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February 24, 2009
BVY 09-014

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

Reference: (1) Letter, USNRC to Entergy, "Issuance of Amendment, Control Rod Systems (TAC No. MD8070)," NVY 09-001, dated January 7, 2009

Subject: Vermont Yankee Nuclear Power Station
License No. DPR-28 (Docket No. 50-271)
Revision of Technical Specification Bases Pages

Dear Sir or Madam,

This letter provides revised Vermont Yankee Technical Specification (TS) Bases. The Vermont Yankee Operating License was revised by License Amendment No. 233 (Reference 1) and implemented on February 19, 2009.

These changes, processed in accordance with our Technical Specification Bases Control Program (TS 6.7.E), were determined not to require prior NRC approval. The revised Bases pages are provided for your information and for updating your copy of Vermont Yankee Technical Specifications. No NRC action is required in conjunction with this submittal.

There are no new regulatory commitments being made in this submittal.

Should you have any questions concerning this submittal, please contact Mr. David J. Mannai at (802) 451-3304.

Sincerely,

JM DeVincentis for

David J. Mannai
Licensing Manager
Vermont Yankee Nuclear Power Station

Attachment (12 pages)
cc listing (next page)

A001
NRR

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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.

BASES: 3.3 & 4.3 (Cont'd)

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, 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 not 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 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 monthly 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 17% 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 40% 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.

BASES: 3.3 & 4.3 (Cont'd)

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.

BASES: 3.3 & 4.3 (Cont'd)

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 40% 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 06 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.

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."

BASES: 3.3 & 4.3 (Cont'd)

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 "Scram Insertion Times", 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.

BASES: 3.3 & 4.3 (Cont'd)

TS 3.3.D.1.a and 1.b

With one control rod scram accumulator inoperable and the reactor steam dome pressure ≥ 900 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.

TS 3.3.D.2.a, 2.b.1 and 2.b.2

With two or more control rod scram accumulators inoperable and reactor steam dome pressure ≥ 900 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.

BASES: 3.3 & 4.3 (Cont'd)

TS 3.3.D.3.a and 3.b

With one or more control rod scram accumulators inoperable and the reactor steam dome pressure < 900 psig, the pressure supplied to the charging water header must be adequate to ensure that accumulators remain charged. With the reactor steam dome pressure < 900 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.

TS 3.3.D.4

The reactor must be shutdown immediately 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. Shutting down the reactor 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 gas pressure exists to provide sufficient scram force. The primary indicator of accumulator OPERABILITY is the accumulator gas pressure. A minimum accumulator gas 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 gas pressure of 940 psig is well below the expected pressure of 1100 psig. Declaring the accumulator inoperable when the minimum gas 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.