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Prairie Island Nuclear Generating Plant Units 1 and 2
Dockets 50-282 and 50-306
License Nos. DPR-42 and DPR-60

Supplement to License Amendment Request to Exclude the Dynamic Effects Associated with Certain Postulated Pipe Ruptures From the Licensing Basis Based Upon Application of Leak-Before-Break Methodology – Response to Request for Additional Information (TAC Nos. ME2976 and ME2977)

References:

1. Letter from Northern States Power Company, a Minnesota corporation, to the Nuclear Regulatory Commission, "License Amendment Request to Exclude the Dynamic Effects Associated with Certain Postulated Pipe Ruptures From the Licensing Basis Based Upon Application of Leak-Before-Break Methodology," L-PI-09-134, dated December 22, 2009, ADAMS Accession Number ML100200129.

2. Letter from T. Wengert (NRC) to M. Schimmel (NSPM), "Prairie Island Nuclear Generating Plant, Units 1 and 2 – Request for Additional Information Related to License Amendment Request to Exclude the Dynamic Effects Associated with Certain Postulated Pipe Ruptures From the Licensing Basis Based Upon Application of Leak-Before-Break Methodology (TAC Nos. ME2976 and ME2977)," dated June 10, 2010, ADAMS Accession Number ML101550668.

3. Letter from Northern States Power Company, a Minnesota corporation, to the Nuclear Regulatory Commission, "Supplement to License Amendment Request to Exclude the Dynamic Effects Associated with Certain Postulated Pipe Ruptures From the Licensing Basis Based Upon Application of Leak-Before-Break Methodology – Response to Request for Additional Information (TAC Nos. ME2976 and ME2977)," L-PI-10-094, dated October 8, 2010, ADAMS Accession Number ML102810518.

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4. Letter from T. Wengert (NRC) to M. Schimmel (NSPM), "Prairie Island Nuclear Generating Plant, Units 1 and 2 – Request for Additional Information Related to Request to Exclude the Dynamic Effects Associated with Certain Postulated Pipe Ruptures From the Licensing Basis Based Upon Application of Leak-Before-Break Methodology (TAC Nos. ME2976 and ME2977)," dated December 14, 2010, ADAMS Accession Number ML103280398.

In Reference 1, Northern States Power Company, a Minnesota corporation (NSPM), doing business as Xcel Energy, submitted a License Amendment Request (LAR) to apply leak-before-break (LBB) methodology to certain piping systems at the Prairie Island Nuclear Generating Plant (PINGP). To support review of this LBB LAR, the U.S. Nuclear Regulatory Commission (NRC) staff issued a request for additional information (RAI) in Reference 2. This RAI included, in part, questions regarding the PINGP Reactor Coolant System (RCS) leakage detection capabilities.

NSPM submitted responses to the Reference 2 questions regarding PINGP RCS leakage detection capabilities in Reference 3, and the NRC staff requested additional information to clarify these responses in Reference 4. This letter provides the additional information in Enclosure 1. NSPM submits this supplement in accordance with the provisions of 10 CFR 50.90.

The supplemental information provided in this letter does not impact the conclusions of the Determination of No Significant Hazards Consideration or Environmental Assessment presented in the Reference 1 submittal.

In accordance with 10 CFR 50.91, NSPM is notifying the State of Minnesota of this LAR supplement by transmitting a copy of this letter to the designated State Official.

If there are any questions or if additional information is needed, please contact Sam Chesnutt at 651-267-7546.

Summary of Commitments

This letter contains no new commitments and no revisions to existing commitments.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on JAN 14 2011

Mark A. Schimmel

Mark A. Schimmel
Site Vice President, Prairie Island Nuclear Generating Plant
Northern States Power Company - Minnesota

Enclosure (1)

cc: Administrator, Region III, USNRC
Project Manager, PINGP, USNRC
Resident Inspector, PINGP, USNRC
State of Minnesota

ENCLOSURE 1

<u>Response to NRC Request for Additional Information dated December 14, 2010, Related to License Amendment Request to Exclude the Dynamic Effects Associated with Certain Postulated Pipe Ruptures From the Licensing Basis Based Upon Application of Leak-Before-Break Methodology at the Prairie Island Nuclear Generating Plant</u>

This enclosure includes responses from the Northern States Power Company, a Minnesota corporation (NSPM), to a request for additional information (RAI) regarding Reactor Coolant System (RCS) leakage detection capabilities at the Prairie Island Nuclear Generating Plant (PINGP).

The information provided in this enclosure is associated with NSPM's License Amendment Request (LAR) submitted December 22, 2009 (Reference 1) regarding the use of Leak-Before-Break (LBB) methodology. To support review of Reference 1, the Nuclear Regulatory Commission (NRC) issued an RAI regarding, in part, RCS leakage detection capabilities (Reference 2). NSPM responded to the Reference 2 RAIs regarding RCS leakage detection in a letter dated October 8, 2010 (Reference 3). The NRC requested additional information in a letter dated December 14, 2010 (Reference 4), and the requested information is provided herein.

This Enclosure quotes each RAI question in italics and each question is followed by the NSPM response. Referenced documents are identified at the end of this Enclosure.

NRC Question 1

Regulatory Guide (RG) 1.45 states that "...plants should use multiple, diverse and redundant detectors at various locations in the containment, as necessary to ensure that the transport delay time of the leakage from its source to the detector will yield an acceptable overall response time..." RG 1.45 suggests that the RCS leakage detection systems should have redundancy, reliability and sensitivity.

In Item 2, Enclosure 2, to the licensee's response dated October 8, 2010, the licensee stated that the response time for each of the RCS leakage detection systems in Table 1-1 in the Structural Integrity Associates report in the 12/22/2009 submittal is no longer be part of the LBB submittal. The licensee provided additional leakage detection information in its response to NRC question E2-2 in the October 8, 2010, letter.

On page 7 of Enclosure 1 to the October 8, 2010, letter, in response to NRC RAI E2-2, the licensee stated that the daily RCS inventory balance can detect a leak rate of 0.2 gpm in 24 hours and that the containment particulate radioactivity monitor (R-11) can detect a leak rate of 0.2 gpm in 53 and 280.7 hours for Units 1 and 2, respectively. RG 1.45 recommends a detection capability of 1 gpm in one hour. The response time for the R-11 monitor exceeds the 1 hour criterion significantly, which brings into question its usefulness in early detection of a pipe crack. The only credible detection method is the daily RCS inventory balance. If that is the case, there appears to be no diverse *detectors that can achieve the capability of 0.2 gpm in 24 hours other than the RCS inventory balance.*

NRC Question 1(a):

(a) Justify how the RCS leakage detection systems at PINGP have satisfied the redundancy, reliability and sensitivity recommended in RG 1.45.

NSPM Response to Question 1(a):

In the October 8, 2010 response to RAIs (Reference 3), NSPM identified that the PINGP RCS leakage detection system was determined to be Operable But Nonconforming (OBN) due to its inability to detect leakage in accordance with the current licensing basis (CLB). Also, resolution of the OBN condition was being pursued through the PINGP Corrective Action Program. As part of the OBN resolution effort, NSPM performed a more detailed calculation of the response time capabilities of the containment particulate monitors, 1R-11 and 2R-11. The new calculation accounted for the additional activity contributed by the daughter products of noble gas decay, which were not previously included, while continuing to assume conservatively low circulating activity levels consistent with current normal plant operations. The results of this calculation show that the R-11 monitors in both Units 1 and 2 are capable of detecting a 1 gpm leak within 1 hour.

Based on the new calculation for R-11 response time, the OBN condition of the RCS leakage detection system has been cleared. The ability of each R-11 monitor to detect a 1 gpm leak within 1 hour is consistent with RG 1.45, Revision 1.

In addition, the new calculation shows that the R-11 monitor is capable of detecting a 0.2 gpm leak within approximately 4 hours. Along with the RCS Inventory Balance, the R-11 response capability provides the RCS leakage detection system with credible, diverse means of detecting small leaks of 0.2 gpm within 24 hours.

These response times for the R-11 monitors supersede and replace the response times for R-11 monitors previously provided in the October 8, 2010 RAI response (Reference 3).

Although PINGP is not committed to and does not fully meet the regulatory positions of RG 1.45, Revision 1 as described in the October 8, 2010 letter, the RCS leakage detection system addresses many of the considerations described in RG 1.45, Revision 1. The October 8, 2010 letter discusses the number of different instruments and detection methods available to detect RCS leaks, the reliability of the instrumentation, and the capabilities of these instruments to detect small leaks. Based on the information previously submitted and the additional information regarding R-11 capabilities provided above, NSPM considers that the PINGP RCS leakage detection methods and instruments collectively provide diversity, redundancy, reliability, and sensitivity as recommended in Regulatory Guide 1.45, Revision 1.

NRC Question 1(b):

(b) Provide the number of R-11 monitors in the containment.

NSPM Response to Question 1(b):

Each unit at PINGP has one containment particulate monitoring system which draws a sample of the containment atmosphere through a detector located in the Auxiliary Building. These monitors are designated 1R-11 (Unit 1) and 2R-11 (Unit 2).

NRC Question 2

On page 10 of the October 8, 2010 response, the licensee stated that the RCS leakage detection system is currently under the status of Operable, But Nonconforming (OBN). The licensee stated further that it is resolving this OBN condition in accordance with the plant corrective action program. The staff has reservations regarding approving an LBB application for a plant with an OBN condition on its RCS leakage detection systems.

Discuss when the OBN will be resolved for the leakage detection systems. After the OBN condition is removed, discuss whether the RCS leakage detection capability will satisfy RG 1.45, Revision 1 and in terms of the LBB analysis assumptions.

NSPM Response to Question 2:

As discussed in the previous question response, the OBN condition of the RCS leakage detection system has been resolved. A new calculation shows the R-11 monitor can detect a 1 gpm leak within 1 hour, consistent with RG 1.45, Revision 1.

The PINGP leak detection system does not fully meet the regulatory positions of RG 1.45, Revision 1, as described previously. This system does, however, provide diversity, redundancy, reliability and sensitivity as recommended in RG 1.45, Revision 1. As described in the response to Question 1(a), the RCS leakage detection system includes multiple means of detecting small RCS leaks, using reliable instruments, with the sensitivity required to detect a 0.2 gpm leak in accordance with the analysis assumptions for the LBB application.

NRC Question 3

If the leak rate is as low as 0.2 gpm, the leakage would likely be manifested as either steam or small drops on the floor or on the outside surface of other pipes. Within 24 hours, the leakage probably will have evaporated. The RCS inventory balance method is based on the measured inventory that remains in the RCS and letdown systems (i.e., primarily temperature corrected RCS volume based on pressurizer level and volume control tank level changes). This introduces limitations because the calculation is not accurate if temperatures are rapidly changing or if there is significant boration or dilution to control power. Therefore, the NRC staff believes that the RCS inventory balance would not be accurate for a few days during and after startup and for several hours after power changes. The containment radiation monitors (R-11) also may not be effective for the first few days during and after startup because the source term is low. The containment sump would provide leakage detection during this period, but it probably is not sensitive enough to detect a 0.2 gpm leak in part because of leakage evaporation.

NRC Question 3(a):

a) *In light of the above discussion, justify your conclusion that the RCS leakage detection systems have a detection capability of 0.2 gpm in 24 hours.*

NSPM Response to Question 3(a):

The October 8 submittal (Reference 3) recognized the limitations of the RCS inventory balance on page 7 of Enclosure 1, which stated "the response time for a 0.2 gpm leak [using the RCS Inventory Balance] is nominally 24 hours, assuming steady state operation." The limitations of various leakage detection systems during dynamic or transition operating conditions are generic to nuclear power facilities, including PINGP. RG 1.45 acknowledges there are periods when some systems may become less effective or entirely ineffective, and suggests that leak detection systems should include sufficient diversity to ensure effective monitoring during these periods. Diversity is provided at PINGP by eight methods of detecting RCS leakage, as described in Reference 3, Enclosure 1, page 6.

Regarding the detectability of a 0.2 gpm leak due to evaporation, it is noted that leakage into the fixed volume of containment would affect parameters such as humidity or cooling coil condensate. These parameters would be observable by the operators. A 0.2 gpm leak results in 288 gallons of water leaking into the containment atmosphere in 24 hours. This is over 2000 pounds of water at room temperature. The containment is essentially a closed system and the containment air has a limited capacity to absorb moisture. Moreover, the containment fan coil units, which are in service during power operations, act as very efficient dehumidifiers and will act to suppress any increase in containment humidity by condensing moisture from the containment air and channeling the moisture to the sump where it will accumulate until detected by the sump run time monitor. For example, containment air at 80 degrees F has insufficient capacity to absorb the moisture resulting from a 0.2 gpm leak after one day, even conservatively ignoring any dehumidification from the fan coil units. Additional moisture will then flow to the sump. Thus, a 0.2 gpm leak will be detectable by the containment sump run time monitors despite the effects of evaporation.

Containment Inspections

An additional consideration that limits the time in which a leak would potentially be undetected is the visual inspections performed after refueling outages. PINGP personnel perform a containment closeout inspection walkdown and an RCS integrity test prior to plant startup after a refueling outage. These visual inspections provide a baseline immediately prior to entering the transient condition where the instrumentation would be considered less able to detect small leaks.

Inventory Balance

The RCS Inventory Balance was described on page 7 of Reference 3 as having a nominal response time of 24 hours, assuming steady state operation. Steady state operations require stable RCS pressure, temperature, power level, pressurizer and makeup tank levels, makeup and letdown, and RCP seal injection and return flows. Steady state operating conditions are needed for a meaningful inventory balance at PINGP as well as other nuclear facilities.

PINGP Technical Specifications Surveillance Requirement (SR) 3.4.14.1 requires a daily inventory balance in Modes 1 through 4 starting 12 hours after steady state conditions have been established. This provides the opportunity to detect leakage even after the containment closeout inspection and RCS integrity test prior to power operation.

After steady state operating conditions have been maintained for at least 12 hours, the daily inventory balance will be performed. Based on plant experience, the results of this inventory balance will typically be available within the following two hours, and a leakage rate will therefore be calculated within approximately 14 hours after achieving steady state operation at any power level in Modes 1 through 4. The inventory balance methodology is capable of detecting leaks significantly less than 0.2 gpm. A 0.2 gpm leak would be detected using the inventory balance method within 14 hours after achieving steady state operations and once per 24 hours thereafter.

The need to allow 12 hours after establishing steady state operations is consistent with other nuclear facilities, as evidenced by the inclusion of this 12 hour stabilization time in the improved Standard Technical Specifications (NUREG-1431 for Westinghouse plants).

Based on the above, NSPM considers that the capabilities of the PINGP leakage detection system during transitional operating conditions are similar to other nuclear facilities and are minimized by several considerations. Containment walkdown inspections and RCS integrity tests prior to plant startup after refueling outages provide opportunities for leaks to be identified prior to resuming plant operations. Also, performance of RCS inventory balances within 12 hours after establishing steady state operations and once per 24 hours thereafter ensures that small leaks, including 0.2 gpm leaks, are identified in a timely manner. Further, the updated response capability of the R-11 containment particulate monitor described in the response to Question 1(a) demonstrates that it can detect a 0.2 gpm leak within approximately 4 hours once circulating activity levels are sufficient for detection.

NRC Question 3(b):

b) *Explain how a substantial margin to the postulated leakage flaw would be maintained considering uncertainties in the release of water and radioactivity from the postulated crack, the potential for the crack to be plugged by particulate debris over time, the response time and accuracy of the leakage detection method, the method of operator identification that the leakage threshold has been exceeded, and the rate of crack growth during the period required for detection.*

NSPM Response to Question 3(b):

The NSPM LBB LAR submittal in Reference 1 describes that a substantial margin will be provided to the 2.12 gpm leakage flaw. This margin is maintained through conservatisms in the LBB analysis methodology and through the use of several leak detection methods and instruments. The RCS Leakage Monitoring Program provides action levels for leak rates as low as 0.1 gpm. A leak rate of 0.2 gpm is identified by the RCS inventory balance and by the R-11 containment particulate monitor. In addition, the time for a crack to grow to the postulated leakage flaw has been calculated using a site specific analysis, as described below.

Uncertainties in the mechanics of release of liquid through a postulated through-wall crack are accounted for in the methodology for determining flaw size and growth. The PINGP-specific evaluations were provided in the December 2009 LBB LAR submittal (Reference 1). These analyses were performed in accordance with NRC regulatory requirements and review criteria, including NUREG-1061 Volume 3 and Standard Review Plan (SRP) 3.6.3. As discussed in SRP 3.6.3, Section III.4, determination of leakage from a piping system under pressure involves uncertainties and, therefore, margins are needed. Sources of uncertainties identified in the SRP include plugging of the leakage crack with particulate material over time, leakage prediction, measurement techniques, personnel, and frequency of monitoring. The SRP continues with the statement that unless a detailed justification can be presented that accounts for the effects of these uncertainties, a margin of 10 on the leakage prediction is required for determining the leakage flaw size. The margin between the PINGP leakage detection system capability of 0.2 gpm and the 2.12 gpm leakage flaw is greater than the minimum factor of 10, and therefore, these uncertainties are accounted for in the LBB analyses.

In addition to the substantial margin provided by the factor of 10 described above, the time to detect a 0.2 gpm leak is significantly less than the time required for a crack to grow to leakage flaw size. When normal plant operating conditions are established, R-11 is capable of detecting a 0.2 gpm leak within approximately 4 hours. Also the RCS inventory balance is capable of detecting a 0.2 gpm leak within 24 hours.

The rate of crack growth was described in the October 8, Reference 3, response. As described in that letter, a recent site-specific calculation performed by Structural Integrity Associates (SI) evaluated crack growth rates due to fatigue in the limiting leakage location at PINGP. This analysis determined that it would take 95 days for a crack to grow from 2.0 gpm leakage size (corresponding to 10 times the 0.2 gpm detection capability) to the 2.12 gpm leakage flaw identified in the Reference 1 LAR. The calculated R-11 sensitivity would detect the 0.2 gpm leak within approximately 4 hours, which is less than 0.2% of the 95 day crack growth duration. Furthermore, the SI calculation determined that it would take approximately 5 years for this 2.12 gpm leakage flaw to grow to critical size. Based on the leakage detection capability described above, and considering the crack growth rate determined in the SI calculation, NSPM considers that substantial margin exists between a 0.2 gpm leak and the postulated leakage flaw.

NRC Question 4

Concerning the licensee's October 8, 2010, response to E1-2 Page 7 (Page 1 of 12 of Enclosure 1 with question repeated):

> *The licensee stated that when LBB was applied to the RCS loop piping in an LBB evaluation in 1986, a criterion of 1 gallon per minute (gpm) in one hour for RCS leakage was used for the leak detection system capability. However, for the current submittal, the licensee used a leakage detection limit of 0.2 gpm. The use of 0.2 gpm in the proposed LBB evaluation is an improvement in the leakage detection capability from the original licensing basis of 1 gpm. However, discuss whether the design basis for the RCS leak detection system needs to be changed in the Updated Final Safety Analysis Report and plant technical specifications via a license amendment process. If not, provide justification.*

The requirements regarding Technical Specification (TS) content are provided in 10 CFR 50.36(c)(2), but the licensee does not address these requirements in its response. The licensee cites Generic Letter (GL) 84-04 as not specifying TS content. However, the GL states that having leak detection capability consistent with RG 1.45 guidelines maintains a large margin against unstable crack extension, and RG 1.45 calls for TS addressing the availability of leak detection instruments and limits on unidentified leakage. The licensee has identified a leak detection capability more sensitive than that provided in RG 1.45 and considered in development of the current Prairie Island TS, so *the licensee's reference to GL 84-04 and the bases of the current Prairie Island TS does not adequately justify the lack of a proposed revision to the TSs. Therefore, the NRC staff requests the licensee clarify its response to address applicable regulations and guidance.*

NSPM Response:

The current PINGP Technical Specifications (TS) include requirements for the availability of leak detection instruments in TS 3.4.16, *RCS Leakage Detection Instrumentation,* and limits on unidentified leakage in TS 3.4.14, *RCS Operational Leakage.* These TS requirements protect the assumptions in the LBB analyses consistent with SRP 3.6.3, and are also consistent with the NRC Policy Statement on Technical Specifications, 10 CFR 50.36(c)(2)(ii), and precedent as follows.

<u>SRP 3.6.3</u>

SRP 3.6.3 provides guidance for LBB applications, including the RCS leakage detection system capabilities. SRP 3.6.3 states that detection should be sufficiently reliable, redundant, and sensitive to support the fracture mechanics evaluation. This SRP also states that the size of the postulated leakage flaw should be at least 10 times greater than the minimum detection system capability. Additional margin is provided in the factor of 2 between the analyzed leakage flaw size (2.12 gpm) and the critical flaw size.

The analyses performed for these margins were described in the LBB LAR (Reference 1), and establish new design requirements for meeting the LBB assumptions under General Design Criterion (GDC) 4. The analyzed leakage value of 2.12 gpm is bounded by the TS Limiting Condition for Operation (LCO) 3.4.14 limit for unidentified leakage of 1 gpm, by greater than a factor of 2. The leakage detection capability of 0.2 gpm is a design requirement that is less than one-tenth of the analyzed leakage flaw and is therefore more conservative than the factor of 10 identified in SRP 3.6.3. As described below, this new design requirement does not warrant a corresponding new TS LCO.

An additional conservatism inherent in SRP 3.6.3 is that LBB methodology is only applicable for applications where flaws would have slow growth rates. Systems cannot be susceptible to water hammer or stress corrosion cracking, and cannot have a history of fatigue cracking or failure, or potential for significant cyclic thermal stresses. As described in the response to Question 3(b), a recent site-specific calculation performed by SI determined that it would take 95 days for a crack to grow from 2.0 gpm leakage size (corresponding to 10 times the 0.2 gpm leak detection capability) to the 2.12 gpm analyzed leakage flaw size. In addition, it would take approximately 5 years for this 2.12 gpm leakage flaw to grow to critical size. Based on this calculation of slow crack growth, the existing unidentified leakage limit of 1 gpm in LCO 3.4.14 provides satisfactory margin for detecting a flaw before it could grow to the analyzed leakage flaw size and before it could become a potential pipe rupture.

10 CFR 50.36

10 CFR 50.36(c)(2)(ii) presents the criteria for inclusion of items in the plant TS. This regulation reads as follows:

> *"ii) A technical specification limiting condition for operation of a nuclear reactor must be established for each item meeting one or more of the following criteria:.."*

The four criteria of this section are addressed in the following sections.

Criterion 1

> *(A) Criterion 1. Installed instrumentation that is used to detect, and indicate in the control room, a significant abnormal degradation of the reactor coolant pressure boundary.*

Criterion 1 allows operators to detect significant abnormal degradation of the reactor coolant pressure boundary (RCPB) and correct or shutdown the plant safely to reduce the likelihood of an accident.

The existing PINGP TS LCO 3.4.16 provides requirements for installed RCS leakage detection instrumentation that monitors the RCPB to detect RCS leakage. LCO 3.4.16 is supportive of Atomic Energy Commission GDC 16 (the PINGP equivalent of Appendix A GDC 30). The Bases for LCO 3.4.16 state that the containment radionuclide monitoring used for RCS leakage detection instrumentation satisfies Criterion 1. LCO 3.4.16 does not specify design requirements or leakage detection capabilities for the containment sump monitor (pump run time instrumentation) or the containment radiological monitoring instrumentation. Therefore, the addition of a 0.2 gpm leakage detection requirement does not require a change to LCO 3.4.16.

As described in the response to Question 1(a), the leak detection capability required for the LBB LAR under GDC 4 is met by the containment particulate radiological monitor, R-11, and by the RCS Inventory Balance. R-11 operability is addressed in the existing LCO 3.4.16 (for PINGP GDC 16). The RCS Inventory Balance is required by the existing TS Surveillance Requirement 3.4.14.1 (also for PINGP GDC 16). Therefore, the existing TS provide operability requirements for the leak detection methods required for the LBB LAR.

As described in the PINGP Updated Safety Analysis Report, Section 6.5.2, *Leakage Detection Systems, Design Basis,* the basis for the unidentified leakage TS is to detect a critical flaw on a piping system that could result in a 3" or larger Loss of Coolant Accident (LOCA). As described above, a critical flaw size is 2 times the analyzed leakage flaw size in accordance with the margin of 2 identified in SRP 3.6.3. A critical flaw could result in a LOCA and would therefore represent a "significant abnormal degradation of the RCS pressure boundary." The 0.2 gpm leakage detection requirement is established to detect the 2.12 gpm leakage flaw identified in the LBB

LAR (Reference 1), which is half of the critical flaw size. Therefore, a 0.2 gpm leak would not indicate the presence of a critical flaw and would not indicate a significant abnormal degradation of the reactor coolant pressure boundary. Only a critical flaw meets the definition of a significant abnormal degradation of the RCS pressure boundary.

The leakage detection requirements for the LBB methodology do not require any changes to instruments required by the existing TS. Also, the existing TS requirements adequately address the instruments and methods used to detect a 0.2 gpm leak as required by the LBB LAR. Therefore, the 0.2 gpm leakage detection capability for the LBB LAR (and compliance with GDC 4) does not meet the requirements of Criterion 1.

<u>Criterion 2</u>

> *(B) Criterion 2. A process variable, design feature, or operating restriction that is an initial condition of a design basis accident or transient analysis that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.*

As described in the NRC's 1993 Final Policy Statement on Technical Specifications (Reference 5), Criterion 2 includes those process variables that are specific values or ranges of values that have been chosen as reference bounds in the design basis accident or transient analyses and which are monitored and controlled during power operation such that process values remain within the analysis bounds.

The limiting LBB LAR analyzed leakage flaw is 2.12 gpm, and an additional factor of 2 assures that there is substantial margin against approaching a critical flaw. The critical flaw is the analyzed point where the flaw could become unstable and potentially develop into an RCPB failure. The LCO 3.4.14 limit of 1 gpm unidentified leakage provides adequate protection against cracks growing to critical size, as shown below:

Safety Limit	Critical flaw (2 times the Leakage flaw size)
Analyzed Value	Leakage flaw – 2.12 gpm
TS Limit	1 gpm

The margin provided by the existing TS limit is also shown by the time required for crack growth. Based on a site-specific SI analysis of crack growth rates in piping included in the LBB LAR, a detection time of 95 days is available between a 2 gpm leak (which is 10 times the 0.2 gpm leak detection requirement) and a 2.12 gpm leakage flaw. A leak in the analyzed systems at the TS LCO limit of 1 gpm would therefore require more than 95 days to grow to the 2.12 gpm leakage flaw. In addition, the SI calculation determined that the 2.12 gpm leakage flaw would take another 5 years to grow to a critical flaw.

The establishment of the 0.2 gpm RCS leakage detection requirement that is greater than a factor of 10 below the 2.12 gpm analyzed leakage limit provides conservative leakage detection sensitivity consistent with SRP 3.6.3, but it does not establish the need for a new LCO limit on RCS leakage. The existing LCO 3.4.14 unidentified leak rate limit of 1 gpm provides ample time for PINGP personnel to detect an RCS leak prior to reaching the analyzed leakage value of 2.12 gpm, and prior to it presenting a challenge to the RCPB integrity. Therefore, the 0.2 gpm leakage detection capability for compliance with GDC 4 does not meet the requirements of Criterion 2.

<u>Criterion 3</u>

> *(C) Criterion 3. A structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.*

Criterion 3 addresses instrumentation that would actuate a safety feature and does not apply to the LBB LAR. RCS leakage detection instrumentation does not perform an automatic actuation function. Therefore, the RCS leakage detection instrumentation and the 0.2 gpm leakage detection requirement do not meet the requirements for Criterion 3.

<u>Criterion 4</u>

> *(D) Criterion 4. A structure, system, or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety."*

The TS Bases for LCO 3.4.16 identify that the containment sump pump run time instrumentation is included in the TS in accordance with Criterion 4. These instruments are not affected by the LBB LAR. Operating experience has shown that the likelihood of failure of large bore Class 1 piping systems is extremely low. The 0.2 gpm leakage detection requirement does not affect containment sump instrumentation or the likelihood of failure and therefore, this requirement does not meet the requirements of Criterion 4.

<u>Precedent</u>

Current PINGP TS limits on unidentified RCS leakage are consistent with the improved Standard Technical Specifications for Westinghouse plants (NUREG-1431), as follows:

- NUREG-1431, LCO 3.4.13, RCS Operational Leakage, includes a 1 gpm unidentified leakage limit and SR 3.4.13.1 requires an RCS inventory balance once per 72 hours. SR 3.4.13.1 is not required to be performed until 12 hours after establishment of steady state operation. These requirements are included in PINGP TS 3.4.14 with the exception that SR 3.4.14.1 requires an inventory balance once per 24 hours.

The current PINGP TS limit is consistent with the TS for the R. E. Ginna Nuclear Power Plant and the Kewaunee Nuclear Power Plant (References 6 and 7, respectively). Both Ginna and Kewanee LBB analyses require a 0.25 gpm detection capability, as described in the NRC's Safety Evaluations approving the application of LBB methodology (References 8 and 9), but were not required to and did not change the TS to reflect this leakage detection capability.

The Ginna TS include the following:

- Ginna LCO 3.4.13, RCS Operational Leakage, includes a 1 gpm limit on unidentified leakage and SR 3.4.13.1 requires an RCS inventory balance at least once per 72 hours. SR 3.4.13.1 is not required to be performed until 12 hours after establishment of steady state operation. These requirements are included in PINGP TS 3.4.14 with the exception that SR 3.4.14.1 requires an inventory balance once per 24 hours.
- Ginna LCO 3.4.15, RCS Leakage Detection Instrumentation, requires one containment sump A monitor (level or pump actuation), gaseous containment atmosphere radioactivity monitor, and particulate containment atmosphere radioactivity monitor. These requirements are included in PINGP TS 3.4.16 with the exception that only one containment radioactivity monitor is required at PINGP.

The Kewaunee TS include the following:

- Kewaunee LCO 3.1.d, RCS Operational Leakage, includes a 1 gpm limit on unidentified leakage and also requires two reactor coolant leak detection systems of different operating principles in operation when the reactor is critical and above 2% power. One of the systems must be sensitive to radioactivity. These requirements are included in PINGP TS 3.4.14 and 3.4.16 except that 3.4.16 requires operable leak detection monitors in Modes 1 through 4.
- Kewaunee SR 4.18 requires an RCS inventory balance each 72 hours except that this surveillance is not required until 12 hours after establishment of steady state operation. These requirements are included in PINGP TS SR 3.4.14.1 except that SR 3.4.14.1 requires an inventory balance once per 24 hours.

Conclusion

In conclusion, NSPM considers that the current PINGP TS are adequate to maintain the assumptions in the LBB LAR analyses and are consistent with regulatory guidance, including 10 CFR 50.36(c)(2)(ii). No TS changes are required. However, a change to the licensing basis in the Updated Safety Analysis Report will be completed, as described in the October 8 submittal (Reference 3).

References

1. Letter from Northern States Power Company, a Minnesota corporation, to the Nuclear Regulatory Commission, "License Amendment Request to Exclude the Dynamic Effects Associated with Certain Postulated Pipe Ruptures From the Licensing Basis Based Upon Application of Leak-Before-Break Methodology," L-PI-09-134, dated December 22, 2009, ADAMS Accession Number ML100200129.

2. Letter from T. Wengert (NRC) to M. Schimmel (NSPM), "Prairie Island Nuclear Generating Plant, Units 1 and 2 – Request for Additional Information Related to License Amendment Request to Exclude the Dynamic Effects Associated with Certain Postulated Pipe Ruptures From the Licensing Basis Based Upon Application of Leak-Before-Break Methodology (TAC Nos. ME2976 and ME2977)," dated June 10, 2010, ADAMS Accession Number ML101550668.

3. Letter from Northern States Power Company, a Minnesota corporation, to the Nuclear Regulatory Commission, "Supplement to License Amendment Request to Exclude the Dynamic Effects Associated with Certain Postulated Pipe Ruptures From the Licensing Basis Based Upon Application of Leak-Before-Break Methodology – Response to Request for Additional Information (TAC Nos. ME2976 and ME2977)," L-PI-10-094, dated October 8, 2010, ADAMS Accession Number ML102810518.

4. Letter from T. Wengert (NRC) to M. Schimmel (NSPM), "Prairie Island Nuclear Generating Plant, Units 1 and 2 – Request for Additional Information Related to Request to Exclude the Dynamic Effects Associated with Certain Postulated Pipe Ruptures From the Licensing Basis Based Upon Application of Leak-Before-Break Methodology (TAC Nos. ME2976 and ME2977)," dated December 14, 2010, ADAMS Accession Number ML103280398.

5. Final Policy Statement on Technical Specifications Improvements for Nuclear Power Reactors, NRC, 1993.

6. R. E. Ginna Nuclear Power Plant, LLC, Docket No. 50-244, Renewed Facility Operating License No. DPR-18 Technical Specifications (ADAMS Accession No. ML052720231).

7. Dominion Energy Kewaunee Inc., Docket No. 50-305, Kewaunee Power Station, Facility Operating License As Amended, License No. DPR-43 Technical Specifications (ADAMS Accession No. ML053040352).

8. Letter from P. Milano (NRC) to M. Korsnick (Ginna), R. E. Ginna Nuclear Power Plant – Amendment Re: Application of Leak-Before-Break Methodology for

Pressurizer Surge Line and Accumulator Lines (TAC No. MC4929), September 22, 2005 (ADAMS Accession No. ML052430343).

9. Letter from J. G. Lamb (NRC) to T. Coutu (NMC), Kewaunee Nuclear Power Plant – Review of Leak-Before-Break Evaluation for the Residual Heat Removal, Accumulator Injection Line, and Safety Injection System (TAC No. MB1301), September 5, 2002 (ADAMS Accession No. ML022400097).