JAFNPP

IMPROVED STANDARD TECHNICAL SPECIFICATIONS (ISTS) CONVERSION

ITS: 3.3.1.1

Reactor Protection System (RPS) Instrumentation

MARKUP OF NUREG-1433, REVISION 1, BASES

B 3.3 INSTRUMENTATION

B 3.3.1.1 Reactor Protection System (RPS) Instrumentation

BASES

BACKGROUND

The RPS initiates a reactor scram when one or more monitored parameters exceed their specified limits, to preserve the integrity of the fuel cladding and the Reactor Coolant System (RCS) and minimize the energy that must be absorbed following a loss of coolant accident (LOCA). This can be accomplished either automatically or manually.

The protection and monitoring functions of the RPS have been designed to ensure safe operation of the reactor. This is achieved by specifying limiting safety system settings (LSSS) in terms of parameters directly monitored by the RPS, as well as LCOs on other reactor system parameters and equipment performance. The LSSS are defined in this Specification as the Allowable Values, which, in conjunction with the LCOs, establish the threshold for protective system action to prevent exceeding acceptable limits, including Safety Limits (SLs) during Design Basis Accidents (DBAs).

The RPS, as shown in the FSAR, Figure [ ] (Ref. 1), includes sensors, relays, bypass circuits, and switches that are necessary to cause initiation of a reactor scram. Functional diversity is provided by monitoring a wide range of dependent and independent parameters. The input parameters to the scram logic are from instrumentation that monitors reactor vessel water level, reactor vessel pressure, neutron flux, main steam line isolation valve position, turbine control valve (TCV) fast closure, trip oil pressure, turbine stop valve (TSV) position, drywell pressure, and scram discharge volume (SDV) water level, as well as reactor mode switch in shutdown position and manual scram signals. There are at least four redundant sensor input signals from each of these parameters (with the exception of the reactor mode switch in shutdown, scram signal). Most channels include electronic equipment (e.g., trip units) that compares measured input signals with pre-established setpoints. When the setpoint is exceeded, the channel output relay actuates, which then outputs an RPS trip signal to the trip logic. Table B 3.3.1.1-1 summarizes the diversity of sensors capable of initiating scrams during anticipated operating transients typically analyzed.

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TA4

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Technical Specifications are required by 10 CFR 50.36 to contain LSSS defined by the regulation as "...settings for automatic protective devices...so chosen that automatic protective action will correct the abnormal situation before a Safety Limit (SL) is exceeded." The Analytic Limit is the limit of the process variable at which a safety action is initiated, as established by the safety analysis, to ensure that a SL is not exceeded. Any automatic protection action that occurs on reaching the Analytic Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protective devices must be chosen to be more conservative than the Analytic Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur.

The Trip Setpoint is a predetermined setting or a protective device chosen to ensure automatic actuation prior to the process variable reaching the Analytic Limit and thus ensuring the SL would not be exceeded. As such, the Trip Setpoint accounts for uncertainties in setting the device (e.g., calibration), uncertainties in how the device might actually perform (e.g., repeatability), changes in the point of action of the device over time (e.g., drift during surveillance intervals), and any other factors which may influence its actual performance (e.g., harsh accident environments). In this manner, the Trip Setpoint plays an important role in ensuring that SLs are not exceeded. As such, the Trip Setpoint meets the definition of an LSSS (Ref. [illegible]) and could be used to meet the requirement that they be contained in the Technical Specifications. PA3

Technical Specifications contain values related to the OPERABILITY of equipment required for the safe operation of the facility. Operable is defined in Technical Specifications as "...being capable of performing its safety function(s)." For automatic protective devices, the required safety function is to ensure that a SL is not exceeded and therefore the LSSS as defined by 10 CFR 50.36 is the same as the OPERABILITY limit for those devices. However, use of the Trip Setpoint to define OPERABILITY in Technical Specifications and its corresponding designation as the LSSS required by 10 CFR 50.36 would be an overly restrictive requirement if it were applied as an OPERABILITY limit for the "as found" value of a protective device setting during a surveillance. This would result in Technical Specification compliance problems, as well as reports and corrective actions required by the rule which are not necessary to ensure safety. For example, an automatic protective device with a setting that has been found to be different from the Trip Setpoint due to some drift of the setting may still be OPERABLE since drift is to be expected. This expected drift would have been specifically accounted for in the setpoint methodology for calculating the Trip Setpoint and thus the automatic protective action would still have ensured that the SL would not be exceeded with the "as found" setting of the protective device. Therefore, the device would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the device to the Trip Setpoint to account for further drift during the next surveillance interval.

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(TA4) INSERT BKGD-2 (continued)

Use of the Trip Setpoint to define "as found" OPERABILITY and its designation as the LSSS under the expected circumstances described above would result in actions required by both the rule and Technical Specifications that are clearly not warranted. However, there is also some point beyond which the device would have not been able to perform its function due, for example, to greater than expected drift. This value needs to be specified in the Technical Specifications in order to define OPERABILITY of the devices and is designated as the Allowable Value which, as stated above, is the same as the LSSS.

The Allowable Values specified in Table 3.3.1.1-1 serves (PA3) as the LSSS such that a channel is OPERABLE if the trip setpoint is found not to exceed the Allowable Value. As such, the Allowable Value differs from the Trip Setpoint by an amount primarily equal to the expected instrument loop uncertainties, such as drift, during the surveillance interval. In this manner, the actual setting of the device will still meet the LSSS definition and ensure that a Safety Limit is not exceeded at any given point of time as long as the device has not drifted beyond that expected during the surveillance interval. If the actual setting of the device is found to have exceeded the Allowable Value the device would be considered inoperable from a Technical Specification perspective. This requires corrective action including those actions required by 10 CFR 50.36 when automatic protective devices do not function as required. Note that, although the channel is "OPERABLE" under these circumstances, the trip setpoint should be left adjusted to a value within the established trip setpoint calibration tolerance band, in accordance with uncertainty assumptions stated in the referenced setpoint methodology (as-left criteria), and confirmed to be operating within the statistical allowance of the uncertainty terms assigned.

BASES

BACKGROUND (continued)

The RPS is comprised of two independent trip systems (A and B) with two logic channels in each trip system (logic channels A1 and A2, B1 and B2) as shown in Reference 1. The outputs of the logic channels in a trip system are combined in a one-out-of-two logic so that either channel can trip the associated trip system. The tripping of both trip systems will produce a reactor scram. This logic arrangement is referred to as a one-out-of-two taken twice logic. Each trip system can be reset by use of a reset switch. If a full scram occurs (both trip systems trip), a relay prevents reset of the trip systems for 10 seconds after the full scram signal is received. This 10 second delay on reset ensures that the scram function will be completed.

Trip channels A1, A2, B1 and B2 contain automatic protective instrument logic. The above monitored parameters are represented by at least one input to each of these automatic trip channels.

INSERT BKGD-1

Two scram pilot valves are located in the hydraulic control unit for each control rod drive (CRD). Each scram pilot valve is solenoid operated, with the solenoids normally energized. The scram pilot valves control the air supply to the scram inlet and outlet valves for the associated CRD. When either scram pilot valve solenoid is energized, air pressure holds the scram valves closed and, therefore, both scram pilot valve solenoids must be de-energized to cause a control rod to scram. The scram valves control the supply and discharge paths for the CRD water during a scram. One of the scram pilot valve solenoids for each CRD is controlled by trip system A, and the other solenoid is controlled by trip system B. Any trip of trip system A in conjunction with any trip in trip system B results in de-energizing both solenoids, air bleeding off, scram valves opening, and control rod scram.

The backup scram valves, which energize on a scram signal to depressurize the scram air header, are also controlled by the RPS. Additionally, the RPS System controls the SDV vent and drain valves such that when both trip systems trip, the SDV vent and drain valves close to isolate the SDV.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

The actions of the RPS are assumed in the safety analyses of References 1, 2, and 3. The RPS initiates a reactor scram when monitored parameter values exceed the Allowable Values, specified by the setpoint methodology and listed in Table 3.3.1.1-1 to preserve the integrity of the fuel cladding, the reactor coolant pressure boundary (RCPB), and

(continued)

DB1

INSERT BKGD-1

There are four RPS channel test switches, one associated with each of the four automatic trip channels. These test switches allow the operator to test the OPERABILITY of the individual trip channel automatic scram contractors. In addition, trip channels A3 and B3 (one trip channel per trip system) are provided for manual scram. Placing the reactor mode switch in shutdown position or depressing both channel push buttons (one per trip system) will initiate the manual trip function.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

the containment by minimizing the energy that must be absorbed following a LOCA.

RPS instrumentation satisfies Criterion 3 of the NRC Policy Statement. Functions not specifically credited in the accident analysis are retained for the overall redundancy and diversity of the RPS as required by the NRC approved licensing basis.

The OPERABILITY of the RPS is dependent on the OPERABILITY of the individual instrumentation channel Functions specified in Table 3.3.1.1-1. Each Function must have a required number of OPERABLE channels per RPS trip system, with their setpoints within the specified Allowable Value, where appropriate. The actual setpoint is calibrated consistent with applicable setpoint methodology assumptions. Each channel must also respond within its assumed response time.

Allowable Values are specified for each RPS Function specified in the Table. Nominal trip setpoints are specified in the setpoint calculations. The nominal setpoints are selected to ensure that the actual setpoints do not exceed the Allowable Value between successive CHANNEL CALIBRATIONS. Operation with a trip setpoint less conservative than the nominal trip setpoint, but within its Allowable Value, is acceptable. A channel is inoperable if its actual trip setpoint is not within its required Allowable Value.

Trip setpoints are those predetermined values of output at which an action should take place. The setpoints are compared to the actual process parameter (e.g., reactor vessel water level), and when the measured output value of the process parameter exceeds the setpoint, the associated device (e.g., trip unit) changes state. The analytic limits are derived from the limiting values of the process parameters obtained from the safety analysis. The Allowable Values are derived from the analytic limits, corrected for calibration, process, and some of the instrument errors. The trip setpoints are then determined accounting for the remaining instrument errors (e.g., drift). The trip setpoints derived in this manner provide adequate protection because instrumentation uncertainties, process effects, calibration tolerances, instrument drift, and severe

(continued)

DB5 INSERT ASA

The trip setpoints are derived from the analytical limits and account for all worst case instrumentation uncertainties as appropriate (e.g., drift, process effects, calibration uncertainties, and severe environmental errors (for channels that must function in harsh environments as defined by 10 CFR 50.49)). The trip setpoints derived in this manner provide adequate protection because all expected uncertainties are accounted for. The Allowable Values are then derived from the trip setpoints by accounting for normal effects that would be seen during periodic surveillance or calibration. These effects are instrumentation uncertainties observed during normal operation (e.g., drift and calibration uncertainties).

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BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

environment errors (for channels that must function in harsh environments as defined by 10 CFR 50.49) are accounted for.

The OPERABILITY of scram pilot valves and associated solenoids, backup scram valves, and SDV valves, described in the Background section, are not addressed by this LCO.

The individual Functions are required to be OPERABLE in the MODES specified in the table, which may require an RPS trip to mitigate the consequences of a design basis accident or transient. To ensure a reliable scram function, a combination of Functions are required in each MODE to provide primary and diverse initiation signals.

The RPS is required to be OPERABLE in MODE 5 with any control rod withdrawn from a core cell containing one or more fuel assemblies. Control rods withdrawn from a core cell containing no fuel assemblies do not affect the reactivity of the core and, therefore, are not required to have the capability to scram. Provided all other control rods remain inserted, the RPS function is not required. In this condition, the required SDM (LCO 3.1.1) and refuel position one-rod-out interlock (LCO 3.9.2) ensure that no event requiring RPS will occur. During normal operation in MODES 3 and 4, all control rods are fully inserted and the Reactor Mode Switch Shutdown Position control rod withdrawal block (LCO 3.3.2.1) does not allow any control rod to be withdrawn. Under these conditions, the RPS function is not required to be OPERABLE.

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

<u>Intermediate Range Monitor (IRM)</u>

<u>1.a. Intermediate Range Monitor Neutron Flux—High</u>

The IRMs monitor neutron flux levels from the upper range of the source range monitor (SRM) to the lower range of the average power range monitors (APRMs). The IRMs are capable of generating trip signals that can be used to prevent fuel damage resulting from abnormal operating transients in the intermediate power range. In this power range, the most significant source of reactivity change is due to control

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

1.a. Intermediate Range Monitor Neutron Flux—High (continued)

rod withdrawal. The IRM provides diverse protection for the rod worth minimizer (RWM), which monitors and controls the movement of control rods at low power. The RWM prevents the withdrawal of an out of sequence control rod during startup that could result in an unacceptable neutron flux excursion (Ref. 2). The IRM provides mitigation of the neutron flux excursion. To demonstrate the capability of the IRM System to mitigate control rod withdrawal events, generic analyses have been performed (Ref. 3) to evaluate the consequences of control rod withdrawal events during startup that are mitigated only by the IRM. This analysis, which assumes that one IRM channel in each trip system is bypassed, demonstrates that the IRMs provide protection against local control rod withdrawal errors and results in peak fuel energy depositions below the 170 cal/gm fuel failure threshold criterion.

The IRMs are also capable of limiting other reactivity excursions during startup, such as cold water injection events, although no credit is specifically assumed.

The IRM System is divided into two groups of IRM channels, with four IRM channels inputting to each trip system. The analysis of Reference 3 assumes that one channel in each trip system is bypassed. Therefore, six channels with three channels in each trip system are required for IRM OPERABILITY to ensure that no single instrument failure will preclude a scram from this Function on a valid signal. This trip is active in each of the 10 ranges of the IRM, which must be selected by the operator to maintain the neutron flux within the monitored level of an IRM range.

The analysis of Reference 3 has adequate conservatism to permit an IRM Allowable Value of 120 divisions of a 125 division scale.

The Intermediate Range Monitor Neutron Flux—High Function must be OPERABLE during MODE 2 when control rods may be withdrawn and the potential for criticality exists. In MODE 5, when a cell with fuel has its control rod withdrawn, the IRMs provide monitoring for and protection against unexpected reactivity excursions. In MODE 1, the APRM

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

1.a. Intermediate Range Monitor Neutron Flux—High (continued)

System and the RWM provide protection against control rod withdrawal error events and the IRMs are not required.

1.b. Intermediate Range Monitor—Inop

This trip signal provides assurance that a minimum number of IRMs are OPERABLE. Anytime an IRM mode switch is moved to any position other than "Operate," the detector voltage drops below a preset level, or when a module is not plugged in, an inoperative trip signal will be received by the RPS unless the IRM is bypassed. Since only one IRM in each trip system may be bypassed, only one IRM in each RPS trip system may be inoperable without resulting in an RPS trip signal.

This Function was not specifically credited in the accident analysis but it is retained for the overall redundancy and diversity of the RPS as required by the NRC approved licensing basis.

Six channels of Intermediate Range Monitor—Inop with three channels in each trip system are required to be OPERABLE to ensure that no single instrument failure will preclude a scram from this Function on a valid signal.

Since this Function is not assumed in the safety analysis, there is no Allowable Value for this Function.

This Function is required to be OPERABLE when the Intermediate Range Monitor Neutron Flux—High Function is required.

Average Power Range Monitor

2.a. Average Power Range Monitor Neutron Flux—High, Setdown

The APRM channels receive input signals from the local power range monitors (LPRMs) within the reactor core to provide an indication of the power distribution and local power changes. The APRM channels average these LPRM signals to provide a continuous indication of average reactor power from a few percent to greater than RTP. For operation at

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

2.a. Average Power Range Monitor Neutron Flux—High, Setdown (continued)

low power (i.e., MODE 2), the Average Power Range Monitor Neutron Flux—High, Setdown Function is capable of generating a trip signal that prevents fuel damage resulting from abnormal operating transients in this power range. For most operation at low power levels, the Average Power Range Monitor Neutron Flux—High, Setdown Function will provide a secondary scram to the Intermediate Range Monitor Neutron Flux—High Function because of the relative setpoints. With the IRMs at Range 9 or 10, it is possible that the Average Power Range Monitor Neutron Flux—High, Setdown Function will provide the primary trip signal for a corewide increase in power.

No specific safety analyses take direct credit for the Average Power Range Monitor Neutron Flux—High, Setdown Function. However, this Function indirectly ensures that before the reactor mode switch is placed in the run position, reactor power does not exceed 25% RTP (SL 2.1.1.1) when operating at low reactor pressure and low core flow. Therefore, it indirectly prevents fuel damage during significant reactivity increases with THERMAL POWER < 25% RTP.

The APRM System is divided into two groups of channels with three APRM channel inputs to each trip system. The system is designed to allow one channel in each trip system to be bypassed. Any one APRM channel in a trip system can cause the associated trip system to trip. Four channels of Average Power Range Monitor Neutron Flux—High, Setdown with two channels in each trip system are required to be OPERABLE to ensure that no single failure will preclude a scram from this Function on a valid signal. In addition, to provide adequate coverage of the entire core, at least 11 LPRM inputs are required for each APRM channel, with at least two LPRM inputs from each of the four axial levels at which the LPRMs are located.

The Allowable Value is based on preventing significant increases in power when THERMAL POWER is < 25% RTP.

The Average Power Range Monitor Neutron Flux—High, Setdown Function must be OPERABLE during MODE 2 when control rods may be withdrawn since the potential for criticality exists.

(continued)

(Startup) PA1

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

2.a. Average Power Range Monitor Neutron Flux—High Setdown (continued)

(Fixed) PA1

In MODE 1, the Average Power Range Monitor Neutron Flux—High Function provides protection against reactivity transients and the RWM and rod block monitor protect against control rod withdrawal error events.

The APRM Neutron Flux—High (Startup) Function is bypassed when the reactor mode switch is in the run position. DB1

2.b. Average Power Range Monitor Flow Biased Simulated Thermal Power—High

PA1 DB3 PA1 Neutron Flux—High

The Average Power Range Monitor Flow Biased Simulated Thermal Power—High Function monitors neutron flux to approximate the THERMAL POWER being transferred to the reactor coolant. The APRM neutron flux is electronically filtered with a time constant representative of the fuel heat transfer dynamics to generate a signal proportional to the THERMAL POWER in the reactor. The trip level is varied as a function of recirculation drive flow (i.e., at lower core flows, the setpoint is reduced proportional to the reduction in power experienced as core flow is reduced with a fixed control rod pattern) but is clamped at an upper limit that is always lower than the Average Power Range Monitor Fixed Neutron Flux—High Function Allowable Value. The Average Power Range Monitor Flow Biased Simulated Thermal Power—High Function provides protection against transients where THERMAL POWER increases slowly (such as the loss of feedwater heating event) and protects the fuel cladding integrity by ensuring that the MCPR SL is not exceeded. During these events, the THERMAL POWER increase does not significantly lag the neutron flux response and, because of a lower trip setpoint, will initiate a scram before the high neutron flux scram. For rapid neutron flux increase events, the THERMAL POWER lags the neutron flux and the Average Power Range Monitor Fixed Neutron Flux—High Function will provide a scram signal before the Average Power Range Monitor Flow Biased Simulated Thermal Power—High Function setpoint is exceeded.

DB3 PA2 , Function 2.c, PA1 DB3 DB3

Insert Function 2.b-1

The APRM System is divided into two groups of channels with four APRM inputs to each trip system. The system is designed to allow one channel in each trip system to be bypassed. Any one APRM channel in a trip system can cause the associated trip system to trip. Four channels of

DB1 three channels providing

(continued)

DB3 INSERT FUNCTION 2.b-1

however, no credit is taken for this Function in the safety analyses except in the case of the thermal-hydraulic instability analysis. This protection is primarily achieved by the clamped portion of the Allowable Value. The APRM Neutron Flux - High (Flow Biased) Function will suppress power oscillations prior to exceeding the fuel safety limit (MCPR) caused by thermal hydraulic instability. As described in References 5 and 6, this protection is provided at a high statistical confidence level for core-wide mode oscillations and at a nominal statistical confidence level for regional mode oscillations. References 5 and 6 also demonstrate that the core-wide mode of oscillation is more likely to occur due to the large single-phase channel pressure drop associated with the small fuel inlet orifice diameters. This protection for power oscillations is achieved by that portion of the Allowable Value which varies as a function of the recirculation drive flow.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

2.b. Average Power Range Monitor Flow Biased Simulated Thermal Power—High (continued)

Average Power Range Monitor Flow Biased Simulated Thermal Power—High with two channels in each trip system arranged in a one-out-of-two logic are required to be OPERABLE to ensure that no single instrument failure will preclude a scram from this Function on a valid signal. In addition, to provide adequate coverage of the entire core, at least 11 LPRM inputs are required for each APRM channel, with at least two LPRM inputs from each of the four axial levels at which the LPRMs are located. Each APRM channel receives two total drive flow signals representative of total core flow. The total drive flow signals are generated by four flow units, two of which supply signals to the trip system A APRMs, while the other two supply signals to the trip system B APRMs. Each flow unit signal is provided by summing up the flow signals from the two recirculation loops. To obtain the most conservative reference signals, the total flow signals from the two flow units (associated with a trip system as described above) are routed to a low auction circuit associated with each APRM. Each APRM's auction circuit selects the lower of the two flow unit signals for use as the scram trip reference for that particular APRM. Each required Average Power Range Monitor Flow Biased Simulated Thermal Power—High channel only requires an input from one OPERABLE flow unit, since the individual APRM channel will perform the intended function with only one OPERABLE flow unit input. However, in order to maintain single failure criteria for the Function, at least one required Average Power Range Monitor Flow Biased Simulated Thermal Power—High channel in each trip system must be capable of maintaining an OPERABLE flow unit signal in the event of a failure of an auction circuit, or a flow unit, in the associated trip system (e.g., if a flow unit is inoperable, one of the two required Average Power Range Monitor Flow Biased Simulated Thermal Power—High channels in the associated trip system must be considered inoperable).

The clamped Allowable Value is based on analyses that take credit for the Average Power Range Monitor Flow Biased Simulated Thermal Power—High Function for the mitigation of the loss of feedwater heating event. The THERMAL POWER time constant of < 7 seconds is based on the fuel heat transfer

(continued)

DB3

INSERT Function 2.b-1

The flow biased Allowable Value is credited in the safety analyses (thermal-hydraulic instability) and is specifically confirmed for each operating cycle. For this reason the Allowable Value is included in the COLR for both single and two recirculation loop operation. The clamped portion of the Allowable Value is set more conservative than the APRM Neutron Flux High (Fixed) (Function 2.c).

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

2.b. Average Power Range Monitor Flow Biased Simulated Thermal Power—High (continued)

dynamics and provides a signal proportional to the THERMAL POWER.

The Average Power Range Monitor Flow Biased Simulated Thermal Power—High Function is required to be OPERABLE in MODE 1 when there is the possibility of generating excessive THERMAL POWER and potentially exceeding the SL applicable to high pressure and core flow conditions (MCPR SL). During MODES 2 and 5, other IRM and APRM Functions provide protection for fuel cladding integrity.

2.c. Average Power Range Monitor Fixed Neutron Flux—High

The APRM channels provide the primary indication of neutron flux within the core and respond almost instantaneously to neutron flux increases. The Average Power Range Monitor Fixed Neutron Flux—High Function is capable of generating a trip signal to prevent fuel damage or excessive RCS pressure. For the overpressurization protection analysis of Reference 6, the Average Power Range Monitor Fixed Neutron Flux—High Function is assumed to terminate the main steam isolation valve (MSIV) closure event and, along with the safety/relief valves (S/RVs), limits the peak reactor pressure vessel (RPV) pressure to less than the ASME Code limits. The control rod drop accident (CRDA) analysis (Ref. 5) takes credit for the Average Power Range Monitor Fixed Neutron Flux—High Function to terminate the CRDA.

The APRM System is divided into two groups of channels with three APRM channels inputting to each trip system. The system is designed to allow one channel in each trip system to be bypassed. Any one APRM channel in a trip system can cause the associated trip system to trip. Four channels of Average Power Range Monitor Fixed Neutron Flux—High with two channels in each trip system arranged in a one-out-of-two logic are required to be OPERABLE to ensure that no single instrument failure will preclude a scram from this Function on a valid signal. In addition, to provide adequate coverage of the entire core, at least 11 LPRM inputs are required for each APRM channel, with at least two LPRM inputs from each of the four axial levels at which the LPRMs are located.

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BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

2.c. Average Power Range Monitor (Fixed) Neutron Flux—High (continued)

The Allowable Value is based on the Analytical Limit assumed in the CRDA analyses.

The Average Power Range Monitor (Fixed) Neutron Flux—High Function is required to be OPERABLE in MODE 1 where the potential consequences of the analyzed transients could result in the SLs (e.g., MCPR and RCS pressure) being exceeded. Although the Average Power Range Monitor (Fixed) Neutron Flux—High Function is assumed in the CRDA analysis which is applicable in MODE 2, the Average Power Range Monitor Neutron Flux—High, Setdown Function conservatively bounds the assumed trip and, together with the assumed IRM trips, provides adequate protection. Therefore, the Average Power Range Monitor (Fixed) Neutron Flux—High Function is not required in MODE 2.

2.d. Average Power Range Monitor—Downscale

This signal ensures that there is adequate Neutron Monitoring System protection if the reactor mode switch is placed in the run position prior to the APRMs coming on scale. With the reactor mode switch in run, an APRM downscale signal coincident with an associated Intermediate Range Monitor Neutron Flux—High or Inop signal generates a trip signal. This Function was not specifically credited in the accident analysis but it is retained for the overall redundancy and diversity of the RPS as required by the NRC approved licensing basis.

The APRM System is divided into two groups of channels with three inputs into each trip system. The system is designed to allow one channel in each trip system to be bypassed. Four channels of Average Power Range Monitor—Downscale with two channels in each trip system arranged in a one-out-of-two logic are required to be OPERABLE to ensure that no single failure will preclude a scram from this Function on a valid signal. The Intermediate Range Monitor Neutron Flux—High and Inop Functions are also part of the OPERABILITY of the Average Power Range Monitor—Downscale Function (i.e., if either of these IRM Functions cannot send a signal to the Average Power Range Monitor—Downscale Function, the associated Average Power Range Monitor—Downscale channel is considered inoperable).

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BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

2.d. Average Power Range Monitor—Downscale (continued)

The Allowable Value is based upon ensuring that the APRMs are in the linear scale range when transfers are made between APRMs and IRMs.

This Function is required to be OPERABLE in MODE 1 since this is when the APRMs are the primary indicators of reactor power.

CLB1

2.e. (d) Average Power Range Monitor—Inop

This signal provides assurance that a minimum number of APRMs are OPERABLE. Anytime an APRM mode (Operate - Calibrate) switch is moved to any position other than "Operate," an APRM module is unplugged, the electronic operating voltage is low, or the APRM has too few LPRM inputs (< 11), an inoperative trip signal will be received by the RPS, unless the APRM is bypassed. Since only one APRM in each trip system may be bypassed, only one APRM in each trip system may be inoperable without resulting in an RPS trip signal. This Function was not specifically credited in the accident analysis, but it is retained for the overall redundancy and diversity of the RPS as required by the NRC approved licensing basis. PA1 DB1 PA2

Four channels of Average Power (2) Range Monitor—Inop (3) with two channels in each trip system are required to be OPERABLE to ensure that no single failure will preclude a scram from this Function on a valid signal.

There is no Allowable Value for this Function.

This Function is required to be OPERABLE in the MODES where the APRM Functions are required.

3. Reactor Vessel Steam Dome Pressure—High PA1

An increase in the RPV (RCS) pressure during reactor operation compresses the steam voids and results in a positive reactivity insertion. This causes the neutron flux and THERMAL POWER transferred to the reactor coolant to increase, which could challenge the integrity of the fuel cladding and the RCPB. No specific safety analysis takes direct credit for this Function. However, the Reactor PA2

DB7: The Reactor Pressure - High Function is specifically credited in the safety analyses for the generator load reject and turbine trip events when initiated from low power levels (Refs. 9 and 10). At low power levels (e.g., below 29% RTP), the Turbine Stop Valve - Closure and Turbine Control Valve Fast Closure, EHC Oil Pressure - Low Functions are not required to be OPERABLE

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

3. Reactor Vessel Steam Dome Pressure—High (continued)

Vessel Steam Dome Pressure—High Function initiates a scram for transients that results in a pressure increase, counteracting the pressure increase by rapidly reducing core power. For the overpressurization protection analysis of Reference 8, reactor scram (the analyses conservatively assume scram on the Average Power Range Monitor Fixed Neutron Flux—High signal, not the Reactor Vessel Steam Dome Pressure—High signal), along with the S/RVs, limits the peak RPV pressure to less than the ASME Section III Code limits.

High reactor pressure signals are initiated from four pressure transmitters that sense reactor pressure. The Reactor Vessel Steam Dome Pressure—High Allowable Value is chosen to provide a sufficient margin to the ASME Section III Code limits during the event.

Four channels of Reactor Vessel Steam Dome Pressure—High Function, with two channels in each trip system arranged in a one-out-of-two logic, are required to be OPERABLE to ensure that no single instrument failure will preclude a scram from this Function on a valid signal. The Function is required to be OPERABLE in MODES 1 and 2 when the RCS is pressurized and the potential for pressure increase exists.

4. Reactor Vessel Water Level—Low, Level 3

Low RPV water level indicates the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. Therefore, a reactor scram is initiated at Level 3 to substantially reduce the heat generated in the fuel from fission. The Reactor Vessel Water Level—Low, Level 3 Function is assumed in the analysis of the recirculation line break (Ref. 6). The reactor scram reduces the amount of energy required to be absorbed and, along with the actions of the Emergency Core Cooling Systems (ECCS), ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

Reactor Vessel Water Level—Low, Level 3 signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

4. Reactor Vessel Water Level—Low, (Level 3) (continued)

water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel.

Four channels of Reactor Vessel Water Level—Low, (Level 3) Function, with two channels in each trip system arranged in a one-out-of-two logic, are required to be OPERABLE to ensure that no single instrument failure will preclude a scram from this Function on a valid signal.

The Reactor Vessel Water Level—Low, (Level 3) Allowable Value is selected to ensure that during normal operation the separator skirts are not uncovered (this protects available recirculation pump net positive suction head (NPSH) from significant carryunder) and, for transients involving loss of all normal feedwater flow, initiation of the low pressure ECCS subsystems at Reactor Vessel Water—Low Low Low, (Level 1) will not be required.

The Function is required in MODES 1 and 2 where considerable energy exists in the RCS resulting in the limiting transients and accidents. ECCS initiations at Reactor Vessel Water Level—Low Low, (Level 2) and Low Low Low, (Level 1) provide sufficient protection for level transients in all other MODES.

5. Main Steam Isolation Valve—Closure

MSIV closure results in loss of the main turbine and the condenser as a heat sink for the nuclear steam supply system and indicates a need to shut down the reactor to reduce heat generation. Therefore, a reactor scram is initiated on a Main Steam Isolation Valve—Closure signal before the MSIVs are completely closed in anticipation of the complete loss of the normal heat sink and subsequent overpressurization transient. However, for the overpressurization protection analysis of Reference 4, the Average Power Range Monitor Fixed Neutron Flux—High Function, along with the S/RVs, limits the peak RPV pressure to less than the ASME Code limits. That is, the direct scram on position switches for MSIV closure events is not assumed in the overpressurization analysis. Additionally, MSIV closure is assumed in the transients analyzed in Reference 7 (e.g., low steam line pressure, manual closure of MSIVs, high steam line flow).

(continued)

DB1

INSERT Function 4

The Allowable Value is the water level above a zero reference level which is 352.56 inches above the lowest point inside the RPV and is also at the top of a 144 inch fuel column (Ref. 12).

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

5. Main Steam Isolation Valve—Closure (continued)

The reactor scram reduces the amount of energy required to be absorbed and, along with the actions of the ECCS, ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

MSIV closure signals are initiated from position switches located on each of the eight MSIVs. Each MSIV has two position switches; one inputs to RPS trip system A while the other inputs to RPS trip system B. Thus, each RPS trip system receives an input from eight Main Steam Isolation Valve—Closure channels, each consisting of one position switch. The logic for the Main Steam Isolation Valve—Closure Function is arranged such that either the inboard or outboard valve on three or more of the main steam lines must close in order for a scram to occur. DB1

The design permits closure of any two lines without a full scram being initiated.

The Main Steam Isolation Valve—Closure Allowable Value is specified to ensure that a scram occurs prior to a significant reduction in steam flow, thereby reducing the severity of the subsequent pressure transient.

Sixteen channels of the Main Steam Isolation Valve—Closure Function, with eight channels in each trip system, are required to be OPERABLE to ensure that no single instrument failure will preclude the scram from this Function on a valid signal. This Function is only required in MODE 1 since, with the MSIVs open and the heat generation rate high, a pressurization transient can occur if the MSIVs close. In MODE 2, the heat generation rate is low enough so that the other diverse RPS functions provide sufficient protection. PA2

6. Drywell Pressure—High

High pressure in the drywell could indicate a break in the RCPB. A reactor scram is initiated to minimize the possibility of fuel damage and to reduce the amount of energy being added to the coolant and the drywell. The Drywell Pressure—High Function is a secondary scram signal to Reactor Vessel Water Level—Low, Level 3 for LOCA events inside the drywell. However, no credit is taken for a scram initiated from this Function for any of the DBAs analyzed in the FSAR. This Function was not specifically credited in DB7

INSERT Function 6

(continued)

DB7

INSERT FUNCTION 6

assumed to scram the reactor for LOCAs inside primary containment (Ref. 11). The reactor scram reduces the amount of energy required to be absorbed and along with the actions of the ECCS, ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

6. Drywell Pressure—High (continued)

the accident analysis, but it is retained for the overall redundancy and diversity of the RPS as required by the NRC approved licensing basis.

High drywell pressure signals are initiated from four pressure transmitters that sense drywell pressure. The Allowable Value was selected to be as low as possible and indicative of a LOCA inside primary containment.

Four channels of Drywell Pressure—High Function, with two channels in each trip system arranged in a one-out-of-two logic, are required to be OPERABLE to ensure that no single instrument failure will preclude a scram from this Function on a valid signal. The Function is required in MODES 1 and 2 where considerable energy exists in the RCS, resulting in the limiting transients and accidents.

7a, 7b. Scram Discharge Volume Water Level—High

The SDV receives the water displaced by the motion of the CRD pistons during a reactor scram. Should this volume fill to a point where there is insufficient volume to accept the displaced water, control rod insertion would be hindered. Therefore, a reactor scram is initiated while the remaining free volume is still sufficient to accommodate the water from a full core scram. The two types of Scram Discharge Volume Water Level—High Functions are an input to the RPS logic. No credit is taken for a scram initiated from these Functions for any of the design basis accidents or transients analyzed in the FSAR. However, they are retained to ensure the RPS remains OPERABLE.

SDV water level is measured by two diverse methods. The level in each of the two SDVs is measured by two float type level switches and two thermal probes for a total of eight level signals. The outputs of these devices are arranged so that there is a signal from a level switch and a thermal probe to each RPS logic channel. The level measurement instrumentation satisfies the recommendations of Reference 8.

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

7a, 7b. Scram Discharge Volume Water Level—High (continued)

The Allowable Value is chosen low enough to ensure that there is sufficient volume in the SDV to accommodate the water from a full scram.

Four channels of each type of Scram Discharge Volume Water Level—High Function, with two channels of each type in each trip system, are required to be OPERABLE to ensure that no single instrument failure will preclude a scram from these Functions on a valid signal. These Functions are required in MODES 1 and 2, and in MODE 5 with any control rod withdrawn from a core cell containing one or more fuel assemblies, since these are the MODES and other specified conditions when control rods are withdrawn. At all other times, this Function may be bypassed.

8. Turbine Stop Valve—Closure

Closure of the TSVs results in the loss of a heat sink that produces reactor pressure, neutron flux, and heat flux transients that must be limited. Therefore, a reactor scram is initiated at the start of TSV closure in anticipation of the transients that would result from the closure of these valves. The Turbine Stop Valve—Closure Function is the primary scram signal for the turbine trip event analyzed in Reference 7. For this event, the reactor scram reduces the amount of energy required to be absorbed and, along with the actions of the End of Cycle Recirculation Pump Trip (EOC-RPT) System, ensures that the MCPR SL is not exceeded.

Turbine Stop Valve—Closure signals are initiated from position switches located on each of the four TSVs. Two independent position switches are associated with each stop valve. One of the two switches provides input to RPS trip system A; the other, to RPS trip system B. Thus, each RPS trip system receives an input from four Turbine Stop Valve—Closure channels, each consisting of one position switch. The logic for the Turbine Stop Valve—Closure Function is such that three or more TSVs must be closed to produce a scram. This Function must be enabled at THERMAL POWER ≥ 30% RTP. This is normally accomplished automatically by pressure transmitters sensing turbine first

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

8. Turbine Stop Valve—Closure (continued)

stage pressure; therefore, to consider this Function OPERABLE, the turbine bypass valves must remain shut at THERMAL POWER ≥ 30% RTP.

The Turbine Stop Valve—Closure Allowable Value is selected to be high enough to detect imminent TSV closure, thereby reducing the severity of the subsequent pressure transient.

Eight channels of Turbine Stop Valve—Closure Function, with four channels in each trip system, are required to be OPERABLE to ensure that no single instrument failure will preclude a scram from this Function if any three TSVs should close. This Function is required, consistent with analysis assumptions, whenever THERMAL POWER is ≥ 30% RTP. This Function is not required when THERMAL POWER is < 30% RTP since the Reactor Vessel Steam Dome Pressure—High and the Average Power Range Monitor (Fixed) Neutron Flux—High Functions are adequate to maintain the necessary safety margins.

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9. Turbine Control Valve Fast Closure, Trip Oil Pressure—Low

Fast closure of the TCVs results in the loss of a heat sink that produces reactor pressure, neutron flux, and heat flux transients that must be limited. Therefore, a reactor scram is initiated on TCV fast closure in anticipation of the transients that would result from the closure of these valves. The Turbine Control Valve Fast Closure, Trip Oil Pressure—Low Function is the primary scram signal for the generator load rejection event analyzed in Reference 3. For this event, the reactor scram reduces the amount of energy required to be absorbed and, along with the actions of the EOC-RPT System, ensures that the MCPR SL is not exceeded.

Turbine Control Valve Fast Closure, Trip Oil Pressure—Low signals are initiated by the electrohydraulic control (EHC) fluid pressure at each control valve. One pressure transmitter is associated with each control valve, and the signal from each transmitter is assigned to a separate RPS logic channel. This Function must be enabled at THERMAL POWER ≥ 30% RTP. This is normally accomplished

(continued)

Revision F

DB8

INSERT FUNCTION 8

In addition, other steam loads, such as second stage reheaters in operation, must be accounted for in establishing the setpoint for turbine first stage pressure. Otherwise, the setpoint would be non-conservative with respect to the 29% RTP RPS bypass.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

9. Turbine Control Valve Fast Closure, Trip Oil Pressure—Low (continued)

automatically by pressure transmitters sensing turbine first stage pressure; therefore, to consider this Function OPERABLE, the turbine bypass valves must remain shut at THERMAL POWER ≥ 30% RTP.

The Turbine Control Valve Fast Closure, Trip Oil Pressure—Low Allowable Value is selected high enough to detect imminent TCV fast closure.

Four channels of Turbine Control Valve Fast Closure, Trip Oil Pressure—Low Function with two channels in each trip system arranged in a one-out-of-two logic are required to be OPERABLE to ensure that no single instrument failure will preclude a scram from this Function on a valid signal. This Function is required, consistent with the analysis assumptions, whenever THERMAL POWER is ≥ 30% RTP. This Function is not required when THERMAL POWER is < 30% RTP, since the Reactor Vessel Steam Dome Pressure—High and the Average Power Range Monitor Fixed Neutron Flux—High Functions are adequate to maintain the necessary safety margins.

10. Reactor Mode Switch—Shutdown Position

The Reactor Mode Switch—Shutdown Position Function provides signals, via the manual scram logic channels, to each of the four RPS logic channels, which are redundant to the automatic protective instrumentation channels and provide manual reactor trip capability. This Function was not specifically credited in the accident analysis, but it is retained for the overall redundancy and diversity of the RPS as required by the NRC approved licensing basis.

The reactor mode switch is a single switch with four channels, each of which provides input into one of the RPS logic channels.

There is no Allowable Value for this Function, since the channels are mechanically actuated based solely on reactor mode switch position.

(continued)

PB8 INSERT FUNCTION 9

In addition, other steam loads, such as second stage reheaters in operation, must be accounted for in establishing the setpoint for turbine first stage pressure. Otherwise, the setpoint would be non-conservative with respect to the 29% RTP RPS bypass.

DB1 INSERT FUNCTION 10

keylock four-position, four-bank switch. The reactor mode switch will scram the reactor if it is placed in the shutdown position. Scram signals from the reactor mode switch are input into each of the two RPS manual scram trip channels.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

10. Reactor Mode Switch—Shutdown Position (continued)

Four channels of Reactor Mode Switch—Shutdown Position Function, with two channels in each trip system, are available and required to be OPERABLE. The Reactor Mode Switch—Shutdown Position Function is required to be OPERABLE in MODES 1 and 2, and MODE 5 with any control rod withdrawn from a core cell containing one or more fuel assemblies, since these are the MODES and other specified conditions when control rods are withdrawn.

11. Manual Scram

The Manual Scram push button channels provide signals, via the manual scram logic channels, to each of the four RPS logic channels, which are redundant to the automatic protective instrumentation channels and provide manual reactor trip capability. This Function was not specifically credited in the accident analysis but it is retained for the overall redundancy and diversity of the RPS as required by the NRC approved licensing basis.

There is one Manual Scram push button channel for each of the four RPS logic channels. In order to cause a scram it is necessary that at least one channel in each trip system be actuated.

There is no Allowable Value for this Function since the channels are mechanically actuated based solely on the position of the push buttons.

Four channels of Manual Scram with two channels in each trip system arranged in a one-out-of-two logic are available and required to be OPERABLE in MODES 1 and 2, and in MODE 5 with any control rod withdrawn from a core cell containing one or more fuel assemblies, since these are the MODES and other specified conditions when control rods are withdrawn.

ACTIONS

[Reviewer's Note: Certain LCO Completion Times are based on approved topical reports. In order for a licensee to use the times, the licensee must justify the Completion Times as required by the staff Safety Evaluation Report (SER) for the topical report.]

(continued)

BASES

ACTIONS (continued)

A Note has been provided to modify the ACTIONS related to RPS instrumentation channels. Section 1.3, Completion Times, specifies that once a Condition has been entered, subsequent divisions, subsystems, components, or variables expressed in the Condition, discovered to be inoperable or not within limits, will not result in separate entry into the Condition. Section 1.3 also specifies that Required Actions of the Condition continue to apply for each additional failure, with Completion Times based on initial entry into the Condition. However, the Required Actions for inoperable RPS instrumentation channels provide appropriate compensatory measures for separate inoperable channels. As such, a Note has been provided that allows separate Condition entry for each inoperable RPS instrumentation channel.

A.1 and A.2

Because of the diversity of sensors available to provide trip signals and the redundancy of the RPS design, an allowable out of service time of 12 hours has been shown to be acceptable (Ref. 9) to permit restoration of any inoperable channel to OPERABLE status. However, this out of service time is only acceptable provided the associated Function's inoperable channel is in one trip system and the Function still maintains RPS trip capability (refer to Required Actions B.1, B.2, and C.1 Bases). If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel or the associated trip system must be placed in the tripped condition per Required Actions A.1 and A.2. Placing the inoperable channel in trip (or the associated trip system in trip) would conservatively compensate for the inoperability, restore capability to accommodate a single failure, and allow operation to continue. Alternatively, if it is not desired to place the channel (or trip system) in trip (e.g., as in the case where placing the inoperable channel in trip would result in a full scram), Condition D must be entered and its Required Action taken.

B.1 and B.2

Condition B exists when, for any one or more Functions, at least one required channel is inoperable in each trip

(continued)

BASES

ACTIONS

B.1 and B.2 (continued)

system. In this condition, provided at least one channel per trip system is OPERABLE, the RPS still maintains trip capability for that Function, but cannot accommodate a single failure in either trip system.

Required Actions B.1 and B.2 limit the time the RPS scram logic, for any Function, would not accommodate single failure in both trip systems (e.g., one-out-of-one and one-out-of-one arrangement for a typical four channel Function). The reduced reliability of this logic arrangement was not evaluated in Reference 9 for the 12 hour Completion Time. Within the 6 hour allowance, the associated Function will have all required channels OPERABLE or in trip (or any combination) in one trip system.

Completing one of these Required Actions restores RPS to a reliability level equivalent to that evaluated in Reference 9, which justified a 12 hour allowable out of service time as presented in Condition A. The trip system in the more degraded state should be placed in trip or, alternatively, all the inoperable channels in that trip system should be placed in trip (e.g., a trip system with two inoperable channels could be in a more degraded state than a trip system with four inoperable channels if the two inoperable channels are in the same Function while the four inoperable channels are all in different Functions). The decision of which trip system is in the more degraded state should be based on prudent judgment and take into account current plant conditions (i.e., what MODE the plant is in). If this action would result in a scram or RPT, it is permissible to place the other trip system or its inoperable channels in trip.

The 6 hour Completion Time is judged acceptable based on the remaining capability to trip, the diversity of the sensors available to provide the trip signals, the low probability of extensive numbers of inoperabilities affecting all diverse Functions, and the low probability of an event requiring the initiation of a scram.

Alternately, if it is not desired to place the inoperable channels (or one trip system) in trip (e.g., as in the case where placing the inoperable channel or associated trip

(continued)

BASES

ACTIONS

B.1 and B.2 (continued)

system in trip would result in a scram [or RPT], Condition D must be entered and its Required Action taken. DB1

C.1

Required Action C.1 is intended to ensure that appropriate actions are taken if multiple, inoperable, untripped channels within the same trip system for the same Function result in the Function not maintaining RPS trip capability. A Function is considered to be maintaining RPS trip capability when sufficient channels are OPERABLE or in trip (or the associated trip system is in trip), such that both trip systems will generate a trip signal from the given Function on a valid signal. For the typical Function with one-out-of-two taken twice logic and the IRM and APRM Functions, this would require both trip systems to have one channel OPERABLE or in trip (or the associated trip system in trip). For Function 5 (Main Steam Isolation Valve—Closure), this would require both trip systems to have each channel associated with the MSIVs in three main steam lines (not necessarily the same main steam lines for both trip systems) OPERABLE or in trip (or the associated trip system in trip). PA2

For Function 8 (Turbine Stop Valve—Closure), this would require both trip systems to have three channels, each OPERABLE or in trip (or the associated trip system in trip).

For Functions 10 (Reactor Mode Switch - Shutdown Position) and 11 (Manual Scram) this would require both trip systems to have one channel each OPERABLE or in trip (or the associated trip system in trip). DB1

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. The 1 hour Completion Time is acceptable because it minimizes risk while allowing time for restoration or tripping of channels.

D.1

Required Action D.1 directs entry into the appropriate Condition referenced in Table 3.3.1.1-1. The applicable Condition specified in the Table is Function and MODE or other specified condition dependent and may change as the Required Action of a previous Condition is completed. Each time an inoperable channel has not met any Required Action

(continued)

BASES

ACTIONS

D.1 (continued)

of Condition A, B, or C and the associated Completion Time has expired, Condition D will be entered for that channel and provides for transfer to the appropriate subsequent Condition.

E.1, F.1, and G.1

If the channel(s) is not restored to OPERABLE status or placed in trip (or the associated trip system placed in trip) within the allowed Completion Time, the plant must be placed in a MODE or other specified condition in which the LCO does not apply. The allowed Completion Times are reasonable, based on operating experience, to reach the specified condition from full power conditions in an orderly manner and without challenging plant systems. In addition, the Completion Time of Required Action E.1 is consistent with the Completion Time provided in LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)."

H.1

If the channel(s) is not restored to OPERABLE status or placed in trip (or the associated trip system placed in trip) within the allowed Completion Time, the plant must be placed in a MODE or other specified condition in which the LCO does not apply. This is done by immediately initiating action to fully insert all insertable control rods in core cells containing one or more fuel assemblies. Control rods in core cells containing no fuel assemblies do not affect the reactivity of the core and are, therefore, not required to be inserted. Action must continue until all insertable control rods in core cells containing one or more fuel assemblies are fully inserted.

SURVEILLANCE REQUIREMENTS

[Reviewer's Note: Certain Frequencies are based on approved topical reports. In order for a licensee to use these Frequencies, the licensee must justify the Frequencies as required by the staff SER for the topical report.]

PAS

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

As noted at the beginning of the SRs, the SRs for each RPS instrumentation Function are located in the SRs column of Table 3.3.1.1-1.

The Surveillances are modified by a Note to indicate that when a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours, provided the associated Function maintains RPS trip capability. Upon completion of the Surveillance, or expiration of the 6 hour allowance, the channel must be returned to OPERABLE status or the applicable Condition entered and Required Actions taken. This Note is based on the reliability analysis (Ref. 3) assumption of the average time required to perform channel Surveillance. That analysis demonstrated that the 6 hour testing allowance does not significantly reduce the probability that the RPS will trip when necessary.

SR 3.3.1.1.1

Performance of the CHANNEL CHECK once every 12 hours ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between instrument channels could be an indication of excessive instrument drift in one of the channels or something even more serious. A CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

Agreement criteria are determined by the plant staff based on a combination of the channel instrument uncertainties, including indication and readability. If a channel is outside the criteria, it may be an indication that the instrument has drifted outside its limit.

The Frequency is based upon operating experience that demonstrates channel failure is rare. The CHANNEL CHECK supplements less formal, but more frequent, checks of

(continued)

PA2

INSERT SR 3.3.1.1.1

For Functions 8 and 9, this SR is associated with the enabling circuit sensing first stage pressure.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.1 (continued)

channels during normal operational use of the displays associated with the channels required by the LCO.

SR 3.3.1.1.2

To ensure that the APRMs are accurately indicating the true core average power, the APRMs are calibrated to the reactor power calculated from a heat balance. LCO 3.2.4, "Average Power Range Monitor (APRM) Gain and Setpoints," allows the APRMs to be reading greater than actual THERMAL POWER to compensate for localized power peaking. When this adjustment is made, the requirement for the APRMs to indicate within 2% RTP of calculated power is modified to require the APRMs to indicate within 2% RTP of calculated MFLPD. The Frequency of once per 7 days is based on minor changes in LPRM sensitivity, which could affect the APRM reading between performances of SR 3.3.1.1.8.

A restriction to satisfying this SR when < 25% RTP is provided that requires the SR to be met only at ≥ 25% RTP because it is difficult to accurately maintain APRM indication of core THERMAL POWER consistent with a heat balance when < 25% RTP. At low power levels, a high degree of accuracy is unnecessary because of the large, inherent margin to thermal limits (MCPR and APLHGR). At ≥ 25% RTP, the Surveillance is required to have been satisfactorily performed within the last 7 days, in accordance with SR 3.0.2. A Note is provided which allows an increase in THERMAL POWER above 25% if the 7 day Frequency is not met per SR 3.0.2. In this event, the SR must be performed within 12 hours after reaching or exceeding 25% RTP. Twelve hours is based on operating experience and in consideration of providing a reasonable time in which to complete the SR.

DB3

For Function 2.b the CHANNEL FUNCTIONAL TEST includes the adjustment of the APRM channel to conform to the calibrated flow signal

CLB5

move to page B 3.3-29 as Insert to SR 3.3.1.1.8 and SR 3.3.1.1.12

SR 3.3.1.1.3

The Average Power Range Monitor Flow Biased Simulated Thermal Power—High Function uses the recirculation loop drive flows to vary the trip setpoint. This SR ensures that the total loop drive flow signals from the flow units used to vary the setpoint is appropriately compared to a calibrated flow signal and, therefore, the APRM Function

valid core

to verify the flow signal trip setpoint

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.3 (continued)

accurately reflects the required setpoint as a function of flow. Each flow signal from the respective flow unit must be ≤ 105% of the calibrated flow signal. If the flow unit signal is not within the limit, one required APRM that receives an input from the inoperable flow unit must be declared inoperable.

The Frequency of 7 days is based on engineering judgment, operating experience, and the reliability of this instrumentation.

SR 3.3.1.1.4

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the intended function.

Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology.

As noted, SR 3.3.1.1.4 is not required to be performed when entering MODE 2 from MODE 1, since testing of the MODE 2 required IRM and APRM Functions cannot be performed in MODE 1 without utilizing jumpers, lifted leads, or movable links. This allows entry into MODE 2 if the 7 day Frequency is not met per SR 3.0.2. In this event, the SR must be performed within 12 hours after entering MODE 2 from MODE 1. Twelve hours is based on operating experience and in consideration of providing a reasonable time in which to complete the SR.

A Frequency of 7 days provides an acceptable level of system average unavailability over the Frequency interval and is based on reliability analysis (Ref. 9).

SR 3.3.1.1.5

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the intended function. A Frequency of 7 days provides an acceptable level of system average availability over the

(continued)

INSERT SR 3.3.1.1.3

A successful test of the required contacts(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with the applicable extensions.

INSERT SR 3.3.1.1.4

A functional test of each automatic scram contactor is performed to ensure that each automatic RPS trip channel will perform the intended function. There are four RPS channel test switches, one associated with each of the four automatic trip channels (A1, A2, B1, and B2). These test switches allow the operator to test the OPERABILITY of the individual trip channel automatic scram contactors as an alternative to using an automatic scram function trip. This is accomplished by placing the RPS channel test switch in the test position, which will input a trip signal into the associated RPS trip channel. The RPS channel test switches are not specifically credited in the accident analysis. The Manual Scram Functions at JAFNPP are not configured the same as the generic model used in Reference 18. However, Reference 18 concluded that the Surveillance Frequency extensions for RPS Functions were not affected by the difference in configuration since each automatic RPS trip channel has a test switch which is functionally the same as the manual scram switches in the generic model. As such, a functional test of each RPS automatic scram contactor using either its associated test switch or by test of any of the associated automatic RPS Functions is required to be performed once every 7 days. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions. In accordance with Reference 18, the scram contactors must be tested as part of the Manual Scram Function. The Frequency of 7 days is based on the reliability analysis of Reference 18. (This automatic scram contactor testing is credited in the analysis to extend many automatic scram Function Surveillance Frequencies).

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.5 (continued)

Frequency and is based on the reliability analysis of Reference 10. (The Manual Scram Function's CHANNEL FUNCTIONAL TEST Frequency was credited in the analysis to extend many automatic scram Functions' Frequencies.)

SR 3.3.1.1.6 and SR 3.3.1.1.7

These Surveillances are established to ensure that no gaps in neutron flux indication exist from subcritical to power operation for monitoring core reactivity status.

The overlap between SRMs and IRMs is required to be demonstrated to ensure that reactor power will not be increased into a neutron flux region without adequate indication. This is required prior to withdrawing SRMs from the fully inserted position since indication is being transitioned from the SRMs to the IRMs.

The overlap between IRMs and APRMs is of concern when reducing power into the IRM range. On power increases, the system design will prevent further increases (by initiating a rod block) if adequate overlap is not maintained. Overlap between IRMs and APRMs exists when sufficient IRMs and APRMs concurrently have onscale readings such that the transition between MODE 1 and MODE 2 can be made without either APRM downscale rod block, or IRM upscale rod block. Overlap between SRMs and IRMs similarly exists when, prior to withdrawing the SRMs from the fully inserted position, IRMs are above mid-scale on range 1 before SRMs have reached the upscale rod block.

As noted, SR 3.3.1.1.7 is only required to be met during entry into MODE 2 from MODE 1. That is, after the overlap requirement has been met and indication has transitioned to the IRMs, maintaining overlap is not required (APRMs may be reading downscale once in MODE 2).

If overlap for a group of channels is not demonstrated (e.g., IRM/APRM overlap), the reason for the failure of the Surveillance should be determined and the appropriate channel(s) declared inoperable. Only those appropriate channels that are required in the current MODE or condition should be declared inoperable.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.6 and SR 3.3.1.1.7 (continued)

A Frequency of 7 days is reasonable based on engineering judgment and the reliability of the IRMs and APRMs.

SR 3.3.1.1.8

LPRM gain settings are determined from the local flux profiles measured by the Traversing Incore Probe (TIP) System. This establishes the relative local flux profile for appropriate representative input to the APRM System. The 1000 MWD/T Frequency is based on operating experience with LPRM sensitivity changes.

SR 3.3.1.1.9 and SR 3.3.1.1.12

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the intended function. Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology. The 92 day Frequency of SR 3.3.1.1.9 is based on the reliability analysis of Reference 9.

The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillance when performed at the 18 month Frequency.

SR 3.3.1.1.10

Calibration of trip units provides a check of the actual trip setpoints. The channel must be declared inoperable if the trip setting is discovered to be less conservative than the Allowable Value specified in Table 3.3.1.1-1. If the trip setting is discovered to be less conservative than accounted for in the appropriate setpoint methodology, but is not beyond the Allowable Value, the channel performance is still within the requirements of the plant safety analysis. Under these conditions, the setpoint must be

(continued)

Revision F

TA2 INSERT SR 3.3.1.1.8a

A successful test of the required contacts(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with the applicable extensions. TSTF-205

CLB6 INSERT SR 3.3.1.1.8

For Function 7.b, the CHANNEL FUNCTIONAL TEST must be performed utilizing a water column or similar device to provide assurance that damage to a float or other portions of the float assembly will be detected.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.10 (continued)

readjusted to be equal to or more conservative than accounted for in the appropriate setpoint methodology.

The Frequency of 92 days is based on the reliability analysis of Reference 9.

SR 3.3.1.1.11 and SR 3.3.1.1.13

A CHANNEL CALIBRATION is a complete check of the instrument loop and the sensor. This test verifies that the channel responds to the measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drifts between successive calibrations consistent with the plant specific setpoint methodology.

Note 1 states that neutron detectors are excluded from CHANNEL CALIBRATION because they are passive devices, with minimal drift, and because of the difficulty of simulating a meaningful signal. Changes in neutron detector sensitivity are compensated for by performing the 7 day calorimetric calibration (SR 3.3.1.1.2) and the 1000 MWD/T LPRM calibration against the TIPs (SR 3.3.1.1.8). A second Note is provided that requires the APRM and IRM SRs to be performed within 12 hours of entering MODE 2 from MODE 1. Testing of the MODE 2 APRM and IRM Functions cannot be performed in MODE 1 without utilizing jumpers, lifted leads, or movable links. This Note allows entry into MODE 2 from MODE 1 if the associated Frequency is not met per SR 3.0.2. Twelve hours is based on operating experience and in consideration of providing a reasonable time in which to complete the SR.

The Frequency of SR 3.3.1.1.11 is based upon the assumption of a 184 day calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis. The Frequency of SR 3.3.1.1.13 is based upon the assumption of an 18 month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

(continued)

PA2 INSERT SR 3.3.1.1.10

For Functions 8 and 9, this SR is associated with the enabling circuit sensing first stage turbine pressure.

CLB6 PA2 INSERT SR 3.3.1.1.13-1

Physical inspection of the position switches is performed in conjunction with SR 3.3.1.1.13 for Function 5 and 8 to ensure that the switches are not corroded or otherwise degraded. For Function 7.b, the CHANNEL CALIBRATION must be performed utilizing a water column or similar device to provide assurance that damage to a float or other portions of the float assembly will be detected. For Function 2.b, the recirculation loop flow signals are calibrated in accordance with SR 3.3.1.1.13 while the calibration of all other components associated with this Function is performed in accordance with SR 3.3.1.1.11. For Functions 8 and 9, SR 3.3.1.1.13 is associated with the enabling circuit sensing first stage turbine pressure as well as the trip function.

CLB9 INSERT SR 3.3.1.1.13-2

Reactor Pressure - High and Reactor Water Level - Low (Level 3) Function sensors (Functions 3 and 4, respectively) are excluded from the RPS RESPONSE TIME testing (Ref. 19). However, prior to the CHANNEL CALIBRATION of these sensors a response check must be performed to ensure adequate response. This testing is required by Reference 20. Personnel involved in this testing must have been trained in response to Reference 21 to ensure they are aware of the consequences of instrument response time degradation. This response check must be performed by placing a fast ramp or a step change into the input of each required sensor. The personnel, must monitor the input and output of the associated sensor so that simultaneous monitoring and verification may be accomplished.

DB9 INSERT SR 3.3.1.1.9

The Frequency of SR 3.3.1.1.9 is based upon the assumption of a 92 day calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.1.14

The Average Power Range Monitor Flow Biased Simulated Thermal Power—High Function uses an electronic filter circuit to generate a signal proportional to the core THERMAL POWER from the APRM neutron flux signal. This filter circuit is representative of the fuel heat transfer dynamics that produce the relationship between the neutron flux and the core THERMAL POWER. The Surveillance filter time constant must be verified to be ≤ 7 seconds to ensure that the channel is accurately reflecting the desired parameter.

The Frequency of 18 months is based on engineering judgment considering the reliability of the components.

SR 3.3.1.1.15

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required trip logic for a specific channel. The functional testing of control rods (LCO 3.1.3), and SDV vent and drain valves (LCO 3.1.8), overlaps this Surveillance to provide complete testing of the assumed safety function.

The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillance when performed at the 18 month Frequency.

SR 3.3.1.1.16

This SR ensures that scrams initiated from the Turbine Stop Valve—Closure and Turbine Control Valve Fast Closure, Trip Oil Pressure—Low Functions will not be inadvertently bypassed when THERMAL POWER is ≥ 30% RTP. This involves calibration of the bypass channels. Adequate margins for the instrument setpoint methodologies are incorporated into the actual setpoint. Because main turbine bypass flow can affect this setpoint nonconservatively (THERMAL POWER is derived from turbine first stage pressure), the main turbine

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.16 (continued)

bypass valves must remain closed at THERMAL POWER ≥ 30% RTP to ensure that the calibration remains valid.

If any bypass channel's setpoint is nonconservative (i.e., the Functions are bypassed at ≥ 30% RTP, either due to open main turbine bypass valve(s) or other reasons), then the affected Turbine Stop Valve—Closure and Turbine Control Valve Fast Closure, Trip Oil Pressure—Low Functions are considered inoperable. Alternatively, the bypass channel can be placed in the conservative condition (nonbypass). If placed in the nonbypass condition, this SR is met and the channel is considered OPERABLE.

The Frequency of 18 months is based on engineering judgment and reliability of the components.

SR 3.3.1.1.17

This SR ensures that the individual channel response times are less than or equal to the maximum values assumed in the accident analysis. This test may be performed in one measurement or in overlapping segments, with verification that all components are tested. The RPS RESPONSE TIME acceptance criteria are included in Reference 10.

As noted, neutron detectors are excluded from RPS RESPONSE TIME testing because the principles of detector operation virtually ensure an instantaneous response time.

RPS RESPONSE TIME tests are conducted on an 18 month STAGGERED TEST BASIS. Note 2 requires STAGGERED TEST BASIS Frequency to be determined based on 4 channels per trip system, in lieu of the 8 channels specified in Table 3.3.1.1-1 for the MSIV Closure Function. This Frequency is based on the logic interrelationships of the various channels required to produce an RPS scram signal. The 18 month Frequency is consistent with the typical industry refueling cycle and is based upon plant operating experience, which shows that random failures of instrumentation components causing serious response time degradation, but not channel failure, are infrequent occurrences.

(continued)

TA1 CLB3 INSERT SR 3.3.1.1.16-1 19 DB6

RPS RESPONSE TIME may be verified by acutal response time measurements in any series of sequential, overlapping, or total channel measurements. However, the sensors for Functions 3 and 4 are allowed to be excluded from specific RPS RESPONSE TIME measurement if the conditions of Reference 11 are satisfied. If these conditions are satisfied, sensor response time may be allocated based on either assumed design sensor response time or the manufacturer's stated design reponse time. When the requirements of Reference 12 are not satisfied, sensor response time must be measured. Furthermore, measurement of the instrument loops response times for Functions 3 and 4 is not required if the conditions of Reference 12 are satisfied.

TSTF 332
RAT 3.3.1.1-1

CLB4 INSERT SR 3.3.1.1.16-2

This ensures all required channels are tested during two Surveillance Frequency intervals. For Functions 2.b, 2.c, 3, 4, 6, and 9, two channels must be tested during each test interval; while for Functions 5 and 8, eight and four channels must be tested, respectively.

BASES (continued)

REFERENCES

1. FSAR, Figure [ ]. (Section 7.2)
2. FSAR, Section [15.1.2]. (14.5.4.2)
3. NEDO-23842, "Continuous Control Rod Withdrawal in the Startup Range," April 18, 1978.
4. 10 CFR 50.36 (c)(2)(ii)
5. NEDO-31960-A, BWR Owners' Group Long Term Stability Solutions Licensing Methodology, June 1991.
6. NEDO-31960-A, BWR Owners' Group Long Term Stability Solutions Licensing Methodology, Supplement 1, March 1992.
7. FSAR, Section [5.2.2]. (14.5.1.2)
8. FSAR, Section [15.1.38]. (14.6.1.2)
11. FSAR, Section [6.3.3].
J. FSAR, Chapter [15].
16. P. Check (NRC) letter to G. Lainas (NRC), "BWR Scram Discharge System Safety Evaluation," December 1, 1980.
18. NEDC-30851-P-A, "Technical Specification Improvement Analyses for BWR Reactor Protection System," March 1988.
22. FSAR, Table [7.2-2]. (5)
17. UFSAR, Section 14.5.9

Insert REF-1
Insert REF-2
Insert REF-3

DB7

INSERT REF-1

9. UFSAR, Section 14.5.2.1.

10. UFSAR, Section 14.5.2.2.

INSERT REF-2

DB7

12. Drawing 11825-5.01-15D, Rev. D, Reactor Assembly Nuclear Boiler, (GE Drawing 919D690BD).

13. UFSAR, Section 14.5.5.1.

14. UFSAR, Section 14.5.2.3.

15. UFSAR, Section 14.6.1.5.

INSERT REF-3

LB3 TAC

19. NEDO-32291-A, System Analyses for the Elimination of Selected Response Time Testing, October 1995.

20. NRC letter dated October 28, 1996, Issuance of Amendment 235 to Facility Operating License DPR-59 for James A. FitzPatrick Nuclear Power Plant.

21. NRC Bulletin 90-01, Supplement 1, Loss of Fill-Oil in Transmitters Manufactured by Rosemount, December 1992.

PA 4

Table B 3.3.1.1-1 (page 1 of 1)*
RPS Instrumentation Sensor Diversity

	Scram Sensors for Initiating Events						
	RPV Variables			Anticipatory			Fuel
Initiation Events	(a)	(b)	(c)	(d)	(e)	(f)	(g)
MSIV Closure	x		x			x	x
Turbine Trip (w/bypass)	x			x	x		x
Generator Trip (w/bypass)	x			x			x
Pressure Regulator Failure (primary pressure decrease) (MSIV closure trip)	x	x	x			x	x
Pressure Regulator Failure (primary pressure decrease) (Level 8 trip)	x				x		x
Pressure Regulator Failure (primary pressure increase)	x						x
Feedwater Controller Failure (high reactor water level)	x	x			x		x
Feedwater Controller Failure (low reactor water level)	x		x			x	
Loss of Condenser Vacuum	x				x	x	x
Loss of AC Power (loss of transformer)	x		x		x	x	
Loss of AC Power (loss of grid connections)	x		x	x	x	x	x

(a) Reactor Vessel Steam Dome Pressure—High
(b) Reactor Vessel Water Level—High, Level 8
(c) Reactor Vessel Water Level—Low, Level 3
(d) Turbine Control Valve Fast Closure
(e) Turbine Stop Valve—Closure
(f) Main Steam Isolation Valve—Closure
(g) Average Power Range Monitor Neutron Flux—High

* This table for illustration purposes only.

JAFNPP

IMPROVED STANDARD TECHNICAL SPECIFICATIONS (ISTS) CONVERSION

ITS: 3.3.1.1

Reactor Protection System (RPS) Instrumentation

JUSTIFICATION FOR DIFFERENCES (JFDs)
FROM NUREG-1433, REVISION 1, BASES

JUSTIFICATION FOR DIFFERENCES FROM NUREG-1433, REVISION 1
ITS BASES: 3.3.1.1 - REACTOR PROTECTION SYSTEM (RPS) INSTRUMENTATION

RETENTION OF EXISTING REQUIREMENT (CLB)

CLB1 Function 2.d has been deleted. The Downscale trip has been removed from the CTS as documented in License Amendment 227. The following Functions have been renumbered as required.

CLB2 SR 3.3.1.1.4 has been added (a functional test of each RPS automatic scram contactor) consistent with current requirements. This Surveillance was added to allow the Surveillance Frequency extensions of the automatic RPS Functions per NEDC-30851-P-A, Technical Specification Improvement Analyses for BWR Reactor Protection System, since the JAFNPP design is different than the generic BWR model used in NEDC-30851-P-A. Therefore, the Bases description in ISTS SR 3.3.1.1.5 of the CHANNEL FUNCTIONAL TEST of the manual scram function has been deleted and replaced with the description of the RPS channel test switches.

CLB3 Consistent with CTS 4.1.A, the measurement of the sensor during response time testing is not required. Appropriate Bases as well as references have been included consistent with TSTF 322 R1. TSTF-322

CLB4 The Bases of ITS SR 3.3.1.1.16 has been modified, to require RPS RESPONSE TIME TESTING consistent with the current licensing basis, and as modified in M8.

CLB5 ISTS SR 3.3.1.1.3, the requirement to adjust the channels to conform to a calibrated signal every 7 days has been deleted since this requirement is currently being performed along with the 92 day channel functional test. This adjustment will be performed in accordance with SR 3.3.1.1.8, the 92 day CHANNEL FUNCTIONAL TEST. This is reflected in the Bases of SR 3.3.1.1.8. Subsequent SRs have been renumbered, as applicable.

CLB6 These requirements have been added in accordance with CTS Table 4.1-1 Note 6 and Table 4.1-2 Note 5, as documented in LA11.

CLB7 The Channel Functional Test Frequency of SR 3.3.1.1.12 has been increased from 18 months to 24 months in accordance with CTS Table 4.1-1. The Frequency is consistent with the JAFNPP fuel cycle.

CLB8 SR 3.3.1.1.10 Surveillance Frequency has been modified to be consistent with the frequency in CTS Table 4.1-1 Note 6 and approved in License Amendment No. 89.

CLB9 The specific details concerning response checks have been added to the Bases of SR 3.3.1.1.13 in accordance with License Amendment No. 235.

PLANT-SPECIFIC WORDING PREFERENCE OR MINOR EDITORIAL IMPROVEMENT (PA)

PA1 The Specification has been modified to reflect plant specific nomenclature.

PA2 Editorial changes have been made for enhanced clarity or to be consistent with other places in the Bases.

PA3 Grammatical or typographical error corrected.

PA4 This Table has been deleted because it provides generic and not plant specific types of information. The information in the Table could be misleading as to which plant specific analyses take credit for these channels to perform a function during accident and transient scenarios.

PA5 The Reviewer's Note has been deleted.

PA6 The quotations used in the Bases References have been removed. The Writer's Guide does not require the use of quotations.

PA7 The Bases description has be modified to better reflect the Applicability of the Functions in Table 3.3.1.1-1.

PLANT-SPECIFIC DIFFERENCE IN THE DESIGN (DB)

DB1 The Bases have been modified to reflect the JAFNPP specific design.

DB2 The brackets have been removed and the proper plant specific reference have been provided.

DB3 The Bases description of Function 2.b, Average Power Range Monitor Flow Biased Simulated Thermal Power – High Function has been modified to be consistent with the JAFNPP design. The filter circuit has been removed consistent with BWR Owner's Group Long Term Stability Solutions (Refs. 5 and 6). Changes have been made in the Bases as a result of this design difference. References have been renumbered, as applicable. In addition, ISTS 3.3.1.1.14 has been deleted because the JAFNPP RPS does not utilize an APRM Flow Biased Simulated Thermal Power – High time constant. Subsequent SRs have been renumbered, as applicable.

DB4 All channels are not required to respond within a specified response time and all channels do not have a specified Allowable Values (e.g. Manual Scram Function channels), therefore the Bases has been revised as necessary.

PLANT-SPECIFIC DIFFERENCE IN THE DESIGN (DB)

DB5 The description of the setpoint calculation methodology has been revised to reflect the plant specific methodology.

DB6 The Bases has been revised to reflect the appropriate references.

DB7 The Bases has been revised to reflect the safety analysis. At low powers (e.g., < 29% RTP) the scram from the TSV and TCV is not required; however, the turbine generator can remain online (and trip with resultant pressure transient) below this power level. The TSV and TCV Fast Closure (turbine trip or main generator trip) provide a direct reactor scram when ≥ 29% RTP. When < 29% RTP, a turbine or main generator trip will not result in a direct scram, but should the pressure transient reach the setpoint for the Reactor High Pressure trip, a scram would occur (i.e., is credited to occur from the Reactor High Pressure trip). Since turbine operation below 29% RTP includes MODE 1 and MODE 2, the necessary applicability of the Reactor High Pressure trip is consistent with specifying MODE 1 and 2. References have been included as applicable. Subsequent references have been renumbered as required.

DB8 The Bases has been revised to reflect the setpoint calculation methodology assumptions.

DB9 SR 3.3.1.1.9 has been added to perform a CHANNEL CALIBRATION every 92 days for Function 7.a (Scram Discharge Instrument Volume Water Level – High, Differential Pressure Transmitter/Trip Unit) consistent with CTS Table 4.1-2. The Frequency is consistent with the setpoint calculation methodology for this Function. The Bases description of SR 3.3.1.1.11 and SR 3.3.1.1.13 have been modified as required to reflect this difference. The Bases description has been reordered, as required.

DIFFERENCE BASED ON AN APPROVED TRAVELER (TA)

TA1 The changes presented in Technical Specification Task Force (TSTF) Technical Specification Change Traveler Number 332, Revision 1 have been incorporated into the revised Improved Technical Specifications. However, NEDO-32291-A, Supplement 1 has not yet been adopted by JAFNPP. Therefore, this portion of the TSTF has not been incorporated.

TA2 The changes presented in Technical Specification Task Force (TSTF) Technical Specification Change Traveler Number 205, Revision 3 have been incorporated into the revised Improved Technical Specifications.

DIFFERENCE BASED ON AN APPROVED TRAVELER (TA)

TA3 The changes presented in Technical Specification Task Force (TSTF) Technical Specification Change Traveler Number 231, Revision 1 have been incorporated into the revised Improved Technical Specifications. TSTF-231

TA4 The changes presented in Technical Specification Task Force (TSTF) Technical Specification Change Traveler Number 355, Revision 0, as modified by WOG-ED-25, have been incorporated into the revised Improved Technical Specifications. TSTF-355

DIFFERENCE BASED ON A SUBMITTED, BUT PENDING TRAVELER (TP)

None

DIFFERENCE FOR ANY REASON OTHER THAN THE ABOVE (X)

X1 NUREG-1433, Revision 1, Bases reference to "the NRC Policy Statement" has been replaced with 10 CFR 50.36(c)(2)(ii), in accordance with 60 FR 36953 effective August 18, 1995. Subsequent References have been renumbered, as applicable.

X2 The SR 3.3.1.1.14 and SR 3.3.1.1.15 Frequencies have been modified from 18 months to 24 months consistent with the JAFNPP fuel cycle.

JAFNPP

IMPROVED STANDARD TECHNICAL SPECIFICATIONS (ISTS) CONVERSION

ITS: 3.3.1.1

Reactor Protection System (RPS) Instrumentation

RETYPED PROPOSED IMPROVED TECHNICAL SPECIFICATIONS (ITS) AND BASES

3.3 INSTRUMENTATION

3.3.1.1 Reactor Protection System (RPS) Instrumentation

LCO 3.3.1.1 The RPS instrumentation for each Function in Table 3.3.1.1-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.1.1-1.

ACTIONS

-----------------------------------NOTE-----------------------------------
Separate Condition entry is allowed for each channel.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more required channels inoperable.	A.1 Place channel in trip.	12 hours
	OR	
	A.2 Place associated trip system in trip.	12 hours
B. One or more Functions with one or more required channels inoperable in both trip systems.	B.1 Place channel in one trip system in trip.	6 hours
	OR	
	B.2 Place one trip system in trip.	6 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
C. One or more Functions with RPS trip capability not maintained.	C.1	Restore RPS trip capability.	1 hour
D. Required Action and associated Completion Time of Condition A, B, or C not met.	D.1	Enter the Condition referenced in Table 3.3.1.1-1 for the channel.	Immediately
E. As required by Required Action D.1 and referenced in Table 3.3.1.1-1.	E.1	Reduce THERMAL POWER to < 29% RTP.	4 hours
F. As required by Required Action D.1 and referenced in Table 3.3.1.1-1.	F.1	Be in MODE 2.	8 hours
G. As required by Required Action D.1 and referenced in Table 3.3.1.1-1.	G.1	Be in MODE 3.	12 hours
H. As required by Required Action D.1 and referenced in Table 3.3.1.1-1.	H.1	Initiate action to fully insert all insertable control rods in core cells containing one or more fuel assemblies.	Immediately

SURVEILLANCE REQUIREMENTS

-----------------------------------NOTES-----------------------------------

1. Refer to Table 3.3.1.1-1 to determine which SRs apply for each RPS Function.

2. When a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours provided the associated Function maintains RPS trip capability.

SURVEILLANCE		FREQUENCY
SR 3.3.1.1.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.1.1.2	-----------------NOTE----------------- Not required to be performed until 12 hours after THERMAL POWER ≥ 25% RTP. --------------------------------------- Verify the absolute difference between the average power range monitor (APRM) channels and the calculated power is ≤ 2% RTP plus any gain adjustment required by LCO 3.2.3, "Average Power Range Monitor (APRM) Gain and Setpoint" while operating at ≥ 25% RTP.	7 days
SR 3.3.1.1.3	-----------------NOTE----------------- Not required to be performed when entering MODE 2 from MODE 1 until 12 hours after entering MODE 2. --------------------------------------- Perform CHANNEL FUNCTIONAL TEST.	7 days
SR 3.3.1.1.4	Perform a functional test of each RPS automatic scram contactor.	7 days

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.1.5	Verify the source range monitor (SRM) and intermediate range monitor (IRM) channels overlap.	Prior to withdrawing SRMs from the fully inserted position
SR 3.3.1.1.6	-----NOTE----- Only required to be met during entry into MODE 2 from MODE 1. ---------- Verify the IRM and APRM channels overlap.	7 days
SR 3.3.1.1.7	Calibrate the local power range monitors.	1000 MWD/T average core exposure
SR 3.3.1.1.8	Perform CHANNEL FUNCTIONAL TEST.	92 days
SR 3.3.1.1.9	Perform a CHANNEL CALIBRATION.	92 days
SR 3.3.1.1.10	Calibrate the trip units.	184 days

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.1.11	-----NOTES----- 1. Neutron detectors are excluded. 2. For Function 2.a, not required to be performed when entering MODE 2 from MODE 1 until 12 hours after entering MODE 2. ---------- Perform CHANNEL CALIBRATION.	184 days
SR 3.3.1.1.12	Perform CHANNEL FUNCTIONAL TEST.	24 months
SR 3.3.1.1.13	-----NOTES----- 1. Neutron detectors are excluded. 2. For Function 1.a, not required to be performed when entering MODE 2 from MODE 1 until 12 hours after entering MODE 2. ---------- Perform CHANNEL CALIBRATION.	24 months
SR 3.3.1.1.14	Perform LOGIC SYSTEM FUNCTIONAL TEST.	24 months
SR 3.3.1.1.15	Verify Turbine Stop Valve - Closure and Turbine Control Valve Fast Closure, EHC Oil Pressure - Low Functions are not bypassed when THERMAL POWER is ≥ 29% RTP.	24 months

(continued)

IE

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.1.16	-----NOTES----- 1. Neutron detectors are excluded. 2. "n" equals 2 channels for the purpose of determining the STAGGERED TEST BASIS Frequency. ---------- Verify the RPS RESPONSE TIME is within limits.	24 months on a STAGGERED TEST BASIS

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Table 3.3.1.1-1 (page 1 of 3)
Reactor Protection System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION D.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Intermediate Range Monitors					
a. Neutron Flux – High	2	3	G	SR 3.3.1.1.1 SR 3.3.1.1.3 SR 3.3.1.1.4 SR 3.3.1.1.5 SR 3.3.1.1.6 SR 3.3.1.1.13 SR 3.3.1.1.14	≤ 120/125 divisions of full scale
	5[(a)]	3	H	SR 3.3.1.1.1 SR 3.3.1.1.3 SR 3.3.1.1.4 SR 3.3.1.1.13 SR 3.3.1.1.14	≤ 120/125 divisions of full scale
b. Inop	2	3	G	SR 3.3.1.1.3 SR 3.3.1.1.4 SR 3.3.1.1.14	NA
	5[(a)]	3	H	SR 3.3.1.1.3 SR 3.3.1.1.4 SR 3.3.1.1.14	NA
2. Average Power Range Monitors					
a. Neutron Flux – High, (Startup)	2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.3 SR 3.3.1.1.4 SR 3.3.1.1.5 SR 3.3.1.1.6 SR 3.3.1.1.11 SR 3.3.1.1.14	≤ 15% RTP
b. Neutron Flux-High (Flow Biased)	1	2	F	SR 3.3.1.1.1 SR 3.3.1.1.2 SR 3.3.1.1.4 SR 3.3.1.1.7 SR 3.3.1.1.8 SR 3.3.1.1.11 SR 3.3.1.1.13 SR 3.3.1.1.14 SR 3.3.1.1.15	As specified in the COLR and ≤ 117% RTP

(continued)

(a) With any control rod withdrawn from a core cell containing one or more fuel assemblies.

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Table 3.3.1.1-1 (page 2 of 3)
Reactor Protection System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION D.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
2. Average Power Range Monitors (continued)					
c. Neutron Flux – High (Fixed)	1	2	F	SR 3.3.1.1.1 SR 3.3.1.1.2 SR 3.3.1.1.4 SR 3.3.1.1.7 SR 3.3.1.1.8 SR 3.3.1.1.11 SR 3.3.1.1.14 SR 3.3.1.1.15	≤ 120% RTP
d. Inop	1,2	2	G	SR 3.3.1.1.4 SR 3.3.1.1.7 SR 3.3.1.1.8 SR 3.3.1.1.14	NA
3. Reactor Pressure – High	1,2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.4 SR 3.3.1.1.8 SR 3.3.1.1.10 SR 3.3.1.1.13 SR 3.3.1.1.14 SR 3.3.1.1.16	≤ 1079 psig
4. Reactor Water Level – Low (Level 3)	1,2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.4 SR 3.3.1.1.8 SR 3.3.1.1.10 SR 3.3.1.1.13 SR 3.3.1.1.14 SR 3.3.1.1.16	≥ 177 inches
5. Main Steam Isolation Valve – Closure	1	8	F	SR 3.3.1.1.4 SR 3.3.1.1.8 SR 3.3.1.1.13 SR 3.3.1.1.14 SR 3.3.1.1.16	≤ 15% closed
6. Drywell Pressure – High	1,2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.4 SR 3.3.1.1.8 SR 3.3.1.1.10 SR 3.3.1.1.13 SR 3.3.1.1.14 SR 3.3.1.1.16	≤ 2.7 psig

(continued)

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Table 3.3.1.1-1 (page 3 of 3)
Reactor Protection System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION D.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
7. Scram Discharge Instrument Volume Water Level – High					
a. Differential Pressure Transmitter/Trip Unit	1,2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.4 SR 3.3.1.1.9 SR 3.3.1.1.14	≤ 34.5 gallons
	5(a)	2	H	SR 3.3.1.1.1 SR 3.3.1.1.4 SR 3.3.1.1.9 SR 3.3.1.1.14	≤ 34.5 gallons
b. Level Switch	1,2	2	G	SR 3.3.1.1.4 SR 3.3.1.1.8 SR 3.3.1.1.13 SR 3.3.1.1.14	≤ 34.5 gallons
	5(a)	2	H	SR 3.3.1.1.4 SR 3.3.1.1.8 SR 3.3.1.1.13 SR 3.3.1.1.14	≤ 34.5 gallons
8. Turbine Stop Valve – Closure	≥ 29% RTP	4	E	SR 3.3.1.1.1 SR 3.3.1.1.4 SR 3.3.1.1.8 SR 3.3.1.1.10 SR 3.3.1.1.13 SR 3.3.1.1.14 SR 3.3.1.1.15 SR 3.3.1.1.16	≤ 15% closed
9. Turbine Control Valve Fast Closure, EHC Oil Pressure – Low	≥ 29% RTP	2	E	SR 3.3.1.1.1 SR 3.3.1.1.4 SR 3.3.1.1.8 SR 3.3.1.1.10 SR 3.3.1.1.13 SR 3.3.1.1.14 SR 3.3.1.1.15 SR 3.3.1.1.16	≥ 500 psig and ≤ 850 psig
10. Reactor Mode Switch – Shutdown Position	1,2	1	G	SR 3.3.1.1.12 SR 3.3.1.1.14	NA
	5(a)	1	H	SR 3.3.1.1.12 SR 3.3.1.1.14	NA
11. Manual Scram	1,2	1	G	SR 3.3.1.1.8 SR 3.3.1.1.14	NA
	5(a)	1	H	SR 3.3.1.1.8 SR 3.3.1.1.14	NA

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(a) With any control rod withdrawn from a core cell containing one or more fuel assemblies.

B 3.3 INSTRUMENTATION

B 3.3.1.1 Reactor Protection System (RPS) Instrumentation

BASES

BACKGROUND

The RPS initiates a reactor scram when one or more monitored parameters exceed their specified limits, to preserve the integrity of the fuel cladding and the reactor coolant pressure boundary (RCPB) and minimize the energy that must be absorbed following a loss of coolant accident (LOCA). This can be accomplished either automatically or manually.

The protection and monitoring functions of the RPS have been designed to ensure safe operation of the reactor. This is achieved by specifying limiting safety system settings (LSSS) in terms of parameters directly monitored by the RPS, as well as LCOs on other reactor system parameters and equipment performance.

Technical Specifications are required by 10 CFR 50.36 to contain LSSS defined by the regulation as "...settings for automatic protective devices...so chosen that automatic protective action will correct the abnormal situation before a Safety Limit (SL) is exceeded." The Analytic Limit is the limit of the process variable at which a safety action is initiated, as established by the safety analysis, to ensure that a SL is not exceeded. Any automatic protection action that occurs on reaching the Analytic Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protective devices must be chosen to be more conservative than the Analytic Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur.

The Trip Setpoint is a predetermined setting or a protective device chosen to ensure automatic actuation prior to the process variable reaching the Analytic Limit and thus ensuring the SL would not be exceeded. As such, the Trip Setpoint accounts for uncertainties in setting the device (e.g., calibration), uncertainties in how the device might actually perform (e.g., repeatability), changes in the point of action of the device over time (e.g., drift during surveillance intervals), and any other factors which may influence its actual performance (e.g., harsh accident

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BASES

BACKGROUND (continued)

environments). In this manner, the Trip Setpoint plays an important role in ensuring that SLs are not exceeded. As such, the Trip Setpoint meets the definition of an LSSS and could be used to meet the requirement that they be contained in the Technical Specifications.

Technical Specifications contain values related to the OPERABILITY of equipment required for the safe operation of the facility. Operable is defined in Technical Specifications as "...being capable of performing its safety function(s)." For automatic protective devices, the required safety function is to ensure that a SL is not exceeded and therefore the LSSS as defined by 10 CFR 50.36 is the same as the OPERABILITY limit for those devices. However, use of the Trip Setpoint to define OPERABILITY in Technical Specifications and its corresponding designation as the LSSS required by 10 CFR 50.36 would be an overly restrictive requirement if it were applied as an OPERABILITY limit for the "as found" value of a protective device setting during a surveillance. This would result in Technical Specification compliance problems, as well as reports and corrective actions required by the rule which are not necessary to ensure safety. For example, an automatic protective device with a setting that has been found to be different from the Trip Setpoint due to some drift of the setting may still be OPERABLE since drift is to be expected. This expected drift would have been specifically accounted for in the setpoint methodology for calculating the Trip Setpoint and thus the automatic protective action would still have ensured that the SL would not be exceeded with the "as found" setting of the protective device. Therefore, the device would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the device to the Trip Setpoint to account for further drift during the next surveillance interval.

Use of the Trip Setpoint to define "as found" OPERABILITY and its designation as the LSSS under the expected circumstances described above would result in actions required by both the rule and Technical Specifications that are clearly not warranted. However, there is also some point beyond which the device would have not been able to perform its function due, for example, to greater than expected drift. This value needs to be specified in the

(continued)

BASES

BACKGROUND (continued)

Technical Specifications in order to define OPERABILITY of the devices and is designated as the Allowable Value which, as stated above, is the same as the LSSS.

The Allowable Values specified in Table 3.3.1.1-1 serve as the LSSS such that a channel is OPERABLE if the trip setpoint is found not to exceed the Allowable Value. As such, the Allowable Value differs from the Trip Setpoint by an amount primarily equal to the expected instrument loop uncertainties, such as drift, during the surveillance interval. In this manner, the actual setting of the device will still meet the LSSS definition and ensure that a Safety Limit is not exceeded at any given point of time as long as the device has not drifted beyond that expected during the surveillance interval. If the actual setting of the device is found to have exceeded the Allowable Value the device would be considered inoperable from a Technical Specification perspective. This requires corrective action including those actions required by 10 CFR 50.36 when automatic protective devices do not function as required. Note that, although the channel is "OPERABLE" under these circumstances, the trip setpoint should be left adjusted to a value within the established trip setpoint calibration tolerance band, in accordance with uncertainty assumptions stated in the referenced setpoint methodology (as-left criteria), and confirmed to be operating within the statistical allowance of the uncertainty terms assigned.

The RPS, as described in the UFSAR, Section 7.2 (Ref. 1), includes sensors, relays, logic circuits, bypass circuits, and switches that are necessary to cause initiation of a reactor scram. Functional diversity is provided by monitoring a wide range of dependent and independent parameters. The input parameters to the scram logic are from instrumentation that monitors reactor vessel water level, reactor vessel pressure, neutron flux, main steam line isolation valve position, turbine control valve (TCV) fast closure (EHC Oil Pressure-Low), turbine stop valve (TSV) position, drywell pressure, and scram discharge instrument volume (SDIV) water level, as well as reactor mode switch in shutdown position and manual scram signals. There are at least four redundant sensor input signals from each of these parameters (with the exception of the reactor mode switch in shutdown position and manual scram signals). Most channels include instrumentation that compares measured input signals with pre-established setpoints. When the

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BACKGROUND (continued)

setpoint is exceeded, the channel outputs an RPS trip signal to the trip logic.

The RPS is comprised of two independent trip systems (A and B) with three trip channels in each trip system (trip channels A1, A2, and A3, B1, B2, and B3) as described in Reference 1. Trip channels A1, A2, B1 and B2 contain automatic protective instrument logic. The above monitored parameters are represented by at least one input to each of these automatic trip channels. The outputs of the automatic trip channels in a trip system are combined in a one-out-of-two logic so that either channel can trip the associated trip system. The tripping of both trip systems will produce a reactor scram. This logic arrangement is referred to as a one-out-of-two taken twice logic. There are four RPS channel test switches, one associated with each of the four automatic trip channels. These test switches allow the operator to test the OPERABILITY of the individual trip channel automatic scram contactors. In addition, trip channels A3 and B3 (one trip channel per trip system) are provided for manual scram. Placing the reactor mode switch in shutdown position or depressing both channel push buttons (one per trip system) will initiate the manual trip function. Each trip system is reset by use of a reset switch. If a full scram occurs (both trip systems trip), a relay prevents reset of the trip systems for approximately 10 seconds after the full scram signal is received. This 10 second delay on reset ensures that the scram function will be completed.

Two scram pilot valves are located in the hydraulic control unit for each control rod drive (CRD). Each scram pilot valve is solenoid operated, with the solenoids normally energized. The scram pilot valves control the air supply to the scram inlet and outlet valves for the associated CRD. When either scram pilot valve solenoid is energized, air pressure holds the scram valves closed and, therefore, both scram pilot valve solenoids must be de-energized to cause a control rod to scram. The scram valves control the supply and discharge paths for the CRD water during a scram. One of the scram pilot valve solenoids for each CRD is controlled by trip system A, and the other solenoid is controlled by trip system B. Any trip of trip system A in conjunction with any trip in trip system B results in de-energizing both solenoids, air bleeding off, scram valves opening, and control rod scram.

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BASES

BACKGROUND (continued)	The backup scram valves, which energize on a scram signal to depressurize the scram air header, are also controlled by the RPS. Additionally, the RPS System controls the SDV vent and drain valves such that when both trip systems trip, the SDV vent and drain valves close to isolate the SDV.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

The actions of the RPS are assumed in the safety analyses of References 1, 2, and 3. The RPS is required to initiate a reactor scram when monitored parameter values exceed the Allowable Values, specified by the setpoint methodology and listed in Table 3.3.1.1-1 to preserve the integrity of the fuel cladding, the RCPB, and the containment by minimizing the energy that must be absorbed following a LOCA.

RPS instrumentation satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii) (Ref. 4). Functions not specifically credited in the accident analysis are retained for the overall redundancy and diversity of the RPS as required by the NRC approved licensing basis.

The OPERABILITY of the RPS is dependent on the OPERABILITY of the individual instrumentation channel Functions specified in Table 3.3.1.1-1. Each Function must have a required number of OPERABLE channels per RPS trip system, with their setpoints within the specified Allowable Value, where appropriate. The actual setpoint is calibrated consistent with applicable setpoint methodology assumptions. Each channel must also respond within its assumed response time, where appropriate.

Allowable Values are specified, as appropriate for RPS Functions specified in the Table. Nominal trip setpoints are specified in the setpoint calculations. The nominal setpoints are selected to ensure that the actual setpoints do not exceed the Allowable Value between successive CHANNEL CALIBRATIONS. Operation with a trip setpoint less conservative than the nominal trip setpoint, but within its Allowable Value, is acceptable. A channel is inoperable if its actual trip setpoint is not within its required Allowable Value.

Trip setpoints are those predetermined values of output at which an action should take place. The setpoints are compared to the actual process parameter (e.g., reactor

(continued)

BASES

APPLICABLE SAFETY ANALYSES LCO, and APPLICABILITY (continued)

vessel water level), and when the measured output value of the process parameter exceeds the setpoint, the associated device (e.g., trip unit) changes state. The analytic limits are derived from the limiting values of the process parameters obtained from the safety analysis or other appropriate documents. The trip setpoints are derived from the analytical limits and account for all worst case instrumentation uncertainties as appropriate (e.g., drift, process effects, calibration uncertainties, and severe environmental errors (for channels that must function in harsh environments as defined by 10 CFR 50.49)). The trip setpoints derived in this manner provide adequate protection because all expected uncertainties are accounted for. The Allowable Values are then derived from the trip setpoints by accounting for normal effects that would be seen during periodic surveillance or calibration. These effects are instrumentation uncertainties observed during normal operation (e.g., drift and calibration uncertainties).

RAI 3.3.1.1-1

The OPERABILITY of scram pilot valves and associated solenoids, backup scram valves, and SDV valves, described in the Background section, are not addressed by this LCO.

The individual Functions are required to be OPERABLE in the MODES or other conditions specified in the table, which may require an RPS trip to mitigate the consequences of a design basis accident or transient. To ensure a reliable scram function, a combination of Functions are required in each MODE to provide primary and diverse initiation signals.

The only MODES specified in Table 3.3.1.1-1 are MODES 1 and 2 and MODE 5 with any control rod withdrawn from a core cell containing one or more fuel assemblies. No RPS Function is required in MODES 3 and 4, since all control rods are fully inserted and the Reactor Mode Switch Shutdown Position control rod withdrawal block (LCO 3.3.2.1) does not allow any control rod to be withdrawn. In MODE 5, control rods withdrawn from a core cell containing no fuel assemblies do not affect the reactivity of the core and, therefore, are not required to have the capability to scram. Provided all other control rods remain inserted, no RPS function is required. In this condition, the required SDM (LCO 3.1.1) and refuel position one-rod-out interlock (LCO 3.9.2) ensure that no event requiring RPS will occur.

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BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

Intermediate Range Monitor (IRM)

1.a. Intermediate Range Monitor Neutron Flux-High

The IRMs monitor neutron flux levels from the upper range of the source range monitor (SRM) to the lower range of the average power range monitors (APRMs). The IRMs are capable of generating trip signals that can be used to prevent fuel damage resulting from abnormal operating transients in the intermediate power range. In this power range, the most significant source of reactivity change is due to control rod withdrawal. The IRM provides diverse protection for the rod worth minimizer (RWM), which monitors and controls the movement of control rods at low power. The RWM prevents the withdrawal of an out of sequence control rod during startup that could result in an unacceptable neutron flux excursion (Ref. 2). The IRM provides mitigation of the neutron flux excursion. To demonstrate the capability of the IRM System to mitigate control rod withdrawal events, a generic analysis has been performed (Ref. 3) to evaluate the consequences of control rod withdrawal events during startup that are mitigated only by the IRM. This analysis, which assumes that one IRM channel in each trip system is bypassed, demonstrates that the IRMs provide protection against local control rod withdrawal errors and result in peak fuel enthalpy below the 170 cal/gm fuel failure threshold criterion.

The IRMs are also capable of limiting other reactivity excursions during startup, such as cold water injection events, although no credit is specifically assumed.

The IRM System is divided into two groups of IRM channels, with four IRM channels inputting to each trip system. The analysis of Reference 3 assumes that one channel in each trip system is bypassed. Therefore, six channels with three channels in each trip system are required for IRM OPERABILITY to ensure that no single instrument failure will preclude a scram from this Function on a valid signal. This trip is active in each of the 10 ranges of the IRM, which must be selected by the operator to maintain the neutron flux within the monitored level of an IRM range.

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BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The analysis of Reference 3 has adequate conservatism to permit the IRM Allowable Value of 120 divisions of a 125 division scale.

The Intermediate Range Monitor Neutron Flux – High Function must be OPERABLE during MODE 2 when control rods may be withdrawn and the potential for criticality exists. In MODE 5, when a cell with fuel has its control rod withdrawn, the IRMs provide monitoring for and protection against unexpected reactivity excursions. In MODE 1, the APRM System, the RWM, and Rod Block Monitor provide protection against control rod withdrawal error events and the IRMs are not required. The IRMs are automatically bypassed when the reactor mode selector switch is in the run position.

1.b. Intermediate Range Monitor – Inop

This trip signal provides assurance that a minimum number of IRMs are OPERABLE. If an IRM Operate-Calibrate switch is moved to any position other than "Operate," the detector voltage drops below a preset level, or a module is not plugged in, an inoperative trip signal will be received by the RPS unless the IRM is bypassed. Since only one IRM in each trip system may be bypassed, only one IRM in each RPS trip system may be inoperable without resulting in an RPS trip signal.

This Function was not specifically credited in the accident analysis but it is retained for the overall redundancy and diversity of the RPS as required by the NRC approved licensing basis.

Six channels of Intermediate Range Monitor – Inop, with three channels in each trip system, are required to be OPERABLE to ensure that no single instrument failure will preclude a scram from this Function on a valid signal.

Since this Function is not assumed in the safety analysis, there is no Allowable Value for this Function.

This Function is required to be OPERABLE when the Intermediate Range Monitor Neutron Flux – High Function is required.

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BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Average Power Range Monitor

2.a. Average Power Range Monitor Neutron Flux-High (Startup)

The APRM channels receive input signals from the local power range monitors (LPRMs) within the reactor core that provide an indication of the power distribution and local power changes. The APRM channels average these LPRM signals to provide a continuous indication of average reactor power from a few percent to greater than RTP. For operation at low power (i.e., MODE 2), the Average Power Range Monitor Neutron Flux-High (Startup) Function is capable of generating a trip signal that prevents fuel damage resulting from abnormal operating transients in this power range. For most operation at low power levels, the Average Power Range Monitor Neutron Flux-High (Startup) Function will provide a secondary scram to the Intermediate Range Monitor Neutron Flux-High Function because of the relative setpoints. With the IRMs at Range 9 or 10, it is possible that the Average Power Range Monitor Neutron Flux-High (Startup) Function will provide the primary trip signal for a core-wide increase in power.

No specific safety analyses take direct credit for the Average Power Range Monitor Neutron Flux-High (Startup) Function. However, this Function indirectly ensures that before the reactor mode switch is placed in the run position, reactor power does not exceed 25% RTP (SL 2.1.1.1) when operating at low reactor pressure and low core flow. Therefore, it indirectly prevents fuel damage during significant reactivity increases with THERMAL POWER < 25% RTP.

The APRM System is divided into two groups of channels with three APRM channels providing input to each trip system. The system is designed to allow one channel in each trip system to be bypassed. Any one APRM channel in a trip system can cause the associated trip system to trip. Four channels of Average Power Range Monitor Neutron Flux-High (Startup) with two channels in each trip system are required to be OPERABLE to ensure that no single failure will preclude a scram from this Function on a valid signal. In addition, to provide adequate coverage of the entire core, at least 11 LPRM inputs are required for each APRM channel, with at least two LPRM inputs from each of the four axial

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BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

2.a. Average Power Range Monitor Neutron Flux – High (Startup) (continued)

levels at which the LPRMs are located.

The Allowable Value is based on preventing significant increases in power when THERMAL POWER is < 25% RTP.

The Average Power Range Monitor Neutron Flux – High (Startup) Function must be OPERABLE during MODE 2 when control rods may be withdrawn since the potential for criticality exists.

In MODE 1, the Average Power Range Monitor Neutron Flux – High (Fixed) Function provides protection against reactivity transients and the RWM and rod block monitor protect against control rod withdrawal error events. The APRM Neutron Flux – High (Startup) Function is bypassed when the reactor mode switch is in the run position.

2.b. Average Power Range Monitor Neutron Flux – High (Flow Biased)

The Average Power Range Monitor Neutron Flux – High (Flow Biased) Function monitors neutron flux. The APRM neutron flux trip level is varied as a function of recirculation drive flow but is clamped at an upper limit that is lower than the Average Power Range Monitor Neutron Flux – High (Fixed) Function, Function 2.c, Allowable Value. The Average Power Range Monitor Neutron Flux – High (Flow Biased) Function is not specifically credited in the safety analysis, but is intended to provide protection against transients where THERMAL POWER increases slowly (such as the loss of feedwater heating event), however, no credit is taken for this Function in the safety analyses except in the case of the thermal-hydraulic instability analysis. This protection is primarily achieved by the clamped portion of the Allowable Value. The APRM Neutron Flux - High (Flow Biased) Function will suppress power oscillations prior to exceeding the fuel safety limit (MCPR) caused by thermal hydraulic instability. As described in References 5 and 6, this protection is provided at a high statistical confidence level for core-wide mode oscillations and at a nominal statistical confidence level for regional mode oscillations. References 5 and 6 also demonstrate that the core-wide mode

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BASES

APPLICABLE SAFETY ANALYSES LCO, and APPLICABILITY

2.b. Average Power Range Monitor Neutron Flux - High (Flow Biased) (continued)

of oscillation is more likely to occur due to the large single-phase channel pressure drop associated with the small fuel inlet orifice diameters. This protection for power oscillations is achieved by that portion of the Allowable Value which varies as a function of the recirculation drive flow.

The APRM System is divided into two groups of channels with three APRM channels providing input to each trip system. The system is designed to allow one channel in each trip system to be bypassed. Any one APRM channel in a trip system can cause the associated trip system to trip. Four channels of Average Power Range Monitor Neutron Flux - High (Flow Biased) with two channels in each trip system arranged in a one-out-of-two logic are required to be OPERABLE to ensure that no single failure will preclude a scram from this Function on a valid signal. In addition, to provide adequate coverage of the entire core, at least 11 LPRM inputs are required for each APRM channel, with at least two LPRM inputs from each of the four axial levels at which the LPRMs are located. Each APRM channel receives two independent, redundant flow signals representative of total recirculation loop flow. The recirculation loop flow signals are generated by four flow units, two of which supply signals to the trip system A APRMs, while the other two supply signals to the trip system B APRMs. Each flow unit signal is provided by summing up the flow signals from the two recirculation loops. To obtain the most conservative reference signals, the total flow signals from the two flow units (associated with a trip system as described above) are routed to a low auction circuit associated with each APRM. Each APRM's auction circuit selects the lower of the two flow unit signals for use as the scram trip reference for that particular APRM. Each required Average Power Range Monitor Neutron Flux - High (Flow Biased) channel requires an input from one OPERABLE flow unit, since the individual APRM channel will perform the intended function with only one OPERABLE flow unit input. However, in order to maintain single failure capability for the Function, at least one required Average Power Range Monitor Neutron Flux - High (Flow Biased) channel in each trip system must be capable of maintaining an OPERABLE flow unit signal in the event of a failure of an

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

2.b. Average Power Range Monitor Neutron Flux-High (Flow Biased) (continued)

auction circuit, or a flow unit, in the associated trip system (e.g., if a flow unit is inoperable, one of the two required Average Power Range Monitor Neutron Flux-High (Flow Biased) channels in the associated trip system must be considered inoperable).

The flow biased Allowable Value is credited in the safety analyses (thermal- hydraulic instability) and is specifically confirmed for each operating cycle. For this reason the Allowable Value is included in the COLR for both single and two recirculation loop operation. The clamped portion of the Allowable Value is set more conservative than the APRM Neutron Flux High (Fixed) (Function 2.c).

The Average Power Range Monitor Neutron Flux-High (Flow Biased) Function is required to be OPERABLE in MODE 1 when there is the possibility of generating excessive THERMAL POWER and potentially exceeding the SL applicable to high pressure and core flow conditions (MCPR SL). During MODES 2 and 5, other IRM and APRM Functions provide protection for fuel cladding integrity.

2.c. Average Power Range Monitor Neutron Flux-High (Fixed)

The APRM channels provide the primary indication of neutron flux within the core and respond almost instantaneously to neutron flux increases. The Average Power Range Monitor Neutron Flux-High (Fixed) Function is capable of generating a trip signal to prevent fuel damage or excessive Reactor Coolant System (RCS) pressure. For the overpressurization protection analysis of Reference 7, the Average Power Range Monitor Neutron Flux-High (Fixed) Function is assumed to terminate the main steam isolation valve (MSIV) closure event and, along with the safety/relief valves (S/RVs), limits the peak reactor pressure vessel (RPV) pressure to less than the ASME Code limits. The control rod drop accident (CRDA) analysis (Ref. 8) takes credit for the Average Power Range Monitor Neutron Flux-High (Fixed) Function to terminate the CRDA.

The APRM System is divided into two groups of channels with three APRM channels providing input to each trip system.

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

2.c. Average Power Range Monitor Neutron Flux-High (Fixed) (continued)

The system is designed to allow one channel in each trip system to be bypassed. Any one APRM channel in a trip system can cause the associated trip system to trip. Four channels of Average Power Range Monitor Neutron Flux-High (Fixed) with two channels in each trip system arranged in a one-out-of-two logic are required to be OPERABLE to ensure that no single failure will preclude a scram from this Function on a valid signal. In addition, to provide adequate coverage of the entire core, at least 11 LPRM inputs are required for each APRM channel, with at least two LPRM inputs from each of the four axial levels at which the LPRMs are located.

The Allowable Value is based on the Analytical Limit assumed in the CRDA analyses.

The Average Power Range Monitor Neutron Flux-High (Fixed) Function is required to be OPERABLE in MODE 1 where the potential consequences of the analyzed transients could result in the SLs (e.g., MCPR and RCS pressure) being exceeded. Although the Average Power Range Monitor Neutron Flux-High (Fixed) Function is assumed in the CRDA analysis (Ref. 8), which is applicable in MODE 2, the Average Power Range Monitor Neutron Flux-High, (Startup) Function conservatively bounds the assumed trip and, together with the assumed IRM trips, provides adequate protection. Therefore, the Average Power Range Monitor Neutron Flux-High (Fixed) Function is not required in MODE 2.

2.d. Average Power Range Monitor-Inop

This signal provides assurance that a minimum number of APRMs are OPERABLE. Anytime an APRM Operate-Calibrate switch is moved to any position other than "Operate," an APRM module is unplugged, or the APRM has too few LPRM inputs (< 11), an inoperative trip signal will be received by the RPS, unless the APRM is bypassed. Since only one APRM in each trip system may be bypassed, only one APRM in each trip system may be inoperable without resulting in an RPS trip signal. This Function was not specifically credited in the accident analysis, but it is retained for the overall redundancy and diversity of the RPS as required by the NRC approved licensing basis.

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

2.d. Average Power Range Monitor - Inop (continued)

Four channels of Average Power Range Monitor - Inop with two channels in each trip system are required to be OPERABLE to ensure that no single failure will preclude a scram from this Function on a valid signal.

There is no Allowable Value for this Function. This Function is required to be OPERABLE in the MODES where the APRM Functions are required.

3. Reactor Pressure - High

An increase in the RCS pressure during reactor operation compresses the steam voids and results in a positive reactivity insertion. This causes the neutron flux and THERMAL POWER transferred to the reactor coolant to increase, which could challenge the integrity of the fuel cladding and the RCPB. The Reactor Pressure-High Function is specifically credited in the safety analyses for the generator load reject and turbine trip events when initiated from low power levels (Refs. 9 and 10). At low power levels (e.g., below 29% RTP), the Turbine Stop Valve - Closure and Turbine Control Valve Fast Closure, EHC Oil Pressure - Low Functions are not required to be OPERABLE. For the overpressurization protection analysis of Reference 7, reactor scram (the analyses conservatively assume scram on the Average Power Range Monitor Neutron Flux - High (Fixed) signal, not the Reactor Pressure - High signal), along with the S/RVs, limits the peak Reactor Pressure Vessel (RPV) pressure to less than the ASME Section III Code limits.

High reactor pressure signals are initiated from four pressure transmitters that sense reactor pressure. The Reactor Pressure - High Allowable Value is chosen to provide a sufficient margin to the ASME Section III Code limits during pressurization events.

Four channels of Reactor Pressure - High Function, with two channels in each trip system arranged in a one-out-of-two logic, are required to be OPERABLE to ensure that no single instrument failure will preclude a scram from this Function on a valid signal. The Function is required to be OPERABLE

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

3. Reactor Pressure - High (continued)

in MODES 1 and 2 when the RCS is pressurized and the potential for pressure increase exists.

4. Reactor Vessel Water Level - Low (Level 3)

Low RPV water level indicates the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. Therefore, a reactor scram is initiated at Level 3 to substantially reduce the heat generated in the fuel from fission. The Reactor Vessel Water Level - Low (Level 3) Function is one of the Functions assumed in the analysis of the recirculation line break (Ref. 11). The reactor scram reduces the amount of energy required to be absorbed and, along with the actions of the Emergency Core Cooling Systems (ECCS), ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

Reactor Vessel Water Level - Low (Level 3) signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel.

Four channels of Reactor Vessel Water Level - Low (Level 3) Function, with two channels in each trip system arranged in a one-out-of-two logic, are required to be OPERABLE to ensure that no single failure will preclude a scram from this Function on a valid signal.

The Reactor Vessel Water Level - Low (Level 3) Allowable Value is selected to ensure that during normal operation the separator skirts are not uncovered (this protects available recirculation pump net positive suction head (NPSH) from significant carryunder) and, for transients involving loss of all normal feedwater flow, initiation of the low pressure ECCS subsystems at Reactor Vessel Water - Low Low Low (Level 1) will not be required. The Allowable Value is the water level above a zero reference level which is 352.56 inches above the lowest point inside the RPV and is also at the top of a 144 inch fuel column (Ref. 12).

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

4. Reactor Vessel Water Level - Low (Level 3) (continued)

The Function is required in MODES 1 and 2 where considerable energy exists in the RCS resulting in the limiting transients and accidents. ECCS initiations at Reactor Vessel Water Level - Low Low (Level 2) and Low Low Low (Level 1) provide sufficient protection for level transients in all other MODES.

5. Main Steam Isolation Valve - Closure

MSIV closure results in loss of the main turbine and the condenser as a heat sink for the nuclear steam supply system and indicates a need to shut down the reactor to reduce heat generation. Therefore, a reactor scram is initiated on a Main Steam Isolation Valve - Closure signal before the MSIVs are completely closed in anticipation of the complete loss of the normal heat sink and subsequent overpressurization transient. However, for the overpressurization protection analysis of Reference 7, the Average Power Range Monitor Neutron Flux - High (Fixed) Function, along with the S/RVs, limits the peak RPV pressure to less than the ASME Code limits. That is, the direct scram on position switches for MSIV closure events is not assumed in the overpressurization analysis. Additionally, MSIV closure is assumed in the transients analyzed in References 13 and 14 (i.e., failure of the pressure regulator and manual closure of MSIVs, respectively) and in the main steam line break accident analyzed in Reference 15.

The reactor scram reduces the amount of energy required to be absorbed and, along with the actions of the ECCS, ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

MSIV closure signals are initiated from position switches located on each of the eight MSIVs. Each MSIV has two position switches; one inputs to RPS trip system A while the other inputs to RPS trip system B. Thus, each RPS trip system receives an input from eight Main Steam Isolation Valve - Closure channels, each consisting of one position switch. The logic for the Main Steam Isolation Valve - Closure Function is arranged such that either the inboard or outboard valve on three or more of the main steam lines must close in order for a scram to occur. The design

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

5. Main Steam Isolation Valve - Closure (continued)

permits closure of any two lines without a full scram being initiated.

The Main Steam Isolation Valve - Closure Allowable Value is specified to ensure that a scram occurs prior to a significant reduction in steam flow, thereby reducing the severity of the subsequent pressure transient.

Sixteen channels of the Main Steam Isolation Valve - Closure Function, with eight channels in each trip system, are required to be OPERABLE to ensure that no single failure will preclude the scram from this Function on a valid signal. This Function is only required in MODE 1 since, with the MSIVs open and the heat generation rate high, a pressurization transient can occur if the MSIVs close. In MODE 2, the heat generation rate is low enough so that the other diverse RPS functions provide sufficient protection.

6. Drywell Pressure - High

High pressure in the drywell could indicate a break in the RCPB. A reactor scram is initiated to minimize the possibility of fuel damage and to reduce the amount of energy being added to the coolant and the drywell. The Drywell Pressure - High Function is assumed to scram the reactor for LOCAs inside primary containment (Ref. 11). The reactor scram reduces the amount of energy required to be absorbed and along with the actions of the ECCS, ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

High drywell pressure signals are initiated from four pressure transmitters that sense drywell pressure. The Allowable Value was selected to be as low as possible and indicative of a LOCA inside primary containment.

Four channels of Drywell Pressure - High Function, with two channels in each trip system arranged in a one-out-of-two logic, are required to be OPERABLE to ensure that no single instrument failure will preclude a scram from this Function on a valid signal. The Function is required in MODES 1 and 2 where considerable energy exists in the RCS, resulting in the limiting transients and accidents.

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

7.a 7.b Scram Discharge Instrument Volume Water Level - High

The SDIVs, east and west, are independent with separate drain lines and isolation valves. Each SDIV accommodates approximately half of the water displaced by the motion of the CRD pistons during a reactor scram. Should either SDIV fill to a point where there is insufficient volume to accept the displaced water, control rod insertion would be hindered. Therefore, a reactor scram is initiated while the remaining free volumes are still sufficient to accommodate the water from a full core scram. The two types of Scram Discharge Instrument Volume Water Level - High Functions are an input to the RPS logic. No credit is taken for a scram initiated from these Functions for any of the design basis accidents or transients analyzed in the UFSAR. However, they are retained to ensure the RPS remains OPERABLE.

SDIV water level is measured by two diverse methods. The level in each of the two SDIVs is measured by two float type level switches and two differential pressure transmitters for a total of eight level signals. The outputs of these devices are arranged so that there are either two level switch signals or two differential pressure transmitter signals to each RPS trip channel. Each trip channel receives signals from instrumentation from both the east and west SDIVs and each RPS trip system receives signals from the two diverse methods. The level measurement instrumentation satisfies the recommendations of Reference 16.

The Allowable Value is chosen low enough to ensure that there is sufficient volume in each SDIV to accommodate the water directed to it from a full scram.

Four channels of each type of Scram Discharge Instrument Volume Water Level - High Function, with two channels of each type in each trip system, are required to be OPERABLE to ensure that no single failure will preclude a scram from these Functions on a valid signal. These Functions are required in MODES 1 and 2, and in MODE 5 with any control rod withdrawn from a core cell containing one or more fuel assemblies, since these are the MODES and other specified conditions when control rods are withdrawn. At all other times, this Function may be bypassed.

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

8. Turbine Stop Valve - Closure

Closure of the TSVs results in the loss of the heat sink and produces reactor pressure, neutron flux, and heat flux transients that must be limited. Therefore, a reactor scram is initiated at the start of TSV closure in anticipation of the transients that would result from the closure of these valves. The Turbine Stop Valve - Closure Function is the primary scram signal for the turbine trip (Ref. 10), feedwater controller failure - maximum demand (Ref. 17), and the loss of main condenser vacuum (Ref. 10) events. For these events, the reactor scram reduces the amount of energy required to be absorbed and ensures that the MCPR SL is not exceeded.

Turbine Stop Valve - Closure signals are initiated from position switches located on each of the four TSVs. One double pole (contact) position switch is associated with each stop valve. One of the two contacts provides input to RPS trip system A; the other, to RPS trip system B. Thus, each RPS trip system receives an input from four Turbine Stop Valve - Closure channels, each consisting of one position switch contact inputting to a relay. The relay contacts provide a parallel logic input to an RPS trip channel. The logic for the Turbine Stop Valve - Closure Function is such that three or more TSVs must be closed to produce a scram. This Function must be enabled at THERMAL POWER ≥ 29% RTP as measured by turbine first stage pressure. This is accomplished automatically by pressure transmitters sensing turbine first stage pressure; therefore, to consider this Function OPERABLE, the turbine bypass valves must remain shut (except during required testing or upon actual demand) at THERMAL POWER ≥ 29% RTP. In addition, other steam loads, such as second stage reheaters in operation, must be accounted for in establishing the setpoint for turbine first stage pressure. Otherwise, the setpoint would be non-conservative with respect to the 29% RTP RPS bypass.

The Turbine Stop Valve - Closure Allowable Value is selected to detect imminent TSV closure, thereby reducing the severity of the subsequent pressure transient.

Eight channels of Turbine Stop Valve - Closure Function, with four channels in each trip system, are required to be OPERABLE to ensure that no single failure will preclude

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

8. Turbine Stop Valve-Closure (continued)

a scram from this Function even if one TSV should fail to close. This Function is required, consistent with analysis assumptions, whenever THERMAL POWER is ≥ 29% RTP. This Function is not required when THERMAL POWER is < 29% RTP since the Reactor Pressure-High and the Average Power Range Monitor Neutron Flux-High (Fixed) Functions are adequate to maintain the necessary safety margins.

9. Turbine Control Valve Fast Closure, EHC Oil Pressure-Low

Fast closure of the TCVs results in the loss of the heat sink and produces reactor pressure, neutron flux, and heat flux transients that must be limited. Therefore, a reactor scram is initiated on TCV fast closure in anticipation of the transients that would result from the closure of these valves. The Turbine Control Valve Fast Closure, EHC Oil Pressure-Low Function is the primary scram signal for the generator load rejection event analyzed in Reference 9. For this event, the reactor scram reduces the amount of energy required to be absorbed and ensures that the MCPR SL is not exceeded.

Turbine Control Valve Fast Closure, EHC Oil Pressure-Low signals are initiated by low electrohydraulic control (EHC) fluid pressure in the emergency trip header, between the fast closure solenoid and the disc dump valve for each control valve. One pressure switch is associated with each control valve, and the signal from each switch is assigned to a separate RPS trip channel. This Function must be enabled at THERMAL POWER ≥ 29% RTP as measured by turbine first stage pressure. This is accomplished automatically by pressure transmitters sensing turbine first stage pressure; therefore, to consider this Function OPERABLE, the turbine bypass valves must remain shut (except during required testing or upon actual demand) at THERMAL POWER ≥ 29% RTP. In addition, other steam loads, such as second stage reheaters in operation, must be accounted for in establishing the setpoint for turbine first stage pressure. Otherwise, the setpoint would be non-conservative with respect to the 29% RTP RPS bypass.

The Turbine Control Valve Fast Closure, EHC Oil Pressure-Low Allowable Value is selected high enough to

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

9. Turbine Control Valve Fast Closure, EHC Oil Pressure - Low (continued)

detect imminent TCV fast closure and low enough to avoid inadvertent scrams.

Four channels of Turbine Control Valve Fast Closure, EHC Oil Pressure - Low Function with two channels in each trip system arranged in a one-out-of-two logic are required to be OPERABLE to ensure that no single failure will preclude a scram from this Function on a valid signal. This Function is required, consistent with the analysis assumptions, whenever THERMAL POWER is ≥ 29% RTP. This Function is not required when THERMAL POWER is < 29% RTP, since the Reactor Pressure - High and the Average Power Range Monitor Neutron Flux - High (Fixed) Functions are adequate to maintain the necessary safety margins.

10. Reactor Mode Switch - Shutdown Position

The Reactor Mode Switch - Shutdown Position Function provides signals, via the manual scram trip channels directly to the scram pilot valve solenoid power circuits. The manual scram trip channels are redundant to the automatic protective instrumentation channels and provide manual reactor trip capability. This Function was not specifically credited in the accident analysis, but it is retained for the overall redundancy and diversity of the RPS as required by the NRC approved licensing basis.

The reactor mode switch is a keylock four-position, four-bank switch. The reactor mode switch will scram the reactor if it is placed in the shutdown position. Scram signals from the reactor mode switch are input into each of the two RPS manual scram trip channels.

There is no Allowable Value for this Function, since the channels are mechanically actuated based solely on reactor mode switch position.

Two channels of Reactor Mode Switch - Shutdown Position Function, with one channel in each trip system, are available and required to be OPERABLE. The Reactor Mode Switch - Shutdown Position Function is required to be OPERABLE in MODES 1 and 2, and MODE 5 with any control rod withdrawn from a core cell containing one or more fuel

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

10. Reactor Mode Switch - Shutdown Position (continued)

assemblies, since these are the MODES and other specified conditions when control rods are withdrawn.

11. Manual Scram

The Manual Scram push button channels provide signals, via the manual scram trip channels, directly to the scram pilot valve solenoid power circuits. These manual scram trip channels are redundant to the automatic protective instrumentation channels and provide manual reactor trip capability. This Function was not specifically credited in the accident analysis but it is retained for the overall redundancy and diversity of the RPS as required by the NRC approved licensing basis.

There is one Manual Scram push button channel for each of the two RPS manual scram trip channels. In order to cause a scram it is necessary that the channel in both manual scram trip systems be actuated.

There is no Allowable Value for this Function since the channels are mechanically actuated based solely on the position of the push buttons.

Two channels of Manual Scram, with one channel in each manual scram trip system, are available and required to be OPERABLE in MODES 1 and 2, and in MODE 5 with any control rod withdrawn from a core cell containing one or more fuel assemblies, since these are the MODES and other specified conditions when control rods are withdrawn.

ACTIONS

A Note has been provided to modify the ACTIONS related to RPS instrumentation channels. Section 1.3, Completion Times, specifies that once a Condition has been entered, subsequent divisions, subsystems, components, or variables expressed in the Condition, discovered to be inoperable or not within limits, will not result in separate entry into the Condition unless specifically stated. Section 1.3 also specifies that the Required Actions of the Condition continue to apply for each additional failure, with Completion Times based on initial entry into the Condition.

(continued)

BASES

ACTIONS (continued)

However, the Required Actions for inoperable RPS instrumentation channels provide appropriate compensatory measures for separate inoperable channels. As such, a Note has been provided that allows separate Condition entry for each inoperable RPS instrumentation channel.

A.1 and A.2

Because of the diversity of sensors available to provide trip signals and the redundancy of the RPS design, an allowable out of service time of 12 hours has been shown to be acceptable (Ref. 18) to permit restoration of any inoperable channel to OPERABLE status. However, this out of service time is only acceptable provided the associated Function's inoperable channel is in one trip system and the Function still maintains RPS trip capability (refer to Required Actions B.1, B.2, and C.1 Bases). If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel or the associated trip system must be placed in the tripped condition per Required Actions A.1 and A.2. Placing the inoperable channel in trip (or the associated trip system in trip) would conservatively compensate for the inoperability, restore capability to accommodate a single failure, and allow operation to continue. Alternatively, if it is not desired to place the channel (or trip system) in trip (e.g., as in the case where placing the inoperable channel in trip would result in a full scram), Condition D must be entered and its Required Action taken.

B.1 and B.2

Condition B exists when, for any one or more Functions, at least one required channel is inoperable in each trip system. In this condition, provided at least one channel per trip system is OPERABLE, the RPS still maintains trip capability for that Function, but cannot accommodate a single failure in either trip system.

Required Actions B.1 and B.2 limit the time the RPS scram logic, for any Function, would not accommodate single failure in both trip systems (e.g., one-out-of-one and one-out-of-one arrangement for a typical four channel Function). The reduced reliability of this logic

(continued)

BASES

ACTIONS

B.1 and B.2 (continued)

arrangement was not evaluated in Reference 18 for the 12 hour Completion Time. Within the 6 hour allowance, the associated Function will have all required channels OPERABLE or in trip (or any combination) in one trip system.

Completing one of these Required Actions restores RPS to a reliability level equivalent to that evaluated in Reference 18, which justified a 12 hour allowable out of service time as presented in Condition A. The trip system in the more degraded state should be placed in trip or, alternatively, all the inoperable channels in that trip system should be placed in trip (e.g., a trip system with two inoperable channels could be in a more degraded state than a trip system with four inoperable channels if the two inoperable channels are in the same Function while the four inoperable channels are all in different Functions). The decision of which trip system is in the more degraded state should be based on prudent judgment and take into account current plant conditions (i.e., what MODE the plant is in). If this action would result in a scram, it is permissible to place the other trip system or its inoperable channels in trip.

The 6 hour Completion Time is judged acceptable based on the remaining capability to trip, the diversity of the sensors available to provide the trip signals, the low probability of extensive numbers of inoperabilities affecting all diverse Functions, and the low probability of an event requiring the initiation of a scram.

Alternately, if it is not desired to place the inoperable channels (or one trip system) in trip (e.g., as in the case where placing the inoperable channel or associated trip system in trip would result in a scram), Condition D must be entered and its Required Action taken.

C.1

Required Action C.1 is intended to ensure that appropriate actions are taken if multiple, inoperable, untripped channels within the same trip system for the same Function result in the Function not maintaining RPS trip capability. A Function is considered to be maintaining RPS trip capability when sufficient channels are OPERABLE or in trip

(continued)

BASES

ACTIONS

C.1 (continued)

(or the associated trip system is in trip), such that both trip systems will generate a trip signal from the given Function on a valid signal. For the typical Function with one-out-of-two taken twice logic and the IRM and APRM Functions, this would require both trip systems to have one channel OPERABLE or in trip (or the associated trip system in trip). For Function 5 (Main Steam Isolation Valve – Closure), this would require both trip systems to have each channel associated with the MSIVs in three main steam lines (not necessarily the same main steam lines for both trip systems) OPERABLE or in trip (or the associated trip system in trip). For Function 8 (Turbine Stop Valve – Closure), this would require both trip systems to have three channels, each OPERABLE or in trip (or the associated trip system in trip).

For Functions 10 (Reactor Mode Switch – Shutdown Position) and 11 (Manual Scram) this would require both trip systems to have one channel each OPERABLE or in trip (or the associated trip system in trip).

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. The 1 hour Completion Time is acceptable because it minimizes risk while allowing time for restoration or tripping of channels.

D.1

Required Action D.1 directs entry into the appropriate Condition referenced in Table 3.3.1.1-1. The applicable Condition specified in the Table is Function and MODE or other specified condition dependent and may change as the Required Action of a previous Condition is completed. Each time an inoperable channel has not met any Required Action of Condition A, B, or C and the associated Completion Time has expired, Condition D will be entered for that channel and provides for transfer to the appropriate subsequent Condition.

(continued)

BASES

ACTIONS (continued)

E.1, F.1, and G.1

If the channel(s) is not restored to OPERABLE status or placed in trip (or the associated trip system placed in trip) within the allowed Completion Time, the plant must be placed in a MODE or other specified condition in which the LCO does not apply. The allowed Completion Times are reasonable, based on operating experience, to reach the specified condition from full power conditions in an orderly manner and without challenging plant systems. In addition, the Completion Time of Required Action E.1 is consistent with the Completion Time provided in LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)."

H.1

If the channel(s) is not restored to OPERABLE status or placed in trip (or the associated trip system placed in trip) within the allowed Completion Time, the plant must be placed in a MODE or other specified condition in which the LCO does not apply. This is done by immediately initiating action to fully insert all insertable control rods in core cells containing one or more fuel assemblies. Control rods in core cells containing no fuel assemblies do not affect the reactivity of the core and are, therefore, not required to be inserted. Action must continue until all insertable control rods in core cells containing one or more fuel assemblies are fully inserted.

SURVEILLANCE REQUIREMENTS

As noted at the beginning of the SRs, the SRs for each RPS instrumentation Function are located in the SRs column of Table 3.3.1.1-1.

The Surveillances are modified by a second Note to indicate that when a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours, provided the associated Function maintains RPS trip capability. Upon completion of the Surveillance, or expiration of the 6 hour allowance, the channel must be returned to OPERABLE status or the applicable Condition entered and Required Actions taken. This Note is based on the reliability analysis (Ref. 18) assumption of the average time required to perform channel

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

Surveillances. That analysis demonstrated that the 6 hour testing allowance does not significantly reduce the probability that the RPS will trip when necessary.

SR 3.3.1.1.1

Performance of the CHANNEL CHECK once every 12 hours ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between instrument channels could be an indication of excessive instrument drift in one of the channels or something even more serious. A CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL CALIBRATION. For Functions 8 and 9, this SR is associated with the enabling circuit sensing first stage pressure.

Channel agreement criteria are determined by the plant staff based on a combination of the channel instrument uncertainties, including indication and readability. If a channel is outside the criteria, it may be an indication that the instrument has drifted outside its limit.

The Frequency is based upon operating experience that demonstrates channel failure is rare. The CHANNEL CHECK supplements less formal, but more frequent, checks of channels during normal operational use of the displays associated with the channels required by the LCO.

SR 3.3.1.1.2

To ensure that the APRMs are accurately indicating the true core average power, the APRMs are calibrated to the reactor power calculated from a heat balance. LCO 3.2.4, "Average Power Range Monitor (APRM) Gain and Setpoints," allows the APRMs to be reading greater than actual THERMAL POWER to compensate for localized power peaking. When this adjustment is made, the requirement for the APRMs to indicate within 2% RTP of calculated power is modified to require the APRMs to indicate within 2% RTP of calculated

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.2 (continued)

MFLPD. The Frequency of once per 7 days is based on minor changes in LPRM sensitivity, which could affect the APRM reading between performances of SR 3.3.1.1.8.

A restriction to satisfying this SR when < 25% RTP is provided that requires the SR to be met only at ≥ 25% RTP because it is difficult to accurately maintain APRM indication of core THERMAL POWER consistent with a heat balance when < 25% RTP. At low power levels, a high degree of accuracy is unnecessary because of the large, inherent margin to thermal limits (MCPR and APLHGR). At ≥ 25% RTP, the Surveillance is required to have been satisfactorily performed within the last 7 days, in accordance with SR 3.0.2. A Note is provided which allows an increase in THERMAL POWER above 25% if the 7 day Frequency is not met per SR 3.0.2. In this event, the SR must be performed within 12 hours after reaching or exceeding 25% RTP. Twelve hours is based on operating experience and in consideration of providing a reasonable time in which to complete the SR.

SR 3.3.1.1.3

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the intended function. A successful test of the required contacts(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with the applicable extensions. Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology.

As noted, SR 3.3.1.1.3 is not required to be performed when entering MODE 2 from MODE 1, since testing of the MODE 2 required IRM and APRM Functions cannot be performed in MODE 1 without utilizing jumpers, lifted leads, or movable links. This allows entry into MODE 2 if the 7 day Frequency is not met per SR 3.0.2. In this event, the SR must be performed within 12 hours after entering MODE 2 from MODE 1. Twelve hours is based on operating experience and in

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.3 (continued)

consideration of providing a reasonable time in which to complete the SR.

A Frequency of 7 days provides an acceptable level of system average unavailability over the Frequency interval and is based on reliability analysis (Ref. 18).

SR 3.3.1.1.4

A functional test of each automatic scram contactor is performed to ensure that each automatic trip channel will perform the intended function. There are four RPS channel test switches, one associated with each of the four automatic trip channels (A1, A2, B1, and B2). These test switches allow the operator to test the OPERABILITY of the individual trip channel automatic scram contactors as an alternative to using an automatic scram function trip. This is accomplished by placing the RPS channel test switch in the test position, which will input a trip signal into the associated RPS trip channel. The RPS channel test switches are not specifically credited in the accident analysis. The Manual Scram Functions at JAFNPP are not configured the same as the generic model used in Reference 18. However, Reference 18 concluded that the Surveillance Frequency extensions for RPS Functions were not affected by the difference in configuration since each automatic RPS trip channel has a test switch which is functionally the same as the manual scram switches in the generic model. As such, a functional test of each RPS automatic scram contactor using either its associated test switch or by test of any of the associated automatic RPS Functions is required to be performed once every 7 days. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions. In accordance with Reference 18, the scram contactors must be tested as part of the Manual Scram Function. The Frequency of 7 days is based on the reliability analysis of Reference 18. (This automatic scram contactor testing is credited in the analysis to extend many automatic Scram Function Surveillance Frequencies).

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(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.1.5 and SR 3.3.1.1.6

These Surveillances are established to ensure that no gaps in neutron flux indication exist from subcritical to power operation for monitoring core reactivity status.

The overlap between SRMs and IRMs is required to be demonstrated to ensure that reactor power will not be increased into a neutron flux region without adequate indication. This is required prior to withdrawing SRMs from the fully inserted position since indication is being transitioned from the SRMs to the IRMs.

The overlap between IRMs and APRMs is of concern when reducing power into the IRM range. On power increases, the system design will prevent further increases (by initiating a rod block) if adequate overlap is not maintained. Overlap between IRMs and APRMs exists when sufficient IRMs and APRMs concurrently have onscale readings such that the transition between MODE 1 and MODE 2 can be made without either APRM downscale rod block, or IRM upscale rod block. Overlap between SRMs and IRMs similarly exists when, prior to withdrawing the SRMs from the fully inserted position, IRMs are above mid-scale on range 1 before SRMs have reached the upscale rod block.

As noted, SR 3.3.1.1.6 is only required to be met during entry into MODE 2 from MODE 1. That is, after the overlap requirement has been met and indication has transitioned to the IRMs, maintaining overlap is not required (APRMs may be reading downscale once in MODE 2).

If overlap for a group of channels is not demonstrated (e.g., IRM/APRM overlap), the reason for the failure of the Surveillance should be determined and the appropriate channel(s) declared inoperable. Only those appropriate channels that are required in the current MODE or condition should be declared inoperable.

A Frequency of 7 days is reasonable based on engineering judgment and the reliability of the IRMs and APRMs.

SR 3.3.1.1.7

LPRM gain settings are determined from the local flux profiles measured by the Traversing Incore Probe (TIP)

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.7 (continued)

System. This establishes the relative local flux profile for appropriate representative input to the APRM System. The 1000 MWD/T Frequency is based on operating experience with LPRM sensitivity changes.

SR 3.3.1.1.8 and SR 3.3.1.1.12

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the channel will perform the intended function. A successful test of the required contacts(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with the applicable extensions. Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology. For Function 2.b, the CHANNEL FUNCTIONAL TEST includes the adjustment of the APRM channel to conform to the calibrated flow signal. This ensures that the total loop drive flow signals from the flow units used to vary the setpoint is appropriately compared to a valid core flow signal to verify the flow signal trip setpoint and, therefore, the APRM Function accurately reflects the required setpoint as a function of flow. If the flow unit signal is not within the appropriate flow limit, one required APRM that receives an input from the inoperable flow unit must be declared inoperable. For Function 7.b, the CHANNEL FUNCTIONAL Test must be performed utilizing a water column or similar device to provide assurance that damage to a float or other portions of the float assembly will be detected.

The 92 day Frequency of SR 3.3.1.1.8 is based on the reliability analysis of Reference 18.

The 24 month Frequency of SR 3.3.1.1.12 is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.8 and SR 3.3.1.1.12 (continued)

reactor at power. Operating experience has shown that these components usually pass the Surveillance when performed at the 24 month Frequency.

SR 3.3.1.1.9, SR 3.3.1.1.11, and SR 3.3.1.1.13

A CHANNEL CALIBRATION is a complete check of the instrument loop and the sensor. This test verifies that the channel responds to the measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drifts between successive calibrations consistent with the plant specific setpoint methodology. Physical inspection of the position switches is performed inconjunction with SR 3.3.1.1.13 for Functions 5 and 8 to ensure that the switches are not corroded or otherwise degraded. For Function 7.b, the CHANNEL CALIBRATION must be performed utilizing a water column or similar device to provide assurance that damage to a float or other portions of the float assembly will be detected. For Function 2.b, the recirculation loop flow signals are calibrated in accordance with SR 3.3.1.1.13 while thecalibration of all other components associated with this Function is performed in accordance with SR 3.3.1.1.11. For Functions 8 and 9, SR 3.3.1.1.13 is associated with the enabling circuit sensing first stage turbine pressure as well as the trip function.

SR 3.3.1.1.11 and SR 3.3.1.1.13 have been modified by two NOTES. Note 1 states that neutron detectors are excluded from CHANNEL CALIBRATION because they are passive devices, with minimal drift, and because of the difficulty of simulating a meaningful signal. Changes in neutron detector sensitivity are compensated for by performing the 7 day calorimetric calibration (SR 3.3.1.1.2) and the 1000 MWD/T LPRM calibration against the TIPs (SR 3.3.1.1.7). A second Note is provided that requires the APRM and IRM SRs to be performed within 12 hours of entering MODE 2 from MODE 1. Testing of the MODE 2 APRM and IRM Functions cannot be performed in MODE 1 without utilizing jumpers, lifted leads, or movable links. This Note allows entry into MODE 2 from MODE 1 if the associated Frequency is not met per SR 3.0.2. Twelve hours is based on operating experience and in

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.9, SR 3.3.1.1.11, and SR 3.3.1.1.13 (continued)

consideration of providing a reasonable time in which to complete the SR.

Reactor Pressure - High and Reactor Water Level - Low (Level 3) Function sensors (Functions 3 and 4, respectively) are excluded from the RPS RESPONSE TIME testing (Ref. 19). However, prior to the CHANNEL CALIBRATION of these sensors a response check must be performed to ensure adequate response. This testing is required by Reference 20. Personnel involved in this testing must have been trained in response to Reference 21 to ensure they are aware of the consequences of instrument response time degradation. This response check must be performed by placing a fast ramp or a step change into the input of each required sensor. The personnel, must monitor the input and output of the associated sensor so that simultaneous monitoring and verification may be accomplished.

The Frequency of SR 3.3.1.1.9 is based on the assumption of a 92 day calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis. The Frequency of SR 3.3.1.1.11 is based upon the assumption of a 184 day calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis. The Frequency of SR 3.3.1.1.13 is based upon the assumption of a 24 month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

SR 3.3.1.1.10

Calibration of trip units provides a check of the actual trip setpoints. The channel must be declared inoperable if the trip setting is discovered to be less conservative than the Allowable Value specified in Table 3.3.1.1-1. If the trip setting is discovered to be less conservative than accounted for in the appropriate setpoint methodology, but is not beyond the Allowable Value, the channel performance is still within the requirements of the plant safety analysis. Under these conditions, the setpoint must be readjusted to be equal to or more conservative than accounted for in the appropriate setpoint methodology. For Functions 8 and 9, this SR is associated with the enabling circuit sensory first stage turbine pressure.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.10 (continued)

The Frequency of 184 days is based on the reliability, accuracy, and lower failure rates of the solid-state electronic Analog Transmitter/Trip System components.

SR 3.3.1.1.14

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required trip logic for a specific channel. The functional testing of control rods (LCO 3.1.3), and SDV vent and drain valves (LCO 3.1.8), overlaps this Surveillance to provide complete testing of the assumed safety function.

The 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillance when performed at the 24 month Frequency.

SR 3.3.1.1.15

This SR ensures that scrams initiated from the Turbine Stop Valve–Closure and Turbine Control Valve Fast Closure, EHC Oil Pressure–Low Functions will not be inadvertently bypassed when THERMAL POWER is ≥ 29% RTP. This involves calibration of the bypass channels. Adequate margins for the instrument setpoint methodologies are incorporated into the actual setpoint. Because main turbine bypass flow can affect this setpoint nonconservatively (THERMAL POWER is derived from turbine first stage pressure), the main turbine bypass valves must remain closed during an inservice calibration at THERMAL POWER ≥ 29% RTP to ensure that the calibration is valid.

If any bypass channel's setpoint is nonconservative (i.e., the Functions are bypassed at ≥ 29% RTP, either due to open main turbine bypass valve(s) or other reasons), then the affected Turbine Stop Valve–Closure and Turbine Control Valve Fast Closure, EHC Oil Pressure–Low Functions are considered inoperable. Alternatively, the bypass channel can be placed in the conservative condition (nonbypass). If

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.15 (continued)

placed in the nonbypass condition, this SR is met and the channel is considered OPERABLE.

The Frequency of 24 months is based on engineering judgment and reliability of the components.

SR 3.3.1.1.16

This SR ensures that the individual channel response times are less than or equal to the maximum values assumed in the accident analysis. The RPS RESPONSE TIME acceptance criteria are included in Reference 22.

RPS RESPONSE TIME may be verified by actual response time measurements in any series of sequential, overlapping, or total channel measurements. However, the sensors for Functions 3 and 4 are allowed to be excluded from specific RPS RESPONSE TIME measurement if the conditions of Reference 19 are satisfied. If these conditions are satisfied, sensor response time may be allocated based on either assumed design sensor response time or the manufacturer's stated design reponse time. When the requirements of Reference 19 are not satisfied, sensor response time must be measured.

Note 1 excludes neutron detectors from RPS RESPONSE TIME testing because the principles of detector operation virtually ensure an instantaneous response time.

RPS RESPONSE TIME tests are conducted on a 24 month STAGGERED TEST BASIS. Note 2 requires STAGGERED TEST BASIS Frequency to be determined based on 2 channels. This ensures all required channels are tested during two Surveillance Frequency intervals. For Functions 2.b, 2.c, 3, 4, 6, and 9, two channels must be tested during each test; while for Functions 5 and 8, eight and four channels must be tested. This Frequency is based on the logic interrelationships of the various channels required to produce an RPS scram signal. The 24 month Frequency is consistent with the typical industry refueling cycle and is based upon plant operating experience, which shows that random failures of instrumentation components causing serious response time degradation, but not channel failure, are infrequent occurrences.

(continued)

BASES

REFERENCES

1. UFSAR, Section 7.2.

2. UFSAR, Section 14.5.4.2.

3. NEDO-23842, Continuous Control Rod Withdrawal Transient In The Startup Range, April 18, 1978.

4. 10 CFR 50.36(c)(2)(ii).

5. NEDO-31960-A, BWR Owners' Group Long Term Stability Solutions Licensing Methodology, June 1991.

6. NEDO-31960-A, Supplement 1, BWR Owners' Group Long Term Stability Solutions Licensing Methodology, Supplement 1, March 1992.

7. UFSAR, Section 14.5.1.2.

8. UFSAR, Section 14.6.1.2.

9. UFSAR, Section 14.5.2.1.

10. UFSAR, Section 14.5.2.2.

11. UFSAR, Section 6.3.

12. Drawing 11825-5.01-15D, Rev. D, Reactor Assembly Nuclear Boiler, (GE Drawing 919D690BD).

13. UFSAR, Section 14.5.5.1.

14. UFSAR, Section 14.5.2.3.

15. UFSAR, Section 14.6.1.5.

16. P. Check (NRC) letter to G. Lainas (NRC), BWR Scram Discharge System Safety Evaluation, December 1, 1980.

17. UFSAR, Section 14.5.9.

18. NEDC-30851P-A, Technical Specification Improvement Analyses for BWR Reactor Protection System, March 1988.

(continued)

BASES

REFERENCES (continued)

19. NEDO-32291-A System Analyses For the Elimination of Selected Response Time Testing Requirements, October 1995.

20. NRC letter dated October 28, 1996, Issuance of Amendment 235 to Facility Operating License DPR-59 for James A. FitzPatrick Nuclear Power Plant.

21. NRC Bulletin 90-01, Supplement 1, Loss of Fill-Oil in Transmitters Manufactured by Rosemount, December 1992.

22. UFSAR, Table 7.2-5.

JAFNPP

IMPROVED STANDARD TECHNICAL SPECIFICATIONS (ISTS) CONVERSION

ITS: 3.3.1.2

Source Range Monitor (SRM) Instrumentation

MARKUP OF CURRENT TECHNICAL SPECIFICATIONS (CTS)

DISCUSSION OF CHANGES (DOCs) TO THE CTS

NO SIGNIFICANT HAZARDS CONSIDERATION (NSHC) FOR LESS RESTRICTIVE CHANGES

MARKUP OF NUREG-1433, REVISION 1, SPECIFICATION

JUSTIFICATION FOR DIFFERENCES (JFDs) FROM NUREG-1433, REVISION 1

MARKUP OF NUREG-1433, REVISION 1, BASES

JUSTIFICATION FOR DIFFERENCES (JFDs) FROM NUREG-1433, REVISION 1, BASES

RETYPED PROPOSED IMPROVED TECHNICAL SPECIFICATIONS (ITS) AND BASES

JAFNPP

IMPROVED STANDARD TECHNICAL SPECIFICATIONS (ISTS) CONVERSION

ITS: 3.3.1.2

Source Range Monitor (SRM) Instrumentation

MARKUP OF CURRENT TECHNICAL SPECIFICATIONS (CTS)

A1

Applicability MODE 2 & 5

M1 three for MODE 2

3.3.B (cont'd)

[LCO 3.3.1.2]
[Table 3.3.1.2-1]

4. Control rods shall not be withdrawn for startup or during refueling unless at least two source range channels have an observed count rate equal to or greater than three counts per second ~~except as permitted by Specifications 3.10.B.3 and 3.10.B.4~~.

A2 [SR 3.3.1.2.4]

5. During operation with limiting control rod patterns, as determined by the reactor engineer, either:

a. Both RBM channels shall be operable, or

b. Control rod withdrawal shall be blocked, or

c. The operating power level shall be limited so the MCPR will remain above the Safety Limit assuming a single error that results in complete withdrawal of any single operable control rod.

See ITS: 3.3.2.1

Applicability MODE 2 & 5

M1 three for MODE 2

4.3.B (cont'd)

4. Prior to control rod withdrawal for startup or during refueling, verify that at least two source range channels have an observed count rate of at least three counts per second ~~except as permitted by Specifications 3.10.B.3 and 3.10.B.4~~.

M3 every 24 hours and 12 hours during CORE ALTERATIONS

5. When a limiting control rod pattern exists, an instrument functional test of the RBM shall be performed prior to withdrawal of the designated rod(s).

M2 add MODE 3 & 4 SRM LCO Table 3.3.1.2-1 requirements

add proposed ACTIONS A, B for MODE 2 operations — L1

add ACTION C for MODE 2 operations — M5, L4

M2 add ACTION D

add SRs for MODE 3 & 4: SR 3.3.1.2.3, SR 3.3.1.2.4, SR 3.3.1.2.6, SR 3.3.1.2.7 — M2

add SRs for MODE 2 3.3.1.2.1, 3.3.1.2.6, 3.3.1.2.7 — M4

add Table 3.3.1.2-1, Note (a) — M1

Specification 3.3.1.2

A1

Source Range Monitor (SRM) Instrumentation

add proposed footnote (b) to Table 3.3.1.2-1 L2

JAFNPP

~~3.10 (cont'd)~~

~~B. Core Monitoring~~

[Note 1 to SR 3.3.1.2.2] During core alterations two SRM's shall be operable, one in the core quadrant where fuel or control rods are being moved and one in an adjacent quadrant. [SR 3.3.1.2.2] For an SRM to be considered operable, the following conditions shall be satisfied: LA1

1. The SRM shall be ~~inserted to the normal operating level.~~ [Table 3.3.1.2-1 footnote (c)] (Use of special movable, dunking type detectors during initial fuel loading and major core alterations in place of normal detecters is permissable as long as the detector is connected into normal SRM circuit).

[SR 3.3.1.2.4] 2. The SRM shall have a minimum of 3 counts/sec with all rods fully inserted in the core ~~except as noted in 3 and 4 below~~.

~~3. Prior to spiral unloading, the SRM's shall have an initial count rate of 3 CPS. During spiral unloading, the count rate of the SRM's may drop below 3 CPS.~~ L2

M8 add proposed ACTION E

add every 12 hours M3

4.10 (cont'd)

~~B. Core Monitoring~~

[SR 3.3.1.2.5] Prior to making alterations to the core the SRM's shall be functionally tested ~~and checked for neutron response. Fuel may be un-loaded as described in Specification 3.10.B.4 prior to this functional test.~~ [SR 3.3.1.2.1] Thereafter, the SRM's will be checked daily for response, ~~except as specified in Specification 3.10.B.3 and 4.~~

M11 M10 every 7 days M10 M11 every 12 hours

add proposed SR 3.3.1.2.2 Frequency M6

add proposed SR 3.3.1.2.2.a and Note 2 to SR 3.3.1.2.2 L2

add proposed signal to noise ratio M7

RAI 3.3.1.2-1

add proposed SR 3.3.1.2.7 for MODE 5 M9

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Revision F

Specification 3.3.1.2

(A1)

(L3)

3.10 (cont'd)

Note to SR 3.3.1.2.4

4. During Spiral reload, SRM operability will be verified by using a portable external source every 12 hours until enough fuel is loaded to maintain 3 CPS. Alternatively, a maximum of four fuel assemblies will be loaded in different cells containing control blades around each SRM to obtain the required 3 CPS. Until these assemblies have been loaded in a given quadrant, it is not necessary for the SRM in that quadrant to indicate the minimum count rate of 3 CPS. The loading of fuel near the SRM's does not violate the intent of the spiral reloading pattern.

JAFNPP

IMPROVED STANDARD TECHNICAL SPECIFICATIONS (ISTS) CONVERSION

ITS: 3.3.1.2

Source Range Monitor (SRM) Instrumentation

DISCUSSION OF CHANGES (DOCs) TO THE CTS

ADMINISTRATIVE CHANGES

A1 In the conversion of the James A. FitzPatrick Nuclear Power Plant (JAFNPP) current Technical Specifications (CTS) to the proposed plant specific Improved Technical Specifications (ITS), certain wording preferences or conventions are adopted that do not result in technical changes. Editorial changes, reformatting, and revised numbering are adopted to make the ITS consistent with the conventions in NUREG-1433, "Standard Technical Specifications, General Electric Plants, BWR/4", Revision 1 (i.e., Improved Standard Technical Specifications (ISTS)).

A2 The current requirement for SRM response of 3 cps is based upon a signal to noise ratio of ≥ 3:1. This is implicit in CTS 4.3.B.4. Thus, the explicit requirement in ITS SR 3.3.1.2.4 to verify 3.0 cps with a signal to noise ratio ≥ 3:1 is considered an administrative change.

TECHNICAL CHANGES - MORE RESTRICTIVE

M1 CTS 3.3.B.4 and 4.3.B.4 require two Source Range Monitors (SRMs) to be Operable whenever control rods are withdrawn for startup or during refueling. ITS LCO 3.3.1.2 (Table 3.3.1.2-1) will require three SRMs to be Operable at all times in MODE 2 prior to and during control rod withdrawal until the flux level is sufficient to maintain the Intermediate Range Monitor (IRM) on Range 3 or above in MODE 2 (Table 3.3.1.2-1 Footnote a). This requirement for an additional SRM to be Operable is more restrictive change and will ensure adequate SRMs are Operable during reactor startup. This is consistent with NUREG-1433, Revision 1.

M2 CTS 3.3.B.4 and 4.3.B.4 require that SRMs be Operable when control rods are withdrawn for startup or during refueling. CTS 3.10.B and 4.10.B require the SRMs to be Operable during "Core Alterations." There are no requirements for SRM Operability during MODE 3 and MODE 4. ITS LCO 3.3.1.2 (Table 3.3.1.2-1) will require 2 SRM channels to be Operable at all times in MODE 3 and MODE 4 because the SRMs are the primary indication of neutron flux levels in these MODES. Additionally, SRM Operability in MODES 3 and 4 must be demonstrated by the performance of ITS SR 3.3.1.2.3 (CHANNEL CHECK), SR 3.3.1.2.4 (count rate verification), SR 3.3.1.2.6, (CHANNEL FUNCTIONAL TEST), and SR 3.3.1.2.7 (channel calibration). ITS LCO 3.3.1.2, ACTION D, will require that all insertable control rods be fully inserted and the reactor mode switch be in the shutdown position within 1 hour if less than the two required SRM channels are Operable. The requirements for SRM Operability in MODE 3 and MODE 4 and the associated SRs and ACTION are required to ensure the SRMs are Operable in MODE 3 and MODE 4 or proper actions are taken. This is consistent with NUREG-1433, Revision 1.

TECHNICAL CHANGES - MORE RESTRICTIVE

M3 CTS 4.3.B.4 requires verification "prior to control rod withdrawal for startup or during refueling" and CTS 4.10.B requires verification "prior to making alterations to the core" and daily while the SRMs are required to be Operable, that SRMs have an observable count rate. ITS SR 3.3.1.2.4 will now require periodic verification of the SRM count rate at least once per 24 hours while in MODE 2 when IRMs are on Range 2 or below. Periodic verification of SRM count rate will be required every 12 hours during CORE ALTERATIONS. This change represents an additional restriction on plant operation necessary to help ensure the SRMs are maintained Operable.

M4 ITS LCO 3.3.1.2 will require 3 additional Surveillance Tests to demonstrate SRM Operability when the IRMs are on Range 2 or below in MODE 2. The proposed Surveillances are: SR 3.3.1.2.1 which will require performance of an SRM Channel Check every 12 hours; SR 3.3.1.2.6 which will require an SRM Channel Functional Test and determination of signal to noise ratios every 31 days; and, SR 3.3.1.2.7 which will require an SRM Channel Calibration every 24 months. SR 3.3.1.2.6 and SR 3.3.1.2.7 will be modified by a Note that will allow deferral of these Surveillances until 12 hours after the IRMs are on Range 2 or below when the reactor is being shutdown. SR 3.3.1.2.7 is also modified by a Note that excludes the neutron detectors from calibration requirements because the detectors are fission chambers that are designed to have a relatively constant sensitivity over the range, with an accuracy specified for a fixed useful life, and cannot readily be adjusted. These additional requirements for testing of SRMs help ensure the SRMs are maintained Operable.

M5 With the requirements of CTS 3.3.B.4 not met, LCO 3.0.C must be entered and cold shutdown must be achieved within 24 hours. The time to reach a non-applicable condition has been reduced from 24 hours in CTS LCO 3.0.C to 12 hours in ITS 3.3.1.2 ACTION C. This change is more restrictive because all rods must be fully inserted within 12 hours rather than the currently allowed 24 hours. The allowed Completion Time of 12 hours is reasonable, based on operating experience, to reach MODE 3 from full power conditions in an orderly manner and without challenging plant systems.

M6 CTS 3.10.B establishes requirements for the location of SRMs during Core Alterations and during core unloading and reloading. ITS SR 3.3.1.2.2 will set similar requirements for SRM location during CORE ALTERATIONS which because of a change in the Definition of Core Alteration will include core loading and unloading. ITS SR 3.3.1.2.2 will add a new requirement to verify every 12 hours during CORE ALTERATIONS that the SRMs are properly located. The proposed change is necessary to

TECHNICAL CHANGES - MORE RESTRICTIVE

M6 (continued)

periodically ensure the SRMs are in the proper location. This change is consistent with NUREG-1433, Revision 1.

M7 ITS SR 3.3.1.2.4 adds the requirement that for a minimum count rate of 3 cps, the signal to noise ratio is within the acceptance criteria stipulated in the SR. The addition of this new signal to noise ratio requirement (Surveillance) to the current Technical Specifications constitutes a more restrictive change necessary to ensure the SRMs are maintained Operable when required to be Operable. Specifically, as stated in the Bases of ITS SRs 3.3.1.2.5 & 3.3.1.2.6, the signal to noise ratio is verified to ensure that the detectors are inserted to an acceptable operating level to enable the SRMs to detect and measure the neutron count rate in the fueled region of the core. Therefore, this change is not considered to result in any reduction to safety. This change is consistent with NUREG-1433, Revision 1. RAI 3.3.1.2-1

M8 CTS 3.10.B does not identify Required Actions if SRM Operability requirements in MODE 5 are not satisfied. ITS LCO 3.3.1.2 will add Required Actions if less than the required number of SRMs are Operable in MODE 5. If one or more required SRMs are inoperable when in MODE 5, ITS LCO 3.3.1.2 ACTION E will require that CORE ALTERATIONS be terminated and action be taken immediately to fully insert all control rods in core cells containing one or more fuel assemblies. The proposed changes are necessary to prevent the two most probable causes of reactivity change in this MODE, fuel loading and control rod withdrawal, and are consistent with NUREG-1433, Revision 1.

M9 ITS SR 3.3.1.2.7 has been added to CTS 4.10.B to perform a Channel Calibration every 24 months to verify the performance of the SRM detectors and associated circuitry during MODE 5. SR 3.3.1.2.7 has been modified by a Note that excludes the neutron detectors from calibration requirements because the detectors are fission chambers that are designed to have a relatively constant sensitivity over the range, with an accuracy specified for a fixed useful life and cannot readily be adjusted. The proposed change is necessary to help ensure the SRMs are maintained Operable.

TECHNICAL CHANGES - MORE RESTRICTIVE

M10 CTS 4.10.B requires the SRMs to be functionally tested prior to making Core Alterations. ITS LCO 3.3.1.2 (Table 3.3.1.2-1) requires that a CHANNEL FUNCTIONAL TEST (ITS SR 3.3.1.2.5) be performed every 7 days when in MODE 5. SR 3.3.1.2.5 also requires the determination of the signal to noise ratio. Since entry into MODE 5 will always occur prior to Core Alterations, the CTS requirements will be satisfied in the ITS. The added requirements to periodically perform this CHANNEL FUNCTIONAL TESTS and to determine the signal to noise ratio are more restrictive but are necessary to ensure the SRMs remain OPERABLE. The verification of the signal to noise ratio also ensures the SRM detectors are inserted to an acceptable level.

M11 CTS 4.10.B requires the SRMs to be checked for neutron response prior to Core Alterations and checked daily thereafter. ITS SR 3.3.1.2.1 requires the performance of a CHANNEL CHECK every 12 hours during MODE 5 operations. Since entry into MODE 5 will always occur prior to any Core Alterations, the CTS requirement will be satisfied in the ITS requirement. The requirement to perform the response or CHANNEL CHECK every 12 hours instead of every day (24 hours) is more restrictive since the surveillance interval is more frequent but necessary to detect gross channels failures. This change is consistent with NUREG-1433, Revision 1.

TECHNICAL CHANGES - LESS RESTRICTIVE (GENERIC)

LA1 CTS 3.10 B.1 requires that SRMs be inserted to the normal operating level during Core Alterations. Proposed specifications have requirements for minimum SRM count rate during CORE ALTERATIONS but do not require that the SRMs be fully inserted. This existing requirement is being relocated to the Bases. The details for system Operability are not necessary to ensure the SRMs are Operable. The requirements of ITS 3.3.1.2 which require the SRMs to be OPERABLE and the definition of OPERABILITY suffice. As such, these details are not required to be in the ITS to provide adequate protection of public health and safety. Changes to the Bases will be controlled by the provisions of the Bases Control Program described in Chapter 5 of the ITS.

TECHNICAL CHANGES - LESS RESTRICTIVE (SPECIFIC)

L1 CTS 3.3.B.4 defaults to CTS 3.0.3, which requires the reactor to be in a Shutdown condition within 24 hours if the SRM Operability requirements in MODE 2 are not satisfied. ITS 3.3.1.2 identifies less restrictive Required Actions and associated Completion Times if SRM Operability requirements in MODE 2 are not satisfied. ITS 3.3.1.2 ACTION A will allow 4 hours to restore the 3 required SRM channels to Operable as long as at least one SRM is always Operable. ITS 3.3.1.2 ACTION B will require suspension of all control rod withdrawal if there are no Operable SRMs; and, in accordance with ACTION A, will allow 4 hours to make the required 3 SRM channels Operable. Proposed ACTION A and B are less restrictive than the existing specifications for the following reasons: ACTION A will allow control rod withdrawal to continue for up to 4 hours with less than the required number of SRMs Operable; ACTION A may be exited either by restoration of the required number of SRM channels or by increasing reactor power until the IRMs are above Range 2; ACTION B will allow up to 4 hours to attempt to restore the required number of SRM channels before a reactor shutdown must be initiated.

In Mode 2 with the IRMs on Range 2 or below, SRMs provide the means of monitoring core reactivity and criticality. With any number of the required SRMs inoperable, the ability to monitor neutron flux is degraded. Therefore, a limited time is allowed to restore the inoperable channels to Operable status.

Provided at least one SRM remains Operable, Required Action A.1 allows 4 hours to restore the required SRMs to Operable status. This time is reasonable because there is adequate capability remaining to monitor the core, there is limited risk of an event during this time, and there is sufficient time to take corrective actions to restore the required SRMs to Operable status or to establish alternate IRM monitoring capability.

RAI 3.3.1.2-2

With three required SRMs inoperable, Required Action B.1 allows no positive changes in reactivity (control rod withdrawal must be immediately suspended) due to inability to monitor changes. Required Action A.1 still applies and allows 4 hours to restore monitoring capability prior to requiring control rod insertion. This allowance is based on the limited risk of an event during this time, provided that no control rod withdrawals are allowed, and the desire to concentrate efforts on repair, rather than to immediately shut down, with no SRMs Operable.

These changes are acceptable because: SRMs are not credited in the analysis of any accident and exist solely to allow operators to monitor changes in power level during startup; at least one SRM will remain Operable during any rod withdrawal; excessive reactivity additions

TECHNICAL CHANGES - LESS RESTRICTIVE (SPECIFIC)

L1 (continued)

during MODE 2 will be quickly identified and mitigated by the IRMs; reactivity addition accidents from the source range are assumed to begin with flux below the level of source range detector sensitivity; and, the analysis assumptions are not affected by the operator's ability to monitor changes in flux levels. These less restrictive Required Actions are consistent with NUREG-1433, Revision 1.

L2 CTS 3.10.B requires two SRMs to be Operable, one in the core quadrant where fuel or control rods are being moved and one in an adjacent quadrant. If a spiral offload or reload pattern is used, the proposed specifications will allow a reduction in the number of SRM channels required to be Operable during refueling. ITS 3.3.1.2 (Table 3.3.1.2-1 footnote (b)) reduces the number of SRM channels required to be Operable from 2 to 1 "during spiral offload or reload when the fueled region includes only that SRM detector." Therefore this change is less restrictive. A reduction in the number of required Operable SRM channels is acceptable when using a spiral pattern for loading or offloading fuel because the use of a spiral pattern provides assurance that the Operable SRM is in the optimum position for monitoring changes in neutron flux levels resulting from the Core Alteration. In addition, ITS SR 3.3.1.2.2.a has been added to ensure an SRM is in the fueled region, and Note 2 to SR 3.3.1.2.2 has been added for clarity to allow the one SRM to satisfy more than one SRM location requirement. Due to these additions, CTS 3.10.B.3, which allows the SRM count rate to not be met during spiral unloading, has been deleted. This was added since during spiral unloading, only one SRM may have fuel around it, thus the other SRM currently required would not meet the count rate requirement. Since only one SRM is now required in this instance, the allowance has been deleted.

L3 CTS 3.10.B.4 requires SRM operability to be verified during spiral reload by using a portable external source every 12 hours until the required amount of fuel is loaded to maintain 3 cps. An alternative is provided to load a maximum of four fuel assemblies in different cells containing control blades around each SRM to obtain the required 3 cps. Proposed Note to SR 3.3.1.2.4 relaxes the 3 cps requirement with less than or equal to four fuel assemblies adjacent to the SRM and no other fuel assemblies in the associated core quadrant. With four or less fuel assemblies loaded around each SRM and no other fuel assemblies in the associated core quadrant, the configuration will not be critical even with a control rod withdrawn.

TECHNICAL CHANGES - LESS RESTRICTIVE (SPECIFIC)

L4 With the requirements of CTS 3.3.B.4 not met, LCO 3.0.C must be entered and cold shutdown must be achieved in 24 hours. ITS 3.3.1.2, ACTION C requires that the reactor be placed in MODE 3 within 12 hours under the same conditions. Therefore, the requirement to place the reactor in MODE 3, and not require a continuation to MODE 4, constitutes a less restrictive change. This change is acceptable, since with all control rods fully inserted, the core is in its least reactive state with the most margin to criticality.

TECHNICAL CHANGES - RELOCATIONS

None

JAFNPP

IMPROVED STANDARD TECHNICAL SPECIFICATIONS (ISTS) CONVERSION

ITS: 3.3.1.2

Source Range Monitor (SRM) Instrumentation

NO SIGNIFICANT HAZARDS CONSIDERATION (NSHC) FOR LESS RESTRICTIVE CHANGES

NO SIGNIFICANT HAZARDS EVALUATION
ITS: 3.3.1.2 - SOURCE RANGE MONITOR (SRM) INSTRUMENTATION

TECHNICAL CHANGES - LESS RESTRICTIVE (SPECIFIC)

L1 CHANGE

New York Power Authority has evaluated the proposed Technical Specification change and has concluded that it does not involve a significant hazards consideration. Our conclusion is in accordance with the criteria set forth in 10 CFR 50.92. The bases for the conclusion that the proposed change does not involve a significant hazards consideration are discussed below.

1. Does the change involve a significant increase in the probability or consequences of an accident previously evaluated?

   The proposed change: will allow rod withdrawal to continue for 4 hours with less than the required number of SRMs as long as at least one SRM is Operable; will allow operation to continue for 4 hours but without rod withdrawal if no SRMs are Operable; and will allow exiting the previous two conditions if overlap with the IRMs is established. The probability of an accident is not increased by these changes because: at least one SRM will remain Operable during rod withdrawal and rod withdrawal will not occur if no SRMs are Operable; and, excessive reactivity additions will be quickly identified and mitigated by the IRMs. The consequences of an accident will not be increased because the SRMs are not credited for the mitigation of any accidents. The IRM Neutron Flux-High scram is credited for mitigating a rod withdrawal accident. Additionally, reactivity addition accidents from the source range are assumed to begin with flux at the lowest level of source range detector sensitivity. A reactivity addition accident initiated during a normal startup would start from a significantly higher flux level than assumed in the reactivity addition accident. Therefore, this change will not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the change create the possibility of a new or different kind of accident from any accident previously evaluated?

   This proposed change will not involve any physical changes to plant systems, structures, or components (SSC), or the manner in which these SSC are operated or maintained. Therefore, this change will not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Does this change involve a significant reduction in a margin of safety?

   The proposed change: will allow rod withdrawal to continue for 4 hours with less than the required number of SRMs as long as at least one SRM

TECHNICAL CHANGES - LESS RESTRICTIVE (SPECIFIC)

L1 CHANGE

3. (continued)

is Operable; will allow operation to continue for 4 hours but without rod withdrawal if no SRMs are Operable; and will allow exiting the previous two conditions if overlap with the IRMs is established. The proposed change does not involve a significant reduction in a margin of safety because: SRMs are not credited in any safety analysis; at least one SRM will remain Operable during rod withdrawal and rod withdrawal will not occur if no SRMs are Operable; and, excessive reactivity additions will be quickly identified and mitigated by the IRMs. Additionally, the IRM Neutron Flux–High scram and not any SRM function is credited for mitigating a rod withdrawal accident. As a result, this change does not affect the current analysis assumptions. Therefore, this change does not involve a significant reduction in a margin of safety.

TECHNICAL CHANGES - LESS RESTRICTIVE (SPECIFIC)

L2 CHANGE

New York Power Authority has evaluated the proposed Technical Specification change and has concluded that it does not involve a significant hazards consideration. Our conclusion is in accordance with the criteria set forth in 10 CFR 50.92. The bases for the conclusion that the proposed change does not involve a significant hazards consideration are discussed below.

1. Does the change involve a significant increase in the probability or consequences of an accident previously evaluated?

   If a spiral offload or reload pattern is used, the proposed specifications will allow a reduction in the number of SRM channels required to be Operable during refueling. The probability of an accident is not increased by relaxed SRM Operability requirements when using a spiral pattern for fuel movements because the use of a spiral pattern provides assurance that the SRM will be in the optimum position for monitoring changes in neutron flux levels resulting from the Core Alteration. The consequences of an accident will not be increased by these changes because the SRMs are not credited for the mitigation of any accidents. The IRM Neutron Flux—High scram and not any SRM function is credited for mitigating a rod withdrawal or reactivity addition accident. Additionally, the reactivity addition accidents are assumed to be initiated at the lowest level of source range detector sensitivity and, therefore, are independent of any changes in the ability to monitor changes in the source range flux level. Therefore, this change will not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the change create the possibility of a new or different kind of accident from any accident previously evaluated?

   This proposed change will not involve any physical changes to plant systems, structures, or components (SSC), or the manner in which these SSC are operated or maintained. Therefore, this change will not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Does this change involve a significant reduction in a margin of safety?

   If a spiral offload or reload pattern is used, the proposed specifications will allow a reduction in the number of SRM channels required to be Operable during refueling. The proposed change does not involve a significant reduction in a margin of safety because: SRMs are

TECHNICAL CHANGES - LESS RESTRICTIVE (SPECIFIC)

L2 CHANGE

3. (continued)

not credited in any safety analysis; at least one SRM will remain Operable during rod withdrawal; and, the use of a spiral pattern provides assurance that the SRM will be in the optimum position for monitoring changes in neutron flux levels resulting from the Core Alteration. As a result, the change does not affect the current analysis assumptions. Therefore, this change does not involve a significant reduction in a margin of safety.

TECHNICAL CHANGES - LESS RESTRICTIVE (SPECIFIC)

L3 CHANGE

New York Power Authority has evaluated the proposed Technical Specification change and has concluded that it does not involve a significant hazards consideration. Our conclusion is in accordance with the criteria set forth in 10 CFR 50.92. The bases for the conclusion that the proposed change does not involve a significant hazards consideration are discussed below.

1. Does the change involve a significant increase in the probability or consequences of an accident previously evaluated?

   This proposed change will not require the 3 cps SRM minimum count rate to be met on an SRM that has less than or equal to four fuel assemblies adjacent to the SRM and no other fuel assemblies in the associated core quadrant. The probability of an accident is not increased because under these conditions, the SRM will be in the optimum position for monitoring changes in neutron flux levels resulting from the Core Alteration. The consequences of an accident will not be increased by these changes because the SRMs are not credited for the mitigation of any accidents. The IRM Neutron Flux-High scram and not any SRM function is credited for mitigating a rod withdrawal or reactivity addition accident. Additionally, the reactivity addition accidents are assumed to be initiated at the lowest level of source range detector sensitivity and, therefore, are independent of any changes in the ability to monitor changes in the source range flux level. Therefore, this change will not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the change create the possibility of a new or different kind of accident from any accident previously evaluated?

   This proposed change will not involve any physical changes to plant systems, structures, or components (SSC), or the manner in which these SSC are operated or maintained. Therefore, this change will not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Does this change involve a significant reduction in a margin of safety?

   This proposed change will not require the 3 cps SRM minimum count rate to be met on an SRM that has less than or equal to four fuel assemblies adjacent to the SRM and no other fuel assemblies in the associated core quadrant. The proposed change does not involve a significant reduction in a margin of safety because the SRMs are not credited in any safety

TECHNICAL CHANGES - LESS RESTRICTIVE (SPECIFIC)

L3 CHANGE

3. (continued)

analysis and, the use of a spiral pattern (no other fuel assemblies in the associated quadrant) provides assurance that the SRM will be in the optimum position for monitoring changes in neutron flux levels resulting from the Core Alteration. As a result, the change does not affect the current analysis assumptions. Therefore, this change does not involve a significant reduction in a margin of safety.

TECHNICAL CHANGES - LESS RESTRICTIVE (SPECIFIC)

L4 CHANGES

New York Power Authority has evaluated the proposed Technical Specification change and has concluded that it does not involve a significant hazards consideration. Our conclusion is in accordance with the criteria set forth in 10 CFR 50.92. The bases for the conclusion that the proposed change does not involve a significant hazards consideration are discussed below.

1. Does the change involve a significant increase in the probability or consequences of an accident previously evaluated?

   This change proposes to modify the Required Actions if SRM OPERABILITY requirements are not met. Current Specifications require that the reactor be placed in cold shutdown (MODE 4) within 24 hours if SRM OPERABILITY requirements are not met for the specified conditions. The proposed change will instead require that the reactor be placed in hot shutdown (MODE 3) within 12 hours under the same conditions. The probability of an accident is not increased because all control rods must still be inserted, and in a shorter time frame (12 hours) than is currently allowed. The consequences of an accident are not increased, because with all control rods inserted, the reactor core is in its least reactive state with the most margin to criticality. Therefore, this change will not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the change create the possibility of a new or different kind of accident from any accident previously evaluated?

   This proposed change will not involve any physical changes to plant systems, structures, or components (SSC), or the manner in which these SSC are operated or maintained. Therefore, this change will not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Does this change involve a significant reduction in a margin of safety?

   The proposed change will require that the reactor be placed in MODE 3 within 12 hours instead of MODE 4 within 24 hours. This change will not involve a reduction in a margin of safety, since placing the reactor in MODE 3 places the reactor core in a condition where all OPERABLE control rods must be fully inserted. In addition, the proposed change will reduce the amount time allowed before placing the reactor in a shutdown condition from 24 hours to 12 hours, in the event that SRM OPERABILITY requirements are not met. Therefore, this change does not involve a significant reduction in a margin of safety.

JAFNPP

IMPROVED STANDARD TECHNICAL SPECIFICATIONS (ISTS) CONVERSION

ITS: 3.3.1.2

Source Range Monitor (SRM) Instrumentation

MARKUP OF NUREG-1433, REVISION 1
SPECIFICATION

3.3 INSTRUMENTATION

3.3.1.2 Source Range Monitor (SRM) Instrumentation

LCO 3.3.1.2 The SRM instrumentation in Table 3.3.1.2-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.1.2-1.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One or more required SRMs inoperable in MODE 2 with intermediate range monitors (IRMs) on Range 2 or below.	A.1	Restore required SRMs to OPERABLE status.	4 hours
B. Three required SRMs inoperable in MODE 2 with IRMs on Range 2 or below.	B.1	Suspend control rod withdrawal.	Immediately
C. Required Action and associated Completion Time of Condition A or B not met.	C.1	Be in MODE 3.	12 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
[M2] D. One or more required SRMs inoperable in MODE 3 or 4.	D.1	Fully insert all insertable control rods.	1 hour
	AND		
	D.2	Place reactor mode switch in the shutdown position.	1 hour
[M8] E. One or more required SRMs inoperable in MODE 5.	E.1	Suspend CORE ALTERATIONS except for control rod insertion.	Immediately
	AND		
	E.2	Initiate action to fully insert all insertable control rods in core cells containing one or more fuel assemblies.	Immediately

SURVEILLANCE REQUIREMENTS

------------------------------------NOTE------------------------------------
Refer to Table 3.3.1.2-1 to determine which SRs apply for each applicable MODE or other specified conditions. (PA1)

SURVEILLANCE		FREQUENCY
[4.10 E] [M4] [M11] SR 3.3.1.2.1	Perform CHANNEL CHECK.	12 hours
[3.10.B] [L2] [M6] SR 3.3.1.2.2	------------------NOTES------------------ 1. Only required to be met during CORE ALTERATIONS. 2. One SRM may be used to satisfy more than one of the following. -- Verify an OPERABLE SRM detector is located in: a. The fueled region; b. The core quadrant where CORE ALTERATIONS are being performed, when the associated SRM is included in the fueled region; and c. A core quadrant adjacent to where CORE ALTERATIONS are being performed, when the associated SRM is included in the fueled region.	12 hours
[M2] SR 3.3.1.2.3	Perform CHANNEL CHECK.	24 hours

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
[4.3.B.4/M3/A2] [3.10.B.2] [M2] [M7] SR 3.3.1.2.4	------------------NOTE------------------ Not required to be met with less than or equal to four fuel assemblies adjacent to the SRM and no other fuel assemblies in the associated core quadrant. -- Verify count rate is: a. ≥ [3.0] cps with a signal to noise ratio ≥ [2:1] or (3) b. ≥ [0.7] cps with a signal to noise ratio ≥ [20:1].	12 hours during CORE ALTERATIONS AND 24 hours (CLB1)
[4.10.B] [M10] SR 3.3.1.2.5	Perform CHANNEL FUNCTIONAL TEST [and determination of signal to noise ratio]. (DB2)	7 days
[M4] [M2] SR 3.3.1.2.6	------------------NOTE------------------ Not required to be performed until 12 hours after IRMs on Range 2 or below. -- Perform CHANNEL FUNCTIONAL TEST [and determination of signal to noise ratio].	31 days
[M2] [M4] SR 3.3.1.2.7	------------------NOTES------------------ 1. Neutron detectors are excluded. 2. Not required to be performed until 12 hours after IRMs on Range 2 or below. -- Perform CHANNEL CALIBRATION.	[18] (24) months (CLB2)

RAI 3.3.1.2-1

Revision F

Table 3.3.1.2-1 (page 1 of 1)
Source Range Monitor Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	SURVEILLANCE REQUIREMENTS
1. Source Range Monitor	2(a)	3	SR 3.3.1.2.1 SR 3.3.1.2.4 SR 3.3.1.2.6 SR 3.3.1.2.7
	3,4	2	SR 3.3.1.2.3 SR 3.3.1.2.4 SR 3.3.1.2.6 SR 3.3.1.2.7
	5	2(b)(c)	SR 3.3.1.2.1 SR 3.3.1.2.2 SR 3.3.1.2.4 SR 3.3.1.2.5 SR 3.3.1.2.7

(a) With IRMs on Range 2 or below.

(b) Only one SRM channel is required to be OPERABLE during spiral offload or reload when the fueled region includes only that SRM detector.

(c) Special movable detectors may be used in place of SRMs if connected to normal SRM circuits.

JAFNPP

IMPROVED STANDARD TECHNICAL SPECIFICATIONS (ISTS) CONVERSION

ITS: 3.3.1.2

Source Range Monitor (SRM) Instrumentation

JUSTIFICATION FOR DIFFERENCES (JFDs)
FROM NUREG-1433, REVISION 1

JUSTIFICATION FOR DIFFERENCES FROM NUREG-1433, REVISION 1
ITS: 3.3.1.2 - SOURCE RANGE MONITOR (SRM) INSTRUMENTATION

RETENTION OF EXISTING REQUIREMENT (CLB)

CLB1 The JAFNPP is not licensed with the option for utilizing a lower count rate. Therefore, this option in ISTS SR 3.3.1.2.4.b has not been used in the JAFNPP ITS. In addition, the current licensed count rate and signal to noise ratio has been included in the SR as specified in UFSAR Section 7.5.4.1.

CLB2 The bracketed Frequency of 18 months in SR 3.3.1.2.7 has been extended to 24 months consistent with the JAFNPP fuel cycle. This Frequency is considered adequate.

PLANT-SPECIFIC WORDING PREFERENCE OR MINOR EDITORIAL IMPROVEMENT (PA)

PA1 Typographical/grammatical correction made.

PLANT-SPECIFIC DIFFERENCE IN THE DESIGN (DB)

DB1 The brackets have been removed and the number of required SRM channels during MODE 2 operations of the three (3) has been included consistent with the values in ITS ACTION B and in Table 3.3.1.2-1 for MODE 2 operations. JAFNPP design is consistent with the Standard and this requirement has been added in accordance with M1.

DB2 The brackets have been removed in ITS SR 3.3.1.2.5 and SR 3.3.1.2.6 and the requirement to perform the determination of the signal to noise ratio along with the CHANNEL FUNCTIONAL TEST maintained since it is an important requirement for SRM OPERABILITY as discussed in the Bases.

DIFFERENCE BASED ON AN APPROVED TRAVELER (TA)

None

DIFFERENCE BASED ON A SUBMITTED, BUT PENDING TRAVELER (TP)

None

DIFFERENCE FOR ANY REASON OTHER THAN THE ABOVE (X)

None

JAFNPP

IMPROVED STANDARD TECHNICAL SPECIFICATIONS (ISTS) CONVERSION

ITS: 3.3.1.2

Source Range Monitor (SRM) Instrumentation

MARKUP OF NUREG-1433, REVISION 1, BASES

B 3.3 INSTRUMENTATION

B 3.3.1.2 Source Range Monitor (SRM) Instrumentation

BASES

BACKGROUND

The SRMs provide the operator with information relative to the neutron flux level at very low flux levels in the core. As such, the SRM indication is used by the operator to monitor the approach to criticality and determine when criticality is achieved. The SRMs are maintained fully inserted until the count rate is greater than a minimum allowed count rate (a control rod block is set at this condition). After SRM to intermediate range monitor (IRM) overlap is demonstrated (as required by SR 3.3.1.1.6), the SRMs are normally fully withdrawn from the core.

PA1

5

The SRM subsystem of the Neutron Monitoring System (NMS) consists of four channels. Each of the SRM channels can be bypassed, but only one at any given time, by the operation of a bypass switch. Each channel includes one detector that can be physically positioned in the core. Each detector assembly consists of a miniature fission chamber with associated cabling, signal conditioning equipment, and electronics associated with the various SRM functions. The signal conditioning equipment converts the current pulses from the fission chamber to analog DC currents that correspond to the count rate. Each channel also includes indication, alarm, and control rod blocks. However, this LCO specifies OPERABILITY requirements only for the monitoring and indication functions of the SRMs.

During refueling, shutdown, and low power operations, the primary indication of neutron flux levels is provided by the SRMs or special movable detectors connected to the normal SRM circuits. The SRMs provide monitoring of reactivity changes during fuel or control rod movement and give the control room operator early indication of unexpected subcritical multiplication that could be indicative of an approach to criticality.

APPLICABLE SAFETY ANALYSES

Prevention and mitigation of prompt reactivity excursions during refueling and low power operation is provided by LCO 3.9.1, "Refueling Equipment Interlocks"; LCO 3.1.1, "SHUTDOWN MARGIN (SDM)"; LCO 3.3.1.1, "Reactor Protection

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

System (RPS) Instrumentation"; IRM Neutron Flux—High and Average Power Range Monitor (APRM) Neutron Flux—High, Setdown Functions; and LCO 3.3.2.1, "Control Rod Block Instrumentation."

The SRMs have no safety function and are not assumed to function during any FSAR design basis accident or transient analysis. However, the SRMs provide the only on scale monitoring of neutron flux levels during startup and refueling. Therefore, they are being retained in Technical Specifications.

LCO

During startup in MODE 2, three of the four SRM channels are required to be OPERABLE to monitor the reactor flux level prior to and during control rod withdrawal, subcritical multiplication and reactor criticality, and neutron flux level and reactor period until the flux level is sufficient to maintain the IRM on Range 3 or above. All but one of the channels are required in order to provide a representation of the overall core response during those periods when reactivity changes are occurring throughout the core.

In MODES 3 and 4, with the reactor shut down, two SRM channels provide redundant monitoring of flux levels in the core.

In MODE 5, during a spiral offload or reload, an SRM outside the fueled region will no longer be required to be OPERABLE, since it is not capable of monitoring neutron flux in the fueled region of the core. Thus, CORE ALTERATIONS are allowed in a quadrant with no OPERABLE SRM in an adjacent quadrant provided the Table 3.3.1.2-1, footnote (b), requirement that the bundles being spiral reloaded or spiral offloaded are all in a single fueled region containing at least one OPERABLE SRM is met. Spiral reloading and offloading encompass reloading or offloading a cell on the edge of a continuous fueled region (the cell can be reloaded or offloaded in any sequence).

In nonspiral routine operations, two SRMs are required to be OPERABLE to provide redundant monitoring of reactivity

(continued)

BASES

LCO (continued)

changes occurring in the reactor core. Because of the local nature of reactivity changes during refueling, adequate coverage is provided by requiring one SRM to be OPERABLE in the quadrant of the reactor core where CORE ALTERATIONS are being performed, and the other SRM to be OPERABLE in an adjacent quadrant containing fuel. These requirements ensure that the reactivity of the core will be continuously monitored during CORE ALTERATIONS.

Special movable detectors, according to footnote (c) of Table 3.3.1.2-1, may be used during CORE ALTERATIONS in place of the normal SRM nuclear detectors. These special detectors must be connected to the normal SRM circuits in the NMS, such that the applicable neutron flux indication can be generated. These special detectors provide more flexibility in monitoring reactivity changes during fuel loading, since they can be positioned anywhere within the core during refueling. They must still meet the location requirements of SR 3.3.1.2.12 and all other required SRs for SRMs. PA3 PA4

For an SRM channel to be considered OPERABLE, it must be providing neutron flux monitoring indication.

APPLICABILITY

The SRMs are required to be OPERABLE in MODES 2, 3, 4, and 5 prior to the IRMs being on scale on Range 3 to provide for neutron monitoring. In MODE 1, the APRMs provide adequate monitoring of reactivity changes in the core; therefore, the SRMs are not required. In MODE 2, with IRMs on Range 3 or above, the IRMs provide adequate monitoring and the SRMs are not required.

ACTIONS

A.1 and B.1

In MODE 2, with the IRMs on Range 2 or below, SRMs provide the means of monitoring core reactivity and criticality. With any number of the required SRMs inoperable, the ability to monitor neutron flux is degraded. Therefore, a limited time is allowed to restore the inoperable channels to OPERABLE status.

(continued)

BASES

ACTIONS

A.1 and B.1 (continued)

Provided at least one SRM remains OPERABLE, Required Action A.1 allows 4 hours to restore the required SRMs to OPERABLE status. This time is reasonable because there is adequate capability remaining to monitor the core, there is limited risk of an event during this time, and there is sufficient time to take corrective actions to restore the required SRMs to OPERABLE status or to establish alternate IRM monitoring capability. During this time, control rod withdrawal and power increase is not precluded by this Required Action. Having the ability to monitor the core with at least one SRM, proceeding to IRM Range 3 or greater (with overlap required by SR 3.3.1.1.6), and thereby exiting the Applicability of this LCO, is acceptable for ensuring adequate core monitoring and allowing continued operation. PA 1 5

With three required SRMs inoperable, Required Action B.1 allows no positive changes in reactivity (control rod withdrawal must be immediately suspended) due to inability to monitor the changes. Required Action A.1 still applies and allows 4 hours to restore monitoring capability prior to requiring control rod insertion. This allowance is based on the limited risk of an event during this time, provided that no control rod withdrawals are allowed, and the desire to concentrate efforts on repair, rather than to immediately shut down, with no SRMs OPERABLE.

C.1

In MODE 2, if the required number of SRMs is not restored to OPERABLE status within the allowed Completion Time, the reactor shall be placed in MODE 3. With all control rods fully inserted, the core is in its least reactive state with the most margin to criticality. The allowed Completion Time of 12 hours is reasonable, based on operating experience, to reach MODE 3 from full power conditions in an orderly manner and without challenging plant systems. PA 3

D.1 and D.2

With one or more required SRMs inoperable in MODE 3 or 4, the neutron flux monitoring capability is degraded or nonexistent. The requirement to fully insert all insertable

(continued)

BASES

ACTIONS

D.1 and D.2 (continued)

control rods ensures that the reactor will be at its minimum reactivity level while no neutron monitoring capability is available. Placing the reactor mode switch in the shutdown position prevents subsequent control rod withdrawal by maintaining a control rod block. The allowed Completion Time of 1 hour is sufficient to accomplish the Required Action, and takes into account the low probability of an event requiring the SRM occurring during this interval.

E.1 and E.2

With one or more required SRM inoperable in MODE 5, the ability to detect local reactivity changes in the core during refueling is degraded. CORE ALTERATIONS must be immediately suspended and action must be immediately initiated to insert all insertable control rods in core cells containing one or more fuel assemblies. Suspending CORE ALTERATIONS prevents the two most probable causes of reactivity changes, fuel loading and control rod withdrawal, from occurring. Inserting all insertable control rods ensures that the reactor will be at its minimum reactivity given that fuel is present in the core. Suspension of CORE ALTERATIONS shall not preclude completion of the movement of a component to a safe, conservative position.

Action (once required to be initiated) to insert control rods must continue until all insertable rods in core cells containing one or more fuel assemblies are inserted.

SURVEILLANCE REQUIREMENTS

The SRs for each SRM Applicable MODE or other specified conditions are found in the SRs column of Table 3.3.1.2-1.

SR 3.3.1.2.1 and SR 3.3.1.2.3

Performance of the CHANNEL CHECK ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on another channel. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.2.1 and SR 3.3.1.2.3 (continued)

same value. Significant deviations between the instrument channels could be an indication of excessive instrument drift in one of the channels or something even more serious. A CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

Channel PA2

Agreement criteria are determined by the plant staff based on a combination of the channel instrument uncertainties, including indication and readability. If a channel is outside the criteria, it may be an indication that the instrument has drifted outside its limit.

The Frequency of once every 12 hours for SR 3.3.1.2.1 is based on operating experience that demonstrates channel failure is rare. While in MODES 3 and 4, reactivity changes are not expected; therefore, the 12 hour Frequency is relaxed to 24 hours for SR 3.3.1.2.3. The CHANNEL CHECK supplements less formal, but more frequent, checks of channels during normal operational use of the displays associated with the channels required by the LCO.

PA3

SR 3.3.1.2.2

when the fueled region encompasses more than one SRM

To provide adequate coverage of potential reactivity changes ~~in the core~~, one SRM is required to be OPERABLE in the quadrant where CORE ALTERATIONS are being performed, and the other OPERABLE SRM must be in an adjacent quadrant containing fuel. Note 1 states that the SR is required to be met only during CORE ALTERATIONS. It is not required to be met at other times in MODE 5 since core reactivity changes are not occurring. This Surveillance consists of a review of plant logs to ensure that SRMs required to be OPERABLE for given CORE ALTERATIONS are, in fact, OPERABLE. In the event that only one SRM is required to be OPERABLE, per Table 3.3.1.2-1, footnote (b), only the a. portion of this SR is required. Note 2 clarifies that more than one of the three requirements can be met by the same OPERABLE SRM. The 12 hour Frequency is based upon operating experience and supplements operational controls over refueling activities that include steps to ensure that the SRMs required by the LCO are in the proper quadrant.

(when the fueled region encompasses only one SRM) PA3

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.2.4

with the detector fill-in (PA3)

This Surveillance consists of a verification of the SRM instrument readout to ensure that the SRM reading is greater than a specified minimum count rate, which ensures that the detectors are indicating count rates indicative of neutron flux levels within the core. With few fuel assemblies loaded, the SRMs will not have a high enough count rate to satisfy the SR. Therefore, allowances are made for loading sufficient "source" material, in the form of irradiated fuel assemblies, to establish the minimum count rate.

To accomplish this, the SR is modified by a Note that states that the count rate is not required to be met on an SRM that has less than or equal to four fuel assemblies adjacent to the SRM and no other fuel assemblies are in the associated core quadrant. With four or less fuel assemblies loaded around each SRM and no other fuel assemblies in the associated core quadrant, even with a control rod withdrawn, the configuration will not be critical.

The Frequency is based upon channel redundancy and other information available in the control room, and ensures that the required channels are frequently monitored while core reactivity changes are occurring. When no reactivity changes are in progress, the Frequency is relaxed from 12 hours to 24 hours.

(TA1) Insert SR 3.3.1.2.5

TSTF-?

SR 3.3.1.2.5 and SR 3.3.1.2.6

Performance of a CHANNEL FUNCTIONAL TEST demonstrates the associated channel will function properly. SR 3.3.1.2.5 is required in MODE 5, and the 7 day Frequency ensures that the channels are OPERABLE while core reactivity changes could be in progress. This Frequency is reasonable, based on operating experience and on other Surveillances (such as a CHANNEL CHECK), that ensure proper functioning between CHANNEL FUNCTIONAL TESTS.

SR 3.3.1.2.6 is required in MODE 2 with IRMs on Range 2 or below, and in MODES 3 and 4. Since core reactivity changes do not normally take place, the Frequency has been extended from 7 days to 31 days. The 31 day Frequency is based on operating experience and on other Surveillances (such as

in MODES 3 and 4, and core reactivity changes are due only to control rod movement in MODE 2 (PA3)

(continued)

Revision F

(TA1)

INSERT SR 3.3.1.2.5

A successful test of the required contacts(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with the applicable extensions.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.2.5 and SR 3.3.1.2.6 (continued)

CHANNEL CHECK) that ensure proper functioning between CHANNEL FUNCTIONAL TESTS.

Verification of the signal to noise ratio also ensures that the detectors are inserted to an acceptable operating level. In a fully withdrawn condition, the detectors are sufficiently removed from the fueled region of the core to essentially eliminate neutrons from reaching the detector. Any count rate obtained while the detectors are fully withdrawn is assumed to be "noise" only.

The Note to the Surveillance allows the Surveillance to be delayed until entry into the specified condition of the Applicability (THERMAL POWER decreased to IRM Range 2 or below). The SR must be performed within 12 hours after IRMs are on Range 2 or below. The allowance to enter the Applicability with the 31 day Frequency not met is reasonable, based on the limited time of 12 hours allowed after entering the Applicability and the inability to perform the Surveillance while at higher power levels. Although the Surveillance could be performed while on IRM Range 3, the plant would not be expected to maintain steady state operation at this power level. In this event, the 12 hour Frequency is reasonable, based on the SRMs being otherwise verified to be OPERABLE (i.e., satisfactorily performing the CHANNEL CHECK) and the time required to perform the Surveillances.

SR 3.3.1.2.7

Performance of a CHANNEL CALIBRATION at a Frequency of 18 months verifies the performance of the SRM detectors and associated circuitry. The Frequency considers the plant conditions required to perform the test, the ease of performing the test, and the likelihood of a change in the system or component status. The neutron detectors are excluded from the CHANNEL CALIBRATION because they cannot readily be adjusted. The detectors are fission chambers that are designed to have a relatively constant sensitivity over the range and with an accuracy specified for a fixed useful life.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.2.7 (continued)

Note 2 to the Surveillance allows the Surveillance to be delayed until entry into the specified condition of the Applicability. The SR must be performed in MODE 2 within 12 hours of entering MODE 2 with IRMs on Range 2 or below. The allowance to enter the Applicability with the 18 month Frequency not met is reasonable, based on the limited time of 12 hours allowed after entering the Applicability and the inability to perform the Surveillance while at higher power levels. Although the Surveillance could be performed while on IRM Range 3, the plant would not be expected to maintain steady state operation at this power level. In this event, the 12 hour Frequency is reasonable, based on the SRMs being otherwise verified to be OPERABLE (i.e., satisfactorily performing the CHANNEL CHECK) and the time required to perform the Surveillances.

24 CLB1

REFERENCES None.

JAFNPP

IMPROVED STANDARD TECHNICAL SPECIFICATIONS (ISTS) CONVERSION

ITS: 3.3.1.2

Source Range Monitor (SRM) Instrumentation

JUSTIFICATION FOR DIFFERENCES (JFDs)
FROM NUREG-1433, REVISION 1, BASES

JUSTIFICATION FOR DIFFERENCES FROM NUREG-1433, REVISION 1
ITS BASES: 3.3.1.2 - SOURCE RANGE MONITOR (SRM) INSTRUMENTATION

RETENTION OF EXISTING REQUIREMENT (CLB)

CLB1 The bracketed Frequency of 18 months in SR 3.3.1.2.7 has been extended to 24 months consistent with the JAFNPP fuel cycle. This Frequency is considered adequate. The Bases has been modified to be consistent with the Specification.

PLANT-SPECIFIC WORDING PREFERENCE OR MINOR EDITORIAL IMPROVEMENT (PA)

PA1 The Bases have been revised to reflect changes made to the Specifications.

PA2 The Bases have been revised to reflect the proper JAFNPP nomenclature.

PA3 The Bases have been revised for clarity or accuracy, with no change in intent.

PA4 Typographical error corrected.

PLANT-SPECIFIC DIFFERENCE IN THE DESIGN (DB)

None

DIFFERENCE BASED ON AN APPROVED TRAVELER (TA)

TA1 The changes presented in Technical Specification Task Force (TSTF) Technical Specification Change Traveler Number 205, Revision 3 have been incorporated into the revised Improved Technical Specifications (TSTF 205, R3) TSTF-205

DIFFERENCE BASED ON A SUBMITTED, BUT PENDING TRAVELER (TP)

None

DIFFERENCE FOR ANY REASON OTHER THAN THE ABOVE (X)

X1 NUREG-1433, Revision 1, Bases reference to "the NRC Policy Statement" has been replaced with 10 CFR 50.36(c)(2)(ii), in accordance with 60 FR 36953 effective August 18, 1995.

JAFNPP

IMPROVED STANDARD TECHNICAL SPECIFICATIONS (ISTS) CONVERSION

ITS: 3.3.1.2

Source Range Monitor (SRM) Instrumentation

RETYPED PROPOSED IMPROVED TECHNICAL SPECIFICATIONS (ITS) AND BASES

3.3 INSTRUMENTATION

3.3.1.2 Source Range Monitor (SRM) Instrumentation

LCO 3.3.1.2 The SRM instrumentation in Table 3.3.1.2-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.1.2-1.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more required SRMs inoperable in MODE 2 with intermediate range monitors (IRMs) on Range 2 or below.	A.1 Restore required SRMs to OPERABLE status.	4 hours
B. Three required SRMs inoperable in MODE 2 with IRMs on Range 2 or below.	B.1 Suspend control rod withdrawal.	Immediately
C. Required Action and associated Completion Time of Condition A or B not met.	C.1 Be in MODE 3.	12 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
D. One or more required SRMs inoperable in MODE 3 or 4.	D.1	Fully insert all insertable control rods.	1 hour
	AND		
	D.2	Place reactor mode switch in the shutdown position.	1 hour
E. One or more required SRMs inoperable in MODE 5.	E.1	Suspend CORE ALTERATIONS except for control rod insertion.	Immediately
	AND		
	E.2	Initiate action to fully insert all insertable control rods in core cells containing one or more fuel assemblies.	Immediately

SURVEILLANCE REQUIREMENTS

-----------------------------------NOTE-----------------------------------
Refer to Table 3.3.1.2-1 to determine which SRs apply for each applicable MODE or other specified condition.

SURVEILLANCE		FREQUENCY
SR 3.3.1.2.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.1.2.2	-----------------NOTES----------------- 1. Only required to be met during CORE ALTERATIONS. 2. One SRM may be used to satisfy more than one of the following. --------------------------------------- Verify an OPERABLE SRM detector is located in: a. The fueled region; b. The core quadrant where CORE ALTERATIONS are being performed, when the associated SRM is included in the fueled region; and c. A core quadrant adjacent to where CORE ALTERATIONS are being performed, when the associated SRM is included in the fueled region.	12 hours
SR 3.3.1.2.3	Perform CHANNEL CHECK.	24 hours

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.2.4	----------------NOTES---------------- Not required to be met with less than or equal to four fuel assemblies adjacent to the SRM and no other fuel assemblies in the associated core quadrant. ------------------------------------- Verify count rate is ≥ 3.0 cps with a signal to noise ratio ≥ 3:1.	12 hours during CORE ALTERATIONS AND 24 hours
SR 3.3.1.2.5	Perform CHANNEL FUNCTIONAL TEST and determination of signal to noise ratio.	7 days
SR 3.3.1.2.6	----------------NOTE---------------- Not required to be performed until 12 hours after IRMs on Range 2 or below. ------------------------------------- Perform CHANNEL FUNCTIONAL TEST and determination of signal to noise ratio.	31 days
SR 3.3.1.2.7	----------------NOTES---------------- 1. Neutron detectors are excluded. 2. Not required to be performed until 12 hours after IRMs on Range 2 or below. ------------------------------------- Perform CHANNEL CALIBRATION.	24 months

Table 3.3.1.2-1 (page 1 of 1)
Source Range Monitor Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	SURVEILLANCE REQUIREMENTS
1. Source Range Monitor	2(a)	3	SR 3.3.1.2.1 SR 3.3.1.2.4 SR 3.3.1.2.6 SR 3.3.1.2.7
	3,4	2	SR 3.3.1.2.3 SR 3.3.1.2.4 SR 3.3.1.2.6 SR 3.3.1.2.7
	5	2(b)(c)	SR 3.3.1.2.1 SR 3.3.1.2.2 SR 3.3.1.2.4 SR 3.3.1.2.5 SR 3.3.1.2.7

(a) With IRMs on Range 2 or below.

(b) Only one SRM channel is required to be OPERABLE during spiral offload or reload when the fueled region includes only that SRM detector.

(c) Special movable detectors may be used in place of SRMs if connected to normal SRM circuits.

B 3.3 INSTRUMENTATION

B 3.3.1.2 Source Range Monitor (SRM) Instrumentation

BASES

BACKGROUND

The SRMs provide the operator with information relative to the neutron flux level at very low flux levels in the core. As such, the SRM indication is used by the operator to monitor the approach to criticality and determine when criticality is achieved. The SRMs are maintained fully inserted until the count rate is greater than a minimum allowed count rate (a control rod block is set at this condition). After SRM to intermediate range monitor (IRM) overlap is demonstrated (as required by SR 3.3.1.1.5), the SRMs are normally fully withdrawn from the core.

The SRM subsystem of the Neutron Monitoring System (NMS) consists of four channels. Each of the SRM channels can be bypassed, but only one at any given time, by the operation of a bypass switch. Each channel includes one detector that can be physically positioned in the core. Each detector assembly consists of a miniature fission chamber with associated cabling, signal conditioning equipment, and electronics associated with the various SRM functions. The signal conditioning equipment converts the current pulses from the fission chamber to analog DC currents that correspond to the count rate. Each channel also includes indication, alarm, and control rod blocks. However, this LCO specifies OPERABILITY requirements only for the monitoring and indication functions of the SRMs.

During refueling, shutdown, and low power operations, the primary indication of neutron flux levels is provided by the SRMs or special movable detectors connected to the normal SRM circuits. The SRMs provide monitoring of reactivity changes during fuel or control rod movement and give the control room operator early indication of unexpected subcritical multiplication that could be indicative of an approach to criticality.

APPLICABLE SAFETY ANALYSES

Prevention and mitigation of prompt reactivity excursions during refueling and low power operation is provided by LCO 3.9.1, "Refueling Equipment Interlocks"; LCO 3.1.1, "SHUTDOWN MARGIN (SDM)"; LCO 3.3.1.1, "Reactor Protection

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

System (RPS) Instrumentation"; IRM Neutron Flux–High and Average Power Range Monitor (APRM) Neutron Flux–High, (Startup) Functions; and LCO 3.3.2.1, "Control Rod Block Instrumentation."

The SRMs have no safety function and are not assumed to function during any UFSAR design basis accident or transient analysis. However, the SRMs provide the only on-scale monitoring of neutron flux levels during startup and refueling. Therefore, they are being retained in Technical Specifications.

LCO

During startup in MODE 2, three of the four SRM channels are required to be OPERABLE to monitor the reactor flux level prior to and during control rod withdrawal, subcritical multiplication and reactor criticality, and neutron flux level and reactor period until the flux level is sufficient to maintain the IRMs on Range 3 or above. All but one of the channels are required in order to provide a representation of the overall core response during those periods when reactivity changes are occurring throughout the core.

In MODES 3 and 4, with the reactor shut down, two SRM channels provide redundant monitoring of flux levels in the core.

In MODE 5, during a spiral offload or reload, an SRM outside the fueled region will no longer be required to be OPERABLE, since it is not capable of monitoring neutron flux in the fueled region of the core. Thus, CORE ALTERATIONS are allowed in a quadrant with no OPERABLE SRM in an adjacent quadrant provided the Table 3.3.1.2-1, footnote (b), requirement that the bundles being spiral reloaded or spiral offloaded are all in a single fueled region containing at least one OPERABLE SRM is met. Spiral reloading and offloading encompass reloading or offloading a cell on the edge of a continuous fueled region (the cell can be reloaded or offloaded in any sequence).

In nonspiral routine operations, two SRMs are required to be OPERABLE to provide redundant monitoring of reactivity

(continued)

BASES

LCO (continued)

changes occurring in the reactor core. Because of the local nature of reactivity changes during refueling, adequate coverage is provided by requiring one SRM to be OPERABLE in the quadrant of the reactor core where CORE ALTERATIONS are being performed, and the other SRM to be OPERABLE in an adjacent quadrant containing fuel. These requirements ensure that the reactivity of the core will be continuously monitored during CORE ALTERATIONS.

Special movable detectors, according to footnote (c) of Table 3.3.1.2-1, may be used in place of the normal SRM nuclear detectors. These special detectors must be connected to the normal SRM circuits in the NMS, such that the applicable neutron flux indication can be generated. These special detectors provide more flexibility in monitoring reactivity changes during fuel loading, since they can be positioned anywhere within the core during refueling. They must still meet the location requirements of SR 3.3.1.2.2 and all other required SRs for SRMs.

For an SRM channel to be considered OPERABLE, it must be providing neutron flux monitoring indication.

APPLICABILITY

The SRMs are required to be OPERABLE in MODES 2, 3, 4, and 5 prior to the IRMs being on scale on Range 3 to provide for neutron monitoring. In MODE 1, the APRMs provide adequate monitoring of reactivity changes in the core; therefore, the SRMs are not required. In MODE 2, with IRMs on Range 3 or above, the IRMs provide adequate monitoring and the SRMs are not required.

ACTIONS

<u>A.1 and B.1</u>

In MODE 2, with the IRMs on Range 2 or below, SRMs provide the means of monitoring core reactivity and criticality. With any number of the required SRMs inoperable, the ability to monitor neutron flux is degraded. Therefore, a limited time is allowed to restore the inoperable channels to OPERABLE status.

(continued)

BASES

ACTIONS

A.1 and B.1 (continued)

Provided at least one SRM remains OPERABLE, Required Action A.1 allows 4 hours to restore the required SRMs to OPERABLE status. This time is reasonable because there is adequate capability remaining to monitor the core, there is limited risk of an event during this time, and there is sufficient time to take corrective actions to restore the required SRMs to OPERABLE status or to establish alternate IRM monitoring capability. During this time, control rod withdrawal and power increase is not precluded by this Required Action. Having the ability to monitor the core with at least one SRM, proceeding to IRM Range 3 or greater (with overlap required by SR 3.3.1.1.5), and thereby exiting the Applicability of this LCO, is acceptable for ensuring adequate core monitoring and allowing continued operation.

With three required SRMs inoperable, Required Action B.1 allows no positive changes in reactivity (control rod withdrawal must be immediately suspended) due to inability to monitor the changes. Required Action A.1 still applies and allows 4 hours to restore monitoring capability prior to requiring control rod insertion. This allowance is based on the limited risk of an event during this time, provided that no control rod withdrawals are allowed, and the desire to concentrate efforts on repair, rather than to immediately shut down, with no SRMs OPERABLE.

C.1

In MODE 2, if the required number of SRMs is not restored to OPERABLE status within the allowed Completion Time, the reactor shall be placed in MODE 3. With all control rods fully inserted, the core is in its least reactive state with the most margin to criticality. The allowed Completion Time of 12 hours is reasonable, based on operating experience, to reach MODE 3 in an orderly manner and without challenging plant systems.

(continued)

BASES

ACTIONS (continued)

D.1 and D.2

With one or more required SRMs inoperable in MODE 3 or 4, the neutron flux monitoring capability is degraded or nonexistent. The requirement to fully insert all insertable control rods ensures that the reactor will be at its minimum reactivity level while no neutron monitoring capability is available. Placing the reactor mode switch in the shutdown position prevents subsequent control rod withdrawal by maintaining a control rod block. The allowed Completion Time of 1 hour is sufficient to accomplish the Required Action, and takes into account the low probability of an event requiring the SRM occurring during this interval.

E.1 and E.2

With one or more required SRMs inoperable in MODE 5, the ability to detect local reactivity changes in the core during refueling is degraded. CORE ALTERATIONS must be immediately suspended and action must be immediately initiated to fully insert all insertable control rods in core cells containing one or more fuel assemblies. Suspending CORE ALTERATIONS prevents the two most probable causes of reactivity changes, fuel loading and control rod withdrawal, from occurring. Inserting all insertable control rods ensures that the reactor will be at its minimum reactivity given that fuel is present in the core. Suspension of CORE ALTERATIONS shall not preclude completion of the movement of a component to a safe, conservative position.

Action (once required to be initiated) to insert control rods must continue until all insertable rods in core cells containing one or more fuel assemblies are inserted.

SURVEILLANCE REQUIREMENTS

As noted at the beginning of the SRs, the SRs for each SRM Applicable MODE or other specified conditions are found in the SRs column of Table 3.3.1.2-1.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.2.1 and SR 3.3.1.2.3

Performance of the CHANNEL CHECK ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on another channel. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the instrument channels could be an indication of excessive instrument drift in one of the channels or something even more serious. A CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

Channel agreement criteria are determined by the plant staff based on a combination of the channel instrument uncertainties, including indication and readability. If a channel is outside the criteria, it may be an indication that the instrument has drifted outside its limit.

The Frequency of once every 12 hours for SR 3.3.1.2.1 is based on operating experience that demonstrates channel failure is rare. While in MODES 3 and 4, reactivity changes are not expected; therefore, the 12 hour Frequency is relaxed to 24 hours for SR 3.3.1.2.3. The CHANNEL CHECK supplements less formal, but more frequent, checks of channels during normal operational use of the displays associated with the channels required by the LCO.

SR 3.3.1.2.2

To provide adequate coverage of potential reactivity changes in the core when the fueled region encompasses more than one SRM, one SRM is required to be OPERABLE in the quadrant where CORE ALTERATIONS are being performed, and the other OPERABLE SRM must be in an adjacent quadrant containing fuel. Note 1 states that the SR is required to be met only during CORE ALTERATIONS. It is not required to be met at other times in MODE 5 since core reactivity changes are not occurring. This Surveillance consists of a review of plant logs to ensure that SRMs required to be OPERABLE for given CORE ALTERATIONS are, in fact, OPERABLE. In the event that only one SRM is required to be OPERABLE (when the fueled region encompasses only one SRM), per Table 3.3.1.2-1,

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.2.2 (continued)

footnote (b), only the a. portion of this SR is required. Note 2 clarifies that more than one of the three requirements can be met by the same OPERABLE SRM. The 12 hour Frequency is based upon operating experience and supplements operational controls over refueling activities that include steps to ensure that the SRMs required by the LCO are in the proper quadrant.

SR 3.3.1.2.4

This Surveillance consists of a verification of the SRM instrument readout to ensure that the SRM reading is greater than a specified minimum count rate with the detector full-in, which ensures that the detectors are indicating count rates indicative of neutron flux levels within the core. With few fuel assemblies loaded, the SRMs will not have a high enough count rate to satisfy the SR. Therefore, allowances are made for loading sufficient "source" material, in the form of irradiated fuel assemblies, to establish the minimum count rate.

To accomplish this, the SR is modified by a Note that states that the count rate is not required to be met on an SRM that has less than or equal to four fuel assemblies adjacent to the SRM and no other fuel assemblies are in the associated core quadrant. With four or less fuel assemblies loaded around each SRM and no other fuel assemblies in the associated core quadrant, even with a control rod withdrawn, the configuration will not be critical.

The Frequency is based upon channel redundancy and other information available in the control room, and ensures that the required channels are frequently monitored while core reactivity changes are occurring. When no reactivity changes are in progress, the Frequency is relaxed from 12 hours to 24 hours.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.2.5 and SR 3.3.1.2.6

Performance of a CHANNEL FUNCTIONAL TEST demonstrates the associated channel will function properly. A successful test of the required contacts(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with the applicable extensions. SR 3.3.1.2.5 is required in MODE 5, and the 7 day Frequency ensures that the channels are OPERABLE while core reactivity changes could be in progress. This Frequency is reasonable, based on operating experience and on other Surveillances (such as a CHANNEL CHECK), that ensure proper functioning between CHANNEL FUNCTIONAL TESTS.

TSTF-205R3

SR 3.3.1.2.6 is required in MODE 2 with IRMs on Range 2 or below, and in MODES 3 and 4. Since core reactivity changes do not normally take place in MODES 3 and 4, and core reactivity changes are due only to control rod movement in MODE 2, the Frequency has been extended from 7 days to 31 days. The 31 day Frequency is based on operating experience and on other Surveillances (such as CHANNEL CHECK) that ensure proper functioning between CHANNEL FUNCTIONAL TESTS.

Verification of the signal to noise ratio also ensures that the detectors are inserted to an acceptable operating level. In a fully withdrawn condition, the detectors are sufficiently removed from the fueled region of the core to essentially eliminate neutrons from reaching the detector. Any count rate obtained while the detectors are fully withdrawn is assumed to be "noise" only.

The Note to SR 3.3.1.2.6 allows the Surveillance to be delayed until entry into the specified condition of the Applicability (THERMAL POWER decreased to IRM Range 2 or below). The SR must be performed within 12 hours after IRMs are on Range 2 or below. The allowance to enter the Applicability with the 31 day Frequency not met is

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.2.5 and SR 3.3.1.2.6

reasonable, based on the limited time of 12 hours allowed after entering the Applicability and the inability to perform the Surveillance while at higher power levels. Although the Surveillance could be performed while on IRM Range 3, the plant would not be expected to maintain steady state operation at this power level. In this event, the 12 hour Frequency is reasonable, based on the SRMs being otherwise verified to be OPERABLE (i.e., satisfactorily performing the CHANNEL CHECK) and the time required to perform the Surveillances.

SR 3.3.1.2.7

Performance of a CHANNEL CALIBRATION at a Frequency of 24 months verifies the performance of the SRM detectors and associated circuitry. The Frequency considers the plant conditions required to perform the test, the ease of performing the test, and the likelihood of a change in the system or component status. The neutron detectors are excluded from the CHANNEL CALIBRATION (Note 1) because they cannot readily be adjusted. The detectors are fission chambers that are designed to have a relatively constant sensitivity over the range and with an accuracy specified for a fixed useful life.

Note 2 to the Surveillance allows the Surveillance to be delayed until entry into the specified condition of the Applicability. The SR must be performed in MODE 2 within 12 hours of entering MODE 2 with IRMs on Range 2 or below. The allowance to enter the Applicability with the 24 month Frequency not met is reasonable, based on the limited time of 12 hours allowed after entering the Applicability and the inability to perform the Surveillance while at higher power levels. Although the Surveillance could be performed while on IRM Range 3, the plant would not be expected to maintain steady state operation at this power level. In this event, the 12 hour Frequency is reasonable, based on the SRMs being otherwise verified to be OPERABLE (i.e., satisfactorily performing the CHANNEL CHECK) and the time required to perform the Surveillances.

REFERENCES

None.

JAFNPP

IMPROVED STANDARD TECHNICAL SPECIFICATIONS (ISTS) CONVERSION

ITS: 3.3.2.1

Control Rod Block Instrumentation

MARKUP OF CURRENT TECHNICAL SPECIFICATIONS (CTS)

DISCUSSION OF CHANGES (DOCs) TO THE CTS

NO SIGNIFICANT HAZARDS CONSIDERATION (NSHC) FOR LESS RESTRICTIVE CHANGES

MARKUP OF NUREG-1433, REVISION 1, SPECIFICATION

JUSTIFICATION FOR DIFFERENCES (JFDs) FROM NUREG-1433, REVISION 1

MARKUP OF NUREG-1433, REVISION 1, BASES

JUSTIFICATION FOR DIFFERENCES (JFDs) FROM NUREG-1433, REVISION 1, BASES

RETYPED PROPOSED IMPROVED TECHNICAL SPECIFICATIONS (ITS) AND BASES

JAFNPP

IMPROVED STANDARD TECHNICAL SPECIFICATIONS (ISTS) CONVERSION

ITS: 3.3.2.1

Control Rod Block Instrumentation

MARKUP OF CURRENT TECHNICAL SPECIFICATIONS (CTS)

Specification 3.3.2.1

(A1) ↓

1.1 (cont'd)

D. Reactor Water Level (Hot or Cold Shutdown Conditions)

Whenever the reactor is in the shutdown condition with irradiated fuel in the reactor vessel, the water level shall not be less than that corresponding to 18 inches above the Top of Active Fuel when it is seated in the core.

see ITS: Chapter 2.0

2.1 (cont'd)

(2) Fixed High Neutron Flux Scram Trip Setting

When the Mode Switch is in the RUN position, the APRM fixed high flux scram trip setting shall be:

S ≤ 120% Power

See ITS: 3.3.1.1

d. APRM Rod Block Setting

The APRM Rod block trip setting shall be less than or equal to the limit specified in Table 3.2-3. This setting shall be adjusted during single loop operation when required by Specification 3.5.J.

(R1)

Amendment No. ~~14~~, ~~30~~, ~~43~~, ~~64~~, ~~74~~, ~~86~~, ~~105~~ 162

3.2 (cont'd)

B. Core and Containment Cooling Systems - Initiation and Control

The limiting conditions for operation for the instrumentation that initiates or controls the Core and Containment Cooling Systems are given in Table 3.2-2. This instrumentation must be operable when the system(s) it initiates or controls are required to be operable as specified in Specification 3.5.

[3.3.2.1] C. Control Rod Block ~~Actuation~~ Instrumentation

[LCO 3.3.2.1] The limiting conditions of operation for the instrumentation that initiates control rod block are given in Table ~~3.2-3~~ 3.3.2.1-1.

D. Radiation Monitoring Systems - Isolation and Initiation Functions

Refer to the Radiological Effluent Technical Specifications (Appendix B).

4.2 (cont'd)

B. Core and Containment Cooling Systems - Initiation and Control

Instrumentation shall be functionally tested, calibrated, and checked as indicated in Table 4.2-2.

System logic shall be functionally tested as indicated in Table 4.2-2.

See ITS: 3.3.5.1 3.3.5.2

[3.3.2.1] C. Control Rod Block Actuation

[SR Note 1]

Instrumentation shall be functionally tested, calibrated, and checked as indicated in Table ~~4.2-3~~ 3.3.2.1-1.

System logic shall be functionally tested as indicated in Table ~~4.2-3~~ 3.3.2.1-1.

D. Radiation Monitoring Systems - Isolation and Initiation Functions

Refer to the Radiological Effluent Technical Specifications (Appendix B).

(A6)

Specification 3.3.2.1

(A1)

JAFNPP

TABLE ~~3.2-3~~ 3.3.2.1-1

CONTROL ROD BLOCK INSTRUMENTATION ~~REQUIREMENTS~~

(LA1)

Minimum No. of Operable Instrument Channels Per Trip Function (Notes 1 and 3)	Trip Function	Trip Level Setting	Total Number of Instrument Channels Provided By Design	Action (Note 2)
4	APRM Flow Referenced Neutron Flux	(Note 9)	6	A
4	APRM Neutron Flux-Start-up	≤ 12%	6	A
4	APRM Downscale	≥ 2.5 indicated on scale	6	A
[Function 1.a] 2 (Note 7)	Rod Block Monitor ~~(Flow Biased)~~ (LA5)	(Note 9)	2 (LA1)	B [ACTION A, B]
[1.c] 2 (Note 7)	Rod Block Monitor (Downscale)	≥ 2.5 indicated on scale	2	B
6	IRM Detector not in Start-up Position	(Note 8)	8	A
6	IRM Upscale	≤ 86.4% (108/125) of full scale	8	A
6	IRM Downscale (Note 4)	≥ 2% (2.5/125) of full scale	8	A
3	SRM Detector not in Start-up Position	(Note 5)	4	A
3 (Note 6)	SRM Upscale	≤ 10^5 counts/sec	4	A
2	Scram Discharge Instrument Volume High Water Level	≤ 26.0 gallons per instrument volume	2	C (Note 10)

(R1)

add proposed Function 1.b, RBM Inoperable (M1)

add Function 2. "Rod Worth Minimizer" (A2)

add Function 3. RMS - Shutdown Position (M2)

TABLE 3.2-3 (Cont'd)

CONTROL ROD BLOCK INSTRUMENTATION REQUIREMENTS

NOTES FOR TABLE 3.2-3

[Applicability for RBM]

1. The trip functions shall be operable in the Startup and Run modes except as follows: (R1)

   a) SRM and IRM: Startup mode only.
   b) RBM: Run mode and ≥ 30% reactor power only. [Note (a)]
   c) APRM Neutron Flux-Startup: Startup mode only.
   d) APRM Flow Referenced Neutron Flux: Run mode only.

2. Actions: (R1)

   Action A: If the number of operable instrument channels is:

   a) one less than the required minimum number of operable instrument channels per trip function, restore the inoperable instrument channel to operable status within 7 days, or place the inoperable instrument channel in the tripped condition within the next hour.

   b) two or more channels less than the required minimum number of operable instrument channels per trip function, place at least one inoperable instrument channel in the tripped condition within one hour.

   Action B: If the number of operable instrument channels is:

   [Action A] a) one less than the required minimum number of operable instrument channels per trip function, verify that the reactor is not operating on a Limiting Control Rod Pattern, and within 7 days (24 hours) (M3) restore the inoperable instrument channel to operable status; otherwise, place the inoperable instrument channel in the tripped condition within the next hour. See Specification 3.3.B.5. (L1) [ACTION B]

   [Action B] b) two channels less than the required minimum number of operable instrument channels per trip function, place at least one inoperable instrument channel in the tripped condition within one hour. See Specification 3.3.B.5.

   Action C: (R1)

   If the number of operable instrument channels is less than the required minimum number of operable instrument channels per trip function, place the inoperable instrument channel in the tripped condition within 12 hours.

add ACTION E for Reactor Mode Switch (M2)

Specification 3.3.2.1

Table ~~3.2-3 (Cont'd)~~ 3.3.2.1-1

A1

CONTROL ROD BLOCK INSTRUMENTATION ~~REQUIREMENTS~~

~~NOTES FOR TABLE 3.2-3 (Cont'd)~~

[Surveillance Note 2]

3. When a channel is placed in an inoperable status solely for performance of required surveillances, entry into associated Limiting Conditions for Operation and required actions may be delayed for up to 6 hours provided the associated Trip Function maintains CRB initiation capability.

4. ~~IRM downscale is bypassed when it is on its lowest range.~~

5. ~~This function is bypassed when the count rate is ≥ 100 cps.~~

6. ~~This SRM Function is bypassed when the IRM range switches are on range 8 or above.~~ (R1)

[Note (a) Table 3.3.2.1-1]

7. RBM is required when reactor power is greater than or equal to 30%. add: and no peripheral control rod selected (L7)

8. ~~This function is bypassed when the Mode Switch is placed in Run.~~ (R1)

[Function 1.a AV]

9. ~~The APRM Flow Referenced Neutron Flux~~ (R1) and Rod Block Monitor trip level ~~setpoint~~ Allowable Value shall be less than or equal to the limit specified in the Core Operating Limits Report.

10. ~~When the reactor is subcritical and the reactor water temperature is less than 212°F, the control rod block is required to be operable only if any control rod in a control cell containing fuel is not fully inserted.~~ (R1)

NPP 3.3.2.1-1

Specification 3.3.2.1

TABLE ~~4.2-3~~

CONTROL ROD BLOCK INSTRUMENTATION
~~TEST AND CALIBRATION REQUIREMENTS~~

A1

	Instrument Channel	Instrument Functional Test (~~Note 5~~) A4	Calibration	Instrument Check (Note 4)
1)	APRM - Downscale	Q	Q	D
2)	APRM - Upscale	Q	Q	D
3)	IRM - Upscale	S/U (Note 2)	Q (Notes 3 & 6)	D
4)	IRM - Downscale	S/U (Note 2)	Q (Notes 3 & 6)	D
5)	IRM - Detector Not in Startup Position	S/U (Note 2)	NA	NA
[1.a] 6)	RBM - Upscale	~~Q~~ A4	SR 3.3.2.1.5 Q	~~D~~ L2
[1.c] 7)	RBM - Downscale	~~Q~~	SR 3.3.2.1.5 Q	~~D~~
8)	SRM - Upscale	S/U (Note 2)	Q (Notes 3 & 6)	D
9)	SRM - Detector Not in Startup Position	S/U (Note 2)	NA	NA
10)	Scram Discharge Instrument Volume - High Water Level (Group B Instruments)	Q	Q	D

R1 (rows 1-5) L5
add Note to SR 3.3.2.1.5
M4 add SR 3.3.2.1.4 for Upscale
R1 (rows 8-10)

~~NOTE: See notes following Table 4.2-5.~~

M1 add SR 3.3.2.1.1 for Function 1.b

A2 add Function 2 "Rod Worth Minitor surveillances"

Amendment No. ~~3, 80, 93, 227,~~ 233

M2 add SR 3.3.2.1.7 for RMS- Shutdown Position

Specification 3.3.2.1 (A1)

NOTES FOR TABLES 4.2-1 THROUGH 4.2-5

1. Initially once every month until acceptance failure rate data are available; thereafter, a request may be made to the NRC to change the test frequency. The compilation of instrument failure rate data may include data obtained from other boiling water reactors for which the same design instruments operate in a environment similar to that of JAFNPP. (See ITS 3.4.5)

2. Functional tests are not required when these instruments are not required to be operable or are tripped. Functional tests shall be performed within seven (7) days prior to each startup. (R1)

3. Calibrations are not required when these instruments are not required to be operable or are tripped. Calibration tests shall be performed within seven (7) days prior to each startup or prior to a pre-planned shutdown.

4. Instrument checks are not required when these instruments are not required to be operable or are tripped. (A5)

5. This instrumentation is exempt from the functional test definition. The functional test will consist of injecting a simulated electrical signal into the measurement channel. (A4)

6. These instrument channels will be calibrated using simulated electrical signals once every three months. (R1)

7. Simulated automatic actuation shall be performed once per 24 months. (See ITS: 3.5.1, 3.6.1.3, 3.6.4.2, 3.6.4.3)

8. Reactor low water level, and high drywell pressure are not included on Table 4.2-1 since they are listed on Table 4.1-2. (See ITS 3.3.6.1)

9. The logic system functional tests shall include a calibration of time delay relays and timers necessary for proper functioning of the trip systems. (See ITS: 3.3.5.1, 3.3.6.1, 3.3.6.2)

10. (Deleted)

11. Perform a calibration once per 24 months using a radiation source. Perform an instrument channel alignment once every 3 months using a current source. (See ITS 3.3.6.1, 3.3.7.2)

12. (Deleted)

13. (Deleted)

14. (Deleted)

15. Sensor calibration once per 24 months. Master/slave trip unit calibration once per 6 months. (See ITS: 3.3.5.1, 3.3.5.2, 3.3.6.1)

16. The quarterly calibration of the temperature sensor consists of comparing the active temperature signal with a redundant temperature signal. (See ITS 3.3.6.1)

Amendment No. ~~34, 48, 57, 89, 181, 207, 227~~, 233

[Applicability]

A1

3.3.B (cont'd)

[LCO 3.3.2.1] [Table 3.3.2.1-1 Function 2]

3. Whenever the reactor is below 10% rated thermal power, the Rod Worth Minimizer (RWM) shall be operable except as follows:

[RA C.2.1.1] [RA C.2.2] [ACTION D]

a. Should the RWM become inoperable during a reactor startup after the first twelve control rods have been withdrawn, or during a reactor shutdown, control rod movement may continue provided that a second licensed reactor operator, licensed senior operator, or reactor engineer independently verifies that the control rods are being positioned in accordance with the RWM program sequence.

[Required Action C.2.1.2] [RA C.2.2]

b. Should the RWM be inoperable before a startup is begun, or become inoperable during the withdrawal of the first twelve control rods, the startup may continue provided that a reactor engineer independently verifies that the control rods are being positioned in accordance with the RWM program sequence. After twelve control rods have been fully withdrawn, startup may continue in accordance with Specification 3.3.B.3.a above.

4.3.B (cont'd)

L4

3. The capability of the Rod Worth Minimizer to properly fulfill its function shall be demonstrated by the following checks:

L4

a. During startup, prior to the start of control rod withdrawal:

[SR 3.3.2.1.8]

(1) The correctness of the RWM program sequence shall be verified.

LA2

(2) The RWM computer on line diagnostic test shall be successfully performed.

(3) Proper annunciation of the selection error of at least one out-of-sequence control rod in each fully inserted group shall be demonstrated.

L3 — add SR 3.3.2.1.2 Note

[SR 3.3.2.1.2] LA3

(4) The rod block function of the RWM shall be demonstrated by withdrawing an out-of-sequence control rod no more than to the block point, then reinserting the subject rod. ← every 92 days (L3)

L4

b. During shutdown, prior to attaining 10% rated power during rod insertion, except by scram:

L4 [SR 3.3.2.1.8]

(1) The correctness of the RWM program sequence shall be verified.

LA2

(2) The RWM computer on line diagnostic test shall be successfully performed.

M5 — add SR 3.3.2.1.3

M6 — add proposed SR 3.3.2.1.6

Specification 3.3.2.1

(A1)

RAI 3.3.2.1-4

3.3.B.3 (cont'd)

4.3.B (cont'd)

[C.2.2] c. When required by Specifications 3.3.B.3.a or b, the second licensed reactor operator, licensed senior operator, or the reactor engineer must be present at the reactor console during rod movements to verify compliance with the prescribed rod pattern. This individual shall have no other concurrent duties during the rod withdrawal or insertion. (LA6)

[Required Action C.2.1.2] d. Plant startup under Specification 3.3.B.3.b is only permitted once per calendar year. Any startup conducted without the RWM as described in Specification 3.3.B.3.b shall be reported to the NRC within 30 days of the startup. This special report shall state the reason for the RWM inoperability, the action taken to restore it, and the schedule for returning the RWM to an operable status. (L8)

e. Control rod patterns shall be equivalent to those prescribed by the Banked Position Withdrawal Sequence (BPWS) such that the drop of any in-sequence control rod would not result in a peak fuel enthalpy greater than 280 calories/gm. (See ITS: 3.1.6)

[Required Action C.1] f. If Specifications 3.3.B.3.a through e cannot be met, the reactor shall not be restarted, or if the reactor is in the run or startup modes at less than 10% rated thermal power, no rod movement is permitted except by scram.

Specification 3.3.2.1

A1

3.3.B (cont'd)

4. Control rods shall not be withdrawn for startup or during refueling unless at least two source range channels have an observed count rate equal to or greater than three counts per second except as permitted by Specifications 3.10.B.3 and 3.10.B.4.

5. During operation with limiting control rod patterns, as determined by the reactor engineer, either:

[LCO 3.3.2.1 Table 3.3.2.1-1 Function 1.a]

a. Both RBM channels shall be operable, or

b. Control rod withdrawal shall be blocked, or

c. The operating power level shall be limited so the MCPR will remain above the Safety Limit assuming a single error that results in complete withdrawal of any single operable control rod.

L1

add ACTION A and B

L1

4.3.B (cont'd)

4. Prior to control rod withdrawal for startup or during refueling, verify that at least two source range channels have an observed count rate of at least three counts per second except as permitted by Specifications 3.10.B.3 and 3.10.B.4.

See: ITS 3.3.1.2

5. When a limiting control rod pattern exists, an instrument functional test of the RBM shall be performed prior to withdrawal of the designated rod(s).

L6

JAFNPP

IMPROVED STANDARD TECHNICAL SPECIFICATIONS (ISTS) CONVERSION

ITS: 3.3.2.1

Control Rod Block Instrumentation

DISCUSSION OF CHANGES (DOCs) TO THE CTS

ADMINISTRATIVE CHANGES

A1 In the conversion of the James A. FitzPatrick Nuclear Power Plant (JAFNPP) Current Technical Specifications (CTS) to the proposed plant specific Improved Technical Specifications (ITS) certain wording preferences or conventions are adopted that do not result in technical changes. Editorial changes, reformatting, and revised numbering are adopted to make the ITS consistent with the conventions in NUREG-1433, "Standard Technical Specifications, General Electric Plants, BWR/4", Revision 1 (i.e., Improved Standard Technical Specifications (ISTS)).

A2 The requirements of the Rod Worth Minimizer (RWM) have been added to CTS Tables 3.2-3 and 4.2-3 (ITS Table 3.3.2.1-1 Function 2). This addition is considered administrative since the requirement concerning RWM OPERABILITY are contained in CTS 3.3.B.3. This change is consistent with NUREG-1433, Revision 1.

A3 Not Used.

A4 CTS Table 4.2-3 requires both an instrument functional test and calibration to be performed on a quarterly basis for both the RBM-Upscale (CTS Table 4.2-3 Function 6) and RBM-Downscale (Function 7) Functions. In the ITS, SR 3.3.2.1.5 requires the performance of a CHANNEL CALIBRATION. It is not necessary to specify a CHANNEL FUNCTIONAL TEST since the ITS definition of CHANNEL CALIBRATION includes all the requirements of a CHANNEL FUNCTIONAL TEST. Therefore, the explicit instrument functional test is not included in the ITS. This change is considered administrative since the CHANNEL CALIBRATION is performed on a quarterly basis and fulfills all the requirements of a CHANNEL FUNCTIONAL TEST. Along with this change, Table 4.2-1 through 4.2-5 Note 5 which is associated with the channel function test (This instrument is exempt...) is deleted from the CTS since the CHANNEL FUNCTIONAL TEST is not required to be performed. The details of this Note are included in the ITS definition of CHANNEL FUNCTIONAL, therefore its removal is also considered administrative.

A5 CTS Table 4.2-1 through 4.2.5 Note 4 states that instrument checks are not required when these instruments are not required to be operable or are tripped. This explicit requirement is not retained in ITS 3.3.2.1. This explicit Note is not needed in ITS 3.3.2.1 since these allowances are included in ITS SR 3.0.1. SR 3.0.1 states that SRs shall be met during the MODES or other specified conditions in the Applicability for individual LCOs, unless otherwise stated in the SR. In addition, the Note states that Surveillances do not have to be performed on inoperable equipment or variables outside specified limits. When equipment is declared inoperable, the Actions of this LCO require the equipment to be placed in the trip condition. In this condition, the equipment is still

ADMINISTRATIVE CHANGES

A5 (continued)

inoperable but has accomplished the required safety function. Therefore the allowances in SR 3.0.1 and the associated actions provide adequate guidance with respect to when the associated surveillances are required to be performed and this explicit requirement is not retained.

A6 CTS 3.2.D and 4.2.D provide a cross reference to the Radiological Effluent Technical Specification (Appendix B) for those Radiation Monitoring Systems which provide an Isolation and Initiation Function. Since CTS 3.2.D and 4.2.D do not prescribe any specific requirements and since the changes to the current requirements in Appendix B are discussed in the Discussion of Changes within this submittal, this cross reference has been deleted. This change is considered administrative since it simply eliminates a cross-reference. This change is consistent with NUREG-1433, Revision 1.

TECHNICAL CHANGES - MORE RESTRICTIVE

M1 An additional Function has been added to CTS Table 3.2-3 for the Rod Block Monitor. ITS Table 3.3.2.1-1 Function 1.b (Rod Block Monitor-Inop) will require the "Inop" function to be Operable consistent with the Applicability with the other Rod Block Monitor Functions. This change is more restrictive but necessary to ensure a rod block is provided if the minimum number of LPRMs inputs are not available to the associated Rod Block Monitor channel. A channel functional test (i.e., SR 3.3.2.1.1) is also proposed for the Rod Block Monitor Inop function. The performance of this SR for each RBM channel will ensure that the entire channel will perform its intended function when it is required to be Operable. The proposed surveillance frequency of 92 days for SR 3.3.2.1.1 is based on the reliability analysis provided in NEDC-30851-P-A (see revised DOC L3 for the bases for concluding that this topical report is acceptable for use at the JAFNPP). Accordingly, the addition of the Rod Block Monitor - Inop function, its associated channel functional test SR and the 92 day surveillance interval will help to ensure that the local flux is adequately monitored during control rod withdrawal by promptly identifying to the operator the inoperability of the Rod Block Monitor as a consequence of certain component failures. RAI 3.3.2.1-6

TECHNICAL CHANGES - MORE RESTRICTIVE

M2 An additional Function has been added to CTS Table 3.2-3. ITS 3.3.2.1, Control Rod Block Instrumentation, will include the Control Rod Block Function of the Reactor Mode Switch as a required function (Function 3 on proposed Table 3.3.2.1-1). The new requirement is that 2 channels of the Rod Block function of Reactor Mode Switch – Shutdown Position must be Operable whenever the Mode Switch is in the Shutdown position. This addition to the Specification for the Control Rod Block Instrumentation will include proposed SR 3.3.2.1.7 (CHANNEL FUNCTIONAL TEST every 24 months) and proposed LCO 3.3.2.1, Condition E (Required Actions and Completion Times if this function is inoperable). ITS SR 3.3.2.1.7 will not be required to be performed until 1 hour after the Reactor Mode Switch is placed in Shutdown. This rod block ensures that control rods are not withdrawn in MODES 3 and 4, since control rods are assumed to be inserted. This change is consistent with NUREG-1433, Revision 1.

M3 The out of service time in CTS Table 3.2-3 Note 2 Action B.a) has been reduced from 7 days to 24 hours (ITS 3.3.2.1 Required Action A.1) when one RBM channel is inoperable. The 24 hour Completion Time is acceptable, based on a low probability of an event occurring coincident with a failure in the remaining channel. This change is more restrictive since less time is permitted but consistent with NUREG-1433, Revision 1.

M4 SR 3.3.2.1.4 has been added to CTS Table 4.2.3 to verify that the RBM is not bypassed at Thermal Power > 30% RTP and when a peripheral control rod is not selected every 92 days. This change is more restrictive since a periodic surveillance has been included. This will ensure the RBM is Operable when required to limit the consequences of a single control rod withdrawal error event during power operation.

M5 A new CHANNEL FUNCTIONAL TEST (ITS SR 3.3.2.1.3) surveillance is proposed to be added similar to CTS 4.3.B.3.a.4 in MODE 1 when Thermal Power is ≤ 10% to ensure the RWM is Operable with the reactor mode switch in RUN. The test is required every 92 days and is consistent with NEDC-30851-P-A, "Technical Specification Improvement Analysis for BWR Control Rod Block Instrumentation," October 1988.

M6 A new SR is proposed to be added to the surveillances of CTS 4.3.B.3. SR 3.3.2.1.6 will verify every 24 months that the Rod Worth Minimizer (RWM) is not bypassed when Thermal Power is ≤ 10%. The RWM may be bypassed when power is above 10%. However, the existing specifications (CTS 4.3.B.3) do not have an explicit requirement to verify the setpoint of the RWM bypass feature. This change represents an additional restriction on plant operations necessary to ensure the RWM Function is Operable when required.

TECHNICAL CHANGES - LESS RESTRICTIVE (GENERIC)

LA1 The specific details in the "Total Number of Instrument Channels Provided By Design" column of CTS Table 3.2-3 are proposed to be relocated to the Bases. Placing these details in the Bases provides assurance they will be maintained. The requirements of ITS 3.3.2.1 which require the Control Rod Block Instrumentation to be OPERABLE, the definition of OPERABILITY, and the proposed Required Action and surveillances suffice. As such, these details are not required to be in the ITS to provide adequate protection of public health and safety. Changes to the Bases will be controlled by the provisions of the Bases Control Program described in Chapter 5 of the ITS.

LA2 The requirements of CTS 4.3.B.3.a.2, 3 and CTS 4.3.B.3.b.2 are proposed to be relocated to the Technical Requirements Manual. The RWM computer on line diagnostic test in CTS 4.3.B.3.a.2 and CTS 4.3.B.3.b.2 and the proper annunciation of the selection error in CTS 4.3.B.3.a.3 are not required to ensure the rod block function is properly working. ITS SRs 3.3.2.1.2 and 3.3.2.1.3 demonstrate the proper operation of the rod block function. Therefore, these tests do not need to be included in the ITS to ensure RWM remains Operable. The requirements of the LCO and the associated RWM surveillances and the definition of OPERABILITY suffice. As such, these details are not required to be in the ITS to provide adequate protection of public health and safety. Changes to the relocated requirements in the TRM will be controlled by the provisions of 10 CFR 50.59.

LA3 The details in CTS 4.3.B.3.a.4 related to the performance of the Rod Worth Minimizer (RWM) Channel Functional Test is proposed to be relocated to the Bases. These testing details do not need to be included in the Specifications to ensure the RWM remains Operable. The requirements of ITS 3.3.2.1 which require the RWM to be Operable and the definition of OPERABILITY suffices. Changes to the Bases will be controlled by the provisions of the Bases Control Program described in Chapter 5 of the ITS.

LA4 Not Used.

LA5 The detail in CTS Table 3.2-3 that the Rod Block Monitor is Flow-Biased is proposed to be relocated to the Bases. The requirement in ITS LCO 3.3.2.1 that the control rod block instrumentation for each Function in Table 3.3.2.1-1 shall be OPERABLE and the specific requirement in ITS Table 3.3.2.1-1 (Function 1.a) for the Rod Block Monitor-Upscale

TECHNICAL CHANGES - LESS RESTRICTIVE (GENERIC)

LA5 (continued)

Function is sufficient to ensure the instrumentation remains OPERABLE. The Bases describes the design of the instrumentation channel. As such, these details are not required to be in the ITS to provide adequate protection of public health and safety. Changes to the Bases will be controlled by the provisions of the Bases Control Program described in Chapter 5 of the ITS.

LA6 The requirement in CTS 3.3.B.3.c that the individuals shall have no other concurrent duties during rod withdrawal or insertion (when the rod worth minimizer is inoperable and a control rod is being moved) is proposed to be relocated to the Bases. If the rod worth minimizer is inoperable during a reactor startup, ITS 3.3.2.1 Required Action C.2.2 requires the verification of movement of control rods is in compliance with bank position withdrawal sequence (BPWS) by a second licensed operator or by a reactor engineer during control rod movement. The Bases states that these individuals shall have no other concurrent duties. As such, these details are not required to be in the ITS to provide adequate protection of public health and safety. Changes to the Bases will be controlled by the provisions of the Bases Control Program described in Chapter 5 of the ITS.

TECHNICAL CHANGES - LESS RESTRICTIVE (SPECIFIC)

L1 The requirements in Table 3.2-3 (Note 2, Action B), and CTS 3.3.B.5 concerning operations on a limiting control rod pattern have been deleted. Since a limiting control rod pattern is defined as operating on a power distribution limit (such as APLHGR or MCPR), the condition is extremely unlikely. The status of power distribution limits does not affect the OPERABILITY of the RBM and therefore, no additional requirements on the RBM System are required (e.g., that it be tripped immediately with a channel inoperable while on a limiting control rod pattern). Adequate requirements on power distribution limits are specified in the LCOs in ITS Section 3.2. Furthermore, due to the improbability of operating on or above a limiting control rod pattern, the ACTIONS would almost never be required. Therefore, the current Actions in Table 3.2-3 Action B as modified by M3 are acceptable for all inoperabilities of the RBM and are included as ITS 3.3.2.1 ACTIONS and B.

TECHNICAL CHANGES - LESS RESTRICTIVE (SPECIFIC)

L2 CTS 4.2.C (Table 4.2-3) requires an Instrument Check (Channel Check) of the RBM Upscale and Downscale once per day. ITS 3.3.2.1 does not require a Channel Check of these Functions. The RBM automatically re-nulls itself whenever a control rod is selected and retains the latest setting until another control rod is selected, making the performance of a Channel Check during static conditions (i.e., a daily channel check) of no safety benefit. Specifically, at the time a control rod is selected for movement, the RBM automaticallly readjusts its input and output readings (different LPRM inputs associated with the rod selected and re-normalization), i.e., "renulling." At this time, the operator is in direct observation and monitoring of the control rod movement and RBM response; in essence, performing a continuous instrument check during the time the RBM is performing its safety function (i.e., during control rod withdrawal). Therefore, a routine daily check of the RBMs during static conditions, prior to the renulling that occurs when a control rod is selected for movement, adds no assurance of safety. Accordingly, the elimination of a formal Channel Check for this instrument is acceptable.

L3 CTS 4.3.B.3.a.4 requires a demonstration of the rod block function during startup, prior to the start of control rod withdrawal. ITS 3.3.2.1 will require a CHANNEL FUNCTIONAL TEST of the RWM every 92 days in MODE 2 (SR 3.3.2.1.2). ITS SR 3.3.2.1.2 will be modified by a Note stating that the CHANNEL FUNCTIONAL TEST is not required during a startup until 1 hour after any control rod is withdrawn at ≤ 10% RTP in MODE 2. The addition of this Note and the change in Frequency to 92 days makes the proposed requirement for a CHANNEL FUNCTIONAL TEST less restrictive because the Surveillance Test is not required until 1 hour after the RWM is required to be Operable, and the test is not required to be performed at startup if performed in the previous 92 days. In addition, a CHANNEL FUNCTIONAL TEST will be required in MODE 1 in accordance with SR 3.3.2.1.3, but not until 1 hour after Thermal Power is ≤ 10% RTP (see M5). The Rod Worth Minimizer does not monitor core thermal conditions but simply enforces preprogrammed rod patterns as a backup intended to prevent reactor operator error in selecting or positioning control rods. The RWM is a reliable system, as shown by both a review of maintenance history and by successful completion of previous startup surveillances. As a result, the effect on safety due to the extended Surveillance is small. Also, the increased testing prior to each startup increases the wear on the instruments, thereby reducing overall reliability. Therefore, an additional Surveillance other than the quarterly Surveillance is not needed to assure the instruments will perform their associated safety function. In addition, other similar rod block functions have a 92 day CHANNEL FUNCTIONAL TEST.

TECHNICAL CHANGES - LESS RESTRICTIVE (SPECIFIC)

L3 (continued)

The Note changes are acceptable since the only way the required Surveillances can be performed prior to entry in the specified condition is by utilizing jumpers or lifted leads. Use of these devices is not recommended since minor errors in their use may significantly increase the probability of a reactor ransient or event which is a precursor to a previously analyzed accident. Therefore, time is allowed to conduct the Surveillances after entering the specified condition.

RAI 3.3.2.1-3

L4 The Frequency in CTS 4.3.B.3.a and CTS 4.3.B.3.b to verify the correctness of the RWM program sequence during startup, prior to the start of control rod withdrawal and during shutdown prior to attaining 10% rated power during rod insertion has been changed to require the verification only prior to declaring RWM OPERABLE following loading of the Sequence into RWM. This change is acceptable since this is when rod sequence input errors are possible. This change is consistent with NUREG-1433, Revision 1.

L5 The proposed change adds a Note to the quarterly CHANNEL CALIBRATION Surveillance Requirement in CTS Table 4.2-3 for the RBM Upscale and Downscale Functions (SR 3.3.2.1.5) excluding the neutron detectors from the Surveillance. The CHANNEL CALIBRATION is a complete check of the instrument loop and the sensor. The test verifies that the channel responds to the measured parameter within the necessary range and accuracy. The neutron detectors are excluded from the CHANNEL CALIBRATIONS because they are passive devices with minimal drift, and because of the difficulty of simulating a meaningful signal. Changes in neutron detector sensitivity are compensated for by performance of the 7 day calorimetric calibration (SR 3.3.1.1.2) and the 1000 MWD/T LPRM calibration against the TIPs (SR 3.3.1.1.7). The change is consistent with NUREG-1433, Revision 1.

L6 CTS 4.3.B.5 requires the performance of a functional test on a RBM when a limiting control rod pattern exists prior to the withdrawal of the designated rod(s). This testing requirement is proposed to be deleted from the current Technical Specifications. Operation with a limiting control rod pattern is analogous to operating on a power distribution limit, such as APLHGR or MCPR. There is no correlation between power distribution limits and its affect on the operability of the RBM. Therefore, initiation of surveillance testing of the RBM based on the status of power distribution limits does not increase the likelihood of

TECHNICAL CHANGES - LESS RESTRICTIVE (SPECIFIC)

L6 (continued)

identifying an inoperable RBM. In fact, since operating on a limiting control rod pattern is extremely unlikely, this surveillance requirement would most likely never be performed. Furthermore, an analysis of the operating experience associated with the performance of RBM instrument functional testing and calibration testing (CTS Table 4.2-3) demonstrates that these surveillance tests, which are performed at a 92 day interval, are indicative of a very high degree of reliability for a RBM instrument channel. These testing requirements and their associated test intervals (i.e., functional/calibration testing at 92 day intervals) are maintained in the ITS by SR 3.3.2.1.5. As discussed in the DOC A4, calibration testing includes all the requirements of a channel functional test. Accordingly, based on the above evaluation, the Licensee has concluded that the deletion of this CTS testing requirement would have an insignificant affect on nuclear safety. This change is consistent with NUREG-1433, Revision 1.

L7 CTS Table 3.2-3 requires the RBM to be Operable when reactor power is greater than or equal to 30%. In the ITS, this requirement is maintained in Table 3.3.2.1-1 Footnote (a) except when a peripheral control rod is selected. This change is acceptable since with a peripheral rod selected the consequences of a control rod withdrawal error event will not exceed the MCPR SL. In addition, this change is consistent with the design of the RBM circuitry. That is when a peripheral control rod is selected the RBM is automatically bypassed and the output set to zero.

L8 The requirement in CTS 3.3.B.3.d to prepare and submit a report to the NRC within 30 days of a plant startup without the RWM Operable is proposed to be deleted from the Technical Specifications. This special report states the reason for the RWM inoperability, the action taken to restore it, and the schedule for returning the RWM to an operable status. This special report provides a mechanism to review the appropriateness of licensee activities after-the-fact, but provides no regulatory authority once the report is submitted (i.e., no requirement for NRC approval). The Quality Assurance requirements of 10 CFR 50, Appendix B, provide assurance that appropriate corrective actions will be taken. Given that the report was required to be provided to the Commission within 30 days following the startup, report completion and submittal was clearly not necessary to assure operation of the facility in a safe manner for the interval between startup of the unit and submittal of the report. Accordingly, based on the above evaluation, RAI 3.3.2.1-4

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L8 (continued)

the RWM Special Report is not required to be in the current Technical Specifications nor the ITS. This change is consistent with NUREG-1433.

TECHNICAL CHANGES - RELOCATIONS

R1 CTS 2.1.A.1.d, Tables 3.2-3 and 4.2-3 and the Notes to these Tables include the Safety Limits, LCOs and SRs for Rod Block functions associated with the APRMs, IRMs, SRMs, and Scram Discharge Volume Level. These requirements are being relocated to the Technical Requirements Manual (TRM). Of these functions, only the RBM-Upscale function is being retained in Technical Specifications. The APRM, IRM, SRM, and Scram Discharge Volume (SDV) rod blocks are intended to prevent control rod withdrawal when plant conditions make such withdrawal imprudent. However, there are no safety analyses that depend upon these rod blocks to prevent, mitigate or establish initial conditions for design basis accidents or transients. The evaluation summarized in NEDO-31466 determined that the loss of the APRM, IRM, SRM, and Scram Discharge Volume rod blocks would be a non-significant risk contributor to core damage frequency and offsite releases. The results of this evaluation have been determined to be applicable to JAFNPP. Therefore, this instrumentation does not satisfy 10 CFR 50.36(c)(2)(ii) for inclusion in the Technical Specifications as documented in the Application of Selection Criteria to the JAFNPP Technical Specifications. The TRM will be incorporated by reference into the UFSAR at ITS implementation. Changes to the TRM will be controlled by the provisions of 10 CFR 50.59.