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10CFR50.90
June 1, 2001

U-603481
8E.100a

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555-0001

Clinton Power Station, Unit 1
Facility Operating License No. NPF-62
NRC Docket No. 50-461

Subject: Request for Amendment to Appendix A, Technical Specifications for the Oscillation Power Range Monitor Instrumentation

References:
(1) Letter from M. T. Coyle (AmerGen Energy Company, LLC) to U. S. NRC, "Revision to the Clinton Power Station Implementation Schedule for the Resolution to Generic Letter (GL) 94-02, Long-Term Solution and Upgrade of Interim Operating Recommendation for Thermal-Hydraulic Instabilities in Boiling Water Reactors," dated March 30, 2000.
(2) Letter from J. G. Cook (Illinois Power Company) to U. S. NRC, " Illinois Power's (IP's) Response to Generic Letter (GL) 94-02, 'Long-Term Solutions and Upgrade of Interim Operating Recommendations for Thermal-Hydraulic Instabilities in Boiling Water Reactors'," dated September 2, 1994.
(3) Letter from C. G. Pardee (Commonwealth Edison Company) to U.S. NRC, "Application for Amendment to Appendix A, Technical Specifications for the Oscillation Power Range Monitor Instrumentation," dated November 10, 2000.
(4) Letter from D. V. Pickett (U. S. NRC) to J. K. Wood (First Energy Nuclear Operating Company), "Perry Nuclear Plant, Unit 1 – Issuance of Amendment Re: Activation of Thermal-Hydraulic Stability Monitoring Instrumentation (TAC No. MA8671)," dated February 26, 2001.

In accordance with 10 CFR 50.90, "Application for amendment of license or construction permit," AmerGen Energy Company, LLC (i.e., AmerGen) proposes changes to Appendix A, Technical Specifications (TS), of Facility Operating License No. NPF-62 for Clinton Power Station (CPS). The proposed changes incorporate into the TS the Oscillation Power Range Monitor (OPRM) Instrumentation that will be declared operable in accordance with the schedule provided in Reference (1).

A001

Boiling Water Reactors (BWRs) are susceptible to thermal-hydraulic instabilities if operated at high power and low flow conditions. The detection and suppression of instabilities is required to ensure that the Minimum Critical Power Ratio (MCPR) safety limit is not exceeded during a transient.

We committed in Reference (2), to address the long-term solution for thermal-hydraulic instabilities by installing the Asea Brown Boveri (ABB) Combustion Engineering Option III OPRM. The OPRM instrumentation will initiate an automatic reactor trip upon detection of an instability that could threaten the MCPR safety limit. Thus, the enabling of this trip function requires that the OPRM instrumentation be incorporated into the TS. The proposed TS changes remove manual monitoring guidance from the TS and incorporate the new OPRM Instrumentation TS.

As noted in Reference (1), the OPRM system was installed during the sixth refueling outage and testing of the system was begun during operating Cycle 7. However, modifications to the system were required during the last refueling outage (i.e., fall 2000), and functional testing of the system has been resumed during the current operating cycle (Cycle 8). Based on this schedule it has been determined that implementation of the OPRM system is planned for the next refueling outage such that its operation will support Cycle 9 operation. These proposed changes are consistent with the amendment request previously submitted for the LaSalle County Station (Reference 3) and approved for the Perry Nuclear Power Plant (Reference 4). Therefore, we request approval of these changes prior to March 30, 2002 in order to support preparation for the next refueling outage.

This request is subdivided as follows:

1. Attachment A gives a description and safety analysis of the proposed changes.

2. Attachment B includes the marked-up TS pages with the requested changes indicated and a marked-up copy of the affected pages from the current TS Bases provided for information only.

3. Attachment C describes our evaluation performed using the criteria in 10 CFR 50.91, "Notice for public comment; State consultation," paragraph (a)(1) which provides information supporting a finding of no significant hazards consideration in accordance with 10 CFR 50.92, "Issuance of amendment," paragraph (c).

4. Attachment D provides information supporting an Environmental Assessment.

The proposed changes have been reviewed by the CPS Plant Operations Review Committee and approved by the Nuclear Safety Review Board.

AmerGen is notifying the State of Illinois of this request for changes to the TS by transmitting a copy of this letter and its attachments to the designated State Official.

Should you have any questions concerning this letter, please contact Mr. T. A. Byam at (630) 663-7266.

Respectfully,

J. M. Heffley
Vice President
Clinton Power Station

TAB/blf

Attachments: Affidavit
Attachment A: Description and Safety Analysis for Proposed Changes
Attachment B: Marked-up pages for Proposed Changes
Attachment C: Information Supporting No Significant Hazard Findings
Attachment D: Information Supporting an Environmental Assessment

cc: Regional Administrator – NRC Region III
NRC Senior Resident Inspector – Clinton Power Station
Office of Nuclear Facility Safety - Illinois Department of Nuclear Safety

STATE OF ILLINOIS	)	
COUNTY OF DEWITT	)	
IN THE MATTER OF	)	
AMERGEN ENERGY COMPANY, LLC	)	**Docket Number**
CLINTON POWER STATION, UNIT 1	)	**50-461**

SUBJECT: **Request for Amendment to Appendix A, Technical Specifications for the Oscillation Power Range Monitor Instrumentation**

AFFIDAVIT

I affirm that the content of this transmittal is true and correct to the best of my knowledge, information and belief.

J. M. Heffley
Vice President
Clinton Power Station

Subscribed and sworn to before me, a Notary Public in and

for the State above named, this 1st day of

June, 2001.

Jacqueline S. Matthias
Notary Public

" OFFICIAL SEAL "
Jacqueline S. Matthias
Notary Public, State of Illinois
My Commission Expires 11/24/2001

DESCRIPTION AND SAFETY ANALYSIS FOR THE PROPOSED CHANGES

A. SUMMARY OF THE PROPOSED CHANGES

In accordance with 10CFR 50.90, "Application for amendment of license or construction permit," AmerGen Energy Company, LLC (i.e., AmerGen) proposes changes to Appendix A, Technical Specifications (TS), of Facility Operating License No. NPF-62 for the Clinton Power Station (CPS). Specifically, we propose to incorporate into the TS Oscillation Power Range Monitor (OPRM) instrumentation. We propose to add TS Section 3.3.1.3, "Oscillation Power Range Monitor (OPRM) Instrumentation," which provides the minimum operability requirements for the OPRM channels, the Required Actions when they become inoperable, and the appropriate surveillance requirements. The proposed change also removes manual monitoring guidance for thermal hydraulic instability monitoring from TS Section 3.4.1, "Recirculation Loops Operating," that will no longer be necessary due to activation of the automatic OPRM instrumentation. In addition, these proposed changes include an update to TS Section 5.6.5, "Core Operating Limits report (COLR)," which requires the documentation of the core limits for the OPRM instrumentation in the COLR. The proposed TS changes will allow the enabling of the OPRM instrumentation trips in accordance with Reference (1).

The proposed changes are described in Section E of this attachment. The marked-up TS pages and the associated TS Bases pages are shown in Attachment B.

B. DESCRIPTION OF THE CURRENT REQUIREMENTS

CPS currently does not have a TS for the OPRM instrumentation. However, TS Section 3.4.1 provides actions and surveillance requirements to address thermal-hydraulic instabilities based on TS Figure 3.4.1-1, "Thermal Power/Core Flow Stability Regions."

C. BASES FOR THE CURRENT REQUIREMENTS

CPS committed in Reference (2), to implement the Interim Corrective Actions (ICAs) described in NRC Bulletin 88-07, Supplement 1, "Power Oscillations in Boiling Water Reactors (BWRs)." The ICAs were intended for use until replaced by the long-term solution (i.e., OPRM instrumentation). TS Section 3.4.1 and the associated actions, surveillance requirement, and Power versus Flow Figure 3.4.1-1, are based on the ICAs and address the potential for thermal hydraulic instabilities by requiring that plant operation be restricted to certain regions of the power/flow map. Since the CPS is susceptible to instabilities when operating at high power and low flow, TS Figure 3.4.1-1 divides the power/flow map into three Regions (i.e., A, B, and C) with Regions A and B being the areas of TS Figure 3.4.1-1 where the potential for instabilities exist. Therefore, Surveillance Requirement (SR) 3.4.1.2 verifies that thermal power and core flow is in Region C.

D. NEED FOR REVISION OF THE REQUIREMENTS

In Reference (2), the NRC was provided with our selection for the long-term solution to the Stability issue and the initial implementation schedule. We selected the OPRM Option III for CPS. The OPRM instrumentation modification was committed to be installed and implemented based on our responses to Generic Letter 94-02, "Long-Term Solutions and Upgrade of Interim Operating Recommendations for Thermal-Hydraulic Instabilities in Boiling Water Reactors." Upon restart from the outage in which the OPRM instrumentation was installed, we committed to operate the OPRM system in a disabled or unarmed state for a period of time such that it would have alarm capability but not be able to effect a reactor scram. Operating the system without its automatic protection enabled would allow for evaluation of system performance, its potential for spurious trips, and familiarization with system operation. A period of at least six months was to be allowed for such operation, consistent with the recommendations of the BWR Owners' Group (BWROG).

The OPRM designer, Asea Brown Boveri (ABB) Combustion Engineering, notified the NRC of a design defect in the OPRM system in accordance with 10 CFR 21, "Reporting of Defects and Non-Compliance," as documented in Reference (3). As a result, the scheduled date for placing the reactor scram capability associated with the system into service was deferred in order to make the necessary modifications to the CPS OPRM system. These modifications were made in the last refueling outage and functional testing resumed following the outage. Therefore, as stated in Reference (1), implementation of the OPRM system is planned for the next refueling outage such that operation will support Cycle 9 operation. These proposed changes are consistent with the amendment request previously approved for the Perry Nuclear Power Plant in Reference (4). These proposed TS changes are required to support operability of the OPRM system in April 2002.

E. DESCRIPTION OF THE PROPOSED CHANGES

The proposed TS changes are as follows.

1. Add the new TS Section 3.3.1.3, "Oscillation Power Range Monitor (OPRM) Instrumentation," including the Limiting Condition for Operation (LCO), Applicability, Actions and Surveillance Requirements necessary to define operability of the OPRM channels, and the actions the plant operators must take when the instruments become inoperable. These controls are consistent with Appendix A of Reference (5). Specifically, the LCO, Applicability, Actions, and Surveillance Requirements are identical to the example, except for the following.

   - The description of the enabled region in SR 3.3.1.3.5 is specified as "Thermal Power is ≥ 30% RTP and recirculation drive flow is ≤ the value corresponding to 60% of rated core flow." This exception more accurately describes the CPS enabled region and is consistent with the wording adopted by the Perry Nuclear Power Plant.

- The 120 day Completion Time for restoring the OPRM trip capability is deleted, consistent with the wording adopted by the Perry Nuclear Power Plant. The OPRM components are safety related, and therefore 10CFR 50 Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," Section XVI, "Corrective Action," applies. The "timeliness of corrective action" controls in this Section are adequate to ensure restoration of equipment operability. Until operability is restored, the ICAs must be in place (as required by Action B.1), similar to the manner in which CPS has been operated for the time period prior to implementation of the OPRM instrumentation.

2. Due to the automatic functions provided by the OPRM instrumentation, the manual operator actions specified in TS Section 3.4.1 (and its associated Conditions, Actions, and Surveillance Requirements), which were required to be taken upon entry into a specified thermal power/core flow region of the core map, are removed. The removal of these references include elimination of LCO items 3.4.1.A.2, B.2 and B.3, removal of Actions B, C, D; G.1 and G.2, as well as deletion of SR 3.4.1.2 and Figure 3.4.1-1.

   The implementation of the OPRM system permits TS Section 3.4.1 to be reformatted to be consistent with the Standard TS provided in Reference (6). Similar to the TS Section 3.4.1 approved for the Perry Nuclear Power Plant in Reference (4), the proposed CPS TS Section 3.4.1 is modeled after Reference (6) with the following exceptions.

   - Condition A currently addresses the condition where the recirculation loop jet pump flow mismatch is not within limits. The required action for this condition is to shut down one recirculation loop within two hours. This condition is not contained in the standard TS but will be retained consistent with Reference (4) and the fact that this required action provides additional control above that required by Reference (6).

   - Condition B currently addresses the condition where thermal power is > 70% rated thermal power (RTP) during single recirculation loop operation. The required action for this condition is to reduce thermal power to ≤ 70% RTP within 4 hours. This condition is not contained in the standard TS but will be retained since it provides an additional control above that required by Reference (6).

3. Administrative Control Specification 5.6.5 is revised to require that the Core Operating Limits Report (COLR) include the applicable operating limits for the OPRM instrumentation, and to specify the Topical Report that is used for determining the setpoint values.

4. We have revised the TS Bases consistent with the changes above.

The proposed TS changes are reflected on a marked-up copy of the affected pages from the CPS TS contained in Attachment B. A marked-up copy of the affected pages from the current TS Bases is also provided in Attachment B for information only. Following NRC approval of this request, we will revise the CPS Bases, in accordance with the TS Bases Control Program of TS Section 5.5.11, to incorporate the changes identified in Attachment B.

F. SAFETY ANALYSIS OF THE PROPOSED CHANGES

10 CFR 50, Appendix A, "General Design Criteria for Nuclear Power Plants," General Design Criterion (GDC) 10, "Reactor design," requires the reactor core and associated coolant, control, and protection systems to be designed with appropriate margin to assure that acceptable fuel design limits are not exceeded during any condition of normal operation, including the effects of anticipated operational occurrences. In addition, GDC 12, "Suppression of reactor power oscillations," requires the reactor core and associated coolant, control, and protection systems to be designed to assure that power oscillations which can result in conditions exceeding acceptable fuel design limits are either not possible or can be reliably and readily detected and suppressed. The OPRM Instrumentation system provides compliance with GDC 10 and GDC 12, thereby providing protection from exceeding the fuel Minimum Critical Power Ration (MCPR) safety limit. As noted in the Bases for TS Section 2.1.1, "Reactor Core SLs," the MCPR safety limit is defined with a margin to the conditions that would produce onset of transition boiling. Essentially, implementation of the OPRM replaces procedure-driven manual operator actions for protecting the MCPR limit, with installed instrumentation providing automatic protection of the limit.

The OPRM System consists of four OPRM trip channels, one per Reactor Protection System (RPS) channel. Each OPRM trip channel consists of two OPRM modules, as described below, either of which can generate a channel trip signal. Each OPRM module receives input from Local Power Range Monitors (LPRMs). Each OPRM module also receives input from the RPS Average Power Range Monitor (APRM) power and flow signals to automatically enable the trip function of the OPRM instrumentation module.

References (5), (7), and (8), describe three separate algorithms for detecting stability related oscillations: the period based detection algorithm, the amplitude based algorithm, and the growth rate algorithm. The OPRM Instrumentation System implements these algorithms within the microprocessor based modules installed in the Neutron Monitoring System (NMS) cabinets. These modules execute the algorithms based on LPRM inputs, and generate alarms and trips based on these calculations. These trips result in tripping the RPS when the appropriate RPS trip logic is satisfied.

Only the period based detection algorithm is used in the safety analysis. The remaining algorithms provide defense in depth and additional protection against unanticipated oscillations. The period based detection algorithm detects an instability related oscillation based on the occurrence of a predetermined number of consecutive period confirmations followed by a relative amplitude signal exceeding a set point. Upon detection of a stability related oscillation, a trip is generated for that OPRM channel. The OPRM channel trip inputs to the RPS trip logic.

Each OPRM module is continuously tested by a self-test function. On detection of any OPRM module failure, either a Trouble alarm or INOP alarm is activated. The Trouble alarm indicates the OPRM module is still performing its function but needs attention. The OPRM module provides an INOP alarm when the self-test feature indicates that the OPRM module may not be capable of meeting its functional requirements. No trip is generated as a result of a self-test failure. When one OPRM Instrumentation module is inoperable, the remaining redundant OPRM Instrumentation module in the associated OPRM trip channel maintains the operability of the trip channel and thus there is no loss of trip function and no TS actions required. If both OPRM Instrumentation modules in an OPRM channel are inoperable, the associated OPRM instrumentation channel is inoperable, and the proposed TS actions are entered consistent with Reference (5).

The safety and effectiveness of the installed system in meeting the design requirement of detecting and suppressing reactor core thermal-hydraulic instabilities is demonstrated and documented in NRC reviewed and approved licensing topical reports (References 5, 7, 8, and 9). References (7), (8), and (9) detail the safety analyses performed to support the development of the long-term solutions for the thermal-hydraulic stability issue. Reference (5) describes the design of the OPRM instrumentation installed at CPS including the extensive controls over the development, implementation, and onsite testing of both the OPRM hardware and software, to ensure that significant oscillations will be detected and suppressed with high reliability.

The extensive controls described in Reference (5) help to ensure there will not be a significant increase in the number of plant scrams due to the new RPS trip signals that are being activated. Currently, the ICAs require the operator to scram the plant upon entry into the restricted region of the power to flow map (i.e., high power and low flow) regardless if core oscillation due to thermal-hydraulic instability is present or not. Thus, under current licensing requirements, transients into this high power, low flow region unnecessarily result in a scram when no oscillation is present. Upon implementation of the OPRM trip, the reactor will only scram in this high power, low flow region if a reactor core oscillation that has sufficient magnitude to threaten the MCPR limit occurs. Thus the expected frequency of scram transients is reduced during the life of the plant.

The design and implementation of the OPRM system does not cause any degradation in the existing APRM, LPRM, and RPS systems. The OPRM system augments the existing APRM trip outputs such that an OPRM trip will logically function in the same manner as the existing APRM trips and conforms to the existing 2 out of 4 trip input to the RPS. The OPRM system is designed as a stand-alone Class 1E safety system to current regulatory requirements and industry standards and does not adversely impact the design basis and operation of the interfacing systems (i.e., the APRM, RPS, recirculation flow unit and LPRM systems). The system is qualified to perform its safety function under all specified environmental, electromagnetic interference (EMI), and seismic conditions. In addition, the system is designed with signal isolation and buffering to ensure there are no safety impacts to existing plant systems.

In Reference (10), the NRC provided their detailed review of the OPRM design. Due to the completion of this detailed review, it was noted that the NRC does not intend to repeat its review of the matters found acceptable in Reference (5) when the report is referenced in licensee-specific applications, except to ensure that the plant-specific issues identified in Reference (10) have been properly addressed. The NRC also stated in Reference (10) that when submitting plant-specific license amendments, licensees should identify and justify any deviations from Reference (5) and the associated SER. The information requested by the NRC consists of the following.

1. "Confirm the applicability of CENPD-400-P, including clarifications and reconciled differences between the specific plant design and the topical report design descriptions."

   Response

   The OPRM instrumentation design at CPS includes alarm, trip, and inoperable/trouble annunciators and is consistent with the design description provided in Reference (5). There are no deviations from Sections 2.3 and 3.0 of Reference (5).

2. "Confirm the applicability of BWROG topical reports that address the OPRM and associated instability functions, set points and margin."

   Response

   The BWROG topical reports which address the OPRM and associated instability functions, set points and margins are References (7) (8) and (9). Each of these topical reports has been determined to be applicable to CPS. This review has determined that an acceptable method for CPS to address GDC 10 and 12 is by the LPRM-based detect and suppress method described in Reference (5). Therefore, implementation of the ABB Option III long term solution has been selected for CPS.

   In their Safety Evaluation (SE) accepting References (7) and (8), the NRC specified five conditions required to be met for implementation of Option III in any type of BWR. Each of these five conditions has been reviewed and the following confirmations of the applicability of References (7) and (8) to the proposed implementation of the Option III solution at CPS are provided.

   i. "All three algorithms described in NEDO-31960 and Supplement 1 should be used in Option III or III-A. These three algorithms are high LPRM oscillation amplitude, high-low detection algorithm, and period-based algorithm."

      Response: All three algorithms are included in the Option III design. Automatic protection is actuated if any of the three algorithms meet their trip conditions. Only the period-based algorithm, however, is used to demonstrate protection of the MCPR safety limit for anticipated reactor instabilities. The other two algorithms are included as defense-in-depth features. Only the period-based algorithm is required for TS operability of the OPRM instrumentation.

ii. "The validity of the scram setpoints selected should be demonstrated by analyses. These analyses may be performed for a generic representative plant when applicable, but should include an uncertainty treatment that accounts for the number of failed sensors permitted by the technical specifications of the plant's applicant."

Response: The validity of the selected scram set points will be confirmed each cycle using the initial application and reload methodology described in Reference (9). This methodology utilizes a combination of generic representative plant and plant specific analyses and includes an uncertainty treatment that accounts for the number of failed sensors.

iii. "Implementation of Option III or III-A will require that the selected bypass region outside of which the detect and suppress action is deactivated be defined in the technical specifications."

Response: This region is defined in Surveillance Requirement 3.3.1.3.5 as provided in Attachment B.

iv. "If the algorithms detect oscillations, an automatic protective action should be initiated. This action may be a full scram or an SRI. If an SRI is implemented with Option III or III-A, a backup full scram must take effect if the oscillations do not disappear in a reasonable period of time or if they reappear before control position and operating conditions have been adjusted in accordance with appropriate procedural requirements to permit reset of the SRI protective action."

Response: The automatic protective action of the OPRMs when fully implemented will be a full reactor scram, rather than a select rod insert (SRI).

v. "The LPRM groupings defined in NEDO-31960 to provide input to the Option III or III-A algorithms are acceptable for the intended oscillation-detection function. These LPRM groupings are the oscillation power range monitor for Option III or the octant based arrangements for Option III-A. The requirements for a minimum operable number of LPRM detectors set forth in NEDO-31960 are acceptable."

Response: The LPRM assignment grouping proposed to be implemented conforms with LPRM assignments shown in Appendix D to Reference (9). In their SE on Reference (9), the NRC concluded that the initial application methodology proposed in Section 5 of the topical report is acceptable. The LPRM assignments in Appendix D of Reference (9) are identified as examples of the expected LPRM assignments a licensee may choose. Therefore, it is concluded that since the LPRM assignment chosen for CPS is consistent with these examples, which were found to be acceptable by the NRC, the proposed CPS assignments are also acceptable. CPS is also consistent with the requirements for the minimum number of operable LPRM detectors as set forth in Reference (7).

3. "Provide a plant-specific Technical Specification (TS) for the OPRM functions consistent with CENPD-400-P, Appendix A."

   Response

   The plant-specific TS are provided in Attachment B and are consistent with CENPD-400-P, Appendix A. Specific differences are described in Section E of this attachment.

4. "Confirm that the plant-specific environmental (temperature, humidity, radiation, electromagnetic and seismic) conditions are enveloped by the OPRM equipment environmental qualification values."

   Response

   The OPRM components are mounted in Main Control Room cabinets which are located in a controlled environment. This environment is maintained during normal and accident plant conditions. The OPRM components installed are those subject to the ABB-CE environmental qualification program. The OPRM system and the dual voltage regulator are qualified to perform their Class 1E safety function for continuous operation for the following environmental conditions as specified in the CPS equipment design criteria.

   Temperature: 65°F to 104°F

   Relative Humidity: 5% to 60%

   Pressure: 0.125 to 2.5 inches water column

   Radiation: 1.0E3 Rads

   Temperature and humidity qualification of the OPRM module was performed by test. As documented in Reference (5), the OPRM is designed to continuously operate in the following environment, while meeting all performance requirements.

   Normal Ambient Temperature: 40°F to 120°F

   Abnormal Ambient Temperature: 140°F for 48 hours

   Humidity: 40% to 95% relative humidity non-condensing

   Frequency: 47.5 to 63 Hz.

   In addition, the equipment has been evaluated by the vendor to remain functional at humidity levels down to 10%. Also, equipment is generally considered operable and will not degrade at low humidity conditions. The primary concern at low humidity conditions is the chance for damage from electrostatic discharge.

The OPRM system is designed to provide a high degree of immunity from EMI/RFI and to minimize generated EMI/RFI that may interfere with devices connected to it, devices that share a common AC supply, and devices located in the same enclosure. The OPRM system is designed and tested to meet electrostatic discharge requirements as documented in Reference (5). In addition, fast transient (i.e., burst) withstand capability has been demonstrated for all power input and output and all process input and output circuits, signal common (i.e., signal reference) and protective earth connections. OPRM circuitry is located inside a metal enclosure. All external power, inputs and outputs pass through filters which, together with the metal enclosure, provide an EMI boundary. These features, when combined with grounding and cable separation in accordance with CPS restrictions on welding and portable transceiver use in the main control room area, ensure the OPRM system is protected from the effects of EMI.

The OPRM is seismically qualified by type testing per IEEE-344. The OPRM is subject to a minimum of five equivalent Operation Basis Earthquakes (OBEs) in each axis followed by at least one equivalent Safe Shutdown Earthquake (SSE) in each axis. As documented in Reference (5), the input spectrum was selected to be generic and to envelop all anticipated applications. A design review was performed to verify the existing qualification of safety related devices and components which remain in the modified panels are not affected by the addition of the OPRM instrumentation. The modified panels were found to remain seismically qualified after the new installation.

5. "Confirm that administrative controls are provided for manually bypassing OPRM channels or protective functions, and for controlling access to the OPRM functions."

   Response:

   The CPS OPRM installation and implementation is consistent with the description provided in Reference (5) as approved by the NRC in Reference (10). CPS procedures provide administrative control for placing individual OPRM modules in manual bypass. When the OPRM modules are not in manual bypass, the OPRM protective function is automatically bypassed or automatically activated when the reactor power and recirculation flow are in the appropriate regions of the reactor power/flow map to require automatic bypass or activation respectively. The OPRM as installed and implemented automatically enables its pre-trip and trip alarm outputs upon entry into the high power, low core flow region of the power/flow operating map.

6. "Confirm that any changes to the plant operator's main control room panel have received human factor reviews per plant-specific procedures."

   Response:

   The CPS OPRM installation and implementation includes activation of the main control room annunciator if the OPRM has been manually bypassed or deliberately rendered inoperable. Keylock access is necessary to manually bypass an OPRM module. Changes to OPRM software require both keylock access and a password. Procedural requirements control placing an OPRM module in bypass and verifying restoration.

   The CPS OPRM installation and implementation includes an operator interface via main control room annunciators that signal system status and/or problems, and the OPRM front panel LEDs. Alarms provided on the main control room annunciator panel include the OPRM ENABLED, OPRM OSCILLATION DETECTED, and OPRM TROUBLE/INOP. The OPRM trip function is included in the DIVISION 1 OR 4 NMS TRIP and the DIVISION 2 OR 3 NMS TRIP main control room annunciators. In addition, the OPRM modules are provided with local indicators include the ALARM, TROUBLE, INOP, TRIP, TRIP ENABLED, and READY LEDs.

   This modification was reviewed to ensure human factors considerations were part of the design. The modification was found not to violate human factors commitments as described in the Updated Safety Analysis Report, and that it incorporates adequate human factors principles consistent with the CPS human factors standards for controls and annunciators.

Other than the plant-specific items addressed above, there are no deviations from Reference (5) and the associated SE.

G. IMPACT ON PREVIOUS SUBMITTALS

We have reviewed the proposed changes regarding impact on any previous submittals, and have determined that there is no impact on any outstanding license amendment requests.

CPS is currently preparing a license amendment request for power uprate operation. The proposed amendment request will address the impact of power uprate operation on the OPRM system including the impact on the proposed TS Section 3.3.1.3.

H. SCHEDULE REQUIREMENTS

We request approval of these proposed changes prior to March 30, 2002, to support preparation for the next refueling outage.

I. REFERENCES

(1) Letter from M. Coyle (AmerGen) to U. S. NRC, "Revision to the Clinton Power Station Implementation Schedule for the Resolution to Generic Letter (GL) 94-02, Long-Term Solution and Upgrade of Interim Operating Recommendation for Thermal-Hydraulic Instabilities in Boiling Water Reactors," dated March 30, 2000.

(2) Letter from J. Cook (Illinois Power) to U. S. NRC, "Illinois Power's (IP's) Response to Generic Letter (GL) 94-02, Long-Term Solutions and Upgrade of Interim Operating Recommendations for Thermal Hydraulic Instabilities in Boiling Water Reactors," dated September 2, 1994.

(3) Letter from I. Rickard (ABB) to U. S. NRC, "Report of a Defect Pursuant to 10 CFR 21 Concerning ABB Oscillation Power Range Monitors for BWRs," dated June 29, 1999.

(4) Letter from D. Pickett (U. S. NRC) to J. Wood (FENOC), "Perry Nuclear Power Plant, Unit 1 – Issuance of Amendment Re: Activation of Thermal-Hydraulic Stability Monitoring Instrumentation (TAC No. MA8671)," dated February 26, 2001.

(5) CENPD-400-P-A, Rev. 1, "Generic Topical Report for the ABB Option III Oscillation Power Range Monitor (OPRM)," dated May 1995.

(6) NUREG-1434, Rev. 1, "Standard Technical Specifications General Electric Plants, BWR/6," dated April 1995.

(7) NEDO-31960-A, "BWR Owners' Group Long-Term Stability Solutions Licensing Methodology," dated November 1995.

(8) NEDO-31960-A, Supplement 1, "BWR Owners' Group Long-Term Stability Solutions Licensing Methodology (Supplement 1)," dated November 1995.

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

(10) Letter from B. Boger (U. S. NRC) to R. Pinelli (BWROG), "Acceptance of Licensing Topical Report CENPD-400-P, 'Generic Topical Report for the ABB Option III Oscillation Power Range Monitor,' (TAC NO. M89222)," dated August 16, 1995.

Attachment B
Proposed Technical Specification Changes
Clinton Power Station, Unit 1

MARKED-UP TS PAGES FOR PROPOSED CHANGES

REVISED TS PAGES

ii
3.4-1
3.4-2
3.4-3
3.4-4
3.4-5
5.0-18
5.0-19

REVISED BASES PAGES
(PROVIDED FOR INFORMATION ONLY)

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(continued)

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.1 Recirculation Loops Operating

LCO 3.4.1

A. Two recirculation loops shall be in operation with **matched flows;**~~:~~

~~1. Matched flows; and~~

~~2. Total core flow and THERMAL POWER within limits.~~

OR

B. One recirculation loop shall be in operation with:

1. THERMAL POWER ≤ 70% RTP;

2. ~~Total core flow and THERMAL POWER within limits~~ **LCO 3.2.1,"AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR)," single loop operation limits specified in the COLR;**

3. ~~Required limits modified for single recirculation loop operation as specified in the COLR~~ **LCO 3.2.2,"MINIMUM CRITICAL POWER RATIO (MCPR)," single loop operation limits specified in the COLR;** and

4. LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation," Function 2.b (Average Power Range Monitors Flow Biased Simulated Thermal Power-High), Allowable Value of Table 3.3.1.1-1 reset for single loop operation.

~~NOTE~~

~~Required limit and setopint modifiacations ofr single recirculation loop operation may be delayed for up to 12 hours after transition from two recirculation loop operation to single recirculation loop operation.~~

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. Recirculation loop jet pump flow mismatch not within limits.	A.1	Shut down one recirculation loop.	2 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~B. Total core flow as a function of THERMAL POWER within Region A or B of Figure 3.4.1-1.~~	~~B.1 Determine Average Power Range Monitor (APRM) and Local Power Range Monitor (LPRM) neutron flux noise levels.~~	~~Once per 8 hours~~ ~~AND~~ ~~30 minutes after an increase of ≥ 5% RTP~~
~~C. Total core flow as a function of THERMAL POWER within Region B of Figure 3.4.1-1.~~ ~~AND~~ ~~APRM or LPRM neutron flux noise level ≥ 3 times established baseline noise level.~~	~~C.1 Restore APRM and LPRM neutron flux noise level to ≤ 3 times established baseline levels.~~	~~2 hours~~
~~D. Total core flow as a function of THERMAL POWER within Region A of Figure 3.4.1-1.~~	~~D.1 Restore total core flow as a function of THERMAL POWER to within Region B or C of Figure 3.4.1.-1.~~	~~4 hours~~
~~E~~B. THERMAL POWER > 70% RTP during single recirculation loop operation.	~~E~~B.1 Reduce THERMAL POWER to ≤ 70% RTP.	4 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~F~~**C**. ~~One or more required limit or setpoint modifications not performed~~ **Requirements B.2, B.3 or B.4 of the LCO not met.**	~~F~~**C**.1 ~~Declare associated limit(s) and setpoint(s) not met~~ **Satisfy the requirements of the LCO.**	~~Immediately~~ **24 hours**
~~C~~**D. Required Action and associated completion time of Condition A, B or C not met.** OR No recirculation loops in operation.	~~C.1 Reduce THERMAL POWER to within Region C of Figure 3.4.1-1.~~ ~~AND~~ ~~C.2 Be in MODE 2.~~ ~~AND~~ ~~C.3~~**D.1** Be in MODE 3.	~~4 hours~~ ~~6 hours~~ 12 hours

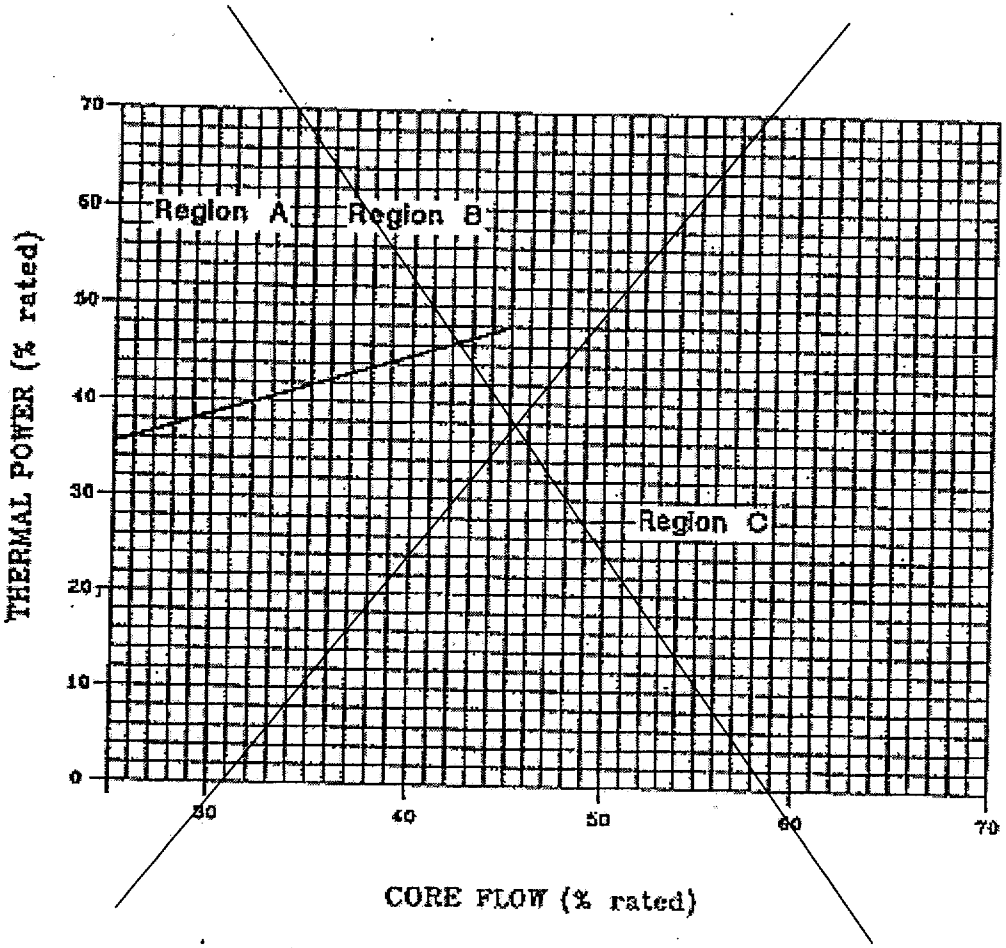
SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.1.1	-------------------NOTE------------------- Not required to be performed until 24 hours after both recirculation loops are in operation. -- Verify recirculation loop jet pump flow mismatch with both recirculation loops in operation is: a. ≤ 10% of rated core flow when operatting at < 70% of rated core flow; and b. ≤ 5% of rated core flow when operating at ≥ 70% of rated core flow.	24 hours

~~(continued)~~

~~SURVEILLANCE REQUIREMENTS (continued)~~

~~SURVEILLANCE~~		~~FREQUENCY~~
~~SR 3.4.1.2~~	~~Verify:~~ ~~a. Total core flow ≥ 45% rated core flow;~~ ~~Or~~ ~~b. THERMAL POWER and total flow within Region C of Figure 3.4.1-1.~~	~~24 hours~~



~~Figure 3.4.1-1 (page 1 of 1)~~
~~Thermal Power/Core Flow Stability Regions~~

5.6 Reporting Requirements

5.6.2 Annual Radiological Environmental Operating Report (continued)

report shall be submitted noting and explaining the reasons for the missing results. The missing data shall be submitted in a supplementary report as soon as possible.

5.6.3 Radioactive Effluent Release Report

The Radioactive Effluent Release Report covering the operation of the unit during the previous calendar year shall be submitted by May 1 of each year. The report shall include a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the unit. The material provided shall be consistent with the objectives outlined in the ODCM and process control program and in conformance with 10 CFR 50.36a and 10 CFR 50, Appendix I, Section IV.B.1.

5.6.4 Monthly Operating Reports

Routine reports of operating statistics and shutdown experience, including documentation of all challenges to the main steam safety/relief valves, shall be submitted on a monthly basis no later than the 15th of each month following the calendar month covered by the report.

5.6.5 CORE OPERATING LIMITS REPORT (COLR)

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

   1. LCO 3.2.1, Average Planar Linear Heat Generation Rate (APLHGR),

   2. LCO 3.2.2, Minimum Critical Power Ratio (MCPR),

   3. LCO 3.2.3, Linear Heat Generation Rate (LHGR), ~~and~~

   4. LCO 3.3.1.1, RPS Instrumentation (SR 3.3.1.1.14)~~.~~, **and**

   5. **LCO 3.3.1.3, Oscillation Power Range Monitor (OPRM) Instrumentation.**

(continued)

5.6 Reporting Requirements

5.6.5 CORE OPERATING LIMITS REPORT (COLR) (continued)

b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC in **(1)** General Electric Standard Application for Reactor Fuel (GESTAR), NEDE-24011-P-A **or (2) NEDO-32465, "Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology for Reload Applications."**

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

d. The COLR, including any midcycle revisions or supplements, shall be provided upon issuance for each reload cycle to the NRC.

BASES

APPLICABLE SAFETY ANALYSES (continued)

operating at the lower flow rate), a small mismatch has been determined to be acceptable based on engineering judgement. The recirculation system is also assumed to have sufficient flow coastdown characteristics to maintain fuel thermal margins during abnormal operational transients (Ref. 2), which are analyzed in Chapter 15 of the USAR.

A plant specific LOCA analysis has been performed assuming only one operating recirculation loop. This analysis has demonstrated that, in the event of a LOCA caused by a pipe break in the operating recirculation loop, the Emergency Core Cooling System response will provide adequate core cooling, provided the APLHGR requirements are modified accordingly (Ref. 3).

The transient analyses of Chapter 15 of the USAR have also been performed for single recirculation loop operation (Ref. 3) and demonstrate sufficient flow coastdown characteristics to maintain fuel thermal margins during the abnormal operational transients analyzed provided the MCPR requirements are modified. During single recirculation loop operation, modification to the Reactor Protection System average power range monitor (APRM) instrument setpoints is also required to account for the different relationships between recirculation drive flow and reactor core flow. The APLHGR and MCPR limits for single loop operation are specified in the COLR. The APRM flow biased simulated thermal power setpoint is in LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation."

Recirculation loops operating satisfies Criterion 2 of the NRC Policy Statement.

LCO

Two recirculation loops are normally required to be in operation with their flows matched within the limits specified in SR 3.4.1.1 to ensure that during a LOCA caused by a break of the piping of one recirculation loop the assumptions of the LOCA analysis are satisfied. ~~In addition, the total core flow must be ≥ 45% of rated core flow or total core flow expressed as a function of THERMAL POWER must be in Region C as identified in Figure 3.4.1-1, "THERMAL POWER/Core Flow Stability Regions."~~ Alternatively, with only one recirculation loop in operation, THERMAL POWER must be ≤ 70% RTP, ~~total core flow must be ≥ 45% of rated~~

(continued)

BASES

LCO (continued)

~~core flow or total core flow expressed as a function of THERMAL POWER must be in Region C of Figure 3.4.1-1,~~ and modifications to the required APLHGR limits (LCO 3.2.1, "AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR)"), MCPR limits (LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)"), and APRM Flow Biased Simulated Thermal Power—High setpoint (LCO 3.3.1.1) must be applied to allow continued operation consistent with the assumptions of Reference 3.

~~The LCO is modified by a Note which allows up to 12 hours before having to put in effect the required modifications to required limits and setpoints after a change in the reactor operating conditions from two recirculation loops operating to single recirculation loop operations. If the require limits and setpoints are not in compliance with the applicable requirements at the end of this period, the associated equipment must be declared inoperable or the limits "not-satisfied," and the ACTIONS required by nonconformance with the applicable Specifications implemented. This time is provided due to the need to the procedural steps necessary to limit flow (to less than the volumetric recirculation loop flow which produces 100% core flow at 100% RPT) in the operating loop, monitor for excessive APRM and local power range monitor (LPRM) neutron flux noise levels, and the complexity and detail required to fully implement and confirm the required limit and setpoint modifications.~~

APPLICABILITY

In MODES 1 and 2, requirements for operation of the Reactor Coolant Recirculation System are necessary since there is considerable energy in the reactor core and the limiting design basis transients and accidents are assumed to occur.

In MODES 3, 4, and 5, the consequences of an accident are reduced and the coastdown characteristics of the recirculation loops are not important.

ACTIONS

A.1

With both recirculation loops operating but the flows not matched, the recirculation loops must be restored to operation with matched flows within 2 hours. If the flow mismatch cannot be restored to within limits within 2 hours, one recirculation loop must be shut down.

(continued)

BASES

ACTIONS

A.1 (continued)

Alternatively, if the single loop requirements of the LCO are applied to operating limits and RPS setpoints, operation with only one recirculation loop would satisfy the requirements of the LCO and the initial conditions of the accident sequence.

The 2 hour Completion Time is based on the low probability of an accident occurring during this time period, on a reasonable time to complete the Required Action, and on frequent core monitoring by operators allowing abrupt changes in core flow conditions to be quickly detected.

~~B.1, C.1, AND D.1~~

~~Due to thermal hydraulic stability concerns, operation of the plant is divided into three regions based on THERMAL POWER and core flows. Region A is a power/flow ratio with power > 80% rod line and core flow ≤ 35.5% of rated core flow. Region B is a power/flow ratio with the power > 80% rod line and core flow ≥ 35.5% and ≤ 45% of rated core flow, respectively. A core flow of 35.5% of rated core flow corresponds to the core flow with both recirculation pumps at rated speed and the minimum control valve position. Because the plant is susceptible to instability in power/flow Regions A and B, APRM and LPRM neutron flux noise levels are required to be determined to assure that thermal hydraulic instability is not occurring. For the LPRM neutron flux noise determination, 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 are monitored. If evidence of approaching instability occurs (i.e., APRM or LPRM neutron flux noise levels exceed three times the established baseline levels) prompt action must be initiated to restore the power/flow ratio to within Region C by increasing core flow to ≥ 45% of rated core flow or by reducing THERMAL POWER to less than or equal to the limits for the existing core flow. The allowed Completion Times are reasonable, based on operating experience, to restore plant parameters in an orderly manner and without challenging plants systems.~~

~~Baseline values are determined uniquely for each cycle during operation in Regions A or B. Within 2 hours of entering Region A and B, the baseline is established. This initial baseline is then used for comparison to all~~

(continued)

BASES

ACTIONS ~~B.1, C.1, and D.1 (continued)~~

~~subsequent neutron flux noise levels during operation in this region.~~

~~A determination of APRM and LPRM neuton flux noise levels every 8 hours provides frequent periodic information relative to established baseline noise levels (see Condition C) that indicate stable steady state operation. A determination of these noise levels within 30 minutes after an increase of ≥ 5% RTP provides a more frequent indication of the stability of operation following any significant potential for change of the thermal hydraulic properties of the system. These Frequencies provide early detection of neutron flux oscillations due to core thermal hydraulic instabilities. Action must be initiated to restore the plant to a more stable power/flow ratio if such indications of limit cycle neutron flux oscillations are detected.~~

~~E~~**B**.1

Should a LOCA occur with THERMAL POWER > 70% RTP **during single loop operation,** the core response may not be bounded by the LOCA analyses. Therefore, only a limited time is allowed to reduce THERMAL POWER TO ≤ 70% RTP.

The 4 hour Completion Time is based on the low probability of an accident occurring during this time period, on a reasonable time to complete the Required Action, and on frequent core monitoring by the operators allowing changes in THERMAL POWER conditions to be quickly detected.

~~F~~**C**.1

If the required limit or setpoint modifications **for single loop operation** are not performed within ~~12~~ **24** hours after transition from two recirculation loop operation to single recirculation loop operation, ~~the required limit and setpoints which have not been modified must be immediately declared not met. The Required Actions for the associated limits and instrument channels must then be taken.~~ **or requirements B.2, B.3, or B.4 of the LCO are not met for some other reason, the unit must be brought to a MODE in which the LCO does not apply (see Condition D). The 24 hour Completion Time of the Condition provides time before the required modifications to required limits and setpoints have to be in effect after a change in the reactor operating conditions from two recirculation loops operating to single recirculation loop operation. This time is provided due to the need to stabilize operation with one** recirculation loop, including the procedural steps necessary to limit flow and adjust the flow control mode in the operating loop, and the complexity and detail required to fully implement and confirm the required limit and setpoint modifications. The 24 hour Completion Time is also based on the low probability of an accident occurring during this period, on a reasonable time to complete the Required Action, and on frequent monitoring by operators allowing abrupt changes in core flow conditions to be quickly detected.

(continued)

BASES

ACTIONS (continued)

~~C.1, C.2, and C.3~~ **D.1**

With no recirculation loops in operation, **or the Required Action and associated Completion Time of Conditions A, B, or C not met,** the unit is required to be brought to a MODE in which the LCO does not apply. ~~Prompt action must be initiated to reduce THERMAL POWER to be within the limits to assure thermal hydraulic stability concerns are addressed.~~ The plant is ~~then~~ required to be placed in ~~MODE 2 in 6 hours and~~ MODE 3 in 12 hours. In this condition, the recirculation loops are not required to be operating because of the reduced severity of DBAs and minimal dependence on the recirculation loop coastdown characteristics. The allowed Completion Time~~s~~ **of 12 hours is** ~~are~~ reasonable, based on operating experience, to reach MODE 3 from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.4.1.1

This SR ensures the recirculation loop flows are within the allowable limits for mismatch. At low core flow (i.e., < 70% of rated core flow), the MCPR requirements provide larger margins to the fuel cladding integrity Safety Limit such that the potential adverse effect of early boiling transition during a LOCA is reduced. A larger flow mismatch can therefore be allowed when core flow is < 70% of rated core flow. The recirculation loop jet pump flow, as used in this Surveillance, is the summation of the flows from all of the jet pumps associated with a single recirculation loop.

The mismatch is measured in terms of percent of rated core flow. This SR is not required when both loops are not in operation since the mismatch limits are meaningless during single loop or natural circulation operation. The Surveillance must be performed within 24 hours after both loops are in operation. The 24 hour Frequency is consistent with the Frequency for jet pump OPERABILITY verification and has been shown by operating experience to be adequate to detect off normal jet pump loop flows in a timely manner.

With regard to recirculation loop flow values obtained pursuant to this SR, as read from plant indication instrumentation, the specified limit is considered to be a nominal value and therefore does not require compensation for instrument indication uncertainties (Ref. 6).

(continued)

BASES

~~SURVEILLANCE REQUIREMENTS~~

~~SR 3.4.1.2~~

~~This SR ensures the reactor THERMAL POWER and core flows are within appropriate parameter limits to prevent uncontrolled power oscillations. At low recirculation flows and high reactor power, the reactor exhibits increased susceptibility to thermal hydraulic instability. Actions have been developed based on the guidance provided in References 4 and 5 to respond to operation in these conditions. This SR identifies when the condition requiring these actions are necessary. The Frequency is based on operating experience and the operators' inherent knowledge of reactor status, including significant changes in THERMAL POWER and core flow.~~

~~With regard to THERMAL POWER and core flow values obtained pursuant to this SR, as read from plant indication instrumentation, the specified limit is considered to be a nominal value and therefore does not require compensation for instrument indication uncertainties (Ref. 6).~~

REFERENCES

1. USAR, Section 6.3.3.7.
2. USAR, Section 5.4.1.1.
3. USAR, Chapter 15, Appendix 15B.
4. NRC Bulletin 88-07, Supplement 1, "Power Oscillations in Boiling Water Reactors," December 1988.
5. GE Letter, "Interim Recommendations for Stability Actions," November 1988.
6. Calculation IP-0-0029.

3.3 INSTRUMENTATION

3.3.1.3 Oscillation Power Range Monitor (OPRM) Instrumentation

LCO 3.3.1.3 Four channels of the OPRM instrumentation shall be OPERABLE.

APPLICABILITY: THERMAL POWER ≥ 25% RTP.

ACTIONS

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

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One or more required channels inoperable.	A.1	Place channel in trip.	30 days
	<u>OR</u>		
	A.2	Place associated RPS trip system in trip.	30 days
	<u>OR</u>		
	A.3	Initiate alternate method to detect and suppress thermal hydraulic instability oscillations.	30 days
B. OPRM trip capability not maintained.	B.1	Initiate alternate method to detect and suppress thermal hydraulic instability oscillations	12 hours
C. Required Action and associated Completion Time not met.	C.1	Reduce THERMAL POWER < 25% RTP.	4 hours

SURVEILLANCE REQUIREMENTS

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

SURVEILLANCE		FREQUENCY
SR 3.3.1.3.1	Perform CHANNEL FUNCTIONAL TEST.	184 days
SR 3.3.1.3.2	Calibrate the local power range monitors.	1000 MWD/T average core exposure
SR 3.3.1.3.3	-------------------NOTE------------------- Neutron detectors are excluded. -- Perform CHANNEL CALIBRATION.	18 months
SR 3.3.1.3.4	Perform LOGIC SYSTEM FUNCTIONAL TEST.	18 months
SR 3.3.1.3.5	Verify OPRM is not bypassed when THERMAL POWER is ≥ 30% RTP and recirculation drive flow is ≤ the value corresponding to 60% of rated core flow.	18 months
SR 3.3.1.3.6	-------------------NOTE------------------- Neutron detectors are excluded. -- Verify the RPS RESPONSE TIME is within limits.	18 months on a STAGGERED TEST BASIS

B 3.3 INSTRUMENTATION

B 3.3.1.3 Oscillation Power Range Monitor (OPRM) Instrumentation

BASES

BACKGROUND

General Design Criterion 10 (GDC 10) requires the reactor core and associated coolant, control, and protection systems to be designed with appropriate margin to assure that acceptable fuel design limits are not exceeded during any condition of normal operation, including the affects of anticipated operational occurrences. Additionally, GDC 12 requires the reactor core and associated coolant, control, and protection systems to be designed to assure that power oscillations which can result in conditions exceeding acceptable fuel design limits are either not possible or can be reliably and readily detected and suppressed. The OPRM System provides compliance with GDC 10 and GDC 12, thereby providing protection from exceeding the fuel Minimum Critical Power Ratio (MCPR) safety limit.

References 1, 2, and 3 describe three separate algorithms for detecting stability related oscillations: the period based detection algorithm, the amplitude based algorithm, and the growth rate algorithm. The OPRM System hardware implements these algorithms in microprocessor based modules. These modules execute the algorithms based on LPRM inputs and generate alarms and trips based on these calculations. These trips result in tripping the Reactor Protection System (RPS) when the appropriate RPS trip logic is satisfied, as described in the Bases for LCO 3.3.1.1, "RPS Instrumentation." Only the period based detection algorithm is used in the safety analysis (Ref. 1, 2, 6, and 7). The remaining algorithms provide defense in depth and additional protection against unanticipated oscillations.

The period based detection algorithm detects a stability related oscillation based on the occurrence of a fixed number of consecutive Local Power Range Monitor (LPRM) signal period confirmations followed by

(continued)

BASES

BACKGROUND (continued)

the LPRM signal amplitude exceeding a specified setpoint. Upon detection of a stability related oscillation, a trip is generated for that OPRM channel.

The OPRM System consists of 4 OPRM trip channels, each channel consisting of two OPRM modules. Each OPRM module receives input from LPRMs. Each OPRM module also receives input from the Neutron Monitoring System (NMS) Average Power Range Monitor (APRM) power and flow signals to automatically enable the trip function of the OPRM module.

Each OPRM module is continuously tested by a self-test function. On detection of any OPRM module failure, either a Trouble alarm or INOP alarm is activated. The OPRM module provides an INOP alarm when the self-test feature indicates that the OPRM module may not be capable of meeting its functional requirements.

APPLICABLE SAFETY ANALYSES

It has been shown that BWR cores may exhibit thermal-hydraulic reactor instabilities in high power and low flow portions of the core power to flow operating domain. GDC 10 requires the reactor core and associated coolant, control, and protection systems to be designed with appropriate margin to assure that acceptable fuel design limits are not exceeded during any condition of normal operation, including the affects of anticipated operational occurrences. GDC 12 requires assurance that power oscillations which can result in conditions exceeding acceptable fuel design limits are either not possible or can be reliably and readily detected and suppressed. The OPRM System provides compliance with GDC 10 and GDC 12 by detecting the onset of oscillations and suppressing them by initiating a reactor scram. This assures that the MCPR safety limit will not be violated for anticipated oscillations.

The OPRM Instrumentation satisfies Criterion 3 of 10CFR 50.36(c)(2)(ii).

(continued)

BASES

LCO

Four channels of the OPRM System are required to be OPERABLE to ensure that stability related oscillations are detected and suppressed prior to exceeding the MCPR safety limit. Only one of the two OPRM modules period based detection algorithm is required for OPRM channel OPERABILITY. The minimum number of LPRMs required OPERABLE to maintain an OPRM channel OPERABLE is consistent with the minimum number of LPRMs required to maintain the APRM System OPERABLE per LCO 3.3.1.1.

APPLICABILITY

The OPRM instrumentation is required to be OPERABLE in order to detect and suppress neutron flux oscillations in the event of thermal-hydraulic instability. As described in References 1, 2, and 3, the region of anticipated oscillation is defined by THERMAL POWER ≥ 30% RTP and recirculation drive flow is ≤ the value corresponding to 60% of rated core flow. The OPRM trip is required to be enabled in this region, and the OPRM must be capable of enabling the trip function as a result of anticipated transients that place the core in that power/flow condition. Therefore, the OPRM is required to be OPERABLE with THERMAL POWER ≥ 25% RTP. It is not necessary for the OPRM to be OPERABLE with THERMAL POWER < 25% RTP because instabilities are not anticipated to grow large enough to threaten the MCPR safety limit. This expectation is due, in part, to the large MCPR margin that exists at low power.

ACTIONS

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

(continued)

BASES

ACTIONS (continued)

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

A.1, A.2, and A.3

Because of the reliability and on-line self-testing of the OPRM instrumentation and the redundancy of the RPS design, an allowable out of service time of 30 days has been shown to be acceptable (Ref. 7) to permit restoration of any inoperable channel to OPERABLE status. However, this out of service time is only acceptable provided the OPRM instrumentation still maintains OPRM trip capability (refer to Required Action B.1). The remaining OPERABLE OPRM channels continue to provide trip capability (see Condition B) and provide operator information relative to stability activity. The remaining OPRM modules have high reliability. With this high reliability, there is a low probability of a subsequent channel failure within the allowable out of service time. In addition, the OPRM modules continue to perform on-line self-testing and alert the operator if any further system degradation occurs.

If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the OPRM channel or associated RPS trip system must be placed in the tripped condition per Required Actions A.1 and A.2. Placing the inoperable OPRM channel in trip (or the associated RPS trip system in trip) would conservatively compensate for the inoperability, restore capability to accommodate a single failure, and allow operation to continue. Alternately, if it is not desired to place the OPRM channel (or RPS trip system) in trip (e.g., as in the case where placing the inoperable channel in trip would result in a full scram), the alternate method of detecting and suppressing thermal-hydraulic instability oscillations is required (Required Action

(continued)

BASES

ACTIONS (continued)

A.3). This alternate method is described in Reference 5. It consists of increased operator awareness and monitoring for neutron flux oscillations when operating in the region where oscillations are possible. If indications of oscillation, as described in Reference 5, are observed by the operator, the operator will take the actions described by procedures, which include initiating a manual scram of the reactor.

B.1

Required Action B.1 is intended to ensure that appropriate actions are taken if multiple, inoperable, untripped OPRM channels within the same RPS trip system result in not maintaining OPRM trip capability. OPRM trip capability is considered to be maintained when sufficient OPRM channels are OPERABLE or in trip (or the associated RPS trip system is in trip), such that a valid OPRM signal will generate a trip signal in both RPS trip systems. This would require both RPS trip systems to have one OPRM channel OPERABLE or in trip (or the associated RPS trip system in trip).

Because of the low probability of the occurrence of an instability, 12 hours is an acceptable time to initiate the alternate method of detecting and suppressing thermal-hydraulic instability oscillations described in the Bases for Action A.3 above. The alternate method of detecting and suppressing thermal-hydraulic instability oscillations would adequately address detection and mitigation in the event of instability oscillations. Based on industry operating experience with actual instability oscillations, the operator would be able to recognize instabilities during this time and take action to suppress them through a manual scram. In addition, the OPRM System may still be available to provide alarms to the operator if the onset of oscillations were to occur. Since plant operation is minimized in areas where oscillations may occur, operation without OPRM trip capability is considered acceptable with implementation of the alternate method of detecting and suppressing thermal-hydraulic instability

(continued)

BASES

ACTIONS (continued)

oscillations, during the period when corrective actions are underway to resolve the inoperability that led to entry into Condition B. One reason this Condition may be utilized is to provide time to implement a software upgrade in the plant to correct a common cause software error in all four channels of the OPRM (Ref. 8).

C.1

With any Required Action and associated Completion Time not met, THERMAL POWER must be reduced to < 25% RTP within 4 hours. Reducing THERMAL POWER to < 25% RTP places the plant in a region where instabilities cannot occur. The 4 hours is reasonable, based on operating experience, to reduce THERMAL POWER < 25% RTP from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

The Surveillances are modified by a Note to indicate that, when a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours, provided the associated Function maintains trip capability. Upon completion of the Surveillance, or expiration of the 6 hour allowance, the channel must be returned to OPERABLE status or the applicable Condition entered and Required Actions taken. This note is based on the RPS reliability analysis (Ref. 9) assumption of the average time required to perform channel surveillance. That analysis demonstrated that the 6 hour testing allowance does not significantly reduce the probability that the RPS will trip when necessary.

For the following OPRM instrumentation Surveillances, both OPRM modules are tested, although only one is required to satisfy the Surveillance Requirement.

SR 3.3.1.3.1

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the channel will

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BASES

SURVEILLANCE REQUIREMENTS (continued)

perform the intended function. A Frequency of 184 days provides an acceptable level of system average availability over the Frequency and is based on the reliability of the channel (Ref. 7).

SR 3.3.1.3.2

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

SR 3.3.1.3.3

The CHANNEL CALIBRATION is a complete check of the instrument loop. This test verifies the channel responds to the measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drifts between successive calibrations, consistent with the plant specific setpoint methodology. Calibration of the channel provides a check of the internal reference voltage and the internal processor clock frequency. It also compares the desired trip setpoints in processor memory. The internal reference voltage and processor clock frequency are used to automatically calibrate the internal analog to digital converters. The Allowable Value for the period based detection algorithm is specified in the Core Operating Limits Report (COLR). As noted, neutron detectors are excluded from CHANNEL CALIBRATION because of the difficulty of simulating a meaningful signal. Changes in neutron detector sensitivity are compensated for by performing the 1000 MWD/T LPRM calibration using the TIPs (SR 3.3.1.3.2).

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BASES

SURVEILLANCE REQUIREMENTS (continued)

The Frequency of 18 months is based upon the assumption of the magnitude of equipment drift provided by the equipment supplier (Ref. 7).

SR 3.3.1.3.4

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required trip logic for a specific channel. The functional testing of control rods in LCO 3.1.3, "Control Rod OPERABILITY," and scram discharge volume (SDV) vent and drain valves in LCO 3.1.8, "Scram Discharge Volume (SDV) Vent and Drain Valves," overlaps this Surveillance to provide complete testing of the assumed safety function. The OPRM self-test function may be utilized to perform this testing for those components that it is designed to monitor.

The 18 month Frequency is based on engineering judgement, high reliability of the components, and operating experience.

SR 3.3.1.3.5

This SR ensures that trips initiated from the OPRM System will not be inadvertently bypassed when THERMAL POWER is ≥ 30% RTP and recirculation drive flow is ≤ the value corresponding to 60% of rated core flow. This normally involves verification of the OPRM bypass function by ensuring the OPRM modules are enabled when the APRM input is ≥ 30% RTP and the recirculation drive flow input is ≤ the value corresponding to 60% of rated core flow. The APRM and Recirculation drive flow inputs are calibrated by surveillances in their respective Technical Specifications. Adequate margins for the instrument setpoint methodology are incorporated into the actual setpoints.

If any bypass channel setpoint is nonconservative (i.e., the OPRM module is bypassed at ≥ 30% RTP and recirculation drive flow ≤ the value corresponding to 60% of rated core flow), then the affected OPRM module

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

is considered inoperable. Alternatively, the bypass channel can be placed in the conservative condition (enabled). If placed in the enabled condition, this SR is met and the module is considered OPERABLE.

The Frequency of 18 months is based on engineering judgement, high reliability of the components, and operating experience.

SR 3.3.1.3.6

This SR ensures that the individual channel response times are less than or equal to the maximum values assumed in the accident analysis (Ref. 6). The OPRM self-test function may be utilized to perform this testing for those components it is designed to monitor. The RPS RESPONSE TIME acceptance criteria are included in plant Surveillance procedures.

As noted, neutron detectors are excluded from RPS RESPONSE TIME testing because the principles of detector operation virtually ensure an instantaneous response time. RPS RESPONSE TIME tests are conducted on an 18 month STAGGERED TEST BASIS. This Frequency is based upon operating experience, which shows that random failures of instrumentation components causing serious time degradation, but not channel failure, are infrequent.

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BASES

REFERENCES

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

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

3. NRC Letter, A. Thadani to L. A. England, "Acceptance for Referencing of Topical Reports NEDO-31960, Supplement 1, 'BWR Owners' Group Long-Term Stability Solutions Licensing Methodology'," July 12, 1994.

4. Generic Letter 94-02, "Long-Term Solutions and Upgrade of Interim Operating Recommendations for Thermal-Hydraulic Instabilities in Boiling Water Reactors," July 11, 1994.

5. BWROG Letter BWROG-9479, "Guidelines for Stability Interim Corrective Action," June 6, 1994.

6. NEDO-32465, "BWR Owners' Group Reactor Stability Detect and Suppress Solution Licensing Basis Methodology and reload Application," May 1995

7. CENPD-400-P, Rev. 01, "Generic Topical Report for the ABB Option III Oscillation Power Range Monitor (OPRM)," May 1995.

8. NRC Letter, B. Boger to R. Pinelli, "Acceptance of Licensing Topical Report CENPD-400-P, 'Generic Topical Report for the ABB Option III Oscillation Power Range Monitor (OPRM)'," August 16, 1995.

9. NEDO-30851-P-A, "Technical Specification Improvement Analyses for BWR Reactor Protection System," March 1988.

INFORMATION SUPPORTING A FINDING OF NO SIGNIFICANT HAZARDS CONSIDERATION

According to 10 CFR 50.92, "Issuance of Amendment," paragraph (c) a proposed amendment to an operating license involves no significant hazards consideration if operation of the facility in accordance with the proposed amendment would not:

(1) Involve a significant increase in the probability of occurrence or consequences of an accident previously evaluated; or,

(2) Create the possibility of a new or different kind of accident from any previously analyzed; or,

(3) Involve a significant reduction in a margin of safety.

AmerGen Energy Company, LLC (i.e., AmerGen), proposes changes to Appendix A, Technical Specifications (TS), of Facility Operating License No. NPF-62. Specifically, we propose to incorporate into the TS, the Oscillation Power Range Monitor (OPRM) instrumentation. We propose to add TS Section 3.3.1.3, "Oscillation Power Range Monitor (OPRM) Instrumentation," which provides the minimum operability requirements for the OPRM channels, the Required Actions when they become inoperable, and the appropriate surveillance requirements. The proposed change also removes manual monitoring guidance for thermal hydraulic instability monitoring from TS Section 3.4.1, "Recirculation Loops Operating," that will no longer be necessary due to activation of the automatic OPRM instrumentation. In addition, these proposed changes include an update to TS Section 5.6.5, "Core Operating Limits report (COLR)" which requires the documentation of the core limits for the OPRM instrumentation in the COLR. The proposed TS changes will allow the enabling of the OPRM instrumentation trips in accordance with the Letter from M. T. Coyle (AmerGen) to U. S. NRC, "Revision to the Clinton Power Station Implementation Schedule for the Resolution to Generic Letter (GL) 94-02, Long-Term Solution and Upgrade of Interim Operating Recommendation for Thermal-Hydraulic Instabilities in Boiling Water Reactors," dated March 30, 2000.

Information supporting the determination that the criteria set forth in 10 CFR 50.92 are met for this amendment request is indicated below.

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

The proposed changes specify limiting conditions for operation, required actions and surveillance requirements for the OPRM system, and allows operation in regions of the power to flow map currently restricted by the requirements of the Interim Corrective Actions (ICAs) and certain limiting conditions of operation of TS Section 3.4.1. The restrictions of the ICAs and TS Section 3.4.1 were imposed to ensure adequate capability to detect and suppress conditions consistent with the onset of thermal-hydraulic oscillations that may develop into a thermal-hydraulic instability event. A thermal-hydraulic instability event has the potential to challenge the Minimum Critical Power Ratio (MCPR) safety limit. The OPRM system can automatically detect and suppress conditions necessary for thermal-hydraulic instability. With the activation of the OPRM system, the restrictions of the ICAs and TS Section 3.4.1 will no longer be required.

The probability of a thermal-hydraulic instability event is impacted by power to flow conditions such that only during operation inside specific regions of the power to flow map, in combination with power shape and inlet enthalpy conditions, can the occurrence of an instability event be postulated to occur. Operation in these regions may increase the probability that operation with conditions necessary for a thermal-hydraulic instability can occur.

When the OPRM is operable with operating limits as specified in the Core Operating Limits Report (COLR), the OPRM can automatically detect the imminent onset of local power oscillations and generate a trip signal. Actuation of a Reactor Protection System (RPS) trip will suppress conditions necessary for thermal-hydraulic instability and decrease the probability of a thermal-hydraulic instability event. In the event the trip capability of the OPRM is not maintained, the proposed changes limit the period of time before an alternate method to detect and suppress thermal-hydraulic oscillations is required. Since the duration of this period of time is limited, the increase in the probability of a thermal-hydraulic instability event is not significant. Therefore, the proposed changes do not result in a significant increase in the probability of an accident previously evaluated.

An unmitigated thermal-hydraulic instability event is postulated to cause a violation of the MCPR safety limit. The proposed changes ensure mitigation of thermal-hydraulic instability events prior to challenging the MCPR safety limit if initiated from anticipated conditions by detection of the onset of oscillations and actuation of an RPS trip signal when the OPRM system is operable with operating limits as specified in the COLR. The OPRM also provides the capability of an RPS trip being generated for thermal-hydraulic instability events initiated from unanticipated but postulated conditions. These mitigative capabilities of the OPRM system would become available as a result of the proposed changes and have the potential to reduce the consequences of anticipated and postulated thermal-hydraulic instability events. Therefore the proposed changes do not significantly increase the consequences of an accident previously evaluated.

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

The proposed changes specify limiting conditions for operations, required actions and surveillance requirements of the OPRM system and allows operation in regions of the power to flow map currently restricted by the requirements of the ICAs and TS Section 3.4.1. The OPRM system uses input signals shared with the Average Range Power Monitor (APRM) system and rod block functions to monitor core conditions and generate an RPS trip when required. Quality requirements for software design, testing, implementation and module self-testing of the OPRM system provide assurance that no new equipment malfunctions due to software errors are created. The design of the OPRM system also ensures that neither operation nor malfunction of the OPRM system will adversely impact the operation of the other systems and no accident or equipment malfunction of these other systems could cause the OPRM system to malfunction or cause a different kind of accident. No new failure modes of either the new OPRM equipment or of the existing APRM equipment have been introduced. Therefore, operation with the OPRM system does not create the possibility of a new or different kind of accident from any previously evaluated.

Operation in regions currently restricted by the ICAs and TS Section 3.4.1 is within the nominal operating domain and ranges of plant systems and components for which postulated equipment and accidents have been evaluated. Therefore, operation within these regions does not create the possibility of a new or different kind of accident from any previously evaluated.

These proposed changes which specify limiting conditions for operations, required actions and surveillance requirements of the OPRM system and allow operation in certain regions of the power to flow map do not create the possibility of a new or different kind of accident from any accident previously evaluated.

Does the change involve a significant reduction in a margin of safety?

The OPRM system monitors small groups of LPRM signals for indication of local variations of core power consistent with thermal-hydraulic oscillations and generates an RPS trip when conditions consistent with the onset of oscillations are detected. An unmitigated thermal-hydraulic instability event has the potential to result in a challenge to the MCPR safety limit. The OPRM system provides the capability to automatically detect and suppress conditions which might result in a thermal-hydraulic instability event and thereby maintains the margin of safety by providing automatic protection for the MCPR safety limit while reducing the burden on the control room operators significantly. Operation with the OPRM system does not involve a significant reduction in a margin of safety.

Operation in regions currently restricted by the requirements of the ICAs and TS Section 3.4.1 is within the nominal operating domain assumed for identifying the range of initial conditions considered in the analysis of anticipated operational occurrences and postulated accidents. Therefore, operation in these regions does not involve a significant reduction in the margin of safety.

The proposed changes, which specify limiting conditions for operations, required actions and surveillance requirements of the OPRM system and allows operation in certain regions of the power to flow map, do not involve a significant reduction in a margin of safety.

Therefore, based upon the above evaluation, we have concluded that these changes do not constitute a significant hazards consideration.

INFORMATION SUPPORTING AN ENVIRONMENTAL ASSESSMENT

AmerGen Energy Company, LLC (i.e., AmerGen) has evaluated this proposed change against the criteria for identification of licensing and regulatory actions requiring environmental assessment in accordance with 10 CFR 51.21, "Criteria for and identification of licensing and regulatory actions requiring environmental assessments." AmerGen has determined that this proposed change meets the criteria for a categorical exclusion set forth in 10 CFR 51.22, "Criterion for categorical exclusion; identification of licensing and regulatory actions eligible for categorical exclusion or otherwise not requiring environmental review," paragraph (c)(9), and as such, has determined that no irreversible consequences exist in accordance with 10 CFR 50.92, "Issuance of amendment," paragraph (b). This determination is based on the fact that this change is being proposed as an amendment to a license issued pursuant to 10 CFR 50, "Domestic Licensing of Production and Utilization Facilities," which changes a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, "Standards for Protection Against Radiation," or that changes an inspection or surveillance requirement, and the amendment meets the following specific criteria.

(i) The proposed changes involve no significant hazards consideration.

As demonstrated in Attachment C, this proposed amendment does not involve any significant hazards consideration.

(ii) There is no significant change in the types or significant increase in the amounts of any effluent that may be released offsite.

The proposed changes, which specify limiting conditions for operations, required actions and surveillance requirements of the Oscillation Power Range Monitor (OPRM) system and allow operation in certain regions of the power to flow map, are consistent with the design of the plant. As documented in Attachment A, there will be no significant increase in the amounts of any effluents released offsite. These changes do not result in an increase in power level, do not increase the production, nor alter the flow path or method of disposal of radioactive waste or byproducts. Therefore, the proposed changes will not affect the types or increase the amounts of any effluents released offsite.

(iii) There is no significant increase in individual or cumulative occupational radiation exposure.

The proposed changes will not result in changes to the normal operation of the facility. The proposed changes specify limiting conditions for operations, required actions and surveillance requirements of OPRM system and allow operation in certain regions of the power to flow map. These changes will not result in a change in the level of controls or methodology used for processing of radioactive effluents or handling of solid radioactive waste, nor will the proposal result in any change in the normal radiation levels in the plant. Therefore, there will be no increase in individual or cumulative occupational radiation exposure resulting from these changes.