ATTACHMENT A

NIAGARA MOHAWK POWER CORPORATION

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Proposed Changes to Technical Specifications

Replace existing pages ix, 2-3, B2-7, 3/4 3-1, 3/4 3-1a, 3/4 3-2, 3/4 3-4, 3/4 3-5, 3/4 3-7, 3/4 3-9, 3/4 4-1, 3/4 4-2, 3/4 4-3, 3/4 4-4, 3/4 4-5, B3/4 3-1, B3/4 4-1, B3/4 4-2, 6-22 and 6-23 with the attached revised pages. Page 3/4 3-9a, B3/4 3-1a and B3/4 3-1b have been added. These pages have been retyped in their entirety with marginal markings to indicate changes to the text.

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TABLE 2.2.1-1

REACTOR PROTECTION SYSTEM INSTRUMENTATION SETPOINTS

FUNCTIONAL UNIT	TRIP SETPOINT	ALLOWABLE VALUE
1. Intermediate Range Monitor, - Neutron Flux - High	≤120/125 divisions of full scale	≤122/125 divisions of full scale
2. Average Power Range Monitor:		
a. Neutron Flux - Upscale, Setdown	≤15% of RATED THERMAL POWER	≤20% of RATED THERMAL POWER
b. Flow-Biased Simulated Thermal Power - Upscale		
1) Flow-Biased 2) High-Flow-Clamped	≤0.58 (W-ΔW)[(a)] + 59%, with a maximum of ≤113.5% of RATED THERMAL POWER	≤0.58 (W-ΔW)[(a)] + 62%, with a maximum of ≤115.5% of RATED THERMAL POWER
c. Fixed Neutron Flux - Upscale	≤118% of RATED THERMAL POWER	≤120% of RATED THERMAL POWER
d. Inoperative	NA	NA
e. 2-Out-Of-4 Voter	NA	NA
f. OPRM Upscale	See COLR	See COLR
3. Reactor Vessel Steam Dome Pressure - High	≤1052 psig	≤1072 psig
4. Reactor Vessel Water Level - Low, Level 3	≥159.3 in. above instrument zero*	≥157.8 in. above instrument zero
5. Main Steam Line Isolation Valve - Closure	≤8% closed	≤12% closed
6. Main Steam Line Radiation [(b)] - High	≤3.0 x full-power background	≤3.6 x full-power background
7. Drywell Pressure - High	≤1.68 psig	≤1.88 psig

* See Bases Figure B3/4 3-1.

(a) The Average Power Range Monitor Scram Function varies as a function of recirculation loop drive flow (W). ΔW is defined as the difference in indicated drive flow (in percent of drive flow which produces rated core flow) between two loop and single loop operation at the same core flow. ΔW=0 for two loop operation. ΔW=5% for single loop operation.

(b) See footnote (**) to Table 3.3.2-2 for trip setpoint during hydrogen addition test.

REACTOR PROTECTION SYSTEM INSTRUMENTATION SETPOINTS

2.2.1 (Continued)

by a significant amount, the rate of power rise is very slow. Generally, the heat flux is in near equilibrium with the fission rate. In an assumed uniform rod withdrawal approach to the trip level, the rate of power rise is not more than 5% of RATED THERMAL POWER per minute and the APRM system would be more than adequate to assure shutdown before the power could exceed the Safety Limit. The 15% neutron flux trip remains active until the mode switch is placed in the Run position.

The APRM trip system is calibrated using heat balance data taken during steady-state conditions. Fission chambers provide the basic input to the system and, therefore, the monitors respond directly and quickly to changes that result from transient operation for the case of the Fixed Neutron Flux - Upscale setpoint; i.e., for a power increase, the THERMAL POWER of the fuel will be less than that indicated by the neutron flux because of the time constants of the heat transfer associated with the fuel. For the Flow-Biased Simulated Thermal Power - Upscale setpoint, a time constant of 6 ± 0.6 seconds is introduced into the flow-biased APRM in order to simulate the fuel thermal transient characteristics. A more conservative maximum value is used for the flow-biased setpoint as shown in Table 2.2.1-1.

The APRM setpoints were selected to provide adequate margin for the Safety Limits and yet allow operating margin that reduces the possibility of unnecessary shutdown. The flow referenced Trip Setpoint must be adjusted by the specified formula in Specification 3.2.2 in order to maintain these margins when CMFLPD is greater than or equal to FRTP.

The APRM channels also include an Oscillation Power Range Monitor (OPRM) Upscale Function. The OPRM Upscale Function provides compliance with GDC 10 and GDC 12, thereby providing protection from exceeding the fuel MCPR safety limit (SL) due to anticipated thermal-hydraulic power oscillations. The OPRM Upscale trip setpoint and allowable value are maintained in the Core Operating Limits Report.

3. Reactor Vessel Steam Dome Pressure - High

High pressure in the nuclear system could cause a rupture to the nuclear system process barrier resulting in the release of fission products. A pressure increase during operation will also tend to increase the power of the reactor by compressing voids, thus adding reactivity. The trip will quickly reduce the neutron flux, counteracting the pressure increase. The trip setting is slightly higher than the operating pressure to permit normal operation without spurious trips. The setting provides for a wide margin to the maximum allowable design pressure and takes into account the location of the pressure measurement compared with the highest pressure that occurs in the system during a transient. This Trip Setpoint is effective at low power/flow conditions when the turbine control valve fast closure and turbine stop valve closure trips are bypassed. For load rejection or a turbine trip under these conditions, the transient analysis indicated an adequate margin to the thermal hydraulic limit.

4. Reactor Vessel Water Level - Low

The reactor vessel water level Trip Setpoint was chosen far enough below the normal operating level to avoid spurious trips but high enough above the fuel to assure that there is adequate protection for the fuel and pressure limits.

3/4.3.1 REACTOR PROTECTION SYSTEM INSTRUMENTATION

LIMITING CONDITIONS FOR OPERATION

3.3.1 As a minimum, the reactor protection system instrumentation channels shown in Table 3.3.1-1 shall be OPERABLE.

APPLICABILITY: As shown in Table 3.3.1-1.

ACTION:

a. With one channel required by Table 3.3.1-1 inoperable in one or more Functional Units, place the inoperable channel and/or that trip system in the tripped condition* within 12 hours. The provisions of Specification 3.0.4 are not applicable.

b. With two or more channels required by Table 3.3.1-1 inoperable in one or more Functional Units:

   1. Within one hour, verify sufficient channels remain OPERABLE or tripped* to maintain trip capability in the Functional Unit, and

   2. Within 6 hours, place the inoperable channel(s) in one trip system and/or that trip system** in the tripped condition*, and

   3. Within 12 hours, restore the inoperable channels in the other trip system to an OPERABLE status or tripped*.

   Otherwise, take the ACTION required by Table 3.3.1-1 for the Functional Unit.

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* An inoperable channel or trip system need not be placed in the tripped condition where this would cause the Trip Function to occur. In these cases, if the inoperable channel is not restored to OPERABLE status within the required time, the ACTION required by Table 3.3.1-1 for the Functional Unit shall be taken.

For Functional Units 2.a, 2.b, 2.c, 2.d, and 2.f, inoperable channels shall be placed in the tripped condition to comply with Action a. Because these Functional Units provide trip inputs to both trip systems, placing either trip system in trip is not applicable. For Functional Units 2.a, 2.b, 2.c, 2.d, and 2.f, Action b.3 applies without regard to "in the other trip systems."

** This ACTION applies to that trip system with the most inoperable channels; if both trip systems have the same number of inoperable channels, the ACTION can be applied to either trip system. Action b.2 is not applicable for Functional Units 2.a, 2.b, 2.c, 2.d, and 2.f.

SURVEILLANCE REQUIREMENTS

4.3.1.1 Each reactor protection system instrumentation channel shall be demonstrated OPERABLE by the performance of the CHANNEL CHECK, CHANNEL FUNCTIONAL TEST, and CHANNEL CALIBRATION operations for the OPERATIONAL CONDITIONS and at the frequencies shown in Table 4.3.1.1-1.

4.3.1.2 LOGIC SYSTEM FUNCTIONAL TESTS and simulated automatic operation of all channels shall be performed at least once per 18 months, except Table 4.3.1.1-1, Functions 2.a, 2.b, 2.c, 2.d, 2.e, and 2.f. Functions 2.a, 2.b, 2.c, 2.d, and 2.f do not require LOGIC SYSTEM FUNCTIONAL TESTS. For Function 2.e, tests shall be performed at least once per 24 months. LOGIC SYSTEM FUNCTIONAL TEST for Function 2.e includes simulating APRM and OPRM trip conditions at the APRM channel inputs to the voter channel to check all combinations of two tripped inputs to the 2-out-of-4 voter logic in the voter channels.

4.3.1.3 The REACTOR PROTECTION SYSTEM RESPONSE TIME of each required reactor trip functional unit shall be demonstrated to be within its limit at least once per 18 months. Neutron detectors, Functions 2.a, 2.b, 2.c, 2.d, and 2.f, and Function 2.e digital electronics are exempt from response time testing. Each test shall include at least one channel per Trip System so that all channels are tested at least once per N times 18 months, where N is the total number of redundant channels in a specific reactor Trip System.

TABLE 3.3.1-1

REACTOR PROTECTION SYSTEM INSTRUMENTATION

	FUNCTIONAL UNIT	APPLICABLE OPERATIONAL CONDITIONS	MINIMUM OPERABLE CHANNELS PER TRIP SYSTEM (a)	ACTION
1.	Intermediate Range Monitors:			
	a. Neutron Flux - High	2 3, 4 5(b)	3 3 3	1 2 3
	b. Inoperative	2 3, 4 5	3 3 3	1 2 3
2.	Average Power Range Monitor:			
	a. Neutron Flux - Upscale, Setdown	2 5(k)	3(l) 3(l)	1 3
	b. Flow Biased Simulated Thermal Power - Upscale	1	3(l)	4
	c. Fixed Neutron Flux - Upscale	1	3(l)	4
	d. Inoperative	1, 2 5(k)	3(l) 3(l)	1 3
	e. 2-Out-Of-4 Voter	1, 2 5(k)	2 2	1 3
	f. OPRM Upscale	1(m)	3(l)	10
3.	Reactor Vessel Steam Dome Pressure - High	1, 2(d)	2	1
4.	Reactor Vessel Water Level - Low, Level 3	1, 2	2	1

TABLE 3.3.1-1 (Continued)

REACTOR PROTECTION SYSTEM INSTRUMENTATION

TABLE NOTATIONS

(a) A channel may be placed in an inoperable status for up to 6 hours for required surveillance without placing the Trip System in the tripped condition provided at least one OPERABLE channel in the same Trip System is monitoring that parameter.

(b) Unless adequate shutdown margin has been demonstrated per Specification 3.1.1, and the Refuel position one-rod-out interlock is OPERABLE per Specification 3.9.1, the shorting links shall be removed from the RPS circuitry prior to and during the time any control rod is withdrawn.*

(c) Deleted.

(d) This function is not required to be OPERABLE when the reactor pressure vessel head is removed per Specification 3.10.1.

(e) This function shall be automatically bypassed when the reactor mode switch is not in the Run position.

(f) This function is not required to be OPERABLE when PRIMARY CONTAINMENT INTEGRITY is not required.

(g) Also actuates the standby gas treatment system.

(h) With any control rod withdrawn. Not applicable to control rods removed per Specification 3.9.10.1 or 3.9.10.2.

(i) This function shall be automatically bypassed when turbine first stage pressure is less than or equal to 136.4** psig, equivalent to THERMAL POWER less than 30% of RATED THERMAL POWER.

(j) Also actuates the EOC-RPT system.

(k) Required to be OPERABLE only during shutdown margin demonstrations performed per Specification 3.10.3.

(l) Since each APRM provides inputs to both trip systems, the minimum operable channels specified in Table 3.3.1-1 are the total APRM channels required (i.e., it is not on a trip system basis). The 6 hour allowed test time to complete a channel surveillance test (Note (a) above) is applicable provided at least two OPERABLE channels are monitoring that parameter.

(m) This function shall be automatically enabled when APRM Simulated Thermal Power is ≥30% and recirculation drive flow is <60% of rated recirculation drive flow.

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* Not required for control rods removed per Specification 3.9.10.1 or 3.9.10.2.

** To allow for instrument accuracy, calibration and drift, a setpoint of less than or equal to 125.8 psig turbine first stage pressure shall be used.

TABLE 3.3.1-1 (Continued)

REACTOR PROTECTION SYSTEM INSTRUMENTATION

ACTION

ACTION 1 - Be in at least HOT SHUTDOWN within 12 hours.

ACTION 2 - Verify all insertable control rods to be inserted in the core and lock the reactor mode switch in the Shutdown position within 1 hour.

ACTION 3 - Suspend all operations involving CORE ALTERATIONS and insert all insertable control rods within 1 hour.

ACTION 4 - Be in at least STARTUP within 6 hours.

ACTION 5 - Be in STARTUP with the main steam line isolation valves closed within 6 hours or in at least HOT SHUTDOWN within 12 hours.

ACTION 6 - Initiate a reduction in THERMAL POWER within 15 minutes and reduce turbine first stage pressure to less than or equal to 136.4* psig, equivalent to THERMAL POWER less than 30% of RATED THERMAL POWER, within 2 hours.

ACTION 7 - Verify all insertable control rods to be inserted within 1 hour.

ACTION 8 - Lock the reactor mode switch in the Shutdown position within 1 hour.

ACTION 9 - Suspend all operations involving CORE ALTERATIONS, and insert all insertable control rods and lock the reactor mode switch in the SHUTDOWN position within 1 hour.

ACTION 10 - Initiate alternate method to detect and suppress thermal-hydraulic instability oscillations within 12 hours AND restore required channels to OPERABLE status within 120 days.

OR

Be in at least HOT SHUTDOWN within 12 hours.

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* To allow for instrument accuracy, calibration, and drift, a setpoint of less than or equal to 125.8 psig turbine first-stage pressure shall be used.

TABLE 4.3.1.1-1

REACTOR PROTECTION SYSTEM INSTRUMENTATION SURVEILLANCE REQUIREMENTS

FUNCTIONAL UNIT	CHANNEL CHECK	CHANNEL FUNCTIONAL TEST	CHANNEL CALIBRATION(a)	OPERATIONAL CONDITIONS FOR WHICH SURVEILLANCE REQUIRED
1. Intermediate Range Monitors:				
a. Neutron Flux - High	S/U, S,(b) S	S/U(c), W, R(d) W	R R	2 3, 4, 5
b. Inoperative	NA	W	NA	2, 3, 4, 5
2. Average Power Range Monitor(e):				
a. Neutron Flux - Upscale, Setdown	D, (b) D	SA(i) SA	R R	2 5(n)
b. Flow-Biased Simulated Thermal Power - Upscale	D	SA(h)	W(g), R(f)	1
c. Fixed Neutron Flux - Upscale	D	SA	W(g), R	1
d. Inoperative	NA	SA	NA	1, 2, 5(n)
e. 2-Out-Of-4 Voter	D	SA	NA	1, 2, 5(n)
f. OPRM Upscale	D	SA(q)	R(p)	1(o)
3. Reactor Vessel Steam Dome Pressure - High	S	Q	R(k)	1, 2
4. Reactor Vessel Water Level - Low, Level 3	S	Q	R(k)	1, 2
5. Main Steam Line Isolation Valve - Closure	NA	Q	R	1
6. Main Steam Line Radiation - High	S	Q	R	1, 2(j)
7. Drywell Pressure - High	S	Q	R(k)	1, 2(l)

TABLE 4.3.1.1-1 (Continued)

REACTOR PROTECTION SYSTEM INSTRUMENTATION SURVEILLANCE REQUIREMENTS

TABLE NOTATIONS

(a) Neutron detectors may be excluded from CHANNEL CALIBRATION.

(b) The IRM and SRM channels shall be determined to overlap for at least 1/2 decade during each startup after entering OPERATIONAL CONDITION 2, and the IRM and APRM channels shall be determined to overlap for at least 1/2 decade during each controlled shutdown, if not performed within the previous 7 days.

(c) Within 24 hours before startup, if not performed within the previous 7 days.

(d) Perform a CHANNEL FUNCTIONAL TEST with the mode switch in Startup/Hot Standby and the plant in the COLD SHUTDOWN or REFUEL Condition.

(e) The LPRMs shall be calibrated at least once per 1000 effective full-power hours (EFPH) using the TIP system.

(f) Calibration includes the flow input function.

(g) This calibration shall consist of the adjustment of the APRM channel to conform to the power values calculated by a heat balance during OPERATIONAL CONDITION 1 when THERMAL POWER ≥25% of RATED THERMAL POWER. Adjust the APRM channel if the absolute difference is greater than 2% of RATED THERMAL POWER. Any APRM channel gain adjustment made in compliance with Specification 3.2.2 shall not be included in determining the absolute difference.

(h) CHANNEL FUNCTIONAL TEST shall include the flow input function, excluding the flow transmitter.

(i) Not required to be performed when entering Mode 2 from Mode 1 until 12 hours after entering Mode 2.

(j) This function is not required to be OPERABLE when the reactor pressure vessel head is removed per Specification 3.10.1.

(k) Perform the calibration procedure for the trip unit setpoint at least once per 92 days.

(l) This function is not required to be OPERABLE when PRIMARY CONTAINMENT INTEGRITY is not required to be OPERABLE per Special Test Exception 3.10.1.

(m) With any control rod withdrawn. Not applicable to control rods removed per Specification 3.9.10.1 or 3.9.10.2.

(n) Required to be OPERABLE only during shutdown margin demonstrations performed per Specification 3.10.3.

(o) This function shall be automatically enabled when APRM Simulated Thermal Power is ≥30% and recirculation drive flow is <60% of rated recirculation drive flow.

TABLE 4.3.1.1-1 (Continued)

REACTOR PROTECTION SYSTEM INSTRUMENTATION SURVEILLANCE REQUIREMENTS

TABLE NOTATIONS

(p) Calibration includes verification that the OPRM Upscale trip is not bypassed when APRM Simulated Thermal Power is ≥30% and recirculation drive flow is <60% of rated recirculation drive flow. No test signal will be injected for the purpose of testing the algorithm. Calibration of the OPRM will consist of verification of OPRM upscale setpoints in the APRM instrument by the review of the "Show Parameters" display.

(q) No test signal will be injected during performance of this test. Functional testing of the OPRM will consist of toggling the appropriate outputs of the APRM instrument only.

3/4.4 REACTOR COOLANT SYSTEM

3/4.4.1 RECIRCULATION SYSTEM

RECIRCULATION LOOPS

LIMITING CONDITIONS FOR OPERATION

3.4.1.1 Two reactor coolant system recirculation loops shall be in operation:

APPLICABILITY: OPERATIONAL CONDITIONS 1* AND 2*.

ACTION:

a. With one reactor coolant system recirculation loop not in operation:

   1. Within four hours:

      a) Place the recirculation flow control system in the Loop Manual (Position Control) mode, and

      b) Reduce THERMAL POWER to ≤70% of RATED THERMAL POWER, and,

      c) Increase the MINIMUM CRITICAL POWER RATIO (MCPR)*** Safety Limit by 0.01 to 1.10 per Specification 2.1.2, and,

      d) Reduce the Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) limit per Specification 3.2.1, and,

      e) Reduce the Average Power Range Monitor (APRM) Scram and Rod Block and Rod Block Monitor Trip Setpoints and Allowable Values to those applicable for single recirculation loop operation per Specifications 2.2.1, 3.2.2 and 3.3.6.

      f) Reduce the volumetric drive flow rate of the operating recirculation loop to ≤41,800** gpm.

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* See Special Test Exception 3.10.4.

** This value represents the volumetric recirculation loop drive flow which produces 100% core flow at 100% THERMAL POWER.

*** MCPR values are applicable to Cycle 7 operation only.

g) Perform Surveillance Requirement 4.4.1.1.2 if THERMAL POWER is ≤ 30%* of RATED THERMAL POWER or the jet pump loop flow in the operating loop is ≤ 50%* of rated jet pump loop flow.

2. The provisions of Specification 3.0.4 are not applicable.

3. Otherwise be in at least HOT SHUTDOWN within the next 12 hours.

b. With no reactor coolant system recirculation loops in operation, place the unit in at least STARTUP within six hours and in HOT SHUTDOWN within the next six hours.

* Final values were determined during Startup Testing based upon the actual THERMAL POWER and jet pump loop flow which will sweep the cold water from the vessel bottom head preventing stratification.

RECIRCULATION LOOPS

SURVEILLANCE REQUIREMENTS

4.4.1.1.1 With one reactor coolant system recirculation loop not in operation, at least once per 12 hours verify that:

a. Reactor THERMAL POWER is ≤ 70% of RATED THERMAL POWER,

b. The recirculation flow control system is in the Loop Manual (Position Control) mode, and

c. The volumetric drive flow rate of the operating loop is ≤ 41,800 gpm.*

4.4.1.1.2 With one reactor coolant system recirculation loop not in operation, within no more than 15 minutes prior to either THERMAL POWER increase or jet pump loop flow increase, verify that the following differential temperature requirements are met if THERMAL POWER is ≤ 30%** of RATED THERMAL POWER or the recirculation jet pump loop flow in the operating recirculation loop is ≤ 50%** of rated jet pump loop flow:

a. ≤ 145°F between reactor vessel steam space coolant and bottom head drain line coolant,

b. ≤ 50°F between the reactor coolant within the loop not in operation and the coolant in the reactor pressure vessel, and

c. ≤ 50°F between the reactor coolant within the loop not in operation and the operating loop.

The differential temperature requirements of Specification 4.4.1.1.2 b. and c. do not apply when the loop not in operation is isolated from the reactor pressure vessel.

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* This value represents the volumetric recirculation loop drive flow which produces 100% core flow at 100% THERMAL POWER.

** Final values were determined during Startup Testing based upon the actual THERMAL POWER and jet pump loop flow which will sweep the cold water from the vessel bottom head preventing stratification.

SURVEILLANCE REQUIREMENTS (Continued)

4.4.1.1.3 Each reactor coolant system recirculation loop flow control valve shall be demonstrated OPERABLE at least once per 18 months by:

a. Verifying that the control valve fails "as is" on loss of hydraulic pressure at the hydraulic control unit, and

b. Verifying that the average rate of control valve movement is:

   1. Less than or equal to 11% of stroke per second opening, and

   2. Less than or equal to 11% of stroke per second closing.

FIGURE 3.4.1.1-1 HAS BEEN DELETED

BASES

3/4.3.1 REACTOR PROTECTION SYSTEM INSTRUMENTATION

The reactor protection system (RPS) automatically initiates a reactor scram to:

a. Preserve the integrity of the fuel cladding.

b. Preserve the integrity of the reactor coolant system.

c. Minimize the energy which must be adsorbed following a loss-of-coolant accident, and

d. Prevent inadvertent criticality.

This specification provides the Limiting Conditions for Operation necessary to preserve the ability of the system to perform its intended function even during periods when instrument channels may be out of service because maintenance is being performed. When necessary, one channel may be made inoperable for brief intervals to conduct required surveillance.

The reactor protection system is made up of two independent trip systems. There are usually four channels to monitor each parameter, and there are two channels in each trip system. The outputs of the channels in a trip system are combined in a logic so that either channel will trip that trip system. The tripping of both trip systems will produce a reactor scram. The APRM system is divided into four APRM channels and four 2-out-of-4 voter channels. Each APRM channel provides inputs to each of the four voter channels. The four voter channels are divided into two groups of two each, with each group of two providing inputs to one RPS trip system. The system is designed to allow one APRM channel, but no voter channels, to be bypassed. Requiring three of the four APRM channels and all four of the voter channels to be OPERABLE ensures that no single failure will preclude a scram on a valid signal. The voter includes separate outputs to RPS for the two independently voted sets of Functions, each of which is redundant (four total outputs). The voter Function 2.e must be declared inoperable if any of its functionality is inoperable. However, due to the independent voting of APRM trips, and the redundancy of outputs, there may be conditions where the voter Function 2.e is inoperable, but trip capability for one or more of the other APRM Functions through that voter is still maintained. This may be considered when determining the condition of other APRM Functions resulting from partial inoperability of the Voter Function 2.e. In addition, to provide adequate coverage of the entire core, consistent with the design bases for the APRM Functions 2.a, 2.b, and 2.c, at least 20 LPRM inputs, with at least 3 LPRM inputs from each of the four axial levels at which the LPRMs are located, must be operable for each APRM channel.

The APRM channels include an Oscillation Power Range Monitor (OPRM) Upscale Function. NEDO-31960-A, "BWR Owners' Group Long-Term Stability Solutions Licensing Methodology," November 1995, and NEDO-31960-A, Supplement 1, "BWR Owners' Group Long-Term Stability Solutions Licensing Methodology," November 1995, plus NEDO-32465-A, "Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology for Reload Applications," (August 1996), describe three algorithms for detecting thermal-hydraulic instability related neutron flux oscillations: the period based detection algorithm, the amplitude based algorithm, and the growth rate algorithm. All three are implemented in the OPRM Upscale Function, but the safety analysis takes credit only for the period based detection algorithm. The remaining algorithms provide defense in depth and additional protection against unanticipated oscillations. OPRM Upscale

Function operability for Technical Specification purposes is based only on the period based detection algorithm.

The OPRM Upscale Function receives input signals from the local power range monitors (LPRMs) within the reactor core, which are combined into "cells" for evaluation by the OPRM algorithms. The OPRM Upscale Function is required to be OPERABLE when the plant is in OC1. In OC1, the automatic trip is enabled when THERMAL POWER, as indicated by the APRM Simulated Thermal Power, is ≥30% RTP and reactor core flow, as indicated by recirculation drive flow, is <60% of rated flow, the operating region where actual thermal-hydraulic oscillations may occur. Requiring OPRM operability in OC1 provides adequate margin to cover the operating region where oscillations may occur as well as the operating regions from which the plant might enter the potential instability region without operator action.

The OPRM Upscale trip is issued from an APRM channel when the period based detection algorithm in that channel detects oscillatory changes in the neutron flux, indicated by the combined signals of the LPRM detectors in a cell, with period confirmations and relative cell amplitude exceeding specified setpoints. One or more OPRM cells in a channel exceeding the trip conditions will result in a channel trip. An OPRM Upscale trip is also issued from the channel if either the growth rate or amplitude based algorithms detect growing oscillatory changes in the neutron flux for one or more cells in that channel. Each channel is capable of detecting neutron flux oscillations indicative of thermal-hydraulic instabilities, by detecting the related neutron flux oscillations, and issuing a trip signal before the MCPR Safety Limit is exceeded.

APRM trip Functions 2.a, 2.b, 2.c, and 2.d are voted independently from OPRM Upscale Function 2.f. Therefore, any Function 2.a, 2.b, 2.c, or 2.d trip from any two unbypassed APRM channels will result in a full trip in each of the four voter channels, which in turn results in two trip inputs into each RPS trip system. Similarly, a Function 2.f trip from any two unbypassed APRM channels will result in a full trip from each of the four voter channels. For the OPRM Upscale, Function 2.f, LPRMs are assigned to "cells" of 4 detectors. A minimum of 21 cells, each with a minimum of 2 LPRMs, must be OPERABLE for the OPRM Upscale Function 2.f to be OPERABLE.

Note (l) to Table 3.3.1-1 states that the Minimum Operable Channels in Table 3.3.1-1 for the APRM Functional Units (except the 2-out-of-4 voter Functional Unit) are the total number of APRM channels required and are not on a trip system basis. Therefore, when only one required APRM is inoperable, Action a is the only Action required to be entered. This Action requires the APRM to be restored to operable status or placed in the tripped condition within 12 hours. As stated in Action a, footnote *, placing either trip system in trip is not applicable since the APRM channels are not on a trip system basis. When two or more required APRMs are inoperable, Action b is entered. Action b.1 requires verification of trip capability in the affected functional unit within one hour (i.e., one APRM operable and one APRM in the tripped condition). Action b.2, as stated in footnote **, is not applicable since the APRM channels are not on a trip system basis. Action b.3 requires that the remaining required inoperable APRM be restored to operable status within 12 hours.

BASES

The system meets the intent of IEEE-279 for nuclear power plant protection systems. Specified surveillance intervals and surveillance and maintenance outage times have been determined in accordance with NEDC-30851P-A, "Technical Specification Improvement Analyses for BWR Reactor Protection System," NEDC-32410P-A, "Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC-PRNM) Retrofit Plus Option III Stability Trip Function," and NEDC-32410P-A, Supplement 1 "Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Plus Option III Stability Trip Function." The bases for the trip settings of the RPS are discussed in the bases for Specification 2.2.1. When a channel is placed in an inoperable status solely for performance of required surveillances, entry into LCO and required ACTIONS may be delayed, provided the associated function maintains RPS trip capability.

BASES

3/4.4.1 RECIRCULATION SYSTEM

The impact of single recirculation loop operation upon plant safety is assessed and shows that single-loop operation is permitted if the MCPR fuel cladding safety limit is increased as noted by Specification 2.1.2, APRM scram and control rod block setpoints are adjusted as noted in Tables 2.2.1-1 and 3.3.6-2, respectively, MAPLHGR limits are decreased by the factor given in Specification 3.2.1, and MCPR operating limits are adjusted per Section 3/4.2.3.

Additionally, surveillance on the volumetric drive flow rate of the operating recirculation loop is imposed to exclude the possibility of excessive core internals vibration. Drive flow is the flow rate for the recirculation pump in the operating loop. The surveillance on differential temperatures below 30% THERMAL POWER or 50% rated jet pump loop flow is to mitigate the undue thermal stress on vessel nozzles, recirculation pump and vessel bottom head during the extended operation of the single recirculation loop mode. Jet pump loop flow is the sum of the flows through the 10 jet pumps in one loop. Core flow is the sum of the two jet pump loop flows.

An inoperable jet pump is not, in itself, a sufficient reason to declare a recirculation loop inoperable, but it does, in case of a design-basis accident, increase the blowdown area and reduce the capability of reflooding the core; thus, the requirement for shutting down the facility when a jet pump is inoperable. Jet pump failure can be detected by monitoring jet pump performance on a prescribed schedule for significant degradation.

Jet pump loop flow mismatch limits are in compliance with the ECCS LOCA analysis design criteria for two recirculation loop operation. The limits will ensure an adequate core flow coastdown from either recirculation loop after a LOCA. In the case where the mismatch limits cannot be maintained during two loop operation, continued operation is permitted in a single recirculation loop mode.

In order to prevent undue stress on the vessel nozzles and bottom head region, the recirculation loop temperatures shall be within 50°F of each other before startup of an idle loop. The loop temperature must also be within 50°F of the reactor pressure vessel coolant temperature to prevent thermal shock to the

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SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

6.9.1.8 (Continued)

The Semiannual Radioactive Effluent Release Reports shall include any changes made during the reporting period to the PROCESS CONTROL PROGRAM (PCP) and to the OFFSITE DOSE CALCULATION MANUAL (ODCM), pursuant to Specifications 6.13 and 6.14, respectively, as well as any major change to liquid, gaseous, or solid radwaste treatment systems pursuant to Specification 6.15. It shall also include a listing of new locations for dose calculations and/or environmental monitoring identified by the land use census pursuant to Specification 3.12.2.

The Semiannual Radioactive Effluent Release Reports shall also include the following: an explanation of why the inoperability of liquid or gaseous effluent monitoring instrumentation was not corrected within the time specified in Specification 3.3.7.9 or 3.3.7.10, respectively, and a description of the events leading to liquid holdup tanks exceeding the limits of Specification 3.11.1.4.

CORE OPERATING LIMITS REPORT

6.9.1.9

a. Core operating limits shall be established prior to each reload cycle, or prior to any remaining portion of a reload cycle for the following:

   1) The AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR) for Specification 3.2.1.

   2) The Average Power Range Monitor (APRM) flow-biased simulated thermal power-upscale scram trip setpoint for Specification 3.2.2.

   3) The K_f core flow adjustment factor for Specification 3.2.3.

   4) The MINIMUM CRITICAL POWER RATIO (MCPR) for Specification 3.2.3.

   5) The LINEAR HEAT GENERATION RATE (LHGR) for Specification 3.2.4.

   6) Control Rod Block Instrumentation Setpoint for the rod block monitor upscale trip setpoint and allowable value for Specification 3.3.6.

   7) Oscillation Power Range Monitor Upscale for Table 2.2.1-1.

   and shall be documented in the CORE OPERATING LIMITS REPORT.

b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents.

   1) The GESTR-LOCA and SAFER Models of the Evaluation of the Loss-of-Coolant Accident - SAFER/GESTR Application Methodology, NEDE-23785-1-PA, latest approved revision.

CORE OPERATING LIMITS REPORT

6.9.1.9 (Continued)

2) General Electric Standard Application for Reactor Fuel, NEDE-24011-P-A-US, latest approved revision.

3) NEDO-32465-A, Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology for Reload Applications, August 1996.

c. The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal-mechanical limits, core thermal-hydraulic limits, ECCS limits, nuclear limits such as shutdown margin, transient analysis limits, and accident analysis limits) of the safety analysis are met.

d. The CORE OPERATING LIMITS REPORT, including any mid-cycle revisions or supplements shall be provided, upon issuance for each reload cycle, to the NRC Document Control Desk with copies to the Regional Administrator and Resident Inspector.

SPECIAL REPORTS

6.9.2 Special reports shall be submitted in accordance with 10 CFR 50.4 within the time period specified for each report.

6.10 RECORD RETENTION

6.10.1 In addition to the applicable record retention requirements of Title 10, of the Code of Federal Regulations (10 CFR), the following records shall be retained for at least the minimum period indicated.

6.10.1.1 The following records shall be retained for at least 5 years:

a. Records and logs of unit operation covering time interval at each power level

b. Records and logs of principal maintenance activities, inspections, repair, and replacement of principal items of equipment related to nuclear safety

c. All REPORTABLE EVENTS submitted to the Commission

d. Records of surveillance activities, inspections, and calibrations required by these Technical Specifications

e. Records of changes made to the procedures required by Specification 6.8.1

f. Records of radioactive shipments

g. Records of sealed source and fission detector leak tests and results

h. Records of annual physical inventory of all sealed source material of record

ATTACHMENT B

NIAGARA MOHAWK POWER CORPORATION

LICENSE NO. NPF-69

DOCKET NO. 50-410

Supporting Information and No Significant Hazards Consideration Analysis

INTRODUCTION

By letter dated July 11, 1994, the Commission issued Generic Letter 94-02, "Long-Term Solutions and Upgrade of Interim Operating Recommendations for Thermal-Hydraulic Instabilities in Boiling Water Reactors." Generic Letter 94-02 requested that licensees submit a plan describing the long-term stability solution option it had selected and the associated implementation schedule. As indicated in our letter dated November 8, 1994, Niagara Mohawk Power Corporation (NMPC) selected Option III, as delineated in NEDO-31960, BWR Owners' Group Long-Term Stability Solutions Licensing Methodology, to address the thermal-hydraulic stability issue at Nine Mile Point Unit 2 (NMP2). Specifically, NMPC elected to replace the Average Power Range Monitors (APRM) System with the General Electric Nuclear Measurement Analysis and Control (NUMAC) Power Range Neutron Monitor (PRNM) with core stability monitoring function. The NUMAC-PRNM monitors groups of LPRM signals and, together with the Oscillation Power Range Monitor (OPRM), initiates a reactor SCRAM upon identification of neutron flux oscillations characteristic of a thermal-hydraulic instability.

By Amendment Application dated October 31, 1997, and as supplemented by letter dated February 3, 1998, NMPC proposed changes to the NMP2 Technical Specifications (TSs) to allow installation of the NUMAC-PRNM and eventual activation of the OPRM. The NRC issued Amendment No. 80 on March 31, 1998 approving these changes and the modification was installed in refueling outage 6 (RFO6). Since RFO6, the OPRM function has operated in "indicate only mode" to allow plant personnel to collect system data. Once activated, the OPRM function will provide a reactor SCRAM signal upon detection of an instability condition. Accordingly, changes have been proposed to include the OPRM as a Reactor Protection System (RPS) Functional Unit including operability requirements and surveillance tests. The current TSs (CTS) used at NMP2 are formatted consistent with the old standard TSs. The proposed changes provided in Attachment A are consistent, with minor exceptions, with NEDC-32410P-A, Supplement 1, Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Plus Option III Stability Trip Function, Section H.1.2, Example of Changes for old Standard TSs.

On October 16, 1998, NMPC submitted an amendment application to convert the NMP2 TSs to the Improved Technical Specifications (ITS) format. The ITS is expected to be approved in the Fall of 1999 and implemented in August of 2000. The OPRM will be activated following RFO7 scheduled for the Spring of 2000. Revised ITS pages will be provided to the NRC after approval of this Amendment Request.

EVALUATION

Change to Table 2.2.1-1, RPS Instrumentation Setpoints, and Associated Bases

As a result of the OPRM activation, APRM Functional Unit 2.f, OPRM Upscale (i.e., period based algorithm), will be added to Table 2.2.1-1. This is consistent with the OPRM upscale function being added to Table 3.3.1-1, RPS Instrumentation, to facilitate minimum operable channel definition, associated actions and applicable operational conditions. As indicated by the proposed change, the OPRM Upscale trip setpoint and allowable value will be maintained through the NMP2 Core Operating Limits Report (COLR). Although maintaining the allowable value through the COLR was not considered in NEDC-32410P-A, NMPC believes adding this reference will provide clear guidelines in determining OPRM operability.

This submittal also includes proposed changes to the Bases for Limiting Safety System Settings, Section 2.2.1, RPS Instrumentation Setpoints. These changes provide a brief description of the OPRM Upscale function consistent with the proposed change to Table 2.2.1-1.

Changes to Table 3.3.1-1, RPS Instrumentation, Associated Table Notations and Actions, and Footnotes* and ** to LCO 3.3.1 and Associated Bases

To facilitate activation of the OPRM, OPRM Upscale (i.e., period based algorithm) will be added to Table 3.3.1-1, RPS Instrumentation, as Functional Unit 2.f, a sub-function of the APRM function. Table 3.3.1-1 delineates the applicable operational conditions, minimum operable channels per trip system and required actions for RPS instrumentation. Changes to the associated Table notations and actions as well as Footnotes * and ** to LCO 3.3.1 are also required.

Concerning Table 3.3.1-1, applicable operational conditions, OPRM Upscale will be required to be operable in Operational Condition (OC) (1). This is consistent with the APRM Fixed Neutron Flux-Upscale function. In addition, the OPRM Upscale is bypassed automatically with thermal power below nominally 30% RTP (as indicated by APRM Simulated Thermal Power) or with flow above nominally 60% rated core flow (as indicated by drive flow). In the region below nominally 30% RTP and above 60% rated core flow, thermal-hydraulic instabilities are not considered credible. There are identified events that can take the plant from 100% power and flow to below 60% flow without operator action. Therefore, even though the OPRM Upscale trip is bypassed above nominally 60% flow, the function must be operable so that if one of the identified events occurred, the OPRM Upscale trip capability is immediately available without operator intervention. There are also events that might occur below 30% power and result in the power increasing to above 30% power without operator intervention, (e.g., loss of feedwater heating). Although this is unlikely to occur at low power levels under the specific conditions that would result in thermal-hydraulic instability, requiring operability in OC 1 provides margin for such an event. Therefore, an operability requirement for the OPRM Upscale function of OC 1 is reasonable to cover the operating region where oscillations may occur and the operating region from which the plant might enter the region where oscillations may occur (without operator action). Note (m) has been worded differently than the example in the LTR to emphasize that automatic enabling of the OPRM trip function is the primary focus for operability, not automatic bypass. Requiring the OPRM to be operable in OC1 versus the specified conditions in OC1 delineated in the LTR (i.e., OC1 when greater than 25% power) is more conservative.

Table 3.3.1-1 also delineates the minimum operable channel requirements for RPS functions. The proposed change would require a minimum of 3 OPRM channels. In the 4-OPRM channel configuration, any two of the OPRM channels out of the total of four and one 2-out-of-4 voter channel in each RPS trip system are required to function for the OPRM safety trip function to be accomplished. Therefore, the operability of three OPRM channels assures that at least two OPRM channels can provide trip inputs to the 2-out-of-4 voter channels even in the event of a single OPRM channel failure, and the minimum of two 2-out-of-4 voter channels per RPS trip system assures at least one voter channel will be operable per RPS trip system even in the event of a single voter channel failure. The Two-Out-Of-Four Logic Module is designed for simplicity to assure very high reliability and can itself detect loss of input signals from the OPRM channels (dynamically encrypted to assure no passive fault at the interface will go undetected). This feature, in combination with the highly reliable digital electronics implementing the OPRM functions and the on-line automatic self-test functions, assures that the 4-OPRM channel configuration will provide reliability equal or greater than the current APRM system relative to the safety trip functions. Detailed failure analysis used to confirm that the overall OPRM unavailability is comparable to that for the current APRM functions is discussed in Section 6 of NEDC-32410P-A. This level of reliability is adequate for the OPRM function. Table notation (l), which states since each APRM provides inputs to both trip systems, the minimum operable channels are the total APRM channels required (i.e., it is not on a trip system basis) applies to OPRM Upscale. Accordingly, this notation will be retained for Functional Unit 2.f.

Action statements and times for OPRM functions equal to APRM functions is conservative in that the instability events are expected to be infrequent events compared to those for which APRM provides protection. The alternate action statement for loss of OPRM trip capability recognizes that this is a new function, and there is the possibility that experience will show some problem with the algorithm or implementation. The inclusion of the proposed action statement (Action 10) pre-plans for such a contingency, requires NMPC to have determined in advance the alternate method to be used in such an eventuality, and provides a specific time (120 days) in which to implement permanent action. The additional action statement requires that the plant be in hot shutdown within 12 hours if the 120-day action time is not met. The 12 hours allowed for this action is conservative compared to the LTR actions (i.e., to be < 25% power in 4 hours), is consistent with the Voter action statement and is considered to be reasonable to reduce power in a prudent manner.

Changes to LCO 3.3.1, Action a and b, Footnotes * and **, are also required based on implementation of the OPRM function. Specifically, Functional Unit 2.f, OPRM Upscale, will be added to the other APRM sub-functions addressed in Footnotes * and **, consistent with changes proposed to Table 3.3.1-1, and as proposed in NEDC-32410P-A, Supplement 1.

This submittal includes changes to the Bases for Specification 3.3.1, RPS Instrumentation. These changes provide a description of the OPRM Upscale function consistent with the changes to TS 3.3.1. Existing Table Notation (c) provides a discussion of APRM operability requirements including the number of LPRM inputs per level and LPRM inputs per APRM channel. Consistent with NEDC-32410P-A, Supplement 1, this discussion has been relocated to the Bases. Any changes to the Bases would be processed in accordance with 10CFR50.59. The reference in Table 3.3.1-1 to Table Notation (c) will be deleted accordingly.

Changes to Surveillance Requirement 4.3.1.2, RPS Logic System Functional Tests

TS Surveillance Requirement 4.3.1.2 requires that a Logic System Functional Test (LSFT) and simulated automatic operation of all RPS channels be performed at least once per 18 months except for Table 4.3.1.1-1, RPS Instrumentation Surveillance Requirements (SR), Functions 2.a, 2.b, 2.c, 2.d, and 2.e (i.e., APRM functions). However, TS 4.3.1.2 does require an LSFT for Function 2.e, which includes simulating APRM trip conditions at the APRM channel inputs to the voter channel, at least once per 24 months. Consistent with NEDC-32410P-A, changes to TS 4.3.1.2 are required to address the addition of OPRM Upscale to Table 4.3.1.1-1. Specifically, Function 2.f will be added as an exception similar to the other APRM functional units. Also, when testing Function 2.e, OPRM trip conditions will be simulated at the APRM channel inputs to the voter channel (similar to the APRM trip conditions). The OPRM function is implemented in the same equipment as the APRM, so reliability is the same as APRM. Therefore, the same LSFT requirements and frequency as for the APRM trip functions is adequate.

Changes to TS 4.3.1.3, RPS Response Times

TS 4.3.1.3 requires that the RPS response time of each required reactor trip functional unit be demonstrated to be within TS limit at least once per 18 months (the TS Table with actual response times was previously removed from TSs) except for Functions 2.a, 2.b, 2.c, 2.d, and Function 2.e digital electronics (i.e., APRM functions). Procedural changes will assure that the response time testing of the 2-out-of-4 voter channels include the OPRM Upscale output relays at the same testing rate as for the APRM flux trip output relays, and with the same response time requirement. Function 2.f would be excluded from TS response time testing.

The analysis methodology supporting the OPRM trip setpoints requires a defined response time between the time the LPRM signals reach the trip level and the time RPS scram occurs. This response includes an allocation of 400 ms maximum delay between the time LPRM input signals reach the trip level and the time the voter output changes to the tripped state, and a 50 ms maximum delay between the time the voter output changes to the tripped state and the time power is removed from the scram solenoid pilot valves (RPS contactor dropout).

The response of all equipment implementing the OPRM Upscale trip that can affect the 400 ms response time is either proven at initial system verification and validation (software controlled aspects) or proven by calibration (hardware controlled aspects). In addition, automatic self-test functions compare independent clocks in the APRM, including the one that controls the time based OPRM calculations. The response time of the system, except for the final output relays from the voter, is entirely determined by the digital processing dependent only on the logic and the digital time base. That processing remains constant, within predictable statistical variations, with maximum values included in the design requirements and confirmed as part of the design process. As long as the time base in the equipment remains correct within limits, the 400 ms system response time requirement will be met. The time base in the equipment is confirmed by self-tests at approximately one hour intervals and as part of the calibration process for all channels on 24-month intervals. Consequently, separate response time testing of the APRM channels and the voter, except for the output relay, would be redundant and is not necessary.

The 50 ms response time depends on the response of the voter output relay, the interfacing relay between the voter and the RPS logic, and the RPS scram contactor (the same relay and

RPS scram contactor that trips for APRM flux trips). That entire path is checked by the APRM related 2-Out-Of-4 Voter response time test except for the actual voter output relay. The voter output relay for the OPRM Upscale trip is separate from the one used for APRM flux trips. As a solid state relay, it is very unlikely that the voter output relay will degrade in response time while still functioning well enough to pass the functional test. However, due to limited experience with the output relays, it is considered prudent to test them at the same rate as the APRM associated test. The proposed rate is equal to the APRM voter output relay and half the rate of testing of the APRM/RPS interfacing relay. This approach will identify systematic degradation of the response time of the voter output relays while not introducing excessive rates of testing RPS scram contactors and APRM/RPS interfacing relays, or requiring special configurations to test the response time of the voter output relay alone.

Changes to Table 4.3.1.1-1, RPS Instrumentation Surveillance Requirements

Table 4.3.1.1-1, RPS Instrumentation SRs, provides the channel check, channel functional test, and channel calibration surveillance requirements, as well as the OCs for which these surveillances are required. As part of the proposed change, OPRM Upscale will be added to Table 4.3.1.1-1 as Functional Unit 2.f, a sub-function of APRM, along with the required surveillances.

A Channel Check will be added for the OPRM Upscale function as once per day which are the same requirements as for the APRM functions. The OPRM Upscale function is implemented in the same equipment as the APRM, so reliability is essentially the same as for the APRM functions. Therefore, the same Channel Check frequency as for APRM functions is adequate.

An OPRM Upscale Functional Test will be added at a frequency of every 184 days (6 months). The Channel Functional Test will include both the OPRM channels and the 2-out-of-4 voter channels. These are also the same requirements as for the existing APRM functions. The OPRM Upscale function is implemented in the same equipment as the APRM, so reliability is essentially the same as the APRM. The expected "demand" for the OPRM Upscale trip is equal or less than that for the APRM functions. Therefore, the same Channel Functional Test frequency as for APRM functions is adequate. Although not included in NEDC-32410P-A, Supplement 1, Notation (q) has been added to delineate exceptions to the TS definition of Channel Functional Test. Specifically, Notation (q) indicates that no test signal will be injected and that the test will consist of toggling the appropriate outputs of the APRM instrument. This test is adequate because this test scope will test all of the hardware required to produce the trip functions, but not directly re-test software controlled logic. Also, the automatic self-test logic monitors the integrity of the EPROMs storing all of the firmware so that if a hardware fault results in a "change" to the software (firmware), that fault will be detected by the self-test logic. The continued operation of the self-test procedures is monitored by the built-in "watch-dog timer" function, so if for some unforeseen reason the self-test function (lowest priority in the instrument logic) stops running, that failure will be detected automatically.

An OPRM Upscale channel calibration will be added to Table 4.3.1.1-1 on a once per refueling outage basis. These are the same requirements for APRM functions. The OPRM Upscale function is implemented in the same equipment as the APRM, and actually uses the signals processed by the APRM. Accuracy requirements are no more stringent than for the APRM, and no additional analog hardware is utilized for the OPRM compared to the APRM. Therefore, the same Channel Calibration frequency as for APRM functions is adequate. Added Table Notation (p) clarifies that the calibration includes verification that the OPRM Upscale Trip is not bypassed when APRM STP is ≥30% and recirculation drive flow is <60% of rated recirculation drive flow. The "auto' enable" region for the OPRM Upscale trip is determined by setpoints in the APRM channels. Even though they are very unlikely to change once set, periodic confirmation is appropriate. The surveillance is based on APRM Simulated Thermal Power levels and recirculation flow as measured in the APRM since these are the parameters actually monitored to enable the OPRM Upscale trip. Other surveillance actions assure that the relationship between thermal power and APRM Simulated Thermal Power, and between core flow and recirculation flow, are within acceptable tolerances. Those surveillances, in combination with this one, provide overlapping surveillances to assure that the OPRM Upscale trip is enabled in the intended region on the plant power/flow map. The 24-months maximum interval is based on engineering judgement recognizing that the actual values are stored digitally, so there is no drift, and that any hardware failures that affect these setpoints will likely be detected by the automatic self-test function. Although not included in NEDC-32410P-A, Supplement 1, Notation (p) also delineates exceptions to the TS definition of Channel Calibration. Specifically, Notation (p) indicates that test signals, other than those necessary to calibrate LPRM and recirculation flow inputs, will not be injected and that the remainder of the calibration will consist of verification of OPRM upscale setpoints in the APRM instrument by a review of the "Show Parameters" display. This test is adequate because, other than the flow and LPRM input processing, all OPRM functional processing is performed digitally involving no "calibrateable" equipment or components.

The proposed change requires that the OPRM Upscale trip surveillances are applicable in (and before entering) OC 1. This is consistent with OPRM OC requirements stated in Table 3.3.1-1, RPS Instrumentation, and is therefore, adequate. As previously noted, the proposed OC requirements for the OPRM are more conservative than the LTR. Note (o) has been worded differently than the example in the LTR to emphasize that automatic enabling of the OPRM trip function is the primary focus for operability, not automatic bypass.

<u>Changes to Technical Specification 3.4.1, Recirculation System, and Associated Bases</u>

TS 3.4.1, Recirculation System (RCS), provides the Limiting Conditions for Operation, and SRs, associated with the NMP2 RCS. TS 3.4.1, in part, provides certain restrictions on plant operation when operating in regions of potential thermal-hydraulic instability.

With the OPRM Upscale trip function enabled, stability long-term solution Option III will be fully implemented, and the TS RCS operational restrictions will no longer be required. The OPRM together with the NUMAC PRNM will detect and automatically suppress any significant core wide or regional power oscillations over the region of the power-to-flow map. This automatic function provides more reliable protection than the requirements proposed for deletion. Deletion of these requirements, together with their associated Bases discussions, will permit NMP2 to have the ability to manually insert control rods and restart a recirculation pump (instead of shutting down immediately) following a recirculation pump trip and is important to reduce the potential for unnecessary plant transients. During such recovery activities, the OPRM will provide reliable, automatic monitoring for potential thermal-hydraulic stability related power oscillations and will immediately and automatically generate a reactor scram before any unacceptable power oscillations can occur.

Based on the above discussion, deletion of the stability related operational restrictions and associated Bases is acceptable, and is consistent with and supported by implementation of the OPRM Upscale trip function. NMPC also proposes to delete the words "initiate measures to" from TS 3.4.1, Action b. This will eliminate confusion as to whether the TS requirement is to "initiate measures" in 6 hours or be in startup within 6 hours. These changes are not within the scope of NEDC-32410P-A, Supplement 1.

Change to Technical Specification 6.9.1.9, Core Operating Limits Report

Administrative Controls TS, Section 6.9.1.9, Core Operating Limits Report (COLR), lists those items for which core operating limits shall be established prior to each reload cycle and the analytical methods used to determine these limits. As discussed above, OPRM Upscale will be added to Table 2.2.1-1 with the trip setpoint and allowable value established based on the COLR. Accordingly, OPRM Upscale will be added to the COLR and appropriately added to TS 6.9.1.9.a. NEDO-32465-A, Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology for Reload Applications, August 1996, provides the NRC review and approved methodology used to determine these limits, and therefore, will be added to 6.9.1.9.b. These changes are not within the scope of NEDC-32410P-A, Supplement 1.

NEDO-32465-A is applicable to NMP2 with certain clarifications and qualifications. Table 3-1, PBDA Period Confirmation Setpoints, lists the acceptable range for the period tolerance (0.1 to 0.3 seconds) and conditioning filter cutoff frequency (1.0 to 2.5 hertz). These parameters affect the sensitivity of the period based algorithm (PBA). These parameters are "tuned" to assure there are sufficient confirmations for a growing instability and to avoid spurious alarms on period confirmations. The NUMAC PRNM system installed at NMP2 has an adjustable range for the period tolerance of 0.05 to 0.3 seconds and an adjustable range of 1.0 to 3.0 hertz for the corner frequency (conditioning filter cutoff frequency). Due to the sensitivity of the PBA at NMP2, NMP2 must use a period tolerance setting of 0.05 seconds and a corner frequency of 3.0 hertz to reduce spurious alarms. The PBA Upscale setpoint must be confirmed each cycle. Additional information regarding NEDO-32465-A as well as NMP2 OPRM tuning data are included as Attachment E.

CONCLUSIONS

The proposed TS changes will add the OPRM Upscale function to the NMP2 TSs and allow activation of the OPRM. Activation of the OPRM will detect and suppress reactor instability conditions consistent with our commitment to implement stability solution Option III as described in NEDO-31960-A. No RPS safety functions are being deleted. Consequently, the proposed TS changes will not adversely affect the health and safety of the public and will not be inimical to the common defense and security.

ANALYSIS

No Significant Hazards Consideration

10CFR50.91 requires that at the time a licensee requests an amendment, it must provide to the Commission its analysis using the standards in 10CFR50.92 concerning the issue of no significant hazards consideration. Therefore, in accordance with 10CFR50.91 and 10CFR50.92, the following analyses have been performed:

<u>The operation of Nine Mile Point Unit 2, in accordance with the proposed amendment, will not involve a significant increase in the probability or consequences of an accident previously evaluated</u>.

The addition of the OPRM Upscale functional unit to TSs involve a system that is intended to detect the symptoms of instability events and initiate mitigative actions. The worst case failure of the system involved would be a failure to initiate mitigative actions (i.e., scram), but no failure can cause an accident. The removal of certain RCS operational restrictions is justified with the addition of the OPRM functional unit which will provide an automatic scram in the event of reactor instabilities. Therefore, the proposed change will not result in a significant increase in the probability of any accidents previously evaluated.

The addition of the OPRM Upscale functional unit to the NMP2 TSs will permit activation of the OPRM. Activation of the OPRM, together with the NUMAC-PRNM, provides NMP2 the ability to detect and suppress reactor instabilities. The existing RPS functional units as well as other plant equipment will continue to perform their intended function in the event of an accident. The addition of the OPRM functional unit fulfills the intended purpose of the TS required RCS operational restrictions. Therefore, the proposed change will not result in a significant increase in the consequences of any accident previously evaluated.

<u>The operation of Nine Mile Point Unit 2, in accordance with the proposed amendment, will not create the possibility of a new or different kind of accident from any accident previously evaluated</u>.

The addition of the OPRM Upscale functional unit to the NMP2 TSs will permit activation of the OPRM. Activation of the OPRM, together with the NUMAC-PRNM, provides NMP2 the ability to detect and suppress reactor instabilities. The OPRM is a mitigative system whose addition as an RPS functional unit will not create the possibility of a new or different accident or adversely affect existing RPS functional units. The worst case failure of the systems involved would be failure to initiate mitigative actions, but no failure can cause an accident. Except for the activation of the OPRM, no new plant configurations are created. The OPRM Upscale functional unit fulfills the intended purpose of the existing TS required RCS operational restrictions. Therefore, the proposed change will not create the possibility of a new or different kind of accident from any previously evaluated.

<u>The operation of Nine Mile Point Unit 2, in accordance with the proposed amendment, will not involve a significant reduction in a margin of safety</u>.

The proposed TS changes will not adversely affect the performance characteristics of RPS instrumentation nor will it affect the ability of the subject instrumentation to perform its intended function.

The addition of the OPRM Upscale functional unit to the NMP2 TSs will permit activation of the OPRM. Activation of the OPRM, together with the NUMAC-PRNM, provides NMP2 the ability to detect and suppress reactor instabilities (stability solution Option III) thereby meeting the requirements of GDC 10 and 12. The NRC has reviewed and accepted the Option III methodology described in Licensing Topical Report NEDO-31960-A and concluded that the solution will provide the intended function. The surveillance testing and frequencies proposed will assure reliability of the OPRM Upscale function. The purpose of the existing TS operational restrictions on the RCS will be met by the automatic scram feature of the OPRM.

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

ATTACHMENT C

NIAGARA MOHAWK POWER CORPORATION

LICENSE NO. NPF-69

DOCKET NO. 50-410

"Marked-Up" Copy of Current Technical Specifications

LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE REQUIREMENTS

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TABLE 2.2.1-1

REACTOR PROTECTION SYSTEM INSTRUMENTATION SETPOINTS

FUNCTIONAL UNIT	TRIP SETPOINT	ALLOWABLE VALUE
1. Intermediate Range Monitor, - Neutron Flux - High	≤120/125 divisions of full scale	≤122/125 divisions of full scale
2. Average Power Range Monitor:		
a. Neutron Flux - Upscale, Setdown	≤15% of RATED THERMAL POWER	≤20% of RATED THERMAL POWER
b. Flow-Biased Simulated Thermal Power - Upscale		
1) Flow-Biased 2) High-Flow-Clamped	$\leq 0.58\ (W-\Delta W)^{(a)} + 59\%$, with a maximum of ≤113.5% of RATED THERMAL POWER	$\leq 0.58\ (W-\Delta W)^{(a)} + 62\%$, with a maximum of ≤115.5% of RATED THERMAL POWER
c. Fixed Neutron Flux - Upscale	≤118% of RATED THERMAL POWER	≤120% of RATED THERMAL POWER
d. Inoperative	NA	NA
e. 2-Out-Of-4 Voter	NA	NA
f. OPRM Upscale	See COLR	See COLR
3. Reactor Vessel Steam Dome Pressure - High	≤1052 psig	≤1072 psig
4. Reactor Vessel Water Level - Low, Level 3	≥159.3 in. above instrument zero*	≥157.8 in. above instrument zero
5. Main Steam Line Isolation Valve - Closure	≤8% closed	≤12% closed
6. Main Steam Line Radiation [(b)] - High	≤3.0 x full-power background	≤3.6 x full-power background
7. Drywell Pressure - High	≤1.68 psig	≤1.88 psig

* See Bases Figure B3/4 3-1.

(a) The Average Power Range Monitor Scram Function varies as a function of recirculation loop drive flow (W). ΔW is defined as the difference in indicated drive flow (in percent of drive flow which produces rated core flow) between two loop and single loop operation at the same core flow. ΔW=0 for two loop operation. ΔW=5% for single loop operation.

(b) See footnote (**) to Table 3.3.2-2 for trip setpoint during hydrogen addition test.

REACTOR PROTECTION SYSTEM INSTRUMENTATION SETPOINTS

2.2.1 (Continued)

by a significant amount, the rate of power rise is very slow. Generally, the heat flux is in near equilibrium with the fission rate. In an assumed uniform rod withdrawal approach to the trip level, the rate of power rise is not more than 5% of RATED THERMAL POWER per minute and the APRM system would be more than adequate to assure shutdown before the power could exceed the Safety Limit. The 15% neutron flux trip remains active until the mode switch is placed in the Run position.

The APRM trip system is calibrated using heat balance data taken during steady-state conditions. Fission chambers provide the basic input to the system and, therefore, the monitors respond directly and quickly to changes that result from transient operation for the case of the Fixed Neutron Flux - Upscale setpoint; i.e., for a power increase, the THERMAL POWER of the fuel will be less than that indicated by the neutron flux because of the time constants of the heat transfer associated with the fuel. For the Flow-Biased Simulated Thermal Power - Upscale setpoint, a time constant of 6 ± 0.6 seconds is introduced into the flow-biased APRM in order to simulate the fuel thermal transient characteristics. A more conservative maximum value is used for the flow-biased setpoint as shown in Table 2.2.1-1.

The APRM setpoints were selected to provide adequate margin for the Safety Limits and yet allow operating margin that reduces the possibility of unnecessary shutdown. The flow referenced Trip Setpoint must be adjusted by the specified formula in Specification 3.2.2 in order to maintain these margins when CMFLPD is greater than or equal to FRTP.

Insert (A)

3. Reactor Vessel Steam Dome Pressure - High

High pressure in the nuclear system could cause a rupture to the nuclear system process barrier resulting in the release of fission products. A pressure increase during operation will also tend to increase the power of the reactor by compressing voids, thus adding reactivity. The trip will quickly reduce the neutron flux, counteracting the pressure increase. The trip setting is slightly higher than the operating pressure to permit normal operation without spurious trips. The setting provides for a wide margin to the maximum allowable design pressure and takes into account the location of the pressure measurement compared with the highest pressure that occurs in the system during a transient. This Trip Setpoint is effective at low power/flow conditions when the turbine control valve fast closure and turbine stop valve closure trips are bypassed. For load rejection or a turbine trip under these conditions, the transient analysis indicated an adequate margin to the thermal hydraulic limit.

4. Reactor Vessel Water Level - Low

The reactor vessel water level Trip Setpoint was chosen far enough below the normal operating level to avoid spurious trips but high enough above the fuel to assure that there is adequate protection for the fuel and pressure limits.

Insert (A)

The APRM channels also include an Oscillation Power Range Monitor (OPRM) Upscale Function. The OPRM Upscale Function provides compliance with GDC 10 and GDC 12, thereby providing protection from exceeding the fuel MCPR safety limit (SL) due to anticipated thermal-hydraulic power oscillations. The OPRM Upscale trip setpoint and allowable value are maintained in the Core Operating Limits Report.

3/4.3.1 REACTOR PROTECTION SYSTEM INSTRUMENTATION

LIMITING CONDITIONS FOR OPERATION

3.3.1 As a minimum, the reactor protection system instrumentation channels shown in Table 3.3.1-1 shall be OPERABLE.

APPLICABILITY: As shown in Table 3.3.1-1.

ACTION:

a. With one channel required by Table 3.3.1-1 inoperable in one or more Functional Units, place the inoperable channel and/or that trip system in the tripped condition* within 12 hours. The provisions of Specification 3.0.4 are not applicable.

b. With two or more channels required by Table 3.3.1-1 inoperable in one or more Functional Units:

   1. Within one hour, verify sufficient channels remain OPERABLE or tripped* to maintain trip capability in the Functional Unit, and

   2. Within 6 hours, place the inoperable channel(s) in one trip system and/or that trip system** in the tripped condition*, and

   3. Within 12 hours, restore the inoperable channels in the other trip system to an OPERABLE status or tripped*.

   Otherwise, take the ACTION required by Table 3.3.1-1 for the Functional Unit.

---

* An inoperable channel or trip system need not be placed in the tripped condition where this would cause the Trip Function to occur. In these cases, if the inoperable channel is not restored to OPERABLE status within the required time, the ACTION required by Table 3.3.1-1 for the Functional Unit shall be taken.

  For Functional Units 2.a, 2.b, 2.c, and 2.d, [and 2.f] inoperable channels shall be placed in the tripped condition to comply with Action a. Because these Functional Units provide trip inputs to both trip systems, placing either trip system in trip is not applicable. For Functional Units 2.a, 2.b, 2.c, and 2.d, [and 2.f] Action b.3 applies without regard to "in the other trip systems."

** This ACTION applies to that trip system with the most inoperable channels; if both trip systems have the same number of inoperable channels, the ACTION can be applied to either trip system. Action b.2 is not applicable for Functional Units 2.a, 2.b, 2.c, and 2.d, [and 2.f]

SURVEILLANCE REQUIREMENTS

4.3.1.1 Each reactor protection system instrumentation channel shall be demonstrated OPERABLE by the performance of the CHANNEL CHECK, CHANNEL FUNCTIONAL TEST, and CHANNEL CALIBRATION operations for the OPERATIONAL CONDITIONS and at the frequencies shown in Table 4.3.1.1-1.

4.3.1.2 LOGIC SYSTEM FUNCTIONAL TESTS and simulated automatic operation of all channels shall be performed at least once per 18 months, except Table 4.3.1.1-1, Functions 2.a, 2.b, 2.c, 2.d, and 2.e. Functions 2.a, 2.b, 2.c, and 2.d do not require LOGIC SYSTEM FUNCTIONAL TESTS. For Function 2.e, tests shall be performed at least once per 24 months. LOGIC SYSTEM FUNCTIONAL TEST for Function 2.e includes simulating APRM trip conditions at the APRM channel inputs to the voter channel to check all combinations of two tripped inputs to the 2-out-of-4 voter logic in the voter channels.

and 2.f

and OPRM

4.3.1.3 The REACTOR PROTECTION SYSTEM RESPONSE TIME of each required reactor trip functional unit shall be demonstrated to be within its limit at least once per 18 months. Neutron detectors, Functions 2.a, 2.b, 2.c, 2.d, and Function 2.e digital electronics are exempt from response time testing. Each test shall include at least one channel per Trip System so that all channels are tested at least once per N times 18 months, where N is the total number of redundant channels in a specific reactor Trip System.

and 2.f

TABLE 3.3.1-1

REACTOR PROTECTION SYSTEM INSTRUMENTATION

FUNCTIONAL UNIT	APPLICABLE OPERATIONAL CONDITIONS	MINIMUM OPERABLE CHANNELS PER TRIP SYSTEM (a)	ACTION
1. Intermediate Range Monitors:			
a. Neutron Flux - High	2 3, 4 5(b)	3 3 3	1 2 3
b. Inoperative	2 3, 4 5	3 3 3	1 2 3
2. Average Power Range Monitor(c):			
a. Neutron Flux - Upscale, Setdown	2 5(k)	3(l) 3(l)	1 3
b. Flow Biased Simulated Thermal Power - Upscale	1	3(l)	4
c. Fixed Neutron Flux - Upscale	1	3(l)	4
d. Inoperative	1, 2 5(k)	3(l) 3(l)	1 3
e. 2-Out-Of-4 Voter	1, 2 5(k)	2 2	1 3
f. OPRM Upscale	1(m)	3(l)	10
3. Reactor Vessel Steam Dome Pressure - High	1, 2(d)	2	1
4. Reactor Vessel Water Level - Low, Level 3	1, 2	2	1

TABLE 3.3.1-1 (Continued)

REACTOR PROTECTION SYSTEM INSTRUMENTATION

TABLE NOTATIONS

(a) A channel may be placed in an inoperable status for up to 6 hours for required surveillance without placing the Trip System in the tripped condition provided at least one OPERABLE channel in the same Trip System is monitoring that parameter.

(b) Unless adequate shutdown margin has been demonstrated per Specification 3.1.1, and the Refuel position one-rod-out interlock is OPERABLE per Specification 3.9.1, the shorting links shall be removed from the RPS circuitry prior to and during the time any control rod is withdrawn.*

Deleted

(c) An APRM channel is inoperable if there are less than 3 LPRM inputs per level or less than 20 LPRM inputs to an APRM channel.

(d) This function is not required to be OPERABLE when the reactor pressure vessel head is removed per Specification 3.10.1.

(e) This function shall be automatically bypassed when the reactor mode switch is not in the Run position.

(f) This function is not required to be OPERABLE when PRIMARY CONTAINMENT INTEGRITY is not required.

(g) Also actuates the standby gas treatment system.

(h) With any control rod withdrawn. Not applicable to control rods removed per Specification 3.9.10.1 or 3.9.10.2.

(i) This function shall be automatically bypassed when turbine first stage pressure is less than or equal to 136.4** psig, equivalent to THERMAL POWER less than 30% of RATED THERMAL POWER.

(j) Also actuates the EOC-RPT system.

(k) Required to be OPERABLE only during shutdown margin demonstrations performed per Specification 3.10.3.

(l) Since each APRM provides inputs to both trip systems, the minimum operable channels specified in Table 3.3.1-1 are the total APRM channels required (i.e., it is not on a trip system basis). The 6 hour allowed test time to complete a channel surveillance test (Note (a) above) is applicable provided at least two OPERABLE channels are monitoring that parameter.

(m) This function shall be automatically enabled when APRM Simulated Thermal Power is ≥ 30% and recirculation drive flow is < 60% of rated recirculation drive flow

* Not required for control rods removed per Specification 3.9.10.1 or 3.9.10.2.

** To allow for instrument accuracy, calibration and drift, a setpoint of less than or equal to 125.8 psig turbine first stage pressure shall be used.

TABLE 3.3.1-1 (Continued)

REACTOR PROTECTION SYSTEM INSTRUMENTATION

ACTION

ACTION 1 - Be in at least HOT SHUTDOWN within 12 hours.

ACTION 2 - Verify all insertable control rods to be inserted in the core and lock the reactor mode switch in the Shutdown position within 1 hour.

ACTION 3 - Suspend all operations involving CORE ALTERATIONS and insert all insertable control rods within 1 hour.

ACTION 4 - Be in at least STARTUP within 6 hours.

ACTION 5 - Be in STARTUP with the main steam line isolation valves closed within 6 hours or in at least HOT SHUTDOWN within 12 hours.

ACTION 6 - Initiate a reduction in THERMAL POWER within 15 minutes and reduce turbine first stage pressure to less than or equal to 136.4* psig, equivalent to THERMAL POWER less than 30% of RATED THERMAL POWER, within 2 hours. (1)

ACTION 7 - Verify all insertable control rods to be inserted within 1 hour.

ACTION 8 - Lock the reactor mode switch in the Shutdown position within 1 hour.

ACTION 9 - Suspend all operations involving CORE ALTERATIONS, and insert all insertable control rods and lock the reactor mode switch in the SHUTDOWN position within 1 hour.

ACTION 10 - Initiate alternate method to detect and suppress thermal-hydraulic instability oscillations within 12 hours AND restore required channels to OPERABLE status within 120 days

* To allow for instrument accuracy, ~~calibration~~ or calibration, and drift, a setpoint of less than or equal to 125.8 psig turbine first-stage pressure shall be used. (1)

Be in at least HOT SHUTDOWN within 12 hours

TABLE 4.3.1.1-1

REACTOR PROTECTION SYSTEM INSTRUMENTATION SURVEILLANCE REQUIREMENTS

FUNCTIONAL UNIT	CHANNEL CHECK	CHANNEL FUNCTIONAL TEST	CHANNEL CALIBRATION(a)	OPERATIONAL CONDITIONS FOR WHICH SURVEILLANCE REQUIRED
1. Intermediate Range Monitors:				
a. Neutron Flux - High	S/U, S,(b) S	S/U(c), W, R(d) W	R R	2 3, 4, 5
b. Inoperative	NA	W	NA	2, 3, 4, 5
2. Average Power Range Monitor(e):				
a. Neutron Flux - Upscale, Setdown	D, (b) D	SA(i) SA	R R	2 5(n)
b. Flow-Biased Simulated Thermal Power - Upscale	D	SA(h)	W(g), R(f)	1
c. Fixed Neutron Flux - Upscale	D	SA	W(g), R	1
d. Inoperative	NA	SA	NA	1, 2, 5(n)
e. 2-Out-Of-4 Voter	D	SA	NA	1, 2, 5(n)
f. OPRM Upscale	D	SA(q)	R(p)	1(o)
3. Reactor Vessel Steam Dome Pressure - High	S	Q	R(k)	1, 2
4. Reactor Vessel Water Level - Low, Level 3	S	Q	R(k)	1, 2
5. Main Steam Line Isolation Valve - Closure	NA	Q	R	1
6. Main Steam Line Radiation - High	S	Q	R	1, 2(j)
7. Drywell Pressure - High	S	Q	R(k)	1, 2(l)

TABLE 4.3.1.1-1 (Continued)

REACTOR PROTECTION SYSTEM INSTRUMENTATION SURVEILLANCE REQUIREMENTS

TABLE NOTATIONS

(a) Neutron detectors may be excluded from CHANNEL CALIBRATION.

(b) The IRM and SRM channels shall be determined to overlap for at least 1/2 decade during each startup after entering OPERATIONAL CONDITION 2, and the IRM and APRM channels shall be determined to overlap for at least 1/2 decade during each controlled shutdown, if not performed within the previous 7 days.

(c) Within 24 hours before startup, if not performed within the previous 7 days.

(d) Perform a CHANNEL FUNCTIONAL TEST with the mode switch in Startup/Hot Standby and the plant in the COLD SHUTDOWN or REFUEL Condition.

(e) The LPRMs shall be calibrated at least once per 1000 effective full-power hours (EFPH) using the TIP system.

(f) Calibration includes the flow input function. (1)

(g) This calibration shall consist of the adjustment of the APRM channel to conform to the power values calculated by a heat balance during OPERATIONAL CONDITION 1 when THERMAL POWER ≥25% of RATED THERMAL POWER. Adjust the APRM channel if the absolute difference is greater than 2% of RATED THERMAL POWER. Any APRM channel gain adjustment made in compliance with Specification 3.2.2 shall not be included in determining the absolute difference.

(h) CHANNEL FUNCTIONAL TEST shall include the flow input function, excluding the flow transmitter.

(i) Not required to be performed when entering Mode 2 from Mode 1 until 12 hours after entering Mode 2.

(j) This function is not required to be OPERABLE when the reactor pressure vessel head is removed per Specification 3.10.1.

(k) Perform the calibration procedure for the trip unit setpoint at least once per 92 days.

(l) This function is not required to be OPERABLE when PRIMARY CONTAINMENT INTEGRITY is not required to be OPERABLE per Special Test Exception 3.10.1.

(m) With any control rod withdrawn. Not applicable to control rods removed per Specification 3.9.10.1 or 3.9.10.2.

(n) Required to be OPERABLE only during shutdown margin demonstrations performed per Specification 3.10.3.

Insert (B)

Insert B

(o) This function shall be automatically enabled when APRM Simulated Thermal Power is ≥30% and recirculation drive flow is <60% of rated recirculation drive flow.

(p) Calibration includes verification that the OPRM Upscale trip is not bypassed when APRM Simulated Thermal Power is ≥30% and recirculation drive flow is <60% of rated recirculation drive flow. No test signal will be injected for the purpose of testing the algorithm. Calibration of the OPRM will consist of verification of OPRM upscale setpoints in the APRM instrument by the review of the "Show Parameters" display.

(q) No test signal will be injected during performance of this test. Functional testing of the OPRM will consist of toggling the appropriate outputs of the APRM instrument only.

3/4.4 REACTOR COOLANT SYSTEM

3/4.4.1 RECIRCULATION SYSTEM

RECIRCULATION LOOPS

LIMITING CONDITIONS FOR OPERATION

3.4.1.1 Two reactor coolant system recirculation loops shall be in operation with:

a. Total core flow greater than or equal to 45% of rated core flow, or
b. THERMAL POWER within the unrestricted zone of Figure 3.4.1.1-1.

APPLICABILITY: OPERATIONAL CONDITIONS 1* AND 2*.

ACTION:

a. With one reactor coolant system recirculation loop not in operation:

1. Within four hours:

a) Place the recirculation flow control system in the Loop Manual (Position Control) mode, and

b) Reduce THERMAL POWER to ≤70% of RATED THERMAL POWER, and,

c) Increase the MINIMUM CRITICAL POWER RATIO (MCPR)*** Safety Limit by 0.01 to 1.10 per Specification 2.1.2, and,

d) Reduce the Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) limit per Specification 3.2.1, and,

e) Reduce the Average Power Range Monitor (APRM) Scram and Rod Block and Rod Block Monitor Trip Setpoints and Allowable Values to those applicable for single recirculation loop operation per Specifications 2.2.1, 3.2.2 and 3.3.6.

f) Reduce the volumetric drive flow rate of the operating recirculation loop to ≤41,800** gpm.

* See Special Test Exception 3.10.4.

** This value represents the volumetric recirculation loop drive flow which produces 100% core flow at 100% THERMAL POWER.

*** MCPR values are applicable to Cycle 7 operation only.

LIMITING CONDITIONS FOR OPERATION (Continued)

g) Perform Surveillance Requirement 4.4.1.1.2 if THERMAL POWER is ≤ 30%* of RATED THERMAL POWER or the jet pump loop flow in the operating loop is ≤ 50%* of rated jet pump loop flow.

2. The provisions of Specification 3.0.4 are not applicable.

3. Otherwise be in at least HOT SHUTDOWN within the next 12 hours.

b. With no reactor coolant system recirculation loops in operation, immediately initiate action to reduce THERMAL POWER such that it is not within the restricted zone of Figure 3.4.1.1-1 within two hours, and initiate measures to place the unit in at least STARTUP within six hours and in HOT SHUTDOWN within the next six hours.

c. With one or two reactor coolant system recirculation loops in operation and total core flow less than 45% but greater than 39%** of rated core flow and THERMAL POWER within the restricted zone of Figure 3.4.1.1-1:

1. Determine the APRM and LPRM*** noise levels per Specification 4.4.1.1.1:

a) At least once per eight hours, and

b) Within 30 minutes after the completion of a THERMAL POWER increase of at least 5% of RATED THERMAL POWER.

2. With the APRM or LPRM*** neutron flux noise levels greater than three times their established baseline noise levels, within 15 minutes initiate corrective action to restore the noise levels within the required limits within two hours by increasing core flow or by reducing THERMAL POWER.

d. With one or two reactor coolant system recirculation loops in operation and total core flow ≤ 39%** and THERMAL POWER within the restricted zone of Figure 3.4.1.1-1, within 15 minutes initiate corrective action to reduce THERMAL POWER to within the unrestricted zone of Figure 3.4.1.1-1 or increase core flow to > 39%** within 4 hours.

---

* Final values were determined during Startup Testing based upon the actual THERMAL POWER and jet pump loop flow which will sweep the cold water from the vessel bottom head preventing stratification.

** Core flow which is equivalent to minimum core flow for 2 recirculation pumps at high speed with minimum flow control valve position.

*** Detector levels A and C of one LPRM string per core octant plus detectors A and C of one LPRM string in the center of the core should be monitored.

REACTOR COOLANT SYSTEM

RECIRCULATION SYSTEM

RECIRCULATION LOOPS

SURVEILLANCE REQUIREMENTS

4.4.1.1.1 With one reactor coolant system recirculation loop not in operation, at least once per 12 hours verify that:

a. Reactor THERMAL POWER is ≤ 70% of RATED THERMAL POWER,

b. The recirculation flow control system is in the Loop Manual (Position Control) mode,

c. The volumetric drive flow rate of the operating loop is ≤ 41,800 gpm,* and

d. Core flow is > 39%** when THERMAL POWER is within the restricted zone of Figure 3.4.1.1-1.

4.4.1.1.2 With one reactor coolant system recirculation loop not in operation, within no more than 15 minutes prior to either THERMAL POWER increase or jet pump loop flow increase, verify that the following differential temperature requirements are met if THERMAL POWER is ≤ 30%** of RATED THERMAL POWER or the recirculation jet pump loop flow in the operating recirculation loop is ≤ 50%** of rated jet pump loop flow:

a. ≤ 145°F between reactor vessel steam space coolant and bottom head drain line coolant,

b. ≤ 50°F between the reactor coolant within the loop not in operation and the coolant in the reactor pressure vessel, and

c. ≤ 50°F between the reactor coolant within the loop not in operation and the operating loop.

The differential temperature requirements of Specification 4.4.1.1.2 b. and c. do not apply when the loop not in operation is isolated from the reactor pressure vessel.

---

* This value represents the volumetric recirculation loop drive flow which produces 100% core flow at 100% THERMAL POWER.

** Core flow which is equivalent to minimum core flow for 2 recirculation pumps at high speed with minimum flow control valve position.

** Final values were determined during Startup Testing based upon the actual THERMAL POWER and jet pump loop flow which will sweep the cold water from the vessel bottom head preventing stratification.

SURVEILLANCE REQUIREMENTS (Continued)

4.4.1.1.3 Each reactor coolant system recirculation loop flow control valve shall be demonstrated OPERABLE at least once per 18 months by:

a. Verifying that the control valve fails "as is" on loss of hydraulic pressure at the hydraulic control unit, and

b. Verifying that the average rate of control valve movement is:

1. Less than or equal to 11% of stroke per second opening, and

2. Less than or equal to 11% of stroke per second closing.

4.4.1.1.4 Establish a baseline APRM and LPRM* neutron flux noise value within the regions for which monitoring is required per Specification 3.4.1.1, ACTION c, within two hours of entering the region for which monitoring is required unless baselining has previously been performed in the region since the last refueling outage.

* Detector levels A and C of one LPRM string per core octant plus detectors A and C of one LPRM string in the center of the core should be monitored.

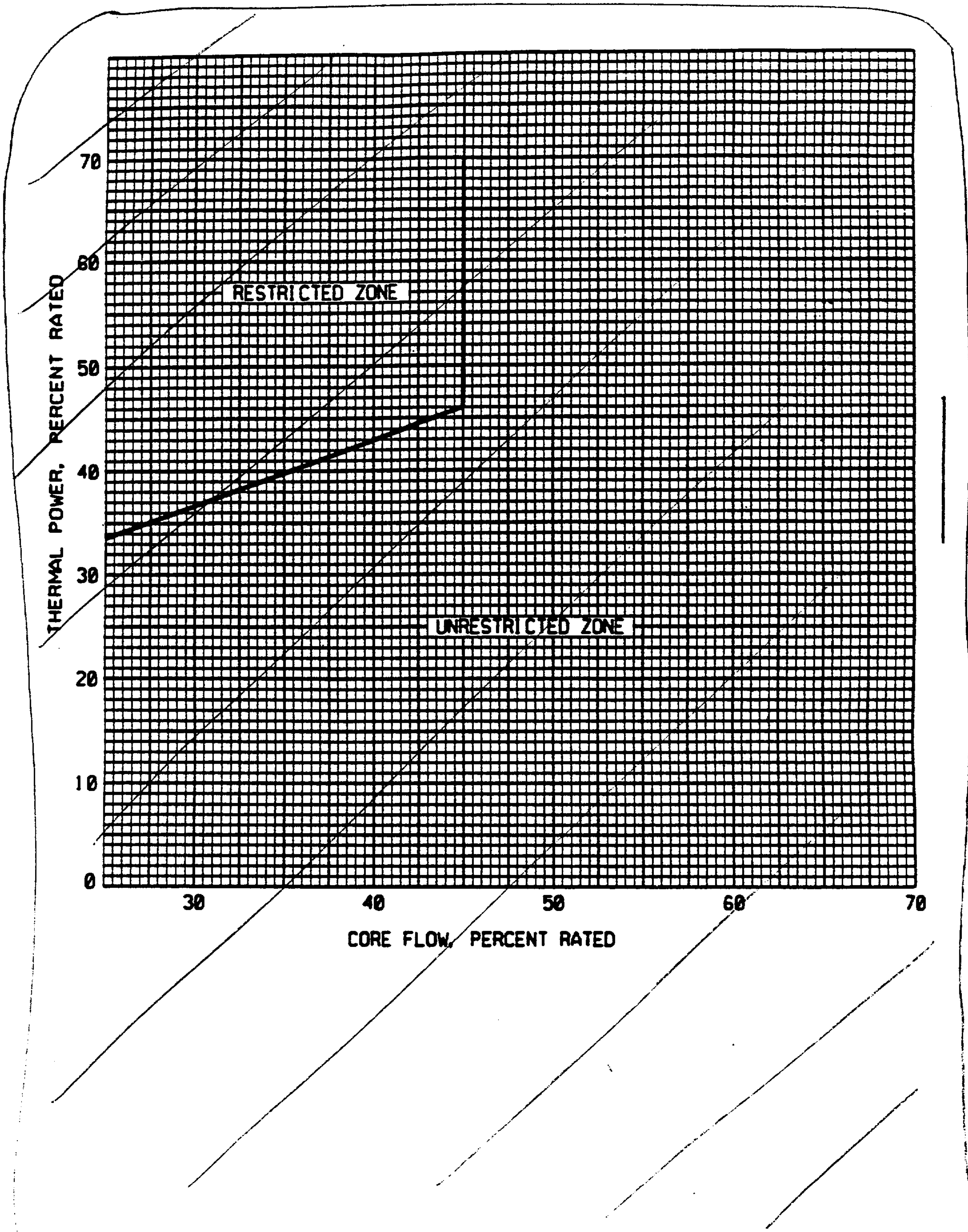

FIGURE 3.4.1.1-1 PERCENT OF RATED CORE THERMAL POWER VS. PERCENT OF RATED CORE FLOW

3/4.3.1 REACTOR PROTECTION SYSTEM INSTRUMENTATION

The reactor protection system (RPS) automatically initiates a reactor scram to:

a. Preserve the integrity of the fuel cladding.

b. Preserve the integrity of the reactor coolant system.

c. Minimize the energy which must be adsorbed following a loss-of-coolant accident, and

d. Prevent inadvertent criticality.

Insert (C)

This specification provides the Limiting Conditions for Operation necessary to preserve the ability of the system to perform its intended function even during periods when instrument channels may be out of service because maintenance is being performed. When necessary, one channel may be made inoperable for brief intervals to conduct required surveillance.

The reactor protection system is made up of two independent trip systems. There are usually four channels to monitor each parameter, and there are two channels in each trip system. The outputs of the channels in a trip system are combined in a logic so that either channel will trip that trip system. The tripping of both trip systems will produce a reactor scram. The APRM system is divided into four APRM channels and four 2-out-of-4 voter channels. Each APRM channel provides inputs to each of the four voter channels. The four voter channels are divided into two groups of two each, with each group of two providing inputs to one RPS trip system. The system is designed to allow one APRM channel, but no voter channels, to be bypassed. Note (l) to Table 3.3.1-1 states that the Minimum Operable Channels in Table 3.3.1-1 for the APRM Functional Units (except the 2-out-of-4 voter Functional Unit) are the total number of APRM channels required and are not on a trip system basis. Therefore, when only one required APRM is inoperable, Action a is the only Action required to be entered. This Action requires the APRM to be restored to operable status or placed in the tripped condition within 12 hours. As stated in Action a, footnote *, placing either trip system in trip is not applicable since the APRM channels are not on a trip system basis. When two or more required APRMs are inoperable, Action b is entered. Action b.1 requires verification of trip capability in the affected functional unit within one hour (i.e., one APRM operable and one APRM in the tripped condition). Action b.2, as stated in footnote **, is not applicable since the APRM channels are not on a trip system basis. Action b.3 requires that the remaining required inoperable APRM be restored to operable status within 12 hours.

The system meets the intent of IEEE-279 for nuclear power plant protection systems. Specified surveillance intervals and surveillance and maintenance outage times have been determined in accordance with NEDC-30851P-A, "Technical Specification Improvement Analyses for BWR Reactor Protection System," and NEDC-32410P-A, "Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC-PRNM) Retrofit Plus Option III Stability Trip Function." The bases for the trip settings of the RPS are discussed in the bases for Specification 2.2.1. When a channel is placed in an inoperable status solely for performance of required surveillances, entry into LCO and required ACTIONS may be delayed, provided the associated function maintains RPS trip capability.

and NEDC-32410P-A, Supplement 1, "Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Plus Option III Stability Trip Function."

(Insert C)

Requiring three of the four APRM channels and all four of the voter channels to be OPERABLE ensures that no single failure will preclude a scram on a valid signal. The voter includes separate outputs to RPS for the two independently voted sets of Functions, each of which is redundant (four total outputs). The voter Function 2.e must be declared inoperable if any of its functionality is inoperable. However, due to the independent voting of APRM trips, and the redundancy of outputs, there may be conditions where the voter Function 2.e is inoperable, but trip capability for one or more of the other APRM Functions through that voter is still maintained. This may be considered when determining the condition of other APRM Functions resulting from partial inoperability of the Voter Function 2.e. In addition, to provide adequate coverage of the entire core, consistent with the design bases for the APRM Functions 2.a, 2.b, and 2.c, at least 20 LPRM inputs, with at least 3 LPRM inputs from each of the four axial levels at which the LPRMs are located, must be operable for each APRM channel.

The APRM channels includes an Oscillation Power Range Monitor (OPRM) Upscale Function. NEDO-31960-A, "BWR Owners' Group Long-Term Stability Solutions Licensing Methodology," November 1995, and NEDO-31960-A, Supplement 1, "BWR Owners' Group Long-Term Stability Solutions Licensing Methodology," November 1995, plus NEDO-32465-A, "Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology for Reload Applications," (August 1996), describe three algorithms for detecting thermal-hydraulic instability related neutron flux oscillations: the period based detection algorithm, the amplitude based algorithm, and the growth rate algorithm. All three are implemented in the OPRM Upscale Function, but the safety analysis takes credit only for the period based detection algorithm. The remaining algorithms provide defense in depth and additional protection against unanticipated oscillations. OPRM Upscale Function operability for Technical Specification purposes is based only on the period based detection algorithm.

The OPRM Upscale Function receives input signals from the local power range monitors (LPRMs) within the reactor core, which are combined into "cells" for evaluation by the OPRM algorithms. The OPRM Upscale Function is required to be OPERABLE when the plant is in OC1. In OC1, the automatic trip is enabled when THERMAL POWER, as indicated by the APRM Simulated Thermal Power, is ≥30% RTP and reactor core flow, as indicated by recirculation drive flow, is <60% of rated flow, the operating region where actual thermal-hydraulic oscillations may occur. Requiring OPRM operability in OC1 provides adequate margin to cover the operating region where oscillations may occur as well as the operating regions from which the plant might enter the potential instability region without operator action.

The OPRM Upscale trip is issued from an APRM channel when the period based detection algorithm in that channel detects oscillatory changes in the neutron flux, indicated by the combined signals of the LPRM detectors in a cell, with period confirmations and relative cell amplitude exceeding specified setpoints. One or more OPRM cells in a channel exceeding the trip conditions will result in a channel trip. An OPRM Upscale trip is also issued from the channel if either the growth rate or amplitude based algorithms detect growing oscillatory changes in the neutron flux for one or more cells in that channel. Each channel is capable of detecting neutron flux oscillations indicative of thermal-hydraulic instabilities, by detecting the related neutron flux oscillations, and issuing a trip signal before the MCPR Safety Limit is exceeded.

APRM trip Functions 2.a, 2.b, 2.c, and 2.d are voted independently from OPRM Upscale Function 2.f. Therefore, any Function 2.a, 2.b, 2.c, or 2.d trip from any two unbypassed APRM channels will result in a full trip in each of the four voter channels, which in turn results in two trip inputs into each RPS trip system. Similarly, a Function 2.f trip from any two unbypassed APRM channels will result in a full trip from each of the four voter channels. For the OPRM Upscale, Function 2.f, LPRMs are assigned to "cells" of 4 detectors. A minimum of 21 cells, each with a minimum of 2 LPRMs, must be OPERABLE for the OPRM Upscale Function 2.f to be OPERABLE.

3/4.4 REACTOR COOLANT SYSTEM

BASES

3/4.4.1 RECIRCULATION SYSTEM

The impact of single recirculation loop operation upon plant safety is assessed and shows that single-loop operation is permitted if the MCPR fuel cladding safety limit is increased as noted by Specification 2.1.2, APRM scram and control rod block setpoints are adjusted as noted in Tables 2.2.1-1 and 3.3.6-2, respectively, MAPLHGR limits are decreased by the factor given in Specification 3.2.1, and MCPR operating limits are adjusted per Section 3/4.2.3.

Additionally, surveillance on the volumetric drive flow rate of the operating recirculation loop is imposed to exclude the possibility of excessive core internals vibration. Drive flow is the flow rate for the recirculation pump in the operating loop. The surveillance on differential temperatures below 30% THERMAL POWER or 50% rated jet pump loop flow is to mitigate the undue thermal stress on vessel nozzles, recirculation pump and vessel bottom head during the extended operation of the single recirculation loop mode. Jet pump loop flow is the sum of the flows through the 10 jet pumps in one loop. Core flow is the sum of the two jet pump loop flows.

The objective of GE BWR plant and fuel design is to provide stable operation with margin over the normal operating domain. However, at the high-power/low-flow corner of the operating domain, a small probability of limit cycle neutron flux oscillations exists, depending on combinations of operating conditions (e.g., rod pattern, power shape). To provide assurance that neutron flux limit cycle oscillations are detected and suppressed, APRM and LPRM neutron flux noise levels should be monitored while operating in this region.

Stability tests at operating BWRs were reviewed to determine a generic region of the power/flow map in which surveillance of neutron flux noise levels should be performed. A conservative decay ratio of 0.6 was chosen as the basis for determining the generic region for surveillance to account for the plant-to-plant variability of decay ratio with core and fuel designs. This generic region has been determined to correspond to a core flow of less than or equal to 45% of rated core flow and a THERMAL POWER greater than that specified in Figure 3.4.1.1-1.

Plant-specific calculations can be performed to determine an applicable region for monitoring neutron flux noise levels. In this case, the degree of conservatism can be reduced since plant-to-plant variability would be eliminated. In this case, adequate margin will be assured by monitoring the region which has a decay ratio greater than or equal to 0.8.

Neutron flux noise limits are also established to ensure early detection of limit cycle neutron flux oscillations. BWR cores typically operate with neutron flux noise caused by random boiling and flow noise. Typical neutron

REACTOR COOLANT SYSTEM

BASES

RECIRCULATION SYSTEM

3/4.4.1 (continued)

flux noise levels between 1% and 12% of rated power (peak-to-peak) have been reported for the range of low to high recirculation loop flow during both single and dual recirculation loop operation. Neutron flux noise levels which significantly bound these values are considered in the thermal/mechanical design of GE BWR fuel and are found to be of negligible consequence. In addition, stability tests at operating BWRs have demonstrated that when stability-related neutron flux limit cycle oscillations occur, they result in peak-to-peak neutron flux limit cycles of 5 to 10 times the typical values. Therefore, actions taken to reduce neutron flux noise levels exceeding three times the typical value are sufficient to ensure early detection of limit cycle neutron flux oscillations.

Typically, neutron flux noise levels show a gradual increase in absolute magnitude as core flow is increased (constant control rod pattern) with two reactor recirculation loops in operation. Therefore, the baseline neutron flux noise level obtained at a specified core flow can be applied over a range of core flows. To maintain a reasonable variation between the low-flow and high-flow end of the flow range, the range over which a specific baseline is applied should not exceed 20% of rated core flow with two recirculation loops in operation. Data from tests and operating plants indicate that a range of 20% of rated core flow will result in approximately a 50% increase in neutron flux noise level during operation with two recirculation loops. Baseline data should be taken near the maximum rod line at which the majority of operation will occur. However, baseline data taken at lower rod lines (i.e., lower power) will result in a conservative value since the neutron flux noise level is proportional to the power level at a given core flow.

An inoperable jet pump is not, in itself, a sufficient reason to declare a recirculation loop inoperable, but it does, in case of a design-basis accident, increase the blowdown area and reduce the capability of reflooding the core; thus, the requirement for shutting down the facility when a jet pump is inoperable. Jet pump failure can be detected by monitoring jet pump performance on a prescribed schedule for significant degradation.

Jet pump loop flow mismatch limits are in compliance with the ECCS LOCA analysis design criteria for two recirculation loop operation. The limits will ensure an adequate core flow coastdown from either recirculation loop after a LOCA. In the case where the mismatch limits cannot be maintained during two loop operation, continued operation is permitted in a single recirculation loop mode.

In order to prevent undue stress on the vessel nozzles and bottom head region, the recirculation loop temperatures shall be within 50°F of each other before startup of an idle loop. The loop temperature must also be within 50°F of the reactor pressure vessel coolant teamperature to prevent thermal shock to the

SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

6.9.1.8 (Continued)

The Semiannual Radioactive Effluent Release Reports shall include any changes made during the reporting period to the PROCESS CONTROL PROGRAM (PCP) and to the OFFSITE DOSE CALCULATION MANUAL (ODCM), pursuant to Specifications 6.13 and 6.14, respectively, as well as any major change to liquid, gaseous, or solid radwaste treatment systems pursuant to Specification 6.15. It shall also include a listing of new locations for dose calculations and/or environmental monitoring identified by the land use census pursuant to Specification 3.12.2.

The Semiannual Radioactive Effluent Release Reports shall also include the following: an explanation of why the inoperability of liquid or gaseous effluent monitoring instrumentation was not corrected within the time specified in Specification 3.3.7.9 or 3.3.7.10, respectively, and a description of the events leading to liquid holdup tanks exceeding the limits of Specification 3.11.1.4.

CORE OPERATING LIMITS REPORT

6.9.1.9

a. Core operating limits shall be established prior to each reload cycle, or prior to any remaining portion of a reload cycle for the following:

   1) The AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR) for Specification 3.2.1.

   2) The Average Power Range Monitor (APRM) flow-biased simulated thermal power-upscale scram trip setpoint for Specification 3.2.2.

   3) The K_f core flow adjustment factor for Specification 3.2.3.

   4) The MINIMUM CRITICAL POWER RATIO (MCPR) for Specification 3.2.3.

   5) The LINEAR HEAT GENERATION RATE (LHGR) for Specification 3.2.4.

   6) Control Rod Block Instrumentation Setpoint for the rod block monitor upscale trip setpoint and allowable value for Specification 3.3.6.

   7) Oscillation Power Range Monitor Upscale for Table 2.2.1-1

and shall be documented in the CORE OPERATING LIMITS REPORT.

b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, specifically those described in the following document, s

(1)

CORE OPERATING LIMITS REPORT

6.9.1.9 (Continued)

1) The GESTR-LOCA and SAFER Models of the Evaluation of the Loss-of-Coolant Accident - SAFER/GESTR Application Methodology, NEDE-23785-1-PA, latest approved revision.

2) General Electric Standard Application for Reactor Fuel, NEDE-24011-P-A-US, latest approved revision.

3) NEDO-32465 - Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology for Reload Applications, August 1996

c. The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal-mechanical limits, core thermal-hydraulic limits, ECCS limits, nuclear limits such as shutdown margin, transient analysis limits, and accident analysis limits) of the safety analysis are met.

d. The CORE OPERATING LIMITS REPORT, including any mid-cycle revisions or supplements shall be provided, upon issuance for each reload cycle, to the NRC Document Control Desk with copies to the Regional Administrator and Resident Inspector.

SPECIAL REPORTS

6.9.2. Special reports shall be submitted in accordance with 10 CFR 50.4 within the time period specified for each report.

6.10 RECORD RETENTION

6.10.1 In addition to the applicable record retention requirements of Title 10, of the Code of Federal Regulations (10 CFR), the following records shall be retained for at least the minimum period indicated.

6.10.1.1 The following records shall be retained for at least 5 years:

a. Records and logs of unit operation covering time interval at each power level

b. Records and logs of principal maintenance activities, inspections, repair, and replacement of principal items of equipment related to nuclear safety

c. All REPORTABLE EVENTS submitted to the Commission

d. Records of surveillance activities, inspections, and calibrations required by these Technical Specifications

e. Records of changes made to the procedures required by Specification 6.8.1

f. Records of radioactive shipments

g. Records of sealed source and fission detector leak tests and results

h. Records of annual physical inventory of all sealed source material of record

ATTACHMENT D

NIAGARA MOHAWK POWER CORPORATION

LICENSE NO. NPF-69

DOCKET NO. 50-410

Eligibility for Categorical Exclusion from Performing an Environmental Assessment

10 CFR 51.22 provides criteria for, and identification of, licensing and regulatory actions eligible for exclusion from performing an environmental assessment. Niagara Mohawk Power Corporation (NMPC) has reviewed the proposed amendment and determined that it does not involve a significant hazards consideration, and there will be no significant change in the types or a significant increase in the amounts of any effluents that may be released offsite; nor will there be any significant increase in individual or cumulative occupational radiation exposure. Therefore, the proposed amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9) and, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment is required to be prepared in connection with this license amendment application.

ATTACHMENT E

NIAGARA MOHAWK POWER CORPORATION

LICENSE NO. NPF-69

DOCKET NO. 50-410

OPRM CORNER FREQUENCY, PERIOD TOLERANCE, AND MAXIMUM PERIOD DISCUSSION, PROPOSED SETPOINT RANGE REVISIONS, AND ASSOCIATED JUSTIFICATIONS

Background

Licensing Topical Report (LTR) NEDO-32465-A, "Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology for Reload Applications" describes the licensing basis methodology for the Option III long term stability solution. The licensing basis for this solution is the period based algorithm (PBA) which relies on the fact that OPRMs, composed of cells of closely spaced local power range monitors (LPRMs), can be used to distinguish between thermal-hydraulic instabilities and stable reactor operation. During normal, steady-state reactor operation, LPRM signals are comprised of a broad range of frequencies that are typically present in a boiling water reactor (BWR). These LPRM signals become more coherent displaying a characteristic frequency in the 0.3 to 0.7 Hertz (Hz) range with the onset of thermal-hydraulic instability. The PBA uses the difference in LPRM signal coherence to detect instabilities. The coherence persists when signals from closely spaced LPRMs are combined in OPRM cells.

Specifically, the OPRM combines signals from LPRMs assigned to the OPRM cell and determines each successive pair of OPRM cell maxima and minima. If the maxima/minima have a frequency in the range of 0.3 to 0.7 Hz, the base period is set. If the subsequent maxima/minima occurs within a specified tolerance band of the base period, the oscillation is considered to be a single period confirmation. Subsequent maxima/minima which fall within the specified base period tolerance range cause the PBA consecutive period confirmation (CPC) counter to be incremented by one. This process continues until a maxima/minima is found to be outside the specified base period tolerance range, at which time the CPC counter is reset to zero. The CPC count prior to resetting is termed the maximum consecutive period confirmation (MCPC) count.

During normal plant operation with large stability margin, non-zero CPC count values are expected due to the random nature of normal neutron flux noise. As shown in the data in Table 1, the largest frequency of occurrence is a MCPC of 1, with rapidly decreasing frequency of occurrence of higher MCPC counts. The OPRM tuning process, the results of which are discussed in the paragraphs that follow, is intended to optimize the setting values of various OPRM tuning parameters so that the PBA is sufficiently sensitive to detect actual core oscillations while not tripping on normal neutron flux noise.

LTR NEDO-32465-A (Section 3.4.1) describes the acceptable range of values for two OPRM parameters, period tolerance and corner frequency. Both of these parameters can be independently adjusted to tune the OPRM to each plant's unique LPRM noise characteristics. Within the ranges defined for these parameters, the OPRM will provide sufficient CPCs to detect thermal-hydraulic instabilities prior to reaching the PBA amplitude trip setpoint. The ranges presented in NEDO-32465-A were based upon testing the PBA using data taken with analog LPRM signals from several different plants. A range for each OPRM setpoint value was defined to ensure that the OPRM is sensitive enough to detect an instability as it develops at low amplitudes while allowing utilities the flexibility to adjust the OPRM response to their plant's noise characteristics during steady-state operation. The adjustments to account for noise characteristics are necessary to avoid spurious alarms and reactor scrams. Normal operational LPRM signals are viewed by the OPRM as a distribution of MCPCs. The OPRM is tuned based on the MCPC distribution under plant operating conditions that have significant stability margin (i.e., near or at rated conditions). Based upon tuning criteria proposed by GE, the NMP2 OPRM setpoints as discussed below provide more than adequate sensitivity.

NMP2 Specific Information

Based on OPRM data collected during Cycle 7, it is apparent that the OPRM is too sensitive when the least sensitive setpoints defined in Table 3-1 of LTR NEDO-32465-A are used (i.e., period tolerance of 100 milliseconds and corner frequency of 2.5 Hz). However, the OPRM design of the PRNM system allows the OPRM period tolerance and corner frequency to be set to less sensitive values than those defined in the LTR, i.e., the hardware allows values from 50 to 300 milliseconds and 1.0 to 3.0 Hz, respectively, in the LTR. NMP2 testing indicates that the OPRM more closely meets the GE tuning criteria under normal operating conditions if a period tolerance of 50 milliseconds and corner frequency of 3.0 Hz are allowed to be utilized.

The maximum oscillation period (T_{max}) is the largest expected period which the OPRM would sense if a reactor instability was present. For example, if the time between successive LPRM signal maxima/minima is greater than T_{max}, the oscillation is not indicative of an anticipated reactor instability. LTR NEDO-32465-A (Section 4.3.2.4) states that studies of actual instability events indicate that the expected period is approximately 1.8 to 2.0 seconds. However, it is desirable to consider an oscillation frequency between 0.3 and 0.7 Hz for conservatism. This corresponds to a T_{max} value of approximately 3.3 seconds. The OPRM design allows this parameter to be set in the range of 3.0 to 5.0 seconds. A review of the online test data indicates that T_{max} may be set at its lower design limit of 3.0 seconds (frequency of 0.333 Hz) to further ensure adequate sensitivity while balancing the need to avoid spurious OPRM alarms and trips. Based on LTR NEDO-32465-A (figure 4-5), allowing T_{max} to be set down to 3.0 seconds does not significantly alter the probability of detecting core instability while helping to minimize the possibility of spurious OPRM alarms and trips.

Table 1 contains a sampling of NMP2 OPRM count data at various OPRM settings collected during Cycle 7 to demonstrate the margin to spurious alarms and trips when the revised OPRM setpoint ranges are utilized. The first two sheets of Table 1 show data taken at various power levels with various corner frequency and period tolerance settings. The last sheet of Table 1 shows data taken at relatively high power and flow conditions with flow above the upper limit of the OPRM-enabled region. The data values highlighted (bolded) in Table 1 were taken with setting values equal to the final selected values.

Conclusion

The OPRM is fully expected to produce enough MCPCs to exceed the alarm and trip setpoints if a thermal-hydraulic instability should occur. Allowing NMP2 to use the full range of the tuning parameters allowed by the OPRM design, including the allowance to set the corner frequency, period tolerance, and maximum period up to the limiting value of 3.0 Hz, and down to the limiting values of 50 milliseconds, and 3.0 seconds, respectively, provides acceptable OPRM sensitivity based on upon the foregoing discussions. These setpoint values are slightly outside the ranges described in LTR NEDO-32465-A, which were based on data from a few plants with different power monitoring system designs. However, the values are consistent with the original definition of the PBA in NEDO-31960-A, Supplement 1. The proposed setpoint range changes provide margin to spurious alarms and trips during stable reactor operation and do not compromise the ability of the OPRM to detect instabilities and initiate an automatic reactor scram prior to violating the minimum critical power ratio (MCPR) safety limit for anticipated reactor instabilities.

TABLE 1
Nine Mile Point Unit 2 OPRM Tuning Data

OPRM Channel	Power/ Flow - (%)	Period min/max (sec)	Corner Freq (Hz) / Period Tol (msec)	Sample Time (min)	Confirmation Counts (Normalized to 10 minute sample.)				
					1	2	3	4	≥5
1	23.3/25.7	1.20/4.00	2.0/150	10	1127	398	9	3	1
1	23.3/25.7	1.20/4.00	2.0/100	10	1218	368	8	5	0
1	23.3/25.7	1.20/4.00	2.0/100	10	1179	372	13	6	0
2	23.1/24.6	1.20/4.00	2.5/150	5	26	0	0	0	0
2	23.1/24.6	1.20/4.00	2.0/200	6	13.5	0	0	0	0
2	23.1/24.6	1.20/4.00	2.0/250	5	12	0	0	0	0
2	23.1/24.6	1.20/4.00	2.0/300	5	18	0	0	0	0
2	23.1/24.6	1.20/4.00	1.5/300	5	0	0	0	0	0
2	23.1/24.6	1.20/4.00	1.0/300	5	0	0	0	0	0
2	23.1/24.6	1.20/4.00	2.5/300	5	232	12	2	0	0
2	23.1/24.6	1.20/4.00	3.0/300	5	820	118	24	4	0
2	23.1/24.6	1.20/4.00	3.0/250	10	768	76	11	3	0
2	23.1/24.6	1.20/4.00	3.0/300	10	737	106	27	2	1
2	23.1/24.6	1.20/4.00	3.0/250	10	761	79	12	2	0
3	22.9/26.1	1.20/4.00	2.0/150	5	720	188	10	0	0
3	22.9/26.1	1.20/4.00	2.0/200	5	748	150	12	6	2
3	22.9/26.1	1.20/4.00	2.0/150	10	706	166	7	6	0
4	22.8/26.7	1.20/4.00	2.0/150	5	678	450	14	10	2
4	22.8/26.7	1.20/4.00	2.0/100	5	694	432	12	18	2
4	22.8/26.7	1.20/4.00	2.5/100	5	346	408	2	18	0
4	22.8/26.7	1.20/4.00	2.5/50	5	428	340	8	4	0
4	22.8/26.7	1.20/4.00	2.5/50	10	462	322	6	6	0
1	56.1/52.1	1.20/4.00	2.0/100	5	5150	816	156	56	6
1	56.1/52.1	1.20/4.00	2.5/100	5	5898	988	156	42	16
1	56.1/52.1	1.20/4.00	2.5/50	5	6462	834	96	10	4
1	56.1/52.1	1.20/4.00	2.0/50	5	5300	596	60	2	0
1	56.1/52.1	1.20/4.00	2.0/50	10	5198	662	102	11	3
1	56.1/52.1	1.20/4.00	1.5/50	5	3784	398	72	14	0
1	56.1/52.1	1.20/4.00	1.0/50	5	2096	134	2	0	0
1	56.1/52.1	1.20/4.00	1.0/100	5	1924	250	26	2	0
1	56.1/52.1	1.20/4.00	1.0/150	5	1522	204	52	6	6
1	56.1/52.1	1.20/4.00	1.0/100	10	1816	186	38	12	8
1	56.1/52.1	1.20/4.00	1.0/50	10	1822	182	10	1	0
2	55.1/52.3	1.20/4.00	3.0/250	5	5068	1482	468	246	192
2	55.1/52.3	1.20/4.00	3.0/200	5	4728	1494	382	146	84
2	55.1/52.3	1.20/4.00	3.0/150	5	5440	1244	290	96	42
2	55.1/52.3	1.20/4.00	3.0/100	5	5844	1166	222	76	18
2	55.1/52.3	1.20/4.00	2.5/100	5	5292	908	212	44	10
2	55.1/52.3	1.20/4.00	2.5/50	5	6062	720	76	12	12
2	55.1/52.3	1.20/4.00	2.0/50	5	4560	518	52	8	2
2	55.1/52.3	1.20/4.00	1.0/50	10	4515	488	60	8	2

TABLE 1
Nine Mile Point Unit 2 OPRM Tuning Data

OPRM Channel	Power/ Flow - (%)	Period min/max (sec)	Corner Freq (Hz) / Period Tol (msec)	Sample Time (min)	Confirmation Counts (Normalized to 10 minute sample.) 1	2	3	4	≥5
3	56.0/53.5	1.20/4.00	2.0/150	5	3846	784	164	62	28
3	56.0/53.5	1.20/4.00	2.0/100	5	4152	608	140	42	8
3	56.0/53.5	1.20/4.00	2.5/100	5	5266	864	156	48	8
3	56.0/53.5	1.20/4.00	2.5/50	5	6032	724	94	10	0
3	56.0/53.5	1.20/4.00	2.5/50	10	5904	697	98	15	5
3	56.0/53.5	1.20/4.00	3.0/100	5	6098	1216	258	54	46
3	56.0/53.5	1.20/4.00	2.0/50	5	4990	630	60	8	4
3	56.0/53.5	1.20/4.00	1.5/50	5	3144	240	14	6	0
3	56.0/53.5	1.20/4.00	1.5/50	10	2598	211	12	3	0
4	54.2/53.1	1.20/4.00	2.5/50	5	6146	942	130	22	2
4	54.2/53.1	1.20/4.00	3.0/100	5	6272	1270	238	62	28
4	54.2/53.1	1.20/4.00	2.0/50	5	5544	710	102	10	4
4	54.2/53.1	1.20/4.00	1.5/50	5	3872	426	44	10	0
4	54.2/53.1	1.20/4.00	1.0/50	5	1994	172	18	6	0
4	54.2/53.1	1.20/4.00	1.0/50	10	1940	181	19	3	0
1	99.0/97.3	1.20/4.00	1.0/50	5	7128	1188	108	24	4
1	99.0/97.3	1.20/4.00	1.5/50	5	6192	1496	102	24	0
1	99.0/97.3	1.20/4.00	2.0/50	5	5266	1314	162	30	4
1	99.0/97.3	1.20/4.00	2.5/50	5	5070	1220	92	14	6
1	99.0/97.3	1.20/4.00	2.0/50	10	5474	1283	91	26	5
1	99.0/97.3	1.20/4.00	1.5/50	10	6348	1430	193	40	6
1	99.0/97.3	1.20/4.00	1.0/50	10	6430	1240	143	70	5
1	99.0/97.3	1.20/4.00	1.5/50	10	5966	1277	114	32	7
2	97.8/96.9	1.20/4.00	1.0/50	5	7116	1274	118	36	10
2	97.8/96.9	1.20/4.00	1.5/50	5	5988	1564	142	18	0
2	97.8/96.9	1.20/4.00	2.0/50	6	5143.3	1261.7	90	11.7	1.7
2	97.8/96.9	1.20/4.00	2.5/50	10	4858	1154	54	11	0
3	98.2/97.0	1.20/4.00	1.5/50	5	5874	1374	122	24	4
3	98.2/97.0	1.20/4.00	2.0/50	5	5504	1440	166	22	2
3	98.2/97.0	1.20/4.00	2.5/50	5	5080	1270	98	22	2
3	98.2/97.0	1.20/4.00	2.5/50	10	5066	1198	77	12	1
4	98.7/98.0	1.20/4.00	1.0/50	5	6492	1366	138	54	6
4	98.7/98.0	1.20/4.00	1.5/50	5	5798	1450	96	16	2
4	98.7/98.0	1.20/4.00	2.0/50	5	5318	1362	100	22	4
4	98.7/98.0	1.20/4.00	2.5/50	5	5270	1318	154	24	2
4	98.7/98.0	1.20/4.00	2.5/50	10	4773	1241	120	19	0

TABLE 1
Nine Mile Point Unit 2 OPRM Tuning Data

OPRM Channel	Power/ Flow - (%)	Period min/max (sec)	Corner Freq (Hz) / Period Tol (msec)	Sample Time (min)	Confirmation Counts (Normalized to 10 minute sample.)									
					1	2	3	4	5	6	7	8	9	10
1	99.0/95.7	1.2/4.0	1.5/50	5	5922	1294	154	30	4	4	0	0	0	0
1	99.0/95.7	1.2/4.0	2.0/50	5	5200	1388	78	18	2	0	0	0	0	0
1	99.0/95.7	1.2/4.0	2.5/50	5	4954	1454	122	44	0	0	0	0	0	0
1	99.0/95.7	1.2/4.0	3.0/50	5	4510	1272	78	14	2	0	0	0	0	0
1	99.0/95.7	1.2/3.9	3.0/50	5	4236	1302	110	26	0	0	0	0	0	0
1	99.0/95.7	1.2/3.6	3.0/50	5	4422	1254	120	24	4	0	0	0	0	0
1	99.0/95.7	1.3/3.6	3.0/50	10	3906	704	49	9	0	0	0	0	0	0
1	99.0/95.7	1.3/3.3	3.0/50	8	2771	688	63	11	0	0	0	0	0	0
1	**99.0/95.7**	**1.4/3.3**	**3.0/50**	**10**	**2931**	**704**	**29**	**3**	**0**	**0**	**0**	**0**	**0**	**0**
2	99.2/94.7	1.2/4.0	2.5/50	5	5130	1464	176	58	0	4	0	0	0	0
2	99.2/94.7	1.2/4.0	3.0/50	5	4728	1144	112	36	6	0	2	0	0	0
2	99.2/94.7	1.4/3.3	3.0/50	8	2734	558	24	10	1	0	0	0	0	0
2	99.2/94.7	1.4/3.25	3.0/50	5	2704	788	50	22	0	0	0	0	0	0
2	99.2/94.7	1.4/3.2	3.0/50	8	3176	805	31	14	0	0	0	0	0	0
2	99.2/94.7	1.4/3.15	3.0/50	6	3090	745	32	15	0	0	0	0	0	0
2	99.2/94.7	1.4/3.1	3.0/50	10	3146	788	33	11	1	0	0	0	0	0
2	99.2/94.7	1.4/3.05	3.0/50	9	2854	690	37	10	0	0	0	0	0	0
2	**99.2/94.7**	**1.4/3.0**	**3.0/50**	**10**	**3166**	**752**	**17**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
3	99.3/95.6	1.2/4.0	2.5/50	5	5064	1456	142	18	0	6	0	0	0	0
3	99.3/95.6	1.2/4.0	3.0/50	5	5152	1102	98	24	2	0	0	0	0	0
3	99.3/95.6	1.2/3.9	3.0/50	5	5000	1288	98	44	8	0	0	0	0	0
3	99.3/95.6	1.2/3.6	3.0/50	5	4900	1248	116	20	0	0	0	0	0	0
3	99.3/95.6	1.3/3.6	3.0/50	5	3530	1014	52	20	0	0	0	0	0	0
3	99.3/95.6	1.3/3.3	3.0/50	5	3616	1064	40	20	4	0	0	0	0	0
3	99.3/95.6	1.4/3.3	3.0/50	5	2860	866	26	10	2	0	0	0	0	0
3	99.3/95.6	1.4/3.25	3.0/50	5	2884	744	24	10	2	0	0	0	0	0
3	**99.3/95.6**	**1.4/3.2**	**3.0/50**	**10**	**2890**	**657**	**32**	**3**	**0**	**0**	**0**	**0**	**0**	**0**
4	99.4/95.8	1.2/4.0	2.5/50	5	5128	1440	118	32	0	0	0	0	0	0
4	99.4/95.8	1.2/5.0	3.0/50	6	4825	1231	94	15	0	0	0	0	0	0
4	99.4/95.8	1.2/3.6	3.0/50	8	5578	966	68	11	0	0	0	0	0	0
4	99.4/95.8	1.3/3.6	3.0/50	10	3948	927	58	9	0	0	0	0	0	0
4	99.4/95.8	1.3/3.3	3.0/50	5	3262	1188	74	18	0	0	0	0	0	0
4	99.4/95.8	1.4/3.3	3.0/50	10	2851	785	41	11	2	0	0	0	0	0
4	99.4/95.8	1.4/3.25	3.0/50	6	2979	877	27	22	0	0	0	0	0	0
4	**99.4/95.8**	**1.4/3.2**	**3.0/50**	**10**	**2948**	**768**	**32**	**5**	**0**	**0**	**0**	**0**	**0**	**0**