PAGES 11, 12, 13, 14 of ENCLOSURE 1 CONTAIN SECURITY-RELATED INFORMATION WITHHOLD UNDER 10 CFR 2.390

Xcel Energy®

JUN 23 2010

L-PI-10-054
10 CFR 50.90

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

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

Response to Requests for Additional Information RE: License Amendment Request to Adopt the Alternative Source Term Methodology (TAC NOS. ME2609 and ME2610)

References:

1. Xcel Energy Letter to US NRC, "License Amendment Request (LAR) to Adopt the Alternative Source Term Methodology," dated October 27, 2009 (ADAMS Accession No. ML093160583).
2. US NRC Letter to Xcel Energy, "Prairie Island Nuclear Generating Plant, Units 1 and 2 – Requests for Additional Information RE: License Amendment Request to Adopt the Alternative Source Term Methodology (TAC Nos. ME2609 and ME2610)," dated March 26, 2010 (ADAMS Accession No. ML100820298).
3. Xcel Energy Letter to US NRC, "Response to Requests for Additional Information RE: License Amendment Request to Adopt the Alternative Source Term Methodology (TAC Nos. ME2609 and ME2610)," dated April 29, 2010 (ADAMS Accession No. ML101200083).
4. US NRC Letter to Xcel Energy, "Prairie Island Nuclear Generating Plant, Units 1 and 2 – Requests for Additional Information (RAI) Associated with Adoption of the Alternative Source Term (AST) Methodology (TAC Nos. ME2609 and ME2610)," dated May 20, 2010 (ADAMS Accession No. ML101380011).
5. Xcel Energy Letter to US NRC, "Response to Requests for Additional Information RE: License Amendment Request to Adopt the Alternative Source Term Methodology (TAC Nos. ME2609 and ME2610)," dated May 25, 2010 (ADAMS Accession No. ML101460064).

In Reference 1, the Northern States Power Company, a Minnesota corporation (NSPM), doing business as Xcel Energy, hereby requested an amendment to the Technical Specifications (TS) for Prairie Island Nuclear Generating Plant (PINGP). The proposed

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amendment requested to adopt the Alternative Source Term (AST) methodology, in addition to TS changes supported by the AST design basis accident radiological consequence analyses.

In Reference 2, the Nuclear Regulatory Commission (NRC) Staff requested additional information to support their review of Reference 1. In Reference 3 and Reference 5, NSPM provided responses to these requests for additional information (RAI). In Reference 4, the NRC Staff requested additional information. Enclosure 1 to this letter provides these responses to the NRC Staff RAIs, specifically, responses to RAIs from the Accident Dose Branch, with the exception of RAI 9. As discussed with the NRC, RAI 9 will be responded to by August 16, 2010.

NSPM requests that Pages 11, 12, 13, and 14 of Enclosure 1, which contain sensitive information, be withheld from public disclosure in accordance with 10 CFR 2.390.

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 and Environmental Assessment presented in the October 27, 2009 submittal, as supplemented by letters dated April 29, 2010, and May 25, 2010.

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 and Enclosure to the designated State Official.

If there are any questions or if additional information is needed, please contact Ms. Amy Hazelhoff, at 269-370-7445.

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 JUN 23 2010

Mark A. Schimmel

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

Enclosure

cc: Administrator, Region III, USNRC
Project Manager, PINGP, USNRC
Resident Inspector, PINGP, USNRC
State of Minnesota (without Security-Related information)

Enclosure 1

Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI)

ACCIDENT DOSE BRANCH (AADB)

Please provide the following information for the NRC staff to continue its review:

NRC RAI - AADB RAI 1

As stated in Section 7.2 of Calculation No. GEN-PI-079, Rev. 0, which is Attachment 6 to the Enclosure of the letter dated October 27, 2009, if the temperature of the leaked coolant is greater than 212°F, then the Constant Enthalpy equation cited by the licensee can be used to calculate the fraction of liquid coolant that flashes to vapor, in accordance with NRC Regulatory Guide (RG) 1.183, Appendix A, Section 5.4. However, if the calculated flashing fraction is less than 10 percent, then, in accordance with RG 1.183, Appendix A, Section 5.5, the amount of iodine that becomes airborne should be assumed to be 10 percent of the total iodine activity in the leaked coolant, unless a smaller amount can be justified based on the actual sump pH history and area ventilation rates.

RG 1.183, Appendix A, Section 5.5, recognizes that coolant composition can vary due to the various impurities and contaminants with which it will mix as it makes its way out of the reactor coolant system. As a result, the chemical properties of the coolant may be uncertain and its response to changes in temperature and pressure may no longer be readily predictable by calculations based on the enthalpy of pure water. In addition, ventilation rates of the rooms into which the coolant is leaked can affect the rate at which the liquid will flash to vapor, thus adding uncertainty to any calculated flashing fraction.

Therefore, please provide the justification requested by RG 1.183 that demonstrates the applicability of the Constant Enthalpy equation to a calculated flashing fraction for this inherently unpredictable coolant composition. Also, please verify the ability of the chosen methodology to account for other factors that may change the flashing fraction of the leaked coolant.

Northern States Power Company, a Minnesota corporation (NSPM) Response

AADB RAI 1

NRC Regulatory Guide (RG) 1.183 (July 2000), Appendix A, provides assumptions for evaluating the radiological consequences of a loss-of-coolant-accident (LOCA). One of the contributions to the radiological consequences from a postulated LOCA is due to release of radioactivity from leakage from the Engineered Safety Features (ESF) Systems. For consistency with the enclosure of the license amendment request, ESF will be referred to as Emergency Core Cooling Systems (ECCS) in this response. Regarding the assumed fraction of total iodine in the liquid that becomes airborne, RG 1.183, Appendix A, Section 5.5 states:

> "If the temperature of the leakage is less than 212°F or the calculated flash fraction is less than 10%, the amount of iodine that becomes airborne should be assumed to be 10% of the total iodine activity in the leaked fluid, unless a smaller amount can be justified based on the actual sump pH history and area ventilation rates."

RG 1.183, Appendix A, Section 5.5, indicates that iodine release percentages less than 10% can be justified based on actual sump pH and area ventilation rates.

Section 3.3.4.1.2 of the enclosure of the license amendment request describes the treatment of ECCS leakage in the AST LOCA radiological consequence analysis. Consistent with RG 1.183, Appendix A, Section 5.4, when the temperature of the leakage exceeds 212°F, the fraction of total iodine in the liquid that becomes airborne is assumed to equal the fraction of the leakage that flashes to vapor. The fraction of the leakage that flashes to vapor is determined using the flash fraction (FF) equation in RG 1.183, Appendix A, Section 5.4, based on sump liquid temperature profile. For the purposes of this analysis, the temperature of leakage is assumed to be the same as the sump liquid temperature. This is appropriate for piping and components upstream of the Residual Heat Removal (RHR) Heat Exchanger. For piping and components downstream of the RHR Heat Exchanger, the liquid temperature will be cooler. Higher liquid temperature results in a higher flash fraction, and is, therefore, conservative.

A three step temperature profile is used to simplify the analysis and bound the time dependent sump liquid temperature profile. The sump liquid temperature profile used and the corresponding calculated flash fractions are shown in Table 1 below.

Table 1, ECCS Leakage Calculated Flashing Fractions

Time Period	Maximum Sump Liquid Temperature (°F)	Calculated Flash Fraction
0 – 5.56 hours	253	4.27%
5.56 - 8.33 hours	230	1.87%
> 8.33 hours	< 212	0.1%(1)

(1) Determined based on liquid temperature of 212.3°F

As shown in the above table the time period that the sump liquid temperature is above 212°F is brief relative to the 30 day (720 hours) used for the radiological consequence analysis. RG 1.183, Appendix A, Section 5.5, states that when the temperature of the leakage is less than 212°F, the amount of iodine that becomes airborne should be assumed to be 10% of the total iodine activity in the leaked fluid, unless a smaller amount can be justified. As shown in the above table, the calculated release rate, considering flash fraction alone, would be at least a factor of 100 less than the assumed 10% release fraction.

For time periods when the temperature of the leakage is less than 212°F, justification for a conservative iodine release fraction considering iodine hydrolysis reactions and experimental results is described in Section 3.3.4.1.2 of the enclosure of the license amendment request. To summarize, based on experimental data, a conservative iodine release fraction for liquid temperatures less than 212°F is 1.12% (EPRI NP-1271). Based on analytical techniques, an average iodine release fraction of 0.48% was determined for a temperature range of 122° to 212°F (ORNL-TM-2412). To bound both the experimental and analytical evidence, for time periods when the temperature of the leakage is less than 212°F, a conservative flash fraction of 3% was used in the analysis. Using 3% provides a margin of a factor of 2.68 above the conservative iodine release rate of 1.12%.

Several conservatisms are used in the analysis that maximizes the radiological consequence impact due to ECCS leakage. For example, the analysis assumes that the iodine released from the ECCS leakage is transported directly to the Auxiliary Building Special Ventilation System (ABSVS) and released to the environment. No credit for dilution or hold-up in the Auxiliary Building (AB) is assumed. In addition, no credit for natural deposition within the Auxiliary Building prior to release is taken.

Regarding the impacts of pH of the liquid to the release fraction, NUREG-1465, "Accident Source Terms for Light-Water Nuclear Power Plants," Section 3.5, states:

> "In an aqueous environment, as expected for LWRs, iodine is expected to dissolve in water pools or plate out on wet surfaces in ionic form as I^-. Subsequently, iodine behavior within containment depends on the time and pH of the water solutions. Because of the presence of other dissolved fission products, radiolysis is expected to occur and lower the pH of the water pools. Without any pH control, the results indicate that large fractions of the dissolved iodine will be converted to elemental iodine and be released to the containment atmosphere. However, if the pH is controlled and maintained at a value of 7 or greater, very little (less than 1%) of the dissolved iodine will be converted to elemental iodine."

Section 3.3.4.1.2 of the enclosure of the license amendment request provides a discussion of the potential impact of the pH of the ECCS fluid on the iodine release fraction. The pH of the ECCS fluid during recirculation operation will be the same as the sump liquid pH. As described in Section 3.3.4.1.1 of the enclosure of the license amendment request, the sump liquid pH is maintained greater than 7 for the duration of the analysis period. Thus, considering the pH of the liquid, the iodine release fractions assumed in the analysis are conservative.

EPRI NP-1271, "Nuclear Power Plant Related Iodine Partition Coefficients," December 1979, addresses the affects of area ventilation rate on the iodine partition coefficient. EPRI NP-1271 states that the iodine partition coefficient is defined as the ratio of the iodine concentration in water to air at equilibrium, but that the application of an equilibrium partition coefficient to predicting the air concentration of iodine over a pool of water is not appropriate because radioiodine is removed continuously in local and general ventilation exhaust air. Per EPRI NP-1271 (Section 3.7), the partition coefficient calculated assuming equilibrium conditions is conservatively greater than the actual partition coefficient considering the effect of area ventilation rates:

> "The consequence of non-equilibrium is that the concentration in air for a given concentration in water is less than that computed by the partition coefficient."

Based on this determination, EPRI NP-1271, pages 1-1 and 1-2, states that the mass transfer relationship established in the report is confirmed independently for the conditions chosen.

As described above, RG 1.183, Appendix A, Section 5.5, indicates that justification for using a smaller iodine release rates should consider sump pH and area ventilation. RG 1.183, Appendix A, Section 5.5, does not include impurities and contaminants as attributes that should be included in this justification. However, EPRI NP-1271 addresses the impacts of chemical impurities and additives on the iodine partition coefficient. EPRI NP-1271, Section 3.6 states that:

> "There is no doubt that there were real differences in iodine behavior between fuel pool water [i.e., contaminated water] and pure laboratory water. However, from a practical point of view, these differences are marginal when compared to other uncertainties."

Furthermore, EPRI NP-1271, Summary page S-2 and Conclusion Section 3.8, Item 6, conclude:

> "The [study] results showed little or no difference in iodine partitioning with the type of water used. This indicates that trace level contaminants in fuel pool water did not influence markedly the behavior of iodine."
>
> And
>
> "The small difference in iodine partitioning between laboratory water on the one hand and fuel storage pool water on the other indicates that trace impurities in the pool water were of little significance".

In conclusion, the preceding discussion is consistent with the guidance in RG 1.183, Appendix A, Section 5.5, providing the justification for the iodine release fractions used in the post-LOCA radiological consequence analysis. For the significant time frame of the accident evolution (i.e., when the temperature of the leakage is less than 212°F) additional margin of at least 2.68 times the maximum iodine release fraction determined either through experimental or analytical data (refer to the cited technical literature) is included in the analysis to account for potential uncertainties such as chemical composition that could potentially impact the flashing fraction.

NRC RAI - AADB RAI 2

Typically, when multiple activity release locations characterize activity releases associated with a given accident, each is modeled independently in order to determine the resulting onsite and offsite dose consequences. Therefore, please provide verification that the methodology used to model multiple activity release locations by determining a weighted average (e.g., as shown in Table 3.6-3) will yield the same result as modeling each release location and its associated atmospheric dispersion factors, independently.

NSPM Response – AADB RAI 2

NRC Regulatory Guide (RG) 1.194, Section 3.2 (second paragraph) states:

> "For cases involving two or more release pathways associated with a single release source, a calculated composite value of X/Q may be considered on a case-by-case basis if the licensee can demonstrate an acceptable modeling approach and justify the conservatism of any assumed weighting factors."

For the PINGP AST, the secondary side release accidents include cases where two or more release pathways are associated with a single release source. Modeling two or more release pathways with a composite X/Q is consistent with RG 1.194, Section 3.2. The technical justification for this modeling approach is provided below.

The dose (D) associated with a release location is directly proportional to the activity profile of the release (A), the mass release rate (M) for the release location, and the atmospheric dispersion factor (X/Q) between the release location and a dose receptor. As an example, for the release of a single isotope, this proportionality is shown by the following equation:

$$D \propto A * M * \chi/Q$$

Other relevant parameters (e.g., dose conversion factors, time durations, breathing rates, etc.) are independent of the release, and therefore, for the sake of clarity, are not included in the preceding proportionality equation.

For two release locations (1 and 2) from the same release source, the dose due to the two release paths can be defined by the following equations:

$$D \propto A * M_1 * (\chi/Q)_1 + A * M_2 * (\chi/Q)_2$$

or

$$D \propto A * \{M_1 * (\chi/Q)_1 + M_2 * (\chi/Q)_2\}$$

The mass release rates (M_1 and M_2) can be defined as fractions (F_1 and F_2) of the total secondary side steam mass release rate from the same release source (M_{Total}) as follows:

$$M_1 = F_1 * M_{Total}$$

$$M_2 = F_2 * M_{Total}$$

Substituting the mass fractions, the dose due to the two release paths is defined by the following equations:

$$D \propto A * \{F_1 * M_{Total} * (\chi/Q)_1 + F_2 * M_{Total} * (\chi/Q)_2\}$$

or $$D \propto A * M_{Total} * \{F_1 * (\chi/Q)_1 + F_2 * (\chi/Q)_2\}$$

This final equation is equivalent to the methodology used in the AST analyses, for example, as shown in Table 3.6-3 in the enclosure of the license amendment request. This same methodology could also be applied where three different release locations (with a common release source) are modeled. This final equation confirms that the methodology used to model multiple activity release locations by determining a weighted average will yield the same result as modeling each release location and its associated atmospheric dispersion factors, independently.

NRC RAI - AADB RAI 3

The purpose of the limiting condition for operation (LCO) for Dose Equivalent 1-131 (DEI) and Dose Equivalent XE-133 (DEX) is to satisfy Title 10 of the Code of Federal Regulations (10 CFR), Section 50.36, criterion 2, which establishes an operating restriction that is an initial condition of a design-basis accident (DBA). When surveillance of the reactor coolant system (RCS) radionuclides is performed, each acceptable set of dose conversion factors (DCFs) will yield a different DEI and DEX. As approved by the NRC staff, the intent of Technical Specification Task Force Traveler (TSTF)-490, Revision 0, "Deletion of E-Bar Definition and Revision to RCS Specific Activity Technical Specification" was to allow the licensee to select, from the acceptable list, one DCF reference for the calculation of DEI and one DCF reference for the calculation of DEX. In Attachment 3 to the Enclosure of the letter dated October 27, 2009, the proposed definitions for DEI and DEX are provided. The definition for DEI indicates one DCF reference for the calculation of DEI, which is consistent with TSTF-490. However, the definition for DEX indicates that DEX may be determined using several references for DCF.

Therefore, consistent with 10 CFR 50.36 and TSTF-490, please provide additional information justifying how the use of multiple DCFs maintain consistency with the specified LCO values and DBA analysis or provide revised definitions for DEI and DEX that specify one DCF reference.

NSPM Response – AADB RAI 3

NSPM is providing a revised definition for DEX, which provides one DCF reference for the calculation of DEX. Attachments 1 and 3 provide the revised TS pages. The TS pages being provided are only the TS pages which have been changed due to the RAI response. These TS pages supersede those pages which were provided in the original submittal.

NRC RAI - AADB RAI 4

In the October 27,2009, submittal, the licensee proposed TS changes to revise Limiting LCO 3.4.17, "RCS Specific Activity," APPLICABILITY requirements to specify that the LCO is applicable in MODES 1, 2, 3, and 4. In accordance with this proposal, the licensee also proposed to add the NOTE that states, "Only required to be performed in MODE 1," to the surveillance requirements of the TS, thus removing the applicability of the surveillance requirements to other MODES.

The NRC staff has a concern about the proposed addition of the aforementioned NOTE. The proposed change revises the conditions for sampling, and may exclude sampling during the plant conditions where LCO 3.4.17 may be exceeded. After transient conditions (i.e. reactor trip, plant depressurization, shutdown or startup) that end in MODES 2, 3, or 4, the surveillance requirements is not required to be performed. Isotopic spiking and fuel failures are more likely during transient conditions than during steady state plant operations.

Because the limits in LCO 3.4.17 could potentially be exceeded after a plant transient or power changes, please provide a basis for why sampling is no longer needed while operating in MODES 2, 3, or 4. Additionally, justify how the LCO 3.4.17 remains consistent with the design bases analysis from which the LCO limits are derived (i.e. main steamline break, steam generator tube rupture, etc.). Furthermore, please justify why there is an apparent disparity between the modes of applicability (MODES 1, 2, 3, and 4) and the limited mode (MODE 1) under which the surveillance is required.

NSPM Response – AADB RAI 4

NSPM is removing the MODE 1 restriction Note from SR 3.4.17.1 and SR 3.4.17.2. Attachments 1 and 3 provide the revised TS pages. Attachment 2 provides the revised TS Bases page. The TS pages being provided are only the TS pages which have been changed due to the RAI response. These TS pages supersede those pages which were provided in the original submittal.

NRC RAI - AADB RAI 5

Page 21 of the enclosure to the letter dated October 27, 2009 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML093160605) states that the normal intake for the control room and makeup air intake Technical Support Center (TSC) ventilation systems are used as the assumed receptors for unfiltered inleakage due to their respective locations and the potential release locations. Is the reference to the normal intake for the control room also designated as either the 121 CR vent intake or the 122 CR vent intake in other parts of the enclosure? With respect to Figure 3.1-1, where are the TSC boundaries relative to its intake and the normal intake(s) relative to the control room envelope boundaries and possible inleakage locations?

NSPM Response – AADB RAI 5

Control Room
The normal CR intake is the same as the 121 CR vent intake and the 122 CR vent intake. These terms are used interchangeably. Section 3.2.2.1 (first paragraph) of the enclosure of the license amendment request describes the Control Room Envelope (CRE):

> "The *[Prairie Island Nuclear Generating Plant]* PINGP control room envelope is located at elevation 735' within the Auxiliary Building approximately equidistant between Unit 1 and Unit 2. The control room envelope consists of the control room and the two mechanical equipment rooms (also referred to as the chiller rooms). The control room ventilation system is entirely located within the two mechanical equipment rooms, with the exception of the outside air supply. The outside air supply dampers are located directly at the envelope boundary. The mechanical equipment rooms are located directly above the control room at elevation 755'. The cable spreading room on the 715' elevation (directly below the control room) is not part of the control room envelope. There are no other ventilation systems that penetrate the control room envelope." *[Text in italics added for clarity].*

Figure 1 of this letter shows the location of the Control Room on elevation 735' within the Auxiliary Building. Figure 2 of this letter shows the location of the two mechanical equipment rooms on elevation 755' within the Auxiliary Building. Figure 2 also shows other locations that are relevant to the response to RAI AADB 10 (i.e., Auxiliary Building Normal Vent Make-Up Air Intake, Common Area of Auxiliary Building and Aux Bldg Special Vent Zone Boundary). Distances for the source-to-receptor pairs are provided in Tables 3.1-3, 3.1-4, and 3.1-7 through 3.1-10 of the enclosure of the license amendment request.

As described on page 10 of the enclosure of the license amendment request, the control room ventilation system consists of two 100-percent-capacity trains that are common to both units; referred to as trains 121 and 122. As described in Section

3.2.2.1 of the enclosure of the license amendment request, the system has two modes of operation; normal and emergency.

- During the normal operation mode, one train is operating and the other train is in standby. The operating train recirculates the air in the control room and draws in fresh air. The design flow rates are 10,000 cfm recirculation flow rate and 2,000 cfm fresh air for a total air handler flow rate of 12,000 cfm. The 121 CR vent intake and the 122 CR vent intake are the normal intakes for the control room, depending on which train is operating.

- In response to a safety injection or high radiation signal, the system is automatically aligned to the emergency mode. In the emergency mode, the system operates in a recirculation mode. Both 121 and 122 CR vent intakes (normal vent intakes) are isolated and both trains start to recirculate and clean-up any unfiltered inleakage to the control room envelope.

Section 3.2.2.1.1 (first paragraph) of the enclosure of the license amendment request describes the assumed control room unfiltered inleakage location as follows:

> "For the purposes of determining radiological consequences in the AST dose analysis, it is assumed that all inleakage to the control room is drawn in through the Control Room outside air intake. As discussed in Section 3.1.3, this is a conservative receptor location. In order to be drawn in through the outside air intake, the release needs to leak by redundant bubble tight dampers."

The location of the control room outside air intake (i.e., 121 and 122 CR Vent Intakes are shown on Figure 3 (Auxiliary Building roof drawing).

<u>Technical Support Center</u>
The Technical Support Center is located on the north side of the Unit 2 Turbine Building at the 735' Elevation. The north side wall of the Technical Support Center is part of the north wall of the Unit 2 Turbine Building. There are two floors within the Technical Support Center. The second floor is occupied by the response team during an actual event with the first floor providing additional personnel space. The relative location of the Technical Support Center including the normal outside air intakes and the emergency outside air intake are shown on Figure 4 of this letter. Distances for the source-to-receptor pairs are provided in Tables 3.1-5 and 3.1-6 of the enclosure of the license amendment request.

As described in Section 3.2.3.1 of the enclosure of the license amendment request, the system has two modes of operation; normal and emergency.

- During the normal operation mode, the system is operating on recirculation using the return fans. Fresh air is supplied through the normal outside air intake(s). Air is exhausted from the TSC at a rate equivalent to the quantity of fresh air supplied. The normal outside air intakes are both located at the exterior north side wall of the Turbine Building above the TSC to directly draw in outside air.

- The system is manually aligned for the emergency mode. Figure 3.2-2 in the enclosure of the license amendment request provides a one line simplified system diagram. Also see USAR Figure 10.3-12. In the emergency mode, the return fan(s) are shut off, the normal outside air dampers are closed, the clean-up fan is started and the emergency outside air supply damper modulates to provide a preset flow rate to maintain a positive pressure in the TSC. The emergency outside air intake is located at the exterior north side wall of the Turbine Building above the TSC to directly draw in outside air.

As described above, during the emergency mode, the TSC is maintained at a positive pressure. As shown in Table 3.2-3 of the enclosure of the license amendment request, an unfiltered inleakage of 50 cfm (including ingress and egress) is included in the radiological consequence analysis.

NRC RAI - AADB RAI 6

Please provide a more detailed description of the common area of the auxiliary building designated as release locations "E" and "F" on Figure 3.1-1. In each case, would the assumed line of sight width of a postulated release moving directly toward each control room intake be approximately 52 and 60 meters, respectively? What ensures that there would be homogenous effluent mixing within the common area of the auxiliary building and uniform release along the assumed lines of release?

NSPM Response – AADB RAI 6

As shown in Table 3.1-2 of the enclosure to the license amendment request, the source-receptor pair for the release from the Common Area of the Auxiliary Building to the Control Room intakes is applicable to the Fuel Handling Accident (FHA) and the Main Steam Line Break (MSLB).

The Common Area of the Auxiliary Building is shown on Figure 2 included with the response to AADB RAI 5. The assumed line of sight width of a postulated release moving directly toward each control room intake is 52.2 meters to the Unit 1 Control Room Vent Intake and 59.7 meters to the Unit 2 Control Room Vent Intake. The Common Area of the Auxiliary Building was previously modeled as a diffuse release for the selective implementation of AST to the FHA for PINGP. As described in Letter L-PI-04-099, dated August 16, 2004 (ADAMS Accession Number ML042470401):

> "This area *[Common Area of the Auxiliary Building]* provides access to the containment maintenance airlocks for both units. The Common Area of the Auxiliary Building area completely encompasses the spent fuel pool enclosure, which encloses Spent Fuel Pool No. 1, Spent Fuel Pool No. 2, Transfer Canal and New Fuel Pool as shown on Figure 2 of NMC Letter L-PI-04-001. The Common Area of the Auxiliary Building is a sheet metal sided building; which is not leak tight. There are no penetrations where leakage from the Common Area of the Auxiliary Building to the environment could present a more limiting release. The common Area of the Auxiliary Building is not serviced by a ventilation system. Thus, there would be no forced ventilation from the building to the outside. The only exception to this would be a possibility for leakage from the Common Area of the Auxiliary Building into the spent fuel pool enclosure. This leakage would be exhausted either via the spent fuel pool normal ventilation system or the spent fuel pool special ventilation system." *[text in italics added for clarity]*

Based on the above justification, NRC Safety Evaluation Report (SER) for License Amendment 166 (Unit 1) and 156 (Unit 2) (ADAMS Accession Number ML042430504) documented acceptance of modeling the release from the Common Area of the Auxiliary Building as a diffuse release.

As shown in Table 3.4-1 of the enclosure to the license amendment request, the limiting release location for a release to the Control Room Vent Intakes based on the X/Q values is the diffuse release from the Common Area of the Auxiliary Building. As described on page 26 of the enclosure of the license amendment request, the X/Q values for the Common Area of the Auxiliary Building to the Control Room Vent Intakes were recalculated to account for the included angle between the source-receptor line of sight and the vertical axis being less than 45°. Recalculating the X/Qs (presented in the enclosure of the license amendment request) to account for this included angle did not change the dimension used to determine the σ_y diffuse release parameter and does not discount the acceptability of considering the Common Area of the Auxiliary Building as a diffuse source. The total dimensions of the Common Area of the Auxiliary Building above the 755' Elevation provide a total gross volume of more than 850,000 ft^3. Based on equipment configurations, this gross volume provides a substantial free air volume. In addition, there are substantial open volumes below 755' Elevation that directly communicate with the volume above 755'. For the FHA, no credit is taken for dilution or hold-up in the Common Area of the Auxiliary Building prior to release to the environment.

For the MSLB, as described in Section 3.6.4 of the enclosure of the license amendment request, the fault in the main steam line is postulated to occur upstream of the Main Steam Isolation Valve (MSIV) resulting in an unisolable release from the faulted Steam Generator (SG). The blowdown from the faulted SG is into the Auxiliary Building. These areas in the Auxiliary Building are normally isolated from the Common Area of the Auxiliary Building. To preclude over-pressurization in the Auxiliary Building during a MSLB, several doors with engineered ceramic pins are provided to open at a relatively low differential pressure. The differential pressure acting on the door will break the ceramic pin and the door will open to relieve the pressure. The open doors provide a flow path to the Common Area of the Auxiliary Building for both the initial release of the secondary side mass from the faulted SG and for the postulated continued primary to secondary leakage. In this case, the steam will enter the Common Area of the Auxiliary Building and be released through the possible paths (leakage through the walls or through the spent fuel pool normal ventilation system). The Common Area of the Auxiliary Building does not have roof ventilators or louvers. Similar to the FHA, the diffuse release from the Common Area of the Auxiliary Building provides the more conservative (higher) X/Q values relative to the other possible release locations. Thus, similar to the FHA, modeling this as a diffuse release is appropriate. Similar to the FHA, for the MSLB, no credit is taken for dilution or hold-up in the Common Area of the Auxiliary Building prior to release to the environment. In addition, for the MSLB, no credit is taken for dilution or hold-up within the Auxiliary Building prior to release to the Common Area of the Auxiliary Building. As described on page 99 of the enclosure of the license amendment request, the free volume in the Auxiliary Building is greater than 700,000 ft^3.

NRC RAI - AADB RAI 7

Page 24 of the enclosure to the October 27,2009, alternative source term license amendment request states that postulation of a loss of offsite power does not change the location of release points or receptor locations. Please confirm that the selection of the release point and receptor location pairs is also limiting with respect to other single failures.

NSPM Response – AADB RAI 7

Regarding determination of release point (source) characteristics, Regulatory Guide 1.194, Section 3.2 (third paragraph) states:

> "Changes in associated parameters that could occur as a result of differences between normal operation and accident conditions, differences between accidents, difference that occur over the duration of the accident, single failure considerations, and considerations of loss of offsite power, consistent with accident sequences and descriptions, must all be considered in the characterization of the release points."

These considerations were included when determining the release point and receptor location pairs. For the control room, there are two possible receptor locations modeled (121 CR Vent Intake or 122 CR Vent Intake). As previously described, the CR Vent Intake was conservatively selected as the assumed location for unfiltered inleakage. In general, as discussed in Section 3.1.3 of the enclosure of the license amendment, several different possible release point and receptor location pairs were considered. The summary of all of the X/Q values considered is presented in Table 3.1-11 of the enclosure of the license amendment request. The limiting X/Q values used in the radiological analysis are shown in Table 3.1-12. Limiting X/Q values were selected to maximize the predicted radiological consequences for each accident sequence accounting for the accident scenario and progression, loss of offsite power and single failure considerations. Examples of how potential single failures were considered in determining release point (source) and receptor locations are discussed in more detail below. It is noted that single failure considerations are in addition to consideration of a loss of offsite power.

<u>Release Point (Source)</u>

As an example, for the LOCA, credit is taken for only one train of Shield Building Ventilation System (SBVS) and Auxiliary Building Special Ventilation System. This results in minimum filtration of the environment in the Shield Building (SB) Annulus and the Auxiliary Building. It is noted that a single failure (i.e., failure of an Emergency Diesel Generator) can affect one train of Shield Building Ventilation, Auxiliary Building Special Ventilation and Control Room Ventilation.

Receptor

As described in Section 3.2.2.1, Page 43, of the enclosure of the license amendment request, in response to a safety injection or high radiation signal, both trains of the Control Room Ventilation System start. To account for a single active failure, only one train of control room ventilation system is credited in the dose analysis. The X/Q value(s) selected for the radiological consequence analysis are based on the train of Control Room Vent System with the limiting X/Qs; usually the closest to the release point. If there is no single failure and both trains of Control Room Vent System are operating, this provides double the filtration capacity for the control room environment.

NRC RAI - AADB RAI 8

The make up (MU) air intake louvers on the sides of the auxiliary building face away from the control room and were modeled as two-dimensional vertical diffuse sources. As noted on page 26, the NRC staff determined that this was acceptable for the LAR associated with Prairie Island Units 1 & 2, Amendment Nos. 191 and 180, respectively (ADAMS Accession No. ML091490611), since the source applied only to the control room inleakage part of the dose assessment. However, the associated safety evaluation stated that if the effluent from the MU air intake louvers is modeled to other receptors, assumptions regarding the specific case should be evaluated. While typically modeled to occur at a single point, control room inleakage could be assumed to occur at multiple undefined locations.

The current LAR has modeled postulated releases from the MU air intake louvers to each control room intake which is a single point where air is being forcefully drawn in. Therefore, please justify why it is appropriate to apply the vertical initial diffusion coefficient, X, for potentially forced flow coming over the roofline from the side of the auxiliary building to a single receptor point.

NSPM Response – AADB RAI 8

As described in Section 3.2.2.1 of the enclosure of the license amendment request, the Control Room Special Ventilation System (CRSVS) has two modes of operation; normal and emergency.

- During the normal operation mode, one train is operating and the other train is in standby. The operating train recirculates the air in the control room and draws in fresh air. The design flow rates are 10,000 cfm recirculation flow rate and 200 cfm fresh air for a total air handler flow rate of 12,000 cfm. The 121 CR vent intake and the 122 CR vent intakes are the normal intakes for the control room, depending on which train is operating.

- In response to a safety injection or high radiation signal, the system is automatically aligned to the emergency mode. Both trains of the CRSVS start and are automatically aligned to isolate the fresh air intake and exhaust, and start and align a portion of the recirculation air flow through the clean-up fan. In the emergency mode, the system operates in a recirculation mode. In this alignment, the system is recirculating and filtering the control room atmosphere.

Section 3.2.2.1.1 (first paragraph) of the enclosure of the license amendment request describes the assumed control room unfiltered inleakage location as follows:

> "For the purposes of determining radiological consequences in the AST dose analysis, it is assumed that all inleakage to the control room is drawn in through the Control Room outside air intake. As discussed in Section 3.1.3, this is a conservative receptor location. In order to be drawn in through the outside air intake, the release needs to leak by redundant bubble tight dampers."

As described in Section 3.1.3 (bottom of page 24) of the enclosure of the license amendment, the Control room outside air intake is a conservative assumed receptor location "as it results in the minimum distances between the source and the receptor".

As described above, in the emergency mode, the control room ventilation system isolates fresh air intake and exhaust and is aligned to recirculate and filter the control room environment. The CRSVS design does not include provisions to intentionally maintain a positive pressure in the control room envelope. Based on system design, during the emergency mode of operation, air is not forcefully drawn into the Control Room Envelope. As noted above, the Control Room Vent intake receptor location is simply used as a conservative receptor for the assumed Control Room (CR) inleakage.

The make up (MU) air intake louvers on the sides of the auxiliary building face away from the control room and were modeled as two-dimensional vertical diffuse sources. The NRC staff determined that this was acceptable for the LAR associated with PINGP Units 1 & 2, Amendment Nos. 191 and 180, respectively (ADAMS Accession Number ML091490611), since the source applied only to the control room inleakage part of the dose assessment.

Previous dose analysis (PINGP Units 1 & 2, Amendment Nos. 191 and 180, respectively - ADAMS Accession Number ML091490611) modeled the receptor location for unfiltered inleakage as the center of the Control Room ceiling as the X/Q values can be considered an average value for in-leakage locations around the Control Room Envelope. For the AST analysis, for conservatism, the receptor location is modeled at the normal intake; although this is not a very likely leakage point based on design of the dampers. As shown in Table 3.1-11 of the enclosure to the license amendment request, the Unit 2 Aux Bldg Normal Vent Make-up Air Intake to the 122 CR Vent Intake is the limiting source/receptor pair for this release location. Table 3 below compares the

X/Q values used in the previous dose analysis (i.e., Unit 2 Aux Bldg Normal Vent Make-Up Air Intake to CR Inleakage) to the AST analysis (Unit 2 Aux Bldg Normal Vent Make-Up Air Intake to 122 CR Vent Intake).

Table 3, Comparison of X/Q Values

Source	Receptor	X/Q (sec/m^3)				
		(0 – 2 hour)	(2 – 8 hour)	(8 – 24 hour)	(1 – 4 days)	4 – 30 days)
Unit 2 Aux Bldg Normal Vent Make-Up Air Intake	CR Inleakage	2.19E-03	1.89E-03	8.49E-04	5.95E-04	5.28E-04
Unit 2 Aux Bldg Normal Vent Make-Up Air Intake	122 CR Vent Intake	2.53E-02	2.13E-02	9.65E-03	7.14E-03	6.15E-03

As shown in the table, the X/Q values used in the AST analysis are higher than those previously used to represent the same receptor (i.e., CR inleakage). This difference represents a conservatism applied in the AST analysis modeling

NRC RAI - AADB RAI 10

Page 29 of the enclosure to the Prairie Island LAR provides a reason why Refueling Water Storage Tank leakage could not migrate to the atmosphere through the auxiliary building normal ventilation duct. Is the auxiliary building normal ventilation duct a release location to the atmosphere? If so, please confirm that any releases from the auxiliary building normal ventilation duct would result in X/Q values that are lower than releases from the common area of the auxiliary building which was modeled as a diffuse release.

NSPM Response – AADB RAI 10

As described in detail below, the assumed location for the leakage from the RWST vent is the Auxiliary Building Normal Vent Make-Up Air Intake Louver(s). The other potential release location for this leakage is into the Auxiliary Building Special Ventilation Zone; which would have a smaller impact on the radiological consequence analysis than the assumed release location. Based on configuration of the Auxiliary Building Normal Ventilation System, leakage that enters the Auxiliary Building Normal Ventilation System will not enter the Common Area of the Auxiliary Building.

As described in Section 3.3.4.1.2 of the enclosure of the license amendment request, during post-LOCA mitigation, a potential radiological release path is due to Emergency Core Cooling System (ECCS) backleakage to the Refueling Water Storage Tank (RWST). Based on the piping lengths and valve seat leakage rates, a conservative transit time of 35 hours is used for the backleakage to reach the RWST. The leakage is then assumed to continue for the 30 day duration of the dose analysis.

As described on pages 25 and 26 of the enclosure of the license amendment request:

"The Refueling Water Storage Tank (RWST) for each unit includes a vent at the top of the tank which discharges into the cylindrical structure which encloses the tank. Personnel access to the top of the tank is provided by a 4'6" x 3" opening in the concrete enclosure which allows a path for released activity to be discharged into the Auxiliary Building Normal Ventilation System Equipment Room With the normal ventilation system isolated due to the SI signal and the start of the Aux Building Special Ventilation System, there will be no forced air movement in the room other than any natural circulation or differential pressure induced flow between the room and the ductwork in the room. With no forced ventilation, the activity discharged from the RWST is assumed to be slowly distributed throughout the room. Some activity is assumed to seep into the ventilation system supply duct through small openings since the ducts are not sealed. This activity will then mix with the air in the duct and be slowly dispersed though the louver and into the environment. No credit is taken for any mixing in order to reduce the concentration prior to release from the louvers. Because of this slow mixing of activity into the room and into the ductwork, releases are assumed to be well mixed by the time they reach the environment and leave the duct uniformly over the face of the louver. Therefore, the type of source that best represents this type of release would be a diffuse source as described in Regulatory Guide 1.194."

The RWST vent area and the Auxiliary Building Normal Ventilation System Equipment Room are shown on Figure 2 of the response to RAI AADB 5; Unit 1 between Rows 3 and 4, Columns G and J, Unit 2 between Rows 14 and 15, Columns G and J. The Auxiliary Building Special Ventilation Zone Boundary is also shown on Figure 2 of the response to RAI AADB 5. As shown the RWST vent area and the Auxiliary Building Normal Ventilation System Equipment Room are outside of the Auxiliary Building Special Ventilation Zone (ABSVZ).

As described in Section 3.3.4.1.2 (page 76) and Section 3.1.3 (pages 25 and 26) of the enclosure of the license amendment request, the leakage from the RWST vent to the Auxiliary Building Normal Ventilation System Equipment Room is assumed to be released directly to the atmosphere through the Aux Bldg Normal Vent Make-Up Air Intake. The description on pages 29 and 30 of the enclosure of the license amendment request is intended to describe the basis for concluding that this is a conservative location for this release. As described on pages 29 and 30 of the enclosure of the license amendment request, the potential release paths to environment for leakage from the RWST Vent to the Auxiliary Building Normal Ventilation System Equipment Room are as follows:

- Leak past the associated Aux Bldg Normal Vent Make-Up Air Intake Louver (s).

  The louvers are located at the Aux Bldg Normal Vent Make-Up Air Intake. Thus, postulated leakage from the Auxiliary Building Normal Ventilation System Equipment Room into the Auxiliary Building Normal Ventilation System and through the louvers would be released directly to the atmosphere. The applicable X/Qs in this case are for the release from the Auxiliary Building Normal Vent Make-Up Air Intake to the 121 or 122 Control Room Vent Intake. As shown in Table 3.1-12 of the enclosure to the license amendment request, the limiting X/Q values for this source-receptor pair are from the Unit 2 Aux Bldg Normal Vent Make-Up Air Intake to the 122 CR Vent Intake.

- Leak into the Auxiliary Building Ventilation System past closed dampers.

  Instead of leaking directly to the environment through the louvers at the intake, another flow path for leakage into the Auxiliary Building Normal Ventilation System is past the fan supply dampers. As described on page 10 of the enclosure of the license amendment request, the Auxiliary Building Special Ventilation System operates in the event of a loss of coolant accident to draw and maintain a negative pressure in the ABSVZ, and to collect and filter leakage into the ABSVZ. The negative pressure within the ABSVZ would collect and filter leakage past the supply dampers. As shown on Figure 2 of the response to RAI AADB 5, the Common Area of the Auxiliary Building is outside of the Auxiliary Building Special Ventilation Zone. Based on configuration of the Auxiliary Building Normal Ventilation System, leakage that enters the Auxiliary Building Normal Ventilation System will not enter the Common Area of the Auxiliary Building. In this scenario, leakage from the RWST vent into the ABSVZ would be filtered through the Auxiliary Building Special Ventilation System filters (HEPA and charcoal) before being released to the environment through the Shield Building Vent Stack. As shown on Tables 3.1-11 and 3.1-12 of the enclosure of the license amendment request, the X/Q values for the release from either Shield Building Vent Stack to either 121 or 122 Control Room Vent Intake are smaller than the X/Q values for the release from the from the Unit 2 Aux Bldg Normal Vent Make-Up Air Intake to the 122 CR Vent Intake.

- Leak into the Auxiliary Building Special Ventilation Zone past door seals between the Auxiliary Building Normal Ventilation System Equipment Room and the Auxiliary Building Special Ventilation Zone.

  Similar to the above discussion, in this event, leakage from the RWST vent to the ABSVZ would be filtered through the Auxiliary Building Special Ventilation System filters (HEPA and charcoal) before being released to the environment through the Shield Building Vent Stack. As shown on Tables 3.1-11 and 3.1-12 of the enclosure of the license amendment request, the X/Q values for the release from either Shield Building Vent Stack to either 121 or 122 Control Room Vent Intake are smaller than the X/Q values for the release from the from the Unit 2 Aux Bldg Normal Vent Make-Up Air Intake to the 122 CR Vent Intake.

- Held-Up in the Auxiliary Building Normal Ventilation System Equipment Room and not leak.

> In this case, the leakage from the RWST vent would be retained in the Auxiliary Building Normal Ventilation System Equipment Room and not contribute to the overall radiological consequences.

To summarize, based on the above discussion, for the radiological consequence analysis, the conservative release location for leakage from the RWST vent is directly to the atmosphere through the Aux Bldg Normal Vent Make-Up Air Intake. This is conservative as this release is unfiltered and the release location has the highest X/Q values relative to any other possible release locations.

NRC RAI - AADB RAI 11

Page 20 of Attachment 4 notes that the 95 percentile wind speed is 16.5 miles per hour (mph) at the lower level and 22.3 mph at the upper level. How were these estimates derived?

NSPM Response – AADB RAI 11

Attachment 4 of the license amendment request provides an assessment of how the AST analysis conforms to the applicable regulatory guidance. Table B of Attachment 4 specifically provides the assessment of conformance with Regulatory Guide (RG) 1.183, Appendix A, "Assumptions for Evaluating the Radiological Consequences of a LWR Loss-of-Coolant Accident". The specific item in question relates to the assessment of conformance with RG 1.183, Appendix A, Section 4.3. RG 1.183, Appendix A, Section 4.3 pertains to consideration of the impact of high wind speeds on the ability of the secondary containment to maintain a negative pressure. Consistent with RG 1.183, Appendix A, Section 4.3, the wind speed assumed for this evaluation is exceeded only 5% of the total number of hours in the data set.

As discussed in the Comments Column of Attachment 4, Table B (Page 20), related to Section 4.3, of the license amendment request,

> "the Shield Building Vent System is designed to achieve and maintain a negative pressure within the annulus in the presence of high winds (40 mph equivalent). As shown in the 5-year meteorological monitoring dataset used in the development of the X/Qs, the maximum 1-hour average wind speed exceeded only 5% of the time is 16.5 mph as measured at the lower elevation and 22.3 mph at the upper elevation."

Based on the meteorological data for the years 1993 to 1997 the 5% values (i.e., 16.5 mph and 22.3 mph) noted in Attachment 4, Table B, were conservatively selected.

From the data, 16.5 mph at the lower elevation and 22.3 mph at the upper elevation are exceeded much less than 5% of the total number of hours in the data set.

Therefore, the PINGP AST analysis conforms to RG 1.183, Appendix A, Section 4.3.

ATTACHMENT 1 to ENCLOSURE

Technical Specification Pages (Markup)

1.1-2
1.1-3
3.4.17-3

3 pages follow

1.1 Definitions (continued)

CHANNEL CHECK	A CHANNEL CHECK shall be the qualitative assessment, by observation, of channel behavior during operation. This determination shall include, where possible, comparison of the channel indication and status to other indications or status derived from independent instrument channels measuring the same parameter.
CHANNEL OPERATIONAL TEST (COT)	A COT shall be the injection of a simulated or actual signal into the channel as close to the sensor output as practicable to verify OPERABILITY of all devices in the channel required for channel OPERABILITY. The COT shall include adjustments, as necessary, of the required alarm, interlock, and trip setpoints required for channel OPERABILITY such that the setpoints are within the necessary range and accuracy. The COT may be performed by means of any series of sequential, overlapping, or total channel steps.
CORE ALTERATION	CORE ALTERATION shall be the movement of any fuel, sources, or reactivity control components, within the reactor vessel with the vessel head removed and fuel in the vessel. Suspension of CORE ALTERATIONS shall not preclude completion of movement of a component to a safe position.
CORE OPERATING LIMITS REPORT (COLR)	The COLR is the unit specific document that provides cycle specific parameter limits for the current reload cycle. These cycle specific parameter limits shall be determined for each reload cycle in accordance with Specification 5.6.5. Plant operation within these limits is addressed in individual Specifications.
DOSE EQUIVALENT I-131	DOSE EQUIVALENT I-131 shall be that concentration of I-131 (microcuries/gram) that alone would produce the same ~~thyroid~~ dose when inhaled as the combined activities of isotopes I-131, I-132, I-133, I-134 and I-135 actually present. The determination of DOSE EQUIVALENT I-131 shall be performed using Committed Dose Equivalent (CDE) or Committed Effective Dose Equivalent (CEDE) dose conversion factors from Table 2.1 of EPA Federal Guidance Report No. 11, "Limiting Values of Radionuclide Intake And Air Concentration and Dose Conversion Factors for Inhalation, Submersion and Ingestion."~~as the quantity and isotopic mixture of I-131, I-132, I-133, I-134, and I-135 actually present. The thyroid~~

~~dose conversion factors used for this calculation shall be those listed in Table III of TID-14844, AEC, 1962, "Calculation of Distance Factors for Power and Test Reactor Sites".~~

1.1 Definitions (continued)

~~$\bar{E}$ -AVERAGE DISINTEGRATION ENERGY~~	~~$\bar{E}$ shall be the average (weighted in proportion to the concentration of each radionuclide in the reactor coolant at the time of sampling) of the sum of the average beta and gamma energies per disintegration (in MeV) for isotopes, other than iodines, with half lives > 15 minutes, making up at least 95% of the total noniodine activity in the coolant.~~
DOSE EQUIVALENT XE-133	DOSE EQUIVALENT XE-133 shall be that concentration of Xe-133 (microcuries per gram) that alone would produce the same acute dose to the whole body as the combined activities of noble gas nuclides Kr-85m, Kr-85, Kr-87, Kr-88, Xe-131m, Xe-133m, Xe-133, Xe-135m, Xe-135, and Xe-138 actually present. If a specific noble gas nuclide is not detected, it should be assumed to be present at the minimum detectable activity. The determination of DOSE EQUIVALENT XE-133 shall be performed using effective dose conversion factors for air submersion listed in Table III.1 of EPA Federal Guidance Report No. 12, 1993, "External Exposure to Radionuclides in Air, Water, and Soil."
LEAKAGE	LEAKAGE from the Reactor Coolant System (RCS) shall be:

a. Identified LEAKAGE

1. LEAKAGE, such as that from pump seals or valve packing (except reactor coolant pump (RCP) seal water injection or leakoff), that is captured and conducted to collection systems or a sump or collecting tank;

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.17.1	~~Verify reactor coolant gross specific activity ≤ 100/Ē μCi/gm.~~ Verify reactor coolant DOSE EQUIVALENT XE-133 specific activity ≤ 580 μCi/gm.	7 days
SR 3.4.17.2	~~-------------------NOTE-------------------~~ ~~Only required to be performed in MODE 1.~~ ~~--~~ Verify reactor coolant DOSE EQUIVALENT I-131 specific activity ≤ 0.5 μCi/gm.	14 days AND Between 2 and 6 hours after a THERMAL POWER change of ≥ 15% RTP within a 1 hour period~~.~~
~~SR 3.4.17.3~~	~~-------------------NOTE-------------------~~ ~~Not required to be performed until 31 days after a minimum of 2 effective full power days and 20 days of MODE 1 operation have elapsed since the reactor was last subcritical for ≥ 48 hours.~~ ~~--~~ ~~Determine Ē from a sample taken in MODE 1 after a minimum of 2 effective full power days and 20 days of MODE 1 operation have elapsed since the reactor was last subcritical for ≥ 48 hours.~~	~~184 days~~

ATTACHMENT 2 to ENCLOSURE

Bases Pages (Markup)

(For Information Only)

3.4.17-7

1 Page Follows

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.4.17.1

SR 3.4.17.1 requires performing a gamma isotopic analysis as a measure of the noble gas ~~gross~~ specific activity of the reactor coolant at least once every 7 days. ~~While basically a quantitative measure of radionuclides with half lives longer than 15 minutes, excluding iodines, t~~This measurement is the sum of the degassed gamma activities and the gaseous gamma activities in the sample taken. This Surveillance provides an indication of any increase in the noble gas ~~gross~~ specific activity.

Trending the results of this Surveillance allows proper remedial action to be taken before reaching the LCO limit under normal operating conditions. ~~The Surveillance is applicable in MODES 1 and 2, and in MODE 3 with T_{avg} at least 500°F.~~ The 7 day Frequency considers the unlikelihood of a gross fuel failure during the time.

Due to the inherent difficulty in detecting Kr-85 in a reactor coolant sample due to masking from radioisotopes with similar decay energies, such as F-18 and I-134, it is acceptable to include the minimum detectable activity for Kr-85 in the SR 3.4.17.1 calculation. If a specific noble gas nuclide listed in the definition of DOSE EQUIVALENT XE-133 is not detected, it should be assumed to be present at the minimum detectable activity.

SR 3.4.17.2

~~This Surveillance is performed in MODE 1 only to ensure iodine remains within limit during normal operation and following fast power changes when fuel failure is more apt to occur.~~ The 14 day Frequency is adequate to trend changes in the iodine activity level,

ATTACHMENT 3 to ENCLOSURE

Technical Specification Pages (Clean)

1.1-2
1.1-3
3.4.17-3

3 pages follow

1.1 Definitions (continued)

CHANNEL CHECK	A CHANNEL CHECK shall be the qualitative assessment, by observation, of channel behavior during operation. This determination shall include, where possible, comparison of the channel indication and status to other indications or status derived from independent instrument channels measuring the same parameter.
CHANNEL OPERATIONAL TEST (COT)	A COT shall be the injection of a simulated or actual signal into the channel as close to the sensor output as practicable to verify OPERABILITY of all devices in the channel required for channel OPERABILITY. The COT shall include adjustments, as necessary, of the required alarm, interlock, and trip setpoints required for channel OPERABILITY such that the setpoints are within the necessary range and accuracy. The COT may be performed by means of any series of sequential, overlapping, or total channel steps.
CORE ALTERATION	CORE ALTERATION shall be the movement of any fuel, sources, or reactivity control components, within the reactor vessel with the vessel head removed and fuel in the vessel. Suspension of CORE ALTERATIONS shall not preclude completion of movement of a component to a safe position.
CORE OPERATING LIMITS REPORT (COLR)	The COLR is the unit specific document that provides cycle specific parameter limits for the current reload cycle. These cycle specific parameter limits shall be determined for each reload cycle in accordance with Specification 5.6.5. Plant operation within these limits is addressed in individual Specifications.
DOSE EQUIVALENT I-131	DOSE EQUIVALENT I-131 shall be that concentration of I-131 (microcuries/gram) that alone would produce the same dose when inhaled as the combined activities of isotopes I-131, I-132, I-133, I-134 and I-135 actually present. The determination of DOSE EQUIVALENT I-131 shall be performed using Committed Dose Equivalent (CDE) or Committed Effective Dose Equivalent (CEDE) dose conversion factors from Table 2.1 of EPA Federal Guidance Report No. 11, "Limiting Values of Radionuclide Intake And Air Concentration and Dose Conversion Factors for Inhalation, Submersion and Ingestion."

1.1 Definitions (continued)

DOSE EQUIVALENT XE-133	DOSE EQUIVALENT XE-133 shall be that concentration of Xe-133 (microcuries per gram) that alone would produce the same acute dose to the whole body as the combined activities of noble gas nuclides Kr-85m, Kr-85, Kr-87, Kr-88, Xe-131m, Xe-133m, Xe-133, Xe-135m, Xe-135, and Xe-138 actually present. If a specific noble gas nuclide is not detected, it should be assumed to be present at the minimum detectable activity. The determination of DOSE EQUIVALENT XE-133 shall be performed using effective dose conversion factors for air submersion listed in Table III.1 of EPA Federal Guidance Report No. 12, 1993, "External Exposure to Radionuclides in Air, Water, and Soil."
LEAKAGE	LEAKAGE from the Reactor Coolant System (RCS) shall be:

a. <u>Identified LEAKAGE</u>

1. LEAKAGE, such as that from pump seals or valve packing (except reactor coolant pump (RCP) seal water injection or leakoff), that is captured and conducted to collection systems or a sump or collecting tank;

2. LEAKAGE into the containment atmosphere from sources that are both specifically located and known either not to interfere with the operation of leakage detection systems or not to be pressure boundary LEAKAGE; or

3. RCS LEAKAGE through a steam generator to the Secondary System (primary to secondary LEAKAGE);

b. <u>Unidentified LEAKAGE</u>

All LEAKAGE (except RCP seal water injection or leakoff) that is not identified LEAKAGE;

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.17.1	Verify reactor coolant DOSE EQUIVALENT XE-133 specific activity ≤ 580 μCi/gm.	7 days
SR 3.4.17.2	Verify reactor coolant DOSE EQUIVALENT I-131 specific activity ≤ 0.5 μCi/gm.	14 days AND Between 2 and 6 hours after a THERMAL POWER change of ≥ 15% RTP within a 1 hour period