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Nuclear Management Company, LLC
Prairie Island Nuclear Generating Plant
1717 Wakonade Dr. East • Welch MN 55089

January 15, 2001

Generic Letter 88-20

U S Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

PRAIRIE ISLAND NUCLEAR GENERATING PLANT
Docket Nos. 50-282 License Nos. DPR-42
50-306 DPR-60

Response to Requests for Additional Information Regarding Report NSPLMI-96001, Individual Plant Examination of External Events (IPEEE), Related to Generic Letter 88-20 (TAC Nos. M88663 and M88664)

In December 1996 and October 1998, we submitted, respectively, report NSPLMI-96001, PINGP Individual Plant Examination for External Events (IPEEE) and Revision 1 to that report, in response to Generic Letter 88-20. The NRC issued a Request for Additional Information (RAI) May 20, 1999 and we responded with a letter dated September 17, 1999. One of the areas of concern of the May 1999 RAI was the IPEEE treatment of flooding due to "probable maximum precipitation." Our response to the "flood" question prompted the following clarifying question from the NRC, transmitted by FAX on July 13, 2000:

> "Specifically, we were looking for the higher intensity rainfall that can occur over short periods of time (like 1 hour) rather than the milder 24 hour level."

This clarification led us to perform a calculation which addresses the concern raised by the NRC review. The calculation is enclosed with this letter.

In this letter we have made no new Nuclear Regulatory Commission commitments. Please contact Jack Leveille (651-388-1121, Ext. 4142) if you have any questions related to this letter.

Joel P. Sorensen
Site General Manager
Prairie Island Nuclear Generating Plant

c: (see next page)

A011

c: Regional Administrator - Region III, NRC
Senior Resident Inspector, NRC
NRR Project Manager, NRC
J E Silberg

Enclosures:
1. Affidavit
2. PRA File V.SMN.00.003, Flooding from Probable Maximum Precipitation

UNITED STATES NUCLEAR REGULATORY COMMISSION

NUCLEAR MANAGEMENT COMPANY, LLC

PRAIRIE ISLAND NUCLEAR GENERATING PLANT

DOCKET NO. 50-282
50-306

GENERIC LETTER 88-20, INDIVIDUAL PLANT EXAMINATION OF EXTERNAL EVENTS FOR SEVERE ACCIDENT VULNERABILITIES - 10 CFR 50.54(f)

Nuclear Management Company, LLC, a Wisconsin corporation, with this letter is submitting information requested by requests for additional information related to NRC Generic Letter 88-20.

This letter contains no restricted or other defense information.

NUCLEAR MANAGEMENT COMPANY, LLC

By _____
Joel P. Sorensen
Site General Manager
Prairie Island Nuclear Generating Plant

State of Minnesota
County of Goodhue
On this 15th day of January 2001 before me a notary public in and for said County, personally appeared Joel P. Sorensen, Site General Manager, Prairie Island Nuclear Generating Plant, and being first duly sworn acknowledged that he is authorized to execute this document on behalf of Nuclear Management Company, LLC, that he knows the contents thereof, and that to the best of his knowledge, information, and belief the statements made in it are true.

Jack Leveille

JACK ALAN LEVEILLE
NOTARY PUBLIC - MINNESOTA
My Comm. Expires Jan. 31, 2005

PRA File V.SMN.00.003
Flooding from Probable Maximum Precipitation

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1. U.S. Nuclear Regulatory Commission Generic Letter 89-22, Potential for Increased Roof Loads and Plant Area Flood Runoff Depth at Licensed Nuclear Power Plants due to Recent Change in Probable Maximum Precipitation Criteria Developed by the National Weather Service, October 19, 1989, 2 pages.

2. Tae Kim, Office of Nuclear Regulation, U.S. Nuclear Regulatory Commission, Letter, Prairie Island Nuclear Generating Plant: Request for Additional Information Concerning IPEEE Program, May 20, 1999, Docket Nos. 50-282 and 50-306, 9 pages.

3. Roger O. Anderson, Nuclear Energy Engineering, Northern States Power Company, Letter, Response to Request for Additional Information Regarding Report NSPLMI, Individual Plant Examination of External Events (IPEEE), Related to Generic Letter 88-20, September 16, 1999, 24 pages.
4. Nuclear Regulatory Commission FAX to Northern States Power Company, Prairie Island IPEEE, July 13, 2000, 8 pages.

All sections of this file prepared by R. H. Hansen Date 12/20/00

1.0 Objective Statement:

From NOAA Hydrometeorological Report (HMR) No. 52, the Probable Maximum Precipitation for 1 square mile in 1 hour at the Prairie Island site is 17 inches [1]. This calculation evaluates the effect of this locally intense rainfall event on the Core Damage Frequency of Prairie Island Nuclear Generating Plant.

Background:

The Prairie Island Nuclear Generating Plant Individual Plant Examination of External Events (IPEEE) [2] responded to Generic Letter 89-22, "Potential for Increased Roof Loads and Plant Area Runoff Depth" [3] by stating the Appendix F of the Prairie Island USAR describes a flood level whose probability approaches zero and therefore bounds any flood levels calculated per Generic Letter 89-22. Generic Letter 89-22 was issued to inform licensees that the criteria used in National Oceanic and Atmospheric Administration (NOAA), National Weather Service (NWS) Hydrometeorological Reports (HMR) 49, 51, 52, 53 and 55 should be used to determine the effects of Maximum Probable Precipitation.

By letter dated May 20, 1999 [4] the NRC requested additional information regarding the basis for claiming that the flood levels determined in the Prairie Island USAR would bound any levels calculated using the Generic Letter 89-22 criteria. In response Prairie Island calculated flood levels for a 24 hour period using NOAA/NWS HMR 51 and showed they are indeed bounded by the levels stated in the USAR [5].

On July 13, 2000, the NRC clarified their original request by FAX, stating that they were specifically looking for the effects of 1 hour, 1 square mile locally intense rainfall as determined in HMR 52 [6]. As stated before, this rainfall at Prairie Island is 17 inches. Precipitation of this magnitude over a very short period of time can be expected to result in water levels higher than the ground floor levels of plant buildings with little or no warning, hence no time to install additional flood barriers.

This calculation addresses Prairie Island's vulnerability to flooding from locally intense rainfall as determined using HMR 52.

2.0 Assumptions:

The following assumptions were made for this calculation:

1. The assessment is limited to effect on Core Damage Frequency only.
2. The locally intense rainfall is assumed to cause a Loss of Offsite Power.
3. The frequency of this event is conservatively assumed to be 10% of the weather related contribution to plant Loss of Offsite Power initiating event frequency
4. Recovery of offsite power is not credited.
5. Due to proximity, 480V Motor Control Centers are affected by the same flood as their loads

3.0 Methodology:

The Loss of Offsite Power accident sequences in the Prairie Island PRA were analyzed to determine those systems required to mitigate that event. A walkdown of those systems was then performed to determine their sensitivity to locally intense rainfall. The systems and their locations are listed in Table 1. The walkdown results conclude that there is no impact on plant safety systems due to PMP. (Attachment 1)

The Conditional Core Damage Frequency from Probable Maximum Precipitation (PMP) can be described simply as:

$CCDF_{PMP} = A*B*C*D$ where

A = Frequency of PMP
B = Probability of Loss of Offsite Power due to PMP
C = Probability of Operator failure to restore offsite power
D = Unavailability of safety functions that respond to the PMP induced Loss of Offsite Power

Furthermore, the unavailability of safety functions responding to the PMP can be expressed as the Birnbaum Factor of Loss of Offsite Power, so

$D = BB_{LOOP}$

4.0 Results:

The weather contribution to Loss of Offsite Power Frequency at Prairie Island is 3.16E-2 [7], so

A = (0.1)(3.16E-2) = 3.16E-3 (Assumption 3)

The PMP is assumed to cause a Loss of Offsite Power so

B = 1.0 (Assumption 2)

Recovery of offsite power is not credited, so

C = 1.0 (Assumption 4)

The Birnbaum Factor of the Loss of Offsite Power initiating event was calculated to be 1.63E-4, so

$D = BB_{LOOP} = 1.63E\text{-}4$

The Conditional Core Damage Frequency of the PMP event for Prairie Island Nuclear Generating Plant then is:

$CCDF_{PMP} = A*B*C*D = (3.16E\text{-}3)(1.0)(1.0)(1.63E\text{-}4) = \underline{5.15E\text{-}7 \text{ events/year}}$

Conclusion: The locally intense rainfall from Probable Maximum Precipitation does not have a significant impact on risk at Prairie Island Nuclear Generating Plant.

5.0 References

1. E.M. Hansen, L.C. Schreiner and J.F. Miller, NOAA Hydrometeorological Report No. 52, Application of Probable Maximum Precipitation Estimates – United States East of the 105th Meridian, Washington, D.C.: National Weather Service, 1982.
2. Prairie Island Nuclear Generating Plant Report NSPLMI-96001, Individual Plant Examination of External Events, Revision 1, Minneapolis, MN, 1998, § C.2.3.2
3. U.S. Nuclear Regulatory Commission Generic Letter 89-22, Potential for Increased Roof Loads and Plant Area Flood Runoff Depth at Licensed Nuclear Power Plants due to Recent Change in Probable Maximum Precipitation Criteria Developed by the National Weather Service, October 19, 1989
4. Tae Kim, Office of Nuclear Regulation, U.S. Nuclear Regulatory Commission, Letter, Prairie Island Nuclear Generating Plant: Request for Additional Information Concerning IPEEE Program, May 20, 1999, Docket Nos. 50-282 and 50-306.
5. Roger O. Anderson, Nuclear Energy Engineering, Northern States Power Company, Letter, Response to Request for Additional Information Regarding Report NSPLMI, Individual Plant Examination of External Events (IPEEE), Related to Generic Letter 88-20, September 16, 1999
6. Nuclear Regulatory Commission FAX to Northern States Power Company, Prairie Island IPEEE, July 13, 2000
7. Prairie Island Nuclear Generating Plant Calculation V.SMD.96.005, Recalculation of LOOP Initiator, August 2, 1996

System	Location	Comments
D1 Emergency Generator	Service Building 695' Level	See Attachment
D2 Emergency Generator	Service Building 695' Level	See Attachment
D5 Emergency Generator	SBO Building 695' Level	See Attachment
D6 Emergency Generator	SBO Building 695' Level	See Attachment
Component Cooling	Auxiliary Building 695' Level	See Attachment
Charging	Auxiliary Building 695' Level	See Attachment
Residual Heat Removal	Auxiliary Building 695' Level	See Attachment
Auxiliary Feedwater	Safeguards Corridor 695' Level	See Attachment
DC Power	Safeguards Corridor 695' Level	See Attachment
Instrument Power	Safeguards Corridor 695' Level	See Attachment
Station Air	Safeguards Corridor 695' Level	See Attachment
Cooling Water	Screenhouse 695' Level	See Attachment
Unit 1 4KV AC Buses	Safeguards Corridor 715' Level	Well above flood level
Unit 1 480V AC Buses	Safeguards Corridor 715' Level	Well above flood level
Unit 2 4KV AC Buses	SBO Building 718' Level	Well above flood level
Unit 2 480V AC Buses	SBO Building 735' Level	Well above flood level
Pressurizer Power Operated Relief Valves	Containment	Containment unaffected by flood
Accumulators	Containment	Containment unaffected by flood

Table 1: Summary of PMP Affected Equipment

Attachment 1: Walkdown of Prairie Island Nuclear Generating Plant for Effects of Locally Intense Rainfall

Topography

The ground floors of all affected buildings are at 695' above sea level. Typically the ground elevation at the edges of these buildings is at 694.5' and slopes downward away from the buildings. Runoff on the West of the Turbine and Auxiliary Buildings is carried away by a ditch which ends in the Cooling Tower area south of the plant. Runoff on the East of the Turbine and Auxiliary Buildings is carried away by a ditch that empties into the Recycle Canal. The grade leading from the West door of the Screenhouse drops quickly from 695' elevation to 689' elevation in 116'. At the low point is a catch basin that empties into the Intake Canal. Runoff from the East side of the Screenhouse is carried away by a ditch that empties into the Transformer Oil Sump and into the Recycle Canal.

NOTE: The walkdown included inspection of applicable safety systems and their support systems.

Service Building, 695' Level

The Service Building is located on the East side of the Auxiliary Building. There is an exterior door on the Southeast corner and the building is open to the Turbine Building to the North. D1 and D2 diesel Generators are in separate rooms within the Service Building, behind Vital Area Access Doors that open out into the Service Building. Most of the water from the Southeast door will be diverted to the remainder of the Service Building and eventually to the Turbine Building Sump. Water from the Turbine Building would be minimal as most would flow into the Condenser Pit. Ingress into the D1 and D2 Rooms is limited to whatever can seep under the doors. Any water which enters the D1 and D2 rooms may eventually block the subfloor portion of room ventilation. Failure of ventilation and subsequent diesel failure if flooding is unchecked would take several hours. Furthermore, by procedure operators are dispatched to the D1 and D2 Generators as a normal response to Loss of Offsite Power or any automatic start to verify and assure proper operation of the Diesel Generators.

SBO Building, 695'Level

The SBO building is located on the West side of the Auxiliary Building. The ground floor of the SBO Building is at 695' elevation above sea level. It has 3 exterior Vital Area Access doors, each of which opens out from the building, which are subject to flooding. Water seeping under the Northeast door is blocked by 2 additional interior doors before reaching any vital D5 or D6 equipment. Water seeping under the 2 West doors will be collected in the D5 and D6 sumps. Sump level is annunciated and the operators are instructed to restore that level to normal. Additionally, by procedure operators are

dispatched to the D5 and D6 Generators as a normal response to Loss of Offsite Power or any automatic start to verify and assure proper operation of the Diesel Generators.

Auxiliary Building, 695' Level

The Auxiliary Building is bounded on the North by the Turbine Building and on the South by the Fuel Receipt Building. There are no openings to the East or West. Water ingress from the North is limited to whatever does not flow into the Turbine Building Condenser Pits. It is blocked by locked close Ventilation Boundary Doors that open out into the Unit 1 Turbine Building and Unit 2 D3 Storage Room, which is on the South wall of the Turbine Building. Water ingress from the South is blocked by closed rollup doors on the East and West sides of the Fuel Receipt Building and closed Ventilation Boundary Airlock doors leading from the Fuel Receipt Building into the Auxiliary Building. These are double sets of doors that open away from the Auxiliary Building.

Safeguards Corridor, 695' Level

The Safeguards Corridor, 695' Level is located on the ground level of the Turbine Building in the center Safeguards area between Unit 1 and Unit 2. The Station Batteries, Instrument Inverters, Auxiliary Feedwater Pumps and Station Air Compressors are in closed rooms in the Safeguards Corridor. The Vital Area Access doors to these rooms open outward toward the Turbine Building. Ingress of water from PMP rainfall towards these rooms would be through the East and West turbine Building Rollup Doors. These doors would likely be open. The West Rollup Door is 282.5' from the Train A Auxiliary Feedwater Pump Room. Water flowing toward the Safeguards Corridor would be intercepted by 3 pipe trenches across the path from the rollup door that drain into the Condenser Pit immediately North of the flowpath. The trenches are large enough to prevent water ingress into the Safeguards Corridor. The flowpath from the East Rollup Door toward the Safeguards Corridor is similar except that it is an additional 90' long.

Screenhouse, 695' Level

The Screenhouse has 2 openings, a rollup door on the West side and a 36" common door on the East side. Both doors are assumed open. Runoff on the West side is considered sufficient to prevent significant ingress of water from the PMP. The door on the East side is 6" above grade. Ingress of water would be intercepted by the stairway to the lower level of the Screenhouse, where there is no equipment supporting any safety function, or blocked by the closed Vital Area Access door leading to the Emergency Cooling Water Pumps, which opens out from the pump room.

Conclusion

This walkdown shows that a locally intense rainfall on the order of a PMP will have no impact on plant safety systems.