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U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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Prairie Island Nuclear Generating Plant Units 1 and 2
Dockets 50-282 and 50-306
Renewed License Nos. DPR-42 and DPR-60

Response to Requests for Additional Information (RAI) Associated with Adoption of the Alternative Source Term (AST) Methodology (TAC Nos. ME2609 and ME2610)

In a letter to the U.S. Nuclear Regulatory Commission (NRC) dated October 27, 2009 (Agencywide Documents and Management System (ADAMS) Accession No. ML093160583), the Northern States Power Company, a Minnesota corporation doing business as Xcel Energy (hereafter "NSPM"), requested an amendment to the Technical Specifications (TS) for Prairie Island Nuclear Generating Plant (PINGP). The proposed amendment requested adoption of the Alternative Source Term (AST) methodology, in addition to TS changes supported by AST design basis accident radiological consequence analyses.

Recently, the NRC staff conducted several conference calls with NSPM staff to discuss the technical details of NSPM's main steam line break atmospheric dispersion model, which was submitted in the subject AST application. To complete their review, the NRC staff requested additional information by electronic mail dated November 2, 2011 (ADAMS Accession No. ML113110094).

The enclosure to this letter provides the response to questions 1, 3, 5 and 6 of the November 2, 2011 request for additional information. Response to questions 2 and 4 will be provided later. This letter supersedes in its entirety our letter of January 13, 2012 on this same subject. That letter should be withheld from public disclosure as our staffs have discussed.

NSPM requests that pages 9-12 of the Enclosure, 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, supplemented by letters

dated April 29, 2010 (ADAMS Accession No. ML101200083), May 25, 2010 (ADAMS Accession No. ML101460064), June 23, 2010 (ADAMS Accession No. ML101760017), August 12, 2010 (ADAMS Accession No. ML102300295), December 17, 2010 (ADAMS Accession No. ML103510322), June 22, 2011 (ADAMS Accession No.ML111740145), July 11, 2011 (ADAMS Accession No. ML111930157), August 9, 2011 (ADAMS Accession No. ML112220098), and December 8, 2011 (ADAMS Accession No. ML113430091).

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

If there are any questions or if additional information is needed, please contact Glenn Adams at (612) 330-6777.

Summary of Commitments

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

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

Executed on FEB 13 2012

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

Enclosure

cc: Administrator, Region III, USNRC
Project Manager, Prairie Island, USNRC
Resident Inspector, Prairie Island, USNRC
State of Minnesota (without enclosure)

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Recently, the NRC staff conducted several conference calls with NSPM staff to discuss the technical details of NSPM's main steam line break atmospheric dispersion model, which was submitted in the subject AST application. To complete their review, the NRC staff provided a request for additional information (RAI) by electronic mail dated November 2, 2011 (ADAMS Accession No. ML113110094). For clarity, the NRC RAI information is provided below in italics font and the NSPM response is provided in plain font.

Background:

Following a conference call with the NRC staff on September 22, 2011, the licensee provided the following information concerning the design criteria for the Common Area of the Auxiliary Building (CAAB):

> *Updated Safety Analysis Report (USAR), Table 12.2-1, Page 1 indicates that the Common Area of the Auxiliary Building is a Design Class III* structure (i.e., above the concrete part of the structure). The CAAB is referred to as "Auxiliary Building (Except Class I or I*)" in the Table. This is a Design Class III* structure. USAR Table 12.2-4 indicates that Class III* structures are designed for Dead + Live + Wind or Snow normal operating loads and Dead + Live + Uniform Building Code Zone I (earthquake) Loads. USAR Section 12.2.1.3.1 defines snow loading as 50 lbs per sq-ft and the design wind speed as 100 mph. USAR Section 12.2.1.4.1d describes the load combinations for Class III* structures. These structures are designed for the greater of the above load combinations, where the Uniform Building Code Zone I earthquake loads are 0.05g. Although the CAAB is a corrugated steel building, it is structurally sound with fairly rigorous design criteria.*

RAI 1:

With regard to a postulated release into the CAAB associated with the faulted steam generator in a main steam line break accident, please summarize the release scenario from the point of release at the failure location to the location of release to the environment from the CAAB. At the location of release to the environment, the effluent is assumed to be uniformly and homogenously distributed along a line in width of

approximately 52.2 meters (m) prior to proceeding to the 121 CR (control room) intake or 59.7 m prior to proceeding toward the 122 CR intake. These dimensions are the product of the initial diffusion coefficients on page 35 of the October 27, 2009, PINGP alternative source term license amendment request (ADAMS Accession No. ML093160583) multiplied by a factor of 6.

The response should include a discussion of the CAAB leak tightness and other factors causing the effluent to be uniformly and homogenously mixed within the CAAB. In addition, the licensee should include any applicable scenarios when pressurization or other factors could cause a reduction in the CAAB normal leakage integrity which would result in effluent releases from the CAAB being of a lesser dimension than the values cited above. This includes a range of potential conditions, from enhanced localized leakage without loss of structural integrity to conditions that may result in breaches in the CAAB (e.g., blowout panel activation).

NSPM Response:

To demonstrate that it is acceptable to use a diffuse release from the CAAB to the CR Vent Intake for the main steam line break (MSLB) accident, the following evaluation approach will be taken:

- Demonstrate that the steam release to the CAAB will promote mixing within the building based on: (1) the relative orientation of the release into the building (i.e., the steam would flow towards the center of the building as it entered through the doors), and (2) the pressure and temperature differences of the incoming steam as compared to the environment in the CAAB.
- Demonstrate that the steam flow path from the door to the closest point of the CAAB to the 122 CR Vent Intake is not a likely direct flow path given the relative orientation of the door to this point of the building.
- Demonstrate that the steam flow path into the CAAB and the function of blow-off panels will prevent an impingement or leakage that would cause a localized breach in the building and more limiting release path than that assumed for the CAAB diffuse release location.

This approach is provided in the following discussion.

As described in the AST license amendment request (LAR) Section 3.6, the limiting MSLB location is a six inch line upstream of the Main Steam Isolation Valve (MSIV); i.e., unisolable from the Steam Generator. USAR Table I.3.2-1 identifies the high energy line break locations outside of containment. The following table summarizes the MSLB locations upstream of the MSIVs in the Auxiliary Building. These branch lines lead to either a power operated relief valve (PORV) or an Auxiliary Feedwater Pump (AFWP).

Steam Generator	Break Description	Location
11	6" branch to PORV	Elev. 735' between Rows N and P, between Columns 6 and 7 (Area X1)
11	6" branch to AFWP	Elev. 735' between Rows N and P, between Columns 6 and 7 (Area X1)
12	6" branch to PORV	Elev. 755' between Rows J and K, between Columns 5 and 6 (Area A1)
12	6" branch to AFWP	Elev. 735' between Rows J and K between Columns 5 and 6 (Area B1)
21	6" branch to PORV	Elev. 735' between Rows N and P, between Columns 11 and 12 (Area X2)
21	6" branch to AFWP	Elev. 735' between Rows N and P, between Columns 11 and 12 (Area X2)
22	6" branch to PORV	Elev. 755' between Rows J and K, between Columns 12 and 13 (Area A2)
22	6" branch to AFWP	Elev. 735' between Rows J and K between Columns 12 and 13 (Area B2)

From the table above, the PORV and AFWP branch line break sites downstream of steam generators 11 and 21 are located within Areas X1 and X2 depicted by Figure 2. The locations are in the vicinity of the Unit 1 and 2 main steam relief headers in the locations listed by the table above, as depicted in USAR Figure 1.1-7.

From the table above, the AFWP branch line break sites downstream of steam generators 12 and 22 are located within Areas B1 and B2 depicted by Figure 2. These locations are in the vicinity of the Unit 1 and 2 main steam restraints in the locations listed in the table above, as depicted in USAR Figure 1.1-7.

From the table above, the PORV branch line break sites downstream of steam generators 12 and 22 are located within Areas A1 and A2 as depicted by Figure 3. These locations are in the vicinity of the Unit 1 and 2 main steam safety valve headers in the locations listed in the table above, as depicted by USAR Figure 1.1-8.

As described in USAR, Appendix I, Section I.4.2:

> "Four sets of doors between the Auxiliary Building (elevations 720', 735' and 755') to the Fuel Handling Building have breakaway ceramic latch pins that permit the doors to open at 0.2 psid [pounds per square inch differential] during a high energy line break and provide a vent path for Auxiliary Building pressure relief."

These four sets of doors are shown on the following figures (Area numbers and associated location are shown on Figures 1 through 3):

- Figure 1: One set of double doors on elevation 720' at Row P between Columns 7 and 8 (See USAR Figure 1.1-6). This set of double doors is near the south side of the CAAB. This set of double doors borders Area Y1 between Columns 7 and 8.
- Figure 2: Two sets of double doors on elevation 735' at Row P between Columns 7 and 8 and at Row P between Columns 10 and 11 (See USAR Figure 1.1-7). These two sets of double doors are near the south side of the CAAB. One set of double doors borders Area X1 between Columns 7 and 8 and the other set borders Area X2 between Columns 10 and 11.
- Figure 3: One door on elevation 755' near Row J between Columns 9 and 10. This door is at the north side of the CAAB (See USAR Figure 1.1-8). This door borders Area A0 near Row J. Area A0 communicates with Areas A1 and A2 through a doorway on each side of Area A0.

The volumes in the Auxiliary Building defined by these areas on elevations 715', 735', and 755' for both units communicate with each other. Between elevations, this communication occurs through open stairwells as seen in USAR Figures 1.1-6, 1.1-7 and 1.1-8. Therefore, a main steam line break in the Auxiliary Building will pressurize all of the volumes and result in all four sets of doors opening from the Auxiliary Building into the CAAB.

By inspection of the above information and as shown on Figures 2 and 3, break locations on the 735' elevation (Areas B1, B2, X1, and X2) are in close proximity to the doors to the CAAB on the 735' elevation which enter near the south side of the CAAB, and the break locations on the 755' elevation (Areas A1 and A2) are in close proximity to the door to the CAAB on the 755' elevation which enters at the north side of the CAAB. Thus, given the relative proximity to the door, the limiting break location with respect to the CAAB release to the Control Room Vent Intake is the six-inch PORV branch line break sites downstream of Steam Generators 12 and 22 on the 755' elevation. This conservatively takes no credit for the opening of the other three sets of doors into the CAAB. Opening of these other doors will further promote mixing within the building.

With the postulated six inch break on the 755' elevation, the associated volume (A1 or A2) in the Auxiliary Building would rapidly fill with steam. This steam would flow to the adjoining volumes and also down the stairs to the volumes on 735' and 715' elevations. The available volume for mixing in the Auxiliary Building is greater than 700,000 ft^3. However, for the purposes of calculating the radioactive release, no credit is taken for mixing and dilution within the Auxiliary Building prior to release to the CAAB. The assumption of no mixing within the Auxiliary Building prior to release to the CAAB is very conservative given that the steam (and associated activity) release is a high energy release to the Auxiliary Building which would disperse rapidly within the building, resulting in mixing and dilution.

The extent of this conservatism can be measured by the following example. The volume of Area A1 is 125,400 ft^3 and the volume of Area A2 is 133,600 ft^3. The total secondary side liquid mass released from the faulted steam generator (SG) is 107,100 lbm. The specific volume for the steam at normal operating conditions (807 psia) is 0.564 ft^3/lbm (full power secondary side pressure). Thus, the steam volume of the secondary side mass is 60,400 ft^3. Thus, the blowdown of this steam volume into Area A1 would reduce the radionuclide concentration to 33% of the initial concentrations. This again is very conservative as it only credits the mixing in Area A1, whereas the steam would actually mix throughout the Auxiliary Building.

As shown on Figure 3, the door into the CAAB from the 755' elevation (from Area A0) would direct steam flow towards the south. As steam flows through the open door, the steam would flow from the north to the south due to the driving force from Area A0 into the CAAB. Thus, the steam would not impinge on the walls or ceiling of the CAAB. Furthermore, the door is at the 755' elevation. The roof of the Auxiliary Building is at the 775' elevation. For this area of the CAAB, the north, east and west walls of the CAAB are concrete. Above the auxiliary building roof, the CAAB walls are steel.

In relation to the door from Area A0 into the CAAB, the closest point of the CAAB to the 122 CR Vent Intake is up and to the west. This can be seen on USAR Figure 1.1-17, which depicts the east and west CR air intakes and the steel portion of the CAAB boundary above elevation 775'. The CR air intake to the east is the 121 CR Vent Intake and the CR air intake to the west is the 122 CR Vent Intake. With the orientation of the door to the assumed release location from the steel portion of the CAAB boundary, the steam would need to enter the CAAB, make a turn (almost 180°) to the northwest and then rise. This directional turn in the steam as it enters the CAAB would be opposite to the expected directional flow (i.e., southerly), as described above. Steam impingement on the steel portion of the CAAB will not occur due to the distance from the break site and the path the steam must take.

The concrete walls of the auxiliary building provide a robust structure to preclude damage from the steam flow into the CAAB. As the steam enters the large volume, it would tend to flow in a relatively direct flow path with some plume dispersion and rise due to the pressure and temperature differences. This flow path directs the steam towards the center of the area volume. Steam temperature and pressure differentials with the air volume of the CAAB would promote further mixing and dispersion within the CAAB.

As described in USAR Section 12, the CAAB is constructed to meet the Uniform Building Code (UBC); which includes UBC Zone 1 earthquake loads, snow loading and a design wind speed of 100 mph.

As the steam enters the CAAB, the volume in the CAAB could pressurize. The CAAB is provided with protection against pressure differential. This protection is in the form of engineered failure locations of the siding or blow-out panels. The failure locations are

designed such that the blow-out panels with the lowest differential pressures are at the far south side of the CAAB (along Row Q). These panels are designed to open at a differential pressure of approximately 0.4 psi.

The direction of flow from these blow-out panels to the 122 CR Vent Intake is similar as the Unit 2 Group 2 PORV to the 122 CR Vent Intake, but the Unit 2 Group 2 PORV release location is closer to the 122 CR Vent Intake than any potential blow-out panel release location. The X/Qs for the Unit 2 Group 2 PORV to the 122 CR Vent Intake are provided on Table 3 in Reference 2. As shown, the X/Qs for this source-receptor pair are much smaller than the X/Qs from the CAAB to the 122 CR Vent Intake listed in Table 3.1-11 of the AST LAR, that are used in the MSLB analysis. Therefore, it is conservative to use the CAAB diffuse release in lieu of a blow-out panel release location.

Based on the above discussion, it is acceptable to use a diffuse release for the CAAB to the CR Vent Intake for the MSLB accident. This is summarized below:

- The steam release to the CAAB will promote mixing within the building based on: (1) the relative orientation of the release into the building (i.e., the steam would flow towards the center of the building as it entered through the doors), and (2) the pressure and temperature differences of the incoming steam as compared to the environment in the CAAB.
- The steam flow path from the door to the closest point of the CAAB to the 122 CR Vent Intake is not a likely direct flow path given the relative orientation of the door to this point of the building.
- This summary of steam release into the CAAB takes no credit for steam release to the CAAB through the other three sets of doors which would also open. These other doors are at the opposite side of the CAAB and would further promote mixing within the building.
- Based on building construction and the orientation of the steam flow path into the CAAB, there are no concerns with steam impingement causing a localized breach in the building.
- Based on building design, pressure differential protection for the building will result in openings at the south side of the CAAB; which have smaller X/Q values than the assumed diffuse release location.
- In addition, the dose analysis takes no credit for mixing in the Auxiliary Building prior to release to the CAAB even though this mixing will be promoted by the steam release from the break.

RAI 3:

Figure 3 of the LAR, along with Attachment 1 of L-PI-09-056 (ADAMS Accession No. ML091210703), show the control room outdoor air intake at column coordinates 5-G. Attachment 2 of L-PI-09-056 shows an elevator close to the same coordinates (5.2-G.8).

a. *Does this elevator have a rooftop equipment room equipped with ventilation? If yes:*

b. *Please discuss the potential for a flow path from a main-steam line break into the elevator shaft through any shaft ventilation openings in the auxiliary building and/or around the doors, out through the elevator equipment room ventilation and to the Unit 1 control room outdoor air intake.*

NSPM Response:

As indicated by Figure 4, the elevator shaft does not extend to the roof at Elevation 775', and the elevator does not have a rooftop equipment room. Thus, there is no potential for a flow path from the main steam line break into the elevator shaft in the Auxiliary Building out through a rooftop equipment room.

RAI 5:

The auxiliary building ventilation make-up air intakes are evaluated as a release point for a RWST release. Please discuss the potential for a release through the auxiliary building ventilation make-up air intakes from a main-steam line break through the ventilation system (back through the fan isolation damper and through the make-up air fan). If the continued operation of the ventilation system during the main-steam line break is credited for preventing such a release, please discuss how the reliability of system operation is justified.

NSPM Response:

There are significant design features that differentiate the postulated Refueling Water Storage Tank (RWST) release (through the auxiliary building makeup air intakes) from a potential MSLB release scenario. Most significantly, the postulated RWST release path during a loss of coolant accident (LOCA) would occur entirely outside the Auxiliary Building Special Ventilation System (ABSVS) boundary, whereas a MSLB occurring in the auxiliary building would have to penetrate the ABSVS boundary to result in a radiological release at this location.

The auxiliary building normal intake system is located in an equipment room outside of the Auxiliary Building Special Ventilation Zone (ABSVZ) boundary. In the direction of normal makeup flow, the intake system consists of controlled louvers (automatically close in response to a SI signal), makeup fan, controlled discharge damper

(automatically closes in response to a SI signal), and a short section of ductwork that penetrates the ABSVZ boundary wall.

For the post-LOCA event, the release path from the RWST vent occurs entirely outside the ABSVZ boundary: i.e., from the RWST through the tank vent, through an access opening in the RWST enclosure into the Auxiliary Building Normal Ventilation System (ABNVS) equipment room where it could seep into ABNVS and pass out the closed louvers, as described in Reference 1. In this scenario, seepage into the ABNVS is postulated even though the RWST enclosure / equipment room would be at the same atmospheric pressure as the pressure inside of the system.

For a MSLB event originating in the Auxiliary Building, the release would have to seep through the ABSVZ boundary, which is precluded by the closure of the dampers that establish the ABSVZ boundary.

The system performance described above is based on actuating the ABSVS and securing the ABNVS. Therefore, preventing a MSLB release through the makeup air intakes does not rely on continued operation of the ABNVS.

RAI 6:

Attachment 1 of L-PI-09-056 (ADAMS Accession No. ML091210703) shows a vent pipe above the roof on the north side of the auxiliary building high bay area (drawing coordinates J.3, 6.7 and J.3, 11.3). Please identify what is vented from this pipe and if this vent can be a release point during any accident.

NSPM Response:

The two cited drawing coordinates do not relate to any pipe that vents to the environment. Rather, the coordinates relate to the Containment Purge Cross-Over Duct that traverses the roof. This 48-inch diameter duct exits the Unit 2 Auxiliary Building (at location J.3,11.3), runs across the roof to the Unit 1 side of the Auxiliary Building, and re-enters the Auxiliary Building at location J.3, 6.7. (See Figure 5 for a description of this cross-over duct.) Therefore, this duct does not represent a potential release point during an accident.

References:

1. NSPM Letter to US NRC, "License Amendment Request (LAR) to Adopt the Alternative Source Term Methodology," dated October 27, 2009 (ADAMS Accession No. ML093160583)
2. NSPM letter to US NRC, L-PI-10-076, "Response to Request for Additional Information RE: License Amendment Request to Adopt the Alternative Source Term Methodology", dated August 12, 2010 (ADAMS Accession No. ML102300295)

Figure 5 – Excerpt from PINGP Drawing NF-39609-16