ComEd

An Exelon Company

LaSalle County Station
2601 N. 21st Road
Marseilles, IL 61341-9757
Tel 815-357-6761

November 10, 2000

United States Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

LaSalle County Station, Units 1 and 2
Facility Operating License Nos. NPF-11 and NPF-18
NRC Docket Nos. 50-373 and 50-374

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

References: (1) Letter from R. M. Krich (ComEd) to U. S. NRC, "Long Term Solution Stability System Oscillating Power Range Monitor Installation Status and Implementation Schedule," dated June 5, 2000.

(2) Letter from J. C. Brons (ComEd) to U. S. NRC, "Response to Generic Letter 94-02 (BWR Stability)," dated September 9, 1994

(3) Letter from R. M. Krich (ComEd) to U. S. NRC, "Request for Technical Specifications Changes for Dresden Nuclear Power Station, Units 2 and 3, LaSalle County Station, Units 1 and 2, Quad Cities Nuclear Power Station, Units 1 and 2, to Convert to Improved Standard Technical Specifications," dated March 3, 2000.

(4) Letter from V. Nerses, Sr. (U. S. NRC) to R. G. Byram PP&L), "Susquehanna Steam Electric Station, Units 1 and 2 (TAC NOS. MA2271 and MA2445)," dated July 30, 1999.

A001

(5) Letter from R. M. Krich (ComEd) to U.S. NRC, "Request for License Amendment for Power Uprate Operation," dated July 14, 1999.

(6) Letter from D. M. Skay (U.S. NRC) to ComEd, "LaSalle – Issuance of Amendments Regarding Power Uprate (TAC Nos. MA6070 and MA6071)," dated May 9, 2000.

(7) Letter from R.M. Krich (ComEd) to U.S. NRC, "Request for Technical Specification Change, Transition to General Electric Fuel," dated September 29, 2000.

In accordance with 10 CFR 50.90, "Application for amendment of license or construction permit," Commonwealth Edison (ComEd) Company proposes changes to Appendix A, Technical Specifications (TS), of Facility Operating License Nos. NPF-11 and NPF-18. The proposed changes incorporate into the TS the Oscillation Power Range Monitor (OPRM) Instrumentation that will be declared operational in accordance with the schedule provided in Reference (1). We have subsequently notified the NRC Project Manager for LaSalle County Station that our schedule for submission of this proposed change is modified to November 2000.

Boiling Water Reactors (BWRs) are susceptible to thermal hydraulic instabilities if operated at high power and low flow conditions. The detection and suppression of instability 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 current stability requirements (e.g., the Power versus Flow TS Figure) in the LaSalle County Station TS and incorporate new OPRM Instrumentation TS.

In reference (3), we proposed changes to the TS of Dresden Nuclear Power Station, LaSalle County Station and Quad Cities Nuclear Power Station to incorporate the format and content of Improved Technical Specifications (ITS). The current proposed implementation date for the proposed ITS changes is prior to the first OPRM Instrumentation operational date, and as such, it is our intent to enable our OPRM Instrumentation trips and incorporate these proposed TS changes after we have converted to ITS.

Additionally, the NRC in Reference (4), has recently approved TS for an ABB Option III OPRM for Susquehanna Steam Electric Station (SSES). The approved SSES TS were in ITS format.

The OPRM Instrumentation trip enabled region of the Power/Flow Operating Map for Power Uprate was submitted by Reference (5) and approved by Reference (6) for LaSalle County Station Units 1 and 2 power uprate.

The information supporting the proposed changes is subdivided as follows.

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

2. Attachment B includes the marked-up TS pages with the proposed changes indicated.

3. Attachment C describes our evaluation performed in accordance with 10 CFR 50.92(c), which provides information supporting a finding of no significant hazards consideration.

4. Attachment D provides information supporting an Environmental Assessment.

The proposed changes have been reviewed by the LaSalle County Station PORC and approved by the Nuclear Safety Review Board (NSRB) in accordance with the Quality Assurance Program.

ComEd is notifying the State of Illinois of this application for amendment 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. William Riffer, Regulatory Assurance Manager, at (815) 357-6761, extension 2383.

Respectfully,

Charles G. Pardee
Site Vice President
LaSalle County Station

Attachments:

Attachment A.	Description and Safety Analysis for the Proposed TS Changes
Attachment B.	Marked-up TS Pages for the Proposed Changes
Attachment C.	Information Supporting a Finding of No Significant Hazards Consideration
Attachment D.	Information Supporting an Environmental Assessment

cc: Regional Administrator – NRC Region III
NRC Senior Resident Inspector – LaSalle County Station
Office of Nuclear Facility Safety – Illinois Department of Nuclear Safety

STATE OF ILLINOIS	)	
IN THE MATTER OF	)	
COMMONWEALTH EDISON COMPANY	)	Docket Nos.
LASALLE COUNTY STATION - UNIT 1 & UNIT 2	)	50-373 and 50-374

Subject: Application 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.

Charles G. Pardee
Site Vice President
LaSalle County Station

Subscribed and sworn to before me, a Notary Public in and for the State above named, this 7th day of November, 2000.
My Commission expires on 10-1-, 04.

OFFICIAL SEAL
DEBRA J FEENEY
NOTARY PUBLIC, STATE OF ILLINOIS
MY COMMISSION EXPIRES: 10/01/04

Notary Public

DESCRIPTION AND SAFETY ANALYSIS FOR THE PROPOSED CHANGES

A. SUMMARY OF THE PROPOSED CHANGES

In accordance with 10 CFR 50.90, "Application for amendment of license or construction permit," Commonwealth Edison (ComEd) Company proposes changes to Appendix A, Technical Specifications (TS), of Facility Operating License Nos. NPF-11 and NPF-18. Specifically, we propose to incorporate into the TS, the Oscillation Power Range Monitor (OPRM) instrumentation. The proposed changes for LaSalle County Station, Units 1 and 2, to Current Technical Specifications (CTS) Sections 3/4.3.9, "Oscillation Power Range Monitor (OPRM) Instrumentation," 3/4.4.1.1, "Recirculation Loops," 3/4.4.1.5, "Thermal Hydraulic Stability," and 6.6.A.6, "Core Operating Limits Reports" and Improved Technical Specification (ITS) Sections 3.3.1.3, "Oscillation Power Range Monitor (OPRM) Instrumentation," 3.4.1,"Recirculation Loops Operating," and 5.6.5, "Core Operating Limits Report (COLR)" will delete the thermal hydraulic instability administrative requirements and Power versus Flow TS figure and associated references to the figure, and insert a new TS for the OPRM instrumentation. The proposed TS 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 CTS and ITS pages and associated CTS and ITS Bases changes are shown in Attachment B.

B. DESCRIPTION OF THE CURRENT REQUIREMENTS

LaSalle County Station CTS and ITS do not have TS for the OPRM instrumentation. LaSalle County Station CTS and ITS do have TS for identified actions and Surveillance Requirements (SRs) to address thermal hydraulic instability based on the Power versus Flow TS Figure.

C. BASES FOR THE CURRENT REQUIREMENTS

LaSalle County Station 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). CTS Section 3/4.4.1.5 and the associated Power versus Flow Figure 3.4.1.5-1, and references to the figure in CTS Section 3/4.4.1.1 were added based on General Electric Company Service Information Letter (SIL) 380, Revision 1, "BWR Core Thermal Hydraulic Stability," and NRC Gereric Letter 86-02, "Technical Resolution of Generic Issue B-19-Thermal Hydraulic Stability."

ITS Section 3.4.1, "Recirculation Loops Operating," submitted by Reference (3) includes actions and SRs based on the same requirements.

D. NEED FOR REVISION OF THE REQUIREMENTS

ComEd, in Reference 1, provided the NRC with the implementation schedule and status for OPRM Instrumentation for LaSalle County Station, Units 1 and 2. We selected OPRM Option III for LaSalle County Station. 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," dated July 11, 1994. We committed to operate each unit OPRM Instrumentation installation with the alarm fully functional, but with the scram initiation bypassed, before declaring each unit's OPRM Instrumentation operational. Additionally, to support the operational date of June 2001, for the LaSalle County Station, Unit 2, OPRM Instrumentation, we proposed to provide the NRC with proposed TS for the OPRM Instrumentation. We subsequently notified the NRC Project Manager for LaSalle County Station that our schedule for submission of the proposed change was modified to November 2000.

E. DESCRIPTION OF THE PROPOSED CHANGES

The proposed ITS changes are as follows.

1. Delete ITS Power versus Flow Figure 3.4.1-1 and associated references to the figure from ITS Section 3.4.1," Limiting Condition for Operation (LCO), Actions, and Surveillance Requirements (SRs).
2. Add ITS Section 3.3.1.3, "Oscillation Power Range Monitor (OPRM) Instrumentation" and add a reference to Section 5.6.5, "Core Operating Limits Report (COLR)".

The proposed changes delete CTS Section 3/4.4.1.5 and the associated Power versus Flow Figure 3.4.1.5-1. References to Figure 3.4.1.5-1 are proposed to be deleted from the LaSalle County Station CTS Section 3.4.1.1 and the new OPRM Instrumentation TS are proposed to be incorporated into the CTS as Section 3/4.3.9. Additionally, a reference is added to Section 6.6.A.6, "Core Operating Limits Reports."

However, it is our intent to enable the OPRM instrumentation trips and incorporate these proposed TS changes, after we have converted to ITS, so the proposed changes to CTS are only provided for consistency.

F. SAFETY ANALYSIS OF THE PROPOSED CHANGES

10 CFR 50, Appendix A, 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 affects of anticipated operational occurrences. Additionally, 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 Ratio (MCPR) safety limit.

The OPRM Instrumentation System uses 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 hardware implements these algorithms in microprocessor based modules. These modules, installed in Local Power Range Monitor (LPRM) flux amplifier slots in the Neutron Monitoring System (NMS) cabinets, 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. 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 a stability related oscillation based on the occurrence of a fixed number of consecutive LPRM signal period confirmations followed by the LPRM signal amplitude exceeding a specified setpoint. Upon detection of a stability related oscillation, a trip is generated for that OPRM instrumentation channel.

The OPRM Instrumentation System consists of four (4) OPRM instrumentation trip channels, each trip channel consisting of two OPRM instrumentation modules. Each OPRM instrumentation module receives input from LPRMs. Each OPRM instrumentation 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.

Each OPRM instrumentation module is continuously tested by a self-test function. On detection of any OPRM instrumentation module failure, either a "Trouble" or "INOP" alarm is activated. The OPRM instrumentation module provides an "INOP" alarm when the self-test feature indicates that the OPRM instrumentation module may not be capable of meeting its functional requirements. 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 redundancy 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 the proposed TS Asea Brown Boveri (ABB) Combustion Engineering topical report CENPD-400-P-A, "Generic Topical Report for the ABB Option III Oscillation Power Range Monitor (OPRM)," Revision 01. This topical report was approved for use by the NRC in its letter dated August 16, 1995.

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 effects 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 Instrumentation 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. Additionally, the OPRM Instrumentation satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

Reference (5), Attachment E, General Electric Company topical report NEDC-32701P, Revision 2, "Power Uprate Safety Analysis Report for LaSalle County Station Units 1 and 2," Section 2.4, "Stability," addressed the changes to both the reactor stability ICAs and OPRM Option III. In order to preserve the same level of protection against the occurrence of a thermal-hydraulic instability, the instability exclusion region boundaries were unchanged with respect absolute power level. The power uprate ICA regions are shown in attached Figure 1, "Power/Flow Operating Map for Power Uprate - ICA Stability Option" (i.e., Figure 2-1 of NEDC-32701P). The power uprate OPRM Option III Armed (i.e., enabled) Region is shown in attached Figure 2, "Power/Flow Operating Map for Power Uprate – OPRM Stability Option. Reactor core flow did not change with power uprate, so the flow portion of the enabled region remains 60% of rated core flow. Power Uprate increased rated thermal power by 5%, from 3323 MWt to 3489 MWt. In order to maintain the same level of protection, 30% of rated thermal power was reduced by the ratio of 100%/105%, which reduces the power portion of the enabled region to 28.6% of rated thermal power. The LaSalle County Station Power Uprate amendments were approved and issued in Reference (6).

The NRC in a letter dated August 16, 1995, "Acceptance of Licensing Topical Report CENPD-400-P, Generic Topical Report for the ABB Option III Oscillation Power Range Monitor (TAC No. M89222)," accepted the use of this OPRM Instrumentation System for licensees to the extent specified and under the limitations delineated in the attached NRC safety evaluation and the ABB topical report CENPD-400-P. The August 16, 1995 NRC letter requested licensees to address the following plant specific questions when referencing the ABB topical report CENPD-400-P in license applications. The topical report was revised to incorporate the August 16, 1995 NRC letter and is now designated as CENPD-400-P-A, Revision 1.

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 LaSalle County Station includes alarm, trip, inoperable and trouble annunciators and is consistent with the topical report design.

   Additionally, the installation and implementation of the OPRM Instrumentation is specified in Reference 1.

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

   Response

   We have reviewed the applicability of BWROG topical reports that address the OPRM Instrumentation and associated instability functions, set points and margin. The review has determined that an acceptable method for LaSalle County Station to address General Design Criteria 10 and 12 is by the detection and suppression methodology described in CENPD-400-P-A, Revision 1.

   Therefore, implementation of the ABB Option III long term solution has been selected for LaSalle County Station.

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.

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

   Response

   All new instruments are being installed in the Main Control Room Panel which has a controlled environment. This environment is maintained during normal and accident

plant conditions. The impact of the new instruments on the Main Control Room environment was evaluated and found acceptable.

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 administrative procedures (i. e., Operating, Instrumentation) are provided for manually bypassing OPRM Instrumentation channels or protective functions, and for controlling access functions during normal and abnormal operation.

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 changes made to the Control Room Panels for the OPRM instrumentation system were evaluated by a ComEd Human Factors Engineer in accordance with human factors engineering procedures for acceptability and conformance to Human Engineering design principles. The OPRM System instrumentation and associated components, controls, and annunciators were found acceptable from a human factors engineering perspective.

The incorporation of the OPRM instrumentation into the TS will allow the deletion of the Power versus Flow TS Figure and associated references and CTS Section 3/4.1.5. The OPRM Instrumentation will provide at least the same level of assurance that the MCPR safety limit will not be violated for anticipated oscillations as that provided by the current stability requirements (e.g., the Power versus Flow TS Figure) in the LaSalle County Station TS.

G. IMPACT ON PREVIOUS SUBMITTALS

We have reviewed the proposed changes regarding impact on any previous submittals, and have determined that our ITS submittal of March 3, 2000 is impacted. However, it is our intent to enable the OPRM Instrumentation trips and incorporate these proposed TS changes, after we have converted to ITS. In addition, our submittal dated September 29, 2000, "Request for Technical Specifications Change, Transition to General Electric Fuel," requests a change to the LPRM calibration interval from 1000 EFPH to 2000 EFPH. This affects proposed Unit 1 and Unit 2 CTS SR 4.3.9.2 on CTS pages 3/4 3-90 and CTS Bases page B 3/4.3-12. This also affects proposed ITS SR 3.3.1.3.3 on page affected is 3.3.1.3-3 and the ITS Bases page affected is B 3.3.1.3-7 for SR 3.3.1.3.3.

H. SCHEDULE REQUIREMENTS

We request approval of these proposed changes by May 1, 2001, with an implementation schedule based on Reference 1, to support the LaSalle County Station, Unit 2, OPRM instrumentation implementation date of June 2001 and Unit 2 OPRM instrumentation implementation date of June 2002.

I. REFERENCES

(1) Letter from R. M. Krich (ComEd) to U. S. NRC, "Long Term Solution Stability System Oscillating Power Range Monitor Installation Status and Implementation Schedule," dated June 5, 2000.

(2) Letter from J. C. Brons (ComEd) to U. S. NRC, "Response to Generic Letter 94-02 (BWR Stability)," dated September 9, 1994.

(3) Letter from R. M. Krich (ComEd) to U. S. NRC, "Request for Technical Specifications Changes for Dresden Nuclear Power Station, Units 2 and 3, LaSalle County Station, Units 1 and 2, Quad Cities Nuclear Power Station, Units 1 and 2, to Convert to Improved Standard Technical Specifications," dated March 3, 2000.

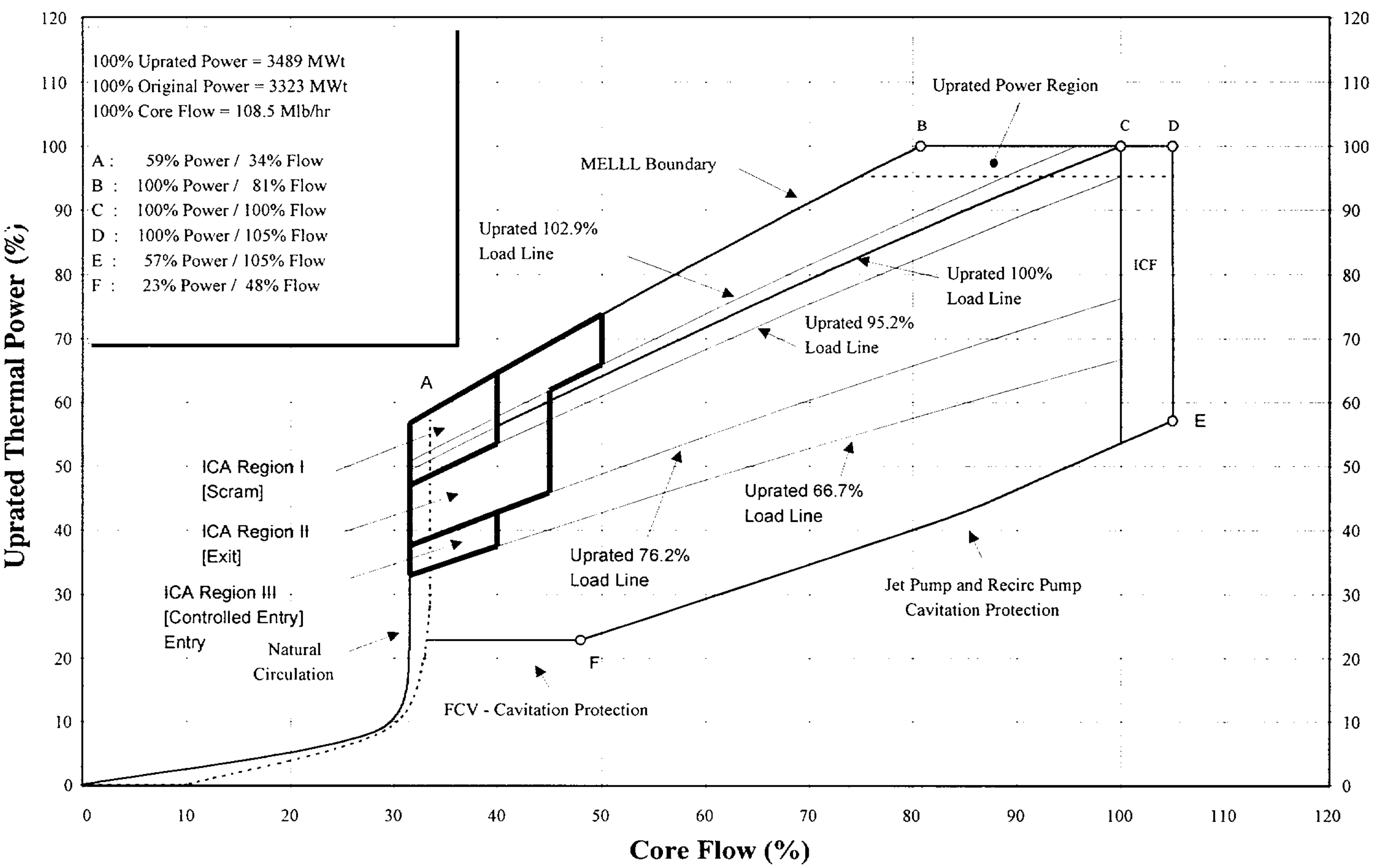
(4) Letter from V. Nerses, Sr. (U. S. NRC) to R. G. Byram (PP&L), "Susquehanna Steam Electric Station, Units 1 and 2 (TAC NOS. MA2271 and MA2445)," dated July 30, 1999.

(5) Letter from R. M. Krich, Commonwealth Edison (ComEd) Company, to U.S. NRC, "Request for License Amendment for Power Uprate Operation," dated July 14, 1999.

(6) Letter from D. M. Skay (U.S. NRC) to ComEd, "LaSalle – Issuance of Amendments Regarding Power Uprate (TAC Nos. MA6070 and MA6071)," dated May 9, 2000.

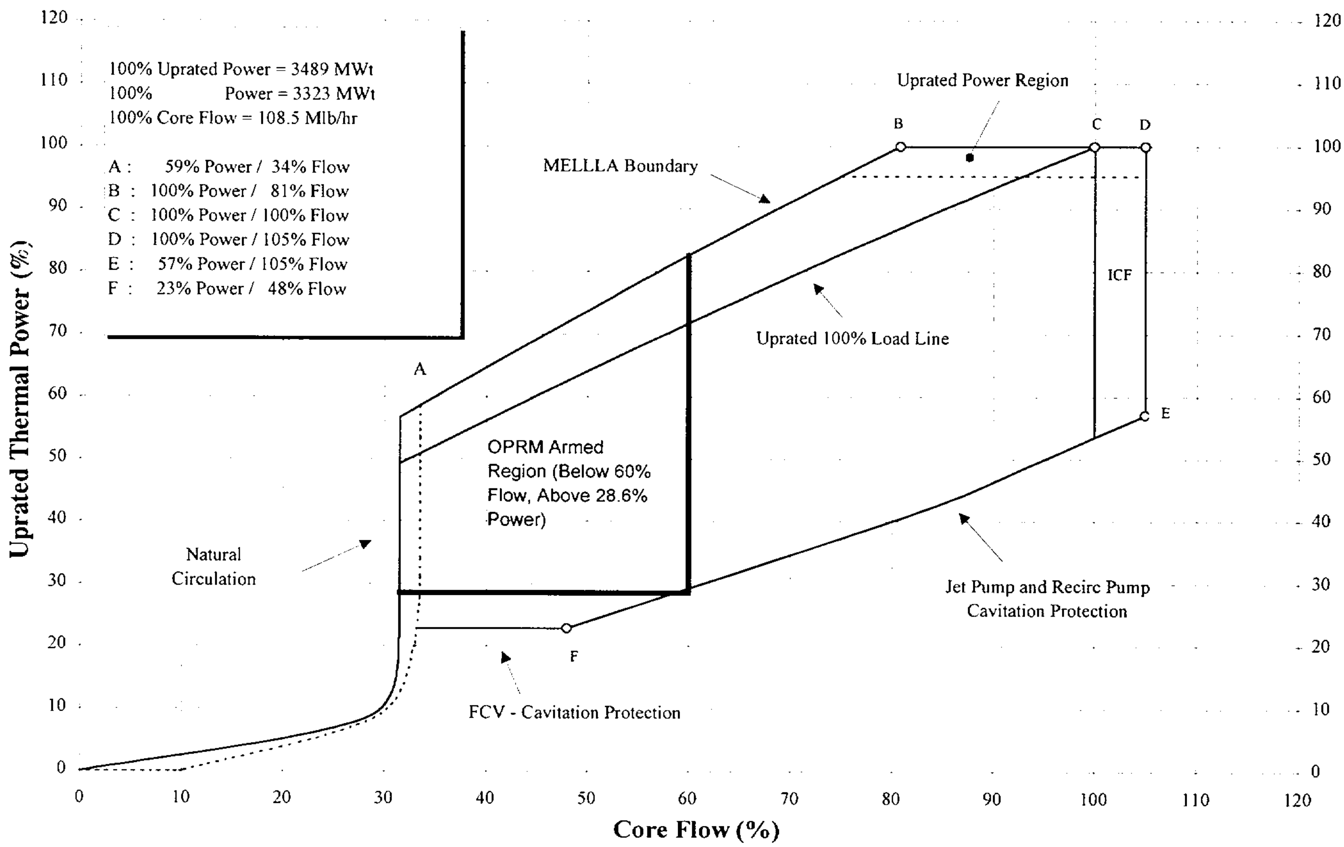
(7) Letter from R. M. Krich, Commonwealth Edison (ComEd) Company, to U.S. NRC, "Request for Technical Specification Change, Transition to General Electric Fuel," dated September 29, 2000.

FIGURE 1



Power/Flow Operating Map for Power Uprate - ICA Stability Option

FIGURE 2



Power/Flow Operating Map for Power Uprate - OPRM Stability Option

ATTACHMENT B
Proposed Technical Specification Changes for
LaSalle County Station, Units 1 and 2

MARKED-UP TS PAGES FOR PROPOSED CHANGES

CTS REVISED PAGES

NPF-11	**NPF-18**
CTS	CTS
V	V
VI	VI
XIII	XIII
XIX	XIX
3/4 4-1	3/4 4-1
3/4 4-4a	3/4 4-5a
3/4 4-4b	3/4 4-5b
3/4 4-4c	3/4 4-5c
B 3/4 4-1	B 3/4 4-1
6-25	6-24*
	6-25
Proposed CTS pages	Proposed CTS pages
3/4 3.3-90	3/4 3.3-90
B 3/4 3-8	B 3/4 3-8
B 3/4 3-9	B 3/4 3-9
B 3/4 3-10	B 3/4 3-10
B 3/4 3-11	B 3/4 3-11
B 3/4 3-12	B 3/4 3-12
B 3/4 3-13	B 3/4 3-13
B 3/4 3-14	B 3/4 3-14
B 3/4 3-15	B 3/4 3-15

* This page is provided for continuity only, there are no changes to this page.

LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE REQUIREMENTS

INDEX

LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE REQUIREMENTS

BASES

LIST OF FIGURES

3/4.4 REACTOR COOLANT SYSTEM

3/4.4.1 RECIRCULATION SYSTEM

RECIRCULATION LOOPS

LIMITING CONDITION FOR OPERATION

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

APPLICABILITY: OPERATIONAL CONDITIONS 1 and 2

ACTION

a. With only one (1) reactor coolant system recirculation loop in operation~~, comply with Specification 3.4.1.5 and~~:

1. Within four (4) hours:

   a) Place the recirculation flow control system in the Master Manual mode or lower, and

   b) Increase the MINIMUM CRITICAL POWER RATIO (MCPR) Safety Limit by 0.01 per Specification 2.1.2, and

   c) Increase the MINIMUM CRITICAL POWER RATIO (MCPR) Limiting Condition for Operation by 0.01 per Specification 3.2.3, and,

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

   e) Reduce the AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR) Limiting Condition for Operation by the applicable Single Loop Operation (SLO) factor specified in the CORE OPERATING LIMITS REPORT.

2. Otherwise, be in at least HOT SHUTDOWN within the next twelve (12) hours.

b. With no reactor coolant recirculation loops in operation:

~~1. Take the ACTION required by Specification 3.4.1.5, and~~

2. (1) Be in at least HOT SHUTDOWN within the next six (6) hours.

3/4.4 REACTOR COOLANT SYSTEM

3/4.4.1 RECIRCULATION SYSTEM

THERMAL HYDRAULIC STABILITY

LIMITING CONDITION FOR OPERATION

3.4.1.5 Forced core circulation shall be maintained with:

a. Total core flow greater than or equal to 45% of rated core flow, or

b. THERMAL POWER within Region III of Figure 3.4.1.5-1, or

c. THERMAL POWER within Region II of Figure 3.4.1.5-1 AND APRM and LPRM noise levels not exceeding the larger of: i) Three (3) times the established baseline noise levels or, ii) 10% peak-to-peak indicated noise level.

APPLICABILITY: OPERATIONAL CONDITION 1

ACTION

a. In Region I of Figure 3.4.1.5-1:

1. With at least 1 reactor coolant recirculation loop in operation immediately initiate action to:

a) Decrease THERMAL POWER by control rod insertion, completing the power decrease within two (2) hours to exit Region I or,

b) Increase core flow with the operating Recirculation Loop(s), to exit Region I within two (2) hours.

2. With no reactor coolant recirculation loops in operation:

a) Immediately reduce CORE THERMAL POWER by inserting control rods, observing the indicated APRM and LPRM noise levels, and complete power reduction to below 36% of RATED CORE THERMAL POWER within two (2) hours, and

b) If indicated LPRM or APRM noise levels exceed 10% peak-to-peak, immediately place the reactor mode switch in the SHUTDOWN position.

c) Comply with Specification 3.4.1.1 ACTION b.2

ACTION (Continued)

b. In Region II of Figure 3.4.1.5-1, with APRM or LPRM neutron flux noise levels exceeding the larger of: i) Three (3) times the established baseline noise levels, or ii) 10% peak-to-peak noise indication.

1. Immediately initiate corrective action by inserting control rods or increasing core flow to restore the noise levels to within the required limit within 2 hours, otherwise.

2. Insert control rods to reduce THERMAL POWER and/or increase core flow to enter Region III of Figure 3.4.1.5-1 within the next 2 hours.

SURVEILLANCE REQUIREMENTS

4.4.1.5 When operating within Region II of Figure 3.4.1.5-1, verify:

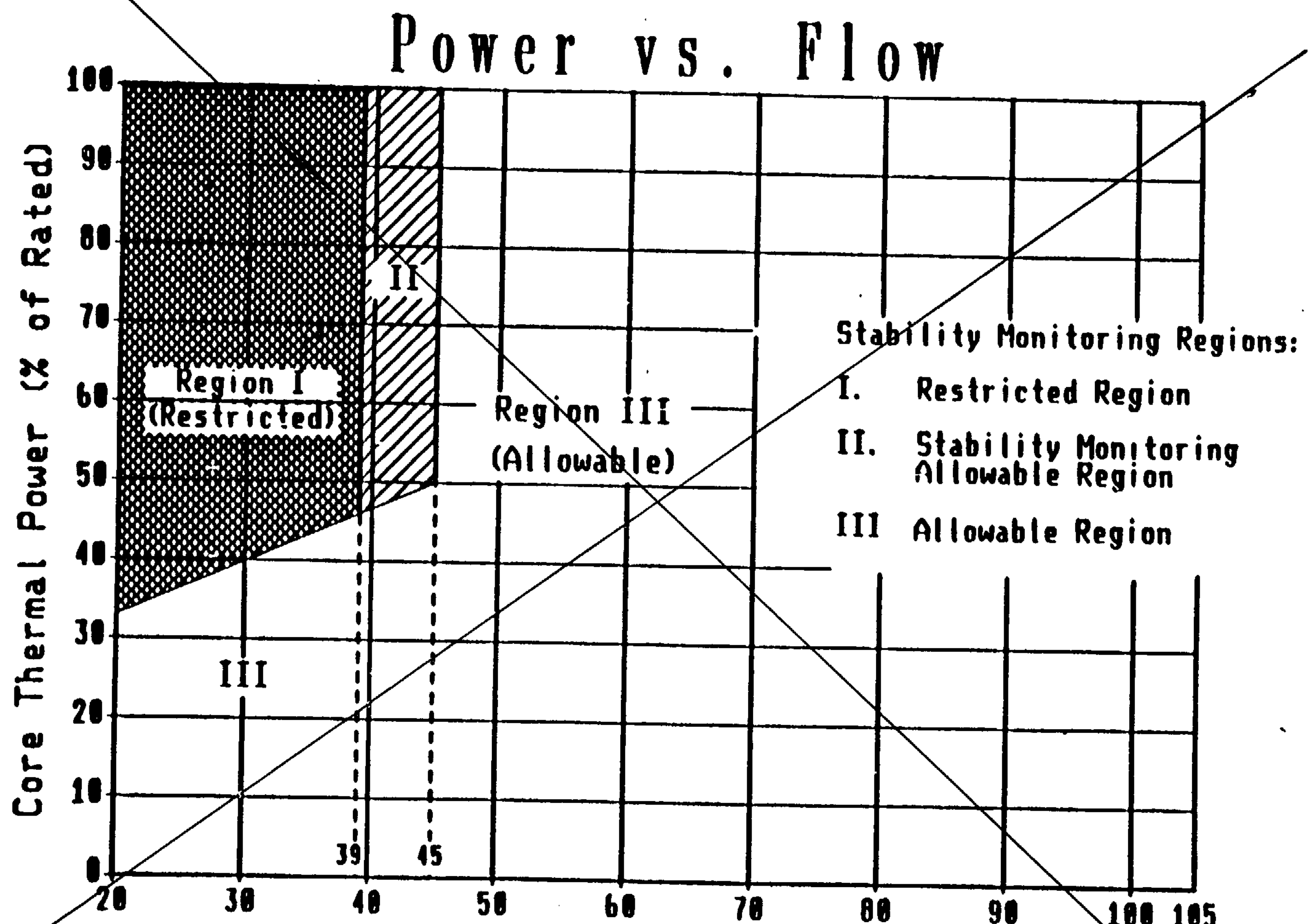
1. That the APRM and LPRM neutron flux noise levels do not exceed the larger of: i) Three (3) times the established baseline levels or, ii) 10% peak-to-peak indicated noise level#:

a. At least once per 12 hours, and

b. Initiate the surveillance within 15 minutes after entering the region or completing an increase of at least 5% of RATED THERMAL POWER, completing the surveillance within the next 30 minutes.

2. That core flow is greater than or equal to 39% of rated core flow at least once per 12 hours.

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



~~TOTAL CORE FLOW (% OF RATED)~~

~~Figure 3.4.1.5-1~~

3/4.4.1 RECIRCULATION SYSTEM

Operation with one reactor recirculation loop inoperable has been evaluated and been found to be acceptable, provided the unit is operated in accordance with the single recirculation loop operation Technical Specifications herein.

An inoperable jet pump is not, in itself, a sufficient reason to declare a recirculation loop inoperable, but it does present a hazard in case of a design-basis-accident by increasing the blowdown area and reducing the capability of reflooding the core, thus, the requirement for shutdown of the facility with a jet pump inoperable. Jet pump failure can be detected by monitoring jet pump performance on a prescribed scheduled for significant degradation. During dual loop operation, the jet pump operability surveillance should be performed with balanced drive flow (drive flow mismatch less than 5%) to ensure an accurate indication of jet pump performance.

Recirculation loop flow mismatch limits are in compliance with the ECCS LOCA analysis design criterion. The limits will ensure an adequate core flow coastdown from either recirculation loop following a LOCA. Where the recirculation loop flow mismatch limits cannot be maintained during the recirculation loop operation, continued operation is permitted in the single recirculation loop operation mode.

In order to prevent undue stress on the vessel nozzles and bottom head region, the recirculation loop temperatures shall be within 50°F of each other prior to startup of an idle loop. The loop temperature must also be within 50°F of the reactor pressure vessel coolant temperature to prevent thermal shock to the recirculation pump and recirculation nozzles. Since the coolant in the bottom of the vessel is at a lower temperature than the water in the upper regions of the core, undue stress on the vessel would result if the temperature difference were greater than 145°F.

The possibility of thermal hydraulic instability in a BWR has been investigated since the startup of early BWRs. Based on tests and analytical models, it has been identified that the high power-low flow corner of the power-to-flow map is the region of least stability margin. This region may be encountered during startups, shutdowns, sequence exchanges, and as a result of a recirculation pump(s) trip event.

~~Region I of Figure 3.4.1.5-1 represents a region of the power/flow map where instability in neutron flux have been observed. Operation in this region is prohibited to ensure that stable reactor conditions are maintained. Actions to immediately exit Region I are intended to prevent lower priority (i.e., non-emergency) concerns from delaying exit from the region. Observation of neutron flux indications, while not requiring formal surveillance, is needed to avoid reliance on automatic protective systems. A manual reactor scram is required if instabilities are evidenced in Region I with no recirculation pumps operating.~~

~~Operation within a designated surveillance region (Region II of Figure 3.4.1.5-1) requires monitoring of APRM and LPRM noise levels. Observed instabilities require immediate corrective action due to the potential for increasing oscillations.~~

Monthly Operating Report (Continued)

A report of any major changes to the radioactive waste treatment systems shall be submitted with the Monthly Operating Report for the period in which the evaluation was reviewed and accepted by Onsite Review and Investigative Function.

6. Core Operating Limits Report

a. Core operating limits shall be established and documented in the CORE OPERATING LIMITS REPORT before each reload cycle or any remaining part of a reload cycle for the following:

(1) The Average Planar Linear Heat Generation Rate (APLHGR) for Technical Specification 3.2.1.

(2) The minimum Critical Power Ratio (MCPR) scram time, dependent MCPR limits, and power and flow dependent MCPR limits for Technical Specification 3.2.3. Effects of analyzed equipment out of service are included.

(3) The Linear Heat Generation Rate (LHGR) for Technical Specification 3.2.4.

(4) The Rod Block Monitor Upscale Instrumentation Setpoints for Technical Specification Table 3.3.6-2.

(5) The allowable value for the Oscillation Power Range Monitor Instrumentation for Technical Specification 3.3.9.

b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC. For LaSalle County Station Unit 1, the topical reports are:

(1) ANFB Critical Power Correlation, ANF-1125(P)(A) and Supplements 1 and 2, Advanced Nuclear Fuels Corporation, April 1990.

(2) Letter, Ashok C. Thadani (NRC) to R.A. Copeland (SPC), "Acceptance for Referencing of ULTRAFLOW™ Spacer on 9x9-IX/X BWR Fuel Design," July 28, 1993.

(3) Advanced Nuclear Fuels Corporation Critical Power Methodology for Boiling Water Reactors/Advanced Nuclear Fuels Corporation Critical Power Methodology for Boiling Water Reactors: Methodology for Analysis of Assembly Channel Bowing Effects/NRC Correspondence, XN-NF-524(P)(A) Revision 2, and Supplement 1 Revision 2, Supplement 2, Advanced Nuclear Fuels Corporation, November 1990.

(4) COTRANSA 2: A Computer Program for Boiling Water Reactor Transient Analysis, ANF-913(P)(A), Volume 1, Revision 1 and Volume 1 Supplements 2, 3, and 4, Advanced Nuclear Fuels Corporation, August 1990.

LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE REQUIREMENTS

LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE REQUIREMENTS

LIST OF FIGURES

3/4.4 REACTOR COOLANT SYSTEM

3/4.4.1 RECIRCULATION SYSTEM

RECIRCULATION LOOPS

LIMITING CONDITION FOR OPERATION

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

APPLICABILITY: OPERATIONAL CONDITIONS 1 and 2

ACTION

a. With only one (1) reactor coolant system recirculation loop in operation~~, comply with Specification 3.4.1.5 and~~:

   1. Within four (4) hours:

      a) Place the recirculation flow control system in the Master Manual mode or lower, and

      b) Increase the MINIMUM CRITICAL POWER RATIO (MCPR) Safety Limit by 0.01 per Specification 2.1.2, and

      c) Increase the MINIMUM CRITICAL POWER RATIO (MCPR) Limiting Condition for Operation by 0.01 per Specification 3.2.3, and,

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

      e) Reduce the AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR) Limiting Condition for Operation by the applicable Single Loop Operation (SLO) factor specified in the CORE OPERATING LIMITS REPORT.

   2. Otherwise, be in at least HOT SHUTDOWN within the next twelve (12) hours.

b. With no reactor coolant recirculation loops in operation:

   ~~1. Take the ACTION required by Specification 3.4.1.5, and~~

   2. Be in at least HOT SHUTDOWN within the next six (6) hours.

   1.

REACTOR COOLANT SYSTEM

3/4.4 REACTOR COOLANT SYSTEM

3/4.4.1 RECIRCULATION SYSTEM

THERMAL HYDRAULIC STABILITY

LIMITING CONDITION FOR OPERATION

3.4.1.5 Forced core circulation shall be maintained with:

a. Total core flow greater than or equal to 45% of rated core flow, or

b. THERMAL POWER within Region III of Figure 3.4.1.5-1, or

c. THERMAL POWER within Region II of Figure 3.4.1.5-1 AND APRM and LPRM noise levels not exceeding the larger of: i) Three (3) times the established baseline noise levels or, ii) 10% peak-to-peak indicated noise level.

APPLICABILITY: OPERATIONAL CONDITION 1

ACTION

a. In Region I of Figure 3.4.1.5-1:

1. With at least 1 reactor coolant recirculation loop in operation immediately initiate action to:

   a) Decrease THERMAL POWER by control rod insertion, completing the power decrease within two (2) hours to exit Region I or,

   b) Increase core flow with the operating Recirculation Loop(s), to exit Region I within two (2) hours.

2. With no reactor coolant recirculation loops in operation:

   a) Immediately reduce CORE THERMAL POWER by inserting control rods, observing the indicated APRM and LPRM noise levels, and complete power reduction to below 36% of RATED CORE THERMAL POWER within two (2) hours, and

   b) If indicated LPRM or APRM noise levels exceed 10% peak-to-peak, immediately place the reactor mode switch in the SHUTDOWN position.

   c) Comply with Specification 3.4.1.1 ACTION b.2

ACTION (Continued)

b. In Region II of Figure 3.4.1.5-1, with APRM or LPRM neutron flux noise levels exceeding the larger of: i) Three (3) times the established baseline noise levels, or ii) 10% peak-to-peak noise indication.

1. Immediately initiate corrective action by inserting control rods or increasing core flow to restore the noise levels to within the required limit within 2 hours, otherwise.

2. Insert control rods to reduce THERMAL POWER and/or increase core flow to enter Region III of Figure 3.4.1.5-1 within the next 2 hours.

SURVEILLANCE REQUIREMENTS

4.4.1.5 When operating within Region II of Figure 3.4.1.5-1, verify:

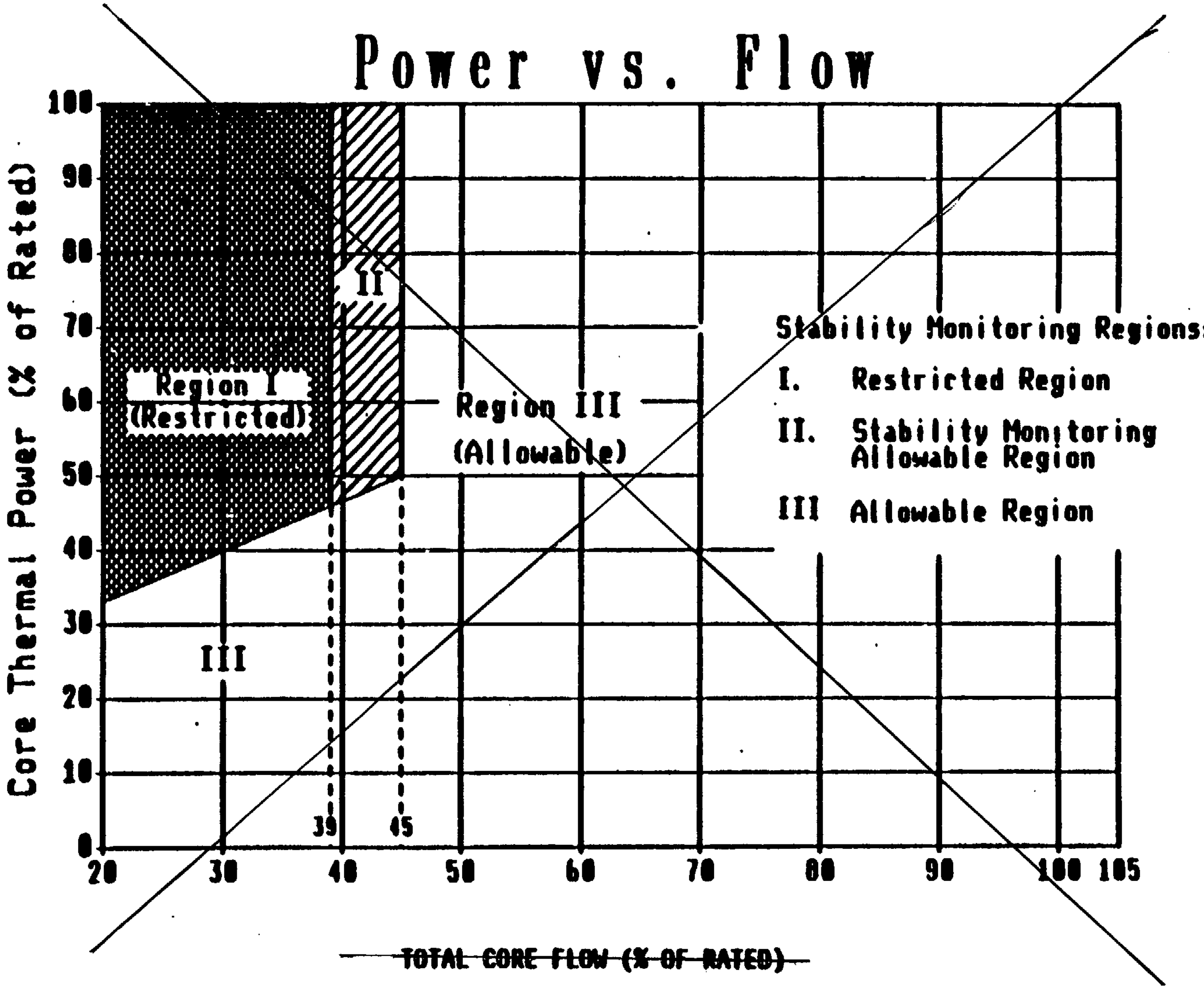
1. That the APRM and LPRM neutron flux noise levels do not exceed the larger of: i) Three (3) times the established baseline levels or, ii) 10% peak-to-peak indicated noise level:

   a. At least once per 12 hours, and

   b. Initiate the surveillance within 15 minutes after entering the region or completing an increase of at least 5% of RATED THERMAL POWER, completing the surveillance within the next 30 minutes.

2. That core flow is greater than or equal to 39% of rated core flow at least once per 12 hours.

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



~~TOTAL CORE FLOW (% OF RATED)~~

~~Figure 3.4.1.5-1~~

3/4.4.1 RECIRCULATION SYSTEM

Operation with one reactor recirculation loop inoperable has been evaluated and been found to be acceptable provided the unit is operated in accordance with the single recirculation loop operation Technical Specifications herein.

An inoperable jet pump is not, in itself, a sufficient reason to declare a recirculation loop inoperable, but it does present a hazard in case of a design-basis-accident by increasing the blowdown area and reducing the capability of reflooding the core; thus, the requirement for shutdown of the facility with a jet pump inoperable. Jet pump failure can be detected by monitoring jet pump performance on a prescribed scheduled for significant degradation. During dual loop operation, the jet pump operability surveillance should be performed with balanced drive flow (drive flow mismatch less than 5%) to ensure an accurate indication of jet pump performance.

Recirculation loop flow mismatch limits are in compliance with the ECCS LOCA analysis design criterion. The limits will ensure an adequate core flow coastdown from either recirculation loop following a LOCA. Where the recirculation loop flow mismatch limits cannot be maintained during the recirculation loop operation, continued operation is permitted in the single recirculation loop operation mode.

In order to prevent undue stress on the vessel nozzles and bottom head region, the recirculation loop temperatures shall be within 50°F of each other prior to startup of an idle loop. The loop temperature must also be within 50°F of the reactor pressure vessel coolant temperature to prevent thermal shock to the recirculation pump and recirculation nozzles. Since the coolant in the bottom of the vessel is at a lower temperature than the water in the upper regions of the core, undue stress on the vessel would result if the temperature difference was greater than 145°F.

The possibility of thermal hydraulic instability in a BWR has been investigated since the startup of early BWRs. Based on tests and analytical models, it has been identified that the high power-low flow corner of the power-to-flow map is the region of least stability margin. This region may be encountered during startups, shutdowns, sequence exchanges, and as a result of a recirculation pump(s) trip event.

~~Region I of Figure 3.4.1.5-1 represents a region of the power/flow map where instability in neutron flux have been observed. Operation in this region is prohibited to ensure that stable reactor conditions are maintained. Actions to immediately exit Region I are intended to prevent lower priority (i.e., non-emergency) concerns from delaying exit from the region. Observation of neutron flux indications, while not requiring formal surveillance, is needed to avoid reliance on automatic protective systems. A manual reactor scram is required if instabilities are evidenced in Region I with no recirculation pumps operating.~~

~~Operation within a designated surveillance region (Region II of Figure 3.4.1.5-1) requires monitoring of APRM and LPRM noise levels. Observed instabilities require immediate corrective action due to the potential for increasing oscillations.~~

prior to the first sample in which the limit was exceeded; (4) Graph of the I-131 concentration and one other radioiodine isotope concentration in microcuries per gram as a function of time for the duration of the specific activity above the steady-state level; and (5) The time duration when the specific activity of the primary coolant exceeded the radioiodine limit.

3. Annual Radiological Environmental Operating Report*

The Annual Radiological Environmental Operating Report covering the operation of the unit during the previous calendar year shall be submitted before May 1 of each year. The report shall include summaries, interpretations, and analysis of trends of the results of the Radiological Environmental Monitoring Program for the reporting period. The material provided shall be consistent with the objectives outlined in (1) the ODCM and (2) Sections IV.B.2, IV.B.3, and IV.C of Appendix I to 10 CFR Part 50.

4. Annual Radioactive Effluent Release Report**

The Annual Radioactive Effluent Release Report covering the operation of the unit during the previous calendar year shall be submitted prior to 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 (1) consistent with the objectives outlined in the ODCM and PCP and (2) in conformance with 10 CFR 50.36a and Section IV.B.1 of Appendix I to 10 CFR Part 50.

5. Monthly Operating Report

Routine reports of operating statistics and shutdown experience, including documentation of all challenges to safety/relief valves, shall be submitted on a monthly basis to the addressees specified in 10 CFR 50.4 no later than the 15th of each month following the calendar month covered by the report.

A report of any major changes to the radioactive waste treatment systems shall be submitted with the Monthly Operating Report for the period in which the evaluation was reviewed and accepted by Onsite Review and Investigative Function.

6. Core Operating Limits Report

a. Core operating limits shall be established and documented in the CORE OPERATING LIMITS REPORT before each reload cycle or any remaining part of a reload cycle for the following:

* A single submittal may be made for a multi-unit station.

** A single submittal may be made for a multi-unit station. The submittal should combine those sections that are common to all units at the station; however, for units with separate radwaste systems, the submittal shall specify the releases of radioactive material from each unit.

This page is provided for Continuity only, no changes

Core Operating Limits Report (Continued)

(1) The Average Planar Linear Heat Generation Rate (APLHGR) for Technical Specification 3.2.1.

(2) The minimum Critical Power Ratio (MCPR) scram time dependent MCPR limits, and power and flow dependent MCPR limits for Technical Specification 3.2.3. Effects of analyzed equipment out of service are included.

(3) The Linear Heat Generation Rate (LHGR) for Technical Specification 3.2.4.

(4) The Rod Block Monitor Upscale Instrumentation Setpoints for Technical Specification Table 3.3.6-2.

(5) The allowable value for the Oscillation Power Range Monitor Instrumentation for Technical Specification 3.3.9

b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC. For LaSalle County Station Unit 2, the topical reports are:

(1) ANFB Critical Power Correlation, ANF-1125(P)(A) and Supplements 1 and 2, Advanced Nuclear Fuels Corporation, April 1990.

(2) Letter, Ashok C. Thadani (NRC) to R.A. Copeland (SPC), "Acceptance for Referencing of ULTRAFLOW™ Spacer on 9x9-IX/X BWR Fuel Design," July 28, 1993.

(3) Advanced Nuclear Fuels Corporation Critical Power Methodology for Boiling Water Reactors/Advanced Nuclear Fuels Corporation Critical Power Methodology for Boiling Water Reactors: Methodology for Analysis of Assembly Channel Bowing Effects/NRC Correspondence, XN-NF-524(P)(A) Revision 2 and Supplement 1 Revision 2, Supplement 2, Advanced Nuclear Fuels Corporation November 1990.

(4) COTRANSA 2: A Computer Program for Boiling Water Reactor Transient Analysis, ANF-913(P)(A), Volume 1, Revision 1 and Volume 1 Supplements 2, 3, and 4, Advanced Nuclear Fuels Corporation, August 1990.

(5) HUXY: A Generalized Multirod Heatup Code with 10 CFR 50, Appendix K Heatup Option, ANF-CC-33(P)(A), Supplement 1 Revision 1; and Supplement 2, Advanced Nuclear Fuels Corporation, August 1986 and January 1991, respectively.

(6) Advanced Nuclear Fuel Methodology for Boiling Water Reactors, XN-NF-80-19(P)(A), Volume 1, Supplement 3, Supplement 3 Appendix F, and Supplement 4, Advanced Nuclear Fuels Corporation, November 1990.

(7) Exxon Nuclear Methodology for Boiling Water Reactors: Application of the ENC Methodology to BWR Reloads, XN-NF-80-19(P)(A), Volume 4, Revision 1, Exxon Nuclear Company, June 1986.

(8) Exxon Nuclear Methodology for Boiling Water Reactors THERMEX: Thermal Limits Methodology Summary Description, XN-NF-80-19(P)(A), Volume 3, Revision 2, Exxon Nuclear Company, January 1987.

3.3.9 OSCILLATION POWER RANGE MONITOR (OPRM) INSTRUMENTATION

LIMITING CONDITION FOR OPERATION

3.3.9 Four channels of the OPRM instrumentation shall be OPERABLE.

APPLICABILITY: THERMAL POWER ≥ 25% RTP

ACTION:*

a. With one or more channels inoperable, place the channel in trip, or, place the associated RPS trip system in trip, or, initiate alternate method to detect and suppress thermal hydraulic instability oscillations, within 30 days.

b. With OPRM trip capability not maintained, initiate alternate method to detect and suppress thermal hydraulic instability oscillations within 12 hours, and, Restore OPRM trip capability within 120 days.

c. With ACTIONS a and b not met, Reduce THERMAL POWER to < 25% RTP within 4 hours.

SURVEILLANCE REQUIREMENTS:**

4.3.9.1 Each OPRM channel shall be demonstrated OPERABLE by performing a CHANNEL FUNCTIONAL TEST at least once per 184 days.

4.3.9.2 Local power range monitors shall be calibrated at least once per 1000 effective full power hours.

4.3.9.3 Each OPRM channel shall be demonstrated OPERABLE by performing a CHANNEL CALIBRATION*** at least once per 24 months.

4.3.9.4 Perform a LOGIC SYSTEM FUNCTIONAL TEST at least once per 24 months.

4.3.9.5 Verify OPRM is not bypassed when THERMAL POWER is ≥ 28.6% RTP and recirculation drive flow < 60% of rated recirculation drive flow at least once per 24 months.

4.3.9.6 Verify the RPS RESPONSE TIME*** is within limits at least once per 24 months on a STAGGERED TEST BASIS.

---

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

** 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 trip capability is maintained.

***NOTE - Neutron detectors are excluded.

3/4.3.9 OSCILLATION POWER RANGE MONITOR (OPRM) INSTRUMENTATION

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 effects 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 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, installed in local power range monitor (LPRM) flux amplifier slots in the Neutron Monitoring System (NMS) cabinets, 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 Limiting Condition for Operation (LCO) 3.3.1.1, "Reactor Protection System Instrumentation." 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 a stability related oscillation based on the occurrence of a fixed number of consecutive LPRM signal period confirmations followed by 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 RPS average power range monitor (APRM) power and flow signals to automatically enable the trip function of the OPRM module. The outputs of the OPRM trip channels input to the associated RPS trip channels which are configured into a one-out-of-two taken twice trip logic as described in the Bases for Section 3.3.1.1.

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.

3/4.3.9 OSCILLATION POWER RANGE MONITOR (OPRM) INSTRUMENTATION (Continued)

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

The OPERABILITY of the OPRM System is dependent on the OPERABILITY of the four individual instrumentation channels with their setpoints within the specified Allowable Value. The actual setpoint is calibrated consistent with applicable setpoint methodology assumptions. Each channel must also respond within its assumed response time.

Allowable values for the OPRM Period Based Trip Function are specified in the Core Operating Limits Report. The Nominal trip setpoint is specified in setpoint calculations. The nominal setpoints are selected to ensure that the actual setpoints do not exceed the Allowable Value between successive CHANNEL CALIBRATIONS. Operation with a trip setpoint less conservative than the nominal trip setpoint, but within its Allowable Value, is acceptable. A channel is inoperable if its actual setpoint is not within its required Allowable Value.

Trip setpoints are those predetermined values of output at which an action should take place. The setpoints are compared to the actual value process parameter and when the measured output value of the process parameter exceeds the setpoint, the associated device (e.g., trip unit) changes state.

The OPRM period based setpoint is determined by cycle specific analysis based on positive margin between the Safety Limit MCPR and the Operating Limit MCPR minus the change in CPR (ΔCPR). This methodology was approved for use by the NRC in Reference 6.

3/4.3.9 OSCILLATION POWER RANGE MONITOR (OPRM) INSTRUMENTATION (Continued)

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 ≥ 28.6% RATED THERMAL POWER (RTP) and core flow < 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 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 the OPRM instrumentation trip function assures that the MCPR safety limit will not be violated for anticipated transients and the MCPR safety limit is not applicable below 25% RTP.

ACTIONS

A Note has been provided to modify the ACTIONS related to the OPRM instrumentation channels. The Required Actions for 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.

ACTION A

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 Action B Bases). The remaining OPERABLE OPRM channels continue to provide trip capability (see Action B) and provide operator information relative to stability activity. The remaining OPRM modules have high reliability. With this high

3/4.3.9 OSCILLATION POWER RANGE MONITOR (OPRM) INSTRUMENTATION (Continued)

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 Action A. 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 per Action A. 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.

ACTION B

Action B 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. The OPRM trip function is considered to be maintaining RPS trip capability when sufficient OPRM channels are OPERABLE or in trip (or the associated RPS trip system is in trip), such that both trip systems will generate a trip signal from the OPRM Period Based Trip Function on a valid signal.

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 Action A 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 oscillation, 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 for 120 days without OPRM trip capability is considered acceptable with implementation of the alternate method of detecting and suppressing thermal hydraulic instability oscillations.

3/4.3.9 OSCILLATION POWER RANGE MONITOR (OPRM) INSTRUMENTATION (Continued)

ACTION C

With any Action and associated completion time not met, the plant must be placed in a mode or other specified condition in which the LCO does not apply. 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.

SURVEILLANCE REQUIREMENT 4.3.9.1

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

A Frequency of 184 days provides an acceptable level of system average unavailability over the Frequency interval and is based on the reliability of the analysis (Ref. 7).

3/4.3.9 OSCILLATION POWER RANGE MONITOR (OPRM) INSTRUMENTATION (Continued)

SURVEILLANCE REQUIREMENT 4.3.9.2

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 effective full power hours (EFPH) Frequency is based on operating experience with LPRM sensitivity changes.

SURVEILLANCE REQUIREMENT 4.3.9.3

The CHANNEL CALIBRATION is a complete check of the instrument loop, including associated trip unit, and the sensor. 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 with those in processor memory. Since the OPRM is a digital system, the internal reference voltage and processor clock frequency are, in turn, used to automatically calibrate the internal analog to digital converters. The Allowable Value for the period based detection algorithm is specified in the 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 EFPH LPRM calibration against the TIPs (SR 4.3.9.2).

The Frequency of 24 months is based upon the assumption of the magnitude of equipment drift provided by the equipment supplier (Ref. 7).

SURVEILLANCE REQUIREMENT 4.3.9.4

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 3.1.3, 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 24 month Frequency is based on engineering judgment and reliability of the components. Operating experience has show that these components usually pass the surveillance when performed at the 24 month Frequency.

3/4.3.9 OSCILLATION POWER RANGE MONITOR (OPRM) INSTRUMENTATION (Continued)

SURVEILLANCE REQUIREMENT 4.3.9.5

This SR ensures that trips initiated from the OPRM System will not be inadvertently bypassed when THERMAL POWER is $\geq$ 28.6% RTP and recirculation drive flow is < 60% of rated recirculation drive flow. This normally involves calibration of the bypass channels. These values have been conservatively selected so that specific, additional uncertainty allowances need not be applied. Thus the setpoints corresponding to the values listed above (28.6% of RTP and 60% of rated recirculation drive flow) will be used to establish the enabled region of the OPRM System trips. (References 1,2, 6, and 8)

If any bypass channel setpoint is nonconservative (i.e., the OPRM module is bypassed at $\geq$ 28.6% RTP and recirculation drive flow < 60% of rated recirculation drive flow), then the affected OPRM module is considered inoperable. Alternatively, the bypass channel can be placed in the conservative condition (nonbypass). If placed in the nonbypass condition, this SR is met and the module is considered OPERABLE.

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

SURVEILLANCE REQUIREMENT 4.3.9.6

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 REACTOR PROTECTION SYSTEM RESPONSE TIME acceptance criteria are included in Reference 9.

As noted, neutron detectors are excluded from REACTOR PROTECTION SYSTEM RESPONSE TIME testing because the principles of detector operation virtually ensure an instantaneous response time. REACTOR PROTECTION SYSTEM RESPONSE TIME tests are conducted on a 24 month STAGGERED TEST BASES. 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.

REFERENCES

1. NEDC-39160, "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.

3/4.3.9 OSCILLATION POWER RANGE MONITOR (OPRM) INSTRUMENTATION (Continued)

3. NRC Letter, A. Thadani to L. A. England, "Acceptance for Referencing of Topical Report 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 Correction Action," June 6, 1994.

6. NEDO-32465-A, "BWR Owners' Group Reactor Stability Detect and Suppress Solution Licensing Basis Methodology and Reload Application," August 1996.

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

8. BWROG Letter OG-96-630-169, "Guidelines for Stability Option III "Enable Region," dated September 12, 1996.

9. Technical Requirements Manual.

3.3.9 OSCILLATION POWER RANGE MONITOR (OPRM) INSTRUMENTATION

LIMITING CONDITION FOR OPERATION

3.3.9 Four channels of the OPRM instrumentation shall be OPERABLE.

APPLICABILITY: THERMAL POWER $\geq$ 25% RTP

ACTION:*

a. With one or more channels inoperable, place the channel in trip, or, place the associated RPS trip system in trip, or, initiate alternate method to detect and suppress thermal hydraulic instability oscillations, within 30 days.

b. With OPRM trip capability not maintained, initiate alternate method to detect and suppress thermal hydraulic instability oscillations within 12 hours, and, Restore OPRM trip capability within 120 days.

c. With ACTIONS a and b not met, Reduce THERMAL POWER to < 25% RTP within 4 hours.

SURVEILLANCE REQUIREMENTS:**

4.3.9.1 Each OPRM channel shall be demonstrated OPERABLE by performing a CHANNEL FUNCTIONAL TEST at least once per 184 days.

4.3.9.2 Local power range monitors shall be calibrated at least once per 1000 effective full power hours.

4.3.9.3 Each OPRM channel shall be demonstrated OPERABLE by performing a CHANNEL CALIBRATION*** at least once per 24 months.

4.3.9.4 Perform a LOGIC SYSTEM FUNCTIONAL TEST at least once per 24 months.

4.3.9.5 Verify OPRM is not bypassed when THERMAL POWER is $\geq$ 28.6% RTP and recirculation drive flow < 60% of rated recirculation drive flow at least once per 24 months.

4.3.9.6 Verify the RPS RESPONSE TIME*** is within limits at least once per 24 months on a STAGGERED TEST BASIS.

---

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

** 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 trip capability is maintained.

***NOTE - Neutron detectors are excluded.

3/4.3.9 OSCILLATION POWER RANGE MONITOR (OPRM) INSTRUMENTATION

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 effects 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 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, installed in local power range monitor (LPRM) flux amplifier slots in the Neutron Monitoring System (NMS) cabinets, 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 Limiting Condition for Operation (LCO) 3.3.1.1, "Reactor Protection System Instrumentation." 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 a stability related oscillation based on the occurrence of a fixed number of consecutive LPRM signal period confirmations followed by 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 RPS average power range monitor (APRM) power and flow signals to automatically enable the trip function of the OPRM module. The outputs of the OPRM trip channels input to the associated RPS trip channels which are configured into a one-out-of-two taken twice trip logic as described in the Bases for Section 3.3.1.1.

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.

3/4.3.9 OSCILLATION POWER RANGE MONITOR (OPRM) INSTRUMENTATION (Continued)

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

The OPERABILITY of the OPRM System is dependent on the OPERABILITY of the four individual instrumentation channels with their setpoints within the specified Allowable Value. The actual setpoint is calibrated consistent with applicable setpoint methodology assumptions. Each channel must also respond within its assumed response time.

Allowable values for the OPRM Period Based Trip Function are specified in the Core Operating Limits Report. The Nominal trip setpoint is specified in setpoint calculations. The nominal setpoints are selected to ensure that the actual setpoints do not exceed the Allowable Value between successive CHANNEL CALIBRATIONS. Operation with a trip setpoint less conservative than the nominal trip setpoint, but within its Allowable Value, is acceptable. A channel is inoperable if its actual setpoint is not within its required Allowable Value.

Trip setpoints are those predetermined values of output at which an action should take place. The setpoints are compared to the actual value process parameter and when the measured output value of the process parameter exceeds the setpoint, the associated device (e.g., trip unit) changes state.

The OPRM period based setpoint is determined by cycle specific analysis based on positive margin between the Safety Limit MCPR and the Operating Limit MCPR minus the change in CPR (ΔCPR). This methodology was approved for use by the NRC in Reference 6.

3/4.3.9 OSCILLATION POWER RANGE MONITOR (OPRM) INSTRUMENTATION (Continued)

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 ≥ 28.6% RATED THERMAL POWER (RTP) and core flow < 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 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 the OPRM instrumentation trip function assures that the MCPR safety limit will not be violated for anticipated transients and the MCPR safety limit is not applicable below 25% RTP.

ACTIONS

A Note has been provided to modify the ACTIONS related to the OPRM instrumentation channels. The Required Actions for 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.

ACTION A

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 Action B Bases). The remaining OPERABLE OPRM channels continue to provide trip capability (see Action B) and provide operator information relative to stability activity. The remaining OPRM modules have high reliability. With this high

3/4.3.9 OSCILLATION POWER RANGE MONITOR (OPRM) INSTRUMENTATION (Continued)

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 Action A. 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 per Action A. 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.

ACTION B

Action B 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. The OPRM trip function is considered to be maintaining RPS trip capability when sufficient OPRM channels are OPERABLE or in trip (or the associated RPS trip system is in trip), such that both trip systems will generate a trip signal from the OPRM Period Based Trip Function on a valid signal.

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 Action A 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 oscillation, 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 for 120 days without OPRM trip capability is considered acceptable with implementation of the alternate method of detecting and suppressing thermal hydraulic instability oscillations.

3/4.3.9 OSCILLATION POWER RANGE MONITOR (OPRM) INSTRUMENTATION (Continued)

ACTION C

With any Action and associated completion time not met, the plant must be placed in a mode or other specified condition in which the LCO does not apply. To achieve this status, 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.

SURVEILLANCE REQUIREMENT 4.3.9.1

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

A Frequency of 184 days provides an acceptable level of system average unavailability over the Frequency interval and is based on the reliability of the analysis (Ref. 7).

3/4.3.9 OSCILLATION POWER RANGE MONITOR (OPRM) INSTRUMENTATION (Continued)

SURVEILLANCE REQUIREMENT 4.3.9.2

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 effective full power hours (EFPH) Frequency is based on operating experience with LPRM sensitivity changes.

SURVEILLANCE REQUIREMENT 4.3.9.3

The CHANNEL CALIBRATION is a complete check of the instrument loop, including associated trip unit, and the sensor. 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 with those in processor memory. Since the OPRM is a digital system, the internal reference voltage and processor clock frequency are, in turn, used to automatically calibrate the internal analog to digital converters. The Allowable Value for the period based detection algorithm is specified in the 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 EFPH LPRM calibration against the TIPs (SR 4.3.9.2).

The Frequency of 24 months is based upon the assumption of the magnitude of equipment drift provided by the equipment supplier (Ref. 7).

SURVEILLANCE REQUIREMENT 4.3.9.4

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 3.1.3, 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 24 month Frequency is based on engineering judgment and reliability of the components. Operating experience has show that these components usually pass the surveillance when performed at the 24 month Frequency.

3/4.3.9 OSCILLATION POWER RANGE MONITOR (OPRM) INSTRUMENTATION (Continued)

SURVEILLANCE REQUIREMENT 4.3.9.5

This SR ensures that trips initiated from the OPRM System will not be inadvertently bypassed when THERMAL POWER is ≥ 28.6% RTP and recirculation drive flow is < 60% of rated recirculation drive flow. This normally involves calibration of the bypass channels. These values have been conservatively selected so that specific, additional uncertainty allowances need not be applied. Thus the setpoints corresponding to the values listed above (28.6% of RTP and 60% of rated recirculation drive flow) will be used to establish the enabled region of the OPRM System trips. (References 1, 2, 6, and 8)

If any bypass channel setpoint is nonconservative (i.e., the OPRM module is bypassed at ≥ 28.6% RTP and recirculation drive flow < 60% of rated recirculation drive flow), then the affected OPRM module is considered inoperable. Alternatively, the bypass channel can be placed in the conservative condition (nonbypass). If placed in the nonbypass condition, this SR is met and the module is considered OPERABLE.

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

SURVEILLANCE REQUIREMENT 4.3.9.6

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 REACTOR PROTECTION SYSTEM RESPONSE TIME acceptance criteria are included in Reference 9.

As noted, neutron detectors are excluded from REACTOR PROTECTION SYSTEM RESPONSE TIME testing because the principles of detector operation virtually ensure an instantaneous response time. REACTOR PROTECTION SYSTEM RESPONSE TIME tests are conducted on a 24 month STAGGERED TEST BASES. 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.

REFERENCES

1. NEDC-39160, "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.

3/4.3.9 OSCILLATION POWER RANGE MONITOR (OPRM) INSTRUMENTATION (Continued)

3. NRC Letter, A. Thadani to L. A. England, "Acceptance for Referencing of Topical Report 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 Correction Action," June 6, 1994.

6. NEDO-32465-A, "BWR Owners' Group Reactor Stability Detect and Suppress Solution Licensing Basis Methodology and Reload Application," August 1996.

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

8. BWROG Letter OG-96-630-169, "Guidelines for Stability Option III "Enable Region," dated September 12, 1996.

9. Technical Requirements Manual.

ATTACHMENT B
Proposed Technical Specification Changes for
LaSalle County Station, Units 1 and 2

MARKED-UP TS PAGES FOR PROPOSED CHANGES

ITS REVISED PAGES

NPF-11 and 18

3.4.1-1
3.4.1-2
3.4.1-3
3.4.1-4
3.4.1-5
3.4.1-6
3.4.1-7
5.6-2*
5.6-3
B 3.4.1-1*
B 3.4.1-2
B 3.4.1-3
B 3.4.1-4
B 3.4.1-5
B 3.4.1-6
B 3.4.1-7
Insert A
B 3.4.1-8
B 3.4.1-9
B 3.4.1-10

Proposed ITS pages

3.3.1.3-1
3.3.1.3-2
3.3.1.3-3
3.4.1-1
3.4.1-2
3.4.1-3
B 3.3.1.3-1
B 3.3.1.3-2
B 3.3.1.3-3
B 3.3.1.3-4
B 3.3.1.3-5
B 3.3.1.3-6
B 3.3.1.3-7
B 3.3.1.3-8
B 3.4.1-1
B 3.4.1-2
B 3.4.1-3
B 3.4.1-4
B 3.4.1-5
B 3.4.1-6

This page is provided for continuity only, there are no changes to this page.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.1 Recirculation Loops Operating

LCO 3.4.1 Two recirculation loops with matched flows shall be in operation ~~within Region III of Figure 3.4.1-1~~.

<u>OR</u>

One recirculation loop shall be in operation ~~within Region III of Figure 3.4.1-1~~ with the following limits applied when the associated LCO is applicable:

a. LCO 3.2.1, "AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR)," single loop operation limits specified in the COLR;

b. LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)," single loop operation limits specified in the COLR;

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

d. LCO 3.3.2.1, "Control Rod Block Instrumentation," Function 1.a (Rod Block Monitor - Upscale), Allowable Value of Table 3.3.2.1-1, specified in the COLR, is reset for single loop operation.

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~A. One or two recirculation loops operating within Region II of Figure 3.4.1-1.~~	~~A.1 -----------NOTE----------- Only applicable when 3 times baseline value is > 10% peak-to-peak value. ------------------------------- Verify APRM and LPRM flux noise levels ≤ 3 times baseline.~~	~~45 minutes~~ ~~AND~~ ~~Once per 12 hours thereafter~~ ~~AND~~ ~~45 minutes from discovery of Condition A concurrent with any THERMAL POWER increase of ≥ 5% RTP.~~
	~~AND~~	

~~(continued)~~

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~A. (continued)~~	~~A.2 ----------NOTE---------- Only applicable when 10% peak-to-peak value is ≥ 3 times baseline value. -------------------------- Verify APRM and LPRM flux noise levels ≤ 10% peak-to-peak.~~	~~45 minutes AND Once per 12 hours thereafter AND 45 minutes from discovery of Condition A concurrent with any THERMAL POWER increase of ≥ 5% RTP.~~
	~~AND A.3 Verify recirculation loop(s) are not operating in Region I of Figure 3.4.1-1.~~	~~Once per 12 hours~~
~~B. Required Action A.1 or A.2 and associated Completion Time not met.~~	~~B.1 Satisfy the requirements of the LCO.~~	~~2 hours~~

(continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. One or two recirculation loops operating within Region I of Figure 3.4.1-1. OR Required Action A.3 and associated Completion Time not met.	C.1 Exit Region I of Figure 3.4.1-1.	2 hours
D. No recirculation loops in operation.	D.1 Verify APRM and LPRM flux noise levels ≤ 10% peak-to-peak. AND D.2 Reduce THERMAL POWER to ≤ 36% RTP. AND D.3 Be in MODE 3.	Immediately 2 hours 12 hours
E. Required Action B.1 or D.1 and associated Completion Time not met.	E.1 Place the mode switch in the shutdown position.	Immediately
F. Recirculation loop flow mismatch not within limits.	F.1 Declare the recirculation loop with lower flow to be "not in operation."	2 hours

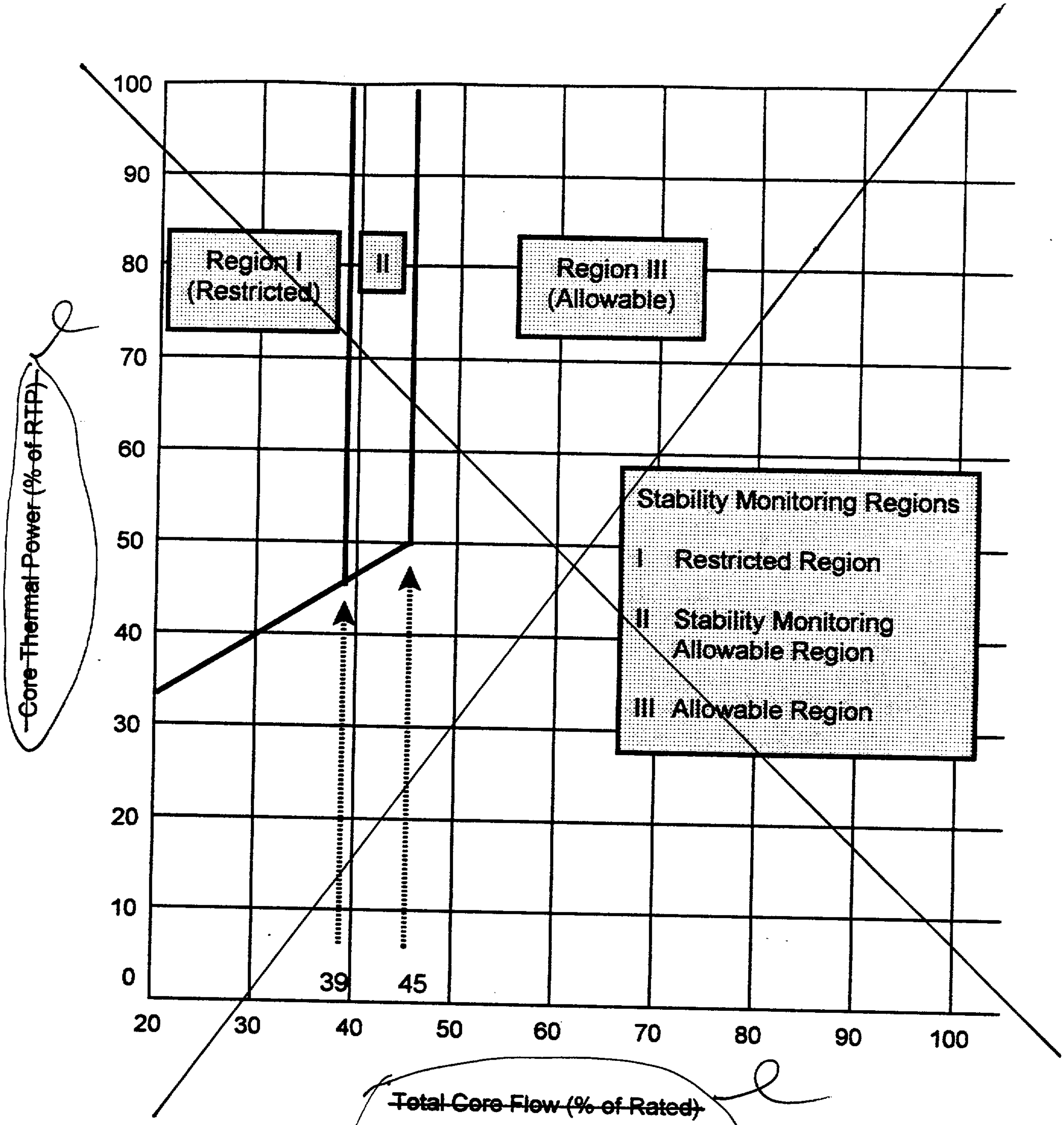
(continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
G. Requirements of the LCO not met for reasons other than Condition A, C, D, and E.	G.1 Satisfy the requirements of the LCO.	12 hours
H. Required Action and associated Completion Time of Condition G not met.	H.1 Be in MODE 3.	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 operating at < 70% of rated core flow; and b. ≤ 5% of rated core flow when operating at ≥ 70% of rated core flow.	24 hours
~~SR 3.4.1.2~~	~~Verify operation is in Region III of Figure 3.4.1-1.~~	~~24 hours~~



~~Figure 3.4.1-1 (Page 1 of 1)~~
~~Power versus Flow~~

This page is provided for continuity only, no changes

5.6 Reporting Requirements

5.6.2 Annual Radiological Environmental Operating Report (continued)

(ODCM), and in 10 CFR 50, Appendix I, Sections IV.B.2, IV.B.3, and IV.C.

5.6.3 Radioactive Effluent Release Report

------------------------------NOTE------------------------------
A single submittal may be made for a multiple unit station. The submittal should combine sections common to all units at the station.

The Radioactive Effluent Release Report covering the operation of the unit shall be submitted prior to May 1 of each year in accordance with 10 CFR 50.36a. 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 the 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 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. The APLHGR for Specification 3.2.1.

2. The MCPR for Specification 3.2.2.

3. The LHGR for Specification 3.2.3.

(continued)

5.6 Reporting Requirements

5.6.5 CORE OPERATING LIMITS REPORT (COLR) (continued)

4. The Rod Block Monitor Upscale Instrumentation Setpoint for the Rod Block Monitor - Upscale Function Allowable Value for Specification 3.3.2.1.

5. The Oscillation Power Range Monitor Instrumentation Allowable Value for Specification 3.3.1.3.

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

1. ANFB Critical Power Correlation, ANF-1125(P)(A) and Supplements 1 and 2, Advanced Nuclear Fuels Corporation, April 1990.

2. Letter, Ashok C. Thadani (NRC) to R.A. Copeland (SPC), "Acceptance for Referencing of ULTRAFLOW™ Spacer on 9x9-IX/X BWR Fuel Design," July 28, 1993.

3. Advanced Nuclear Fuels Corporation Critical Power Methodology for Boiling Water Reactors/Advanced Nuclear Fuels Corporation Critical Power Methodology for Boiling Water Reactors: Methodology for Analysis of Assembly Channel Bowing Effects/NRC Correspondence, XN-NF-524(P)(A) Revision 2 and Supplement 1 Revision 2, Supplement 2, Advanced Nuclear Fuels Corporation November 1990.

4. COTRANSA 2: A Computer Program for Boiling Water Reactor Transient Analysis, ANF-913(P)(A), Volume 1, Revision 1 and Volume 1 Supplements 2, 3, and 4, Advanced Nuclear Fuels Corporation, August 1990.

5. HUXY: A Generalized Multirod Heatup Code with 10 CFR 50, Appendix K Heatup Option, ANF-CC-33(P)(A), Supplement 1 Revision 1; and Supplement 2, Advanced Nuclear Fuels Corporation, August 1986 and January 1991, respectively.

6. Advanced Nuclear Fuel Methodology for Boiling Water Reactors, XN-NF-80-19(P)(A), Volume 1, Supplement 3, Supplement 3 Appendix F, and Supplement 4, Advanced Nuclear Fuels Corporation, November 1990.

(continued)

This page is provided for continuity only, no changes

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.1 Recirculation Loops Operating

BASES

BACKGROUND

The Reactor Recirculation System is designed to provide a forced coolant flow through the core to remove heat from the fuel. The forced coolant flow removes heat at a faster rate from the fuel than would be possible with just natural circulation. The forced flow, therefore, allows operation at significantly higher power than would otherwise be possible. The recirculation system also controls reactivity over a wide span of reactor power by varying the recirculation flow rate to control the void content of the moderator. The Reactor Recirculation System consists of two recirculation pump loops external to the reactor vessel. These loops provide the piping path for the driving flow of water to the reactor vessel jet pumps. Each external loop contains a two speed motor driven recirculation pump, a flow control valve, associated piping, jet pumps, valves, and instrumentation. The recirculation loops are part of the reactor coolant pressure boundary and are located inside the drywell structure. The jet pumps are reactor vessel internals.

The recirculated coolant consists of saturated water from the steam separators and dryers that has been subcooled by incoming feedwater. This water passes down the annulus between the reactor vessel wall and the core shroud. A portion of the coolant flows from the vessel, through the two external recirculation loops, and becomes the driving flow for the jet pumps. Each of the two external recirculation loops discharges high pressure flow into an external manifold, from which individual recirculation inlet lines are routed to the jet pump risers within the reactor vessel. The remaining portion of the coolant mixture in the annulus becomes the suction flow for the jet pumps. This flow enters the jet pump at suction inlets and is accelerated by the driving flow. The drive flow and suction flow are mixed in the jet pump throat section and result in partial pressure recovery. The total flow then passes through the jet pump diffuser section into the area below the core (lower plenum), gaining sufficient head in the process to drive the required flow upward through the core.

(continued)

BASES

BACKGROUND (continued)

The subcooled water enters the bottom of the fuel channels and contacts the fuel cladding, where heat is transferred to the coolant. As it rises, the coolant begins to boil, creating steam voids within the fuel channel that continue until the coolant exits the core. Because of reduced moderation, the steam voiding introduces negative reactivity that must be compensated for to maintain or to increase reactor power. The recirculation flow control allows operators to increase recirculation flow and sweep some of the voids from the fuel channel, overcoming the negative reactivity void effect. Thus, the reason for having variable recirculation flow is to compensate for reactivity effects of boiling over a wide range of power generation (i.e., approximately 65 to 100% RTP) without having to move control rods and disturb desirable flux patterns. ~~In addition, the combination of core flow and THERMAL POWER is normally maintained such that core thermal-hydraulic oscillations do not occur. These oscillations can occur during two recirculation loop operation, single recirculation loop, and no recirculation loop operation. Plant procedures include requirements of this LCO as well as other vendor and NRC recommended requirements and actions to minimize the potential of core thermal-hydraulic oscillations.~~

Each recirculation loop is manually started from the control room. The recirculation flow control valves provide regulation of individual recirculation loop drive flows. The flow in each loop can be manually or automatically controlled.

APPLICABLE SAFETY ANALYSES

The operation of the Reactor Recirculation System is an initial condition assumed in the design basis loss of coolant accident (LOCA) (Ref. 1). During a LOCA caused by a recirculation loop pipe break, the intact loop is assumed to provide coolant flow during the first few seconds of the accident. The initial core flow decrease is rapid because the recirculation pump in the broken loop ceases to pump reactor coolant to the vessel almost immediately. The pump in the intact loop coasts down relatively slowly. This pump coastdown governs the core flow response for the next several seconds until the jet pump suction is uncovered (Ref. 2). The analyses assume that both loops are operating at the same flow prior to the accident. However, the LOCA

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

analysis was reviewed for the case with a flow mismatch between the two loops, with the pipe break assumed to be in the loop with the higher flow. While the flow coastdown and core response are potentially more severe in this assumed case (since the intact loop starts at a lower flow rate and the core response is the same as if both loops were operating at a 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 UFSAR.

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 in Chapter 15 of the UFSAR 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) and the Rod Block Monitor (RBM) Allowable Values 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-Upscale Allowable Value is in LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation." The Rod Block Monitor-Upscale Allowable Value is specified in the COLR. ~~Safety analyses performed in References 1, 2, and 3 implicitly assume core conditions are stable. However, during operation at the high power/low flow region of the operating domain, a small probability of limit cycle neutron flux oscillations exists depending on combinations of operating conditions (e.g., power shape, bundle power, and bundle flow).~~

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

General Electric (GE) Service Information Letter (SIL) No. 380 (Ref. 4) addressed boiling instability and made several recommendations. In this SIL, the power/flow operating map was divided into several regions of varying concern. It also discussed the objectives and philosophy of "detect and suppress."

NRC Generic Letter 86-02 (Ref. 5) discussed both the GE and Siemens stability methodology and stated that due to uncertainties, 10 CFR 50, Appendix A, General Design Criteria (GDC) 10 and 12 could not be met using available analytical procedures on a BWR. The Generic Letter discussed SIL 380 and stated that GDC 10 and 12 could be met by imposing SIL 380 recommendations in operating regions of potential instability. The NRC concluded that regions of potential instability constituted decay ratios of 0.8 and greater by the GE methodology and 0.75 by the Siemens methodology. Figure 3.4.1-1 was generated as an interim solution to provide an increased margin of safety until the investigation is completed (Ref. 6).

Recirculation loops operating satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

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. With the limits specified in SR 3.4.1.1 not met, the recirculation loop with the lower flow must be considered not in operation. With only one recirculation loop in operation, 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)"), APRM Flow Biased Simulated Thermal Power – Upscale Allowable Value (LCO 3.3.1.1), and the Rod Block Monitor – Upscale Allowable Value (LCO 3.3.2.1) must be applied to allow continued operation consistent with the assumptions of Reference 3. In addition, during two loop and single loop

(continued)

BASES

LCO (continued)	~~operation, the combination of core flow and THERMAL POWER must be in Region III of Figure 3.4.1-1 to ensure core thermal hydraulic oscillations do not occur.~~
APPLICABILITY	In MODES 1 and 2, requirements for operation of the Reactor 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, A.2, and A.3~~ ~~With one or two recirculation loops in operation in Region II of Figure 3.4.1-1, the plant is operating in a region where the potential for thermal-hydraulic oscillations exists. To ensure oscillations are not occurring, APRM and LPRM neutron flux noise levels must be verified to be less than or equal to the larger of either 3 times the baseline noise levels or 10% peak-to-peak (Required Action A.1 and A.2) when Region II is entered. For the LPRM neutron flux noise verification, detector levels A and C of one LPRM string per core octant plus detector levels A and C of one LPRM string in the center region of the core should be monitored. Prompt action to monitor APRM and LPRM neutron flux noise levels should be taken to ensure oscillations are not occurring.~~ ~~The 45 minute Completion Time of Required Actions A.1 and A.2 provides a reasonable time to stabilize operation in Region II and verify the neutron flux noise levels are within limits. A verification of the APRM and LPRM neutron flux noise levels once per 12 hours following the initial verification provides frequent periodic information of neutron flux noise levels to verify stable steady state operation. Also, a verification of neutron flux noise levels after any THERMAL POWER increase of ≥ 5% RTP while in Region II provides indication of operational stability following a potential for change of the thermal-hydraulic properties of the system.~~

(continued)

BASES

ACTIONS

A.1, A.2, and A.3 (continued)

In addition, a verification that one or both recirculation loops are not operating within Region I of Figure 3.4.1-1 (Required Action A.3) is required to be performed once per 12 hours. The Completion Time of once per 12 hours is reasonable based on operating experience and the operator's knowledge of reactor status, including changes in reactor power and core flow.

B.1

If evidence of approaching reactor instability occurs (i.e., APRM or LPRM neutron flux noise levels exceed the associated limit of Required Actions A.1 or A.2, as applicable) while operating in Region II of Figure 3.4.1-1, prompt action should be taken to restore the APRM or LPRM neutron flux noise levels to within the associated limit or exit Region II of Figure 3.4.1-1. This may be accomplished by either increasing core flow by recirculation loop flow control valve manipulation or reduction of THERMAL POWER by control rod insertion. The 2 hour Completion Time is reasonable to restore plant parameters in an orderly manner and without challenging plant systems.

C.1

With one or both recirculation loops in operation in Region I of Figure 3.4.1-1, the plant is operating in a region where the potential for thermal-hydraulic oscillations is increased and sufficient margin may not be available for operator response to suppress potential thermal-hydraulic oscillations. As a result, prompt action should be taken to exit Region I of Figure 3.4.1-1. This may be accomplished by either increasing core flow by recirculation loop flow control valve manipulation or reduction of THERMAL POWER by control rod insertion. The 2 hour Completion Time is reasonable to restore plant parameters in an orderly manner and without challenging plant systems.

(continued)

BASES

A.1

ACTIONS (continued)

INSERT A

D.1, D.2, and D.3

With no recirculation loops in service, the probability of thermal-hydraulic oscillations is greatly increased. Therefore, prompt action should be taken to ensure oscillations are not occurring by verifying APRM and LPRM neutron flux noise levels are ≤ 10% peak-to-peak. If neutron flux noise levels are discovered to be > 10% peak-to-peak at anytime while in this Condition, Condition E must be immediately entered.

Also, prompt action should be taken to reduce THERMAL POWER low enough to avoid the region of potential instability in natural circulation (i.e., reduce THERMAL POWER below 36% RTP). The 2 hour Completion Time provides are reasonable time to restore operation to Region III of Figure 3.4.1-1.

In addition, with no recirculation loops in operation, plant operation is not allowed to continue in MODE 1 or 2. Therefore, the unit is required to be brought to a MODE in which the LCO does not apply. The allowed Completion Time of 12 hours is reasonable, based on operating experience, to reach MODE 3 in an orderly manner and without challenging plant systems.

E.1

In the event no recirculation loops are in operation and evidence is indicated of approaching reactor instability (i.e., APRM or LPRM neutron flux noise levels exceed the associated limit) or APRM or LPRM neutron flux noise levels cannot be restored within 2 hours while in Region II of Figure 3.4.1-1, action must be immediately initiated to eliminate the potential for a thermal-hydraulic instability event. As such, the reactor mode switch must be immediately placed in the shutdown position.

(continued)

ATTACHMENT B
Proposed Technical Specification Changes for
LaSalle County Station, Units 1 and 2

INSERT A

With no recirculation loops in operation, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the unit must be brought to MODE 3 within 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 of 12 hours is reasonable, based on operating experience, to reach MODE 3 from full power condition in an orderly manner and without challenging plant systems.

BASES

ACTIONS (continued)

B.1 and C.1

With both recirculation loops operating but the flows not matched, the flows must be matched within 2 hours. If matched flows are not restored, the recirculation loop with lower flow must be declared "not in operation," as required by Required Action B.1. This Required Action does not require tripping the recirculation pump in the lowest flow loop when the mismatch between total jet pump flows of the two loops is greater than the required limits. However, in cases where large flow mismatches occur, low flow or reverse flow can occur in the low flow loop jet pumps, causing vibration of the jet pumps. If zero or reverse flow is detected, the condition should be alleviated by changing flow control valve position to re-establish forward flow or by tripping the pump.

With the requirements of the LCO not met for reasons other than Condition A or B (e.g., one loop is "not in operation"), compliance with the LCO must be restored within 12 hours. A recirculation loop is considered not in operation when the pump in that loop is idle or when the mismatch between total jet pump flows of the two loops is greater than required limits for greater than 2 hours (i.e., Required Action B.1 has been taken). Should a LOCA occur with one recirculation loop not in operation, the core flow coastdown and resultant core response may not be bounded by the LOCA analyses. Therefore, only a limited time is allowed to restore the inoperable loop to operating status.

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

The 2 hour and 12 hour Completion Times are 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.

(continued)

BASES

ACTIONS (continued)

C.1

If the Required Action and associated Completion Time of Condition B is not met, the unit is required to be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to MODE 3 within 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 of 12 hours is reasonable, based on operating experience, to reach MODE 3 from full power conditions in an orderly manner and without challenging plant systems.

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 APLHGR and 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. If the flow mismatch exceeds the specified limits, the loop with the lower flow is considered not in operation. 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.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

~~SR 3.4.1.2~~

~~The SR ensures the combination of core flow and THERMAL POWER are within the appropriate limits to prevent inadvertent entry into a region of potential thermal-hydraulic instability. At low recirculation loop flow and high reactor power, the reactor exhibits increased susceptibility to thermal-hydraulic instability. Figure 3.4.1-1 is based on guidance provided in References 4 and 5. The 24 hour Frequency is based on operating experience and the operator's knowledge of the reactor status, including significant changes in THERMAL POWER and core flow.~~

REFERENCES

1. UFSAR, Sections 6.3 and 15.6.5.

2. UFSAR, Appendix G.3.1.2.

3. UFSAR, Section 6.B.

~~4. GE Service Information Letter (SIL) No. 380, "BWR Core Thermal Hydraulic Stability," Revision 1, February 10, 1984.~~

~~5. NRC Generic Letter 86-02, "Technical Resolution of Generic Issue B-19, Thermal Hydraulic Stability," January 22, 1986.~~

~~6. NRC Safety Evaluation supporting Amendment No. 60 to Facility Operating License No. 11 and Amendment No. 40 to Facility Operating License No. 18, Commonwealth Edison Company, LaSalle County Station, Units 1 and 2, dated September 7, 1988.~~

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 channels inoperable.	A.1 Place channel in trip. OR A.2 Place associated RPS trip system in trip. OR A.3 Initiate alternate method to detect and suppress thermal hydraulic instability oscillations.	30 days 30 days 30 days
B. OPRM trip capability not maintained.	B.1 Initiate alternate method to detect and suppress thermal hydraulic instability oscillations. AND B.2 Restore OPRM trip capability.	12 hours 120 days

(continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Required Action and associated Completion Time not met.	C.1 Reduce THERMAL POWER to < 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 OPRM trip capability is maintained.

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 effective full power hours
SR 3.3.1.3.3	----------------------NOTE---------------------- Neutron detectors are excluded. --- Perform CHANNEL CALIBRATION. The Allowable Value shall be as specified in the COLR.	24 months
SR 3.3.1.3.4	Perform LOGIC SYSTEM FUNCTIONAL TEST.	24 months
SR 3.3.1.3.5	Verify OPRM is not bypassed when THERMAL POWER is $\geq$ 28.6% RTP and recirculation drive flow < 60% of rated recirculation drive flow.	24 months
SR 3.3.1.3.6	----------------------NOTE---------------------- Neutron detectors are excluded. --- Verify the RPS RESPONSE TIME is within limits.	24 months on a STAGGERED TEST BASIS

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.1 Recirculation Loops Operating

LCO 3.4.1 Two recirculation loops with matched flows shall be in operation,

<u>OR</u>

One recirculation loop shall be in operation with the following limits applied when the associated LCO is applicable:

a. LCO 3.2.1, "AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR)," single loop operation limits specified in the COLR;

b. LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)," single loop operation limits specified in the COLR;

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

d. LCO 3.3.2.1, "Control Rod Block Instrumentation," Function 1.a (Rod Block Monitor - Upscale), Allowable Value of Table 3.3.2.1-1, specified in the COLR, is reset for single loop operation.

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. No recirculation loops in operation.	A.1 Be in MODE 3.	12 hours
B. Recirculation loop flow mismatch not within limits.	B.1 Declare the recirculation loop with lower flow to be "not in operation."	2 hours
C. Requirements of the LCO not met for reasons other than Condition A or B.	C.1 Satisfy the requirements of the LCO.	12 hours
D. Required Action and associated Completion Time of Condition C not met.	D.1 Be in MODE 3.	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 operating at < 70% of rated core flow; and b. ≤ 5% of rated core flow when operating at ≥ 70% of rated core flow.	24 hours

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 effects 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 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, installed in local power range monitor (LPRM) flux amplifier slots in the Neutron Monitoring System (NMS) cabinets, 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, "Reactor Protection System (RPS) Instrumentation." 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 a stability related oscillation based on the occurrence of a fixed number of consecutive LPRM signal period confirmations followed by the LPRM signal amplitude exceeding a specified setpoint. Upon detection of a stability related oscillation, a trip is generated for that OPRM channel.

(continued)

BASES

BACKGROUND (continued)

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 RPS average power range monitor (APRM) power and flow signals to automatically enable the trip function of the OPRM module. The outputs of the OPRM trip channels input to the associated RPS trip channels which are configured into a one-out-of-two taken twice trip logic as described in the Bases for Section 3.3.1.1.

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

The OPERABILITY of the OPRM System is dependent on the OPERABILITY of the four individual instrumentation channels with their setpoints within the specified Allowable Value. The actual setpoint is calibrated consistent with applicable setpoint methodology assumptions. Each channel must also respond within its assumed response time.

Allowable values for the OPRM Period Based Trip Function are specified in the Core Operating Limits Report. The nominal trip setpoint is specified in setpoint calculations. The nominal setpoints are selected to ensure that the actual setpoints do not exceed the Allowable Value between successive CHANNEL CALIBRATIONS. Operation with a trip setpoint less conservative than the nominal trip setpoint, but within its Allowable Value, is acceptable. A channel is inoperable if its actual setpoint is not within its required Allowable Value.

(continued)

APPLICABLE SAFETY ANALYSES (continued)

Trip setpoints are those predetermined values of output at which an action should take place. The setpoints are compared to the actual value process parameter and when the measured output value of the process parameter exceeds the setpoint, the associated device (e.g., trip unit) changes state.

The OPRM period based setpoint is determined by cycle specific analysis based on positive margin between the Safety Limit MCPR and the Operating Limit MCPR minus the change in CPR (ΔCPR). This methodology was approved for use by the NRC in Reference 6.

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 ≥ 28.6% RTP and core flow < 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 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 the OPRM instrumentation trip function assures that the MCPR safety limit will not be violated for anticipated transients and the MCPR safety limit is not applicable below 25% RTP.

(continued)

BASES

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 limit will not result in separate entry into the Condition. Section 1.3 also specifies that Required Actions of the Condition continue to apply for each additional failure, with Completion Times based on initial entry into the Condition. However, the Required Actions for inoperable 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 Actions B.1 and B.2 Bases). 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 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.

(continued)

BASES

ACTIONS (continued)

B.1 and B.2

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. The OPRM trip function is considered to be maintaining RPS trip capability when sufficient OPRM channels are OPERABLE or in trip (or the associated RPS trip system is in trip), such that both trip systems will generate a trip signal from the OPRM Period Based Trip Function on a valid signal.

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 Required 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 oscillation, 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 for 120 days without OPRM trip capability is considered acceptable with implementation of the alternate method of detecting and suppressing thermal hydraulic instability oscillations.

C.1

With any Required Action and associated Completion Time not met the plant must be placed in a mode or other specified condition in which the LCO does not apply. To achieve this status, 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.

(continued)

BASES

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.

SR 3.3.1.3.1

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

A Frequency of 184 days provides an acceptable level of system average unavailability over the Frequency interval and is based on the reliability analysis (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 effective full power hours (EFPH) 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, including associated trip unit, and the sensor. 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 with those in processor memory. Since the OPRM is a digital system, the internal reference voltage and processor clock frequency are, in turn, used to automatically calibrate the internal analog to digital converters. The Allowable Value for the period based detection algorithm is specified in

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.3.3 (continued)

the 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 EFPH LPRM calibration against the TIPs (SR 3.3.1.3.2).

The Frequency of 24 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 24 month Frequency is based on engineering judgment and reliability of the components. Operating experience has show that these components usually pass the surveillance when performed at the 24 month Frequency.

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 ≥ 28.6% RTP and recirculation drive flow is < 60% of rated recirculation drive flow. This normally involves calibration of the bypass channels. These values have been conservatively selected so that specific, additional uncertainty allowances need not be applied. Thus the setpoints corresponding to the values listed above (28.6% of RTP and 60% of rated recirculation drive flow) will be used to establish the enabled region of the OPRM System trips. (References 1, 2, 6, and 8)

If any bypass channel setpoint is nonconservative (i.e., the OPRM module is bypassed at ≥ 28.6% RTP and recirculation drive flow < 60% of rated recirculation drive flow), then the affected OPRM module is considered inoperable. Alternatively, the bypass channel can be placed in the conservative condition (nonbypass). If placed in the nonbypass condition, this SR is met and the module is considered OPERABLE.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

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 Reference 9.

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 24 month STAGGERED TEST BASES. 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.

REFERENCES

1. NEDC-39160, "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 Report 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 Correction Action," June 6, 1994.

6. NEDO-32465-A, "BWR Owners' Group Reactor Stability Detect and Suppress Solution Licensing Basis Methodology and Reload Application," August 1996.

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

8. BWROG Letter OG-96-630-169, "Guidelines for Stability Option III "Enable Region," dated September 12, 1996.

9. Technical Requirements Manual.

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.1 Recirculation Loops Operating

BASES

BACKGROUND

The Reactor Recirculation System is designed to provide a forced coolant flow through the core to remove heat from the fuel. The forced coolant flow removes heat at a faster rate from the fuel than would be possible with just natural circulation. The forced flow, therefore, allows operation at significantly higher power than would otherwise be possible. The recirculation system also controls reactivity over a wide span of reactor power by varying the recirculation flow rate to control the void content of the moderator. The Reactor Recirculation System consists of two recirculation pump loops external to the reactor vessel. These loops provide the piping path for the driving flow of water to the reactor vessel jet pumps. Each external loop contains a two speed motor driven recirculation pump, a flow control valve, associated piping, jet pumps, valves, and instrumentation. The recirculation loops are part of the reactor coolant pressure boundary and are located inside the drywell structure. The jet pumps are reactor vessel internals.

The recirculated coolant consists of saturated water from the steam separators and dryers that has been subcooled by incoming feedwater. This water passes down the annulus between the reactor vessel wall and the core shroud. A portion of the coolant flows from the vessel, through the two external recirculation loops, and becomes the driving flow for the jet pumps. Each of the two external recirculation loops discharges high pressure flow into an external manifold, from which individual recirculation inlet lines are routed to the jet pump risers within the reactor vessel. The remaining portion of the coolant mixture in the annulus becomes the suction flow for the jet pumps. This flow enters the jet pump at suction inlets and is accelerated by the driving flow. The drive flow and suction flow are mixed in the jet pump throat section and result in partial pressure recovery. The total flow then passes through the jet pump diffuser section into the area below the core (lower plenum), gaining sufficient head in the process to drive the required flow upward through the core.

(continued)

BASES

BACKGROUND (continued)	The subcooled water enters the bottom of the fuel channels and contacts the fuel cladding, where heat is transferred to the coolant. As it rises, the coolant begins to boil, creating steam voids within the fuel channel that continue until the coolant exits the core. Because of reduced moderation, the steam voiding introduces negative reactivity that must be compensated for to maintain or to increase reactor power. The recirculation flow control allows operators to increase recirculation flow and sweep some of the voids from the fuel channel, overcoming the negative reactivity void effect. Thus, the reason for having variable recirculation flow is to compensate for reactivity effects of boiling over a wide range of power generation (i.e., approximately 65 to 100% RTP) without having to move control rods and disturb desirable flux patterns. Each recirculation loop is manually started from the control room. The recirculation flow control valves provide regulation of individual recirculation loop drive flows. The flow in each loop can be manually or automatically controlled.
APPLICABLE SAFETY ANALYSES	The operation of the Reactor Recirculation System is an initial condition assumed in the design basis loss of coolant accident (LOCA) (Ref. 1). During a LOCA caused by a recirculation loop pipe break, the intact loop is assumed to provide coolant flow during the first few seconds of the accident. The initial core flow decrease is rapid because the recirculation pump in the broken loop ceases to pump reactor coolant to the vessel almost immediately. The pump in the intact loop coasts down relatively slowly. This pump coastdown governs the core flow response for the next several seconds until the jet pump suction is uncovered (Ref. 2). The analyses assume that both loops are operating at the same flow prior to the accident. However, the LOCA analysis was reviewed for the case with a flow mismatch between the two loops, with the pipe break assumed to be in the loop with the higher flow. While the flow coastdown and core response are potentially more severe in this assumed case (since the intact loop starts at a lower flow rate and the core response is the same as if both loops were operating at a lower flow rate), a small mismatch has been determined to be acceptable based on engineering judgement.

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)	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 UFSAR. 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 in Chapter 15 of the UFSAR 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) and the Rod Block Monitor (RBM) Allowable Values 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-Upscale Allowable Value is in LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation." The Rod Block Monitor-Upscale Allowable Value is specified in the COLR. Recirculation loops operating satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).
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. With the limits specified in SR 3.4.1.1 not met, the recirculation loop with the lower flow must be considered not in operation. With only one recirculation loop in operation, modifications to the required APLHGR limits

(continued)

BASES

LCO (continued)

(LCO 3.2.1, "AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR)"), MCPR limits (LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)"), APRM Flow Biased Simulated Thermal Power– Upscale Allowable Value (LCO 3.3.1.1), and the Rod Block Monitor– Upscale Allowable Value (LCO 3.3.2.1) must be applied to allow continued operation consistent with the assumptions of Reference 3.

APPLICABILITY

In MODES 1 and 2, requirements for operation of the Reactor 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 no recirculation loops in operation, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the unit must be brought to MODE 3 within 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 of 12 hours is reasonable, based on operating experience, to reach MODE 3 from full power condition in an orderly manner and without challenging plant systems.

B.1 and C.1

With both recirculation loops operating but the flows not matched, the flows must be matched within 2 hours. If matched flows are not restored, the recirculation loop with lower flow must be declared "not in operation," as required by Required Action B.1. This Required Action does not require tripping the recirculation pump in the lowest flow loop

(continued)

BASES

ACTIONS

B.1 and C.1 (continued)

when the mismatch between total jet pump flows of the two loops is greater than the required limits. However, in cases where large flow mismatches occur, low flow or reverse flow can occur in the low flow loop jet pumps, causing vibration of the jet pumps. If zero or reverse flow is detected, the condition should be alleviated by changing flow control valve position to re-establish forward flow or by tripping the pump.

With the requirements of the LCO not met for reasons other than Condition A or B (e.g., one loop is "not in operation"), compliance with the LCO must be restored within 12 hours. A recirculation loop is considered not in operation when the pump in that loop is idle or when the mismatch between total jet pump flows of the two loops is greater than required limits for greater than 2 hours (i.e., Required Action B.1 has been taken). Should a LOCA occur with one recirculation loop not in operation, the core flow coastdown and resultant core response may not be bounded by the LOCA analyses. Therefore, only a limited time is allowed to restore the inoperable loop to operating status.

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

The 2 hour and 12 hour Completion Times are 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.

D.1

If the Required Action and associated Completion Time of Condition C is not met, the unit is required to be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to

(continued)

BASES

ACTIONS

D.1 (continued)

MODE 3 within 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 of 12 hours is reasonable, based on operating experience, to reach MODE 3 from full power conditions in an orderly manner and without challenging plant systems.

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 APLHGR and 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. If the flow mismatch exceeds the specified limits, the loop with the lower flow is considered not in operation. 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.

REFERENCES

1. UFSAR, Sections 6.3 and 15.6.5.
2. UFSAR, Appendix G.3.1.2.
3. UFSAR, Section 6.B.

INFORMATION SUPPORTING A FINDING OF NO SIGNIFICANT HAZARDS CONSIDERATION

ComEd has evaluated the proposed changes and determined that they do not involve a significant hazards consideration. According to 10 CFR 50.92(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:

> Involve a significant increase in the probability of occurrence or consequences of an accident previously evaluated;
>
> Create the possibility of a new or different kind of accident from any previously analyzed; or
>
> Involve a significant reduction in a margin of safety.

The proposed changes for LaSalle County Station, Units 1 and 2, to Current Technical Specifications (CTS) Sections 3/4.3.9, "Oscillation Power Range Monitor (OPRM) Instrumentation," 3/4.4.1.1, "Recirculation Loops," 3/4.4.1.5, "Thermal Hydraulic Stability," and 6.6.A.6, "Core Operating Limits Reports" and Improved Technical Specification (ITS) Sections 3.3.1.3, "Oscillation Power Range Monitor (OPRM) Instrumentation," 3.4.1,"Recirculation Loops Operating," and 5.6.5, "Core Operating Limits Report (COLR)" will delete the thermal hydraulic instability requirements and Power versus Flow figure and references to it from the LaSalle County Station Technical Specifications (TS), and insert a new TS for the Oscillation Power Range Monitor (OPRM) Instrumentation. The proposed TS will allow the enabling of the OPRM Instrumentation trips in accordance with the Letter from R. M. Krich (ComEd) to U. S. NRC, "Long Term Solution Stability System Oscillating Power Range Monitor Installation Status and Implementation Schedule," dated June 5, 2000.

The determination that the criteria set forth in 10 CFR 50.92 (c) is 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 for LaSalle County Station will delete the thermal hydraulic instability administrative requirements and Power versus Flow figure and references to it from the TS, and insert a new TS for the OPRM instrumentation. The proposed TS will allow the enabling of the OPRM instrumentation trips. The deletion of the thermal hydraulic instability administrative requirements and Power versus Flow figure and the requirement to have an operable OPRM instrumentation trip does not have an effect on any accident previously evaluated or the associated accident assumptions. Thus, the

proposed changes do not significantly increase the probability of an accident previously evaluated.

The proposed changes do not adversely affect the integrity of the fuel cladding, reactor coolant system or secondary containment. As such, the radiological consequences of previously evaluated accidents are not changed. Therefore, the proposed changes do not 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 do not effect the assumed accident performance of any structure, system, or component previously evaluated. The proposed changes do not introduce any new modes of system operation or failure mechanisms.

The OPRM instrumentation will initiate an automatic reactor trip upon detection of an instability that could threaten the Minimum Critical Power Ratio (MCPR) safety limit. The OPRM Instrumentation System consists of four (4) OPRM instrumentation trip channels. 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 redundancy.

Thus, this proposed changes 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?

Boiling Water Reactors are susceptible to thermal hydraulic instabilities if operated at high power and low flow conditions. 10 CFR 50, Appendix A, 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. Additionally, 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 detection and suppression of instability is required to insure that the MCPR safety limit is not exceeded during a transient. The OPRM instrumentation will

initiate an automatic reactor trip upon detection of an instability that could threaten the MCPR safety limit.

The OPRM Instrumentation System consists of four (4) OPRM instrumentation trip channels, each trip channel consisting of two OPRM instrumentation modules. Each OPRM instrumentation module receives input from LPRMs. Each OPRM instrumentation 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.

Each OPRM instrumentation module is continuously tested by a self-test function. On detection of any OPRM instrumentation module failure, either a "Trouble" or "INOP" alarm is activated. The OPRM instrumentation module provides an "INOP" alarm when the self-test feature indicates that the OPRM instrumentation module may not be capable of meeting its functional requirements. 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 redundancy The OPRM Instrumentation System provides compliance with GDC 10 and GDC 12.

The incorporation of the OPRM instrumentation into the TS will allow the deletion of the current thermal hydraulic instability administrative requirements and Power versus Flow TS Figure and associated actions. The OPRM instrumentation will provide the same level of assurance that the MCPR safety limit will not be violated for anticipated oscillations as that provided by the Power versus Flow TS Figure.

The OPRM Instrumentation System enabled region of the Power verses Flow figure was adjusted to maintain the same level of protection against the occurrence of a thermal-hydraulic instability by maintaining the pre-power uprate absolute power and flow coordinates. A 5% Power Uprate was approved for LaSalle County Station, Units 1 and 2, by Facility Operating License Amendments 140 and 125, respectively, in an NRC letter dated May 9, 2000.

The proposed changes do not affect the margin of safety as the OPRM Instrumentation will initiate an automatic reactor trip upon detection of an instability that could threaten the MCPR safety limit.

Thus, this proposed change does not involve a significant reduction in a margin of safety.

Therefore, based upon the above evaluation, we have concluded that this change does not constitute a significant hazards consideration.

ATTACHMENT D
Proposed Technical Specification Changes for
LaSalle County Station, Units 1 and 2

INFORMATION SUPPORTING AN ENVIRONMENTAL ASSESSMENT

ComEd has evaluated the proposed changes against the criteria for identification of licensing and regulatory actions requiring environmental assessment in accordance with 10 CFR 51.21. ComEd has determined that the proposed changes meet the criteria for a categorical exclusion set forth in 10 CFR 51.22(c)(9) and as such, has determined that no irreversible consequences exist in accordance with 10 CFR 50.92(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 that changes a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or that changes an inspection or a surveillance requirement, and the proposed changes meet the following specific criteria.

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

The proposed changes do not involve a 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 will not change the types or significantly 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 in the operation of the facility. There will be no 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 within the plant. Therefore, there will be no increase in individual or cumulative occupational radiation exposure resulting from the proposed changes.