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U S Nuclear Regulatory Commission
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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

<u>Supplement to License Amendment Request (LAR) to Revise the Loss of Coolant Accident (LOCA) and Main Steam Line Break (MSLB) Accident Dose Consequences Analyses and Affected Technical Specifications (TS) (TAC Nos. MD9140, MD9141)</u>

Reference:
1. Nuclear Management Company, LLC (NMC) letter to US Nuclear Regulatory Commission (NRC), "License Amendment Request (LAR) to Revise the Loss of Coolant Accident (LOCA) and Main Steam Line Break (MSLB) Accident Dose Consequences Analyses and Affected Technical Specifications (TS)", dated June 26, 2008, Accession Number ML081790439.
2. NRC letter to NSPM, "Prairie Island Nuclear Generating Plant, Units 1 and 2 – Request for Additional Information Related to License Amendment Request for Technical Specification Changes Related to Licensing Basis Radiological Dose Consequences", dated January 26, 2009, Accession Number ML090090307.

In Reference 1, NMC* submitted an LAR for the Prairie Island Nuclear Generating Plant (PINGP) Units 1 and 2 to revise the licensing basis LOCA and MSLB accident radiological dose consequences for PINGP as currently described in the Updated Safety Analysis Report (USAR) and revise TS 3.3.5, "Containment Ventilation Isolation Instrumentation", TS 3.4.17, "RCS Specific Activity", and TS 3.6.3, "Containment Isolation Valves". In Reference 2, the NRC Staff requested additional information to support their review of Reference 1. The Enclosure 1 to this letter provides the responses to the NRC Staff requests for additional information. Enclosure 2 provides

* On September 22, 2008, NMC transferred its operating authority to Northern States Power Company, a Minnesota Corporation (NSPM), doing business as Xcel Energy. By letter dated September 3, 2008, NSPM assumed responsibility for actions and commitments previously submitted by NMC.

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the ARCON96 input and output files for the χ/Q values requested by the NRC Staff. 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 June 26, 2008 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 and Enclosure 1 to the designated State Official.

If there are any questions or if additional information is needed, please contact Mr. Dale Vincent, P.E., at 651-388-1121.

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 March 16, 2009.

Michael D. Wadley

Michael D. Wadley
Site Vice President, Prairie Island Nuclear Generating Plant Units 1 and 2
Northern States Power Company - Minnesota

Enclosures (2)

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

Enclosure 1

The Nuclear Regulatory Commission (NRC) Staff has requested the following additional information to support review and approval of the Northern States Power, a Minnesota corporation (NSPM), License Amendment Request (LAR) to Revise the Loss of Coolant Accident (LOCA) and Main Steam Line Break (MSLB) Accident Dose Consequences Analyses and Affected Technical Specifications (TS), dated June 26, 2008. NRC questions are shown in bold.

Question (1):

Regarding the June 26, 2008, license amendment request (LAR) to revise the dose consequences of the LOCA and MSLB accident, as well as affected TSs, for PINGP [*Prairie Island Nuclear Generating Plant*], *modifications were made to the* onsite atmospheric dispersion factors (i.e., χ/Q values) used in the subsequent dose analyses. Accordingly, Enclosure 2, "Offsite & Control Room Dose Consequences," states:

> **"... as part of NRC SER [Safety Evaluation Report] for License Amendment 166 and 156 ... the staff performed a quality review of the on-site hourly met data (1993 through 1997) and concluded that the data was an acceptable basis for making estimates of atmospheric dispersion for design basis accidents. The above NRC-approved on-site hourly met data was *utilized to develop the* ARCON96 *on-site atmospheric dispersion* factors used in the LOCA and MSLB dose consequence analyses."**

a. **For new or updated χ/Q values which were not already specifically approved, provide the input files (electronic files for data input into the ARCON96 computer code) and a discussion of the assumptions used to generate the χ/Q values, summary output files, and/or cite references where this information has been previously docketed. These input files should clearly indicate the release height, receptor height, distance, and direction (with respect to true north) for each release/receptor pair analyzed.**

b. **Provide figures which support the selection of the inputs and assumptions used to calculate all of the onsite χ/Q values. Include a figure of the general arrangement of plant structures, drawn approximately to scale and showing true north, sufficient to enable the NRC staff to make confirmatory estimates of the selected inputs and assumptions and resultant χ/Q values for both the LOCA and MSLB accident. For each accident, highlight the postulated release and receptor locations including control room locations that may experience unfiltered inleakage.**

c. **Were the distance inputs into the ARCON96 calculations directly estimated as horizontal straight line distances or was another methodology (e.g., a "taut string" methodology) used to estimate the distances? If the distances were not estimated directly as the straight line horizontal distance, how were they determined? Did the procedure used to estimate the distances properly factor in differences in heights between source and receptor?**

NSPM response:

1a. The release point and receptor configuration, meteorological sensor configuration, and release modes, used as input to computer code ARCON96 to generate the atmospheric dispersion factors (χ/Qs) supporting the dose consequences following the LOCA and the MSLB accident reported in Enclosure 2 to the June 26, 2008 LAR submittal are provided in Table 1.

The input data in Table 1 are for the controlling χ/Q values presented in Table 5.2-1 of Enclosure 2 to the June 26, 2008 LAR submittal. These χ/Q values were selected from various release/receptor combinations that were evaluated. Note that Table 1 includes input data for both the Unit 1 and Unit 2 Shield Building stacks, as the controlling 0-2 hour χ/Q value is due to the release from the Unit 2 Shield Building stack, while the controlling longer averaging time χ/Q values are due to the release from the Unit 1 Shield Building stack.

The ARCON96 input and output files for the χ/Q values presented in Table 5.2-1, as well as the 1993 to 1997 onsite meteorological data (in ARCON96 data format), are provided on as electronic files as Enclosure 2 to this submittal.

The assumptions used in generating the aforementioned χ/Q values are summarized on page 11 of 12 of Enclosure 2 to the June 26, 2008 LAR submittal, and are presented below:

- The distances from the Unit 1 and Unit 2 Shield Building surfaces to the receptors are determined from the closest edge of the Shield Buildings (conservative);
- The Shield Building area having an effect on the dispersion of the applicable releases is that portion above the Auxiliary Building roof;
- The Shield Building surface releases are treated as diffuse vertical sources given the large horizontal and vertical surfaces from which the releases emanate;
- The Shield Building Vent releases are treated as point sources;

- The Main Steam Safety Valves (MSSVs) / Steam Generator (SG) Power Operated Relief Valve (PORV) releases are from the centroid of a rectangle encompassing the valves and are treated as a diffuse area source only when releases occur simultaneously from both the MSSVs and the SG PORVs;

- The SG PORV releases are from the centroid of a rectangle encompassing the valves and are treated as a point source when releases occur only from the SG PORVs;

- The Refueling Water Storage Tank (RWST) releases are treated as diffuse vertical sources as they enter the environment via the Auxiliary Building make-up air intake louvers that are 9-ft wide and 10-ft high;

- Initial diffusion coefficients for diffuse sources are based on the recommendations in Regulatory Guide 1.194;

- The wind direction range (90 degrees azimuth), wind speed assigned to calm (0.5 m/sec), surface roughness length (0.2 meter), and sector averaging constant (4.3) are taken from the recommendations in Regulatory Guide 1.194;

- All releases are conservatively treated as ground level releases as there are no release conditions that merit categorization as an elevated release (i.e., 2.5 times Shield Building height) at this site;

- The plume centerline from each release is conservatively transported directly over the receptor;

- For the control room centerline receptor, the elevation is chosen to conservatively minimize the distance between the release and the receptor;

- <u>Control Room Unfiltered In-leakage</u>: The χ/Q from the accident release point to the center of the Control Room ceiling is utilized for Control Room in-leakage since the above χ/Q can be considered an average value for in-leakage locations around the Control Room envelope; and,

- <u>Control Room Ingress/Egress</u>: The χ/Q from the accident release point to the center of the Control Room ceiling may be utilized for Control Room ingress/egress. The doors to the Control Room are located on the north (i.e., Turbine Building side) of the Control Room, as well as in the northeast and northwest corners. With the exception of the RWST vents which are located east and west of the Control Room, all release points are located south of the Control Room. Therefore, the distances from these release points to the Control Room center are conservative (i.e., shorter) relative to the Control Room doors. Relative to releases from the RWST vents, the distance from each of these release points to the center of the Control Room ceiling is reasonably representative of the average distance from each release point to the Control Room doors. Therefore, the χ/Q values to the center of the Control Room is considered reasonable for ingress/egress.

1b. The PINGP plot plan, showing the general arrangement of plant structures, true north, and the postulated release and receptor locations, including the Control Room location that represents the receptor for unfiltered in-leakage, is provided in Attachment 1 to this enclosure. See response to NRC RAI No. 2 below for further detail regarding accident-specific release point and receptor locations.

1c. Distance inputs to the ARCON96 calculations were based on measured horizontal straight line distances based on the plant general arrangement drawing provided in the response to Item 1b.

Question (2):

Regarding the LOCA and MSLB accident reanalyzed in support of this proposed amendment, please confirm that the generated χ/Q values model the limiting doses and all potential release scenarios were considered, including those due to loss of offsite power or other single failures.

NSPM response:

As noted on Page 11 of Enclosure 2 to the June 26, 2008 LAR submittal, and presented below, the potential release-receptor combinations evaluated for the LOCA and the MSLB are:

1. Unit 1 and Unit 2 Shield Building Surface to the Unit 1 and Unit 2 Control Room Air Intakes and the Control Room Center;

2. Unit 1 and Unit 2 Shield Building Vent to the Unit 1 and Unit 2 Control Room Air Intakes and the Control Room Center;

3. Unit 1 and Unit 2 RWST Vent (i.e., the Auxiliary Make-up Air Intake) to the Unit 1 and Unit 2 Control Room Air Intakes and the Control Room Center;

4. Unit 1 and Unit 2 MSSVs/SG PORVs to the Unit 1 and Unit 2 Control Room Air Intakes and the Control Room Center (Diffuse Source); and,

5. Unit 1 and Unit 2 SG PORVs (also utilized for the main steam line break location) to the Unit 1 and Unit 2 Control Room Air Intakes and the Control Room Center (Point Source).

Combinations 1, 2 and 3 are applicable to the LOCA, while combinations 4 and 5 are applicable to the MSLB. The above combinations represent all potential release scenarios including those due to loss-of-offsite power and the loss of one train of Engineered Safety Features due to the failure of an emergency diesel generator to start.

The ARCON96 input data for all Unit 1 and Unit 2 release point/receptor combinations applicable for the LOCA and MSLB listed above are provided in Table 2 to confirm that the χ/Q values in Table 5.2-1 will generate the limiting doses for the potential release scenarios. In Table 2, the input data corresponding to the controlling χ/Q values appearing in Table 5.2-1 is in bold font.

Question (3):

On page 15 of Enclosure 2 to the June 26, 2008, LAR submittal, the licensee stated that PINGP control room inleakage tracer gas testing resulted in a measurement of 165 cubic feet per minute (cfm). A total control room unfiltered inleakage value of 175 cfm is thereby assumed in the dose consequence analysis, including an additional assumed 10 cfm of unfiltered inleakage to account for ingress/egress. Typically, there is a quantifiable uncertainty associated with tracer gas testing. The licensee's unfiltered inleakage assumption of 175 cfm does not appear to include such an allowance for measurement uncertainty.

Therefore, if 165 cfm was the inleakage measured by the PINGP tracer gas test, please either provide the uncertainty associated with this measurement and quantify its effect on control room dose consequence, or provide technical justification for not including the uncertainty in the analysis.

NSPM response:

Measurement uncertainty is included in the results of the tracer gas testing for PINGP. The 165 cfm mentioned on page 15 of Enclosure 2 to the June 26, 2008 LAR submittal was taken from the tracer gas testing performed in July of 1998 and includes the uncertainty of ± 5 cfm (see Table 3 below). Tracer gas testing was again performed at PINGP during the week of November 29 through December 3, 2004. The results of this testing were bound by the July 1998 testing. The following table shows the results for both tests:

Table 3
Control Room Inleakage

System Configuration	July 1998 Results Unfiltered Inleakage (cfm)	2004 Results Unfiltered Inleakage (cfm)
High Radiation - Train A(1)	160 ± 5	115 ± 36
Safety Injection - Train A(1)	145 ± 5	114 ± 21

(1) Inleakage results are higher with Train A operating

This table was also documented in the PINGP supplemental response to Generic Letter (GL) 2003-01 (Letter from NMC to US NRC Document Control Desk, "Supplemental Response to Generic Letter 2003-01, 'Control Room Habitability'", Dated December 18, 2006, ADAMS Accession Number ML06352045).

Question (4):

Please explain where "Containment Leakage that is collected in the annulus (Shield Building)" is released. Is this leakage at any time, prior to equilibrium exhaust flow being achieved and maintained, assumed to be released from the Shield Building Stack? If so, please explain why this assumption is acceptable.

NSPM response:

The current licensing basis relative to modeling of the release points, release rates, and release timing associated with the post-LOCA containment leakage released via the Shield Building is presented in PINGP Updated Safety Analysis Report (USAR) Section 14.9.4. Pages 17 and 18 of Enclosure 2 to the June 26, 2008 LAR submittal provide the corresponding information relevant to modeling of the release points, release rates, and release timing utilized in this application.

The only difference from the current licensing basis discussed above, is that with this application, PINGP assumes that containment leakage that is collected in the Shield Building can be released to the environment via two release points; a) prior to achieving negative pressure in the shield building (approximately -2 inches water gauge (w.g.) with respect to the atmosphere), an unfiltered component of the containment leakage collected in the Shield Building is released directly to the environment as a diffuse source from the shield building wall, and b) a filtered component of the containment leakage collected in the Shield Building is released as a point source from the Shield Building Stack. This is different from that assumed in the safety analysis supporting the current licensing basis which assumed that both the unfiltered and filtered components referenced above are released from a single release point that is near the top of the Shield Building.

In accordance with current licensing basis, at PINGP, filtered containment leakage is assumed to be released from the Shield Building Stack upon initiation of the Shield Building Ventilation System at T=36 seconds. As indicated above, prior to the Shield Building having achieved a negative pressure of approximately -2 inches w.g., the containment leakage into the Shield Building is released via two pathways a) an unfiltered release pathway assuming a diffuse source from the shield building wall, and b) a filtered release pathway via the Shield Building Stack at the exhaust flowrate of Shield Building Ventilation System. The unfiltered release pathway is terminated when the Shield Building reaches a negative pressure of approximately -2 inches w.g. at 4.5 minutes. The exhaust flow via the filtered release pathway used in the dose model bounds the estimated flow versus time out of the Shield Building Ventilation System during a design basis transient (see USAR Figure 14.9-4).

In summary, and as noted in Enclosure 2 to the June 26, 2008 LAR submittal, the containment leakage pathway via the Shield Building is modeled as noted below:

- During the initial 36 seconds after the accident, (when the Shield Building pressure increases due to containment shell expansion and heat transfer from the containment shell to the Shield Building air), the activity leaked from the containment into the Shield Building is assumed to be uniformly mixed in 50% of the shield building volume and released without filtration to the atmosphere as a diffuse source from the shield building wall.

- Releases from 36 seconds to 4.5 minutes include both a direct unfiltered release from the shield building wall and a filtered release from the Shield Building Stack. This is because the analysis takes into consideration that at T=36 seconds, one Shield Building Ventilation System (SBVS) fan begins to draw air from the Shield Building at 6000 cfm and a negative pressure of approximately -2 inches w.g is reached in the Shield Building at 4.5 minutes. During this time period, the analysis conservatively assumes continued unfiltered releases from the shield building wall at the same rate as assumed during the 0-36 second time period, plus a 6000 cfm filtered releases via the Shield Building Stack.

- In accordance with the current licensing basis noted in USAR Section 14.9.4, direct out leakage from the Shield Building is assumed not to occur after 4.5 minutes since the Shield Building annulus is at a negative pressure of approximately -2 inches of water with respect to the atmosphere. Thus for the period between 4.5 minutes to 30 days, the release is assumed to be filtered and released from the Shield Building Stack, but at various reduced exhaust rates (i.e., reduced from 6000 cfm to 3000 cfm for the 4.5 minutes to 10 minutes period, further reduced to 1300 cfm for the 10 minutes to 20 minutes time period, and finally maintained at constant equilibrium flow of 1000 cfm for the remainder of the accident duration).

The above modeling of the Shield Building release is considered to be conservative since the analysis assumes continued unfiltered releases from the shield building wall during the time period between 36 seconds - 4.5 minutes, at the same rate as that assumed during the 0-36 second time period. In reality, direct out leakage from the Shield Building wall is expected to be much reduced as negative pressure is established in the building.

Question (5):

On pages 17 and 18 of Enclosure 2 to the LAR submittal, the licensee explained that, at various times prior to 20 minutes after accident initiation, when equilibrium exhaust flow is achieved and maintained, both filtered and unfiltered containment leakage releases are assumed to be taking place.

Please explain how the dose from filtered releases to the control room intake is accounted for during this time period.

NSPM response:

As discussed in Pages 17 and 18 of Enclosure 2 to the June 26, 2008 LAR submittal, and in response to RAI No. 4, the filtered releases via the Shield Building from T=36 seconds (one SBVS fan begins to draw air from the Shield Building Annulus), to T=20 minutes (equilibrium exhaust flow is established and maintained), are modeled as shown in Table 4.

Table 4
Shield Building Ventilation Flow

Time period	Flow (cfm)
36 seconds – 4.5 minutes	6000
4.5 minutes – 10 minutes	3000
10 minutes – 20 minutes	1300

The Shield Building volume available for mixing is assumed to be 50% of the Shield Building Annulus free volume. Recirculation removal of airborne activity is not credited during this period. The SBVS filter efficiency is 70% for elemental and organic iodine, and 99% for particulates. The release point is the Shield Building Stack. The bounding χ/Q value (i.e., between the Unit 1 Shield Building Stack to either Unit 1 and 2 Control Room intakes and the Unit 2 Shield Building Stack to either Unit 1 and 2 Control Room intakes) presented in Table 5.2-1 of Enclosure 2 to the June 26, 2008 LAR submittal is utilized for the analysis. Similarly, the bounding χ/Q values from Unit 1 and Unit 2 Shield Building Stacks to the center of the common control room is used to calculate the dose due to unfiltered inleakage into the control room.

Question (6):

Please explain how unfiltered inleakage into the control room is modeled before the assumed time of control room isolation at 2 minutes. Is it assumed to be in addition to the normal unfiltered intake flow? If it is not assessed, please explain why ignoring unfiltered inleakage during this pre-isolation time period is acceptable.

NSPM response:

As explained on page 15 of Enclosure 2 to the June 26, 2008 LAR submittal, prior to control room isolation, a 175 cfm control room unfiltered inleakage is assumed to occur in addition to the normal operation unfiltered intake flow of 2000 cfm. For purposes of model simplification, a single control room intake flow of 2175 cfm, in conjunction with the χ/Q values associated with the Shield Building Wall to Control Room intake is used. This is conservative since, as shown in Table 5.2-1 of Enclosure 2 to the June 26, 2008 LAR submittal, the χ/Q values for the Shield Building Wall to the Control Room intake bound that associated with the Shield Building Wall to the receptor assumed for Control Room Inleakage.

Question (7):

The LAR proposes to remove TS 3.3.5, "Containment Ventilation Isolation Instrumentation", which provides requirements for instrumentation to close the Containment Inservice Purge System (CIPS) isolation valves, in its entirety.

a. **Please confirm that pages 3.3.5-2, -3, and -4 will also be removed from the TS.**

b. **In Enclosure 1, page 11 of 21 of the LAR, the licensee states that, with the blind flanges installed, the CIPS isolation valves are no longer credited for isolation of CIPS following an accident in containment and therefore the isolation instrumentation is no longer required. What changes, if any, are being implemented in how these valves presently receive and operate in response to this instrumentation, e.g. physical modifications such as signal and wiring disconnect from the safety related portions of the isolation system?**

c. **In Enclosure 1, page 11 of 21 of [the LAR,] the licensee states that CIPS may be operated in Modes 5 and 6. Will the manual initiation functions from the control room to operate the CIPS isolation valves be retained so they can be used during this mode of operation?**

d. **In Enclosure 1, page 11 of 21 of the LAR, the licensee states that the CIPS penetrations will continue to be isolated during movement of recently irradiated fuel in accordance with the provisions of TS 3.9.4, "Containment**

Penetrations." Please clarify whether the blind flanges or the CIPS isolation valves will provide this isolation function.

NSPM response:

7a. TS pages 3.3.5-2, 3.3.5-3 and 3.3.5-4 will be removed as part of removing CIPS TS.

7b. No physical modification to the CIPS valves or instrumentation are planned or needed to maintain the plant in a safe configuration. The current TS requirements for CIPS in TS 3.3.5 are only applicable when CIPS is not isolated. As discussed in the TS 3.6.3 Bases Background, when the blind flanges are installed, the CIPS is isolated and the status of the valves and instrumentation is not addressed by TS. The changes proposed in this LAR for TS 3.6.3 will assure that the blind flanges are installed during plant operation in Modes 1, 2, 3, and 4.

7c. If this LAR is approved, the plant may continue to maintain availability of the CIPS isolation valves and instrumentation during Modes 5 and 6, including manual initiation functions, to provide defense-in-depth to minimize potential releases from a refueling outage event. Currently there are no TS requirements to have CIPS actuation and isolation available during these modes.

7d. The requirements of TS 3.9.4 for containment closure would be met. As quoted in the LAR, the TS 3.9.4 Bases state that the CIPS must remain closed during handling of recently irradiated fuel. TS 3.9.4.c provides requirements for acceptable isolation of containment penetrations during the movement of recently irradiated fuel as, ". . . closed by a manual or automatic isolation valve, blind flange, or equivalent." The TS 3.9.4 Bases defines equivalent isolation methods as, ". . . material that can provide a temporary, atmospheric pressure, ventilation barrier for other containment penetrations . . ." TS 3.9.4 Bases explains the basis for isolation during this Condition of Applicability:

> In MODE 6, the potential for containment pressurization as a result of an accident is not likely; therefore, requirements to isolate the containment from the outside atmosphere can be less stringent and requirements are referred to as "containment closure" rather than "containment OPERABILITY." Containment closure means that all potential escape paths are closed. Since there is no potential for containment pressurization, the Appendix J leakage criteria and tests are not required.

However, as a practical matter, any specific considerations of containment isolation during movement of recently irradiated fuel are hypothetical since it is not physically possible for recently irradiated fuel to be moved at PINGP. Recently irradiated fuel is defined as fuel that has been in a critical core within the last 50 hours. At PINGP it is not possible to perform the activities necessary to physically allow movement of irradiated fuel, including cool down the reactor coolant system, remove the reactor head bolts and remove the reactor head and upper internals, within 50 hours of critical core operations.

Question (8):

Please confirm that the changes to the current design basis input used in the LOCA and MSLB dose analyses will not impact the post-accident containment pressures and temperatures.

NSPM response:

The changes do not impact post-accident containment pressure and temperature. The analyzed break location for the MSLB dose analysis is outside of containment. Therefore, this analysis does not impact the containment pressure and temperature analysis. For the LOCA dose analysis, changes to the design basis inputs were made in order to make them consistent with the current PINGP design and licensing basis. The changes do not reflect any unanalyzed change to the current design and licensing basis for the post-accident containment pressure and temperature analysis. Additionally, no plant or procedure changes are being proposed as part of the LOCA dose analysis that would have an impact on the containment pressure and temperature analysis results.

Question (9):

Are the spool pieces and blind flanges provided for the CIPS penetrations located inside or outside containment?

NSPM response:

The CIPS supply and exhaust line blind flanges and spool pieces are located outside containment in the shield building annular space.

Question (10):

In Enclosure 2, page 5 of 36 of the LAR, it is stated that the Auxiliary Building drawdown time prior to crediting the Auxiliary Building special ventilation system is 6 minutes. Please confirm whether this value [is] supported by periodic drawdown tests.

NSPM response:

The drawdown time of 6 minutes is supported by periodic drawdown tests. PINGP TS 3.7.12, “Auxiliary Building Special Ventilation System (ABSVS)”, contains Surveillance

Requirement (SR) 3.7.12.3 which states, "Verify each ABSVS train can produce a negative pressure within 6 minutes after initiation." The frequency of this SR is 92 days.

Question (11):

In Enclosure 2, page 5 of 36 of the LAR, identifies changes to the current design basis inputs for spray initiation time (42 seconds) and the control room isolation time (2 minutes). Please identify the basis for these changes.

NSPM response:

Spray Initiation

NSPM determined that a non-conservative input was chosen for the spray initiation time. The 42 seconds used as an input to the LOCA dose analysis was selected from Table 14.6-2 of the PINGP USAR, Rev. 29. This USAR table documents the inputs used for the Large Break LOCA (LBLOCA) analysis that ensures the acceptance criteria of 10 CFR 50.46 are met with respect to peak cladding temperature, core cooling, and hydrogen generation. For this type of LBLOCA analysis, a minimum containment spray initiation time is conservative. Since a maximum spray initiation time is more conservative for dose analysis, the selection of 42 seconds does not result in a bounding dose consequence analysis.

This non-conservative design input was documented in the NSPM Corrective Action Process. PINGP USAR Appendix K contains the documentation of the containment response to a LOCA. As documented in Table K-19 of Appendix K, the containment pressure analysis uses a maximum spray initiation delay time of 72 seconds.

The LOCA dose analysis was re-run with the 72 second spray initiation time. No other changes to the design inputs were made. The new results (in REM) of the analysis are shown in Table 5.

Table 5
LOCA Dose Results

Location	Thyroid	Whole Body	Beta	Regulatory Limit
EAB[1]	22	2	-	300 (Thyroid) 25 (Whole Body)
LPZ[2]	16.5	2	-	300 (Thyroid) 25 (Whole Body)
Control Room	29.5	1.5	16.5	30 (Thyroid) 5 (Whole Body) 30 (Beta)

(1) Exclusion Area Boundary (EAB)
(2) Low Population Zone (EPZ)

The results show that the dose consequences of the LOCA are still below the regulatory limits set by 10CFR100.11 and General Design Criterion (GDC) 19.

NSPM reviewed the design input lists for the LOCA and MSLB dose analyses to evaluate the extent of condition of non-conservative design inputs with respect to the current design and licensing basis. The review of the design inputs concluded that the remaining inputs are valid and appropriate for use in the LOCA and MSLB dose analyses.

Control Room (CR) Isolation

The current LOCA dose analysis did not assume any delay time for the CR isolation which was a non-conservative assumption. USAR Section 10.3.3.3.2.1 states the following:

> The control room ventilation system is aligned to the emergency mode by either a safety injection (SI) or High Radiation signal. In most instances, the high radiation signal and the SI signal are redundant. The exceptions are that, for the following scenarios, the high radiation signal is relied on to back-up the SI signal.
>
> - If 121 CR Vent is initially running and Train A SI signal fails to actuate, the High Radiation signal (R-23 and/or R-24) is relied on to close the 121 CR Vent outside air dampers.
> - If 122 CR Vent is initially running and Train B SI signal fails to actuate, the High Radiation signal (R-23 and/or R-24) is relied on to close the 122 CR Vent outside air dampers.

Relying on the high radiation signals would result in a delay between event initiation and the isolation of the control room since the radiation monitors are located downstream of the control room filter unit inside the CR in the supply distribution ductwork. While the delay is anticipated to be on the order of a fraction of a minute, isolation of the CR is conservatively assumed to be 2 minutes.

Table 1
Prairie Island Design Inputs Used to Determine ARCON96 χ/Q Values for Table 5.2-1 to the June 26, 2008 LAR submittal

ARCON96 Parameter	Source/Receptor			
	Unit 2 Shield Bldg. Wall/ Unit 2 Control Room Air Intake	**Unit 1 Shield Bldg. Wall/ Control Room Inleakage Receptor**	**Unit 1 Shield Bldg. Stack/ Control Room Inleakage Receptor**	**Unit 2 Shield Bldg. Stack/ Control Room Inleakage Receptor**
Meteorological Information:				
Period of Meteorological Data	1993 - 1997	1993 - 1997	1993 - 1997	1993 - 1997
Lower Measurement Height (m)	10.0	10.0	10.0	10.0
Upper Measurement Height (m)	60.0	60.0	60.0	60.0
Wind Speed Units	m/sec	m/sec	m/sec	m/sec
Meteorological Data File Names	PI93.met, PI94.met, PI95.met, PI96.met, PI97.met	PI93.met, PI94.met, PI95.met, PI96.met, PI97.met	PI93.met, PI94.met, PI95.met, PI96.met, PI97.met	PI93.met, PI94.met, PI95.met, PI96.met, PI97.met
Source Information:				
Release Type	ground	ground	ground	ground
Release Height (m)	43.0	43.6	56.7	56.7
Building Area (m^2)	2,176	2,176	2,176	2,176
Vertical Velocity (m/sec)	0.0	0.0	0.0	0.0
Stack Flow (m^3/sec)	0.0	0.0	0.0	0.0
Stack Radius (m)	0.0	0.0	0.0	0.0
Receptor Information:				
Distance to Receptor (m)	10.4	28.0	39.0	37.0
Intake Height (m)	25.0	24.7	24.7	24.7
Elevation Difference (m)	0.0	0.0	0.0	0.0
Direction to Source (deg az)	168	131	110	248
Default Information:				
Surface Roughness Length (m)	0.20	0.20	0.20	0.20
Wind Direction Window (deg az)	90	90	90	90
Minimum Wind Speed (m/sec)	0.5	0.5	0.5	0.5
Averaging Sector Width Constant	4.3	4.3	4.3	4.3
Initial Diffusion Coefficients (m)	6.10, 6.30	6.10, 6.30	0.00, 0.00	0.00, 0.00

Table 1 - Continued
Prairie Island Design Inputs Used to Determine ARCON96 χ/Q Values for Table 5.2-1 to the June 26, 2008 LAR submittal

ARCON96 Parameter	Source/Receptor		
	Unit 2 Aux. Bldg. Make-up Air Intake/ Control Room Inleakage Receptor	**Unit 1 SG PORVs & MSLB-Point/ Control Room Inleakage Receptor**	**Unit 2 SG PORVs & MSLB-Point/Units 2 Control Room Air Intake**
Meteorological Information:			
Period of Meteorological Data	1993 - 1997	1993 - 1997	1993 - 1997
Lower Measurement Height (m)	10.0	10.0	10.0
Upper Measurement Height (m)	60.0	60.0	60.0
Wind Speed Units	m/sec	m/sec	m/sec
Meteorological Data File Names	PI93.met, PI94.met, PI95.met, PI96.met, PI97.met	PI93.met, PI94.met, PI95.met, PI96.met, PI97.met	PI93.met, PI94.met, PI95.met, PI96.met, PI97.met
Source Information:			
Release Type	ground	ground	ground
Release Height (m)	16.8	28.4	28.4
Building Area (m^2)	2,176	2,176	2,176
Vertical Velocity (m/sec)	0.0	0.0	0.0
Stack Flow (m^3/sec)	0.0	0.0	0.0
Stack Radius (m)	0.0	0.0	0.0
Receptor Information:			
Distance to Receptor (m)	50.0	34.0	13.0
Intake Height (m)	18.6	24.7	25.0
Elevation Difference (m)	0.0	0.0	0.0
Direction to Source (deg az)	279	108	129
Default Information:			
Surface Roughness Length (m)	0.20	0.20	0.20
Wind Direction Window (deg az)	90	90	90
Minimum Wind Speed (m/sec)	0.5	0.5	0.5
Averaging Sector Width Constant	4.3	4.3	4.3
Initial Diffusion Coefficients (m)	0.50, 0.50	0.00, 0.00	0.00, 0.00

Table 2
Prairie Island Design Inputs Used to Determine ARCON96 χ/Q Values for All Release/Receptor Combinations

ARCON96 Parameter	**Source/Receptor**			
	Unit 1 Shield Bldg. Wall/ Unit 1 Control Room Air Intake	**Unit 1 Shield Bldg. Wall/ Unit 2 Control Room Air Intake**	**Unit 2 Shield Bldg. Wall/ Unit 1 Control Room Air Intake**	**Unit 2 Shield Bldg. Wall/ Unit 2 Control Room Air Intake**
Meteorological Information:				
Period of Meteorological Data	1993 - 1997	1993 - 1997	1993 - 1997	**1993 - 1997**
Lower Measurement Height (m)	10.0	10.0	10.0	**10.0**
Upper Measurement Height (m)	60.0	60.0	60.0	**60.0**
Wind Speed Units	m/sec	m/sec	m/sec	**m/sec**
Meteorological Data File Names	PI93.met, PI94.met, PI95.met, PI96.met, PI97.met	PI93.met, PI94.met, PI95.met, PI96.met, PI97.met	PI93.met, PI94.met, PI95.met, PI96.met, PI97.met	**PI93.met, PI94.met, PI95.met, PI96.met, PI97.met**
Source Information:				
Release Type	ground	ground	ground	**ground**
Release Height (m)	43.0	43.0	43.0	**43.0**
Building Area (m^2)	2,176	2,176	2,176	**2,176**
Vertical Velocity (m/sec)	0.0	0.0	0.0	**0.0**
Stack Flow (m^3/sec)	0.0	0.0	0.0	**0.0**
Stack Radius (m)	0.0	0.0	0.0	**0.0**
Receptor Information:				
Distance to Receptor (m)	18.4	62.0	57.7	**10.4**
Intake Height (m)	25.0	25.0	25.0	**25.0**
Elevation Difference (m)	0.0	0.0	0.0	**0.0**
Direction to Source (deg az)	168	109	239	**168**
Default Information:				
Surface Roughness Length (m)	0.20	0.20	0.20	**0.20**
Wind Direction Window (deg az)	90	90	90	**90**
Minimum Wind Speed (m/sec)	0.5	0.5	0.5	**0.5**
Averaging Sector Width Constant	4.3	4.3	4.3	**4.3**
Initial Diffusion Coefficients (m)	6.10, 6.30	6.10, 6.30	6.10, 6.30	**6.10, 6.30**

Table 2 - Continued
Prairie Island Design Inputs Used to Determine ARCON96 χ/Q Values for All Release/Receptor Combinations

ARCON96 Parameter	Source/Receptor			
	Unit 1 Shield Bldg. Wall/ Control Room Inleakage Receptor	**Unit 2 Shield Bldg. Wall/ Control Room Inleakage Receptor**	**Unit 1 Shield Bldg. Stack/ Control Room Inleakage Receptor**	**Unit 2 Shield Bldg. Stack/ Control Room Inleakage Receptor**
Meteorological Information:				
Period of Meteorological Data	**1993 - 1997**	1993 - 1997	**1993 - 1997**	**1993 - 1997**
Lower Measurement Height (m)	**10.0**	10.0	**10.0**	**10.0**
Upper Measurement Height (m)	**60.0**	60.0	**60.0**	**60.0**
Wind Speed Units	**m/sec**	m/sec	**m/sec**	**m/sec**
Meteorological Data File Names	**PI93.met, PI94.met, PI95.met, PI96.met, PI97.met**	PI93.met, PI94.met, PI95.met, PI96.met, PI97.met	**PI93.met, PI94.met, PI95.met, PI96.met, PI97.met**	**PI93.met, PI94.met, PI95.met, PI96.met, PI97.met**
Source Information:				
Release Type	**ground**	ground	**ground**	**ground**
Release Height (m)	**43.6**	43.6	**56.7**	**56.7**
Building Area (m^2)	**2,176**	2,176	**2,176**	**2,176**
Vertical Velocity (m/sec)	**0.0**	0.0	**0.0**	**0.0**
Stack Flow (m^3/sec)	**0.0**	0.0	**0.0**	**0.0**
Stack Radius (m)	**0.0**	0.0	**0.0**	**0.0**
Receptor Information:				
Distance to Receptor (m)	**28.0**	28.0	**39.0**	**37.0**
Intake Height (m)	**24.7**	24.7	**24.7**	**24.7**
Elevation Difference (m)	**0.0**	0.0	**0.0**	**0.0**
Direction to Source (deg az)	**131**	229	**110**	**248**
Default Information:				
Surface Roughness Length (m)	**0.20**	0.20	**0.20**	**0.20**
Wind Direction Window (deg az)	**90**	90	**90**	**90**
Minimum Wind Speed (m/sec)	**0.5**	0.5	**0.5**	**0.5**
Averaging Sector Width Constant	**4.3**	4.3	**4.3**	**4.3**
Initial Diffusion Coefficients (m)	**6.10, 6.30**	6.10, 6.30	**0.00, 0.00**	**0.00, 0.00**

Table 2 - Continued
Prairie Island Design Inputs Used to Determine ARCON96 χ/Q Values for All Release/Receptor Combinations

ARCON96 Parameter	Source			
	Unit 1 Aux. Bldg. Make-up Air Intake/ Control Room Inleakage Receptor	**Unit 2 Aux. Bldg. Make-up Air Intake/ Control Room Inleakage Receptor**	**Unit 1 SG PORVs & MSLB-Point/ Control Room Inleakage Receptor**	**Unit 2 SG PORVs & MSLB-Point/ Control Room Inleakage Receptor**
Meteorological Information:				
Period of Meteorological Data	1993 - 1997	**1993 - 1997**	**1993 - 1997**	1993 - 1997
Lower Measurement Height (m)	10.0	**10.0**	**10.0**	10.0
Upper Measurement Height (m)	60.0	**60.0**	**60.0**	60.0
Wind Speed Units	m/sec	**m/sec**	**m/sec**	m/sec
Meteorological Data File Names	PI93.met, PI94.met, PI95.met, PI96.met, PI97.met	**PI93.met, PI94.met, PI95.met, PI96.met, PI97.met**	**PI93.met, PI94.met, PI95.met, PI96.met, PI97.met**	PI93.met, PI94.met, PI95.met, PI96.met, PI97.met
Source Information:				
Release Type	ground	**ground**	**ground**	ground
Release Height (m)	16.8	**16.8**	**28.4**	28.4
Building Area (m^2)	2,176	**2,176**	**2,176**	2,176
Vertical Velocity (m/sec)	0.0	**0.0**	**0.0**	0.0
Stack Flow (m^3/sec)	0.0	**0.0**	**0.0**	0.0
Stack Radius (m)	0.0	**0.0**	**0.0**	0.0
Receptor Information:				
Distance to Receptor (m)	50.0	**50.0**	**34.0**	34.0
Intake Height (m)	18.6	**18.6**	**24.7**	24.7
Elevation Difference (m)	0.0	**0.0**	**0.0**	0.0
Direction to Source (deg az)	81	**279**	**108**	250
Default Information:				
Surface Roughness Length (m)	0.20	**0.20**	**0.20**	0.20
Wind Direction Window (deg az)	90	**90**	**90**	90
Minimum Wind Speed (m/sec)	0.5	**0.5**	**0.5**	0.5
Averaging Sector Width Constant	4.3	**4.3**	**4.3**	4.3
Initial Diffusion Coefficients (m)	0.50, 0.50	**0.50, 0.50**	**0.00, 0.00**	0.00, 0.00

Table 2 - Continued
Prairie Island Design Inputs Used to Determine ARCON96 χ/Q Values for All Release/Receptor Combinations

ARCON96 Parameter	Source/Receptor			
	Unit 1 SG PORVs & MSLB-Point/Unit 1 Control Room Air Intake	**Unit 1 SG PORVs & MSLB-Point/Unit 2 Control Room Air Intake**	**Unit 2 SG PORVs & MSLB-Point/Unit 1 Control Room Air Intake**	**Unit 2 SG PORVs & MSLB-Point/Unit 2 Control Room Air Intake**
Meteorological Information:				
Period of Meteorological Data	1993 - 1997	1993 - 1997	1993 - 1997	**1993 - 1997**
Lower Measurement Height (m)	10.0	10.0	10.0	**10.0**
Upper Measurement Height (m)	60.0	60.0	60.0	**60.0**
Wind Speed Units	m/sec	m/sec	m/sec	**m/sec**
Meteorological Data File Names	PI93.met, PI94.met, PI95.met, PI96.met, PI97.met	PI93.met, PI94.met, PI95.met, PI96.met, PI97.met	PI93.met, PI94.met, PI95.met, PI96.met, PI97.met	**PI93.met, PI94.met, PI95.met, PI96.met, PI97.met**
Source Information:				
Release Type	ground	ground	ground	**ground**
Release Height (m)	28.4	28.4	28.4	**28.4**
Building Area (m^2)	2,176	2,176	2,176	**2,176**
Vertical Velocity (m/sec)	0.0	0.0	0.0	**0.0**
Stack Flow (m^3/sec)	0.0	0.0	0.0	**0.0**
Stack Radius (m)	0.0	0.0	0.0	**0.0**
Receptor Information:				
Distance to Receptor (m)	16.0	67.0	53.0	**13.0**
Intake Height (m)	25.0	25.0	25.0	**25.0**
Elevation Difference (m)	0.0	0.0	0.0	**0.0**
Direction to Source (deg)	180	97	253	**129**
Default Information:				
Surface Roughness Length (m)	0.20	0.20	0.20	**0.20**
Wind Direction Window (deg)	90	90	90	**90**
Minimum Wind Speed (m/sec)	0.5	0.5	0.5	**0.5**
Averaging Sector Width Constant	4.3	4.3	4.3	**4.3**
Initial Diffusion Coefficients (m)	0.00, 0.00	0.00, 0.00	0.00, 0.00	**0.00, 0.00**

Note: Input data in bold font corresponds to the controlling χ/Q values appearing in Table 5.2-1 of Enclosure 2 to the June 26, 2008 LAR submittal.

Enclosure 2

ARCON96 Input and Output Files for χ/Q
and
Meteorological Data

One CD-ROM enclosed

All CD-ROM files non-proprietary
(publicly available)

Enclosure 2

ARCON96 Input/Output Files for the χ/Q Values reported in Table 5.2-1 to the June 26, 2008 LAR submittal

Release Point	Receptor	Input File /Date/Size	Output File /Date/Size
Unit 2 Shield Building Wall	Unit 2 Control Room Air Intake	pi2ctcr2.rsf 2/18/2009 566 bytes (non-proprietary)	pi2ctcr2.log 2/18/2009 5,034 bytes (non-proprietary)
Unit 1 Shield Building Wall	Control Room Center	pi1ctsc1.rsf 2/27/2008 566 bytes (non-proprietary)	pi1ctsc1.log 1/9/2008 5,034 bytes (non-proprietary)
Unit 1 Shield Building Stack (all except 0-2 hour χ/Q)	Control Room Center	pi1sbvc.rsf 1/2/2008 566 bytes (non-proprietary)	pi1sbvc.log 1/2/2008 5,034 bytes (non-proprietary)
Unit 2 Shield Building Stack (0-2 hour χ/Q only)	Control Room Center	pi2sbvc.rsf 1/2/2008 566 bytes (non-proprietary)	pi2sbvc.log 1/2/2008 5,034 bytes (non-proprietary)
Unit 2 Auxiliary Building Makeup Air Intake	Control Room Center	pi2rwsc1.rsf 1/9/2008 566 bytes (non-proprietary)	pi2rwsc1.log 1/9/2008 5,034 bytes (non-proprietary)
Unit 1 Steam Generator Power Operated Relief Valves and Main Steamline Break-Point	Control Room Center	pi1porvc.rsf 4/17/2008 566 bytes (non-proprietary)	pi1porvc.log 4/17/2008 5,034 bytes (non-proprietary)
Unit 2 Steam Generator Power Operated Relief Valves and Main Steamline Break-Point	Unit 2 Control Room Air Intake	pi2porv2.rsf 4/17/2008 566 bytes (non-proprietary)	pi2porv2.log 4/17/2008 5,034 bytes (non-proprietary)

Enclosure 2

Meteorological Data files

File Name	Date	Size	Disclosure Type
Pi93.met	12/13/2007	324,120 bytes	non-proprietary
Pi94.met	12/13/2007	324,120 bytes	non-proprietary
Pi95.met	12/13/2007	324,120 bytes	non-proprietary
Pi96.met	12/13/2007	324,120 bytes	non-proprietary
Pi97.met	12/13/2007	324,120 bytes	non-proprietary

Attachment 1
Prairie Island General Arrangement Drawing Showing Release/Receptor Combinations