January 29, 2007

L-MT-07-009
10 CFR 50.90

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

Monticello Nuclear Generating Plant
Docket 50-263
License No. DPR-22

License Amendment Request: Revision to the Allowable Values and Surveillance Intervals for the Low Pressure Coolant Injection Loop Select Logic Time Delay Relays

Pursuant to 10 CFR 50.90, the Nuclear Management Company, LLC (NMC) proposes to revise the allowable values and surveillance intervals specified in the Technical Specifications (TS) for the following Low Pressure Coolant Injection (LPCI) loop select logic time delay relay functions in Table 3.3.5.1-1 of Specification 3.3.5.1, "Emergency Core Cooling System (ECCS) Instrumentation:"

2.k. Reactor Steam Dome Pressure - Time Delay Relay (Break Detection)

2.l. Recirculation Pump Differential Pressure - Time Delay Relay (Break Detection)

2.m. Recirculation Riser Differential Pressure - Time Delay Relay (Break Detection)

On-line testing of these time delay relays poses an unacceptable risk for an inadvertent plant transient resulting in an unnecessary challenge to safety systems. NMC requests to extend the surveillance interval, and revise the allowable values accordingly, for these LPCI loop select logic time delay relays to reflect a nominal 24-month interval.

Enclosure 1 provides a description of the proposed change and includes the technical evaluation and associated no significant hazards and environmental considerations. Enclosure 2 provides the existing TS pages marked-up to indicate the proposed changes. Enclosure 3 provides the re-typed (clean) TS pages.

NMC requests approval of the proposed license amendment by June 25, 2007, with an implementation period of 60 days.

Summary of Commitments

This letter makes the following new commitment:

The LPCI loop select time delay relays will be added to the Instrument Trending Program.

In accordance with 10 CFR 50.91, a copy of this application, with attachments, is being provided to the designated Minnesota Official.

I declare under penalty of perjury that the foregoing is true and correct.
Executed on January 19, 2007.

J. T. Conway
Site Vice President, Monticello Nuclear Generating Plant
Nuclear Management Company, LLC

Enclosures (3)

cc: Administrator, Region III, USNRC
Project Manager, Monticello, USNRC
Resident Inspector, Monticello, USNRC
Minnesota Department of Commerce

ENCLOSURE 1

DESCRIPTION OF CHANGE

LICENSE AMENDMENT REQUEST
REVISION TO THE ALLOWABLE VALUES AND SURVEILLANCE INTERVALS FOR THE LOW PRESSURE COOLANT INJECTION LOOP SELECT LOGIC TIME DELAY RELAYS

1.0 INTRODUCTION

Pursuant to 10 CFR 50.90, the Nuclear Management Company, LLC (NMC) proposes to revise the allowable values and surveillance intervals specified in the Technical Specifications (TS) for the following Low Pressure Coolant Injection (LPCI) loop select logic time delay relay functions in Table 3.3.5.1-1 of Specification 3.3.5.1, "Emergency Core Cooling System (ECCS) Instrumentation:"

2.k. Reactor Steam Dome Pressure - Time Delay Relay (Break Detection)

2.l. Recirculation Pump Differential Pressure - Time Delay Relay (Break Detection)

2.m. Recirculation Riser Differential Pressure - Time Delay Relay (Break Detection)

The LPCI loop select logic time delay relay functions were not included in the Monticello Nuclear Generating Plant (MNGP) custom TS. The LPCI loop select logic time delay relays were demonstrated functional during the once-a-cycle Emergency Core Cooling System (ECCS) performance testing during refueling outages. On October 29, 2006, the NMC implemented the Improved Standard Technical Specifications (ITS). Surveillance testing of the time delays for these LPCI loop select logic time delay relays were added during the ITS conversion process.

The LPCI loop select logic is not designed to be tested on-line. Testing of these time delay relay functions has not been performed on-line at the MNGP or at any other Boiling Water Reactor (BWR) to the best of our knowledge. NMC inappropriately specified a quarterly (92 day) surveillance interval for testing these LPCI loop select time delay relays during ITS development. ITS Surveillance Requirements (SR) 3.3.5.1.2 and 3.3.5.1.4 require performance of a CHANNEL FUNCTIONAL TEST and a CHANNEL CALIBRATION, respectively, every 92 days, which will require testing of the LPCI loop select logic on-line. To correct this situation NMC proposes to revise the surveillance interval for these SRs to reflect a nominal 24-month interval, as should have been specified in the MNGP ITS conversion amendment application for these time delay relays. A 24-month surveillance interval is consistent with the once per cycle durations approved by the NRC for other ITS conversions for BWR plants which retained

the LPCI loop select logic. Revising the channel functional testing and channel calibration surveillance interval to 24-months for these LPCI loop select logic time delay relay functions also requires that the associated allowable values specified in the TS to be changed.

Since the LPCI loop select logic was not designed to be tested on-line, testing on-line presents an unacceptable risk for inadvertent plant transient(s) resulting in unnecessary challenges to safety systems. To correct this situation in the short-term, NMC submitted a license amendment request (LAR) on November 14, 2006, (Reference 1), and received on January 18, 2007, (Reference 2) a one-time extension of the surveillance test interval for these LPCI loop select logic time delay relays. The one-time extension expires upon entry into MODE 2 during startup from the upcoming spring 2007 Refueling Outage (RFO).[1]

To permanently correct this situation NMC is submitting this LAR to revise the allowable values and channel functional testing and channel calibration surveillance intervals for the LPCI loop select logic time delay relays to reflect a 24-month frequency as should have been specified in the ITS conversion amendment application. The proposed TS changes will allow performance of the surveillance test(s) during modes (i.e., MODES 4 and 5) when the unit is off-line, the LPCI loop select logic time delay relay instrumentation is not required to be OPERABLE, and the unit is configured to minimize the possibility and the effects of inadvertent plant transients.

2.0 BACKGROUND

The original design of General Electric (GE) Boiling Water Reactors of the BWR/3 and 4 vintage included a LPCI loop select logic used to determine the broken recirculation loop in the event of a design basis Loss of Coolant Accident (LOCA) and to direct flow from the Residual Heat Removal (RHR) LPCI mode pumps to the discharge line of the unbroken recirculation loop. GE subsequently offered a LPCI modification resulting in the loop select logic being removed from most of the applicable BWRs. In the ITS NUREG for the BWR/4 plant design (NUREG-1433) (Reference 3), guidance for only those plants without the LPCI loop select logic design was provided. No guidance was provided for plants retaining the logic. This resulted in the LPCI loop select logic being addressed on a case-by-case basis during the ITS conversion process for those few BWR plants that retained the logic (including the MNGP).

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1 The present scheduled start date for the 2007 RFO is March 14, 2007.

3.0 PROPOSED CHANGES

NMC proposes to revise the allowable values and the CHANNEL FUNCTIONAL TEST and CHANNEL CALIBRATION surveillance intervals for the three LPCI loop select logic time delay relay functions, to reflect a once per cycle, 24-month, nominal surveillance interval consistent with other BWR plants with the LPCI loop select logic.

Also, revisions to the allowable values in TS Table 3.3.5.1-1 for Functions 2.k, 2.l, and 2.m (shown below) are required to reflect a 24-month nominal surveillance interval. A mark-up of the proposed changes to the surveillance requirements and allowable values for the applicable portion of TS Table 3.3.5.1-1 is presented below.

	FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
2.	LPCI System					
k.	Reactor Steam Dome Pressure - Time Delay Relay (Break Detection)	1, 2, 3	2	B	~~SR 3.3.5.1.2~~[f] ~~SR 3.3.5.1.4~~[f] SR 3.3.5.1.7 SR 3.3.5.1.8 SR 3.3.5.1.9	≤ ~~2.79~~ 2.97 seconds
l.	Recirculation Pump Differential Pressure - Time Delay Relay (Break Detection)	1, 2, 3	2	C	~~SR 3.3.5.1.2~~[f] ~~SR 3.3.5.1.4~~[f] SR 3.3.5.1.7 SR 3.3.5.1.8 SR 3.3.5.1.9	≤ ~~0.716~~ 0.75 seconds
m.	Recirculation Riser Differential Pressure - Time Delay Relay (Break Detection)	1, 2, 3	2	C	~~SR 3.3.5.1.2~~[f] ~~SR 3.3.5.1.4~~[f] SR 3.3.5.1.7 SR 3.3.5.1.8 SR 3.3.5.1.9	≤ ~~0.697~~ 0.75 seconds

~~(f) Surveillance performance for these functions is not required to be current until entry into MODE 2 from the 2007 refueling outage.~~

TS Table 3.3.5.1-1 currently lists SR 3.3.5.1.2 as the applicable channel functional and SR 3.3.5.1.4[(2)] as the applicable channel calibration surveillance requirements for Functions 2.k, 2.l, and 2.m, requiring performance at a 92 day frequency. NMC proposes the following changes to the surveillance requirements listed in Table 3.3.5.1-1:

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2 SR 3.3.5.1.2 and SR 3.3.5.1.4 (specified to be performed at a 92 day frequency) are applied to other Functions in Table 3.3.5.1-1, and hence cannot be revised to reflect a 24-month frequency.

- Add a new surveillance requirement, SR 3.3.5.1.9, "Perform CHANNEL FUNCTIONAL TEST." at a 24 month frequency to the Surveillance Requirements listing in front of Table 3.3.5.1-1.

- Replace SR 3.3.5.1.2 (for Functions 2.k, 2.l, and 2.m) with a new SR 3.3.5.1.9, to require performance of a CHANNEL FUNCTIONAL TEST at a 24 month frequency.

- Replace SR 3.3.5.1.4 (for Functions 2.k, 2.l, and 2.m) with existing SR 3.3.5.1.7, which requires performance of a CHANNEL CALIBRATION at a 24 month frequency.

NMC received on January 18, 2007, (Reference 2), a license amendment to add footnote (f) to SR 3.3.5.1.2 and SR 3.3.5.1.4 in Table 3.3.5.1-1 for Functions 2.k, 2.l, and 2.m to extend the surveillance interval on a one-time basis from the nominal 92-day frequency to until prior to entry into MODE 2 during startup from the upcoming spring 2007 RFO. With approval of this proposed LAR, footnote (f) will no longer be required and should be removed.

Separately, a typographical error in a note to Function 1.e, "Reactor Steam Dome Pressure Permissive – Bypass Timer (Pump Permissive)" was identified and is proposed to be corrected. In the 'Applicable Modes or Other Specified Conditions' column the parenthesis to note $5^{(a)}$ was not closed and reads as "$5^{(a}$" rather than "$5^{(a)}$". A revised replacement page is included in the re-typed TS pages in Enclosure 3 to correct this typographical error.

A mark-up of the proposed changes to TS Table 3.3.5.1-1 is provided in Enclosure 2. Additions to Table 3.3.5.1-1 are indicated with double-underlining, deletions are lined-out. A re-typed version of the applicable pages of Table 3.3.5.1-1 is provided in Enclosure 3. Associated TS Bases changes will be issued by NMC in accordance with the Technical Specifications Bases Control Program upon approval of this LAR.

Discussion of Requested Date for Approval of the License Amendment

Specification 3.3.5.1 requires the instrumentation for each LPCI loop select logic time delay relay function in Table 3.3.5.1-1 to be OPERABLE in the applicable modes. Current SR 3.3.5.1.2 requires a CHANNEL FUNCTIONAL TEST and current SR 3.3.5.1.4 requires a CHANNEL CALIBRATION to be performed at a specified frequency of 92 days.

On March 14, 2007, the unit is scheduled to enter MODE 4 during shutdown for the 2007 RFO. From entry into MODE 4 during shutdown until entry into MODE 2 during startup from the outage the LPCI loop select logic time delay relay functions are not required to be OPERABLE. Footnote (f) allows the

surveillances for Functions 2.k, 2.l, and 2.m in Table 3.3.5.1-1 to be extended beyond the end of the nominal, quarterly (92 day), surveillance interval, i.e. from January 29, 2007, until entry into MODE 2 from the 2007 RFO.

Performance of SR 3.3.5.1.2 and SR 3.3.5.1.4 for the LPCI loop select logic time delay relay functions is currently projected for an outage window between March 28, 2007 and April 1, 2007, the actual performance date establishing the beginning of the next 92 day nominal surveillance interval. The date requested for approval of this LAR is therefore the earliest projected date requiring performance of these surveillances on-line after the 2007 RFO, plus several days margin. The earliest date is currently projected as June 28, 2007,[3] which is the duration of the nominal quarterly (92 day) surveillance interval from the earliest assumed surveillance performance date of March 28, 2007. Including several days margin, NMC requests receipt of this license amendment by June 25, 2007. This date may change, based upon changes to the outage schedule. NMC will update the NRC of any change to the requested amendment issue date.

4.0 LPCI LOOP SELECT LOGIC SYSTEM OPERATION

On receipt of an initiation signal, the ECCS pumps automatically start and align to inject water from either the Condensate Storage Tanks or suppression pool (SP) into the Reactor Coolant System (RCS). The Automatic Depressurization System (ADS) is initiated, but action is delayed, allowing the operator to interrupt the timed sequence to depressurization if it is not required. Following initiation, the High Pressure Coolant Injection (HPCI) System pump discharge pressure almost immediately exceeds RCS pressure and coolant is injected into the reactor vessel to cool the core. If the break is small, the HPCI System maintains coolant inventory as well as level with the RCS pressurized. If HPCI fails, or is unable to maintain inventory, it is backed up by the ADS in combination with the LPCI and Core Spray (CS) Systems. In this case, the ADS timed sequence is allowed to time-out and open selected safety / relief valves depressurizing the RCS, allowing the LPCI and CS to overcome RCS pressure and inject. If the break is large, RCS pressure initially drops rapidly and the LPCI and CS cool the core. Water from the RCS break returns to the SP where it is recycled and circulated through a heat exchanger cooled by the RHR Service Water System.

Low Pressure Coolant Injection Mode of Operation

The LPCI mode is an independent operating mode of the RHR System. There are two LPCI subsystems, each consisting of two motor driven RHR pumps (in the same RHR division) and piping and valves to transfer water from the SP to the RCS via the selected recirculation loop. The LPCI system initiation logic contains the LPCI loop select logic whose purpose is to determine which, if any,

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3 The duration of the quarterly surveillance interval applying SR 3.0.2 is 115 days (92 + 23). The required performance date applying SR 3.0.2 is July 21, 2007.

of the recirculation loops are broken and select the non-broken loop for injection (the B loop is selected if neither loop is broken).

The LPCI subsystems are designed to provide core cooling at low RCS pressure. Upon receipt of an initiation signal, all four LPCI pumps are automatically started (A and B at approximately 5 seconds and C and D at approximately 10 seconds after AC power is available). The RHR System valves in the LPCI flow path automatically position to provide the proper flow path to inject into the selected recirculation loop. When the RCS pressure drops sufficiently, LPCI injection begins and water enters the reactor via the jet pumps.

Low Pressure Coolant Injection Loop Select Logic Operation

There are two redundant trip systems in the LPCI loop select logic. The logic is initiated upon the receipt of either a Reactor Vessel Water Level - Low Low signal or a Drywell Pressure - High signal. When initiated, the logic first determines recirculation pump operation by sensing the differential pressure (Δp) between the suction and discharge of each recirculation pump.

If the logic senses that either recirculation pump is not running, i.e., the unit is in single loop operation, then a trip signal is sent to both recirculation pumps to eliminate the possibility of pipe breaks being masked by the operating recirculation pump pressure. The recirculation pump trip signal is delayed by approximately 0.5 second to ensure that at least one pump is off since the break detection sensitivity is greater with both pumps running. If a recirculation pump trip signal is generated, reactor steam dome pressure must decrease to a specified value before the logic will continue. This adjusts the selection time to optimize sensitivity and still ensure that LPCI injection is not unnecessarily delayed. After the satisfaction of this pressure requirement or if both recirculation pumps indicate they are running, a 2 second time delay is provided to allow momentum effects to establish the maximum Δp for loop selection. Selection of the unbroken recirculation loop is then done by comparing the absolute pressure of the two recirculation riser loops. A broken recirculation loop is indicated by a lower pressure than the unbroken loop. The recirculation loop with the higher pressure is used for LPCI injection. If, after a small time delay (approximately 0.5 seconds), the pressure in recirculation loop A is not indicating higher than loop B, the logic will actuate to inject to the B recirculation loop, the 'default' choice for the logic. A signal will be provided to close the B recirculation loop discharge valve, open the LPCI injection valve to the B recirculation loop and close the LPCI injection valve to the A recirculation loop. If recirculation loop A pressure indicates higher than loop B pressure, the converse occurs.

Description of the Reactor Steam Dome Pressure, Recirculation Pump Differential Pressure, and Recirculation Riser Differential Pressure Time Delay Relays Function in Support of LPCI Loop Select Logic Operation

Reactor Steam Dome Pressure - Time Delay Relay (Function 2.k)

The purpose of this time delay is to optimize the LPCI loop select logic sensitivity if the logic previously actuated recirculation pump trips. This is accomplished by preventing the logic from continuing on to the unbroken loop selection activity until reactor steam dome pressure drops below a specified value. The value of the reactor steam dome pressure was chosen to allow for coastdown of any recirculation pump which has just tripped, optimizing the sensitivity of the loop select logic and the associated time delay was chosen to allow momentum effects to establish the maximum Δp for break detection.

Recirculation Pump Differential Pressure - Time Delay Relay (Function 2.l)

Recirculation pump Δp signals are used by the LPCI loop select logic to determine if either recirculation pump is running. If either pump is not running, i.e., single loop operation, the logic, after a short time delay, sends a trip signal to both recirculation pumps. This is necessary to eliminate the possibility of small pipe breaks being masked by a running recirculation pump. The recirculation pump Δp was chosen to be as low as possible, while still maintaining the ability to differentiate between a running and non-running recirculation pump, while the associated time delay was chosen to allow enough time to determine the status of the operating condition of the recirculation pumps.

Recirculation Riser Differential Pressure - Time Delay Relay (Function 2.m)

Recirculation riser Δp signals are used by the LPCI loop select logic to determine which, if any, recirculation loop is broken by comparing the pressure of the two recirculation loops. A broken loop will indicate a lower pressure than an unbroken loop. The loop with the higher pressure is then selected, after a short delay, for LPCI injection. If neither loop is broken, the logic defaults to injecting into the B recirculation loop. The recirculation riser Δp signals are initiated from Δp pressure switches that sense the Δp between the A and B recirculation loop risers. If, after a small time delay, the pressure in loop A is not indicating higher than loop B pressure, the logic will select the B loop for injection. If recirculation loop A pressure is indicating higher than loop B, the logic will select the A loop for LPCI injection. The recirculation riser Δp value was chosen to be as low as

possible, while still maintaining the ability to differentiate between a broken and unbroken recirculation loop, while the associated time delay was chosen to provide sufficient time to determine which recirculation loop was broken.

5.0 TECHNICAL ANALYSIS

On October 29, 2006, the NMC implemented the ITS. The LPCI loop select logic time delay relay functions, listed below, are contained in ITS Table 3.3.5.1-1 of Specification 3.3.5.1, "Emergency Core Cooling System (ECCS) Instrumentation," but were not included in the previous MNGP custom TS. Testing of the time delay feature of these relays by performance of a CHANNEL FUNCTIONAL TEST (SR 3.3.5.1.2) and a CHANNEL CALIBRATION (SR 3.3.5.1.4) quarterly (nominally every 92 days) was added during the ITS conversion process. However, the logic was not designed to be tested on-line and under the custom TS the LPCI loop select logic time delay relays were functionally tested, once-a-cycle, as part of ECCS performance testing during refueling outages.

2.k. Reactor Steam Dome Pressure - Time Delay Relay (Break Detection)

2.l. Recirculation Pump Differential Pressure - Time Delay Relay (Break Detection)

2.m. Recirculation Riser Differential Pressure - Time Delay Relay (Break Detection)

During detailed plant implementation reviews by I&C personnel of ITS surveillance procedures it was identified that on-line surveillance performance was not consistent with conservative unit operation. NMC failed to recognize the inappropriateness of the quarterly surveillance testing interval for these relays during ITS development. Section 5.1, discusses the potential for plant transients due to errors occurring during on-line surveillance testing.

License Amendment 149 was received on January 18, 2007, to extend the surveillance interval for the LPCI loop select logic time delay relays on a one-time basis. NMC proposes in this follow-up LAR a permanent revision of the allowable values and the channel functional and channel calibration surveillance intervals to that which should have been specified in the ITS conversion amendment application, i.e., nominally 24-months (once per cycle), consistent with conversions for other BWR plants with the LPCI loop select logic.

A discussion on the applicability of Generic Letter 91-04, "Changes in Technical Specification Surveillance Intervals to Accommodate a 24-Month Fuel Cycle," and the instrument setpoint program applied for License Amendment 143 where changes were approved to operate on a 24-month cycle is provided in the

following sections. While this submittal is not intended to be considered risk-informed, the impact of the extension of the surveillance interval to 24-month (nominal) was also evaluated from a Probabilistic Risk Analysis (PRA) perspective.

5.1 Potential for Plant Transients Due to Surveillance Testing Errors

Since the LPCI loop select logic was not designed to be tested on-line, once per cycle nominal surveillance intervals were requested by licensees and approved by the NRC for other ITS conversions for BWR plants that retained the LPCI loop select logic. As described, in-part below, testing on-line presents unacceptable risks for inadvertent plant transient(s) resulting in unnecessary challenges to safety systems.

Based upon a draft channel calibration and functional test procedure, a multi-channel recorder would be connected across each time delay relay to accurately measure the output, and the circuits actuated by the LPCI logic must be isolated by disabling (booting) the relay contacts (or installing jumpers) to prevent the normal functioning of the equipment. A jumper must be installed to simulate an initiation signal for the LPCI break detection logic, and finally a manual test switch must be closed to initiate the logic. Note, the logic has two divisions and the above actions must be repeated for each division of the associated time delay relays.

Some of the potential consequences identified that could occur if an error were to occur during on-line performance of the channel calibrations and functional tests of the logic at the currently specified frequency of every 92 days are:

1. A failure to correctly install the recorder channel connections could inadvertently blow circuit fuses or cross-connect portions of the logic circuitry that were not intended.

2. A failure to correctly install the 'boots' for relay isolation could result in equipment actuating that was not desired. Examples are:

    a. Inadvertent opening of the LPCI inboard motor operated isolation valves (MO-2014 and/or MO-2015), potentially resulting in a high/low pressure interface (intersystem LOCA) event.
    b. Inadvertent closing of the 11 and/or 12 recirculation pump discharge valves, resulting in a trip of the reactor recirculation pump(s) and a down power transient.
    c. Inadvertent trip of the 11 and/or 12 recirculation pumps causing a down power transient.

3. A failure to correctly install the jumpers to simulate an initiation signal for the LPCI break detection logic could initiate undesired portions of the LPCI logic.

4. A failure to correctly install the test switches in the LPCI loop select logic circuitry could result in the actuation of undesired portions of the circuitry or could inadvertently blow circuit fuses.

Many other plant systems are designed as separate trains (or subsystems) which can be fully removed from service and isolated for on-line testing. However, the design of the LPCI loop select logic was not developed and not intended to support on-line testing, and hence does not include the capabilities, e.g., such as test jacks, and having sufficient redundancy to allow the ability to put a channel in test while maintaining complete functionality during testing. Hence, any testing on-line of the LPCI loop select logic provides an inherent possibility of inducing a transient. Performance of this testing during MODES 4 and 5, when the instrumentation functions are not required to be OPERABLE (and the unit is not operating) greatly reduces the potential consequences of an inadvertent human performance error. Public health and safety will be enhanced by the decreased risk associated with performance of channel calibrations and channel functional tests of the LPCI loop select logic time delay relays during the shutdown state occurring during outages.

5.2 Summary Description of the Analysis Basis for LPCI Loop Select Logic

The LPCI loop select logic functions specified in TS Table 3.3.5.1-1 are only necessary in the event of a recirculation line break LOCA, i.e., proper functioning of this logic is assumed for mitigation. The GE ECCS performance evaluation (References 4 and 5) considered breaks ranging from the maximum recirculation suction line break down to a 0.05 square-foot recirculation suction line break. For the DBA LOCA analysis the bounding break location was assumed to be in the recirculation system suction piping. For a recirculation line break, including the DBA LOCA, the analysis assumes that the LPCI loop select logic successfully identifies and directs LPCI flow to the unbroken recirculation loop, so that core reflooding is accomplished in time to ensure that the peak cladding temperature of the fuel remains within the limits of 10 CFR 50.46. ECCS performance for four non-recirculation line breaks; i.e., in the feedwater, core spray, and main steam lines (both in and outside containment) were also evaluated. For these other LOCA events, (i.e., for non-recirculation system pipe breaks) success of the loop select logic to properly pick the unbroken recirculation loop is not required.

In MODES 1, 2, and 3, operation of the LPCI loop select logic functions is required to ensure that no single failure can prevent successfully selecting the unbroken recirculation loop for LPCI injection. These functions are not required OPERABLE in MODES 4 and 5 because the event of concern in these modes is

an inadvertent vessel draindown rather than a LOCA. Multiple means of low pressure injection (controlled by plant procedures) are available in MODES 4 and 5 and the LPCI loop select logic is not required to be OPERABLE.

5.3 Determination of the LPCI Loop Select Time Delay Relay Allowable Values

The impact of the variation of the time delay for the LPCI loop select time delay relays on the ECCS performance analysis was considered. Updated Safety Analysis Report (USAR) Section 14.7.2.3.3 discusses ECCS equipment performance. USAR Figure 14.7-12 depicts schematically the LPCI initiation logic and Table 14.7-12 presents the timing parameters used in the ECCS performance analysis. The maximum of the time required to complete each of several parallel event sequences determines the LPCI injection time. The time required to complete each path is a combination of initiation signal and equipment parameter times. Inspection of USAR Figure 14.7-2 indicates that minor variations in subcomponent time delays (including LPCI loop selection) are inconsequential considering the overall duration of the LPCI injection actuation scenarios.

The LPCI loop select time delay relays have very specific functions which do not specifically relate to accident timing parameters, Analytical Limits are not readily apparent. However, the time delay relays do need to work within reasonable bounds to ensure that the overall LPCI System response is acceptable. For a large break LOCA the LPCI loop selection process proceeds in parallel with the Diesel Generator (DG) startup (15 seconds from USAR Table 14.7-12). For a large break LOCA with Single Loop Operation, the time delay for LPCI loop selection will be the maximum delay times of the Functions 2.k, 2.l, and 2.m relays plus a very small nominal time for the relay logic (on the order of milliseconds). The total of all the nominal time delay settings is 3 seconds, and does not approach the 15 seconds available for completion. Totaling the upper adjustment limit for the three time delay relays involved in LPCI loop selection adds up to a total time of 9 seconds, and does not approach the 15 second requirement.

Prior to implementation of the ITS, the LPCI loop select time delay relay functions were not included in the MNGP TS and no setpoint calculation existed. The GE Instrument Setpoint Methodology (ISM) (Reference 6) as implemented through the MNGP setpoint program as discussed in the 24-month fuel cycle amendment was applied to develop the setpoints for these instruments. Since no specific Analytical Limits exist for the LPCI Loop select time delay relay functions, the Allowable Values were chosen based on a reasonable variation from the Nominal Trip Setpoint (NTSP), to detect a malfunctioning relay, and thus detect potential inoperability of the respective function.

The GE Licensee Event Report (LER) Avoidance Test evaluation was applied to assure sufficient margin between the setpoint and the Allowable Value. Essentially, the GE LER Avoidance Test determines a standard deviation of the statistical combination of the uncertainties of an instrument channel, consisting of the following: the channel instrument accuracy, channel calibration accuracy, and instrument drift (combined by square-root-sum-of-the-squares), and compares that to the absolute value of the difference of the NTSP and Allowable Value. The LER Avoidance Test therefore determines the margin required between the Allowable Value and the NTSP to allow for instrument drift that might occur during the established surveillance period.

Although no Analytical Limits have been established for these LPCI loop select time delay relay functions, calculated design limits can be determined by adding the applicable error terms onto the above proposed Allowable Values. These calculated design limits therefore represent the maximum value at which the time delay relays would be expected to operate when all known errors are considered. The calculated design limits can then be compared to the time available in the ECCS performance analysis. The following Allowable Values and calculated design limits were determined assuming a 24-month calibration interval:

Function	Current AV	Proposed AV	Calculated Design Limit
2.k	≤ 2.79 seconds	≤ 2.97 seconds	3.31 seconds
2.l	≤ 0.716 seconds	≤ 0.75 seconds	0.84 seconds
2.m	≤ 0.697 seconds	≤ 0.75 seconds	0.84 seconds

The total design limit of the three relays is approximately five seconds. This is much less then the 15 seconds available in the ECCS performance analysis. Therefore, the calculated Allowable Values provide adequate assurance that the time delay relays will not affect the assumptions used in the ECCS performance analysis.

5.4 Applicability of MNGP Instrument Setpoint Program and NRC Generic Letter 91-04 Guidance

On June 30, 2004, (Reference 7) NMC applied for and on September 30, 2005, received License Amendment 143 (Reference 8), approving changes to the MNGP custom TS necessary to operate on a 24-month fuel cycle. The LPCI loop select logic time delay relay functions were not included in the custom TS, and hence were not included in the 24-month fuel cycle license amendment. They were added as part of the ITS conversion amendment.

ENCLOSURE 1

The guidance of NRC Generic Letter (GL) 91-04, "Changes in Technical Specification Surveillance Intervals to Accommodate a 24-Month Fuel Cycle," (Reference 9) was applied in the development of the setpoint changes for the 24-month fuel cycle amendment and incorporated into the MNGP instrument setpoint program. The enclosures listed below were provided for NRC review as part of the June 30, 2004, 24-month cycle licensing submittal and are included on the MNGP docket. While not included within this submittal the methodology, positions and interpretations taken, and standards therein, are incorporated and reflect the current program. The associated ADAMS Accession Numbers for the pertinent parts of the submittal are provided for reference. Also, the ADAMS Accession Number for the license amendment approving the 24-month cycle license amendment is listed.

Enclosure	Enclosure Title	ADAMS Accession Number
1	Methodology Summary and Compliance With Generic Letter 91-04	ML042040169
2	NMC's Interpretation of the NRC Comments on the Staff Review of EPRI Technical Report 103335, "Guidelines for Instrument Calibration Extension / Reduction Programs"	ML042040174
4	"Drift Analysis (Instrumentation and Controls)," Appendix III to the Engineering Standards Manual Procedure (ESM 03.02-APP-III)	ML042040177
	Monticello Nuclear Generating Plant – Issuance of Amendment Re: Implementation of 24-Month Fuel Cycles (TAC No. MC3692)," dated September 30, 2005.	ML052700252

While GL 91-04 was written using examples associated with changing from an 18-month to 24-month fuel cycle, neither the text itself nor the principles expressed prohibit the GL guidance from being used in other applications involving different time frames. The GL 91-04 methodology has been utilized by other licensees (see References 10, 11 and 12), and approved by the NRC, in prior LARs which extended instrument calibration intervals to nominally 24-months from existing intervals which were significantly shorter than 18 months (and for the accompanying Allowable Value changes, where necessary).

The guidance of GL 91-04, as reflected in the NRC reviewed methodology for the 24-month fuel cycle amendment for the MNGP, was applied to evaluate the affects of extending the surveillance interval to reflect a nominal 24-month cycle and the associated changes to the Allowable Values for the LPCI loop select logic time delay relay functions.

Applicability of TSTF-493, "Clarify Application of Setpoint Methodology for LSSS Functions"

The guidance of draft TSTF-493 (Reference 13) and the associated NRC and Nuclear Energy Institute (NEI) correspondence was reviewed. The LPCI loop select logic time delay relay functions do not meet the criteria for Limiting Safety System Settings (LSSS) that protect a Safety Limit under development by the Boiling Water Reactor Owners Group in support of TSTF-493. Hence, TSTF-493 is not applicable. NMC in response to an NRC request for additional information dated July 1, 2005, (Reference 14) made the following commitments in conjunction with 24-month fuel cycle license amendment. The disposition of these commitments with respect to the LPCI loop select time delay relays is:

- *Continue resetting Limiting Safety System Settings (LSSS) setpoints within the specified tolerances (as-left criteria) until the Technical Specification Task Force's TS change pertinent to instrument setpoints [i.e., TSTF-493] has been approved by the NRC and assessed for applicability to Monticello.*

  The LPCI loop select time delay relay functions are not LSSS that protect a Safety Limit and consequently this commitment does not apply.

- *Assess applicability of the Technical Specification Task Force's TS change pertinent to instrument setpoints [i.e., TSTF-493], when approved by the NRC, to determine whether changes to Monticello's licensing basis are necessary.*

  The LPCI loop select time delay relay functions are not LSSS that protect a Safety Limit and hence this commitment does not apply.

Review Against the Seven Guidelines in Enclosure 2 to GL 91-04

An evaluation for extending the LPCI loop select time delay relays' calibration frequency to 24 months has been performed in accordance with GL 91-04, specifically Enclosure 2, "Guidance for Addressing the Effect of Increased Surveillance Intervals on Instrument Drift and Safety Analysis Assumptions." The evaluation concluded that the surveillance frequency can be extended to 24 months (30 months including the SR 3.0.2 "grace period") without any adverse effects on plant safety. The NMC evaluation demonstrates that changing to a 24-month surveillance interval for the LPCI loop select time delays relays has minimal impact on safety system reliability.

The seven guidelines stipulated in Enclosure 2 of GL 91-04, followed by the MNGP's response to each, are provided below.

1. **Confirm that instrument drift as determined by as-found and as-left calibration data from surveillance and maintenance records has not, except on rare occasions, exceeded acceptable limits for a calibration interval.**

   The LPCI loop select logic time delay relays were not included in the previous MNGP custom TS. The relays were added to the TS during the ITS conversion process. Previously, they were functionally tested once-a-cycle as part of ECCS performance testing during refueling outages. The relays have functioned properly during ECCS performance testing each cycle (during refueling outages) and no malfunctions associated with these relays have been identified. The LPCI loop select logic time delay relays are nuclear safety-related Agastat model ETR14D3A, where "A" specifies a range of 0.15 to 3 seconds.[4] Since there was no requirement in the custom TS to test the time delay feature, calibration data from surveillance or maintenance records was not available for the LPCI loop select logic time delay relays to directly establish their drift characteristics.

   The LPCI loop select logic time delay relays are of the same manufacturer and type, with only a range difference, as time delay relays used in other safety-related applications. Agastat model ETR14D3B time delay relays, where the "B" specifies a range of 0.55 to 15 seconds, are used in a number of nuclear safety-related applications at the MNGP.

   Quarterly calibration data was available for the TS Table 3.3.6.1-1, Function 3.a, "HPCI Steam Line Flow – High (Time Delay Function)," relays (Agastat model ETR14D3B). The same model and range of time delay relays (Agastat model ETR14D3B) are also used for the TS Table 3.3.5.1-1, Functions 1.f and 2.f, "Core Spray Pump Start – Time Delay Relay," and "Low Pressure Coolant Injection Pump Start – Time Delay Relay," sequencing relays, respectively. The Core Spray and LPCI Pump Start time delay relays are calibrated on a once-per-cycle frequency. These time delay relays have been previously calibrated on both 3 and 18-month calibration frequencies (depending on the specific application), providing data from which a conservative, representative drift value for the LPCI loop select logic time delay relays could be determined.

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4 The relays for TS Table 3.3.5.1-1, Function 2.l, "Recirculation Pump Differential Pressure - Time Delay Relay (Break Detection)," (relays 10A-K28A and 10A-K28B) are to be changed to Agastat ETR14D3A time delay relays during the 2007 RFO.

Since these types of devices, i.e., time delay relays, generally perform proportionally to percent of setpoint, the drift uncertainty in percent of setpoint was computed for several functions using the Agastat model ETR14D3B time delay relays and was applied to the LPCI loop select logic time delay relays.

The Agastat ETR time delay relays have shown good stability over long periods. Neither of the HPCI Steam Line Flow – High time delay relays has required adjustment for the almost 5 year period since they have been installed. Similarly, of the 18 installed Core Spray and LPCI Pump Start time delay relays, there has only been one instance of the As Found value being outside of the established As Found Tolerances, in the 90 calibrations, since they were installed in 1998.

2. **Confirm that the values of drift for each instrument type (make, model, and range) and application have been determined with a high probability and a high degree of confidence. Provide a summary of the methodology and assumptions used to determine the rate of instrument drift with time based upon historical plant calibration data.**

The NMC has performed drift evaluations, based upon a MNGP specific drift analysis (Instrumentation and Controls) using Microsoft® Excel spreadsheets based upon the guidance in the Electric Power Research Institute (EPRI) technical report TR-103335, "Guidelines for Instrument Calibration Extension/Reduction Programs," (Reference 15). Quattro-Pro®, Lotus 1-2-3® or MathCad® applications were used to verify the analysis.

The NMC drift analysis for the MNGP utilizes the As-found/As-left (AFAL) analysis methodology to statistically determine the drift for current calibration intervals. A detailed explanation of the MNGP drift evaluation methods, including the applicability of TR-103335, was included in the 24-month fuel cycle LAR. The guidance described in the EPRI report provides more detail than GL 91-04 on application of statistical methods to support 24-month fuel cycles. As discussed in the NRC Safety Evaluation (SE) for the 24-month cycle amendment, the staff has not formally endorsed TR-103335, but in a letter dated December 1, 1997, (Reference 16), indicated the report offered acceptable guidance for GL 91-04 calibration interval extension programs except in some areas where they had comments requiring further clarification. As stated in the SE, "In Enclosure 2 of the June 30, 2004, application, the licensee [has] addressed all the concerns that the NRC staff identified in its December 1, 1997, letter." Therefore, the MNGP specific methodology applied in the LPCI loop select logic time delay relay drift analysis meets NRC standards.

Based on the recommendations from the EPRI TR-103335 and the NRC review comments to the report, the time dependence of the current drift was evaluated, where possible, and conservative assumptions were made in extrapolating the current drift values to new drift values to be applied for 24-month (nominal) fuel cycles.

As discussed previously, the LPCI loop select logic time delay relays have not been routinely calibrated in the past; therefore, calibration data for similar Agastat model ETR14D3B time delay relays was used to determine the 30-month drift values used in determining the Allowable Values as described below.

3. **Confirm that the magnitude of instrument drift has been determined with a high probability and a high degree of confidence for a bounding calibration interval of 30 months for each instrument type (make, model number, and range) and application that performs a safety function. Provide a list of the channels by TS section that identifies these instrument applications.**

The methodology described in previous sections was used to determine the magnitude of instrument drift with a high degree of confidence and a high degree of probability for a bounding calibration interval of 30 months. The following TS Functions were evaluated for this LAR:

TS Table Function and Title	Make	Model / Relay No.	Range
3.3.5.1-1, Function 2.k, Reactor Steam Dome Pressure – Time Delay Relay (Break Detection)	Agastat	ETR14D3A 10A-K34A 10A-K34B	0.15 to 3 Seconds
3.3.5.1-1, Function 2.l, Recirculation Pump Differential Pressure – Time Delay Relay (Break Detection)	Agastat	ETR14D3A 10A-K28A 10A-K28B	0.15 to 3 Seconds
3.3.5.1-1, Function 2.m, Recirculation Riser Differential Pressure – Time Delay (Break Detection)	Agastat	ETR14D3A 10A-K40A 10A-K40B	0.15 to 3 Seconds

As previously discussed the LPCI loop select time delay relays have not been routinely calibrated in the past; and therefore, sufficient calibration data was not available to determine the drift characteristics of these relays. However, since the LPCI loop select time delay relays are of the same manufacturer and type (Agastat ETR14D3) as some of the other time delay

relays used in other applications, the other time delay relays drift data could potentially be utilized. The drift data for the TS Functions listed below was reviewed for applicability.

TS Table Function and Title	Make	Model	Range
3.3.5.1-1, Function 1.f, Core Spray Pump Start – Time Delay Relay	Agastat	ETR14D3B	0.55 to 15 Seconds
3.3.5.1-1, Function 2.f, Low Pressure Coolant Injection Pump Start – Time Delay Relay	Agastat	ETR14D3B	0.55 to 15 Seconds
3.3.6.1-1, Function 3.a, HPCI Steam Line Flow – High (Time Delay Function)	Agastat	ETR14D3B	0.55 to 15 Seconds

Drift evaluations performed using the MNGP specific drift analysis procedure determined a 92-day drift uncertainty of approximately ± 9.9 percent of setpoint for the HPCI Steam Line Flow – High time delay relays. The drift evaluations determined a 30-month drift uncertainty of approximately ± 5.5 percent of setpoint for the Core Spray and LPCI Pump Start time delay relays. The current calibration methods (stopwatch) used for testing these time delay relays add a significant human reaction time error. This error, while fairly consistent in terms of time, is a larger percent of the shorter HPCI Steam Line Flow – High time delay relay setpoint (4 seconds) than the 5, 10, and 15 second time delay relay setpoints for the Core Spray and LPCI Pump Start sequencing timers.

An improved testing methodology will be utilized for testing the LPCI loop select time delay relays which will remove this human reaction time error component. A much more accurate means, e.g., a multi-channel recorder or electronic timer, will be applied to accurately measure the time delays of the LPCI loop select logic time delay relays.

The Agastat ETR time delay relays have shown good stability over long periods, neither of the HPCI Steam Line Flow – High time delay relays has required adjustment for the 5-year period since they have been installed.

Based on the past performance of Agastat ETR time delay relays, the drift uncertainty does not exhibit a time dependency. In order to very conservatively determine bounding Allowable Values and reasonable As Found Tolerances, the 92-day drift uncertainty (approximately ± 9.9 percent) determined for the HPCI Steam Line Flow – High time delay relays was expanded to apply to the 30-month calibration interval of the LPCI loop select logic time delay relays. (The 30-month drift uncertainty of

approximately ± 5.5 percent of setpoint for the Core Spray and LPCI Pump Start time delay relays was not utilized.)

In order to provide a bounding Allowable Value, the drift uncertainty from the HPCI Steam Line Flow – High time delay relays was treated as moderately time dependent and extrapolated to 30-months by multiplying the 92-day drift value by the square root of the ratio of the time periods. This resulted in a calculated 30-month drift of approximately ± 31.4 percent.

To calculate the As Found Tolerances, the drift uncertainty from the HPCI Steam Line Flow – High time delay relays was treated as non-time dependent. The drift uncertainty for the extended calibration interval was determined by increasing the tolerance factor to the 99%/95% level. This resulted in a 30-month drift uncertainty of approximately ± 10.9 percent of setpoint.

Use of the larger HPCI Steam Line Flow – High time delay relay drift uncertainty (approximately ± 31.4 percent) in determining the Allowable Values provides a high probability that the Allowable Values determined and applied to the LPCI loop select logic time delay relays will not be exceeded during routine calibrations. The proposed Allowable Values also were shown to provide adequate assurance that the time delay relays will not affect the assumptions used in the ECCS performance analysis.

Use of the smaller HPCI Steam Line Flow – High time delay relay drift uncertainty (approximately ± 10.9 percent) in determining the As Found Tolerances results in more conservative As Found Tolerances than would have been determined using the larger value. The more conservative As Found Tolerances will assure that potential time delay relay performance problems are identified well before the Allowable Value is approached.

4. **Confirm that a comparison of the projected instrument drift errors has been made with the values of drift used in the setpoint analysis. If this results in revised setpoints to accommodate larger drift errors, provide proposed TS changes to update trip setpoints. If the drift errors result in a revised safety analysis to support existing setpoints, provide a summary of the updated analysis conclusions to confirm that safety limits and safety analysis assumptions are not exceeded.**

NMC uses the setpoint methodology provided in GE NEDC-31336, "General Electric Setpoint Methodology". As discussed above, new Allowable Values were determined for the LPCI loop select logic time delay relay functions.

In no case was it necessary to change the existing analytical limit or safety analysis to accommodate a larger instrument drift error.

5. **Confirm that the projected instrument errors caused by drift are acceptable for control of plant parameters to effect a safe shutdown with the associated instrumentation.**

   The calculated drift values were compared to drift allowances in the setpoint calculation, other uncertainty analyses and the GE design basis. The setpoint calculation for these time delay relays was revised to include the calculated 30-month drift values and new TS allowable values were determined for these functions. In no case was it necessary to change the existing safe shutdown analysis to account for failures or drift.

6. **Confirm that all conditions and assumptions of the setpoint and safety analyses have been checked and are appropriately reflected in the acceptance criteria of plant surveillance procedures for channel checks, channel functional tests, and channel calibrations.**

   This license amendment request proposes revisions to Allowable Values for these functions based on the revised setpoint calculation. The associated plant surveillance procedures are revised upon approval of this license amendment to reflect the new Allowable Values and surveillance intervals. As part of the procedural review process plant surveillance procedures are verified to appropriately reflect the assumptions and conditions of the setpoint calculations.

7. **Provide a summary description of the program for monitoring and assessing the effects of increased calibration surveillance intervals on instrument drift and its effect on safety.**

   As part of the 24-month fuel cycle license amendment (License Amendment 143), MNGP implemented a trending program to monitor calibration results and the potential effect on instrument drift accompanying an increase in calibration intervals. The program provides data for evaluating the effects of the increased calibration intervals. In the 24-month fuel cycle LAR, NMC made the following commitment:

   > Monticello will implement a trending program to address setpoints for TS calibration intervals extended to 24 months. Setpoints found to exceed the expected drift for the instruments would require an additional evaluation to ensure the instrument's performance is still enveloped by the assumptions in the drift or setpoint analysis. The trending program will also plot setpoint or transmitter As-Found/As-Left (AFAL) values to verify that the performance of the instruments is within expected boundaries and that adverse trends (repeated directional changes in AFAL even of smaller magnitudes) are detected and evaluated.

The LPCI loop select time delay relays will be added to the trending program developed to address the above commitment. Therefore, NMC is making the following commitment:

> The LPCI loop select time delay relays will be added to the Instrument Trending Program.

As described in the program, setpoints found to exceed the expected drift for the relays require an additional evaluation to ensure the instrument's performance is still enveloped by the assumptions in the drift or setpoint analysis. Relays found outside of the As Found Tolerance are entered in the MNGP Corrective Action Program (CAP) to ensure that any negative trend will be identified, documented, and appropriate actions taken.

The NRC approved the necessary changes to the NMC custom TS to operate on a 24-month cycle on September 30, 2005, in License Amendment 143. Corresponding changes were included in the ITS conversion amendment which was approved on June 5, 2006.

Consideration of Relay Logic Reliability

In the 24-month fuel cycle LAR, NMC referenced the NRC safety evaluation (SE) dated August 2, 1993, relating to the extension of the Peach Bottom, Units 2 and 3, surveillance intervals from 18 months to 24 months. In this SE, as reiterated in the SE to the 24-month fuel cycle licensing amendment, the NRC staff stated the following:

> Industry reliability studies for boiling water reactors (BWRs), prepared by the BWR Owners Group (NEDC-30936P), show that the overall safety systems' reliability is not dominated by the reliability of the logic system, but by the mechanical components (e.g., pumps and valves), which are consequently tested on a more frequent basis. Since the probability of a relay or contact failure is small relative to the probability of mechanical component failure, increasing the logic system functional test interval represents no significant change in the overall safety system unavailability.

The original design of GE BWR/3 and 4 reactors included the LPCI loop select logic. Subsequently it was removed from most BWRs as part of the LPCI modification resulting in it not being included directly in the above referenced study, nonetheless, the LPCI loop select logic is included as part of the ECCS, in this case LPCI logic system, and was designed at the same time to the same design constraints as the logic evaluated. Therefore, increasing the surveillance test interval for the LPCI loop select logic time delay relays should represent no significant change in the overall safety system unavailability.

The above evaluations demonstrate that extending the LPCI loop select time delay relays calibration interval to 24 months does not have any adverse effects on plant safety. New TS Allowable Values have been determined for these functions. The probability of exceeding the new TS Allowable values is small and the probability itself remains well within the setpoint methodology guideline. The methodology used was in accordance with "General Electric Instrument Setpoint Methodology," NEDC-31336P-A, accepted by NRC Safety Evaluation Report dated November 6, 1995. Therefore, NMC has concluded that the proposed revision to the MNGP TS are acceptable.

5.5 Probabilistic Risk Assessment (PRA)

The MNGP 2005 average maintenance Probabilistic Risk Assessment (PRA) model was applied to reasonably quantify the significance of increasing the surveillance interval for the LPCI loop select logic time delay relays. While this submittal is not intended to be considered risk-informed, the impact of the extension of the surveillance interval to 24-month (nominal) was evaluated from a PRA perspective as far as the model would allow. To do this, the change in the probability of failure (failure rate) associated with extending a surveillance interval from 3 to 24 months was determined, and then the PRA model was run assuming this failure rate and failure of the LPCI loop select logic (i.e., the logic always selects the wrong recirculation loop for injection).

The effect of increasing a surveillance interval can be determined by applying the equation for determining the average unavailability between tests.

$$\text{Average Unavailability between Tests} = 1 + 1/\lambda\tau \, (e^{-\lambda\tau} - 1)$$

Applying this equation and assuming a failure rate (λ) of 1.0 E-06/hour (a conservative failure rate), the following failure probabilities were determined when the surveillance test interval (τ) was changed from 3 to 24 months. This represents less than a factor of eight increase in failure probability.

- Probability of failure at 3 months 1.10 E-03
- Probability of failure at 24 months 8.71 E-03

The failure rate for the LPCI loop select logic event presently included in the PRA model was conservatively increased by a factor of ten to account for the increase in surveillance interval from 3 to 24 months.

Note that the importance of the LPCI loop select logic in the PRA model is limited since it is not required at all for any accident other than for the recirculation line break LOCA. The PRA model conservatively assumes that failure of the LPCI loop select logic will always result in LPCI injection to the broken (wrong) recirculation loop as apposed to a random chance that the logic selects the broken loop. This in turn, will result in complete LPCI failure for recirculation loop

LOCA initiated events with break sizes greater than a 3 inch equivalent diameter. For breaks with less than a 3 inch equivalent diameter hole the current PRA average maintenance model indicates that adequate core cooling is maintained even with LPCI injection into the broken recirculation loop.

Quantifying the model with this ten fold increase in loop select failure probability results in a Core Damage Frequency (CDF) of 7.329 E-06/year as opposed to the baseline CDF value of 7.315 E-06/year, a change (ΔCDF) of 1.4 E-08/year.

As discussed in Regulatory Guide (RG) 1.174 (Reference 17), a change in CDF at Monticello is considered "Very Small" if it is less than 1.0 E-06/year. Additionally, RG 1.174 considers a change in Large Early Release Frequency (LERF) to be "Very Small" if it is less than 1.0 E-07/year. For this evaluation, if all core damage events were assumed to lead to a large early release, the resulting ΔLERF would still remain below the "Very Small" threshold.

The NMC has conservatively evaluated the change in risk, consisting of CDF and LERF, associated with increasing the surveillance interval for SR 3.3.5.1.2 and SR 3.3.5.1.4 for the LPCI loop select time delay relays. The results of the analysis are:

1. The change in CDF is 1.4 E-08/year (much less than 1.0 E-06/year).

2. The change in LERF is less than 1.0 E-07/year.

As can be seen the increase in CDF assuming an increase in surveillance interval to 24 months represents much less than a "Very Small" change as described in RG 1.174. Accordingly, the increase in risk from lengthening the surveillance interval from a nominal quarterly frequency to a nominal 24-month frequency results in an extremely small increase in risk, resulting in a negligible risk impact.

5.6 Conclusion

The potential for plant transients is greatly increased by performing channel calibration and channel functional testing of the LPCI loop select time delay relays with the plant on-line. Performance of this testing when the plant is shutdown and these instrument functions are not required to be OPERABLE greatly reduces the potential consequences of an error.

The proposed TS changes involve changes in the LPCI loop select time delay relay Allowable Values to allow a 24 month nominal operating cycle length. The proposed TS changes do not physically impact the normal operation of the plant, nor do they impact any design or functional requirements of the associated systems. The proposed TS changes do not introduce any accident initiators.

NMC has concluded that extending the surveillance interval to 24 months has minimal impact on the LPCI System reliability and the overall impact on plant safety is negligible.

In Enclosure 1 to the June 30, 2004, application for the 24-month fuel cycle amendment the methodology used to evaluate the acceptability of changes to a 24-month fuel cycle and compliance with GL 91-04 was discussed. The proposed 24-month calibration frequency is supported by plant-specific analyses consistent with those performed for the 24-month cycle amendment. The historical maintenance and surveillance test data at the bounding surveillance test interval limit was reviewed, and an evaluation performed to ensure that a 24-month surveillance test interval would not invalidate any assumption in the plant licensing bases, and determined that the safety impact of the surveillance interval extension and corresponding changes to the Allowable Values were acceptable.

The proposed extension in the nominal surveillance interval to 24-months for the LPCI loop select time delay relays is supported by the calibration interval drift evaluation and the PRA evaluation associated with extending the surveillance intervals.

6.0 REGULATORY ANALYSIS

6.1 No Significant Hazards Determination

In accordance with the requirements of 10 CFR 50.90, Nuclear Management Company (licensee) requests an amendment to facility Operating License DPR-22, for the Monticello Nuclear Generating Plant (MNGP). The proposed amendment requests to change the allowable values and surveillance intervals for the following low pressure coolant injection (LPCI) loop select logic time delay relay functions in Technical Specification Table 3.3.5.1-1; reactor steam dome pressure (2.k) and the recirculation pump and riser differential pressures (2.l and 2.m).

The proposed changes in Allowable Values and surveillance frequencies for the LPCI loop select time delay relays instrumentation have been established using the GE Instrument setpoint methodology guidance, as specified in the Monticello setpoint methodology. The difference between the analytic limit and the Allowable Value allows for channel instrument accuracy, calibration accuracy, process measurement accuracy, and primary element accuracy. The margin between the Allowable Value and the nominal trip setpoint (NTSP) allows for instrument drift that might occur during the established surveillance period. Two separate verifications were performed for the calculated NTSP. The first, a Spurious Trip Avoidance Test, evaluates the impact of the NTSP on plant availability. The second verification, an LER Avoidance Test, calculates the probability of avoiding a Licensee Event Report (or exceeding the Allowable

Value) due to instrument drift. These two verifications are statistical evaluations to provide additional assurance of the acceptability of the NTSP. Use of these methods and verifications provides the assurance that if the setpoint is found conservative to the Allowable Value during surveillance testing, the instrumentation would have provided the required trip function by the time the process reached the analytic limit for the applicable events.

NMC, has evaluated the proposed amendment in accordance with 10 CFR 50.91 against the standards in 10 CFR 50.92 and has determined that the operation of the MNGP in accordance with the proposed amendment presents no significant hazards. NMC's evaluation against each of the criteria in 10 CFR 50.92 follows.

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

   Response: No.

   The proposed chance involves a change in the Allowable Values and associated surveillance frequencies for the LPCI loop select time delay relay instrumentation. The relays for one LPCI loop select time delay relay function are being replaced with the same make, model number, and range as those presently installed to perform the two other LPCI loop select time delay relay functions (which have been demonstrated to be reliable). The LPCI loop select time delay relay instrumentation is not assumed to be an initiator for any analyzed event. The existing operating margin between plant conditions and actual plant setpoints is not significantly reduced due to this proposed change. As a result, the proposed changes in Allowable Values will not result in unnecessary plant transients. The role of the instrumentation is in mitigating and thereby limiting the consequences of accidents. The Allowable Values have been developed to ensure that the design and safety analyses limits will be satisfied. The methodology used for the development of the Allowable Values and associated surveillance frequencies ensures that the LPCI loop select time delay relay instrumentation remains capable of mitigating design basis events as described in the safety analyses, and that the results and consequences described in the safety analyses remain bounding. No new failure modes have been introduced because of this action and the consequences remain consistent with previously evaluated accidents. Additionally, the proposed changes do not alter the ability of the instrumentation and associated systems and components to detect and mitigate events. Therefore, the proposed changes do not involve a significant increase in the probability or consequences of an accident previously evaluated.

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

Response: No.

The proposed changes have been established using the GE Instrument Setpoint Methodology guidance, as specified and applied in the Monticello setpoint methodology program, and does not create the possibility of a new or different kind of accident from any accident previously evaluated. This is based on the fact that the method and manner of plant operation is unchanged. The use of the proposed Allowable Values does not impact safe operation of the plant, in that the safety analyses limits are maintained. The relays for one LPCI loop select time delay relay function are being replaced with the same model as presently installed to perform other LPCI loop select time delay functions (which have been demonstrated to be reliable).

These Allowable Values were developed using a methodology to ensure the affected instrumentation and associated systems and components remain capable of mitigating accidents and transients. The proposed amendment does not involve operation of any system, structure, or component (SSC) in a manner or configuration different from those previously recognized or evaluated. No new failure mechanisms are introduced. Plant equipment will not be operated in a manner different from previous operation, except that the Allowable Values have been changed. Since the existing operating parameters have been evaluated to maintain the unit within existing design basis criteria, the proposed changes do not create the possibility of a new or different kind of accident from any previously evaluated.

3. Does the proposed amendment involve a significant reduction in a margin of safety?

Response: No.

Extending the surveillance interval does not involve a change to any limit on accident consequences specified in the license or regulations and does not involve a change to how accidents are mitigated or a significant increase in the consequences of an accident. The instrumentation and components involved in this request have exhibited reliable operation based on the results of their performance during past periodic ECCS functional testing. The proposed changes have been developed using a methodology to ensure safety analyses limits are not exceeded. Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above, the NMC has determined that operation of the facility in accordance with the proposed change does not involve a significant hazards consideration as defined in 10 CFR 50.92(c), in that it does not: (1) involve a significant increase in the probability or consequences of an accident previously evaluated; or (2) create the possibility of a new or different kind of accident from any accident previously evaluated; or (3) involve a significant reduction in a margin of safety.

6.2 Applicable Regulatory Requirements

The MNGP was designed largely before the publishing of the 70 General Design Criteria (GDC) for Nuclear Power Plant Construction Permits proposed by the Atomic Energy Commission (AEC) for public comment in July, 1967 and the 1971 publishing of the GDCs in Appendix A to 10 CFR 50. As such, MNGP is not licensed to the GDCs. The MNGP Updated Safety Analysis Report (USAR), Section 1.2, lists the principal design criteria (PDCs) for the design, construction and operation of the plant and USAR Appendix E provides a plant comparative evaluation to the 70 proposed AEC design criteria. NMC believes that the MNGP design is in conformance with the intent of the GDCs.

Criterion 38 - Reliability and Testability of Engineered Safely Features

All engineered safety features shall be designed to provide high functional reliability and ready testability. In determining the suitability of a facility for proposed site, the degree of reliance upon and acceptance of the inherent and engineered safety afforded by the systems, including engineered safety features, will be influenced by the known and the demonstrated performance capability and reliability of the systems, and by the extent to which the operability of such systems can be tested and inspected where appropriate during the life of the plant.

Criterion 46 - Testing of Emergency Core Cooling System Components

Design provisions shall be made so that active components of the emergency core cooling systems, such as pumps and valves, can be tested periodically for operability and required functional performance.

The proposed Surveillance Requirement changes were evaluated in accordance with the guidance provided in NRC Generic Letter 91-04, "Changes in Technical Specification Surveillance Intervals to Accommodate a 24-Month Fuel Cycle," dated April 2, 1991. Justification for these changes has also been provided in accordance with the guidance contained in GL 91-04. Based on the evaluation presented herein, NMC has concluded that the proposed TS changes in instrumentation surveillance frequency to reflect a 24-month interval (and associated allowable values) are consistent with the guidance of GL 91-04. The

MNGP monitoring program is adequate for assessing the effects of the extended instrument calibration surveillance intervals on future instrument drift.

NMC has evaluated the proposed changes against the applicable regulatory requirements and acceptance criteria as described herein. Based on this there is reasonable assurance that the health and safety of the public, following approval of this change to revise the allowable value and extend the LPCI loop select logic time delay relay surveillance interval to nominally 24-months, is unaffected.

7.0 ENVIRONMENTAL EVALUATION

NMC has determined that the proposed amendment would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. The proposed amendment does not involve (i) a significant hazards consideration, or (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for a categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, NMC concludes pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

REFERENCES

1. NMC letter to NRC, "License Amendment Request: One-Time Low Pressure Coolant Injection Loop Select Logic Time Delay Relay Surveillance Interval Extension," (L-MT-06-071) dated November 14, 2006, (ADAMS Ascension Number ML063190116).

2. NRC letter to NMC, "Monticello Nuclear Generating Plant - Issuance of Amendment Re: One-Time Extension of Low Pressure Coolant Injection Loop Select Logic Time Delay Surveillance Interval (TAC No. MD3580)," dated January 18, 2007.

3. NRC NUREG-1433, "Standard Technical Specifications, General Electric Plants, BWR/4," Revision 3.0, dated June 2004.

4. General Electric report, NEDC-32514P, Revision 1, "Monticello Nuclear Generating Plant SAFER/GESTR-LOCA Loss-of-Coolant Accident Analysis," dated October 1997.

5. GE-NE-J1103878-09-02P, "Monticello ECCS-LOCA Evaluation for GE14," August 2001.

6. GE Nuclear Energy, NEDC-31336-P-A, "General Electric Instrument Setpoint Methodology," dated September 1996.

7. NMC letter to NRC, "License Amendment Request to Support 24-Month Fuel Cycles," (L-MT-04-036) dated June 30, 2004, (ADAMS Ascension Number ML052700252).

8. NRC letter to NMC, "Monticello Nuclear Generating Plant – Issuance of Amendment Re: Implementation of 24-Month Fuel Cycles (TAC No. MC3692)," dated September 30, 2005, (ADAMS Ascension Number ML052700252).

9. NRC Generic Letter 91-04, "Changes in Technical Specification Surveillance Intervals to Accommodate a 24-Month Fuel Cycle," dated April 2, 1991.

10. NRC letter to TVA, "Browns Ferry Nuclear Plant, Units 2 and 3 – Issuance of Amendments Regarding Extension of Surveillance Calibration Interval for Area Temperature Monitoring Instrumentation of the Main Steam Valve Vault," dated November 26, 2002, (ADAMS Ascension Number ML023310327).

11. NRC letter to Entergy Nuclear Operations, "Pilgrim Nuclear Station – Issuance of Amendment Re: Instrumentation Trip Level Settings and Calibration Intervals Changes," dated April 17, 2003, (ADAMS Ascension Number ML030690008).

12. NRC letter to TVA, "Browns Ferry Nuclear Plant, Units 1, 2 and 3 – Issuance of Amendments Regarding Extension of Channel Calibration Surveillance Requirement Performance Frequency and Allowable Value Revision," dated September 21, 2006, (ADAMS Ascension Number ML062160077).

13. Technical Specification Task Force (TSTF), Improved Standard Technical Specifications Change Traveler, TSTF-493 Revision 1, "Clarify Application of Setpoint Methodology for LSSS Functions."

14. NMC letter to NRC, "Response to NRC Requests for Additional Information Reqarding License Amendment Request Supportinq 24-Month Fuel Cycles (TAC No. MC3692)," (L-MT-05-075) dated July 1, 2005.

15. Electric Power Research Institute (EPRI) Report TR-103335, "Guidelines for Instrument Calibration Extension/Reduction Programs," Revision 1.

16. NRC to EPRI, "Status Report on the Staff Review of EPRI Technical Report TR-103335, Guidelines for Instrument Calibration Extension/Reduction Programs, dated March 1994,"

17. NRC Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," Revision 1, dated November 2002.

ENCLOSURE 2

MONTICELLO NUCLEAR GENERATING PLANT

LICENSE AMENDMENT REQUEST
ONE-TIME LOW PRESSURE COOLANT INJECTION LOOP SELECT
LOGIC TIME DELAY RELAY SURVEILLANCE INTERVAL EXTENSION

MARKED-UP TECHNICAL SPECIFICATION PAGES

(3 pages follows)

SURVEILLANCE REQUIREMENTS

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

1. Refer to Table 3.3.5.1-1 to determine which SRs apply for each ECCS Function.

2. When a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed as follows: (a) for up to 6 hours for Functions 3.c and 3.f; and (b) for up to 6 hours for Functions other than 3.c and 3.f provided the associated Function or the redundant Function maintains ECCS initiation capability.

SURVEILLANCE		FREQUENCY
SR 3.3.5.1.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.5.1.2	Perform CHANNEL FUNCTIONAL TEST.	92 days
SR 3.3.5.1.3	Calibrate the trip unit.	92 days
SR 3.3.5.1.4	Perform CHANNEL CALIBRATION.	92 days
SR 3.3.5.1.5	Perform CHANNEL FUNCTIONAL TEST.	12 months
SR 3.3.5.1.6	Perform CHANNEL CALIBRATION.	12 months
SR 3.3.5.1.7	Perform CHANNEL CALIBRATION.	24 months
SR 3.3.5.1.8	Perform LOGIC SYSTEM FUNCTIONAL TEST.	24 months
SR 3.3.5.1.9	Perform CHANNEL FUNCTIONAL TEST.	24 months

Table 3.3.5.1-1 (page 3 of 6)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
2. LPCI System					
e. Reactor Steam Dome Pressure Permissive - Bypass Timer (Pump Permissive)	1, 2, 3	2	C	SR 3.3.5.1.7 SR 3.3.5.1.8	≥ 18 minutes and ≤ 22 minutes
	4[(a)], 5[(a)]	2	B	SR 3.3.5.1.7 SR 3.3.5.1.8	≥ 18 minutes and ≤ 22 minutes
f. Low Pressure Coolant Injection Pump Start - Time Delay Relay	1, 2, 3, 4[(a)], 5[(a)]	4 per pump	B	SR 3.3.5.1.7 SR 3.3.5.1.8	
Pumps A, B					≤ 5.33 seconds
Pumps C, D					≤ 10.59 seconds
g. Low Pressure Coolant Injection Pump Discharge Flow - Low (Bypass)	1, 2, 3, 4[(a)], 5[(a)]	1 per pump	E	SR 3.3.5.1.2 SR 3.3.5.1.7 SR 3.3.5.1.8	≥ 360 gpm and ≤ 745 gpm
h. Reactor Steam Dome Pressure - Low (Break Detection)	1, 2, 3,	4	B	SR 3.3.5.1.2 SR 3.3.5.1.7 SR 3.3.5.1.8	≥ 873.6 psig and ≤ 923.4 psig
i. Recirculation Pump Differential Pressure - High (Break Detection)	1, 2, 3	4 per pump	C	SR 3.3.5.1.2 SR 3.3.5.1.7 SR 3.3.5.1.8	≥ 63.5 inches wc
j. Recirculation Riser Differential Pressure - High (Break Detection)	1, 2, 3	4	C	SR 3.3.5.1.2 SR 3.3.5.1.6 SR 3.3.5.1.8	≤ 24.0 inches wc
k. Reactor Steam Dome Pressure - Time Delay Relay (Break Detection)	1, 2, 3	2	B	~~SR 3.3.5.1.2[(f)]~~ ~~SR 3.3.5.1.4[(f)]~~ SR 3.3.5.1.7 SR 3.3.5.1.8 SR 3.3.5.1.9	≤ ~~2.79~~ 2.97 seconds

(a) When associated ECCS subsystem(s) are required to be OPERABLE per LCO 3.5.2.

~~(f) Surveillance performance for these functions is not required to be current until entry into MODE 2 from the 2007 refueling outage.~~

Table 3.3.5.1-1 (page 4 of 6)
Emergency Core Cooling System Instrumentation

	FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
2.	LPCI System					
l.	Recirculation Pump Differential Pressure - Time Delay Relay (Break Detection)	1, 2, 3	2	C	~~SR 3.3.5.1.2~~[f] ~~SR 3.3.5.1.4~~[f] SR 3.3.5.1.7 SR 3.3.5.1.8 SR 3.3.5.1.9	≤ ~~0.716~~ 0.75 seconds
m.	Recirculation Riser Differential Pressure - Time Delay Relay (Break Detection)	1, 2, 3	2	C	~~SR 3.3.5.1.2~~[f] ~~SR 3.3.5.1.4~~[f] SR 3.3.5.1.7 SR 3.3.5.1.8 SR 3.3.5.1.9	≤ ~~0.697~~ 0.75 seconds
3.	High Pressure Coolant Injection (HPCI) System					
a.	Reactor Vessel Water Level - Low Low	1, 2[e], 3[e]	4	B	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.3 SR 3.3.5.1.7 SR 3.3.5.1.8	≥ -48 inches
b.	Drywell Pressure - High	1, 2[e], 3[e]	4	B	SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.8	≤ 2 psig
c.	Reactor Vessel Water Level - High	1, 2[e], 3[e]	2	C	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.3 SR 3.3.5.1.7 SR 3.3.5.1.8	≤ 48 inches
d.	Condensate Storage Tank Level - Low	1, 2[e], 3[e]	2	D	SR 3.3.5.1.7 SR 3.3.5.1.8	≥ 29.3 inches
e.	Suppression Pool Water Level - High	1, 2[e], 3[e]	2	D	SR 3.3.5.1.5 SR 3.3.5.1.6 SR 3.3.5.1.8	≤ 3.0 inches
f.	High Pressure Coolant Injection Pump Discharge Flow - Low (Bypass)	1, 2[e], 3[e]	1	E	SR 3.3.5.1.5 SR 3.3.5.1.6 SR 3.3.5.1.8	≥ 362 gpm and ≤ 849 gpm

(e) With reactor steam dome pressure > 150 psig.

~~(f) Surveillance performance for these functions is not required to be current until entry into MODE 2 from the 2007 refueling outage.~~

ENCLOSURE 3

MONTICELLO NUCLEAR GENERATING PLANT

LICENSE AMENDMENT REQUEST
ONE-TIME LOW PRESSURE COOLANT INJECTION LOOP SELECT
LOGIC TIME DELAY RELAY SURVEILLANCE INTERVAL EXTENSION

RETYPED TECHNICAL SPECIFICATION PAGES

(4 pages follows)

SURVEILLANCE REQUIREMENTS

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

1. Refer to Table 3.3.5.1-1 to determine which SRs apply for each ECCS Function.

2. When a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed as follows: (a) for up to 6 hours for Functions 3.c and 3.f; and (b) for up to 6 hours for Functions other than 3.c and 3.f provided the associated Function or the redundant Function maintains ECCS initiation capability.

SURVEILLANCE		FREQUENCY
SR 3.3.5.1.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.5.1.2	Perform CHANNEL FUNCTIONAL TEST.	92 days
SR 3.3.5.1.3	Calibrate the trip unit.	92 days
SR 3.3.5.1.4	Perform CHANNEL CALIBRATION.	92 days
SR 3.3.5.1.5	Perform CHANNEL FUNCTIONAL TEST.	12 months
SR 3.3.5.1.6	Perform CHANNEL CALIBRATION.	12 months
SR 3.3.5.1.7	Perform CHANNEL CALIBRATION.	24 months
SR 3.3.5.1.8	Perform LOGIC SYSTEM FUNCTIONAL TEST.	24 months
SR 3.3.5.1.9	Perform CHANNEL FUNCTIONAL TEST.	24 months

Table 3.3.5.1-1 (page 1 of 6)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Core Spray System					
a. Reactor Vessel Water Level - Low Low	1, 2, 3, 4[(a)], 5[(a)]	4[(b)]	B	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.3 SR 3.3.5.1.7 SR 3.3.5.1.8	≥ -48 inches
b. Drywell Pressure - High	1, 2, 3	4[(b)]	B	SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.8	≤ 2 psig
c. Reactor Steam Dome Pressure - Low (Injection Permissive)	1, 2, 3	2	C	SR 3.3.5.1.2 SR 3.3.5.1.4[(c)(d)] SR 3.3.5.1.8	≥ 397 psig and ≤ 440 psig
	4[(a)], 5[(a)]	2	B	SR 3.3.5.1.2 SR 3.3.5.1.4[(c)(d)] SR 3.3.5.1.8	≥ 397 psig and ≤ 440 psig
d. Reactor Steam Dome Pressure Permissive - Low (Pump Permissive)	1, 2, 3	2	C	SR 3.3.5.1.2 SR 3.3.5.1.4[(c)(d)] SR 3.3.5.1.8	≥ 397 psig
	4[(a)], 5[(a)]	2	B	SR 3.3.5.1.2 SR 3.3.5.1.4[(c)(d)] SR 3.3.5.1.8	≥ 397 psig
e. Reactor Steam Dome Pressure Permissive - Bypass Timer (Pump Permissive)	1, 2, 3	2	C	SR 3.3.5.1.7 SR 3.3.5.1.8	≥ 18 minutes and ≤ 22 minutes
	4[(a)], 5[(a)]	2	B	SR 3.3.5.1.7 SR 3.3.5.1.8	≥ 18 minutes and ≤ 22 minutes

(a) When associated ECCS subsystem(s) are required to be OPERABLE per LCO 3.5.2, "ECCS - Shutdown."

(b) Also required to initiate the associated emergency diesel generator (EDG).

(c) If the as-found channel setpoint is conservative with respect to the Allowable Value but outside its predefined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service.

(d) The instrument channel setpoint shall be reset to a value that is within the as-left tolerance of the nominal trip setpoint; otherwise, the channel shall be declared inoperable. The nominal trip setpoint and the methodology used to determine the as-found tolerance and the as-left tolerance are specified in the Technical Requirements Manual (TRM).

Table 3.3.5.1-1 (page 3 of 6)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
2. LPCI System					
e. Reactor Steam Dome Pressure Permissive - Bypass Timer (Pump Permissive)	1, 2, 3	2	C	SR 3.3.5.1.7 SR 3.3.5.1.8	≥ 18 minutes and ≤ 22 minutes
	4[(a)], 5[(a)]	2	B	SR 3.3.5.1.7 SR 3.3.5.1.8	≥ 18 minutes and ≤ 22 minutes
f. Low Pressure Coolant Injection Pump Start - Time Delay Relay	1, 2, 3, 4[(a)], 5[(a)]	4 per pump	B	SR 3.3.5.1.7 SR 3.3.5.1.8	
Pumps A, B					≤ 5.33 seconds
Pumps C, D					≤ 10.59 seconds
g. Low Pressure Coolant Injection Pump Discharge Flow - Low (Bypass)	1, 2, 3, 4[(a)], 5[(a)]	1 per pump	E	SR 3.3.5.1.2 SR 3.3.5.1.7 SR 3.3.5.1.8	≥ 360 gpm and ≤ 745 gpm
h. Reactor Steam Dome Pressure - Low (Break Detection)	1, 2, 3,	4	B	SR 3.3.5.1.2 SR 3.3.5.1.7 SR 3.3.5.1.8	≥ 873.6 psig and ≤ 923.4 psig
i. Recirculation Pump Differential Pressure - High (Break Detection)	1, 2, 3	4 per pump	C	SR 3.3.5.1.2 SR 3.3.5.1.7 SR 3.3.5.1.8	≥ 63.5 inches wc
j. Recirculation Riser Differential Pressure - High (Break Detection)	1, 2, 3	4	C	SR 3.3.5.1.2 SR 3.3.5.1.6 SR 3.3.5.1.8	≤ 24.0 inches wc
k. Reactor Steam Dome Pressure - Time Delay Relay (Break Detection)	1, 2, 3	2	B	SR 3.3.5.1.7 SR 3.3.5.1.8 SR 3.3.5.1.9	≤ 2.97 seconds

(a) When associated ECCS subsystem(s) are required to be OPERABLE per LCO 3.5.2.

Table 3.3.5.1-1 (page 4 of 6)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
2. LPCI System					
l. Recirculation Pump Differential Pressure - Time Delay Relay (Break Detection)	1, 2, 3	2	C	SR 3.3.5.1.7 SR 3.3.5.1.8 SR 3.3.5.1.9	≤ 0.75 seconds
m. Recirculation Riser Differential Pressure - Time Delay Relay (Break Detection)	1, 2, 3	2	C	SR 3.3.5.1.7 SR 3.3.5.1.8 SR 3.3.5.1.9	≤ 0.75 seconds
3. High Pressure Coolant Injection (HPCI) System					
a. Reactor Vessel Water Level - Low Low	1, 2[(e)], 3[(e)]	4	B	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.3 SR 3.3.5.1.7 SR 3.3.5.1.8	≥ -48 inches
b. Drywell Pressure - High	1, 2[(e)], 3[(e)]	4	B	SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.8	≤ 2 psig
c. Reactor Vessel Water Level - High	1, 2[(e)], 3[(e)]	2	C	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.3 SR 3.3.5.1.7 SR 3.3.5.1.8	≤ 48 inches
d. Condensate Storage Tank Level - Low	1, 2[(e)], 3[(e)]	2	D	SR 3.3.5.1.7 SR 3.3.5.1.8	≥ 29.3 inches
e. Suppression Pool Water Level - High	1, 2[(e)], 3[(e)]	2	D	SR 3.3.5.1.5 SR 3.3.5.1.6 SR 3.3.5.1.8	≤ 3.0 inches
f. High Pressure Coolant Injection Pump Discharge Flow - Low (Bypass)	1, 2[(e)], 3[(e)]	1	E	SR 3.3.5.1.5 SR 3.3.5.1.6 SR 3.3.5.1.8	≥ 362 gpm and ≤ 849 gpm

(e) With reactor steam dome pressure > 150 psig.