 OPERABLE control rods shall be "slow," in accordance with Table 4.3.C-1, and
b. No more than 2 OPERABLE control rods that are "slow" shall occupy adjacent locations.

INSERT 2 [TS SR 4.3.C.1]

NOTE:
During single control rod scram time Surveillances, the control rod drive (CRD) pumps shall be isolated from the associated scram accumulator.

---

a. Prior to exceeding 30% RATED THERMAL POWER (RTP) after each reactor shutdown of ≥ 120 days, verify each control rod scram time is within the limits of Table 4.3.C-1 with reactor steam dome pressure ≥ 800 psig.

b. Every 200 days cumulative operation in RUN MODE, verify, for a representative sample, each control rod scram time is within the limits of Table 4.3.C-1 with reactor steam dome pressure ≥ 800 psig.

c. Prior to declaring a control rod OPERABLE after work on a control rod or the CRD System that could affect scram time, verify each affected control rod scram time is within the limits of Table 4.3.C-1 with any reactor steam dome pressure.

d. Prior to exceeding 30% RTP after fuel movement within the affected core cell AND prior to exceeding 30% RTP after work on a control rod or the CRD System that could affect scram time, verify each affected control rod scram time is within the limits of Table 4.3.C-1 with reactor steam dome pressure ≥ 800 psig.

INSERT 3

Table 4.3.C-1
Control Rod Scram Times

NOTES:

1. OPERABLE control rods with scram times not within the limits of this Table are considered "slow."
2. Follow the Required Actions of LCO 3.3.C.4 for control rods with scram times > 7 seconds to notch position 04. These control rods are inoperable, in accordance with SR 4.3.C.2, and are not considered "slow."

NOTCH POSITION	SCRAM TIMES[(a)(b)] (seconds) WHEN REACTOR STEAM DOME PRESSURE ≥ 800 psig
46	0.358
36	1.096
26	1.860
06	3.419

(a) Maximum scram time from fully withdrawn position, based on de-energization of scram pilot valve solenoids at time zero.
(b) Scram times as a function of reactor steam dome pressure, when < 800 psig, are within established limits.

INSERT 4 [TS 4.3.C.2]

In accordance with SR's 4.3.C.1.a, b, c & d above, verify each control rod scram time from fully withdrawn to notch position 04 is ≤ 7 seconds.

INSERT 5 [TS 3.3.D]

Each control rod scram accumulator shall be OPERABLE when in the STARTUP or RUN MODES.

NOTE:
Separate action item entry is allowed for each control rod scram accumulator.

---

1. If a control rod scram accumulator is inoperable with reactor steam dome pressure ≥ 800 psig:

   NOTE:
   Only applicable if the associated control rod scram time was within the limits of Table 4.3.C-1 during the last scram time Surveillance.

   ---

   a. Declare the associated control rod scram time "slow" within 8 hours,
      - OR -
   b. Declare the associated control rod inoperable within 8 hours.

2 If two or more control rod scram accumulators are inoperable with reactor steam dome pressure ≥ 800 psig:

   a. Verify / restore the charging water header pressure to ≥ 940 psig within 20 minutes.
      - AND –

   NOTE:
   Only applicable if the associated control rod scram time was within the limits of Table 4.3.C-1 during the last scram time Surveillance.

   ---

   b.1 Declare the associated control rod scram time "slow" within 1 hour,
      - OR -
   b.2 Declare the associated control rod inoperable within 1 hour.

3. If one or more control rod scram accumulators are inoperable with reactor steam dome pressure < 800 psig:

   a. Verify all control rods associated with inoperable accumulators are fully inserted immediately upon discovery of charging water header pressure < 940 psig.
      - AND -
   b. Declare the associated control rod inoperable within 1 hour.

4. ---

   NOTE:
   Not applicable if all inoperable control rod scram accumulators are associated with fully inserted control rods.

   If Specifications 3.3.D.2.a or 3.3.D.3.a are not met, place the reactor mode switch in the shutdown position within 1 hour.

INSERT 6 [BASES 3.3.B.1 and 4.3.B.1]

Coupling verification is performed to ensure the control rod is connected to the CRDM and will perform its intended function when necessary. The Surveillance requires verifying a control rod does not go to the withdrawn over-travel position. The over-travel position feature provides a positive check on the coupling integrity since only an uncoupled CRD can reach the over-travel position. The verification is required to be performed any time a control rod is withdrawn to the "full out" position (notch position 48) or prior to declaring the control rod OPERABLE after work on the control rod or CRD System that could affect coupling. This includes control rods inserted one notch and then returned to the "full out" position during the performance of SR 4.3.A.2. This Frequency is acceptable, considering the low probability that a control rod will become uncoupled when it is not being moved and operating experience related to uncoupling events.

INSERT 7 [BASES 3.3.B.6]

The action statement for TS 3.3.B.6 requires that the plant be placed in HOT SHUTDOWN within 12 hours if the required actions of TS 3.3.B.1 through 3.3.B.5 are not satisfied. This ensures that all insertable control rods are inserted and places the reactor in a condition that does not require the active function (i.e., scram) of the control rods. The allowed completion time of 12 hours is reasonable, based upon operating experience to reach HOT SHUTDOWN from full power in an orderly manner and without challenging plant systems.

INSERT 8 [BASES 3.3.C. and 4.3.C.]

BACKGROUND

The scram function of the Control Rod Drive (CRD) System controls reactivity changes during abnormal operational transients to ensure that specified acceptable fuel design limits are not exceeded. The control rods are scrammed by positive means using hydraulic pressure exerted on the CRD piston.

When a scram signal is initiated, control air is vented from the scram valves, allowing them to open by spring action. Opening the exhaust valve reduces the pressure above the main drive piston to atmospheric pressure, and opening the inlet valve applies the accumulator or reactor pressure to the bottom of the piston. Since the notches in the index tube are tapered on the lower edge, the collet fingers are forced open by cam action, allowing the index tube to move upward without restriction because of the high differential pressure across the piston. As the drive moves upward and the accumulator pressure reduces below the reactor pressure, a ball check valve opens, letting the reactor pressure complete the scram action. If the reactor pressure is low, such as during startup, the accumulator will fully insert the control rod in the required time without assistance from reactor pressure.

APPLICABLE SAFETY ANALYSES

The Design Basis Accident (DBA) and transient analyses assume that all of the control rods scram at a specified insertion rate. The resulting negative scram reactivity forms the basis for the determination of plant thermal limits (e.g., MCPR). Other distributions of scram times (e.g., several control rods scramming slower than the average time with several control rods scramming faster than the average time) can also provide sufficient scram reactivity.

Surveillance of each individual control rod's scram time ensures the scram reactivity assumed in the DBA and transient analyses can be met.

The scram function of the CRD System protects the MCPR Safety Limit (SL) (reference TS 1.1.A, "Bundle Safety Limit (Reactor Pressure >800 psia and Core Flow >10% of Rated)," and TS 3.11.C, "Minimum Critical Power Ratio (MCPR)") and the 1% cladding plastic strain fuel design limit (reference specification 3.11.A, "Average Planar Linear Heat Generation Rate (APLHGR)"), which ensure that no fuel damage will occur if these limits are not exceeded. Above 800 psig, the scram function is designed to insert negative reactivity at a rate fast enough to prevent the actual MCPR from becoming less than the MCPR SL, during the analyzed limiting power transient. Below 800 psig, the scram function is assumed to perform during the control rod drop accident (Reference 1) and, therefore, also provides protection against violating fuel damage limits during reactivity insertion accidents (Reference TS 3.3.B.3 and 3.3.B.4, regarding the Rod Worth Minimizer and control rod patterns). For the reactor vessel overpressure protection analysis, the scram function, along with the safety/relief valves, ensure that the peak vessel pressure is maintained within the applicable ASME Code limits.

Control rod scram times satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

The scram times specified in Table 4.3.C-1 (in the accompanying LCO) are required to ensure that the scram reactivity assumed in the DBA and transient analysis is met (Reference 2). To account for single failures and "slow" scramming control rods, the scram times specified in Table 4.3.C-1 are faster than those assumed in the design basis analysis. The scram times have a margin that allows up to approximately 7% of the control rods (e.g., 89 x 7% ≈ 6) to have scram times exceeding the specified limits (i.e., "slow" control rods) assuming a single stuck control rod, as limited by TS 3.3.A. "Reactivity Limitations," and an additional control rod failing to scram per the single failure criterion. The scram times are specified as a function of reactor steam dome pressure to account for the pressure dependence of the scram times. The scram times are specified relative to measurements based on reed switch positions, which provide the control rod position indication. The reed switch closes ("pickup") when the index tube passes a specific location and then opens ("dropout") as the index tube travels upward. Verification of the specified scram times in Table 4.3.C-1 is accomplished through measurement of the "dropout" times. To ensure that local scram reactivity rates are maintained within acceptable limits, no more than two of the allowed "slow" control rods may occupy adjacent locations.

Table 4.3.C-1 is modified by two Notes which state that control rods with scram times not within the limits of the Table are considered "slow" and that control rods with scram times > 7 seconds are considered inoperable as required by SR 4.3.C.2. Slow scramming control rods may be conservatively declared inoperable and not accounted for as "slow" control rods.

APPLICABILITY

In STARTUP and RUN MODES, a scram is assumed to function during transients and accidents analyzed for these plant conditions. These events are assumed to occur during startup and power operation; therefore, the scram function of the control rods is required during these MODES. In SHUTDOWN, the control rods are not able to be withdrawn since the reactor mode switch is in shutdown and a control rod block is applied. This provides adequate requirements for control rod scram capability during these conditions. In REFUELING, only one control rod is able to be withdrawn. Additional restrictions and requirements when in REFUELING can be found in TS 3.12 "Refueling and Spent Fuel Handling."

REQUIRED ACTIONS

TS 3.3.C.3

When the requirements of TS 3.3.C.1 are not met, the rate of negative reactivity insertion during a scram may not be within the assumptions of the safety analyses. Therefore, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least the HOT SHUTDOWN condition within 12 hours. The allowed completion time of 12 hours is reasonable, based on operating experience, to reach the SHUTDOWN MODE from full power conditions in an orderly manner and without challenging plant systems.

TS 3.3.C.4

Specification 3.3.C.2 requires that no operable control rod have a scram time greater than 7 seconds. TS 3.3.C.4 requires that for control rods that do not satisfy the 7 second requirement, that they be considered inoperable. In addition, the subject control rod must be fully inserted into the core within 3 hours and disarmed (electrically or hydraulically) within the following 4 hours. Inserting a control rod ensures the shutdown and scram capabilities are not adversely affected. The control rod is disarmed to prevent inadvertent withdrawal during subsequent operations. The control rods can be hydraulically disarmed by closing the drive water and exhaust water isolation valves. The control rods can be electrically disarmed by disconnecting power from all four directional control valve solenoids. The allowed completion times are reasonable, considering the small number of allowed inoperable control rods, and provide time to insert and disarm the control rods in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS (SR)

The four surveillances of SR 4.3.C.1 are modified by a Note stating that during a single control rod scram time surveillance, the CRD pumps shall be isolated from the associated scram accumulator. With the CRD pump isolated, (i.e., charging valve closed) the influence of the CRD pump head does not affect the single control rod scram times. During a full core scram, the CRD pump head would be seen by all control rods and would have a negligible effect on the scram insertion times.

SR 4.3.C.1.a

The scram reactivity used in DBA and transient analyses is based on an assumed control rod scram time. Measurement of the scram times with reactor steam dome pressure ≥ 800 psig demonstrates acceptable scram times for the transients analyzed.

Maximum scram insertion times occur at a reactor steam dome pressure of approximately 800 psig because of the competing effects of reactor steam dome pressure and stored accumulator energy. Therefore, demonstration of adequate scram times at reactor steam dome pressure ≥ 800 psig ensures that the measured scram times will be within the specified limits at higher pressures. Limits are specified as a function of reactor pressure to account for the sensitivity of the scram insertion times with pressure and to allow a range of pressures over which scram time testing can be performed. To ensure that scram time testing is performed within a reasonable time following a shutdown ≥ 120 days or longer, control rods are required to be tested before exceeding 30% RTP following the shutdown. This frequency is acceptable considering the additional surveillances performed for control rod OPERABILITY, the frequent verification of adequate accumulator pressure, and the required testing of control rods affected by fuel movement within the associated core cell and by work on control rods or the CRD System.

SR 4.3.C.1.b
Additional testing of a sample of control rods is required to verify the continued performance of the scram function during the cycle. A representative sample contains at least 10% of the control rods. The sample remains representative if no more than 7.5% of the control rods in the sample tested are determined to be "slow." With more than 7.5% of the sample declared to be "slow" per the criteria in Table 4.3.C-1, additional control rods are tested until this 7.5% criterion (e.g., 7.5% of the entire sample size) is satisfied, or until the total number of "slow" control rods (throughout the core, from all surveillances) exceeds the LCO limit. For planned testing, the control rods selected for the sample should be different for each test. Data from inadvertent scrams should be used whenever possible to avoid unnecessary testing at power, even if the control rods with data may have been previously tested in a sample. The 200 day Frequency is based on operating experience that has shown control rod scram times do not significantly change over an operating cycle. This Frequency is also reasonable based on the additional Surveillances done on the CRDs at more frequent intervals in accordance with SR 4.3.A.2 "Notch Testing" and SR 4.3.D, "Control Rod Accumulators."

SR 4.3.C.1.c
When work that could affect the scram insertion time is performed on a control rod or the CRD System, testing must be done to demonstrate that each affected control rod retains adequate scram performance over the range of applicable reactor pressures from zero to the maximum permissible pressure. The scram testing must be performed once before declaring the control rod OPERABLE. The required scram time testing must demonstrate the affected control rod is still within acceptable limits. The limits for reactor pressures < 800 psig are established based on a high probability of meeting the acceptance criteria at reactor pressures ≥ 800 psig. Limits for ≥ 800 psig are found in Table 4.3.C-1. If testing demonstrates the affected control rod does not meet these limits, but is within the 7 second limit of Table 4.3.C-1, Note 2, the control rod can be declared OPERABLE and "slow."

Specific examples of work that could affect the scram times are (but are not limited to) the following: removal of any CRD for maintenance or modification; replacement of a control rod; and maintenance or modification of a scram solenoid pilot valve, scram valve, accumulator, isolation valve or check valve in the piping required for scram.

The Frequency of once prior to declaring the affected control rod OPERABLE is acceptable because of the capability to test the control rod over a range of operating conditions and the more frequent surveillances on other aspects of control rod OPERABILITY.

SR 4.3.C.1.d
When work that could affect the scram insertion time is performed on a control rod or CRD System, or when fuel movement within the reactor pressure vessel occurs, testing must be done to demonstrate each affected control rod is still within the limits of Table 4.3.C-1 with the reactor steam dome pressure ≥ 800 psig. Where work has been performed at high reactor pressure, the requirements of SR 4.3.C.1.c and SR 4.3.C.1.d can be satisfied with one test. For a control rod affected by work performed while shut down, however, a zero pressure and high pressure test may be required. This testing ensures that, prior to withdrawing the control rod for continued operation; the control rod scram performance is acceptable for operating reactor pressure conditions. Alternatively, a control rod scram test during hydrostatic pressure testing could also satisfy both criteria. When fuel movement within the reactor pressure vessel occurs, only those control rods associated with the core cells affected by the fuel movement are

required to be scram time tested. During a routine refueling outage, it is expected that all control rods will be affected.

The Frequency of once prior to exceeding 30% RTP is acceptable because of the capability to test the control rod over a range of operating conditions and the more frequent surveillances on other aspects of control rod OPERABILITY.

SR 4.3.C.2
Verifying that the scram time for each control rod to notch position 04 is ≤ 7 seconds provides reasonable assurance that the control rod will insert when required during a DBA or transient, thereby completing its shutdown function. This SR is performed in conjunction with the control rod scram time testing of SR 4.3.C.1.a, SR 4.3.C.1.b, SR 4.3.C.1.c, and SR 4.3.C.1.d. The associated Frequencies are acceptable, considering the more frequent testing performed to demonstrate other aspects of control rod OPERABILITY and operating experience, which shows scram times do not significantly change over an operating cycle.

REFERENCES

1. NEDE-24011-P-A-9, "General Electric Standard Application for Reactor Fuel," Section 3.2.4.1, September 1988.
2. Letter from R.F. Janecek (BWROG) to R.W. Starostecki (NRC), "BWR Owners Group Revised Reactivity Control System Technical Specifications," BWROG-8754, dated September 17, 1987.

INSERT 9 [BASES for 3.3.D]

BACKGROUND

The control rod scram accumulators are part of the Control Rod Drive (CRD) System and are provided to ensure that the control rods scram under varying reactor conditions. The control rod scram accumulators store sufficient energy to fully insert a control rod at any reactor vessel pressure. The accumulator is a hydraulic cylinder with a free floating piston. The piston separates the water used to scram the control rods from the nitrogen, which provides the required energy. The scram accumulators are necessary to scram the control rods within the required insertion times of LCO 3.3.C, "Scram Insertion Times."

APPLICABLE SAFETY ANALYSES

The Design Basis Accident (DBA) and transient analyses assume that all of the control rods scram at a specified insertion rate. OPERABILITY of each individual control rod scram accumulator, along with LCO 3.3.A.2, "Reactivity Margin – Inoperable Control Rods," LCO 3.3.B "Control Rods," and LCO 3.3.C, ensures that the scram reactivity assumed in the DBA and transient analyses can be met. The existence of an inoperable accumulator may invalidate prior scram time measurements for the associated control rod.

The scram function of the CRD System, and therefore the OPERABILITY of the accumulators, protects the MCPR Safety Limit (reference TS 1.1.A, "Bundle Safety Limit (Reactor Pressure >800 psia and Core Flow >10% of Rated)," and TS 3.11.C, "Minimum Critical Power Ratio (MCPR)") and 1% cladding plastic strain fuel design limit (reference specification 3.11.A, "Average Planar Linear Heat Generation Rate (APLHGR),") and TS 3.11.B, "Linear Heat Generation Rate (LHGR)"), which ensure that no fuel damage will occur if these limits are not exceeded. In addition, the scram function at low reactor vessel pressure (i.e., startup conditions) provides protection against violating fuel design limits during reactivity insertion accidents (Reference TS 3.3.B.3 and 3.3.B.4, regarding the Rod Worth Minimizer and control rod patterns).

Control rod scram accumulators satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

The OPERABILITY of the control rod scram accumulators is required to ensure that adequate scram insertion capability exists when needed over the entire range of reactor pressures. The OPERABILITY of the scram accumulators is based on maintaining adequate accumulator pressure.

APPLICABILITY

In STARTUP and RUN MODES, the scram function is required for mitigation of DBAs and transients, and therefore the scram accumulators must be OPERABLE to support the scram function. In SHUTDOWN, control rods are not allowed to be withdrawn since the reactor mode switch is in shutdown and a control rod block is applied. This provides adequate requirements for control rod scram accumulator OPERABILITY during these conditions. In REFUELING, only one control rod is able to be withdrawn. Additional restrictions and requirements when in REFUELING can be found in TS 3.12 "Refueling and Spent Fuel Handling."

REQUIRED ACTIONS

The required actions of TS 3.3.D is modified by a Note indicating that a separate condition entry is allowed for each control rod scram accumulator. This is acceptable since the required actions for each condition provide appropriate compensatory actions for each inoperable accumulator. Complying with the Required Actions may allow for continued operation.

1.a and 1.b
With one control rod scram accumulator inoperable and the reactor steam dome pressure ≥ 800 psig, the control rod may be declared "slow," since the control rod will still scram at the reactor operating pressure but may not satisfy the required scram times in Table 4.3.C-1. Required action 1.a is modified by a Note indicating that declaring the control rod "slow" only applies if the associated control scram time was within the limits of Table 4.3.C-1 during the last scram time test. Otherwise, the control rod would already be considered "slow" and the further degradation of scram performance with an inoperable accumulator could result in excessive scram times. In this event, the associated control rod is declared inoperable (required action 1.b) and LCO 3.3.C.4 is entered. This would result in requiring the affected control rod to be fully inserted and disarmed, thereby satisfying its intended function.

The allowed Completion Time of 8 hours is reasonable, based on the large number of control rods available to provide the scram function and the ability of the affected control rod to scram only with reactor pressure at high reactor pressures.

2.a, 2.b.1 and 2.b.2
With two or more control rod scram accumulators inoperable and reactor steam dome pressure ≥ 800 psig, adequate pressure must be supplied to the charging water header. With inadequate charging water header pressure, all of the accumulators could become inoperable, resulting in a potentially severe degradation of the scram performance. Therefore, within 20 minutes from discovery of charging water header pressure < 940 psig concurrent with condition 2, adequate charging water header pressure must be restored. The allowed completion time of 20 minutes is reasonable, to place a CRD pump into service to restore the charging header pressure, if required. This completion time is based on the ability of the reactor pressure alone to fully insert all control rods.

The control rod may be declared "slow," since the control rod will still scram using only reactor pressure, but may not satisfy the times in Table 4.3.C-1. Required action 2.b.1 is modified by a Note indicating that declaring the control rod "slow" only applies if the associated control scram time is within the limits of Table 4.3.C-1 during the last scram time test. Otherwise, the control rod would already be considered "slow" and the further degradation of scram performance with an inoperable accumulator could result in excessive scram times. In this event, the associated control rod is declared inoperable (required action 2.b.2) and LCO 3.3.C.4 entered. This would result in requiring the affected control rod to be fully inserted and disarmed, thereby satisfying its intended function.

The allowed completion time of 1 hour is reasonable, based on the ability of only the reactor pressure to scram the control rods and the low probability of a DBA or transient occurring while the affected accumulators are inoperable.

3.a and 3.b
With one or more control rod scram accumulators inoperable and the reactor steam dome pressure < 800 psig, the pressure supplied to the charging water header must be adequate to

ensure that accumulators remain charged. With the reactor steam dome pressure < 800 psig, the function of the accumulators in providing the scram force becomes much more important since the scram function could become severely degraded during a depressurization event or at low reactor pressures. Therefore, immediately upon discovery of charging water header pressure < 940 psig, concurrent with condition 3, all control rods associated with inoperable accumulators must be verified to be fully inserted. Withdrawn control rods with inoperable accumulators may fail to scram under these low pressure conditions. The associated control rods must also be declared inoperable within 1 hour. The allowed completion time of 1 hour is reasonable for required action 3.b, considering the low probability of a DBA or transient occurring during the time that the accumulator is inoperable.

<u>4</u>
The reactor mode switch must be placed in the shutdown position within 1 hour if either required action and associated completion time associated with loss of the CRD charging pump (required actions 2.a and 3.a) cannot be met. Placing the mode switch in the shutdown position ensures that all insertable control rods are inserted and that the reactor would then be in a condition that does not require the active function (i.e., scram) of the control rods. This required action is modified by a Note stating that the action is not applicable if all control rods associated with the inoperable scram accumulators are fully inserted, since the function of the control rods has been performed.

SURVEILLANCE REQUIREMENTS

<u>SR 4.3.D</u>
SR 4.3.D requires that the accumulator pressure be checked every 7 days to ensure adequate accumulator pressure exists to provide sufficient scram force. The primary indicator of accumulator OPERABILITY is the accumulator pressure. A minimum accumulator pressure is specified, below which the capability of the accumulator to perform its intended function becomes degraded and the accumulator is considered inoperable. The minimum accumulator pressure of 940 psig is well below the expected pressure of 1100 psig. Declaring the accumulator inoperable when the minimum pressure is not maintained ensures that significant degradation in scram times does not occur. The 7 day frequency has been shown to be acceptable through operating experience and takes into account indications available in the control room.

Enclosure 4

Vermont Yankee Nuclear Power Station

Proposed Technical Specification Change No. 266

Revision to Control Rod Operability, Scram Time Testing and Control Rod Accumulators

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
82	82
83	83
84	84
85	85
86	86
87	87
	87a
	87b
88	88
89a	89a
90	90
91	91
	91a
	91b
	91c
	91d
	91e
	91f
	91g

3.3 LIMITING CONDITIONS FOR OPERATION

3.3 CONTROL ROD SYSTEM

Applicability:

Applies to the operational status of the control rod system.

Objective:

To assure the ability of the control rod system to control reactivity.

Specification:

A. Reactivity Limitations

1. Reactivity Margin - Core Loading

The core loading shall be limited to that which can be made subcritical in the most reactive condition during the operation cycle with the highest worth, operable control rod in its fully withdrawn position and all other operable rods inserted.

To ensure this capability, the shutdown margin shall be provided as follows any time there is fuel in the core:

(a) $\geq$0.38% Δk/k with the highest worth rod analytically determined;

or

(b) $\geq$0.28% Δk/k with the highest worth rod determined by test.

With the required shutdown margin not met during power operation, either restore the required shutdown margin within 6 hours, or be in hot shutdown within the next 12 hours.

4.3 SURVEILLANCE REQUIREMENTS

4.3 CONTROL ROD SYSTEM

Applicability:

Applies to the surveillance requirements of the control rod system.

Objective:

To verify the ability of the control rod system to control reactivity.

Specification:

A. Reactivity Limitations

1. Reactivity Margin - Core Loading

Verify that the required SDM is met prior to each in-vessel fuel movement during the fuel loading sequence.

Within 4 hours after criticality following fuel movement within the reactor pressure vessel or control rod replacement, verify the required shutdown margin will be met at any time in the subsequent operation cycle with the highest worth operable control rod fully withdrawn and all other operable rods inserted (except as provided in Specifications 3.12.D and 3.12.E).

3.3 LIMITING CONDITIONS FOR OPERATION

With the required shutdown margin not met and the mode switch in the "Refuel" position, immediately suspend Alteration of the Reactor Core except for control rod insertion and fuel assembly removal; immediately initiate action to fully insert all insertable control rods in core cells containing one or more fuel assemblies; within 1 hour, initiate action to restore the integrity of the Secondary Containment System.

2. Reactivity Margin - Inoperable Control Rods

Control rod drives which cannot be moved with control rod drive pressure shall be considered inoperable. If a partially or fully withdrawn control rod drive cannot be moved with drive or scram pressure, the reactor shall be brought to a shutdown condition within 48 hours unless investigation demonstrates that the cause of the failure is not due to a failed control rod drive mechanism collet housing. The control rod directional control valves for inoperable control rods shall be

4.3 SURVEILLANCE REQUIREMENTS

2. Reactivity Margin - Inoperable Control Rods

Each partially or fully withdrawn operable control rod shall be exercised one notch at least once each week. This test shall be performed at least once per 24 hours in the event power operation is continuing with two or more inoperable control rods or in the event power operation is continuing with one fully or partially withdrawn rod which cannot be moved and for which control rod drive mechanism damage has not been ruled out. The surveillance need not be completed within 24 hours if the number

3.3 LIMITING CONDITIONS FOR OPERATION

disarmed except for control rods which are inoperable because of scram times greater than those specified in Specification 3.3.C. In no case shall the number of inoperable rods which are not fully inserted be greater than six during power operation.

B. Control Rods

1. Each control rod shall be either coupled to its drive or placed in the inserted position and its directional valves disarmed electrically. When removing up to one control rod drive per quadrant for inspection and the reactor is in the refueling mode, this requirement does not apply.

4.3 SURVEILLANCE REQUIREMENTS

of inoperable rods has been reduced to less than two and if it has been demonstrated that control rod drive mechanism collet housing failure is not the cause of an immovable control rod.

B. Control Rods

1. The coupling integrity shall be verified:

   (a) When a rod is fully withdrawn, observe that the rod does not go to the over-travel position.

   (b) Prior to declaring a control rod OPERABLE after work on a control rod or the CRD system that could affect coupling, each rod shall be fully withdrawn and verified that the rod does not go to the over-travel position.

3.3 LIMITING CONDITIONS FOR OPERATION

2. The Control Rod Drive Housing Support System shall be in place when the Reactor Coolant System is pressurized above atmospheric pressure with fuel in the reactor vessel unless all operable control rods are fully inserted.

3. While the reactor is below 20% power, the Rod Worth Minimizer (RWM) shall be operating while moving control rods except that:

   (a) If after withdrawal of at least 12 control rods during a startup, the RWM fails, the startup may continue provided a second licensed operator verifies that the operator at the reactor console is following the control rod program; or

   (b) If all rods, except those that cannot be moved with control rod drive

4.3 SURVEILLANCE REQUIREMENTS

2. The Control Rod Drive Housing Support System shall be inspected after reassembly and the results of the inspection recorded.

3. Prior to control rod withdrawal for startup the Rod Worth Minimizer (RWM) shall be verified as operable by performing the following:

   (a) Verify that the control rod withdrawal sequence for the Rod Worth Minimizer computer is correct.

   (b) The Rod Worth Minimizer diagnostic test shall be performed.

3.3 LIMITING CONDITIONS FOR OPERATION

pressure, are fully inserted, no more than two rods may be moved.

4. Control rod patterns and the sequence of withdrawal or insertion shall be established such that the rod drop accident limit of 280 cal/g is not exceeded.

5. Control rods shall not be withdrawn for startup or refueling unless at least two source range channels have an observed count rate greater than or equal to three counts per second.

6. If the above specifications are not satisfied, the reactor shall be placed in HOT SHUTDOWN within 12 hours.

4.3 SURVEILLANCE REQUIREMENTS

(c) Out-of-sequence control rods in each distinct RWM group shall be selected and the annunciator of the selection errors verified.

(d) An out-of-sequence control rod shall be withdrawn no more than three notches and the rod block function verified.

4. The control rod pattern and sequence of withdrawal or insertion shall be verified to comply with Specification 3.3.B.4.

5. Prior to control rod withdrawal for startup or during refueling, verification shall be made that at least two source range channels have an observed count rate of at least three counts per second.

6. Deleted

3.3 LIMITING CONDITIONS FOR OPERATION

C. Scram Insertion Times

1. When the reactor is in the STARTUP or RUN MODES;

   a. No more than 6 OPERABLE control rods shall be "slow," in accordance with Table 4.3.C-1, and

   b. No more than 2 OPERABLE control rods that are "slow" shall occupy adjacent locations.

4.3 SURVEILLANCE REQUIREMENTS

7. The scram discharge volume drain and vent valves shall be verified open at least once per month. These valves may be closed intermittently for testing under administrative control.

C. Scram Insertion Times

NOTE:
During single control rod scram time Surveillances, the control rod drive (CRD) pumps shall be isolated from the associated scram accumulator.

1.a. Prior to exceeding 30% RATED THERMAL POWER (RTP) after each reactor shutdown of ≥ 120 days, verify each control rod scram time is within the limits of Table 4.3.C-1 with reactor steam dome pressure ≥ 800 psig.

b. Every 200 days cumulative operation in RUN MODE, verify, for a representative sample, each control rod scram time is within the limits of Table 4.3.C-1 with reactor steam dome pressure ≥ 800 psig.

c. Prior to declaring a control rod OPERABLE after work on a control rod or the CRD System that could affect scram time, verify each affected control rod scram time is within the limits of Table 4.3.C-1 with any reactor steam dome pressure.

d. Prior to exceeding 30% RTP after fuel movement within the affected core cell AND prior to exceeding 30% RTP after work on a control rod or the CRD System that could affect scram time, verify each affected control rod scram time is within the limits of Table 4.3.C-1 with reactor steam dome pressure ≥ 800 psig.

3.3 LIMITING CONDITIONS FOR OPERATION

4.3 SURVEILLANCE REQUIREMENTS

Table 4.3.C-1
Control Rod Scram Times

NOTES:

1. OPERABLE control rods with scram times not within the limits of this Table are considered "slow."

2. Follow the Required Actions of LCO 3.3.C.4 for control rods with scram times > 7 seconds to notch position 04. These control rods are inoperable, in accordance with SR 4.3.C.2, and are not considered "slow."

NOTCH POSITION	SCRAM TIMES [a] [b] (seconds) WHEN REACTOR STEAM DOME PRESSURE ≥ 800 psig
46	0.358
36	1.096
26	1.860
06	3.419

(a) Maximum scram time from fully withdrawn position, based on de-energization of scram pilot valve solenoids at time zero.

(b) Scram times as a function of reactor steam dome pressure, when < 800 psig, are within established limits.

2. The maximum scram insertion time to notch position 04 of any OPERABLE control rod shall not exceed 7.00 seconds.

2. In accordance with SR's 4.3.C.1.a,b,c & d above,verify each control rod scram time from fully withdrawn to notch position 04 is ≤ 7 seconds.

3.3 LIMITING CONDITIONS FOR OPERATION

3. If Specification 3.3.C.1. cannot be met, the reactor shall not be made supercritical; if operating, the reactor shall be placed in the HOT SHUTDOWN condition within 12 hours.

4. If Specification 3.3.C.2 cannot be met, the deficient control rod shall be considered inoperable, fully inserted into the core within 3 hours, and disarmed within the following 4 hours.

D. <u>Control Rod Accumulators</u>

Each control rod scram accumulator shall be OPERABLE when in the STARTUP or RUN MODES.

NOTE:
Separate action item entry is allowed for each control rod scram accumulator.

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1. If a control rod scram accumulator is inoperable with reactor steam dome pressure ≥ 800 psig:

NOTE:
Only applicable if the associated control rod scram time was within the limits of Table 4.3.C-1 during the last scram time Surveillance.

----

a. Declare the associated control rod scram time "slow" within 8 hours,

-OR-

b. Declare the associated control rod inoperable within 8 hours.

4.3 SURVEILLANCE REQUIREMENTS

D. <u>Control Rod Accumulators</u>

Once every 7 days verify each control rod scram accumulator pressure is ≥ 940 psig.

3.3 LIMITING CONDITIONS FOR OPERATION

4.3 SURVEILLANCE REQUIREMENTS

2. If two or more control rod scram accumulators are inoperable with reactor steam dome pressure ≥ 800 psig:

   a. Verify/restore the charging water header pressure to ≥ 940 psig within 20 minutes.

   -AND-

NOTE:
Only applicable if the associated control rod scram time was within the limits of Table 4.3.C-1 during the last scram time Surveillance.

----

   b.1 Declare the associated control rod scram time "slow" within 1 hour,

   -OR-

   b.2 Declare the associated control rod inoperable within 1 hour.

3. If one or more control rod scram acculumators are inoperable with reactor steam dome pressure < 800 psig:

   a. Verify all control rods associated with inoperable accumulators are fully inserted immediately upon discovery of charging water header pressure < 940 psig.

   -AND-

   b. Declare the associated control rod inoperable within 1 hour.

3.3 LIMITING CONDITIONS FOR OPERATION

4. If Specifications 3.3.D.2.a or 3.3.D.3.a are not met, place the reactor mode switch in the shutdown position within 1 hour.

NOTE:
The above specification is not applicable if all inoperable control rod scram accumulators are associated with fully inserted control rods.

4.3 SURVEILLANCE REQUIREMENTS

3.3 LIMITING CONDITIONS FOR OPERATION

E. Reactivity Anomalies

The reactivity equivalent of the difference between the actual critical rod configuration and the expected configuration during power operation shall not exceed 1% $\Delta k/k$. If this limit is exceeded, the reactor will be shut down until the cause has been determined and corrective actions have been taken if such actions are appropriate.

4.3 SURVEILLANCE REQUIREMENTS

E. Reactivity Anomalies

During the startup test program and startups following refueling outages, the critical rod configurations will be compared to the expected configurations at selected operating conditions. These comparisons will be used as base data for reactivity monitoring during subsequent power operation throughout the fuel cycle. At specific power operating conditions, the critical rod configuration will be compared to the configuration expected based upon appropriately corrected past data. This comparison will be made at least every equivalent full power month.

BASES:

3.3 & 4.3 CONTROL ROD SYSTEM

A. Reactivity Limitations

1. Reactivity Margin - Core Loading

The specified shutdown margin (SDM) limit accounts for the uncertainty in the demonstration of SDM by testing. Separate SDM limits are provided for testing where the highest worth control rod is determined analytically or by measurement. This is due to the reduced uncertainty in the SDM test when the highest worth control rod is determined by measurement (e.g., SDM may be demonstrated by an in-sequence control rod withdrawal, in which the highest worth control rod is analytically determined, or by local criticals, where the highest worth rod is determined by testing).

Following a refueling, adequate SDM must be demonstrated to ensure that the reactor can be made subcritical at any point during the cycle. Since core reactivity will vary during the cycle as a function of fuel depletion and poison burnup, the beginning of cycle (BOC) test must also account for changes in core reactivity during the cycle. Therefore, to obtain the SDM, the initial measured value must exceed LCO 3.3.A.1 by an adder, "R", which is the difference between the calculated value of maximum core reactivity during the operating cycle and the calculated BOC core reactivity. If the value of "R" is negative (that is, BOC is the most reactive point in the cycle), no correction to the BOC measured value is required. The value of R shall include the potential shutdown margin loss assuming full B_4C settling in all inverted poison tubes present in the core. The frequency of 4 hours after reaching criticality is allowed to provide a reasonable amount of time to perform the required calculations and have appropriate verification.

When SDM is demonstrated by calculations not associated with a test (e.g., to confirm SDM during the fuel loading sequence), additional margin must be included to account for uncertainties in the calculation. During refueling, adequate SDM is required to ensure that the reactor does not reach criticality during control rod withdrawals. An evaluation of each in-vessel fuel movement during fuel loading (including shuffling fuel within the core) is required to ensure adequate SDM is maintained during refueling. This evaluation ensures that the intermediate loading patterns are bounded by the safety analyses for the final core loading pattern. For example, bounding analyses that demonstrate adequate SDM for the most reactive configurations during the refueling may be performed to demonstrate acceptability of the entire fuel movement sequence. These bounding analyses include additional margins to account for the associated uncertainties in the calculation.

2. Reactivity Margin - Inoperable Control Rods

Specification 3.3.A.2 requires that a rod be taken out of service if it cannot be moved with drive pressure. If a rod is disarmed electrically, its position shall be consistent with the shutdown reactivity limitation stated in Specification 3.3.A.1. This assures that the core can be shutdown at all times with the remaining control rods, assuming the highest worth, operable control rod does rod insert. An allowable pattern for control rods valved out of service will be available to the reactor operator. The number of rods permitted to be inoperable could be

BASES: 3.3 & 4.3 (Cont'd)

many more than the six allowed by the Specification, particularly late in the operation cycle; however, the occurrence of more than six could be indicative of a generic control rod drive problem and the reactor will be shutdown. Also if damage within the control rod drive mechanism and in particular, cracks in drive internal housing, cannot be ruled out, then a generic problem affecting a number of drives cannot be ruled out. Circumferential cracks resulting from stress assisted intergranular corrosion have occurred in the collet housing of drives at several BWRs. This type of cracking could occur in a number of drives and if the cracks propagated until severance of the collet housing occurred, scram could be prevented in the affected rods. Limiting the period of operation with a potentially severed collet housing and requiring increased surveillance after detecting one stuck rod will assure that the reactor will not be operated with a large number of rods with failed collet housings.

The weekly control rod exercise test serves as a periodic check against deterioration of the Control Rod System and also verifies the ability of the control rod drive to scram. The frequency of exercising the control rods under the conditions of two or more control rods valved out of service provides even further assurance of the reliability of the remaining control rods.

B. Control Rods

1. Control rod dropout accidents as discussed in the UFSAR can lead to significant core damage. If coupling integrity is maintained, the possibility of a rod dropout accident is eliminated.

   Coupling verification is performed to ensure the control rod is connected to the CRDM and will perform its intended function when necessary. The Surveillance requires verifying a control rod does not go to the withdrawn over-travel position. The over-travel position feature provides a positive check on the coupling integrity since only an uncoupled CRD can reach the over-travel position. The verification is required to be performed any time a control rod is withdrawn to the "full out" position (notch position 48) or prior to declaring the control rod OPERABLE after work on the control rod or CRD System that could affect coupling. This includes control rods inserted one notch and then returned to the "full out" position during the performance of SR 4.3.A.2. This Frequency is acceptable, considering the low probability that a control rod will become uncoupled when it is not being moved and operating experience related to uncoupling events.

BASES: 3.3 & 4.3 (Cont'd)

2. The control rod housing support restricts the outward movement of a control rod to less than 3 inches in the extremely remote event of a housing failure. The amount of reactivity which could be added by this small amount of rod withdrawal, which is less than a normal single withdrawal increment, will not contribute to any damage of the primary coolant system. The design basis is given in Subsection 3.5.2 of the FSAR, and the design evaluation is given in Subsection 3.5.4. This support is not required if the reactor coolant system is at atmospheric pressure since there would then be no driving force to rapidly eject a drive housing.

3. In the course of performing normal startup and shutdown procedures, a pre-specified sequence for the withdrawal or insertion of control rods is followed. Control rod dropout accidents which might lead to significant core damage, cannot occur if this sequence of rod withdrawals or insertions is followed. The Rod Worth Minimizer restricts withdrawals and insertions to those listed in the pre-specified sequence and provides an additional check that the reactor operator is following prescribed sequence. Although beginning a reactor startup without having the RWM operable would entail unnecessary risk, continuing to withdraw rods if the RWM fails subsequently is acceptable if a second licensed operator verifies the withdrawal sequence. Continuing the startup increases core power, reduces the rod worth and reduces the consequences of dropping any rod. Withdrawal of rods for testing is permitted with the RWM inoperable, if the reactor is subcritical and all other rods are fully inserted. Above 20% power, the RWM is not needed since even with a single error an operator cannot withdraw a rod with sufficient worth, which if dropped, would result in anything but minor consequences.

4. Refer to the "General Electric Standard Application for Reactor Fuel (GESTAR II)," NEDE-24011-P-A, (the latest NRC-approved version will be listed in the COLR).

5. The Source Range Monitor (SRM) system provides a scram function in noncoincident configuration. It does provide the operator with a visual indication of neutron level. The consequences of reactivity accidents are a function of the initial neutron flux. The requirement of at least three counts per second assures that any transient, should it occur, begins at or above the initial value of 10^{-8} of rated power used in the analyses of transients from cold conditions. One operable SRM channel is adequate to monitor the approach to criticality, therefore, two operable SRM's are specified for added conservatism.

6. The action statement for TS 3.3.B.6 requires that the plant be placed in HOT SHUTDOWN within 12 hours if the required actions of TS 3.3.B.1 through 3.3.B.5 are not satisfied. This ensures that all insertable control rods are inserted and places the reactor in a condition that does not require the active function (i.e., scram) of the control rods. The allowed completion time of 12 hours is reasonable, based upon operating experience to reach HOT SHUTDOWN from full power in an orderly manner and without challenging plant systems.

BASES: 3.3 & 4.3 (Cont'd)

7. Periodic verification that the Scram Discharge Volume (SDV) drain and vent valves are maintained in the open position provides assurance that the SDV will be available to accept the water displaced from the control rod drives in the event of a scram.

C. Scram Insertion Times

BACKGROUND

The scram function of the Control Rod Drive (CRD) System controls reactivity changes during abnormal operational transients to ensure that specified acceptable fuel design limits are not exceeded. The control rods are scrammed by positive means using hydraulic pressure exerted on the CRD piston.

When a scram signal is initiated, control air is vented from the scram valves, allowing them to open by spring action. Opening the exhaust valve reduces the pressure above the main drive piston to atmospheric pressure, and opening the inlet valve applies the accumulator or reactor pressure to the bottom of the piston. Since the notches in the index tube are tapered on the lower edge, the collet fingers are forced open by cam action, allowing the index tube to move upward without restriction because of the high differential pressure across the piston. As the drive moves upward and the accumulator pressure reduces below the reactor pressure, a ball check valve opens, letting the reactor pressure complete the scram action. If the reactor pressure is low, such as during startup, the accumulator will fully insert the control rod in the required time without assistance from reactor pressure.

APPLICABLE SAFETY ANALYSES

The Design Basis Accident (DBA) and transient analyses assume that all of the control rods scram at a specified insertion rate. The resulting negative scram reactivity forms the basis for the determination of plant thermal limits (e.g., MCPR). Other distributions of scram times (e.g., several control rods scramming slower than the average time with several control rods scramming faster than the average time) can also provide sufficient scram reactivity. Surveillance of each individual control rod's scram time ensures the scram reactivity assumed in the DBA and transient analyses can be met.

The scram function of the CRD System protects the MCPR Safety Limit (SL) (reference TS 1.1.A, "Bundle Safety Limit (Reactor Pressure >800 psia and Core Flow >10% of Rated)," and TS 3.11.C, "Minimum Critical Power Ratio (MCPR)") and the 1% cladding plastic strain fuel design limit (reference specification 3.11.A, "Average Planar Linear Heat Generation Rate (APLHGR)"), which ensure that no fuel damage will occur if these limits are not exceeded. Above 800 psig, the scram function is designed to insert negative reactivity at a rate fast enough to prevent the actual MCPR from becoming less than the MCPR SL, during the analyzed limiting power transient. Below 800 psig, the scram function is assumed to perform during the control rod drop accident (Reference 1) and, therefore, also provides protection against violating fuel damage limits during reactivity insertion accidents (Reference TS 3.3.B.3 and 3.3.B.4, regarding the Rod Worth Minimizer and control rod patterns). For the reactor vessel overpressure protection analysis, the scram function, along with the safety/relief valves, ensure that the peak vessel pressure is maintained within the applicable ASME Code limits.

Control rod scram times satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

BASES: 3.3 & 4.3 (Cont'd)

LCO

The scram times specified in Table 4.3.C-1 (in the accompanying LCO) are required to ensure that the scram reactivity assumed in the DBA and transient analysis is met (Reference 2). To account for single failures and "slow" scramming control rods, the scram times specified in Table 4.3.C-1 are faster than those assumed in the design basis analysis. The scram times have a margin that allows up to approximately 7% of the control rods (e.g., 89 x 7% ≈ 6) to have scram times exceeding the specified limits (i.e., "slow" control rods) assuming a single stuck control rod (as limited by TS 3.3.A. "Reactivity Limitations") and an additional control rod failing to scram per the single failure criterion. The scram times are specified as a function of reactor steam dome pressure to account for the pressure dependence of the scram times. The scram times are specified relative to measurements based on reed switch positions, which provide the control rod position indication. The reed switch closes ("pickup") when the index tube passes a specific location and then opens ("dropout") as the index tube travels upward. Verification of the specified scram times in Table 4.3.C-1 is accomplished through measurement of the "dropout" times. To ensure that local scram reactivity rates are maintained within acceptable limits, no more than two of the allowed "slow" control rods may occupy adjacent locations.

Table 4.3.C-1 is modified by two Notes which state that control rods with scram times not within the limits of the Table are considered "slow" and that control rods with scram times > 7 seconds are considered inoperable as required by SR 4.3.C.2. Slow scramming control rods may be conservatively declared inoperable and not accounted for as "slow" control rods.

APPLICABILITY

In STARTUP and RUN MODES, a scram is assumed to function during transients and accidents analyzed for these plant conditions. These events are assumed to occur during startup and power operation; therefore, the scram function of the control rods is required during these MODES. In SHUTDOWN, the control rods are not able to be withdrawn since the reactor mode switch is in shutdown and a control rod block is applied. This provides adequate requirements for control rod scram capability during these conditions. In REFUELING, only one control rod is able to be withdrawn. Additional restrictions and requirements when in REFUELING can be found in TS 3.12 "Refueling and Spent Fuel Handling."

REQUIRED ACTIONS

TS 3.3.C.3

When the requirements of TS 3.3.C.1 are not met, the rate of negative reactivity insertion during a scram may not be within the assumptions of the safety analyses. Therefore, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least the HOT SHUTDOWN condition within 12 hours. The allowed completion time of 12 hours is reasonable, based on operating experience, to reach the SHUTDOWN MODE from full power conditions in an orderly manner and without challenging plant systems.

BASES: 3.3 & 4.3 (Cont'd)

TS 3.3.C.4

Specification 3.3.C.2 requires that no operable control rod have a scram time greater than 7 seconds. TS 3.3.C.4 requires that for control rods that do not satisfy the 7 second requirement, that they be considered inoperable. In addition, the subject control rod must be fully inserted into the core within 3 hours and (electrically or hydraulically) disarmed within the following 4 hours. Inserting a control rod ensures the shutdown and scram capabilities are not adversely affected. The control rod is disarmed to prevent inadvertent withdrawal during subsequent operations. The control rods can be hydraulically disarmed by closing the drive water and exhaust water isolation valves. The control rods can be electrically disarmed by disconnecting power from all four directional control valve solenoids. The allowed completion times are reasonable, considering the small number of allowed inoperable control rods, and provide time to insert and disarm the control rods in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS (SR)

The four surveillances of SR 4.3.C.1 are modified by a Note stating that during a single control rod scram time surveillance, the CRD pumps shall be isolated from the associated scram accumulator. With the CRD pump isolated, (i.e., charging valve closed) the influence of the CRD pump head does not affect the single control rod scram times. During a full core scram, the CRD pump head would be seen by all control rods and would have a negligible effect on the scram insertion times.

SR 4.3.C.1.a

The scram reactivity used in DBA and transient analyses is based on an assumed control rod scram time. Measurement of the scram times with reactor steam dome pressure ≥ 800 psig demonstrates acceptable scram times for the transients analyzed.

Maximum scram insertion times occur at a reactor steam dome pressure of approximately 800 psig because of the competing effects of reactor steam dome pressure and stored accumulator energy. Therefore, demonstration of adequate scram times at reactor steam dome pressure ≥ 800 psig ensures that the measured scram times will be within the specified limits at higher pressures. Limits are specified as a function of reactor pressure to account for the sensitivity of the scram insertion times with pressure and to allow a range of pressures over which scram time testing can be performed. To ensure that scram time testing is performed within a reasonable time following a shutdown ≥ 120 days or longer, control rods are required to be tested before exceeding 30% RTP following the shutdown. This frequency is acceptable considering the additional surveillances performed for control rod OPERABILITY, the frequent verification of adequate accumulator pressure, and the required testing of control rods affected by fuel movement within the associated core cell and by work on control rods or the CRD System.

SR 4.3.C.1.b

Additional testing of a sample of control rods is required to verify the continued performance of the scram function during the cycle. A representative sample contains at least 10% of the control rods. The sample remains representative if no more than 7.5% of the control rods in the sample tested are determined to be "slow." With more than 7.5% of the sample declared to be "slow" per the criteria in Table 4.3.C-1, additional control rods are tested until this 7.5% criterion (e.g., 7.5% of the entire sample size) is satisfied, or until the total number of "slow" control rods (throughout the core, from all surveillances) exceeds the LCO limit. For planned testing, the control rods selected for the sample should be different for each test. Data from inadvertent scrams should be used whenever possible to avoid unnecessary testing at power, even if the control rods with data may have been previously tested in a sample. The 200 day Frequency is based on operating experience that has shown control rod scram times do not significantly change over an operating cycle. This Frequency is also reasonable based on the additional Surveillances done on the CRDs at more frequent intervals in accordance with SR 4.3.A.2 "Notch Testing" and SR 4.3.D, "Control Rod Accumulators."

SR 4.3.C.1.c
When work that could affect the scram insertion time is performed on a control rod or the CRD System, testing must be done to demonstrate that each affected control rod retains adequate scram performance over the range of applicable reactor pressures from zero to the maximum permissible pressure. The scram testing must be performed once before declaring the control rod OPERABLE. The required scram time testing must demonstrate the affected control rod is still within acceptable limits. The limits for reactor pressures < 800 psig are established based on a high probability of meeting the acceptance criteria at reactor pressures ≥ 800 psig. Limits for ≥ 800 psig are found in Table 4.3.C-1. If testing demonstrates the affected control rod does not meet these limits, but is within the 7 second limit of Table 4.3.C-1, Note 2, the control rod can be declared OPERABLE and "slow."

Specific examples of work that could affect the scram times are (but are not limited to) the following: removal of any CRD for maintenance or modification; replacement of a control rod; and maintenance or modification of a scram solenoid pilot valve, scram valve, accumulator, isolation valve or check valve in the piping required for scram.

The Frequency of once prior to declaring the affected control rod OPERABLE is acceptable because of the capability to test the control rod over a range of operating conditions and the more frequent surveillances on other aspects of control rod OPERABILITY.

SR 4.3.C.1.d
When work that could affect the scram insertion time is performed on a control rod or CRD System, or when fuel movement within the reactor pressure vessel occurs, testing must be done to demonstrate each affected control rod is still within the limits of Table 4.3.C-1 with the reactor steam dome pressure ≥ 800 psig. Where work has been performed at high reactor pressure, the requirements of SR 4.3.C.1.c and SR 4.3.C.1.d can be satisfied with one test. For a control rod affected by work performed while shut down, however, a zero pressure and high pressure test may be required. This testing ensures that, prior to withdrawing the control rod for continued operation; the control rod scram performance is acceptable for operating reactor pressure conditions. Alternatively, a control rod scram test during hydrostatic pressure testing could also satisfy both criteria. When fuel movement within the reactor pressure vessel occurs, only those control rods associated with the core cells affected by the fuel movement are required to be scram time tested. During a routine refueling outage, it is expected that all control rods will be affected.

The Frequency of once prior to exceeding 30% RTP is acceptable because of the capability to test the control rod over a range of operating conditions and the more frequent surveillances on other aspects of control rod OPERABILITY.

SR 4.3.C.2
Verifying that the scram time for each control rod to notch position 04 is ≤ 7 seconds provides reasonable assurance that the control rod will insert when required during a DBA or transient, thereby completing its shutdown function. This SR is performed in conjunction with the control rod scram time testing of SR 4.3.C.1.a, SR 4.3.C.1.b,

BASES: 3.3 & 4.3 (Cont'd)

SR 4.3.C.1.c, and SR 4.3.C.1.d. The associated Frequencies are acceptable, considering the more frequent testing performed to demonstrate other aspects of control rod OPERABILITY and operating experience, which shows scram times do not significantly change over an operating cycle.

REFERENCES

1. NEDE-24011-P-A-9, "General Electric Standard Application for Reactor Fuel," Section 3.2.4.1, September 1988.
2. Letter from R.F. Janecek (BWROG) to R.W. Starostecki (NRC), "BWR Owners Group Revised Reactivity Control System Technical Specifications," BWROG-8754, dated September 17, 1987.

D. Control Rod Accumulators

BACKGROUND

The control rod scram accumulators are part of the Control Rod Drive (CRD) System and are provided to ensure that the control rods scram under varying reactor conditions. The control rod scram accumulators store sufficient energy to fully insert a control rod at any reactor vessel pressure. The accumulator is a hydraulic cylinder with a free floating piston. The piston separates the water used to scram the control rods from the nitrogen, which provides the required energy. The scram accumulators are necessary to scram the control rods within the required insertion times of LCO 3.3.C, "Scram Insertion Times."

APPLICABLE SAFETY ANALYSES

The Design Basis Accident (DBA) and transient analyses assume that all of the control rods scram at a specified insertion rate. OPERABILITY of each individual control rod scram accumulator, along with LCO 3.3.A.2, "Reactivity Margin - Inoperable Control Rods," LCO 3.3.B "Control Rods," and LCO 3.3.C, ensures that the scram reactivity assumed in the DBA and transient analyses can be met. The existence of an inoperable accumulator may invalidate prior scram time measurements for the associated control rod.

The scram function of the CRD System, and therefore the OPERABILITY of the accumulators, protects the MCPR Safety Limit (reference TS 1.1.A, "Bundle Safety Limit (Reactor Pressure >800 psia and Core Flow >10% of Rated)," and TS 3.11.C, "Minimum Critical Power Ratio (MCPR)") and 1% cladding plastic strain fuel design limit (reference specification 3.11.A, "Average Planar Linear Heat Generation Rate (APLHGR),") and TS 3.11.B, "Linear Heat Generation Rate (LHGR)"), which ensure that no fuel damage will occur if these limits are not exceeded. In addition, the scram function at low reactor vessel pressure (i.e., startup conditions) provides protection against violating fuel design limits during reactivity insertion accidents (Reference TS 3.3.B.3 and 3.3.B.4, regarding the Rod Worth Minimizer and control rod patterns).

Control rod scram accumulators satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

BASES: 3.3 & 4.3 (Cont'd)

LCO

The OPERABILITY of the control rod scram accumulators is required to ensure that adequate scram insertion capability exists when needed over the entire range of reactor pressures. The OPERABILITY of the scram accumulators is based on maintaining adequate accumulator pressure.

APPLICABILITY

In STARTUP and RUN MODES, the scram function is required for mitigation of DBAs and transients, and therefore the scram accumulators must be OPERABLE to support the scram function. In SHUTDOWN, control rods are not allowed to be withdrawn since the reactor mode switch is in shutdown and a control rod block is applied. This provides adequate requirements for control rod scram accumulator OPERABILITY during these conditions. In REFUELING, only one control rod is able to be withdrawn. Additional restrictions and requirements when in REFUELING can be found in TS 3.12 "Refueling and Spent Fuel Handling."

REQUIRED ACTIONS

The required actions of TS 3.3.D is modified by a Note indicating that a separate condition entry is allowed for each control rod scram accumulator. This is acceptable since the required actions for each condition provide appropriate compensatory actions for each inoperable accumulator. Complying with the Required Actions may allow for continued operation.

1.a and 1.b
With one control rod scram accumulator inoperable and the reactor steam dome pressure ≥ 800 psig, the control rod may be declared "slow," since the control rod will still scram at the reactor operating pressure but may not satisfy the required scram times in Table 4.3.C-1. Required action 1.a is modified by a Note indicating that declaring the control rod "slow" only applies if the associated control scram time was within the limits of Table 4.3.C-1 during the last scram time test. Otherwise, the control rod would already be considered "slow" and the further degradation of scram performance with an inoperable accumulator could result in excessive scram times. In this event, the associated control rod is declared inoperable (required action 1.b) and LCO 3.3.C.4 is entered. This would result in requiring the affected control rod to be fully inserted and disarmed, thereby satisfying its intended function.

The allowed Completion Time of 8 hours is reasonable, based on the large number of control rods available to provide the scram function and the ability of the affected control rod to scram only with reactor pressure at high reactor pressures.

2.a, 2.b.1 and 2.b.2
With two or more control rod scram accumulators inoperable and reactor steam dome pressure ≥ 800 psig, adequate pressure must be supplied to the charging water header. With inadequate charging water header pressure, all of the accumulators could become inoperable, resulting in a potentially severe degradation of the scram performance. Therefore, within 20 minutes from discovery of charging water header pressure < 940 psig concurrent with condition 2, adequate charging water header pressure must be restored. The allowed completion time of 20 minutes is reasonable, to place a CRD pump into service to restore the charging header pressure, if required. This completion time is based on the ability of the reactor pressure alone to fully insert all control rods.

The control rod may be declared "slow," since the control rod will still scram using only reactor pressure, but may not satisfy the times in Table 4.3.C-1. Required action 2.b.1 is modified by a Note indicating that declaring the control rod "slow" only applies if the associated control scram time is within the limits of Table 4.3.C-1 during the last scram time test. Otherwise, the control rod would already be considered "slow" and the further degradation of scram performance with an inoperable accumulator could result in excessive scram times. In this event, the associated control rod is declared inoperable (required action 2.b.2) and LCO 3.3.C.4 entered. This would result in requiring the affected control rod to be fully inserted and disarmed, thereby satisfying its intended function.

The allowed completion time of 1 hour is reasonable, based on the ability of only the reactor pressure to scram the control rods and the low probability of a DBA or transient occurring while the affected accumulators are inoperable.

3.a and 3.b

With one or more control rod scram accumulators inoperable and the reactor steam dome pressure < 800 psig, the pressure supplied to the charging water header must be adequate to ensure that accumulators remain charged. With the reactor steam dome pressure < 800 psig, the function of the accumulators in providing the scram force becomes much more important since the scram function could become severely degraded during a depressurization event or at low reactor pressures. Therefore, immediately upon discovery of charging water header pressure < 940 psig, concurrent with condition 3, all control rods associated with inoperable accumulators must be verified to be fully inserted. Withdrawn control rods with inoperable accumulators may fail to scram under these low pressure conditions. The associated control rods must also be declared inoperable within 1 hour. The allowed completion time of 1 hour is reasonable for required action 3.b, considering the low probability of a DBA or transient occurring during the time that the accumulator is inoperable.

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The reactor mode switch must be placed in the shutdown position within 1 hour if either required action and associated completion time associated with loss of the CRD charging pump (required actions 2.a and 3.a) cannot be met. Placing the mode switch in the shutdown position ensures that all insertable control rods are inserted and that the reactor would then be in a condition that does not require the active function (i.e., scram) of the control rods. This required action is modified by a Note stating that the action is not applicable if all control rods associated with the inoperable scram accumulators are fully inserted, since the function of the control rods has been performed.

SURVEILLANCE REQUIREMENTS

SR 4.3.D

SR 4.3.D requires that the accumulator pressure be checked every 7 days to ensure adequate accumulator pressure exists to provide sufficient scram force. The primary indicator of accumulator OPERABILITY is the accumulator pressure. A minimum accumulator pressure is specified, below which the capability of the accumulator to perform its intended function becomes degraded and the accumulator is considered inoperable. The minimum accumulator pressure of 940 psig is well below the expected pressure of 1100 psig. Declaring the accumulator inoperable when the minimum pressure is not maintained ensures that significant degradation in scram times does not occur. The 7 day frequency has been shown to be acceptable through operating experience and takes into account indications available in the control room.

BASES: 3.3 & 4.3 (Cont'd)

E. Reactivity Anomalies

During each fuel cycle, excess operating reactivity varies as fuel depletes and as any burnable poison in supplementary control is burned. The magnitude of this excess reactivity may be inferred from the critical rod configuration. As fuel burnup progresses, anomalous behavior in the excess reactivity may be detected by comparison of the critical rod pattern selected base states to the predicted rod inventory at that state. Power operation base conditions provide the most sensitive and directly interpretable data relative to core reactivity. Furthermore, using power operating base conditions permits frequent reactivity comparisons. Reactivity anomaly is used as a measure of the predicted versus measured core reactivity during power operation. If the measured and predicted rod density for identical core conditions at BOC do not reasonably agree, then the assumptions used in the reload cycle design analysis or the calculation models used to predict rod density may not be accurate. If reasonable agreement between measured and predicted core reactivity exists at BOC, then the prediction may be normalized to the measured value. Requiring a reactivity comparison at the specified frequency assures that a comparison will be made before the core reactivity change exceeds 1% $\Delta k/k$. Deviations in core reactivity greater than 1% $\Delta k/k$ are not expected and require thorough evaluation. One percent reactivity limit is considered safe since an insertion of the reactivity into the core would not lead to transients exceeding design conditions of the Reactor System.